2022 CAT

IATF 16949 ISO 14001

ALUMINUM ELECTROLYTIC
CAPACITORS

- Conductive Polymer Aluminum Solid Capacitors
- Surface Mount Aluminum Electrolytic Capacitors
- Miniature Aluminum Electrolytic Capacitors
- Large Sized Aluminum Electrolytic Capacitors

SamYoung Electronics Co.,Ltd.

CONDUCTIVE POLYMER ALUMINUM SOLID CAPACITORS

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AXV 105℃ 2,000~5,000Hrs SMD type Super Low ESR — P 19

APV 125℃ 2,000Hrs SMD type Wide Temp. — P 21

AHV 105℃ 2,000~5,000Hrs SMD type High Voltage — P 23

AQV 125℃ 4,000Hrs SMD type Wide Temp. — P 25

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NXH 105℃ 6,000~10,000Hrs Low Impedance Long Life — P 124

NXQ 105℃ 6,000~10,000Hrs Low Impedance Long Life, High Ripple — P 127

NXW 105℃ 6,000~10,000Hrs Low Impedance Long Life, High Ripple — P 130

High Reliability

NXE 105℃ 3,000~4,000Hrs Ultra Low ESR — P 132

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PFB 130℃ 8,000~10,000Hrs Wide temperature range — P 193

PHA 150℃ 2,000Hrs Wide temperature range — P 195

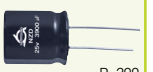
Special Applications

AHS
85℃ 2,000Hrs
For HI-FI Audio

P 197

PHL
5~35℃
5,000Times
For photo flash

P 199

NZD
105℃ 5,000Hrs
Air-bag

P 200

NZK
105℃ 5,000Hrs
Air-bag

P 202

NZH
105℃ 2,000Hrs
High ripple 550v
Surge

P 204

NZR
105℃ 2,000Hrs
High ripple 550v
Surge

P 206

NLF
105℃ 5,000Hrs
Flame Retardant
electrolyte type

P 208

LARGE TYPES

PCB Terminals

RDC
85℃ 2,000Hrs

P 209

TDA
105℃ 2,000Hrs

P 213

TDC
105℃ 2,000Hrs
Downsized

P 217

TEA
105℃ 2,000Hrs
Height 15mm

P 220

RLS
85℃ 3,000Hrs
Long Life

P 222

RLB
85℃ 3,000Hrs
High ripple

P 225

RLC
85℃ 5,000Hrs
Long Life

P 227

TLA
105℃ 3,000Hrs
Long Life

P 230

TLS
105℃ 3,000Hrs
High ripple

P 233

TLG
105℃ 3,000Hrs
High ripple, Low Temp

P 236

TLJ
105℃ 3,000Hrs
High ripple, Low Temp

P 239

TLK
105℃ 3,000Hrs
High ripple

P 241

TLR
105℃ 3,000Hrs
High ripple

P 243

TLC(LXG)
105℃ 5,000Hrs
Long Life

P 245

TLB
105℃ 7,000Hrs
Long Life

P 249

TLL
105℃ 10,000Hrs
Long Life

P 252

UDA
125℃ 1,000Hrs
Wide Temperature range

P 254

Screw-Bolt Terminals

TGA(KMH)
105℃ 2,000Hrs
General
Wide temperature range

P 264

RGB
85℃ 2,000Hrs
For Inverter
High ripple capability
High voltage

P 268

RFC(RWF)
85℃ 5,000Hrs
For Inverter
High ripple capability
Long Life

P 271

RFA
85℃ 8,000~20,000Hrs
For Inverter
High ripple capability
Long Life

P 273

TFA
105℃ 2,000~5,000Hrs
For Inverter
High ripple capability
Wide temperature range

P 275

Special Applications

RVA
85℃ 2,000Hrs
No sparks with
DC overvoltage

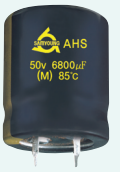
P 256

TVA
105℃ 2,000Hrs
No sparks with
DC overvoltage

P 258

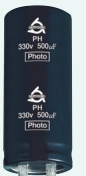
DL
85℃ 2,000Hrs
General Audio grade

P 260

AHS
85℃ 2,000Hrs
HI-FI Audio grade

P 261

TZF
105℃ 2,000Hrs
Flame Retardant
electrolyte type

P 263

PH
5~35℃ 5,000Times
For photo flash

P 277

DH
40℃ 1,000,000Times
For welding machine

P 278

ISO International Organization for Standardization

bsi.

Certificate of Registration

QUALITY MANAGEMENT SYSTEM - IATF 16949:2016

This is to certify that: Samyoung Electronics Co., Ltd.
47, Sagimakgol-ro
Jungwon-gu
Seongnam-si
Gyeonggi-do
13209
Republic of Korea

operates a Quality Management System which complies with the requirements of IATF 16949:2016 for the following scope:

The design and manufacture of aluminium electrolytic capacitors and aluminium solid capacitors.

For and on behalf of BSI: Managing Director, NE Asia Region - Peter Pu

BSI Certificate Number: 603336
IATF Number: 0415069

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...making excellence a habit.™

Certification Date: 2021-07-28 Latest Issue: 2021-07-28 Expiry Date: 2024-07-27

This certificate was issued electronically and remains the property of BSI and is bound by the conditions of contract.
An electronic certificate can be authenticated online.
Printed copies can be validated at www.bsigroup.com/ClientDirectory or telephone +82 2 777 4123.
IATF Contracted Office: BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.

BSI Group Korea, 8F Taehwa Bldg. 29, Insadong 5-gil, Jongno-gu, Seoul, 03162, Korea
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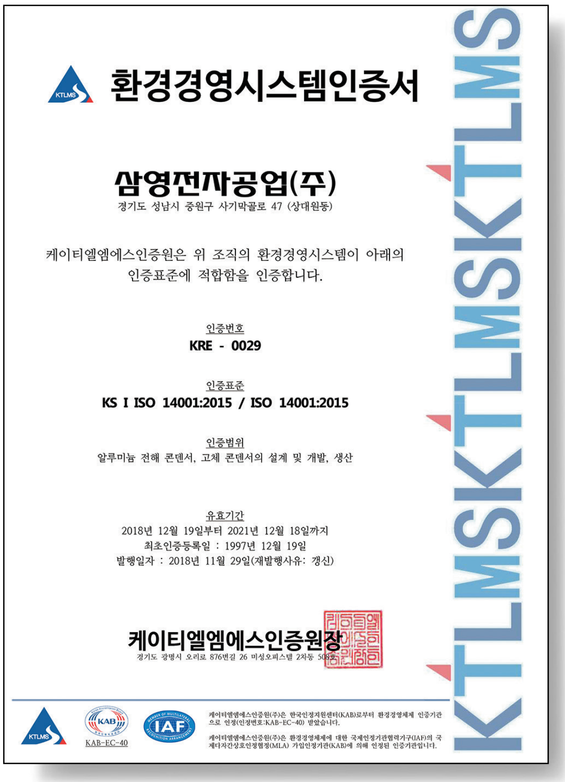

환경경영시스템인증서

삼영전자공업(주)
경기도 성남시 중원구 사기막골로 47 (상대원동)

케이티엘엠에스인증원은 위 조직의 환경경영시스템이 아래의 인증표준에 적합함을 인증합니다.

인증번호
KRE - 0029

인증표준
KS I ISO 14001:2015 / ISO 14001:2015

인증범위
알루미늄 전해 콘덴서, 고체 콘덴서의 설계 및 개발, 생산

유효기간
2018년 12월 19일부터 2021년 12월 18일까지
최초인증등록일 : 1997년 12월 19일
발행일자 : 2018년 11월 29일(재발행사유: 갱신)

케이티엘엠에스인증원장
경기도 광명시 오리로 876번길 26 미성오피스텔 2차동 508호

KAB-EC-40

케이티엘엠에스인증원(주)은 한국인정지원센터(KAB)로부터 환경경영체제 인증기관으로 인정(인정번호:KAB-EC-40) 받았습니다.

케이티엘엠에스인증원(주)은 환경경영체제에 대한 국제인정기관협력기구(IAF)의 국제다자간상호인정협정(MLA) 가입인정기관(KAB)에 의해 인정된 인증기관입니다.

KTLMSKTLMSKTLMS

CERTIFICATE OF ENVIRONMENTAL MANAGEMENT SYSTEMS

SAMYOUNG ELECTRONICS Co., Ltd.
47, Sagimakgol-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

This is to certify that the Environmental Management Systems of this organization has been found to conform to the below Certification Standard by KTLMS

Certificate No.
KRE - 0029

Certification Standard
KS I ISO 14001:2015 / ISO 14001:2015

Certification Scope
Design & development, production of ALUMINUM ELECTROLYTIC CAPACITORS and SOLID CAPACITORS

Period of Validity
from 19 December 2018 until 18 December 2021
Initial Registration Date : 19 December 1997
Date of Issue : 29 November 2018

President
KTLMS Co., Ltd.
2-508, Mi Seong Officetel, 26, Ori-ro 876beon-gil, Gwangmyeong-si, Gyeonggi-do, Korea

KAB-EC-40

KTLMS has been accredited as a certification body of Environmental Management System from KAB(Accreditation Number : KAB-EC-40)

KTLMS is a certification body that has been accredited by the accreditation body that has been registered in the Multilateral Recognition Arrangement (MLA) of the International Accreditation Forum(IAF)

KTLMSKTLMSKTLMS

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■ CONDUCTIVE POLYMER ALUMINUM SOLID CAPACITORS (reALcap™)

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Conductive Polymer Aluminum Solid Capacitors(reALcap™)	Surface mount	ASV	Vertical type, 105°C, Low ESR	105°C 2,000~5,000hrs		●		●	●	SMD	4~25	10~820	17
		AXV	Vertical type, 105°C, Super Low ESR	105°C 2,000~5,000hrs			●	●	●	SMD	4~25	47~2,200	19
		APV	Vertical type, 125°C, High Temperature	125°C 2,000hrs				●	●	SMD	10~25	8.2~82	21
		AHV Upgrade	Vertical type, 105°C, High Voltage	105°C 2,000~5,000hrs					●	SMD	16~100	10~470	23
		AQV	Vertical type, 125°C, High Voltage/Temperature	125°C 4,000hrs					●	SMD	50~80	10~68	25
	Radial	ASA	Radial type, 105°C, Low ESR	105°C 2,000~5,000hrs		●		●	●	Radial	4~25	10~1,200	27
		AXA	Radial type, 105°C, Super Low ESR	105°C 2,000~5,000hrs			●	●	●	Radial	4~25	47~1,800	29
		APA	Radial type, 125°C, High Temperature	125°C 2,000hrs				●	●	Radial	10~25	8.2~82	31
		AHA Upgrade	Radial type, 105°C, High Voltage	105°C 2,000~5,000hrs					●	Radial	16~100	10~560	33
		AQA	Radial type, 125°C, High Voltage/Temperature	125°C 4,000hrs					●	Radial	50~80	10~82	35

■ SURFACE MOUNT ALUMINUM ELECTROLYTIC CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Surface mount	General Purpose	MVG	5.5~22.0mm max. Height	85°C 2,000hrs	●				●	SMD	4~450	0.1~10,000	53
		BDS(MVK)	5.5~22.0mm max. Height	105°C 1,000~2,000hrs		●			●	SMD	6.3~450	0.1~6,800	55
		BDR	5.5~10.5mm max. Height, Downsized	105°C 1,000~2,000hrs	●				●	SMD	6.3~100	4.7~1,200	57
		BXA	5.6~10.5mm max. Height, Low Imp.	105°C 1,000~2,000hrs			●		●	SMD	6.3~50	2.2~1,500	59
		BXE	5.6~10.5mm max. Height, Very Low Imp.	105°C 1,000~2,000hrs			●		●	SMD	6.3~35	4.7~1,500	61
		BXJ	5.6~14.0mm max. Height, Low Imp., Long Life	105°C 2,000~5,000hrs			●	●	●	SMD	6.3~100	4.7~2,200	63
		BXF	5.5~10.5mm max. Height, Ultra Low ESR	105°C 2,000hrs			●		●	SMD	6.3~50	68~1,500	65
		BXQ	6.1~14.0mm max. Height, Downsized, Ultra Low ESR	105°C 2,000hrs			●		●	SMD	6.3~50	47~2,200	67
		BXW NEW	8~10.5mm max. Height, Ultra Low ESR, Long Life	105°C 3,000~5,000hrs			●		●	SMD	6.3~50	68~2,200	69
		BDA	5.5~6.0mm max. Height, Long Life	105°C 2,000hrs				●	●	SMD	4~50	1~100	71
		BLA	5.5~14.0mm max. Height, Long Life	105°C 5,000hrs				●	●	SMD	4~400	1~1,000	73
		BLH	10.5~14.0mm max. Height, Long Life	105°C 10,000hrs				●	●	SMD	10~50	33~1,000	75
		CLZ	5.5~22.0mm max. Height, Wide Temp., Low ESR	125°C 1,000~5,000hrs			●	●	●	SMD	10~400	2.2~4,700	77
		CLX	10.5~14.0mm max. Height, Wide Temp., Ultra Low ESR	125°C 2,000~4,000hrs			●	●	●	SMD	10~50	33~1,000	79
		CLS	6.0~10.5mm max. Height, Downsized, Ultra Low ESR	125°C 2,000hrs			●		●	SMD	10~50	47~470	81
		CLU NEW	8~10.5mm max. Height, Downsized, Ultra Low ESR, Long Life	125°C 3,000~5,000hrs			●		●	SMD	10~50	47~680	83
		VDA	10.5~14.0mm max. Height, Wide Temp.	150°C 1,000hrs				●	●	SMD	10~50	47~1,000	85
	Bi-Polar	MVG(MV)-BP	5.5mm max. Height, Bi-polar	85°C 2,000hrs					●	SMD	4~50	1~47	87
		BDS(MVK)-BP	5.5~6.0mm max. Height, Bi-polar	105°C 1,000hrs				●	●	SMD	6.3~50	1~47	87

■ MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Miniature	Low Profile	GSA / GZA	7mm Height / Reflow Application	85°C 2,000hrs	●					Radial	6.3~63	0.1~470	90
		HMA	7mm Height, Wide temp., Long Life	105°C 2,000hrs				●		Radial	6.3~50	0.1~150	92
		HXB	9mm Height, Low Imp.	105°C 1,000~2,000hrs			●	●		Radial	6.3~50	1~390	93
		HXE	9mm Height, Ultra Low Imp.	105°C 2,000hrs			●	●		Radial	6.3~35	4.7~390	94
		HXL	9mm Height, Low Imp., Long Life	105°C 2,000~3,000hrs			●	●		Radial	6.3~50	1~390	96
		HML	9mm Height., Long Life	105°C 3,000~5,000hrs			●	●		Radial	6.3~50	1~390	97
	General Purpose	MHA	High Capacitance, Downsized	85°C 2,000hrs	●					Radial	6.3~500	1~15,000	98
		NHA	High Capacitance, Downsized	105°C 1,000~2,000hrs	●					Radial	6.3~500	1~15,000	100
	Low Leakage	GSA-LL / LL	Height 7mm / General	85°C 2,000hrs		●				Radial	6.3~100	1~4,700	102
	Bi-polar	GSA-BP	7mm Height	85°C 2,000hrs		●				Radial	6.3~50	1~47	104
		MHA-BP	General	85°C 2,000hrs		●				Radial	6.3~250	3.3~6,800	105
		NHA-BP	General, Wide Temp.	105°C 1,000hrs		●			●	Radial	6.3~250	3.3~6,800	107
	ESR. Low Imp.	NXL(LXV)	Low Imp., Long Life	105°C 2,000~5,000hrs			●	●	●	Radial	6.3~100	1~15,000	109
		NXP(LXZ)	Low Imp., Long Life	105°C 2,000~5,000hrs			●	●	●	Radial	6.3~50	22~18,000	112
		NXR	Low Imp., Long Life	105°C 4,000~7,000hrs			●	●	●	Radial	6.3~35	330~12,000	114
		NXA	Low Imp., Long Life	105°C 4,000~10,000hrs			●	●		Radial	6.3~100	1~18,000	116
		NXB	Low Imp., Long Life	105°C 2,000~5,000hrs			●	●		Radial	6.3~120	1~8,200	119
		NXK	Low Imp., Long Life, High Ripple	105°C 4,000~5,000hrs			●	●		Radial	10~50	100~2,700	122
		NXH	Low Imp., Long Life	105°C 6,000~10,000hrs			●	●		Radial	6.3~100	2.2~10,000	124
		NXQ	Low Imp., Long Life, High Ripple	105°C 6,000~10,000hrs			●	●		Radial	6.3~120	8.2~8,200	127
		NXW	Low Imp., Long Life, High Ripple	105°C 6,000~10,000hrs			●	●		Radial	6.3~50	27~8,200	130

LIST OF PRODUCTS

■ MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

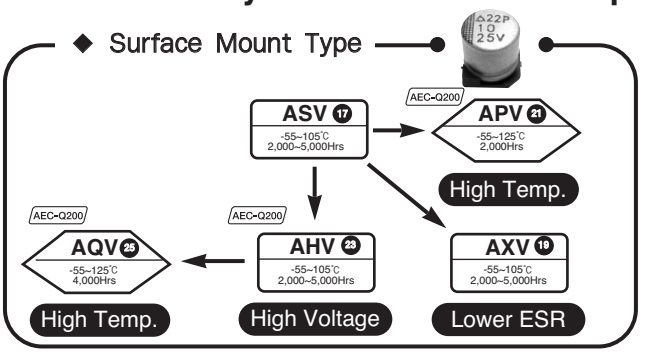
Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Miniature	ESR. Low Imp.	NXE	Ultra Low ESR, Long Life	105℃ 3,000~4,000hrs			●	●		Radial	6.3~35	150~3,300	132
		NXG	Ultra Low ESR, Long Life, High Ripple	105℃ 3,000~4,000hrs			●	●		Radial	6.3~35	150~3,300	134
	High Reliability	MLB	Long Life	85℃ 8,000hrs				●		Radial	400~500	10~150	136
		MLC	Long Life	85℃ 10,000hrs				●		Radial	400~500	10~150	138
		NZE	High Ripple	105℃ 2,000hrs		●				Radial	160~500	3.3~1,000	140
		NZL	Long Life, High Ripple	105℃ 3,000hrs		●				Radial	400~500	10~150	143
		NFC	Long Life, High Ripple	105℃ 2,000~5,000hrs				●		Radial	160~500	3.3~1,000	145
		NFK	Long Life, High Ripple	105℃ 5,000hrs				●		Radial	160~500	4.7~1,000	148
		NFS	Long Life, High Ripple	105℃ 5,000hrs				●		Radial	200~500	6.8 ~ 150	151
		NBA	Long Life, High Ripple, Low Temp.	105℃ 3,000~5,000hrs				●		Radial	160~500	1~1,000	153
		NBR	Long Life, High Ripple, Low Temp.	105℃ 3,000~5,000hrs				●		Radial	160~550	1~470	156
		NBS	Long Life, High Ripple, Low Temp.	105℃ 5,000hrs				●		Radial	160~500	6.8~470	159
		NFA	Long Life, High Ripple	105℃ 7,000~10,000hrs				●		Radial	160~500	2.2~1,000	161
		NFL	Long Life, High Ripple	105℃ 8,000~12,000hrs				●		Radial	160~500	33~180	164
		NFR	Long Life, High Ripple	105℃ 8,000~12,000hrs				●		Radial	160~500	1~470	167
		NBC	Long Life, High Ripple, Low Temp.	105℃ 5,000~12,000hrs				●		Radial	160~500	1~1,000	170
		NBF NEW	Long Life, High Ripple, Low Temp.	105℃ 12,000hrs				●		Radial	450~500	33~180	173
		NBD	Long Life, High Ripple, Low Temp.	105℃ 10,000~12,000hrs				●		Radial	160~500	6.8~470	175
		NBL	Long Life, High Ripple, Low Temp.	105℃ 15,000~20,000hrs				●		Radial	160~500	3.3~470	177
		NBH	Long Life, High Ripple, Low Temp.	105℃ 20,000hrs				●		Radial	160~500	33~470	179
		NLA	Long Life	105℃ 4,000~10,000hrs			●	●		Radial	6.3~50	10~18,000	181
		NLC	Long Life	105℃ 10,000hrs			●	●		Radial	6.3~100	1~680	183
		PXB	Wide Temp., Low Imp., Long Life	125℃ 2,000~5,000hrs			●	●	●	Radial	10~450	1~4,700	185
		PXD	Wide Temp., Ultra Low Imp., Long Life	125℃ 2,000~5,000hrs			●	●	●	Radial	10~80	10~4,700	187
		PFA	Wide Temp., Low ESR	135℃ 2,000hrs			●	●	●	Radial	10~100	180~14,000	189
		PFD NEW	Wide Temp.	125℃ 5,000hrs / 135℃ 2,000hrs			●	●	●	Radial	50~80	470~3,600	191
		PFB	Wide temp.,Long life,High Voltage	130℃ 8,000~10,000hrs				●		Radial	400~500	18~150	193
		PHA	Wide Temp.	150℃ 2,000hrs				●	●	Radial	10~50	100~3,300	195
	Special Application	AHS	Audio Grade	85℃ 2,000hrs	●					Radial	10~100	1~10,000	197
		PHL	For Photo Flash	5~35℃ 5,000times						Radial	300~330	5~160	199
		NZD	Air Bag	105℃ 5,000hrs				●	●	Radial	25~35	1,100~15,000	200
		NZK NEW	Air Bag	105℃ 5,000hrs				●	●	Radial	25~35	2,800~14,000	202
		NZH	High Ripple, 550V Surge	105℃ 2,000hrs						Radial	450	18~150	204
		NZR	High Ripple, 550V Surge	105℃ 2,000hrs						Radial	450	23~150	206
		NLF	Flame Retardant electrolyte type	105℃ 5,000hrs						Radial	400~500		208

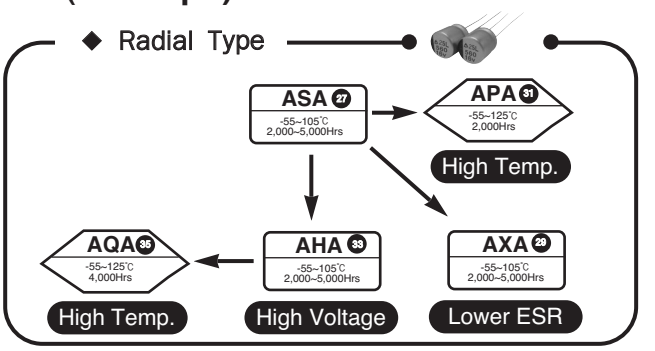
■ LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
PCB Terminal Type	General Purpose	RDC	More Downsized	85℃ 2,000hrs	●					Pin	16~500	68~56,000	209
		TDA	Miniature	105℃ 2,000hrs	●					Pin	16~500	47~47,000	213
		TDC	More Downsized	105℃ 2,000hrs	●					Pin	160~500	68~1,200	217
		TEA	15mm Height	105℃ 2,000hrs	●					Pin	160~400	39~390	220
	High Reliability	RLS	Miniature, Long Life	85℃ 3,000hrs				●		Pin	160~500	47~1,200	222
		RLB	Downsized, Long Life, High Ripple, Low Temp.	85℃ 3,000hrs				●		Pin	400~500	82~1,000	225
		RLC	Downsized, Long Life	85℃ 5,000hrs				●		Pin	160~500	39~2,200	227
		TLA	Downsized, Long Life, Wide Temp.	105℃ 3,000hrs				●		Pin	160~500	56~2,200	230
		TLS	Downsized, Long Life, Wide Temp., High Ripple	105℃ 3,000hrs				●		Pin	160~550	56~3,300	233
		TLG	Downsized, Long Life, High Ripple, Low Temp.	105℃ 3,000hrs				●		Pin	160~500	47~2,700	236
		TLJ	Downsized, Long Life,High Ripple, Low Temp.	105℃ 3,000hrs				●		Pin	400~500	56~680	239
		TLK	Downsized, Long Life,High Ripple, Low Temp.	105℃ 3,000hrs				●		Pin	400~500	56~680	241
		TLR	Downsized, Long Life,High Ripple, Low Temp.	105℃ 3,000hrs				●		Pin	400~500	68~680	243
		TLC(LXG)	Miniature, Long Life	105℃ 5,000hrs				●		Pin	10~500	47~47,000	245
		TLB	Miniature, Long Life	105℃ 7,000hrs	●			●		Pin	160~500	47~2,200	249
		TLL	Miniature, Long Life	105℃ 10,000hrs				●		Pin	200~500	100~1,800	252
		UDA	Wide Temp.	125℃ 1,000hrs				●		Pin	16~250	100~10,000	254
	Special Application	RVA	No Spark With DC Overvoltage	85℃ 2,000hrs						Pin	200~450	47~2,200	256
		TVA	No Spark With DC Overvoltage	105℃ 2,000hrs						Pin	200~450	56~1,800	258
		DL	General Audio	85℃ 2,000hrs		●				Pin	50~100	3,300~22,000	260
		AHS	Hi-Fi Audio Miniature	85℃ 2,000hrs	●					Pin	50~100	3,300~22,000	261
		TZF	Flame Retardant electrolyte type	105℃ 2,000hrs						Pin	400~450		263
Screw-Bolt Terminal Type	General Purpose	TGA(KMH)	General, Wide Temp.	105℃ 2,000hrs		●				Screw	10~450	180~680,000	264
	For Inverter	RGB	High Ripple, High Voltage	85℃ 2,000hrs						Screw	16~650	100~680,000	268
		RFC(RWF)	High Ripple, Long Life	85℃ 5,000hrs				●		Screw	350~550	1,500~22,000	271
		RFA	High Ripple, Long Life	85℃ 8,000~20,000hrs				●		Screw	350~550	1,000~22,000	273
		TFA	High Ripple, Long Life	105℃ 2,000~5,000hrs				●		Screw	350~550	1,000~22,000	275
	Special Application	PH	For Photo Flash	5~35℃ 5,000Times						Pin/	330	165~2,000	277
		DH	For Welding Machine	40℃ 1,000,000Times						Screw	315, 475	100~330	278

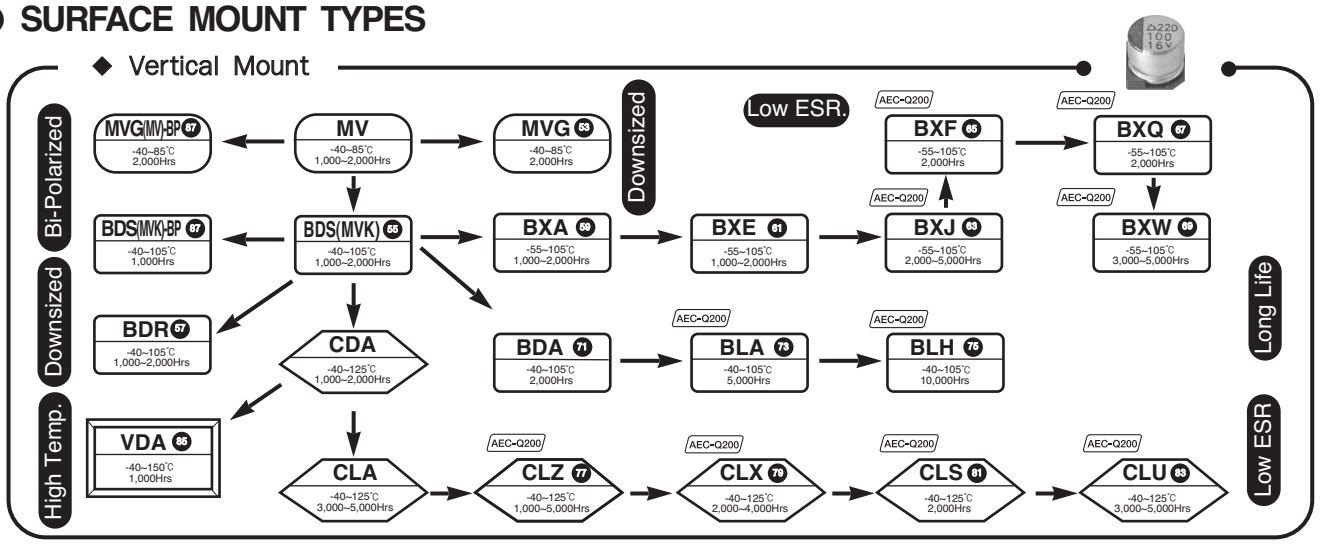
SERIES GROUP CHART

● Conductive Polymer Aluminum Solid Capacitors (reALcap™)

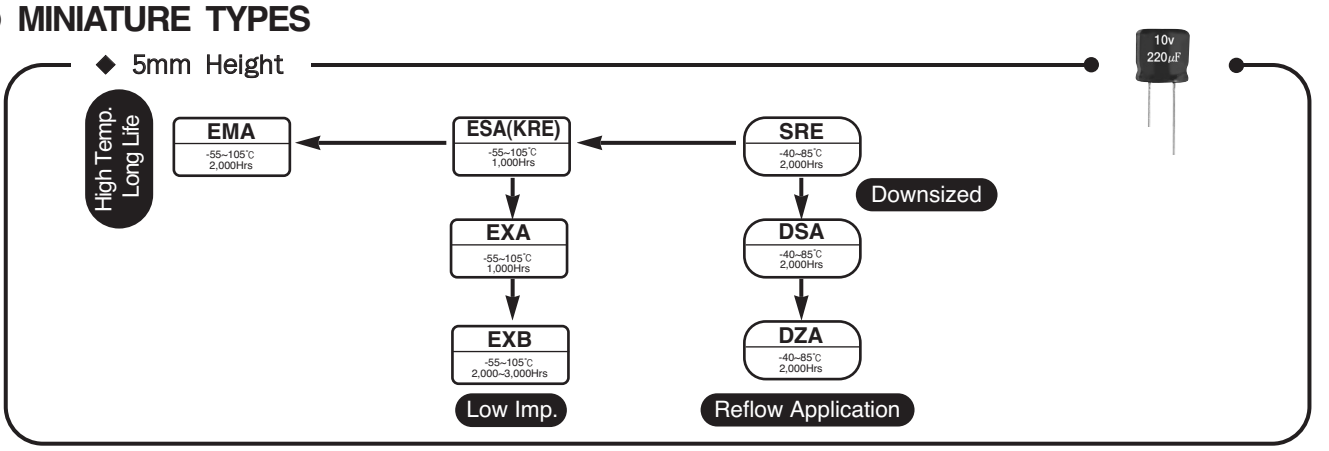


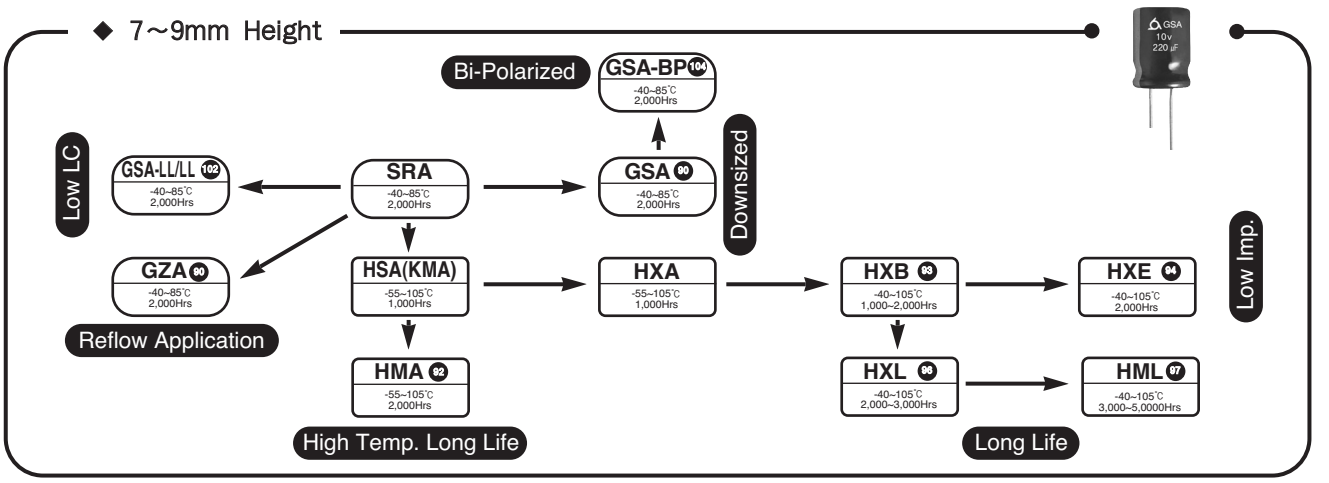


● SURFACE MOUNT TYPES



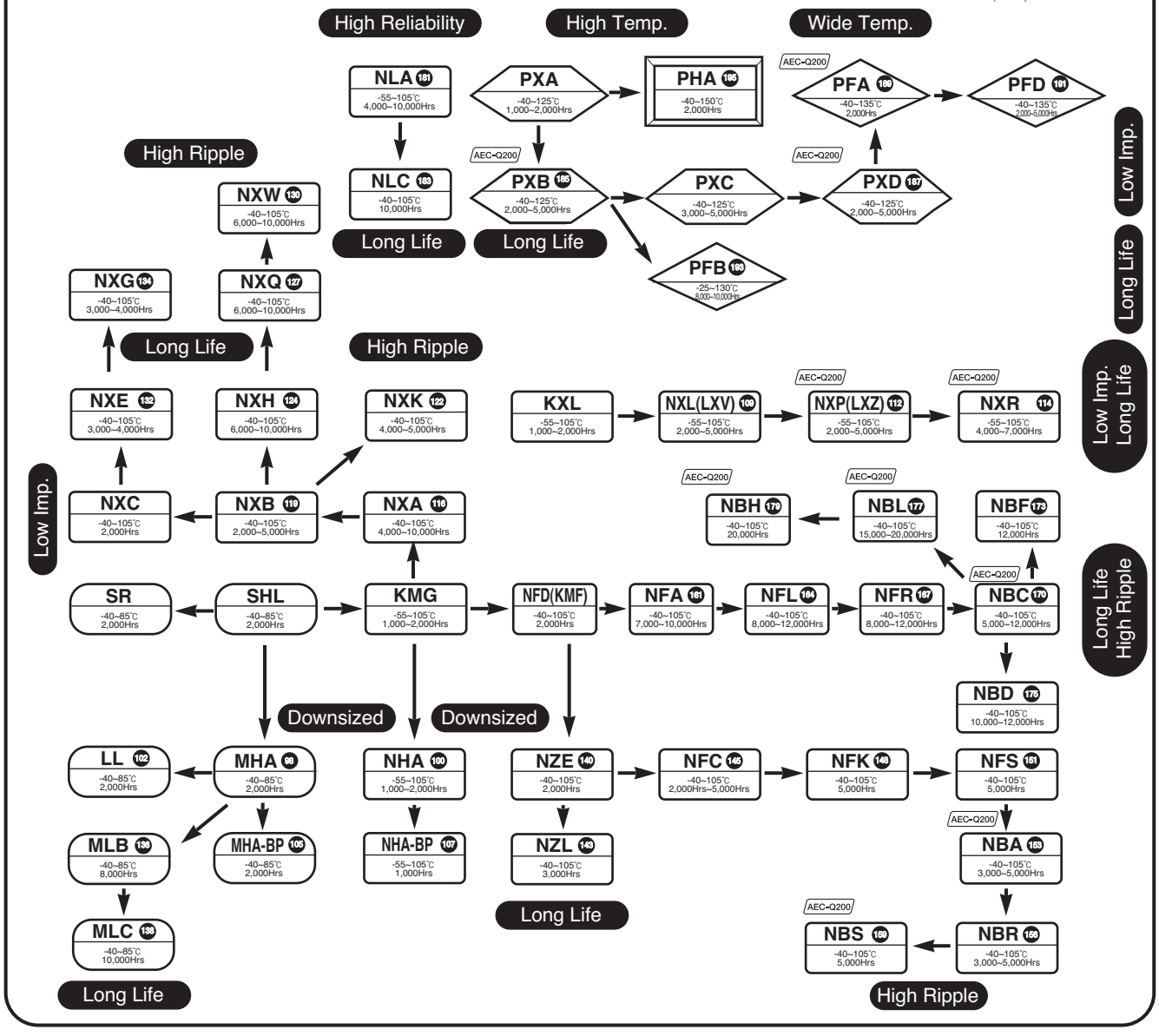
● MINIATURE TYPES



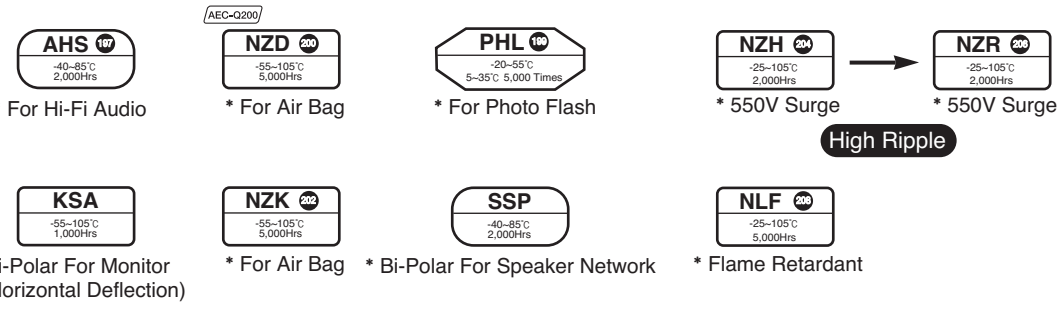


● MINIATURE TYPES

◆ CM-I, CM-II

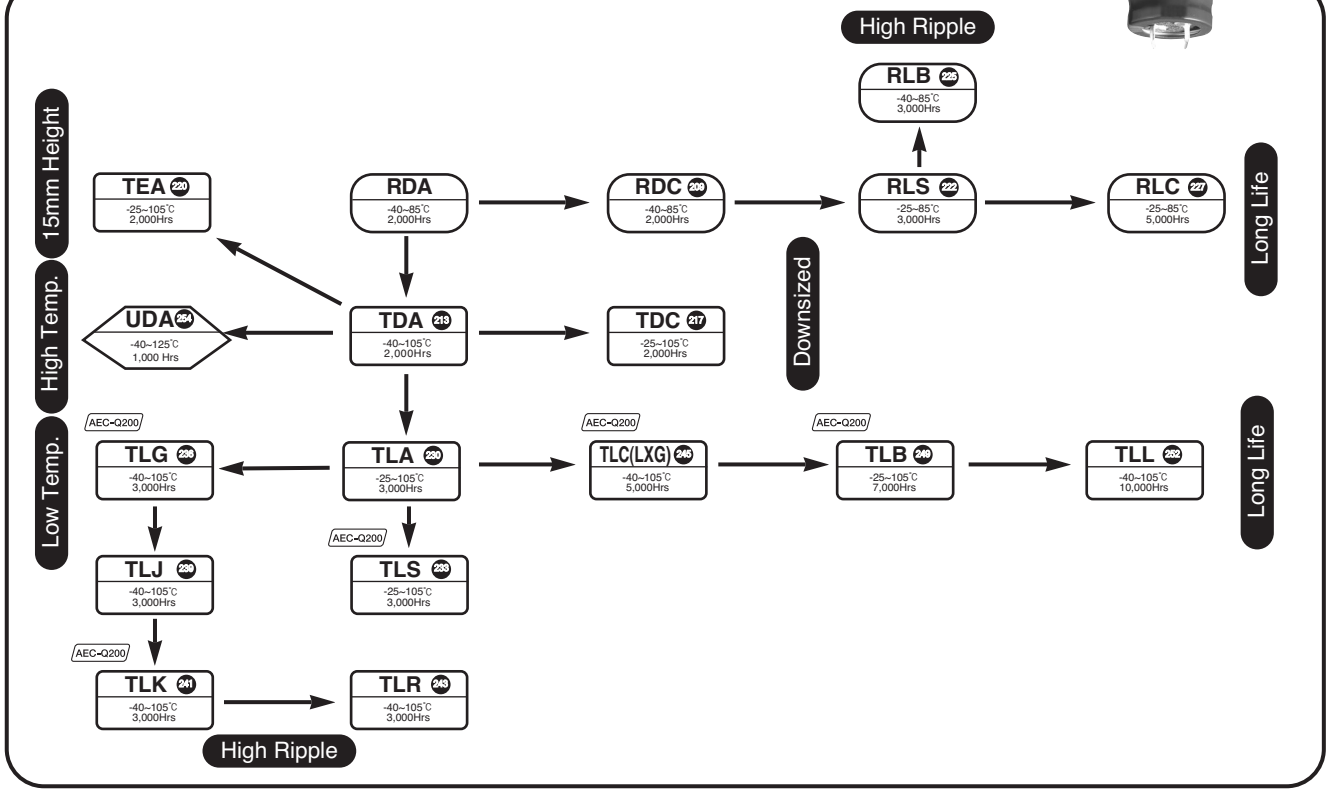


◆ Special Applications

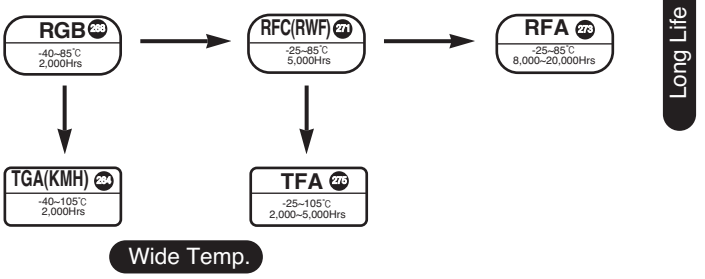


● LARGE TYPES

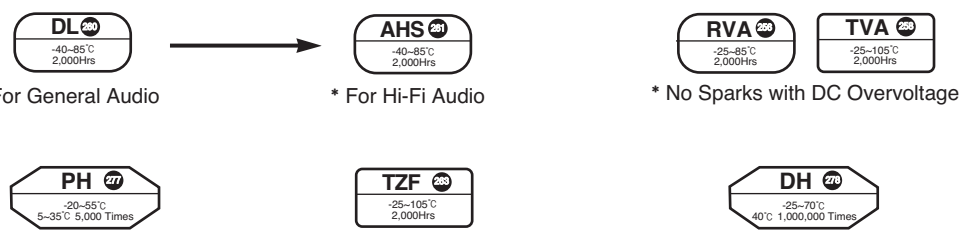
◆ PCB Terminals



◆ Screw-Bolt Terminals



◆ Special Applications



DETAIL SPECIFICATIONS OF TAPING METHOD

■ SURFACE MOUNT TYPE

TAPING DIMENSIONS

Fig.1

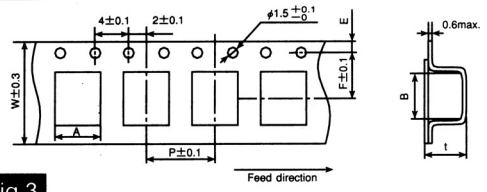


Fig.2

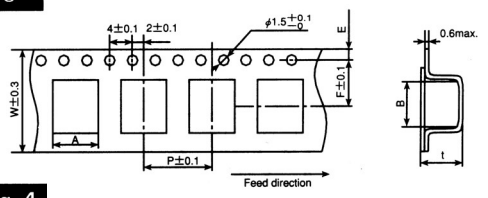


Fig.3

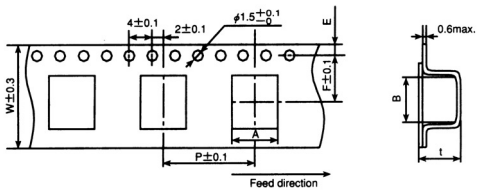
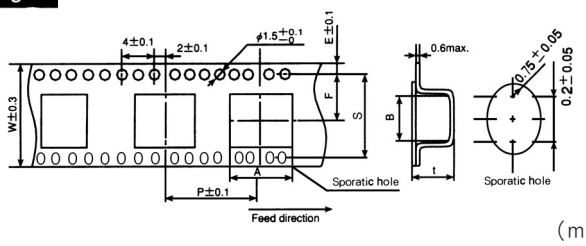


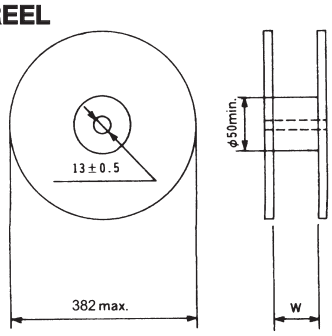
Fig.4



(mm)

Series	Case Code	Fig	W	A	B	F	E	P	t	S
AL CHIP reALcap™	ø4(D55,D56)	1	12	4.7±0.2	4.7±0.2	5.5	1.75±0.1	8	5.7±0.2(D55,D56)	-
	ø5(E55,E56,E61)	2	12	5.7±0.2	5.7±0.2	5.5	1.75±0.1	12	5.7±0.2(E55,E56) 6.3±0.2(E61)	-
	ø6.3(F55,F56,F60)	2	16	7.0±0.2	7.0±0.2	7.5	1.75±0.1	12	5.7±0.2(F55,F56) 6.3±0.3(F60)	-
	ø6.3×8L(F80)	2	16	7.0±0.2	7.0±0.2	7.5	1.75±0.1	12	8.2±0.2	-
	ø8×6L(H63)	2	16	8.7±0.2	8.7±0.2	7.5	1.75±0.1	12	6.8±0.2	-
	ø8×6.7L(H70)	2	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	12	7.3±0.2	-
	ø8×10L(H10)	3	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	16	11.0±0.2	-
	ø8×11.5L(H12)	3	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	16	12.3±0.2	-
	ø10×8.5L(J85)	3	24	10.7±0.2	10.7±0.2	11.5	1.75±0.1	16	9.1±0.2	-
	ø10×10L(J10)	3	24	10.7±0.2	10.7±0.2	11.5	1.75±0.1	16	11.0±0.2	-
	ø10×12.2L(J12)	3	24	10.7±0.2	10.7±0.2	11.5	1.75±0.1	16	13.0±0.2	-
	ø12.5×13.5L(K14)	4	32	13.4±0.2	13.4±0.2	14.2	1.75±0.1	24	14.0±0.2	28.4±0.1

REEL



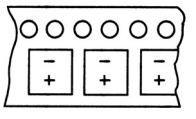
QUANTITY PER REEL

Series	Case Code	W(mm)	Q'ty(pcs/reel)	Q'ty(pcs/box)
AL CHIP reALcap™	ø4(D55,D56)	14	2,000	20,000
	ø5(E55,E56,E61)	14	1,000	10,000
	ø6.3(F55,F56,F60)	18	1,000	10,000
	ø6.3×8L(F80)	18	900	9,000
	ø8×6L(H63)	18	1,000	10,000
	ø8×6.7L(H70)	26	1,000	6,000
	ø8×10L(H10)	26	500	3,000
	ø8×11.5L(H12)	26	400	2,400
	ø10×8.5L(J85)	26	500	3,000
	ø10×10L(J10)	26	500	3,000
	ø10×12.2L(J12)	26	400	2,400
	ø12.5×13.5L(K14)	34	200	1,000

ORIENTATION OF POLARITY

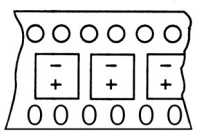
- AL CHIP
- reALcap™

Feed Direction



〈ø4~ø10〉

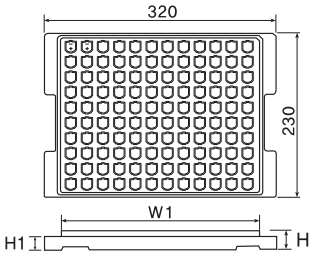
Feed Direction



〈ø12.5〉

■ SURFACE MOUNT TYPE(TRAY)

DIMENSIONS(mm)



QUANTITY PER TRAY/BOX

Case Code	H (mm)	W1 (mm)	H1 (mm)	Q'ty (pcs/tray)	Q'ty (pcs/box)
L17~L22	28.0	284	24.0	80	160, 400
M17~M22	28.0	284	24.0	60	120, 300

■ MINIATURE TYPE

Unit(mm)

Fig.1
ØD = Ø3~6.3

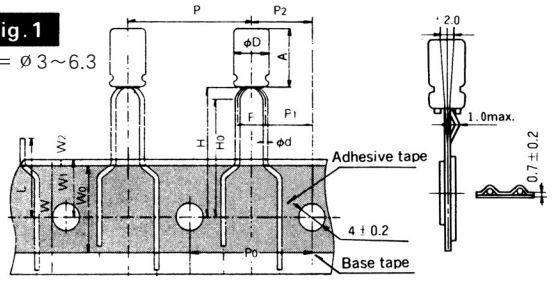


Fig.2
ØD = Ø5
ØD = Ø8

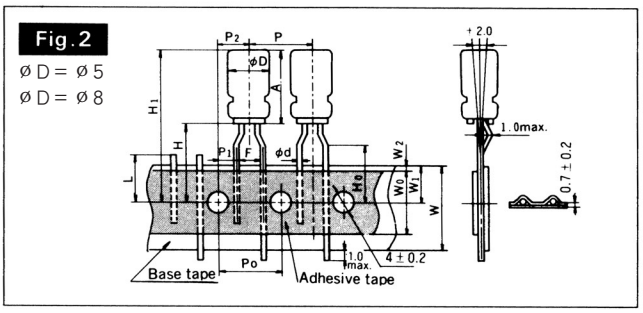


Fig.3
ØD = Ø6.3, 8
ØD = Ø10, 12.5

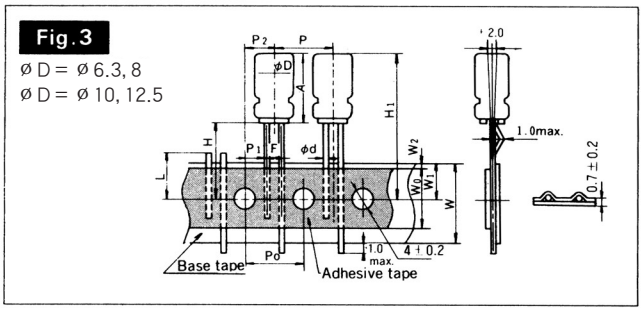
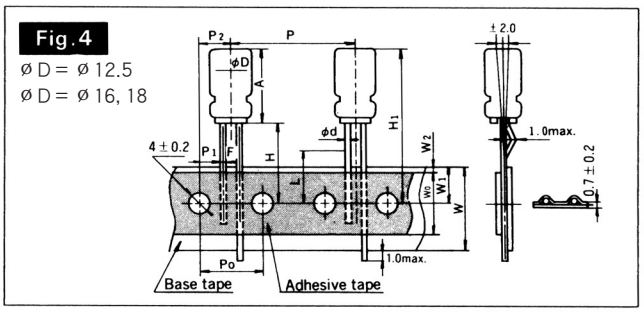


Fig.4
ØD = Ø12.5
ØD = Ø16, 18



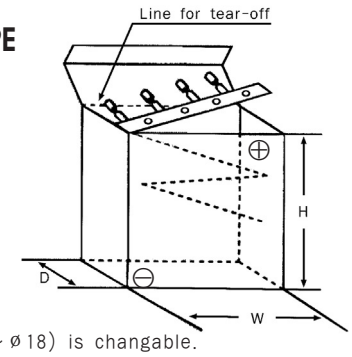
Code	Case size ØD	Case size A	Ød	P	P0	P1	P2	F	W	W0	W1	W2	H	H0	H1	L	Fig.
Tol.	±0.5	※1)	±0.05	±1.0	±0.2	±0.7	±1.0	+0.8 -0.2	±0.5	min.	±0.5	max.	±0.75	±0.5	-	max.	
Nominal	4	5~7	0.45	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.2	-	H1 = H + A Check insertion machine specs.	11.0	1
						3.85		5.0					17.5	16.0			2
	5	5~7	0.45	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.2	-		11.0	1
						3.85		5.0					17.5	16.0			2
		11~15	0.5	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.5	17.2		11.0	2
						3.85		5.0						16.0			2
	6.3	5~7	0.45	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.2	-		11.0	3
						3.85		5.0					17.5	16.0			2
		9~15	0.5	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.5	-		11.0	3
						3.85		5.0						16.0			2
	8	※2) 5	0.45	12.7	12.7	5.1	6.35	2.5	18.0	10	9.0	1.5	18.2	-		11.0	3
						3.85		5.0					17.5	16.0			2
		7	0.45	12.7	12.7	5.1	6.35	3.5	18.0	10	9.0	1.5	20	-		11.0	3
						3.85		5.0					18.5	16.0			2
		9	0.6	12.7	12.7	5.1	6.35	3.5	18.0	10	9.0	1.5	20	-		11.0	3
						3.85		5.0						16.0			2
		11~20	0.6	12.7	12.7	4.6	6.35	3.5	18.0	10	9.0	1.5	18.5	-		11.0	3
						3.85		5.0						15.7			2
Tol.	±0.5	max.	±0.05	±1.0	±0.3	±0.7	±1.3	+0.8 -0.2	±0.5	min.	±0.5	max.	±0.75	-		max.	
Nominal	10	27	0.6	12.7	12.7	3.85	6.35	5.0	18.0	12.5	9.0	1.5	18.5	-		11.0	3
	12.5	27	0.6	15	15	5.0	7.5	5.0	18.0	12.5	9.0	1.5	18.5	-		11.0	3
			● 0.6	25.4	12.7	3.85	6.35	5.0	18.0	12.5	9.0	1.5	18.5	-		11.0	4
	16	37.5	0.8	30	15	3.75	7.5	7.5	18.0	12.5	9.0	3.0	18~20	-		11.0	4
	18	37.5	0.8	30	15	3.75	7.5	7.5	18.0	12.5	9.0	3.0	18~20	-		11.0	4

● P = 25.4 taping is not standard. Use P = 15 taping.
※1) Refer to the drawing of each series for tolerance.
※2) Ø8×5L(Height) is 6.5mm max.

PACKING QUANTITY

■ MINIATURE TYPE

TAPING



Packing quantity (ø3～ø18) is changable.

Item		Inner Box (PCS)	Out Box (PCS)	Box Dimension D×W×H(mm)
RMV ø6.3	6L	1,500	9,000	41×330×232
RMV ø8		1,000	5,000	51×330×230
RMV ø10		500	2,500	53×330×190
SRE ø3, 3.5		3,000	18,000	41×330×232
SRE, A ø4		2,500	15,000	41×330×232
SRE, A ø5		2,000	12,000	41×330×232
SRE, A ø6.3		1,500	9,000	41×330×232
SRE, A ø8		1,000	6,000	41×330×232
ø5		2,000	10,000	51×330×230
ø6.3		1,500	7,500	48×330×211
ø8	11.5L	1,000	5,000	51×330×230
	15L	1,000	5,000	51×330×230
	20L	800	4,000	62×330×198
ø10	16L max.	500	2,500	53×330×190
	25L max.			62×330×190
	33L max.		2,000	68×330×190
ø12.5	25L max.	400	2,000	61×324×235
ø16	25L max.	250	1,250	62×342×245
	35.5L max.		1,000	73×342×245
ø18	25L max.	200	1,000	62×342×245
	35.5L max.		800	73×342×245

LONG AND FORMING CUT

Item	ø D×L(mm)	Terminal Conf.	Vinyl Bag (PCS)	Inner Box (PCS)	Out Box (PCS)
RMV	ø5	Long/Forming	500	2,000	24,000
	ø6.3X6	Long/Forming	500	2,000	24,000
	ø8	Long	200	1,000	12,000
	ø10	Long	100	2,000	8,000
SRE	ø3～ø4	Long/Forming	500	4,000	48,000
	ø5	Long/Forming	500	3,000	36,000
	ø6.3	Long/Forming	500	3,000	30,000
	ø8	Long/Forming	200	1,000	12,000
SRA	ø4～ø5	Long/Forming	500	3,000	36,000
	ø6.3	Long/Forming	500	2,000	24,000
	ø8	Long/Forming	200	1,000	12,000
SR	ø6×9L	Long/Forming	500	2,000	24,000
	ø8×9L	Long	200	1,000	12,000
		Forming		2,000	24,000
CM-Ⅰ	ø5	Long	200	2,000	24,000
		Forming			
	ø6.3	Long	200	2,000	20,000
		Forming			24,000
	ø8×11.5L	Long/Forming	200	1,000	12,000
	ø8×15L	Long	100	500	6,000
	ø8×20L	Long	100	500	6,000

Item	ø D×L(mm)	Terminal Conf.	Vinyl Bag (PCS)	Inner Box (PCS)	Out Box (PCS)
CM-Ⅱ	ø10×12～12.5L	Forming	100	2,500	10,000
		Long	100	2,000	8,000
	ø10×15～16L	Forming	100	2,000	8,000
		Long	100	1,500	6,000
	ø10×20L	Forming	100	1,600	6,400
		Long	100	1,200	4,800
	ø10×25～33L	Forming	100	1,200	4,800
		Long	100	1,000	4,000
	ø10×40L	Long	50	700	2,800
	ø10×45～50L	Long	50	500	2,000
	ø12.5×13L	Forming	100	1,500	6,000
		Long	100	1,500	6,000
	ø12.5×15～16L	Forming	100	1,000	4,000
		Long	100	1,000	4,000
	ø12.5×20～25L	Forming	100	1,000	4,000
		Long	100	800	3,200
	ø12.5×30～35L	Forming	50	600	2,400
		Long	50	500	2,000
	ø12.5×40～42.5L	Forming	50	500	2,000
		Long	50	400	1,600
	ø12.5×45～50L	Long	50	400	1,600
	ø12.5×60L	Long	50	300	1,200
	ø16×15L	Forming	50	600	2,400
		Long	50	600	2,400
	ø16×20～25L	Forming	50	600	2,400
		Long	50	500	2,000
	ø16×31.5～35.5L	Forming	50	400	1,600
		Long	50	400	1,600
	ø16×40L	Forming	50	400	1,600
		Long	25	250	1,000
	ø16×45L	Forming	-	200	800
		Long	25	200	1,000
	ø16×50L	Forming	-	200	600
		Long	20	200	800
	ø18×20～25L	Forming	50	400	1,600
		Long	50	400	1,600
	ø18×30～40L	Forming	25	300	1,200
		Long	25	250	1,000
	ø18×45～50L	Long	20	200	800
	ø20×40L	Forming	-	150	600
		Long	20	160	640
	ø22×20～30L	Forming	-	100	400
		Long	20	200	800
	ø22×35～40L	Forming	-	100	400
		Long	20	160	640
	ø22×45L	Forming	-	100	300
		Long	20	160	640
	ø22×50L	Long	15	120	480
	ø25.4×25L	Forming	-	100	400
		Long	15	160	640
	ø25.4×30L	Forming	-	100	400
		Long	15	120	480
	ø25.4×35L	Forming	-	100	400
		Long	15	120	480
	ø25.4×40L	Forming	-	100	400
		Long	15	120	480
	ø25.4×45～50L	Forming	-	100	300
		Long	15	120	480

GENERAL PACKAGE

Size		Terminal Config.	Product Q'ty Per Inner Box(pcs)	Product Q'ty Per Out Box(pcs)
ø D(mm)	L(mm)			
14.5	35	LA	320	1,280
16	25～45		250	1,000
	50		250	750
20	25～45	LA, VN, VS	150	600
	50		150	450
22～30	15～45		100	400
	50～65		100	300
35～40	15～45	VN, VS, VR, LA, LR, LI	50	200
	50～60		50	150
35	70～80		80	160
40	70～80		50	100
35	-	LA, LG, LR	-	50
50	-		-	32
63.5～89	-		-	10
100	-	LG	-	8

Conductive Polymer Aluminum Solid Capacitors

PRECAUTIONS AND GUIDELINES (CONDUCTIVE POLYMER SOLID CAPACITORS)

DESIGNING DEVICE CIRCUITS

1. Types of circuits where reALcap capacitors are not to be used

The leakage current may increase due to soldering and other processes. Since large leakage current can bring problems, avoid the use of conductive polymer solid capacitors(hereafter called solid capacitors) in the following circuits.

1) High impedance circuits
2) Time constant circuits
   The capacitance can be varied depending the operating conditions. The change of capacitance affects the time constant circuit.
3) Coupling circuits
4) Other circuits where circuits are affected by leakage current.

2. Polarity

Solid Capacitors are polarized. Do not apply either reverse voltage or AC voltage to the solid capacitor. Reverse voltage may cause a short circuit.

3. Rated voltage

Do not apply voltage exceeding rated voltage. Overvoltage may cause a short circuit.

4. Operating Temperature

Do not use the solid capacitor at temperature which exceeds the specified range. High temperature may cause decrease the life of the solid capacitor.

5. Ripple current

Do not apply the exceeding current which value exceeds the rated ripple current. The over ripple current cause decrease the life of the solid capacitor.

6. Charge and discharge

Do not use the solid capacitor in circuits for rapid charge and discharge repetitively.
Repetitively charge and discharge of capacitors may reduce the capacitance.
Use of a protective circuit to ensure reliability is recommended when rush current exceed 10A.

회로 설계시 주의 사항

1. 고체콘덴서 사용을 피해야 하는 회로

누설전류는 납땜이나 다른 이유로 인해 증가할 수 있습니다. 누설전류는 문제를 야기할 수 있기 때문에 아래의 회로에는 고체콘덴서 사용을 피하여 주십시오. (전도성 고분자 고체 콘덴서를 축약하여 고체 콘덴서로 표기함.)

1) 큰 임피던스를 갖는 회로
2) 시정수용 회로
   고체콘덴서는 작동 조건에 따라 용량이 변할 수 있습니다. 용량의 변화는 시정수 회로에 영향을 줍니다.
3) 커플링 회로
4) 누설전류에 의해 영향을 받는 회로

2. 극성

고체콘덴서는 극성을 갖고 있습니다. 역전압이나 교류전압을 고체콘덴서에 인가하지 마십시오. 역전압은 고체콘덴서를 쇼트 시킬 수 있습니다.

3. 정격 전압

정격전압을 초과하는 전압을 인가하지 마십시오.
과전압은 고체콘덴서를 쇼트 시킬 수 있습니다.

4. 사용 온도

보증 온도를 초과하는 온도에서 고체콘덴서를 사용하지 마십시오. 높은 온도는 고체콘덴서의 수명을 줄어들게 합니다.

5. 리플 전류

정격 리플전류를 초과하는 전류를 인가하지 마십시오. 과도한 리플전류는 고체콘덴서의 수명을 줄어들게 합니다.

6. 충전과 방전

고체콘덴서를 빠르게 충전과 방전을 반복하는 회로에 사용하지 마십시오. 반복적인 충전과 방전은 용량을 줄어들게 합니다.
또한, 돌입전류가 10A를 초과할 경우에는 보호회로를 사용할 것을 권고합니다.

7. Insulation

Aluminum case, cathode lead wire, anode lead wire and circuit pattern should be electrically isolated.

8. Solid Capacitor Usage Environment

The following environment should be avoided.

1) Damp conditions such as water, saltwater spray, or oil spray or fumes.
   High humidity or humidity condensation situations.
2) Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas, nitrous acid, chlorine gas or ammonia.
3) Ozone, ultraviolet rays or radiation.
4) Severe vibration or mechanical shock.

9. Capacitor Mounting

1) Surface Mount Type
   Land pattern on PCB board should comply with the specification.
2) Radial Type
   Interval of terminal holes on the PCB is in accordance with the specification.

INSTALLING CAPACITORS

1. Installing

1) Do not reuse capacitors which already assembled.
2) The capacitor may have self-charge during storage time. In this case, discharge the capacitor through about 1kΩ resistor before use.
3) Leakage current of capacitors may be increased during storage. In this case, the capacitors can be reformed by the voltage treatment through about 1kΩ resistor.

〈Voltage Treatment〉

Applying rated voltage for 120 minutes at maximum operating temperature range.

4) Do not apply severe vibration or mechanical shock.

7. 절연

Al 케이스와 음극 리드선, 양극 리드선을 회로적으로 완전히 격리시켜 주십시오.

8. 고체콘덴서 사용 환경

아래의 환경은 피해 주십시오.

1) 습한 환경
   (물, 소금물, 기름이 있는 환경)
2) 유해한 가스
   (황화 수소, 아황산 가스, 아질산, 염소, 암모니아)가 있는 환경
3) 오존, 자외선이 있는 환경
4) 진동과 기계적 충격이 있는 환경

9. 고체콘덴서의 장착

1) SMD 타입 제품
   PCB의 패턴은 규정과 일치해야 합니다.
2) RADIAL 타입 제품
   PCB의 홀 간격은 규정과 일치해야 합니다.

콘덴서 설치

1. 설치

1) 장착되었던 콘덴서를 다시 사용하지 마십시오.
2) 고체콘덴서는 보관 중에 충전될 수 있습니다. 이 경우에는, 사용 전에 약 1kΩ 저항을 통하여 방전하십시오.
3) 누설전류는 보관 중에 증가할 수 있습니다. 이 경우에, 고체콘덴서는 1kΩ 저항을 통하여 전압처리를 한 후에 사용하십시오.

〈전압처리〉

최고사용온도에서 120분 동안 정격 전압 인가.

4) 진동이나 기계적 충격을 주지 마십시오.

2. Soldering

The leakage current may increase due to thermal stress that occur during soldering. Ensure the soldering conditions meet the specifications.

2-1. Soldering with a soldering iron

1) Ensure the lead spacing of the solid capacitor meets the hole spacing on the PCB board.
2) Ensure the soldering conditions meets the approval sheet.
3) Soldering iron should not touch the solid capacitor' s body.

2-2. Reflow soldering

1) Reflow soldering must not be used for radial type solid capacitors.
2) Soldering conditions(preheat, solder temperature and reflow time) should be within the limits prescribed in the catalogs or product specifications.
3) For setting a degree of heating infrared heaters, consider that the infrared absorption may vary in the color and materials of a solid capacitor.
4) Do not solder solid capacitors more than once by reflow.

3. Handling after soldering

1) Do not lean or twist the solid capacitor' s body after soldering on PCB.
2) Do not pick-up or move PCB by holding the soldered solid capacitors.

4. Cleaning PCB boards

4-1. Agents must be avoided

1) Do not wash boards by using the following agents.
   - Halogenated solvents
   - Alkali system solvents
   - Petroleum system solvents
   - Xylene, Acetone
2) Monitor conductivity, pH, specific gravity and the water content before cleaning boards.

2. 납땜

누설전류는 납땜 중에 발생하는 열 충격에 의하여 증가할 수 있습니다. 납땜조건이 규정을 만족하는지 확인하십시오.

2-1. 인두를 사용한 납땜

1) 고체콘덴서의 단자간격이 PCB 기판의 홀 간격과 일치하는지 확인하십시오.
2) 납땜 조건이 승인원을 만족하는지 확인하십시오.
3) 납땜 인두로 고체콘덴서 몸체를 접촉하지 마십시오.

2-2. 리플로 납땜

1) 리플로 솔더링은 RADIAL 타입 고체콘덴서에 적용하지 마십시오.
2) 솔더링 조건(온도 및 시간)은 카탈로그나 제품승인원에서 규정한 제한치 이내이어야 합니다.
3) 적외선 히터 사용시, 고체콘덴서 색상과 재질에 따라 적외선 흡수율이 상이함을 고려하십시오.
4) 고체콘덴서를 2회 이상 리플로를 통과시키지 마십시오.

3. 납땜 후 관리

1) 납땜 후 고체콘덴서의 몸체를 기울이거나 비틀지 마십시오.
2) 납땜되어진 고체콘덴서를 잡고 PCB 기판을 들어올리거나 움직이지 마십시오.

4. PCB 기판 세척

4-1. 피해야 할 세척제

1) 아래의 약품으로 세척하지 마십시오.
   - Halogenated solvents
   - Alkali system solvents
   - Petroleum system solvents
   - Xylene, Acetone
2) 기판 세척 전에, 세척제의 전도도, pH, 비중과 수분함유량을 확인하십시오.

3) Influence of cleaning agents
(Halogenated solvents)
Solid capacitors are easily affected by halogen ions, particularly by chloride ions. When halogen ions enter the inside of the solid capacitor, the capacitor may be failed due to corrosion of capacitor' s foil.

3) 할로겐계 세척제의 문제점

고체콘덴서는 할로겐 이온(특히 염소 이온)에 의해 쉽게 영향을 받습니다. 할로겐 이온들이 고체콘덴서 내부에 침투하게 되면, 콘덴서 박의 부식에 의해 고장날 수 있습니다.

4-2. Recommended Agents

1) Higher alcohol cleaning agents
Solid capacitors may withstand immersion or ultrasonic cleaning for 10 minutes at a maximum liquid temperature of 60℃
2) IPA(Isopropyl Alcohol)
Solid capacitors are capable of withstanding any one of immersion, ultrasonic or vapor cleaning for 5 minutes.

4-2. 권장 세척제

1) Higher alcohol cleaning agents
고체콘덴서는 침적 혹은 초음파 세척을 최대 60℃에서 10분 동안 견딜 수 있습니다.

2) IPA(Isopropyl Alcohol)
고체콘덴서는 침적이나 초음파 혹은 증기 세척을 5분 동안 견딜 수 있습니다.

5. Using adhesives and coating materials

1) Do not use halogenated adhesives and coating materials.
2) Flux and cleaning agents should be removed before using adhesives or coating materials.
3) Do not cover up the whole surface of the solid capacitor. Make coverage only partial.
(The sealing area 30%)

5. 제품의 고정제와 코팅제

1) 할로겐계의 고정제와 코팅제를 사용하지 마십시오.

2) 고정제와 코팅제를 사용하기 전에, 플럭스와 세척제를 제거하십시오.
3) 고체콘덴서 봉구부 전체를 밀봉시키지 마십시오.
(봉구부의 30% 이하)

THE OPERATION OF DEVICES

- Do not directly touch the solid capacitor terminals.
- Do not connect with conductors between the terminals.
- The following environment should be avoided when using solid capacitors.

  - Damp conditions such as water, saltwater spray, or oil spray or fumes, High humidity or humidity condensation situations.
  - Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas, nitrous acid, chlorine gas or ammonia.
  - Exposure to ozone, ultraviolet rays or radiation.

기기 작동 중 주의사항

- 콘덴서 단자를 직접적으로 만지지 마십시오.
- 단자 사이를 도전체로 연결하지 마십시오.
- 아래의 환경에서는 고체콘덴서 사용을 피하여 주십시오.

  - 습한 환경 (물, 소금물, 기름이 있는 환경)
  - 유해 가스 (황화 수소, 아황산 가스, 아질산, 염소, 암모니아 등) 에 노출된 환경
  - 오존, 자외선에 노출된 환경

EMERGENCY ACTION

- If a short circuit occurs and odorous gas is released, immediately turn off the main power switch or pull out the plug from the power outlet.
- If the gas comes in contact with eyes or skin, rinse immediately. If the gas is inhaled, gargle immediately.

응급 조치

- 콘덴서가 쇼트 되거나 냄새가 나는 가스를 배출하면, 즉시 전원을 끄십시오.
- 배출된 가스가 눈이나 피부에 닿게되면, 즉시 세척하십시오. 가스 흡입 시 입안을 닦아 주십시오.

CONDITIONS OF STORAGE

- Do not store solid capacitors at a high temperature and high humidity. Store the solid capacitors indoors at a temperature 5~35℃ and a humidity of less than 75%RH.
- Store solid capacitors in places free from water, oil or salt water.
- Store solid capacitors in places free from toxic gases(hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.)
- Store solid capacitors in places out of ozone, ultraviolet rays or radiation.
- Keep solid capacitors in the package.

보관 조건

- 고체콘덴서를 고온/다습한 환경에서 보관하지 마십시오. 온도가 5~35℃, 습도가 75%RH 이하인 실내에서 보관하여 주십시오.
- 물이나 소금물, 기름이 없는 장소에 보관하십시오.
- 유해 가스(황화 수소, 아황산 가스, 아질산, 염소, 암모니아 등)가 없는 환경에서 보관하십시오.
- 오존, 자외선이 없는 곳에서 보관하십시오.
- 고체콘덴서를 포장된 상태에서 보관하십시오.

ABOUT AEC-Q200

- The Automotive Electronics Council (AEC) was originally established by American major automotive manufactures. Today, the committees are composed of representatives from the sustaining Members of manufacturing companies in automotive electrical components. It has standardized the criteria for “stress test qualification” and “reliability test” for the electronic components. AEC-Q200 is the reliability test standard for approval of passive components, it has been specified test subjects and quantity etc. for each components. Criteria of reliability tests for Aluminum Electrolytic Capacitors are also described in this.
  As customer requirement, Samyoung Electronics has submits the test results according to AEC-Q200 for the Aluminum Electrolytic Capacitors used in automotive applications to increase in recent years. Please contact us for more information.

AEC-Q200에 대하여

- 자동차 전자 위원회 (AEC) 는 본래 미국의 주요 자동차 제조사들에 의해 설립 되었습니다. 오늘날, 이 위원회는 자동차 전자 부품을 생산하는 회사의 지지회원들의 대표자들로 구성되어 있습니다. 이것은 전자 부품의 “부하 시험 자격” 과 “신뢰성 시험”에 대해 표준화된 기준을 가지고 있습니다. AEC-Q200 은 수동소자들의 승인을 위한 신뢰성 실험의 표준이며, 시험 항목과 수량, 기타 등이 명시되어 있습니다. 알루미늄 전해 콘덴서의 신뢰성 시험 기준또한 여기에 표기 되어 있습니다.
  고객의 요구에 의해, 삼영전자는 최근 몇년동안 자동차 부품에 적용되는 알루미늄 전해 콘덴서에 대한 AEC-Q200에 근거한 시험 결과를 제출하여 왔습니다. 더 많은 정보를 위해 저희에게 연락 주시기 바랍니다.

OTHERS

- Case sizes and other product standards specified in this catalog may be changed or modified without notice for improvement of quality.

기타

- 카다로그에 규정된 케이스 사이즈나 다른 제품 기준은 품질개선을 위하여 귀사에 통지 없이 변경될 수 있습니다.

reALcap™ ASV Series

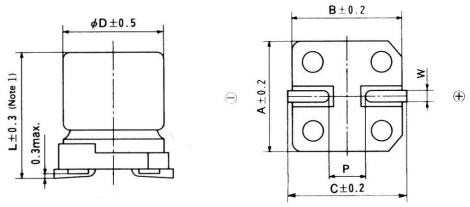
- Low ESR (at 100kHz~300kHz).
- High Ripple Current.
- -55℃ ~ +105℃.
- Endurance 105℃, 2,000~5,000hrs.

SPECIFICATIONS

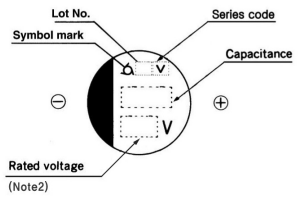
Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	4 to 25VDC
Surge voltage	Rated Voltage(WV): 4 / 6.3 / 10 / 16 / 20 / 25 Surge Voltage(SV): 5.2 / 8.2 / 11.5 / 18.4 / 23 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of ASV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of ASV series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of ASV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio: Z(-25℃)/Z(+20℃) ≤ 1.15; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Size / Time(Hrs): 6.3×5.7, 8×6.7 — 2,000Hrs; 8×10, 8×11.5, 10×10 — 5,000Hrs
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment:Applying rated voltage for 120minutes at 105℃)
※ 2. Reflow Conditions : Refer to 37 page

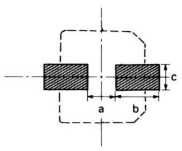
DIMENSIONS



MARKING



Recommended solder land on PC board



▨ : Solder land on PC board

Note 1 : L±0.5 for 8×10.0(H10)~8×11.5(H12), L±0.7 for 10×10(J10)
Note 2 : 6.3WV is marked by 6V

Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H10	8.0	10.0	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10.0	10.0	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF ASV Series

Case Code	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 105°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
F60	4	150	30	2,250	0.10	120
	6.3	100	30	2,250	0.10	126
	6.3	120	30	2,250	0.10	151
	10	47	30	2,250	0.10	94
	10	56	30	2,250	0.10	112
	16	39	35	2,080	0.10	125
	16	47	35	2,080	0.10	150
	20	22	40	1,950	0.10	88
	25	10	45	1,840	0.10	50
	25	33	45	1,840	0.10	165
H70	4	330	35	2,560	0.10	264
	6.3	220	35	2,560	0.10	277
	10	120	35	2,560	0.10	240
	10	150	35	2,560	0.10	300
	16	82	40	2,120	0.10	262
	20	33	45	1,890	0.10	132
	20	47	45	1,890	0.10	188
H10	4	330	17	3,510	0.10	264
	6.3	270	17	3,510	0.10	340
	10	220	17	3,510	0.10	440
	16	180	20	3,240	0.10	576
	20	68	25	2,890	0.10	272
	25	47	30	2,640	0.10	235
H12	4	680	14	4,350	0.10	544
	6.3	470	15	4,210	0.10	592
	10	330	17	3,950	0.10	660
	16	180	20	3,640	0.10	576
	20	100	24	3,320	0.10	400
	25	33	30	2,980	0.10	165
J10	4	820	14	4,570	0.10	656
	6.3	560	14	4,570	0.10	706
	10	470	14	4,570	0.10	940
	16	330	16	4,280	0.10	1,056
	20	150	20	3,830	0.10	600
	25	56	25	3,430	0.10	280

reALcap™ AXV Series

- Super Low ESR, Large Capacitance.
- High Ripple Current.
- -55℃ ~ +105℃.
- Endurance 105℃, 2,000~5,000hrs.

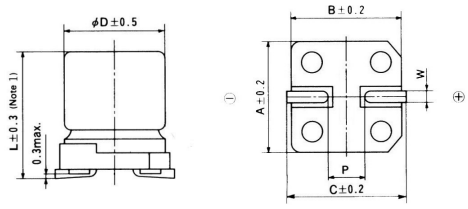
ASV → AXV
Low ESR

SPECIFICATIONS

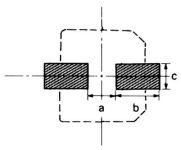
Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	4 to 25VDC
Surge voltage	Rated Voltage(WV): 4 / 6.3 / 10 / 16 / 20 / 25 Surge Voltage(SV): 5.2 / 8.2 / 11.5 / 18.4 / 23 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AXV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AXV series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AXV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio: Z(-25℃)/Z(+20℃) ≤ 1.15; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Size / Time(Hrs): 6.3×5.7, 8×6.7 — 2,000Hrs; 8×11.5, 10×10 — 5,000Hrs
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment: Applying rated voltage for 120minutes at 105℃)
※ 2. Reflow Conditions : Refer to 37page

DIMENSIONS



Recommended solder land on PC board



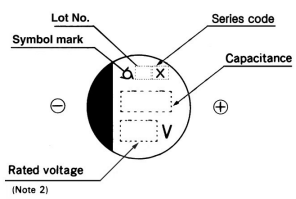
▨ : Solder land on PC board

Note 1 : L±0.5 for 8×11.5(H12), L±0.7 for 10×10(J10)
Note 2 : 6.3WV is marked by 6V

Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10.0	10.0	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF AXV Series

Case Code	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 105°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
F60	4	330	20	2,700	0.10	264
	6.3	220	20	2,700	0.10	277
	6.3	330	20	2,700	0.10	416
	10	150	20	2,700	0.10	300
	16	68	20	2,700	0.10	218
	16	100	20	2,700	0.10	320
	20	47	25	2,410	0.10	188
	25	47	30	2,200	0.10	235
H70	4	470	22	3,220	0.10	376
	6.3	390	22	3,220	0.10	491
	10	220	22	3,220	0.10	440
	10	270	22	3,220	0.10	540
	16	150	22	3,220	0.10	480
	20	68	25	3,020	0.10	272
	25	56	30	2,760	0.10	280
H12	4	1,000	14	4,350	0.10	800
	6.3	820	14	4,350	0.10	1,033
	10	680	14	4,350	0.10	1,360
	16	270	14	4,350	0.10	864
	16	470	14	4,350	0.10	1,504
	16	560	14	4,350	0.10	1,792
	20	270	14	4,350	0.10	1,080
	25	220	16	4,070	0.10	1,100
J10	4	2,200	14	4,570	0.10	1,760
	6.3	1,800	14	4,570	0.10	2,268
	10	1,000	14	4,570	0.10	2,000
	16	680	14	4,570	0.10	2,176
	20	390	14	4,570	0.10	1,560
	25	330	16	4,280	0.10	1,650

reALcap™ APV Series

- Higher heat resistance (125℃).
- High Ripple Current.
- Endurance 125℃, 2,000hrs.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

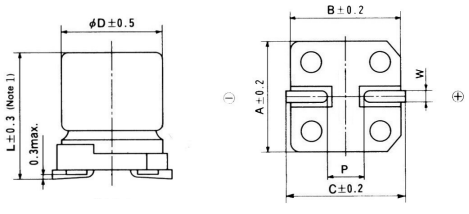
ASV → APV
High Temp.

SPECIFICATIONS

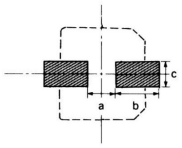
Item	Characteristics
Category temperature range	-55 to +125℃
Rated voltage range	10 to 25VDC
Surge voltage	Rated Voltage(WV): 10 / 16 / 25 ; Surge Voltage(SV): 11.5 / 18.4 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of APV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of APV series. (at 20℃, 2minutes)
ESR	Shall not exceed the value in Ratings of APV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-25℃)/Z(+20℃) ≤ 1.15 ; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value; Tan δ ≦ 200% of the initial specified value; ESR ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 500 hours. Capacitance change ≦ ±20% of the initial value; Tan δ ≦ 200% of the initial specified value; ESR ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment:Applying rated voltage for 120minutes at 125℃)
※ 2. Reflow Conditions : Refer to 37 page

DIMENSIONS



Recommended solder land on PC board



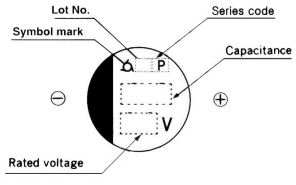
▨ : Solder land on PC board

Note 1 : L±0.5 for 8×11.5(H12)

Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF APV Series

Case Code	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current (mArms) at 100kHz		Tangent of loss angle	Leakage Current (μA)
				105℃<Temp.≤125℃	Temp.≤105℃		
F60	10	56	45	538	1,700	0.10	112
	25	10	65	474	1,500	0.10	50
H70	16	82	40	670	2,120	0.10	262
	25	22	48	580	1,835	0.10	110
H12	16	150	27	994	3,140	0.10	480
	25	47	30	943	2,980	0.10	235

reALcap™ AHV Series

- High Voltage(16～100V)
- High Ripple Current
- Endurance 105℃, 2,000～5,000hrs
- AEC-Q200 compliant : Please contact us for more details, test data, information.

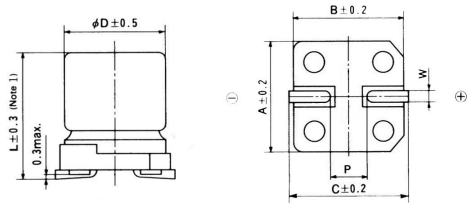
ASV → AHV
High Voltage

SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	16 to 100VDC
Surge voltage	Rated Voltage(WV): 16 / 20 / 25 / 35 / 50 / 63 / 80 / 100 Surge Voltage(SV): 18.4 / 23 / 29 / 40 / 57.5 / 72.5 / 92 / 115
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AHV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AHV series. (at 20℃, 2minutes)
ESR	Shall not exceed the value in Ratings of AHV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-25℃)/Z(+20℃) ≤ 1.15 Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Voltage(V) / Case Code / Time(Hrs): 16～80 — F60, H70 — 3,000; H12, J10 — 5,000; 100 — H12, J10 — 2,000
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90～95%RH for 1000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 105℃)
※ 2. Reflow Conditions : Refer to 37 page

DIMENSIONS



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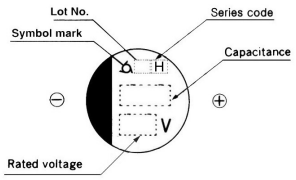
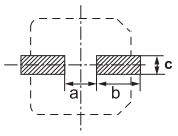


Recommended solder land on PC board



▨ : Solder land on PC board

Note 1 : L±0.5 for 8×11.5(H12), L±0.7 for 10×10(J10) Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10.0	10.0	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF AHV Series

Case Code	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 105°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
F60	16	56	40	1,790	0.10	179
	20	47	40	1,790	0.10	188
	25	33	45	1,690	0.10	165
	35	18	47	1,650	0.10	126
	50	12	50	1,600	0.10	120
	63	10	60	1,460	0.10	126
H70	16	82	35	2,350	0.10	262
	20	68	35	2,350	0.10	272
	25	56	40	2,200	0.10	280
	35	27	42	2,147	0.10	189
	50	22	45	2,070	0.10	220
	63	12	50	1,960	0.10	151
H12	16	270	25	3,400	0.10	864
	20	220	25	3,400	0.10	880
	25	150	30	3,100	0.10	750
	35	82	35	2,870	0.10	574
	50	56	40	2,690	0.10	560
	63	39	45	2,530	0.10	491
	80	33	50	2,400	0.10	528
	100	15	60	2,190	0.10	300
J10	16	470	25	3,650	0.10	1504
	20	330	25	3,650	0.10	1320
	25	270	30	3,330	0.10	1350
	35	120	35	3,090	0.10	840
	50	82	40	2,890	0.10	820
	63	68	45	2,720	0.10	857
	80	47	50	2,580	0.10	752
	100	22	60	2,360	0.10	440

reALcap™ AQV Series

- High Voltage(50～80V)
- Wide Temperature range
- Endurance 125℃, 4,000hrs
- AEC-Q200 compliant : Please contact us for more details, test data, information.

AHV → AQV

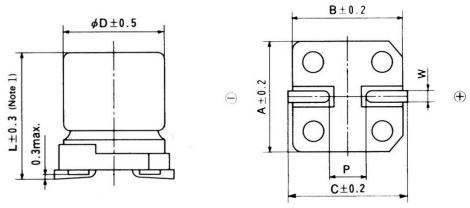
High Temp.

SPECIFICATIONS

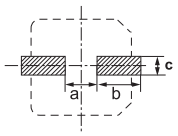
Item	Characteristics
Category temperature range	-55 to +125℃
Rated voltage range	50 to 80VDC
Surge voltage	Rated Voltage(WV): 50 / 63 / 80 ; Surge Voltage(SV): 57.5 / 72.5 / 92
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AQV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AQV series. (at 20℃, 2minutes)
ESR	Shall not exceed the value in Ratings of AQV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-25℃)/Z(+20℃) ≤ 1.15; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 4,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value; Tan δ ≦ 200% of the initial specified value; ESR ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90～95%RH for 500 hours. Capacitance change ≦ ±20% of the initial value; Tan δ ≦ 200% of the initial specified value; ESR ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 125℃)
※ 2. Reflow Conditions : Refer to 37 page

DIMENSIONS



Recommended solder land on PC board

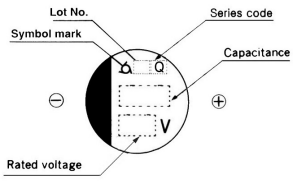


▨ : Solder land on PC board

Note 1 : L±0.5 for 8×11.5(H12), L±0.7 for 10×10(J10) Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10.0	10.0	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

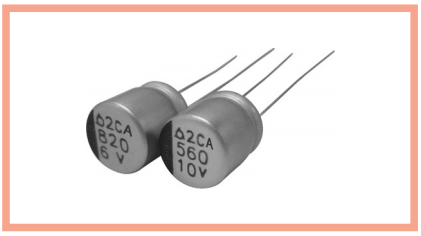
Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF AQV Series

Case Code	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 125°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
H70	50	12	45	960	0.10	120
	63	10	50	910	0.10	126
H12	50	47	35	1,500	0.10	470
	63	33	40	1,410	0.10	416
	80	15	45	1,340	0.10	240
J10	50	68	30	1,610	0.10	680
	63	47	35	1,520	0.10	592
	80	22	40	1,440	0.10	352

reALcap™ ASA Series

- Low ESR (at 100kHz~300kHz)
- High Ripple Current
- -55℃ ~ +105℃
- Endurance 105℃, 2,000~5,000hrs



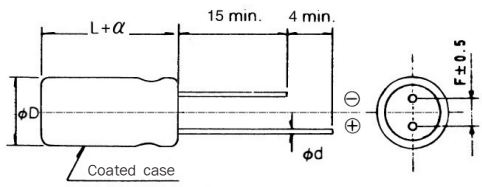
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	4 to 25VDC
Surge voltage	Rated Voltage(WV): 4 / 6.3 / 10 / 16 / 20 / 25 Surge Voltage(SV): 5.2 / 8.2 / 11.5 / 18.4 / 23 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of ASA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of ASA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of ASA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio Z(-25℃)/Z(+20℃) ≤ 1.15 Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Size / Time(Hrs): 6.3×6, 8×7 / 2,000Hrs; 8×10, 10×10, 8×11.5, 10×12.5 / 5,000Hrs
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

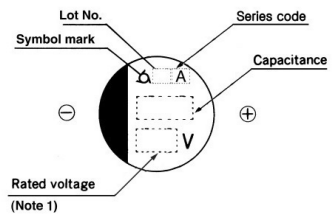
Coating Case Type



Unit(mm)

ø D(+0.5max.)	6.3	8.0	8.0	8.0	10.0	10.0
L	6.0	7.0	10.0	11.5	10.0	12.5
α	0.5					
ø d(±0.05)	0.45	0.45	0.6	0.6	0.6	0.6
F(±0.5)	2.5	3.5	3.5	3.5	5.0	5.0

MARKING



Note 1 : 6.3WV is marked by 6V

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

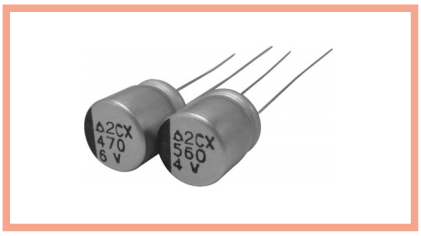
RATINGS OF ASA Series

Case Size (ØD×L) (mm)	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 105°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
6.3×6	4	150	30	2,250	0.10	120
	6.3	100	30	2,250	0.10	126
	6.3	120	30	2,250	0.10	151
	10	47	30	2,250	0.10	94
	10	56	30	2,250	0.10	112
	16	39	35	2,080	0.10	125
	16	47	35	2,080	0.10	150
	20	22	40	1,950	0.10	88
	20	33	40	1,950	0.10	132
	25	10	45	1,840	0.10	50
	25	33	45	1,840	0.10	165
8×7	4	330	35	2,560	0.10	264
	6.3	220	35	2,560	0.10	277
	10	120	35	2,560	0.10	240
	10	150	35	2,560	0.10	300
	16	82	40	2,120	0.10	262
	20	33	45	1,890	0.10	132
	20	47	45	1,890	0.10	188
8×10	4	330	17	3,510	0.10	264
	6.3	270	17	3,510	0.10	340
	10	220	17	3,510	0.10	440
	16	180	20	3,240	0.10	576
	20	68	25	2,890	0.10	272
	25	47	30	2,640	0.10	235
8×11.5	4	680	14	4,350	0.10	544
	6.3	470	15	4,210	0.10	592
	10	330	17	3,950	0.10	660
	16	180	20	3,640	0.10	576
	20	100	24	3,320	0.10	400
	25	33	30	2,980	0.10	165
10×10	4	820	14	4,570	0.10	656
	6.3	560	14	4,570	0.10	706
	10	470	14	4,570	0.10	940
	16	330	16	4,280	0.10	1,056
	20	150	20	3,830	0.10	600
	25	56	25	3,430	0.10	280
10×12.5	4	1,200	14	5,160	0.10	960
	6.3	820	14	5,160	0.10	1,033
	10	560	14	5,160	0.10	1,120
	16	330	16	4,720	0.10	1,056
	20	150	20	4,320	0.10	600
	25	56	28	3,800	0.10	280

reALcap™ AXA Series

- Super Low ESR, Large Capacitance.
- High Ripple Current.
- -55℃ ~ +105℃.
- Endurance 105℃, 2,000~5,000hrs.

ASA → AXA
Low ESR



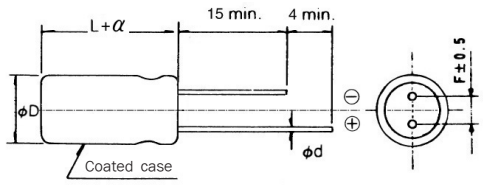
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	4 to 25VDC
Surge voltage	Rated Voltage(WV): 4 / 6.3 / 10 / 16 / 20 / 25 Surge Voltage(SV): 5.2 / 8.2 / 11.5 / 18.4 / 23 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AXA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AXA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AXA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance / Ratio Z(-25℃)/Z(+20℃) ≤ 1.15 Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Size / Time(Hrs): 6.3×6, 8×7 / 2,000Hrs; 8×11.5, 10×12.5 / 5,000Hrs
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

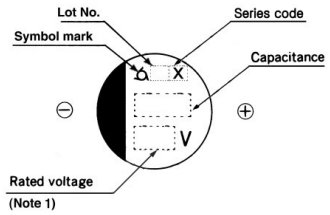
Coating Case Type



Unit(mm)

φD(+0.5max.)	6.3	8.0	8.0	10.0
L	6.0	7.0	11.5	12.5
α	0.5			
φd(±0.05)	0.45	0.45	0.6	0.6
F(±0.5)	2.5	3.5	3.5	5.0

MARKING



Note 1 : 6.3WV is marked by 6V

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

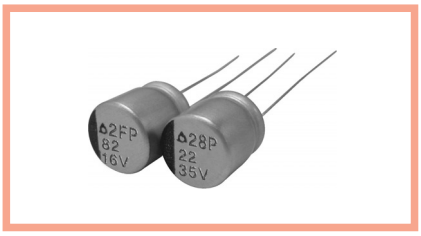
RATINGS OF AXA Series

Case Size (ØD×L) (mm)	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms/ 105°C, 100kHz)	Tangent of loss angle	Leakage Current (μA)
6.3×6	4	330	20	2,700	0.10	264
	6.3	220	20	2,700	0.10	277
	6.3	330	20	2,700	0.10	416
	10	150	20	2,700	0.10	300
	10	180	20	2,700	0.10	360
	16	68	20	2,700	0.10	218
	16	100	20	2,700	0.10	320
	20	47	25	2,410	0.10	188
8×7	4	470	22	3,220	0.10	376
	6.3	390	22	3,220	0.10	491
	10	220	22	3,220	0.10	440
	10	270	22	3,220	0.10	540
	16	150	22	3,220	0.10	480
	20	68	25	3,020	0.10	272
	25	56	30	2,760	0.10	280
8×11.5	4	1,000	14	4,350	0.10	800
	6.3	820	14	4,350	0.10	1,033
	10	680	14	4,350	0.10	1,360
	16	270	14	4,350	0.10	864
	16	470	14	4,350	0.10	1,504
	16	560	14	4,350	0.10	1,792
	20	270	14	4,350	0.10	1,080
	25	220	16	4,070	0.10	1,100
10×12.5	4	1,800	14	5,160	0.10	1,440
	6.3	1,500	14	5,160	0.10	1,890
	10	1,200	14	5,160	0.10	2,400
	16	470	14	5,160	0.10	1,504
	16	680	14	5,160	0.10	2,176
	16	820	14	5,160	0.10	2,624
	20	470	14	5,160	0.10	1,880
	25	470	16	4,830	0.10	2,350

reALcap™ APA Series

- Higher heat resistance (125℃)
- High Ripple Current
- Endurance 125℃, 2,000hrs

ASA → APA
High Temp.



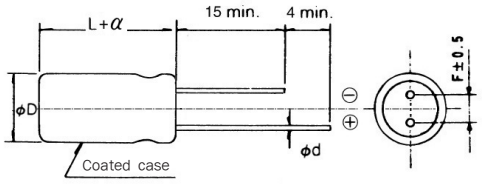
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +125℃
Rated voltage range	10 to 25VDC
Surge voltage	Rated Voltage(WV): 10 / 16 / 25 Surge Voltage(SV): 11.5 / 18.4 / 29
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of APA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of APA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of APA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio: Z(-25℃)/Z(+20℃) ≤ 1.15; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 500 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 125℃)

DIMENSIONS

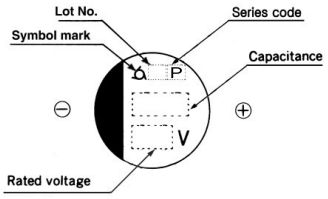
Coating Case Type



Unit(mm)

φD(+0.5max.)	6.3	8.0	8.0
L	6.0	7.0	11.5
α	0.5		
φd(±0.05)	0.45	0.45	0.6
F(±0.5)	2.5	3.5	3.5

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

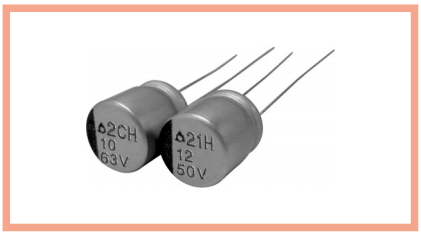
RATINGS OF APA Series

Case Size (øD×L) (mm)	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current (mArms) at 100kHz		Tangent of loss angle	Leakage Current (μA)
				105℃<Temp.≤125℃	Temp.≤105℃		
6.3×6	10	56	45	538	1,700	0.10	112
	25	10	65	474	1,500	0.10	50
8×7	16	82	40	670	2,120	0.10	262
	25	22	48	580	1,835	0.10	110
8×11.5	16	150	27	994	3,140	0.10	480
	25	47	30	943	2,980	0.10	235

reALcap™ AHA Series

- High Voltage(16~100V)
- High Ripple Current
- Endurance 105℃, 2,000~5,000hrs

ASA → AHA
High Voltage



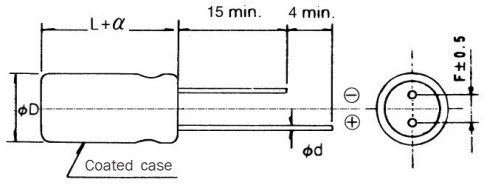
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	16 to 100VDC
Surge voltage	Rated Voltage(WV): 16, 20, 25, 35, 50, 63, 80, 100 Surge Voltage(SV): 18.4, 23, 29, 40, 57.5, 72.5, 92, 115
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AHA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AHA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AHA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-25℃)/Z(+20℃) ≤ 1.15 Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value Voltage(V) / Case Size / Time(Hrs): 16~80 — 6.3×6, 8×7 — 3,000; 8×11.5, 10×10, 10×12.5 — 5,000; 100 — 8×11.5, 10×10, 10×12.5 — 2,000
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1. If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

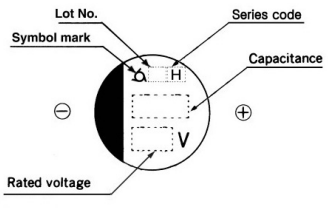
Coating Case Type



Unit(mm)

φD(+0.5max.)	6.3	8.0	8.0	10.0	10.0
L	6.0	7.0	11.5	10.0	12.5
α			0.5		
φd(±0.05)	0.45	0.45	0.6	0.6	0.6
F(±0.5)	2.5	3.5	3.5	5.0	5.0

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

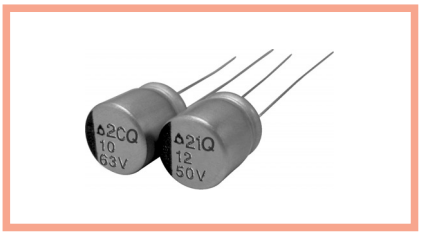
RATINGS OF AHA Series

Case Size (ø D×L) (mm)	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms /105℃, 100kHz)	Tangent of loss angle	Leakage Current (μA)
6.3×6	16	56	40	1,790	0.10	179
	20	47	40	1,790	0.10	188
	25	33	45	1,690	0.10	165
	35	18	47	1,650	0.10	126
	50	12	50	1,600	0.10	120
	63	10	60	1,460	0.10	126
8×7	16	82	35	2,350	0.10	262
	20	68	35	2,350	0.10	272
	25	56	40	2,200	0.10	280
	35	27	42	2,147	0.10	189
	50	22	45	2,070	0.10	220
	63	12	50	1,960	0.10	151
8×11.5	16	270	25	3,400	0.10	864
	20	220	25	3,400	0.10	880
	25	150	30	3,100	0.10	750
	35	82	35	2,870	0.10	574
	50	56	40	2,690	0.10	560
	63	39	45	2,530	0.10	491
	80	33	50	2,400	0.10	528
	100	15	60	2,190	0.10	300
10×10	16	470	25	3,650	0.10	1504
	20	330	25	3,650	0.10	1320
	25	270	30	3,330	0.10	1350
	35	120	35	3,090	0.10	840
	50	82	40	2,890	0.10	820
	63	68	45	2,720	0.10	857
	80	47	50	2,580	0.10	752
	100	22	60	2,360	0.10	440
10×12.5	16	560	23	4,180	0.10	1792
	20	470	23	4,180	0.10	1880
	25	330	28	3,790	0.10	1650
	35	150	33	3,490	0.10	1050
	50	120	37	3,300	0.10	1200
	63	82	42	3,090	0.10	1033
	80	56	45	2,990	0.10	896
	100	33	55	2,700	0.10	660

reALcap™ AQA Series

- High Voltage(50～80V)
- Wide Temperature range
- Endurance 125℃, 4,000hrs

AHA → AQA
High Temp.



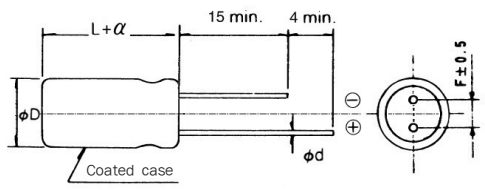
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +125℃
Rated voltage range	50 to 80VDC
Surge voltage	Rated Voltage(WV): 50 / 63 / 80 Surge Voltage(SV): 57.5 / 72.5 / 92
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AQA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AQA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AQA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio: Z(-25℃)/Z(+20℃) ≤ 1.15; Z(-55℃)/Z(+20℃) ≤ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 4,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90～95%RH for 500 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value

※ 1 : if any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 125℃)

DIMENSIONS

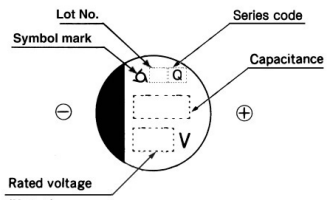
Coating Case Type



Unit(mm)

φD(+0.5max.)	8.0	8.0	10.0	10.0
L	7.0	11.5	10.0	12.5
α	0.5			
φd(±0.05)	0.45	0.6	0.6	0.6
F(±0.5)	3.5	3.5	5.0	5.0

MARKING



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120≦ f <1k	1k≦ f <10k	10k≦ f <100k	100k≦ f <500k
Factor	0.05	0.3	0.7	1

RATINGS OF AQA Series

Case Size (øD×L) (mm)	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms /125℃, 100kHz)	Tangent of loss angle	Leakage Current (μA)
8×7	50	12	45	960	0.10	120
	63	10	50	910	0.10	126
8×11.5	50	47	40	1,500	0.10	470
	63	33	45	1,410	0.10	416
	80	15	50	1,340	0.10	240
10×10	50	68	40	1,610	0.10	680
	63	47	45	1,520	0.10	592
	80	22	50	1,440	0.10	352
10×12.5	50	82	37	1,740	0.10	820
	63	68	42	1,630	0.10	857
	80	33	45	1,580	0.10	528

PRECAUTIONS TO USERS

Soldering method
SMD Type have no capability to withstand such dip or wave soldering as totally immerses a components into a solder bath.

Reflow soldering
Use the capacitors within the Recommended Reflow Soldering Conditions, and also make sure to check the temperature stress to the capacitors because the following makes a difference in the stress to the capacitors. If any other reflow soldering conditions are applied, please consult us.

① Location of components. (The edge sides of a PC board increases its temperature more than the center does.)
② Population of components. The less the component population is the more the temperature is increased.
③ Material of printed circuit board. As a ceramic board needs heating up more than a glass epoxy board to reach the same board temperature, the capacitors may be damaged.
④ Thickness of PC board. A thick PC board needs heating up more than a thin board. It may damage the capacitors.
⑤ Size of PC board. A large PC board needs heating up more than a small board, and it may damage the capacitors.
⑥ Location of infrared ray lamps. On IR reflow as well as hot plate reflow, heating only the reverse side of the PC board will reduce a stress to the capacitors.
⑦ Case leakage current will increase (~mA) after the reflow process, the leakage current which rose gradually decreases when voltage is applied.

Rework of soldering
Avoid soldering more than once by reflow. Use a soldering iron for rework of solder, and do not exceed an iron tip temperature of 300℃ and a max. exposure time of 5 seconds.

Mechanical stress
Do not lift up or push the capacitor after soldering. Avoid curvature of the PC board. These may damage the capacitor.

Cleaning of assembly board
Immediately after solvent cleaning, evaporate a residual solvent for at least 10 minutes with a hot forced air. If the assembly board is inadequately dried after a washing process, the capacitors will keep suffering from a residual solvent for long periods of time, and will be corroded while in service.

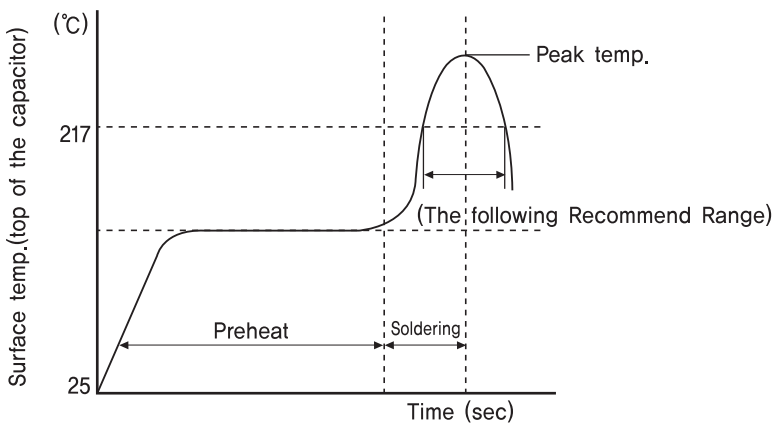
Coating on assembly board
① Before coating, evaporate cleaning solvents from the assembly board.
② Before the conformal coating, using a buffer pre-coat which does not contain chloride is recommanded to reduce stress to the capacitors.

Molding by resin
Inner pressure of a capacitor slowly increases over the service life of the capacitor with gas being produced by internal chemical reaction. If the end seal of the capacitor is completely be in danger. Also if the resin contains a large amount of chlorine ion, it will penetrate into the end seal, get into the inside element of the capacitor, and damage the capacitor while in service.

Others
Refer to PRECAUTION and GUIDELINES(Conductive Polymer)

RECOMMENDED PB-FREE REFLOW SOLDERING CONDITIONS

The following conditions are recomended for air or infrared reflow soldering of the surface mount capacitors onto a glass epoxy circuit board of 90×50×0.8mm (with resist) by cream solder (eutectic solder) . The temperatures shown are the surface temperature values of the top of the capacitor.



TEMPERATURE PROFILE

CASE CODE	Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
F60, H70, H10, H12, J10	60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250℃ (10 Sec ↓)	1 TIME

Aluminum Electrolytic Capacitors

LIST OF SUBSTITUTE FOR DISCONTINUED SERIES

The following series are discontinued.
Please use the recommended replacements in the table.

◆LIST OF SMD REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	MV	MVG
Low Impedance	MVY	BXJ
High Temperature	CDA, CLA	CLZ, CLS

◆LIST OF RADIAL REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	SL,SM,SMS,SRF,SHL,SR	MHA
105℃ standard	KM,KMC,KME,KRF,KMG	NHA
85℃ Bi-polarized	SRA-BP	GSA-BP
85℃ Bi-polarized	SM-BP(D), SMS-BP,SH-BP	MHA-BP
105℃ Bi-polarized	KM-BP(D),KME-BP,KMG-BP	NHA-BP
85℃ Bi-polarized	SM-BP(P)	SSP
85℃ Bi-polarized	SM-BP(S),SSA	KSA
105℃ Bi-polarized	KM-BP(S)	KSA
Low Impedance	LXF	NXQ, NXW
Low Impedance	RX,RZ,SXA,SXC,SXE,LXJ,KXL	NXR
Ultra Low ESR	NXC, NXF	NXE, NXG
High Ripple	KHR,NFD(KMF)	NZE
	NFE(KMX)	NFK, NFS, NBA, NBS, NBC, NBD
High Temperature	KXC,PXA	PXB, PXD
High Temperature, Low Impedance	PXC	PFD
7L Standard	SRA	GSA, HMA

◆LIST OF SNAP-IN REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	SM,NM,SMS,SHL,SMK,SMG,SMH, SLT,RDA	RDC
105℃ standard	KM,KME,KMG,KMH,KLT	TDA
Protecting Overvoltage	KLG	RVA,TVA

◆LIST OF SCREW-BOLT REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	SMH, RGA	TGA(KMH), RGB
105℃ standard	KME	TGA(KMH)
For Inverter	GW, RWA	RFA

PRECAUTIONS AND GUIDELINES TO USERS

PRECAUTION FOR USE OF ALUMINUM ELECTROLYTIC CAPACITORS

Select the capacitors suited to their installation and operating environment, and use them within the performance limits prescribed in their catalog or product specifications, please pay attention to the points listed below.

- Allowable operating temperature range is exceed
- PCB board cleaning conditions
- Reverse voltage
- Voltage exceeds rated working voltage
- Rapid charging and discharging
- Severe vibration or mechanical shock

Please pay attention to right circuit pattern design. When you fail to follow above precautions, you can expect the leakage of electrolyte or opening of the vent in a capacitor because of sudden heating and increased internal pressure.

CAUTION DURING CIRCUIT DESIGN

1. Rated voltage

If a voltage exceeding the capacitor's rated voltage is applied, the capacitor may be damaged as leakage current increases. When using the capacitor with AC voltage superimposed on DC voltage, care must be exercised that the peak value of AC voltage does not exceed the rated voltage.

2. Operating Temperature

Do not use Aluminum Electrolytc Capacitors at temperature which exceeds the specified operating temperature range. Applying capacitors surpassing guaranteed conditions may cause destruction due to rappid characteristic det-erioration. Where, temperature of a capacitor in-cludes radiation heat of Power transistor, IC, Re-sitor, etc. and self heat by ripple current as well as ambient temperature of a set.

3. Ripple Current

Do not apply excessive current to the capacitors, which exceeds the specfied maximum permissible ripple current. If you apply over-rated ripple current, you can expect initial failure in your set. When the value of direct bias voltage is small, even though you apply permissible ripple current, reversed voltage can be occurred. Please take deep attention to possible reversed voltage.

4. Charge and discharge

General Aluminum Electrolytic Capacitors are not suitable for rapid charge and discharge app-

알루미늄 전해 콘덴서의 사용상의 주의점

콘덴서를 사용하고자 할때 카다로그나 승인원에 제시된 범위 내에서 설치 및 사용 환경에 맞게 선정하고 검토시 아래 사항에 대해 유의하시길 바랍니다.

- 허용 사용온도 범위 초과
- 기판 세척 조건
- 역전압
- 정격 전압을 초과하는 과전압
- 급격한 충전 방전
- 가혹한 진동과 기계적 쇼크

상기와 같은 경우, 급격한 발열 및 내압 상승으로 인한 전해액 누설 또는 방폭변 동작으로 발열, 발화되는 경우가 있으므로 회로 패턴 설계시 주의하여 주시기 바랍니다.

회로 설계시 주의 사항

1. 정격 전압

정격전압 이상의 전압을 인가하면 콘덴서의 누설전류가 증대되어 파손되어 버립니다. 또 DC에 AC를 중첩하여 사용할 때에는 AC전압의 Peak치가 정격전압 이하가 되도록 주의하여 주십시오.

2. 사용 온도

규정되어 있는 사용온도 범위를 초과하여 사용하지말아 주십시오. 보증범위를 초과하는 조건에서의 사용은 급격한 특성 열화가 발생되어 파손되는 경우가 있습니다. 온도는 Set의 주위온도 뿐만 아니라 Set내의 발열체(Power TR, IC, 저항 등)의 방사열, 리플 전류에 따른 자기발열 등이 모두 포함된 콘덴서의 실제온도를 확인하여 주십시오.

3. 리플 전류

과전류(허용 리플을 초과하는 전류)를 흘리지 말아주십시오. 정격치 이상의 리플전류가 흐르게 되면 초기고장이 발생할 수 있습니다. 허용 리플치 이하에서 사용하더라도 직류 Bias 전압이 작을 때는 역전압이 인가되는 경우가 있습니다. 역전압이 인가되지 않는 범위에서 사용하여 주십시오.

4. 충 · 방전

일반적인 Al전해 콘덴서는 급격한 충방전이 이루어지는 회로에 사용하지 말아 주십시오.

lications. Consult with samyoung about specially designed capacitors for rapid charge and discharge.

충방전 목적의 회로에 적용할 경우에는 폐사에 연락 바랍니다.

5. Polarization

Aluminum Electrolytic Capacitors are normally polarized. Reverse voltage or AC voltage should not be applied. When polarity of applied voltage is uncertain or when the polarity may flip over, non-polar type capacitors should be used. But the non-polar type cannot be used for AC circuit. Please confirm the polarity to avoid applying any reverse voltage or ac voltage to the capacitors. Polarity is indicated as below:

- Negative polarity is indicated on the side of body by meams of a stripe or an arrow.
- On radial leaded Aluminum Electrolytic Capacitors, the shorter lead is the negative terminal.
- On Snap-In and Lug Terminal type capacitors, the knurled rivets 〔 ▨ , ● 〕 indicates the negative terminal.
- On Surface Mount Capacitors, the mark 〔 ◖ 〕 indicates the direction of Negative Polarity.

5. 극성

Al 전해 콘덴서는 극성이 있습니다. 역전압 또는 교류 전압을 인가하지 말아 주십시오. 극성이 불확실하거나 극성이 반전하는 회로에는 무극성 콘덴서를 사용하십시오. 그러나 무극성 콘덴서라 하더라도 교류 회로에는 사용하실 수가 없습니다.
역전압 혹은 교류전압이 인가되어지지 않을 경우에도 확인 후 사용해 주십시오. 극성은 아래와 같이 표시되어 집니다.

- 음극은 제품 옆면에 띠 또는 실선 인쇄로 표시되어집니다.
- 리드선 단자 동일 방향 콘덴서는 리드선이 짧은 쪽이 음극을 표시합니다.
- 기판 자립형(pcb terminal)인 LUG 단자의 콘덴서는 〔 ▨ , ● 〕로 음극을 표시합니다.
- SMD Type은 〔◖ 〕로 음극을 표시합니다.

6. Insulation

- Aluminum case, cathode lead wire, anode lead wire and circuit pattern should be electrically isolated.
- The blank terminals must not be connected to a solder trace on the pc board, but be electrically isolated from negative or positve terminal.
- The PVC sleeve of Aluminum Electrolytic Capacitors is not recognized as an insulator, and therefore, the standard capacitor should not be used in a place where insulation function is needed. Please consult with Samyoung should your require a higher grade of insulating sleeve.

6. 절연

- Al 케이스와 음극 리드선, 양극 리드선을 회로적으로 완전히 격리시켜 주십시오.
- BLANK 단자는 PCB 회로에서 음극 또는 양극 단자와 연결납땜하지 말아 주십시오.
- 콘덴서의 외장 PVC Sleeve는 절연이 보장되어 있지 않습니다. 절연기능이 필요한 경우에는 사용하지 말아 주십시오. Sleeve의 절연 기능이 필요한 경우에는 폐사에 연락바랍니다.

7. Surge Voltage

The surge voltage rating is the maximum DC overvoltage to which the capacitor may be subjected for short periods not exceeding approximately 30 seconds at infrequent intervals of not more than six minutes. According to KS C IEC 60384-4, the test shall be continued 1000 cycles at room temperature for the capacitors of characteristic KS C IEC 60384-4 or at the maximum operating temperature for the capacitors of characteristics B and C of KS C IEC 60384-4 with voltage applied through a series resistance of 1000 ohms without discharge, the electrical characteristics of the capacitor after the test are specified in KS C IEC 60384-4 unless otherwise specified, the surge voltages are as follows:

7. 써지 전압

써지 전압이란 DC 최대 과전압으로 6분의 주기로 약 30초간 견딜수 있는 전압을 말합니다.
(30초 충전, 5분 30초 방전)
시험방법은 직렬저항 1000Ω을 통하여 상온에서 충·방전하여 1000회 실시하게 되어 있습니다.
시험 후의 전기적 특성은 KS C IEC 60384-4 규격을 참조바랍니다. 특별한 언급이 없을 경우 써지전압은 아래의 표와 같습니다.

Rated Voltage (WV)	4	6.3	10	16	25	35	50	63	80	100	120	160	200	250	315	350	400	420	450	460	500	550	600
Surge Voltage (SV)	5	8	13	20	32	44	63	79	100	125	150	200	250	300	365	400	450	470	500	550	550	600	650

8. Lead Stress

Do not apply excessive force to the lead wires or terminals. If excessive force is applied to the lead

8. 리드 스트레스

콘덴서의 리드선이나 단자에 무리한 힘을 가하지 마십시오. 리드선이나 단자의 단선 및 회로의 개방을 초래할 수 있습니다.

wires and/or terminals, they may break and cause an open circuit. After mounting, avoid holding or applying force to the capacitor. Do not twist or carry the PC board by grasping the capacitor body after the capacitor are soldered to the PC board.

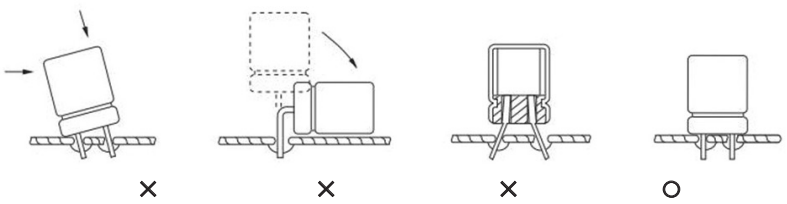
9. Mounting

The distance between the terminal holes on the circuit board should be the same as that between the lead wires or terminals of the capacitor. Excessive force in mounting on circuit boards should be avoided.
Improper insertion of the lead wires in circuit board may cause electrolyte leakage, break the lead wires or impair their connection with the internal elements.
When the distance between the two terminal holes on the circuit board cannot be reduced to that between the lead wires, lead formed capacitors are recommended.

기판 장착 후에도 콘덴서에 무리한 힘을 가하지 마십시오.
회로기판에 장착 후 콘덴서를 잡고 이동하거나 비틀지 마십시오.

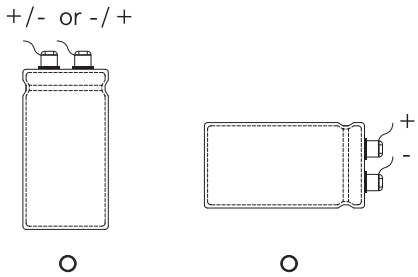
9. 기판 장착

회로기판에서 단자 홀(hole) 간격은 콘덴서의 리드선이나 단자간의 간격과 같아야 합니다.
회로기판에 장착시 무리한 힘을 가하지 마십시오.
회로기판에 리드선을 무리하게 삽입할 경우 전해액의 누설, 리드선의 손상, 내부 요소와의 접속부위의 파손 등이 발생할 수 있습니다.
회로기판의 홀(hole) 간격과 리드선의 간격이 맞지 않을 때에는 리드선이 가공된 콘덴서를 사용하십시오.

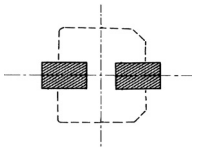


CONSIDERATION TO ASSEMBLY CONDITION

- Design the appropriate hole spacing to match the lead pitch of capacitors.
- Do not locate any wiring and circuit patterns directly above the capacitor`s vent.
- The sealing side of the screw terminal type should not face down in the application. When the capacitors are mounted horizontally, the anode screw terminals must be positioned at the upper side.



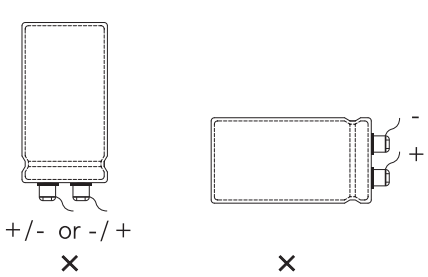
- Parts which radiate heat should not be placed Capacitors on the PCB board.
- Land pattern of Surface Mount Capacitors should comply with the specification which is mentioned in the catalog or specification sheets.
  (Refer to SMD Type)
- Torque of tightening screw terminals should not exceed the specified maximum value which is described in the catalog or specification sheets.



: Solder land

취급 환경 설계

- 콘덴서 단자 간격에 맞게 PCB 구멍을 설계해 주십시오.
- 콘덴서 안전장치(방폭변)부분 위에 배선 및 PCB 회로패턴이 닿지 않게 설계해 주십시오.
- Screw 단자형 콘덴서의 봉구부를 밑으로 향하게 하지 말아주십시오. 만약 제품을 옆으로 눕힐 경우에는 양극 단자를 위로 향하게 하여 주십시오.



- 콘덴서의 주변 및 PCB 의 반대쪽(제품 밑)에 발열 부품의 배치를 피해주십시오.
- SMD Type형 콘덴서의 PCB 패턴의 납땜 Land는 카다로그 또는 승인원에 규정된 범위내에서 연결하여 주시길 바랍니다. (SMD Type 참조)
- Screw 단자에 회로를 연결하실 때의 토르크는 카다로그 또는 승인원에 규정된 범위내에서 연결하여 주시기 바랍니다.

- Consider current balance when 2 or more Aluminum Electrolytic Capacitors are connected in parallel.
- Use bleeder resistors when 2 or more Aluminum Electrolytic Capacitors are connected in series. In this case, the resitors should be connected parallel to the capacitors.
- Aluminum Electrolytic Capacitors may accumulate charge maturally during storage. In this case, discharge through about 1kΩ resistor before use.
- Leakage current of Aluminum Electrolytic Capacitors may be increased during long storage time. In this case, the capacitors should be subject to voltage treatment through about 1kΩ resistor before use.

- 콘덴서를 2개이상 병렬로 연결할 때는 전류 Balance를 고려해 주시길 바랍니다.
- 콘덴서 2개이상을 직렬로 연결하실때는 전압 Balance를 고려해서 콘덴서에 병렬로 분압 저항기를 삽입하여 주십시오.
- 전해 콘덴서는 재기 전압이 발생할 경우가 있습니다. 이런 경우에는 사용하기 전에 약 1kΩ의 저항을 통해 방전 처리 후 사용하여 주십시오.
- 전해 콘덴서의 누설전류는 장기간 사용치 않고 보관시 증가 됩니다. 이런 경우에는 약1kΩ의 저항을 통해 전압처리 후 사용하여 주시길 바랍니다.

1. Soldering

- Kindly follow the soldering conditions (temperature and time) defined on your approval sheet, otherwise less 10 seconds at 260℃.
- In case lead wire reforming is needed due to inappropriate pitch between capacitor and holes on PCB stress to the capacitor should be avoided.
- In case soldered capacitor has to be withdrawn from the PCB by soldering irons, the capacitor should be removed after solder has melted sufficiently in order to avoid stress to the capacitor or lead wires.
- Soldering iron should never touch the capacitor's body.

1. 납땜

- 납땜 조건(온도, 시간)은 승인원에 규정된 범위내 또는 260℃, 10초 이하의 조건에서 사용하여 주십시오.
- 리드선 간격과 PCB기판 구멍이 달라 리드선의 가공이 필요한 경우 납땜하기전 콘덴서 본체에 스트레스가 가해지지 않도록 주의 바랍니다.
- 납땜된 콘덴서를 떼어내어 다시 사용코자할 때에는 납땜전에 콘덴서의 단자에 스트레스가 가지않도록 납을 충분히 묻혀 주십시오.
- 납땜 인두가 콘덴서 본체에 닿지 않도록 하여주십시오.

2. Flow soldering

- Do not dip capacitor's body into melted solder.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the catalogs of product specifications.
- Do not put flux on any part of capacitors others than their terminals.
- Do not let other components lean against the capacitors while soldering.

2. Flow 납땜

- 콘덴서의 본체를 납 용융되는 곳에 넣지 말아 주십시오.
- 납땜 조건(예비가열, 납땜온도, 침적시간)은 카다로그 또는 승인원에 규정된 범위내에서 하여 주십시오.
- 단자부 이외 부분에 플럭스가 부착되지 않도록 해주십시오.
- 납땜중에 콘덴서에 다른 부품들이 닿지 않도록 하여주십시오.

3. Reflow soldering (Refer to page 89)

- Soldering conditions (preheat, solder temperature and reflow time) should be within the limits precribed in the catalogs or product specifications.
- For setting a degree of heating infrared heater

3. Reflow 납땜 (89page 참조)

- 납땜 조건(예비가열, 납땜온도, Relfow시간)은 카다로그 또는 승인원에 규정된 범위내에서 하여 주십시오.
- 적외선 히터를 사용할때에는 콘덴서의 색깔이나 재질에

consider that the color and material of a capacitvary their infrared absorption.
- Do not solder capacitors more than once by refolw.

따라 적외선 흡수율이 다르기 때문에 가열 온도를 맞추어 주십시오.
- 한번 Reflow를 통과한 것에 대해서 다시 하지 말아주십시오.

4. Handling after soldering

- Do not bend of twist the capacitor' s body after soldering on PCB.
- Do not pick-up or move PCB by holding the soered capacitors.
- Do not hit the capacitors and isolate capacitor from the PCB of their device when stacking PCB store.

4. 납땜후 제품 취급 요령

- PCB에 콘덴서를 납땜한 후 제품을 비틀지 말아 주십시오.
- 납땜 되어진 콘덴서를 잡고 PCB를 올리거나 이동시키지 말아 주십시오.
- PCB에 콘덴서가 장착된 상태로 PCB를 쌓을 경우 PCB나 기타 제품이 닿지 않게 하여 주십시오.

5. Mounting Capacitors with pressure Relief Vent

- Make the following open space over the pressure relief vent of the capacitor so that the vent can operate.

5. 안전변이 있는 제품의 장착

- 콘덴서 안전변이 동작할 수 있는 공간이 있어야 합니다.

ø D(mm)	6.3～16	18～35	40～
space	2mm min.	3mm min.	5mm min.

- Do not locate any wire or copper trace over the vent of the capacitor
- If the capacitor is mounted with its vent faced down on the PCB, make a ventilation hole in the PCB in place.
- In designing double-sided PCB, do not locate any copper trace under the seal side of a capacitor.
  If it is absolutely unavoidable, these traces must be sufficiently spaced at least 1 or 2 mm apart.

- 콘덴서의 안전변 위에 배선이나 회로 패턴이 없도록 하여 주십시오.
- 만약 콘덴서의 안전변이 PCB쪽으로 향할경우 PCB에 구멍을 설치하여야 합니다.
- 양면 PCB를 사용한 경우 콘덴서 밑으로 회로를 설계 하지 말고 만약 불가피할 경우 최소한 콘덴서로 부터 1mm ～ 2mm 정도 떨어지게 설계해 주십시오.

6. Protecting Vibration

- Radial lead type : Applicable to items with over 10g in weight, diameter of 18mm or longer than 30mm in length
- PCB terminal type : Applicable to items with diameter of 22mm and longer than 40mm in length.

  In order to prevent possible damage by vibration on the PCB, kindly bond our capacitors on the PCB or use any fastening devices.

6. 진동 대비

- 리드 동일방향형 : 질량 10g, ø18 이상 또는 L치수 30이상 제품
- PCB Terminal Type : ø22, L치수 40이상 제품

  진동으로 문제시되는 PCB에 상기 제품을 장착하는 경우에는 반드시 PCB와 제품 바닥면을 Bonding하여 사용하거나 별도 지그를 부착하여 사용하십시오.

7. Adhesive and Coating Materials

- Do not use halogenated adhesives and coating materials to fix Aluminum Electrolytic Capacitors.

7. 제품 고정제와 코팅

- 할로겐계 용제를 포함하는 고정제, 코팅제는 사용하지 말아 주십시오.

- Flux between the surface of capacitors should be cleaned before using adhesives or coating materials.
- Solvents should be dried up before using adhesives or coating materials.
- Do not cover up all the sealing area of capacitor with adhesives or coating materials. Make coverag only partial. (The sealing area 30%)

8. Influence of cleaning solvent for aluminum electrolytic capacitors

- Aluminum electrolytic capacitors are easily affected by halogen ions, particularly by chloride and bromine ions. Excessive amounts of halogen ions, if happened to enter the inside of the capacitors, will give corrosion accidents-rapid capacitance drop and vent open. The extent of corrosion accidents varies with kinds of electrolytes and seal-materials.
- Therefore, the prevention of halogen ion contamination is the most important check point for quality lines. At present, halogenated hydrocarbon- contained organic solvents contained organic solvents such as Trichloroethylene, 1-1-1 Trich-loroethane, and Freon are used to remove flux from circuit boards. If electroytic capacitors are cleaned with such solvents, they may gradually penetrate the seal portion and cause the erosion.
- When using latex-based adhesive on the capacitor's rubber end seal for adhesion to a PCB, corrosion may occur depending on the kind of solvent in the adhesive. Select an adhesive as an organic solvent with dissolved polymer that is not halogenated hydrocarbon. Hot air drying is required for eliminating the solvent between the product and the PCB at 50℃~80℃ after coating.
- Followings are the penetration path of the halogenated solvent
  ① Penetration between the rubber and the aluminum case
  ② Penetration between the rubber and the lead wire
  ③ Penetration through the rubber
- The inside of the capacitors, the mechanism of corrosion of aluminum electrolytic capacitors by halogen ions can be explained as follows:
  Halides(RX) are absorbed and diffused into thseal portion. The halides then enter the inside of the capacitors and contact with the electrolyte of the capacitors, where by halogen ions are made free by a hydrolysis with water in the electrolyte:

$$RX + H_2O \rightarrow ROH + H^+ + X^-$$

- 고정제, 코팅제를 사용하기 전에 기판과 콘덴서 봉구부 부분에 플럭스가 남거나 오염된 채로 놓아두지 말아주십시오.
- 기판 세척제는 고정제, 코팅제를 사용하기 전에 완전히 건조시켜 주십시오.
- 고정제, 코팅제를 사용할 때 콘덴서 봉구부 전체를 밀봉시키지 말아 주십시오.(봉구부의 30% 이하)

8. 알루미늄 전해 콘덴서 세척용 용매의 영향

- 알루미늄 전해 콘덴서는 할로겐계 이온, 특히 염소, 브롬 이온에 쉽게 영향을 받습니다. 할로겐계 이온이 콘덴서 내부로 침투하게 되면 부식활동에 의해 급속한 용량감소 및 방폭변이 개변등의 현상이 일어납니다. 부식활동의 정도는 전해액 및 봉합물질의 종류에 따라 달라지게 됩니다.
- 따라서 폐사의 생산 라인에서는 할로겐계 이온의 침투 방지를 품질관리의 최고 중점관리 사항으로 관리하고 있습니다. 현재 Trichloroethylene, 1-1-1 Trichloroethane 및 Freon과 같은 탄화수소 화합물이 들어있는 유기용제들이 회로기판의 플럭스를 제거하기 위해 사용됩니다. 그러나 그와 같은 용매로 세척할 경우 점차적으로 봉입부분으로 흘러들어가 콘덴서 내부의 부식이 발생합니다.
- 콘덴서의 밀폐용 고무에 고무계의 접착제를 사용하여 인쇄 회로 기판에 접착할 경우, 접착제의 종류에 따라 콘덴서의 부식이 발생 할 수 있습니다. 접착제로서는 할로겐화되지 않은 유용성 폴리머로 구성된 유기용제를 선택하십시요. 코팅(Coating)을 행할 경우 제품과 기판간에 세정액이 남지 않도록 세정 직후 50℃~80℃에서 열풍 건조하여 주시기 바랍니다.
- 할로겐계 용제의 침투경로는 다음과 같습니다.
  ① 봉구고무 알루미늄 케이스 사이로 침투
  ② 봉구고무와 리드선 사이로 침투
  ③ 봉구고무를 통과하여 침투
- 할로겐이온에 의한 부식의 진행은 다음과 같이 설명되어집니다. 할로겐화물이 수분과 반응하여 다음식과 같이 해리된 다음 봉입부분으로 확산되어 집니다.

$$RX + H_2O \rightarrow ROH + H^+ + X^-$$

The halogen ions(X^-) react with the dielectric substance (Al_2O_3) of aluminum electrolytic capacitors:

$$Al_2O_3 + 6H^+ + 6X^- \rightarrow 2AlX_3 + 3H_2O$$

AlX_3 is dissociated with water:

$$AlX_3 + 3H_2O \rightarrow Al(OH)_3 + 3H^+ + 3X^-$$

- Aluminum electrolytic capacitors have been exposed to halogenated hydrolcarbon cleaning and defluxing solvents are susceptible to attack by these solvents. This exposure can result in solvent penetration into the capacitors, leading to internal corrosion and potential failure.
- Common type of halogenated cleaning agent are listed below.

Chemical Name	Structual Formula	Representative Brand Name
Trichlorotrifluoroethane	$C_2Cl_3F_3$	Freon TF , Daiflon S-3
Fluorotrichloromethane	CCl_3F	Freon-11 , Daiflon S-1
1,1,1-Trichloroethane	$C_2H_3Cl_3$	Chloethane
Trichloroethylene	C_2HCl_3	Trichene
Methyl Chloride	CH_3Cl	MC

- All electrolytic capcitors, including solvent-proof capacitors, should be free from halogenated solvents during PCB cleaning after soldering. If cleaning is required, use solvent-proof capacitor and follow the specified cleaning condition.

- We would like to recommend you the below cleaning materials for your stable cleaning condition taking place of previous materials.

- Isopropyl Alcohol(IPA) or water Cleaning method: One of immersion, vapor cleaning, ultrasonic Maximum cleaning time : 5minutes. (Chip type : 2minutes)

  ∗ Do not use AK225AES

- Solvent-proof capacitors in the catalogue is mark with the solvent-proof.

Solvent-proof

- Solvents should have well controlled conductivity ph, specific gravity and water contents during the cleaning of solvent-proof capacitors. Chlorine levels can rise with contamination and adversely affect the performance of the capacitor.

할로겐 이온(X^-)은 알루미늄 전해콘덴서의 유전체(Al_2O_3)와 반응합니다.

$$Al_2O_3 + 6H^+ + 6X^- \rightarrow 2AlX_3 + 3H_2O$$

AlX_3 는 물과 반응하면 할로겐 이온을 해리시키면서 알루미늄 하이드록사이드로 됩니다.

$$AlX_3 + 3H_2O \rightarrow Al(OH)_3 + 3H^+ + 3X^-$$

- 세척 및 플럭스 제거용으로 사용된 할로겐계 탄화수소 용매에 접한 알루미늄 콘덴서는 이러한 용매들에 의해 손상을 받을 우려가 있습니다. 콘덴서 내부로 용매가 침투하면서 내부부식으로 인한 불량을 유발할 수 있습니다.

- 할로겐계의 세척제의 일반적인 유형은 아래 표와 같습니다.

화학명	구조식	대표 상품명
Trichlorotrifluoroethane	$C_2Cl_3F_3$	Freon TF , Daiflon S-3
Fluorotrichloromethane	CCl_3F	Freon-11 , Daiflon S-1
1,1,1-Trichloroethane	$C_2H_3Cl_3$	Chloethane
Trichloroethylene	C_2HCl_3	Trichene
Methyl Chloride	CH_3Cl	MC

- 내세척용 콘덴서를 포함한 모든 전해 콘덴서는 할로겐용제 등으로 세척할 수 없습니다. 다만 세척이 필요한 경우에는 폐사에서 권장하는 내세척용 콘덴서를 사용하고 카다로그 또는 승인원에 규정된 세척방법으로 세척을 권장합니다.

- 폐사에서는 안정적인 세척을 위해서 다음의 세척제를 권장합니다.

- Isopropyl Alcohol(이소프로필 알코올)또는 물 세척방법 : 침적, 증기세척, 초음파
  최대 세척시간 : 5분(단 Chip Type은 2분)

  ∗ AK225AES는 사용하지 마십시오.

- 카다로그 내에서 내세척용 콘덴서는

Solvent-proof 로 표시합니다.

- 내세척용 콘덴서를 세척할 때 세척제의 오염관리 (도전도, pH, 비중, 수분량 등)를 하여 주십시오. 세척제가 오염되었을 때에는 염소농도가 높게되어 콘덴서 내부가 부식되는 경우가 있습니다.

EMERGENCY ACTION

- When the vent is open and some gas blows out from the capacitor, please turn the main swich of the equipment off or pull out the plug from the power outlet immediately.
- During vent operation, extremly hot gas(over 100℃) may blow out from the capacitors. Do not stand close to the capacitors. In case of eye contact, flush the open eye(s) with large amount or clean water immediately, do not swallow. Do not touch electrolyte but wash skin with soap and water in case or skin contact.

CONDITION OF STORAGE/USE

If electrolytic capacitors temperatures caused by such things as direct sunlight,the life of the capacitor may be adversely affected. Storage in a high humidity atmosphere may affect the solderability of lead wires and terminals.

1. STORAGE AREA

- Do not store capacitors at a high temperature and high humidity. Store the capacitors indoors at a temperature of 5 to 35℃ and a humidity of less than 75%RH.
- Store the capacitors in places free from water, oil or salt water.
- Store the capacitors in places free from toxic gasses (hydrogen sulfide, sulrurous acid, nitrous acid, chlorine, ammonium, etc.)
- Store the capacitors in places out of ozone, ultraviolet rays or radiation.
- Keep capacitors in the package.

2. CONDITIONS OF USE

The following environment should be avoided when using aluminum electrolytic capacitors.

- Damp conditions such as water, saltwater spray, or oil spray or fumes, High humidity or humidity condensation situations.
- Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas,nitrous acid, chlorine gas or ammonia.
- Exposure to ozone, ultraviolet rays or radiation.

3. VOLTAGE TREATMENT

If the electrolytic capacitor is allowed to stand for a long time, its withstand voltage is liable to drop, resulting in increased leakage current.
If the rated voltage is applied to such a product, a large leakage current occurs and this generates internalheat, which damaged the capacitor.
Of the electrolytic capacitor is allowed to stand for a long time, therefore, use it after giving voltage treatment. It is recommended to apply DC rated voltage to the capacitor for a minimum of 30minutes through 1㏀ of protective series resistor.

만일의 경우

- 사용중 콘덴서가 개변되어 Gas가 분출될 경우 Set의 주전원 장치의 스위치를 끄거나 플러그를 뽑아 주십시오.

- 콘덴서의 안전변 동작시 +100℃를 초과하는 고온Gas가 분출하기 때문에 얼굴을 가까이 대지 말아주십시오. 분출한 Gas가 눈에 들어 가거나 흡입한 경우에는 즉시 물로 눈을 씻거나 삼키지 말고 입안을 닦아주시기 바랍니다. 전해액은 만지지 말고 만약 피부에 묻었을 경우 물이나 비누로 닦아 주시길 바랍니다.

보관/사용 조건

전해 콘덴서를 직사광을 받는 장소, 고온장소에 보관하게 되면 제품 수명에 악영향을 초래하며 또 다습한 장소에 보관 하게 되면 리드선과 단자의 납땜성이 나빠질 우려가 있습니다.

1. 보관 장소

- 콘덴서를 고온 다습 조건에 보관하지 말아 주십시오. 실내 온도가 5~35℃, 습도는 75%RH 이하 조건에서 보관하시길 바랍니다.

- 콘덴서를 물, 기름 또는 소금물에 오염되지 않도록 해주십시오.
- 콘덴서를 유해 Gas(유화 수소, 아황산, 아질산, 염소, 암모늄 등)에 노출된 환경에서 보관하지 말아주십시오.

- 콘덴서를 오존, 자외선 및 방사선에 노출되는 환경에서 보관하지 말아 주십시오.
- 포장 상태에서 보관하여 주십시오.

2. 사용 조건

다음의 환경에서는 전해 콘덴서를 사용하지 말아 주십시오.

- 직접수, 염수, 기름이 근접해 있거나 다습 또는 결로 상태가 되는 환경

- 유해 Gas(유화수소, 아황산, 아질산, 염소, 암모니아 등) 가 가득한 환경
- 오존, 자외선 또는 방사선에 노출된 환경

3. 전압 처리

전해 콘덴서는 장시간 방치하게 되면 내압이 떨어져 누설전류가 증가하는 경향이 있습니다. 이러한 제품에 전압을 인가하면 과대한 누설전류로 인한 내부 발열로 파손되는 일이 있습니다. 장기간 방치된 제품에 대해서는 전압처리 후 사용하여 주십시오.
전압처리란 약 1㏀의 저항을 통해 직류정격전압을 최소 30분 동안 인가하는 것을 말합니다.

4. RECOVERY VOLTAGE

After discharged aluminum electrolytic capacitor, the voltage will be increasing again. This phenomenon is called by “Recovery Voltage”, it happens very often and commonly for all aluminum electrolytic capacitors. In this case, discharge through a 1KΩ resistance before use at your process, because you may have trouble on sensitive device and frighten a person working with the capacitor.

4. 재기전압

알루미늄 전해 콘덴서를 방치하면 전압이 다시 상승하게 됩니다. ‘재기전압’이라고 하는 이 현상은 알루미늄 전해 콘덴서에서 자주 발생할 수 있는 흔한 현상입니다. 콘덴서를 이용한 공정 시 이러한 재기전압으로 인해 민감한 장치에는 트러블을 일으키고 작업자 또한 놀랄 수 있으므로 작업 전 1kΩ의 저항으로 콘덴서를 방전 시키는 것이 좋습니다.

DESTRUCTING CAPACITORS

In case of destructing our capacitors, kindly take following instructions.

- Burn capacitors up after making holes on them or scrapping. When you try to destrory them by fire, you may expect explosion in the capacitors.
- In order to prevent hazardous gas like chlorine gas, burn our capacitors on high temperature range. Burning sleeve on low temperature may cause producting chlorine gas.
- When you do not have burning facilities, please contact special industrial wastes processing companies.

폐기에 대하여

콘덴서를 폐기할 경우에는 다음의 방법대로 하여주십시오.

- 콘덴서에 구멍을 내거나 충분히 부순 후에 소각하여 주십시오. 소각시 콘덴서가 폭발하는 경우가 있습니다.
- 콘덴서는 외장슬리브(폴리염화비닐)가 씌워져 있기 때문에 고온 소각을 하여 주십시요. 저온 소각을 하면 염소 Gas등의 유해 Gas가 발생되는 원인이 됩니다.
- 콘덴서를 소각하지 않는 경우는 전문 산업폐기물 처리업체에 의뢰하여 주십시오.

ABOUT AEC-Q200

- The Automotive Electronics Council (AEC) was originally established by American major automotive manufactures. Today, the committees are composed of representatives from the sustaining Members of manufacturing companies in automotive electrical components. It has standardized the criteria for “stress test qualification” and “reliability test” for the electronic components. AEC-Q200 is the reliability test standard for approval of passive components, it has been specified test subjects and quantity etc. for each components. Criteria of reliability tests for Aluminum Electrolytic Capacitors are also described in this.
  As customer requirement, Samyoung Electronics has submits the test results according to AEC-Q200 for the Aluminum Electrolytic Capacitors used in automotive applications to increase in recent years. Please contact us for more information.

AEC-Q200에 대하여

- 자동차 전자 위원회 (AEC) 는 본래 미국의 주요 자동차 제조사들에 의해 설립 되었습니다. 오늘날, 이 위원회는 자동차 전자 부품을 생산하는 회사의 지지회원들의 대표자들로 구성되어 있습니다. 이것은 전자 부품의 “부하 시험 자격” 과 “신뢰성 시험”에 대해 표준화된 기준을 가지고 있습니다. AEC-Q200 은 수동소자들의 승인을 위한 신뢰성 실험의 표준이며, 시험 항목과 수량, 기타 등이 명시되어 있습니다. 알루미늄 전해 콘덴서의 신뢰성 시험 기준 또한 여기에 표기 되어 있습니다.
  고객의 요구에 의해, 삼영전자는 최근 몇년동안 자동차 부품에 적용되는 알루미늄 전해 콘덴서에 대한 AEC-Q200에 근거한 시험 결과를 제출하여 왔습니다. 더 많은 정보를 위해 저희에게 연락 주시기 바랍니다.

OTHERS

- Since it has possibilities for electric shock or burns, kindly discharge it at the level of 1kΩ in advance.(sufficient and safe resistance values should be considered before applying)
- Capacitor case sizes and other product standards specified in this catalog may be changed or modified without notice for improvement of quality.
- For methods of testing, refer to KS C IEC 60384-4 (JIS C 5101-1, JIS C 5101-4)

기타

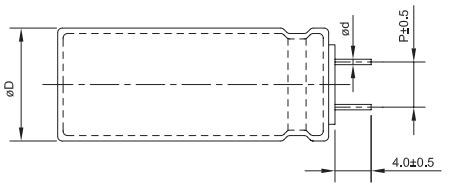
- 감전 및 화상의 우려가 있으므로 사용전에 1kΩ(전압, 용량에 따라 충분히 여유를 고려한 저항 선택)의 저항을 통해서 방전처리해 주십시오.
- 카다로그에 규정된 제품 케이스 사이즈 및 기타 제품기준은 품질 개선의 필요성으로 인하여 귀사에 통지없이 변경될 수 있습니다.
- 기타 시험규격에 대해서는 KS C IEC 60384-4 (JIS C 5101-1, JIS C 5101-4)을 참조 바랍니다.

LEAD CUTTING/FORMING SPECIFICATIONS

(mm)

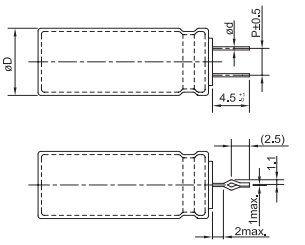
● Lead configuration : CC

ø D = 4 to 25.4



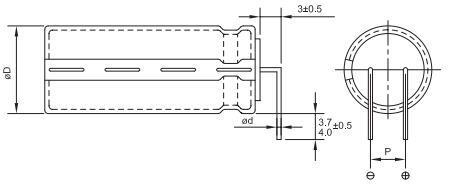
● Lead configuration : MC

ø D = 10 to 25.4



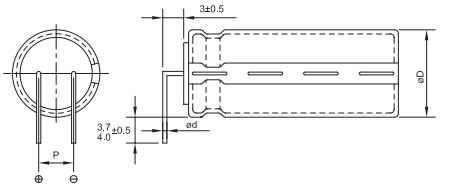
● Lead configuration : RB

ø D = 5 to 22



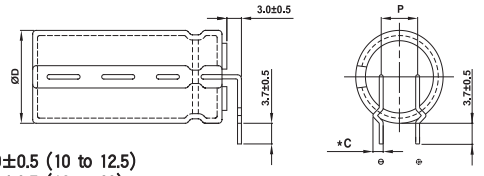
● Lead configuration : LB

ø D = 5 to 22



● Lead configuration : RA

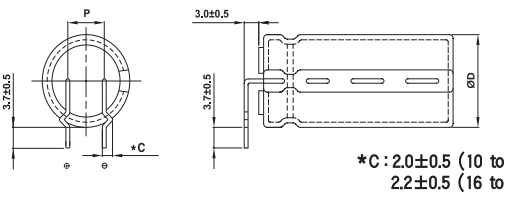
ø D = 10 to 22



*C : 2.0±0.5 (10 to 12.5)
2.2±0.5 (16 to 22)

● Lead configuration : LA

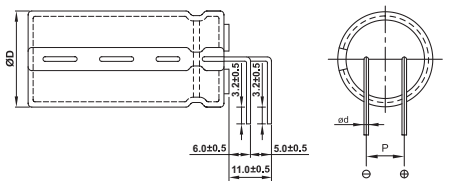
ø D = 10 to 22



*C : 2.0±0.5 (10 to 12.5)
2.2±0.5 (16 to 22)

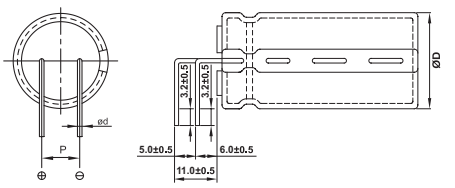
● Lead configuration : RD

ø D = 10 to 12.5



● Lead configuration : LD

ø D = 10 to 12.5



■ LEAD SPACING & RECOMMENDED PCB DIMENSIONS

(mm)

Dimensions / ø D	ø d	P	PC Board		Lead Configuration	
			Hole diameter	Thickness		
5	0.5	2.0	0.8	1.6	CC RB/LB	
6.3	0.5	2.5	0.8			
8	0.6	3.5	1.0			
10	0.6	5.0	1.0	1.6	RD/LD	CC MC
12.5	0.6	5.0	1.0			
16	0.8	7.5	1.2		RB/LB RA/LA	
18	0.8	7.5	1.2			
20	0.8	7.5	1.2			
22	1.0	10	1.2			
25.4	1.0	10	1.4			
	1.0	12.5	1.4			

※ Note : Other case sizes are available upon request. Please check with us about individual size and dimensions.

PART NUMBER INDICATION CHART

1. CATALOG NUMBERING SYSTEM(CONDUCTIVE POLYMER, ALUMINUM ELECTROLYTIC)

Capacitance tolerance	Symbol	Capacitance tolerance	Symbol
-10%～ +10%	K	-20%～ +20%	M
0%～ +100%	P	-30%～ +30%	N
-10%～ +50%	T	-10%～ +30%	Q
-10%～ +100%	W	-10%～ +20%	V
0%～ +20%	R	0%～ +30%	S

Nominal values are used.
10V → 10
100V → 100
450V → 450

Miniature	Surface Mount	Large Sized					
VB	VC	VN/VS	LG	LR	VR	LA	LI

MHA	450	VB	4.7	M	5.0TP	10×16
Series	Rated voltage	Lead type	Capacitance	Cap. tolerance	Lead forming/ Taping	size(mm) (øD×L)

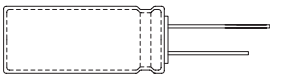
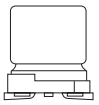
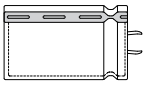
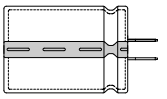
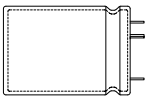
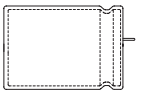
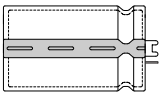
Capacitance(μF)	Code
0.1	R1
1	1
4.7	4R7
10	10
100	100

Taping Clinch	Code
2.5mm	2.5TP
3.5mm	3.5TP
5.0mm	5.0TP
7.5mm	7.5TP

	Code
Lead Cut, Formed Type	CC, MC, RD, LD, RB, LB, RA, LA

2. SUBSTANCE

Terminal Type

Symbol	Configuration	Type
VB		CE04 (SINGLE ENDED) TYPE (ø 3 ~ ø 25.4)
VC		SURFACE MOUNT TYPE (ø 4 ~ ø 12.5)
VN/VS		PCB TERMINAL TYPE (ø 20 ~ ø 40 : 2 TERMINALS)
LG		SCREW-BOLT TERMINALS TYPE (ø 35 ~ ø 100)
LR		PCB TERMINAL TYPE (ø 35 ~ ø 63.5 : 2 TERMINALS)
VR		PCB TERMINAL TYPE (ø 35 ~ ø 50 : 4 TERMINALS)
LA		CE62 TYPE (ø 14.5 ~ ø 50 : 2 TERMINALS)
LI		PCB TERMINAL TYPE (ø 30 ~ ø 40 : 2 TERMINALS)

MVG Series

• 85℃ 2,000Hrs assured.

Solvent-proof

WV ≦ 63VDC

- Vertical SMD Type.
- For CD/DVD-ROM, Navigation, LED MT/TV.
- RoHS compliant.
- Halogen-free capacitors are also available.

MV → MVG

Downsized

SPECIFICATIONS

Item	Characteristics								
Rated Voltage Range	4 ~ 450 VDC								
Operating Temperature Range	-40 ~ +85℃								
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)								
Leakage Current	Rated Volatag(VDC)	4~100	160~450						
	Max. Leakage current(μA)	0.01CV (μA) or 3μA, whichever is greater. (at 20℃, 2 minutes)	0.04CV+100(μA) (at 20℃, 1 minute)						
	Where, C:Nominal capacitance(μF), V:Rated voltage(VDC)								
Dissipation Factor(Tanδ)	Rated Voltage(VDC)	4	6.3	10	16	25~50	63~100	160~250	400~450
	Tanδ(Max.)	0.42	0.40	0.30	0.20	0.15	0.12	0.20	0.25
	(at 20℃, 120Hz)								
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC)	4	6.3	10	16	25	35~50	63~100	160~250	400~450
	Z(-25℃)/Z(+20℃)	7	4	3	2	2	2	3	3	6
	Z(-40℃)/Z(+20℃)	15	10	8	6	4	3	4	6	10
	(at 120Hz)									
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃.								
	Rated Voltage(VDC)	4 ~ 6.3	10 ~ 100	160~450					
	Capacitance change	≦±30% of the initial value	≦±25% of the initial value	≦±20% of the initial value					
	Tanδ	≦ 300% of the initial specified value	≦ 200% of the initial specified value						
	Leakage Current	≦ The initial specified value							
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.								
	Rated Voltage(VDC)	4 ~ 6.3	10 ~ 100	160~450					
	Capacitance change	≦±30% of the initial value	≦±25% of the initial value	≦±20% of the initial value					
	Tanδ	≦ 300% of the initial specified value	≦ 200% of the initial specified value						
	Leakage Current	≦ The initial specified value							
Others	Satisfied characteristics KS C IEC 60384-4								

PART NUMBERING SYSTEM

MVG 16 VC 22 M D56 TP

- TP: With tape
- D56: Case code
- M: Capacitance tolerance(±20%)
- 22: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- MVG: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Size code	Freq.(Hz) / Cap.(μF)	120	1K	10K	100K
D56~J10	0.1 ~ 1.0	1.00	1.50	1.75	1.80
	2.2 ~ 10	1.00	1.30	1.40	1.50
	22 ~ 1,500	1.00	1.05	1.08	1.08
K14~M22	4.7	1.00	1.75	2.30	2.50
	10 ~ 68	1.00	1.50	1.75	1.80
	100 ~ 1,000	1.00	1.30	1.40	1.50
	1,500 ~ 10,000	1.00	1.05	1.08	1.08

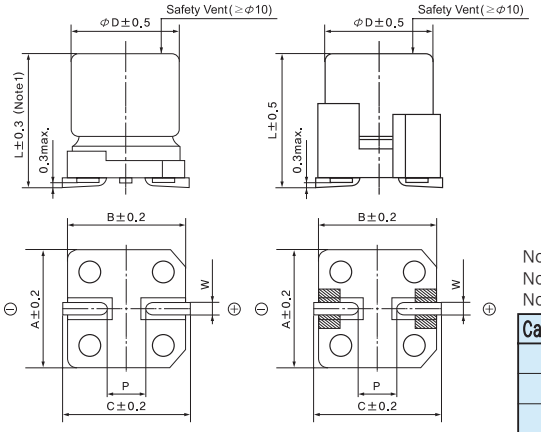
DIMENSIONS OF MVG Series

Unit(mm)

DIMENSIONS

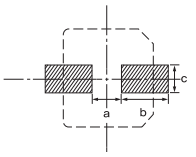
● Vibration Resistance

〈Size code:D56～M22〉 〈Size code:H10～M22〉



▩ : Dummy terminals

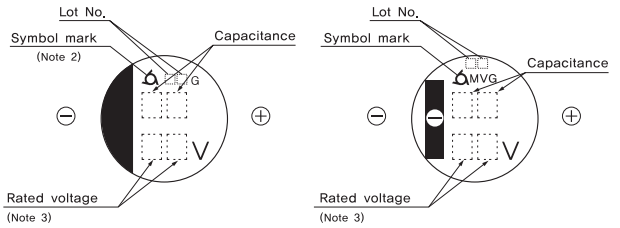
Recommended Solder land on PC board



▨ : Solder land on PC board

※Please inquire beforehand for 16, 18Ø size

MARKING



〈D56 ～ J10〉 〈K14～M22〉

Note 1 : L±0.5 for 8×6.3(H63) ～ 18×21.5(M22)
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6			
E56	5	5.3	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
F56	6.3	5.3	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3
L17	16	16.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF MVG Series

WVDC / μF	4		6.3		10		16		25		35		50		63		100	
0.1													D56	1.3	D56	1.3		
0.22													D56	2.9	D56	3.0		
0.33													D56	3.5	D56	4.0		
0.47													D56	4.2	D56	5.0		
1													D56	6.2	D56	8.0		
2.2											D56	7.7	D56	10	D56	12		
3.3											D56	9.4	D56	14	E56	17		
4.7									D56	10.5	D56	15	D56	19	E56	20		
10					D56	12.8	D56	17	D56	20	D56	25	E56	29	F60	32		
22	D56	14	D56	23	D56	27	D56	27	E56	28	F56	33	F60	40	F80	60	H10	90
33	D56	23	D56	30	D56	30	E56	40	E56	40	F56	40	F80	55	H10	110	J10	120
47	D56	27	D56	33	E56	45	E56	45	F56	60	F60	55	H63	140	H10	130	J10	144
68	E56	38	E56	49	F56	54	F56	78	F60	90	H63	157	H10	170	J10	170	K14	380
100	E56	46	E56	55	F56	65	F60	85	F80|H63	145	H10	175	H10	190	K14	380	K14	440
220	F56	74	F60	75	F80|H63	130	F80	130	H10	260	H10	260	J10	320	K14	580	M17	800
330			F80|H63	135	H10	270	H10	270	H10	300	J10	360	K14	600	L17	820	M22	1,000
470			H10	280	H10	280	H10	280	J10	400	K14	600	L17	850	M17	1,000		
1,000			J10	430	J10	430	K14	710	K14	820	L17	1,100	L22	1,300				
1,500			J10	480	K14	850												
2,200			K14	890	K14	960	L17	1,150	M17	1,400	M22	1,700						
3,300			L17	1,200	L17	1,300	M17	1,450	M22	1,800								
4,700			L17	1,400	M17	1,600	M22	1,750										
6,800			M17	1,700	M22	1,850												
10,000			M22	2,000														

WVDC / μF	160		200		250		400		450	
4.7							K14	120	K14	120
10	J10	55	K14	150	K14	150	L17	140	L17	140
22	K14	240	K14	240	L17	300	M17	280	L22	280
33	K14	260	L17	350	L17	340	M22	350	M22	350
47	L17	400	L17	420	M17	420				
68	L17	500	M17	510	M22	490				
100	M17	590	M22	590						

Rated Ripple Current(mArms/85℃, 120Hz)
Case code

BDS(MVK) Series

• 105℃ 1,000~2,000Hrs assured.

- Vertical SMD type.
- Wide Temperature range.
- For CD/DVD-ROM, Navigation, LED MT/TV.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

Solvent-proof

WV ≦ 63VDC

MV → BDS (MVK)

Wide Temp.

SPECIFICATIONS

Item	Characteristics							
Rated Voltage Range	6.3 ~ 450 VDC							
Operating Temperature Range	-40 ~ +105℃							
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)							
Leakage Current	Rated Voltage(VDC)	6.3~100					160~450	
	Max. Leakage current(μA)	0.01CV (μA) or 3μA , whichever is greater. (at 20℃, 2 minutes)					0.04CV+100(μA) (at 20℃, 1 minute)	
	Where, C:Nominal capacitance(μF), V:Rated voltage(VDC)							
Dissipation Factor(Tanδ)	Rated voltage(VDC)	6.3	10	16	25	35	50~100	160~250	400~450
	ø4~ø6.3	0.30	0.24	0.20	0.16	0.14	0.12	-	-
	ø8~ø18	0.40	0.30	0.26	0.16	0.14	0.12	0.15	0.20
	(at 20℃, at 120Hz)								
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC)	6.3	10	16	25	35	50~100	160~250	400~450
	Z(-25℃)/Z(+20℃)	4	3	2	2	2	3	3	6
	Z(-40℃)/Z(+20℃)	10	8	6	4	3	4	6	15
	(at 120Hz)								
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. ø4~ø6.3:105℃, 1,000 hours, ø8~ø18:105℃, 2,000 hours. Capacitance change ø4~ø6.3 ≦ ±30% of the initial value ø8~ø18 ≦ ±20% of the initial value Tanδ ø4~ø6.3 ≦ 300% of the initial specified value ø8~ø18 ≦ 200% of the initial specified value Leakage current ≦ The initial specified value							
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for the specified time at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. ø4~ø6.3:105℃, 500 hours, ø8~ø18:105℃, 1,000 hours. Capacitance change ø4~ø6.3 ≦ ±25% of the initial value ø8~ø18 ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value							
Others	Satisfied characteristics KS C IEC 60384-4							

PART NUMBERING SYSTEM

BDS 50 VC R47 M D55 TP

- TP: With tape
- D55: Case code
- M: Capacitance tolerance(±20%)
- R47: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 50: Rated voltage
- BDS: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Size code	Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
D55~J10	0.1 ~ 1.0	1.00	1.50	1.75	1.80
	2.2 ~ 10	1.00	1.30	1.40	1.50
	22 ~ 1,500	1.00	1.05	1.08	1.08
K14~M22	3.3 ~ 4.7	1.00	1.75	2.30	2.50
	10 ~ 68	1.00	1.50	1.75	1.80
	100 ~ 1,000	1.00	1.30	1.40	1.50
	1,500 ~ 6,800	1.00	1.05	1.08	1.08

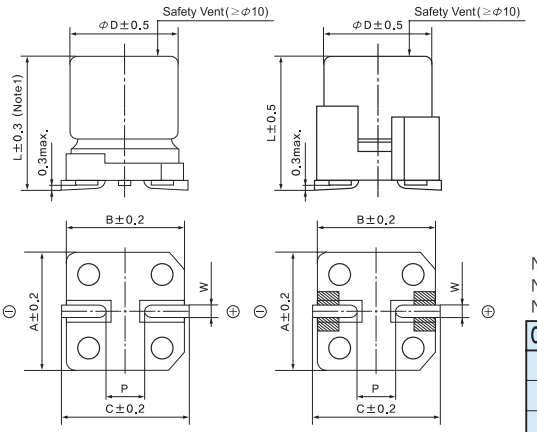
DIMENSIONS OF BDS(MVK) Series

Unit(mm)

DIMENSIONS

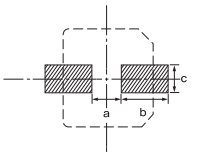
● Vibration Resistance

〈Size code:D55~M22〉 〈Size code:H10~M22〉



▨ : Dummy terminals

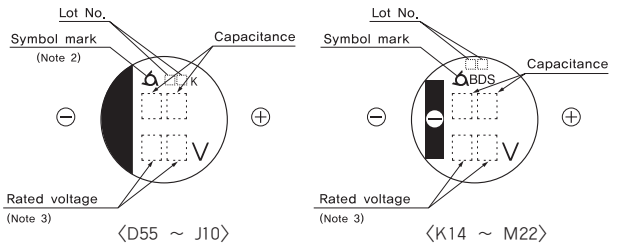
Recommended Solder land on PC board



▨ : Solder land on PC board

※Please inquire beforehand for 16, 18Ø size

MARKING



Note 1 : L±0.5 for 8×6.3(H63) ~ 18×21.5(M22)
Note 2 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6			
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3
L17	16	16.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF BDS(MVK) Series

μF \ VDC	6.3		10		16		25		35		50		63		100	
0.1											D55	1.3	D55	1.3		
0.22											D55	2.6	D55	3.0		
0.33											D55	3.2	D55	4.0		
0.47											D55	3.8	D55	5.0		
1											D55	5.6	D55	8.0		
2.2											D55	10	D55	12		
3.3											D55	14	E55	17		
4.7									D55	15	E55	19	E55	20		
10					D55	16	E55	25	E55	25	F55	29	F60	32	H63	48
22	D55	21	E55	30	E55	30	F55	40	F55	40	H63	70	H10	80	H10	90
33	E55	34	E55	34	F55	45	F55	45	H63	80	H10	140	H10	145	J10	150
47	E55	36	F55	48	F55	48	F60|H63	52|80	H63	140	H10	170	H10	180	K14	250
100	F55|F60	56	F60|H63	90	F60|H10	110|180	F80|H63	135	H10	250	J10	310	K14	380	K14	380
220	H63	150	F80|H63	150	F80|H10	150|275	H10	275	J10	375	K14	420	K14	470	M17	750
330	F80|H10	127|290	J10	450	J10	450	J10	450	K14	480	K14	500	L17	700	M22	980
470	J10	460	J10	460	J10	460	J10	460	K14	520	L17	700	M17	900		
1,000	J10	520	J10	540	K14	550	K14	550	L17	750	M22	1,200				
1,500	J10	550	K14	620												
2,200	K14	680	L17	850	M17	1,000	M22	1,300	M22	1,450						
3,300	M17	1,000	M17	1,100	M17	1,200										
4,700	L22	1,200	M22	1,350												
6,800	M22	1,350														

μF \ VDC	160		200		250		400		450	
3.3							K14	30	K14	40
4.7					K14	65	L17	60	L17	60
10	J10	45	K14	80	L17	100	L17	85	L17	85
22	K14	85	K14	85	L17	180	M22	130	M22	130
33	K14	95	L17	220	M17	230				
47	L17	260	M17	270	M22	280				
68	M17	320	M22	330						
100	L22	380								

Rated Ripple Current(mArms/105℃, 120Hz)
Case code

BDR Series

• 105℃ 1,000~2,000Hrs assured.

- Vertical SMD type.
- For STB, Satellite Radio, Computer Server.
- RoHS compliant.
- Halogen-free capacitors are also available.

Solvent-proof

WV ≦ 63VDC

MVK (BDS) → BDR

Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50~100 ø4~ø6.3: 0.30 / 0.24 / 0.20 / 0.16 / 0.14 / - ø8~ø10: 0.40 / 0.30 / 0.26 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50~100 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 3 Z(-40℃)/Z(+20℃): 10 / 8 / 6 / 4 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. ø4~ø6.3 : 105℃, 1,000 hours, ø8~ø10 : 105℃, 2,000 hours. Capacitance change ø4 ~ ø6.3 ≦ ±30 % of the initial value ø8 ~ ø10 ≦ ±20 % of the initial value Tanδ ø4 ~ ø6.3 ≦ 300 % of the initial specified value ø8 ~ ø10 ≦ 200 % of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them of the specifid time at 105℃ without voltage applied. The rated volage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. ø4~ø6.3:105℃, 500hours. ø8~ø10:105℃, 1,000 hours. Capacitance change ø4 ~ ø6.3 ≦ ±25 % of the initial value ø8 ~ ø10 ≦ ±20 % of the initial value Tanδ ≦ 200 % of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BDR 6.3 VC 220 M F61 TP

- TP: With tape
- F61: Case Code
- M: Capacitance tolerance(±20%)
- 220: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 6.3: Rated voltage in volts
- BDR: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
4.7 ~ 10	1.00	1.30	1.40	1.50
22 ~ 1200	1.00	1.05	1.08	1.08

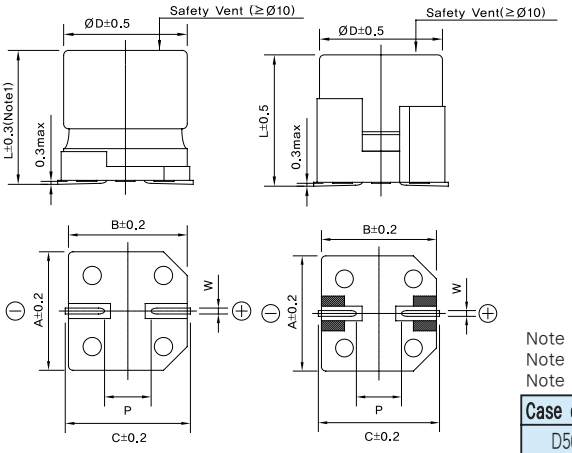
DIMENSIONS OF BDR Series

Unit(mm)

DIMENSIONS

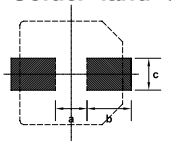
● Vibration Resistance

〈Size code:D56～J10〉 〈Size code:H10～J10〉



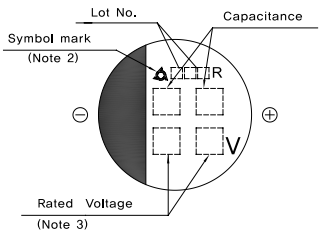
▬ : Dummy terminals

Recommended Solder land on PC board



▬ : Solder land on PC board

MARKING



Note 1 : L±0.5 for 8×10(H10)～10×10(J10)
Note 2 : 4x5.3(D56), 5x5.2(E55), 5x5.3(E56), 5x5.8(E61) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6			
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
E56	5	5.3	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
E61	5	5.8	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5

● Vibration Resistance

RATINGS OF BDR Series Size Table

VDC	Cap.(μF)	Case Code	Rated Ripple Current (mArms/105℃, 120Hz)
6.3	33	D56	21
	100	E56	55
	220	F60	85
	470	H10	340
	1,000	H10	430
10	33	D56	21
	47	E55	47
	68	E61	60
	100	F60	92
	220	F80	150
	330	H10	290
	470	H10	400
	1,200	J10	592
16	22	D56	21
	33	E56	44
	47	E61	40
	100	F60	113
	330	H10	290
	470	H10	300
25	22	E56	39
	33	E61	46
	47	F60	54
	150	F80	165
	330	H10	290

VDC	Cap.(μF)	Case Code	Rated Ripple Current (mArms/105℃, 120Hz)
35	10	D56	15
	22	E61	36
	33	F60	40
	47	F60	52
	100	F80	135
	220	H10	275
	330	J10	450
50	10	E56	21
	22	F55	44
	33	F80	80
	47	F80	84
	100	H10	210
	220	J10	360
63	4.7	E55	20
	10	F60	34
	22	F80	48
	56	H10	196
	100	J10	320
100	22	H10	90
	33	J10	150
	47	J10	160

BXA Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Low Impedance.
- For STB, Satellite Radio, Computer Server.
- RoHS compliant.
- Halogen-free capacitors are also available.

MVY → BXA
Low Imp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) / SIZE: 6.3 / 10 / 16 / 25 / 35 / 50 D56~H63: 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.12 H10~J10: 0.28 / 0.24 / 0.20 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 / 2 / 2 Z(-55℃)/Z(20℃): 5 / 4 / 4 / 3 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. ø4~ø6.3 : 105℃, 1,000 hours, ø8 & ø10 : 105℃, 2,000 hours. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXA 16 VC 100 M F60 TP

- TP: With tape
- F60: Case code
- M: Capacitance tolerance(±20%)
- 100: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- BXA: Series name

RATED RIPPLE CURRENT MULTIPLIERS

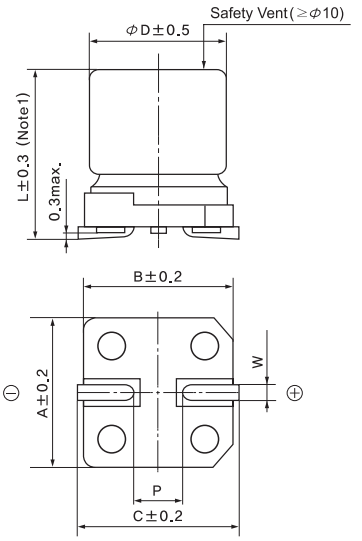
Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
2.2 ~ 4.7	0.35	0.70	0.90	1.00
10 ~ 100	0.40	0.75	0.90	1.00
220 ~ 470	0.50	0.85	0.94	1.00
1,000 ~ 1,500	0.60	0.87	0.95	1.00

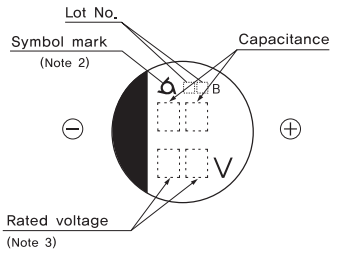
DIMENSIONS OF BXA Series

Unit(mm)

DIMENSIONS



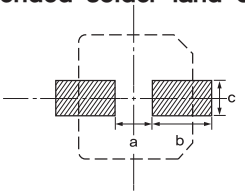
MARKING



Note 1 : L±0.5 for 8×6.3(H63)~10×10(J10)
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ø D	L	A	B	C	W	P	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6
E56	5	5.3	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXA Series

μF \ VDC	6.3			10			16			25			35			50		
2.2																D56	4.80	30
4.7													D56	2.10	80	E56	3.00	50
10										D56	2.10	80	E56	0.90	150	F60	2.00	70
22				D56	2.10	80	E56	0.90	150	E56	0.90	150	E56	0.90	150	F60	2.00	70
33	D56	2.10	80	E56	0.90	150	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	1.00	170
47	E56	0.90	150	F60	0.44	230	F60	0.44	230	F60	0.44	230	F60	0.44	230	H63	0.90	180
68	F60	0.44	230	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	0.34	280	H10	0.44	230
100	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	0.34	280	H10	0.17	450	H10	0.44	230
										H63	0.32	300						
220	F60	0.44	230	F80	0.34	280	F80	0.34	280	H10	0.17	450	H10	0.17	450	J10	0.30	350
330	F80	0.34	280	H10	0.17	450	H10	0.17	450	H10	0.17	450	J10	0.09	670			
470	H10	0.17	450	H10	0.17	450	H10	0.17	450	J10	0.09	670						
1,000	H10	0.17	450	J10	0.09	670												
1,500	J10	0.09	670															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case code

BXE Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Very low Impedance.
- For STB, Satellite Radio, Computer Server.
- RoHS compliant.
- Halogen-free capacitors are also available.

BXA → BXE
Low Imp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Tanδ (Max.): 0.26 / 0.19 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 / 2 Z(-55℃)/Z(20℃): 5 / 4 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. φ4~φ6.3 : 105℃, 1,000 hours, φ8 & φ10 : 105℃, 2,000 hours. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXE 16 VC 100 M F60 TP

- TP: With tape
- F60: Case code
- M: Capacitance tolerance(±20%)
- 100: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- BXE: Series name

RATED RIPPLE CURRENT MULTIPLIERS

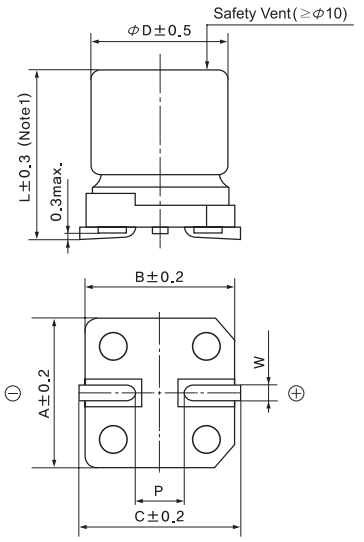
Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
4.7	0.35	0.70	0.90	1.00
10 ~ 100	0.40	0.75	0.90	1.00
220 ~ 470	0.50	0.85	0.94	1.00
1,000 ~ 1,500	0.60	0.87	0.95	1.00

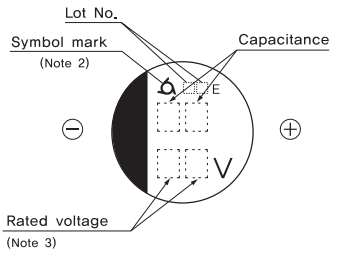
DIMENSIONS OF BXE Series

Unit(mm)

DIMENSIONS



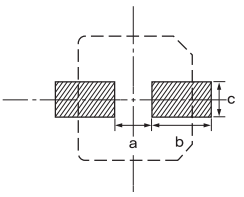
MARKING



Note 1 : L±0.5 for 8×10(H10), 10×10(J10)
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ø D	L	A	B	C	W	P	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6
E56	5	5.3	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXE Series

μF \ VDC	6.3			10			16			25			35		
4.7													D56	1.80	85
10										D56	1.80	85	E56	0.80	155
22				D56	1.80	85	E56	0.80	155	E56	0.80	155	E56	0.80	155
33	D56	1.80	85	E56	0.80	155	F60	0.36	240	F60	0.36	240	F60	0.36	240
47	E56	0.80	155	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240
68	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280
100	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280	H10	0.16	600
220	F60	0.36	240	F80	0.34	280	F80	0.34	280	H10	0.16	600	H10	0.16	600
330	F80	0.34	280	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850
470	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850			
1,000	H10	0.16	600	J10	0.08	850									
1,500	J10	0.08	850												

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case code

BXJ Series

• 105℃ 2,000~5,000Hrs assured.

- Vertical SMD type.
- Very low Impedance, Long Life.
- For STB, Tuner.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

Solvent-proof

WV ≦ 63VDC

BXE → BXJ

Long Life

SPECIFICATIONS

Item	Characteristics							
Rated Voltage Range	6.3 ~ 50VDC				63 ~ 100VDC			
Operating Temperature Range	-55 ~ +105℃				-40 ~ +105℃			
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)							
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)							
Dissipation Factor(Tanδ)	Rated Voltage(VDC)	6.3	10	16	25	35	50	63	100
	Tanδ (Max.)	0.26	0.19	0.16	0.14	0.12	0.12	0.12	0.12
	(at 20℃, 120Hz)								
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC)	6.3	10	16	25	35	50	63	100
	Z(-25℃)/Z(+20℃)	3	2	2	2	2	2	3	3
	Z(-55℃)/Z(+20℃)	5	4	4	3	3	3	※4	※4
	※Z(-40℃)/Z(+20℃) (at 120Hz)								
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. D56~H63, J85 : 105℃, 2,000 hours, H10 ~ K14 : 105℃, 5,000 hours. Capacitance change D56~H63, J85 ≦ ±30% of the initial value H10~K14 ≦ ±35% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value								
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change D56~H63, J85 ≦ ±30% of the initial value H10~K14 ≦ ±35% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value								
Others	Satisfied characteristics KS C IEC 60384-4								

PART NUMBERING SYSTEM

BXJ 6.3 VC 220 M F60 TP

- TP : With tape
- F60 : Case code
- M : Capacitance tolerance(±20%)
- 220 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 6.3 : Rated voltage
- BXJ : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Size code	Freq.(Hz) / Cap.(μF)	120	1K	10K	100K
D56 ~ J10	4.7	0.35	0.70	0.90	1.00
	10 ~ 100	0.40	0.75	0.90	1.00
	220 ~ 470	0.50	0.85	0.94	1.00
	1,000 ~ 1,500	0.60	0.87	0.95	1.00
K14	47 ~ 100	0.40	0.75	0.90	1.00
	330 ~ 470	0.50	0.85	0.94	1.00
	680 ~ 2,000	0.60	0.87	0.95	1.00

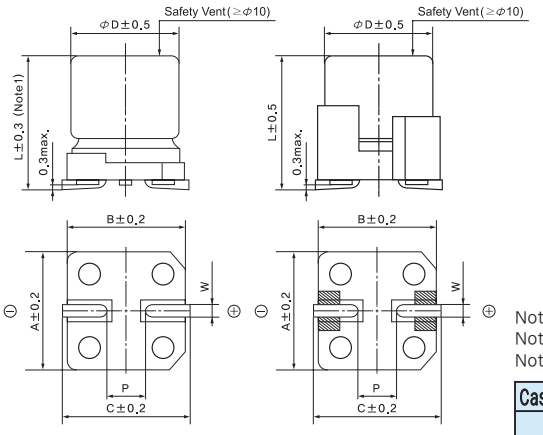
DIMENSIONS OF BXJ Series

Unit(mm)

DIMENSIONS

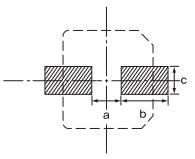
● Vibration Resistance

〈Size code:D56～K14〉 〈Size code:H10～K14〉



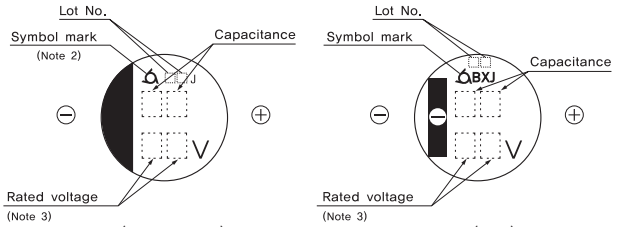
▨ : Dummy terminals

Recommended solder land on PC board



▨ : Solder land on PC board

MARKING



〈D56 ~ J10〉 〈K14〉

Note 1 : L±0.5 for 8×6.3(H63)～12.5×13.5(K14)
Note 2 : 4×5.3(D56), 5×5.3(E56), 5×5.8(E61) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6			
E56	5	5.3	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
E61	5	5.8	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J85	10	8.5	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2			
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3

● Vibration Resistance

RATINGS OF BXJ Series

μF \ VDC	6.3			10			16			25			35			50			63			100		
4.7													D56	1.80	85	E56	3.00	55						
10							D56	1.80	85	D56	1.80	85	D56	1.80	85	E61	2.00	50	F60	4.50	48	H63	1.80	85
													E56	0.80	155	F60	1.20	120				J85	1.35	100
22				D56	1.80	85	E56	0.80	155	E56	0.80	155	E61	0.70	160	F60	1.20	120	H63	1.50	100	H10	1.50	160
							E61	0.70	160	E61	0.70	160	F55	0.55	220				H10	1.00	200			
33	D56	1.80	85	E56	0.80	155	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.90	150	J85	0.95	205	J10	0.60	330
							E61	0.70	160	F55	0.55	220												
47	E56	0.80	155	E61	0.70	160	F60	0.36	240	F60	0.36	240	F60	0.36	240	H63	0.75	200	H10	1.00	200	K14	0.40	400
				F60	0.36	240																		
68	E61	0.70	160	E61	0.70	160	F60	0.36	240	F60	0.36	240	F80	0.34	280	H10	0.44	300	J10	0.50	350	K14	0.40	400
	F60	0.36	240	F60	0.36	240				F80	0.34	280	H63	0.26	300									
100	E61	0.70	160	F60	0.36	240	F60	0.36	240	H63	0.26	300	H10	0.16	600	H10	0.44	300	J10	0.50	350	K14	0.40	400
	F60	0.36	240							H10	0.16	600	J85	0.15	620	J85	0.40	315						
													J10	0.08	850	J10	0.25	500						
220	F60	0.36	240	F80	0.34	280	F80	0.34	280	J85	0.15	620	H10	0.16	600	J10	0.25	500						
							H10	0.16	600	H10	0.16	600												
330	F80	0.34	280	H10	0.16	600	J85	0.15	620	J10	0.08	850	J10	0.08	850	K14	0.11	650						
							H10	0.16	600															
470	H10	0.16	600	H10	0.16	600	J10	0.08	850	J10	0.08	850	K14	0.06	1,100									
	J85	0.15	620	J85	0.15	620																		
1,000	H10	0.16	600	J10	0.08	850	K14	0.06	1,100	K14	0.06	1,100												
1,500	J10	0.08	850	K14	0.06	1,100																		
2,200	K14	0.06	1,100	K14	0.06	1,100																		

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case code

BXF Series

• 105℃ 2,000Hrs assured.

Solvent-proof

- Solvent proof.
- Ultra low ESR.
- For STB, Tuner.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

BXJ → BXF
Low ESR

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 6.3 10 16 25 35 50 Tanδ (Max.) 0.26 0.19 0.16 0.14 0.12 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 10 16 25 35 50 Z(-25℃)/Z(+20℃) 2 2 2 2 2 2 Z(-55℃)/Z(+20℃) 4 4 4 3 3 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 105℃ for 2,000hours. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXF 6.3 VC 330 M F80 TP

- TP : With tape
- F80 : Case code
- M : Capacitance tolerance(±20%)
- 330 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 6.3 : Rated voltage
- BXF : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
68 ~ 100	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,500	0.60	0.87	0.95	1.00

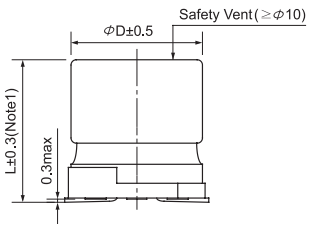
DIMENSIONS OF BXF Series

Unit(mm)

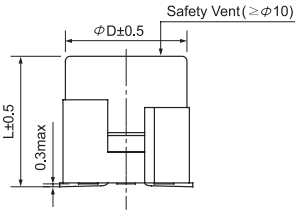
DIMENSIONS

● Vibration Resistance

〈Size code : F80~J10〉



〈Size code : H10~J10〉



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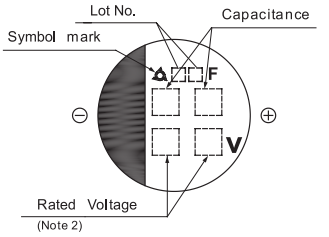
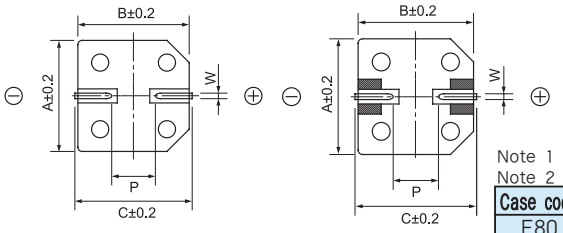


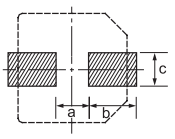


Note 1 : L±0.5 for 8×10(H10)~10×10(J10)
Note 2 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5

● Vibration Resistance

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXF Series

μF \ VDC	6.3			10			16			25			35			50		
68													F80	0.16	600			
100										F80	0.16	600	F80	0.16	600	H10	0.34	350
150							F80	0.16	600	H10	0.08	850	H10	0.08	850	J10	0.18	670
220				F80	0.16	600	F80	0.16	600	H10	0.08	850	H10	0.09	850	J10	0.18	670
330	F80	0.16	600	H10	0.08	850	H10	0.08	850	H10	0.08	850	J10	0.06	1,190			
470	H10	0.08	850	H10	0.08	850	H10	0.08	850	J10	0.06	1,190						
560	H10	0.08	850	H10	0.08	850	J10	0.06	1,190	J10	0.06	1,190						
680	H10	0.08	850	H10	0.08	850	J10	0.06	1,190									
820	H10	0.08	850	J10	0.06	1,190	J10	0.06	1,190									
1,000	H10	0.08	850	J10	0.06	1,190												
1,500	J10	0.06	1,190															

Rated Ripple Current (mArms/105℃, 100kHz)
ESR (Ω max./20℃, 100kHz)
Case code

BXQ Series

• 105℃ 2,000Hrs assured.

Solvent-proof

- Solvent proof.
- Ultra low ESR.
- For STB, Tuner, Car.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

BXF → BXQ
Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whicher is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 6.3 10 16 25 35 50 Tanδ (Max.) 0.26 0.19 0.16 0.14 0.12 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 10 16 25 35 50 Z(-25℃)/Z(+20℃) 2 2 2 2 2 2 Z(-55℃)/Z(+20℃) 4 4 4 3 3 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 105℃ for 2,000hours. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXQ 6.3 VC 680 M F80 TP

- TP : With tape
- F80 : Case code
- M : Capacitance tolerance(±20%)
- 680 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 6.3 : Rated voltage
- BXQ : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
47 ~ 150	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 2,200	0.60	0.87	0.95	1.00

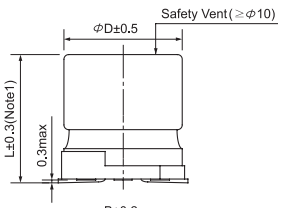
DIMENSIONS OF BXQ Series

Unit(mm)

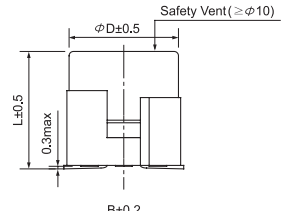
DIMENSIONS

● Vibration Resistance

〈Size code : E61～K14〉



〈Size code : H10～K14〉



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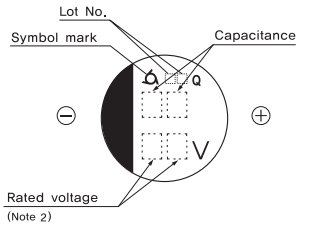
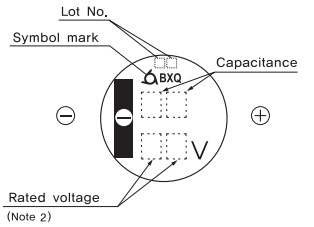
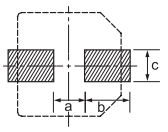


〈E61 ~ J10〉



〈K14〉

Recommended solder land on PC board



▨ : Solder land on PC board

Note 1 : L±0.5 for 8×10(H10)～12.5×13.5(K14)
Note 2 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
E61	5	5.8	5.3	5.3	5.9	0.5～0.8	1.4	1.4	3.0	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0～1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3

● Vibration Resistance

RATINGS OF BXQ Series

VDC	Cap.(㎌)	Case code	ESR (Ω max. / 20℃, 100kHz)	Rated Ripple Current (mArms / 105℃, 100kHz)
6.3	680	F80	0.16	600
	1,500	H10	0.08	850
	2,200	J10	0.06	1,190
10	470	F80	0.16	600
	1,000	H10	0.08	850
	1,500	J10	0.06	1,190
16	100	E61	0.36	240
	330	F80	0.16	600
	680	H10	0.08	850
	1,000	J10	0.06	1,190
	1,800	K14	0.08	1,300
25	68	E61	0.36	240
	220	F80	0.16	600
	470	H10	0.08	850
	820	J10	0.06	1,190
	1,000	J10	0.06	1,190
	1,200	K14	0.08	1,300
35	47	E61	0.36	240
	150	F80	0.16	600
	330	H10	0.08	850
	560	J10	0.06	1,190
	680	J10	0.075	1,190
	1,000	K14	0.08	1,300
50	100	F80	0.34	350
	220	H10	0.18	670
	330	J10	0.12	900

BXW Series

• 105℃ 3000~5,000Hrs assured.

Solvent-proof

- Vertical SMD type
- Ultra low ESR, Long Life
- For STB, Tuner, Car
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

BXQ → BXW
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whicher is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 6.3 10 16 25 35 50 Tanδ (Max.) 0.26 0.19 0.16 0.14 0.12 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 10 16 25 35 50 Z(-25℃)/Z(+20℃) 2 2 2 2 2 2 Z(-55℃)/Z(+20℃) 4 4 4 3 3 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000~5,000hours at 105℃. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated volage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30 % of the initial value Tanδ ≤ 300 % of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXW 35 VC 680 M J10 TP

- TP : With tape
- J10 : Case code
- M : Capacitance tolerance(±20%)
- 680 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 35 : Rated voltage
- BXW : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
68 ~ 150	0.40	0.75	0.90	1.00
180 ~ 560	0.50	0.85	0.94	1.00
680 ~ 2,200	0.60	0.87	0.95	1.00

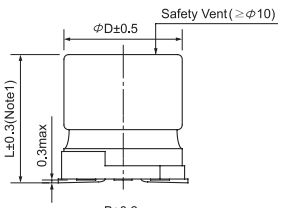
DIMENSIONS OF BXW Series

Unit(mm)

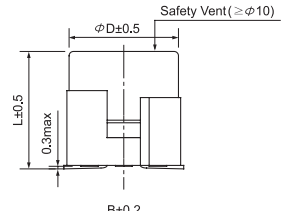
DIMENSIONS

● Vibration Resistance

〈Size code : F80～J10〉



〈Size code : F80～J10〉



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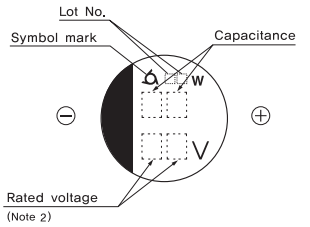
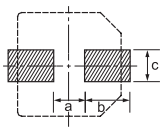


Recommended solder land on PC board



: Solder land on PC board

Note 1 : L±0.5 for H10 , J10
Note 2 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
F80	6.3	7.7	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5

● Vibration Resistance

RATINGS OF BXW Series

Endurance : 105℃ 3,000 hours

Vdc	Cap.(μF)	Case Code	ESR (Ωmax./20℃,100㎑)	Rated Ripple Current (mArms/105℃,100㎑)
6.3	680	F80	0.16	600
	1,500	H10	0.08	850
	2,200	J10	0.06	1,190
10	470	F80	0.16	600
	1,000	H10	0.08	850
	1,500	J10	0.06	1,190
16	330	F80	0.16	600
	680	H10	0.08	850
	1,000	J10	0.06	1,190
25	220	F80	0.16	600
	470	H10	0.08	850
	1,000	J10	0.06	1,190
35	150	F80	0.16	600
	330	H10	0.08	850
	680	J10	0.075	1,190
50	100	F80	0.34	350
	220	H10	0.18	670
	330	J10	0.12	900

Endurance : 105℃ 5,000 hours

Vdc	Cap.(μF)	Case Code	ESR (Ωmax./20℃,100㎑)	Rated Ripple Current (mArms/105℃,100㎑)
6.3	470	F80	0.30	420
	1,000	H10	0.16	600
	1,500	J10	0.08	850
10	330	F80	0.30	420
	820	H10	0.16	600
	1,200	J10	0.08	850
16	270	F80	0.30	420
	680	H10	0.08	850
	1,000	J10	0.06	1,190
25	180	F80	0.30	420
	470	H10	0.08	850
	820	J10	0.06	1,190
35	120	F80	0.30	420
	330	H10	0.08	850
	560	J10	0.06	1,190
50	68	F80	0.40	250
	180	H10	0.18	670
	270	J10	0.14	750

BDA Series

• 105℃ 2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Long Life.
- For LED MT/TV, Copying Machine.
- RoHS compliant.
- Halogen-free capacitors are also available.

BDS (MVK) → BDA
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 4 / 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.37 / 0.28 / 0.24 / 0.20 / 0.16 / 0.13 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 4 / 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 6 / 3 / 3 / 2 / 2 Z(-40℃)/Z(20℃): 12 / 8 / 5 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 105℃. Rated voltage(VDC): 4 ~ 16 / 25 ~ 50 Capacitance change: ≦ ±25% of the initial value / ≦ ±20% of the initial value Tanδ: ≦ 200% of the initial specified value Leakage current: ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Rated voltage(VDC): 4 ~ 16 / 25 ~ 50 Capacitance change: ≦ ±25% of the initial value / ≦ ±20% of the initial value Tanδ: ≦ 200% of the initial specified value Leakage current: ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BDA 16 VC 100 M F60 TP

- TP: With tape
- F60: Case code
- M: Capacitance tolerance(±20%)
- 100: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- BDA: Series name

RATED RIPPLE CURRENT MULTIPLIERS

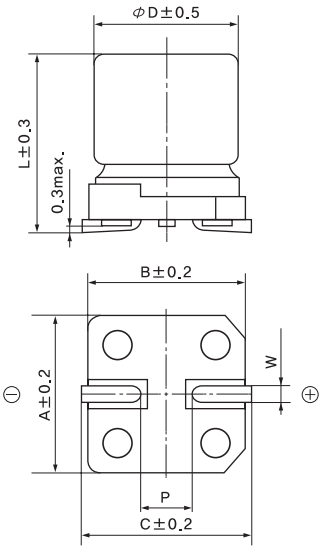
Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
1	1.00	1.50	1.75	1.80
2.2 ~ 10	1.00	1.30	1.40	1.50
22 ~ 100	1.00	1.05	1.08	1.08

DIMENSIONS OF BDA Series

Unit(mm)

DIMENSIONS



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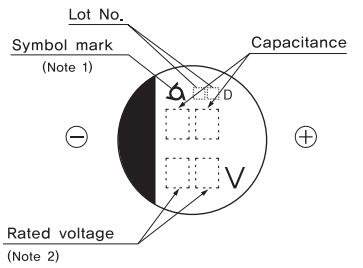
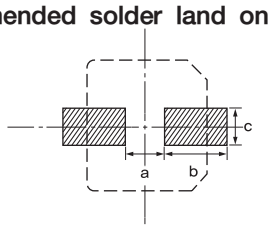


Note 1 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark.
Note 2 : 6.3WV is marked by 6V.

Case code	ø D	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BDA Series

WVDC / μF	4		6.3		10		16		25		35		50	
1													D55	5.6
2.2													D55	10
3.3													D55	14
4.7									D55	13	D55	15	E55	19
10							D55	16	E55	25	E55	25	F55	29
22	D55	19	D55	21	E55	30	E55	30	F55	40	F55	40		
33	E55	30	E55	34	E55	34	F55	45	F55	45				
47	E55	34	E55	36	F55	48	F55	48	F60	52				
100	E55	45	F60	56	F60	90	F60	110						

Rated Ripple Current (mArms/105℃, 120Hz)

Case code

BLA Series

• 105℃ 5,000Hrs assured.

- Vertical SMD type.
- Long Life.
- For LED MT, AVN.
- RoHS compliant.
- Halogen-free capacitors are also available.

• AEC-Q200 compliant : Please contact us for more details, test data, information.

Solvent-proof

WV ≦ 63Vdc

BDA → BLA

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 400 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	Rated Voltage(VDC): 4~100 / 160~400 Max. Leakage current(μA): 0.01CV (μA) or 3μA , whichever is greater. (at 20℃, 2 minutes) / 0.04CV+100(μA) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 5,000 hours at 105℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

Rated voltage(VDC)	4	6.3	10	16	25	35	50	63~100	160~250	400
Tanδ(Max.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12	0.12	0.15	0.20

Rated voltage(VDC)	4	6.3	10	16	25~50	63~100	160~250	400
Z(-25℃)/Z(+20℃)	8	4	3	2	2	3	3	6
Z(-40℃)/Z(+20℃)	14	10	7	5	3	4	6	10

PART NUMBERING SYSTEM

BLA 16 VC 100 M F60 TP

- TP : With tape
- F60 : Case code
- M : Capacitance tolerance(±20%)
- 100 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 16 : Rated voltage
- BLA : Series name

RATED RIPPLE CURRENT MULTIPLIERS

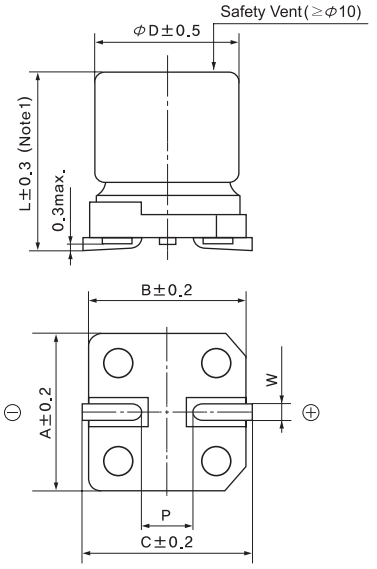
Frequency Multipliers

Freq.(Hz)	120	1K	10K	100K
Factor	1.00	1.05	1.08	1.08

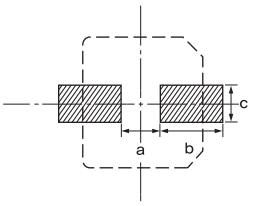
DIMENSIONS OF BLA Series

Unit(mm)

DIMENSIONS

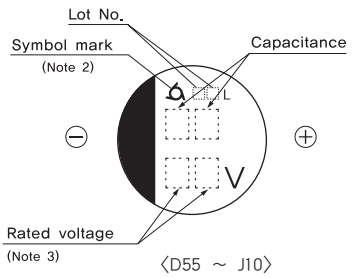


Recommended solder land on PC board

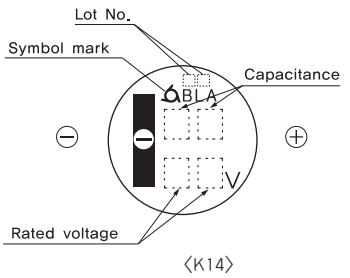


: Solder land on PC board

MARKING



〈D55 ~ J10〉



〈K14〉

Note 1 : L±0.5 for 8×10(H10)~12.5×13.5(K14)
Note 2 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ø D	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5

RATINGS OF BLA Series

μF \ Vdc	4		6.3		10		16		25		35		50		63		100	
1													D55	5.6				
2.2													D55	10				
3.3													D55	14				
4.7									D55	13	D55	15	E55	19				
10							D55	16	E55	25	E55	25	F55	29	F60	32	H63	48
22	D55	19	D55	21	E55	30	E55	30	F55	40	F55	40	F60	43	H10	69	H10	91
33	E55	30	E55	34	E55	34	F55	45	F55	45	F80	57	H10	77	J10	96	J10	127
47	E55	34	E55	36	F55	48	F55	48	F60	52	H10	92	H10	92	J10	114	K14	193
100	E55	45	F60	56	F60	90	F60	110	H10	116	J10	151	J10	151	K14	212	K14	281
220					F80	120	H10	140	J10	216	J10	216	K14	221				
330					H10	170	J10	238	J10	238	K14	271						
470					J10	254	J10	254	K14	324								
1,000					K14	472	K14	472										

μF \ Vdc	160		200		250		400	
2.2							J10	26
3.3					J10	46	J10	37
4.7			J10	54	K14	65	K14	70
10	J10	79	J10	79	K14	102		
22	K14	148	K14	148				
33	K14	182						

Rated Ripple Current (mArms/105℃, 120Hz)
Case code

BLH Series

• 105℃ 10,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Long Life.
- For LED MT/TV, AVN.
- RoHS compliant.
- Halogen-free capacitors are also available.

• AEC-Q200 compliant : Please contact us for more details, test data, information.

BLA → BLH
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.13 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 10 / 16 / 25~50 Z(-25℃)/Z(+20℃): 3 / 2 / 2 Z(-40℃)/Z(+20℃): 7 / 5 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 10,000 hours at 105℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BLH 16 VC 220 M H10 TP

- TP : With tape
- H10 : Case code
- M : Capacitance tolerance(±20%)
- 220 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 16 : Rated voltage
- BLH : Series name

RATED RIPPLE CURRENT MULTIPLIERS

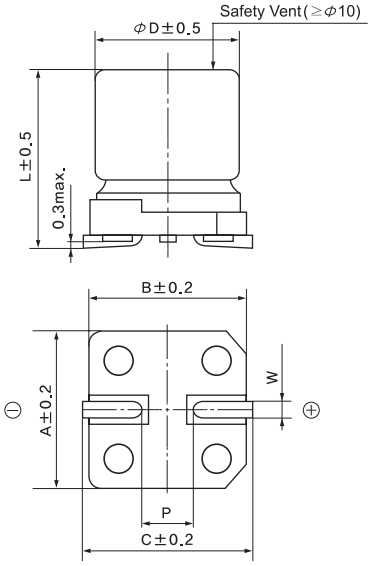
Frequency Multipliers

Freq.(Hz)	120	1K	10K	100K
Factor	1.00	1.05	1.08	1.08

DIMENSIONS OF BLH Series

Unit(mm)

DIMENSIONS



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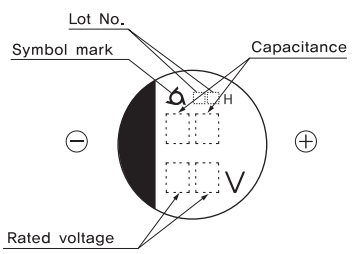
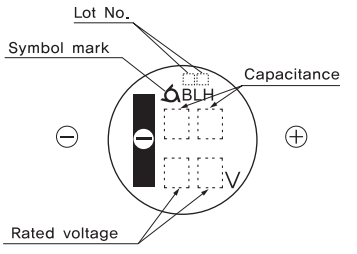


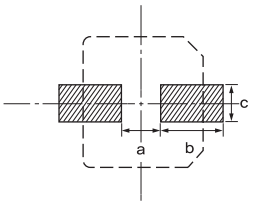
〈H10 ~ J10〉



〈K14〉

Case code	ø D	L	A	B	C	W	P	a	b	c
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BLH Series

VDC / μF	10		16		25		35		50	
33									H10	77
47							H10	92	H10	92
100					H10	116	J10	151	J10	151
220			H10	140	J10	218	J10	216	K14	255
330	H10	170	J10	238	J10	238	K14	301		
470	J10	254	J10	254	K14	324				
1,000	K14	472	K14	472						

Rated Ripple Current (mArms/105℃, 120Hz)

Case code

CLZ Series

• 125℃ 1,000~5,000Hrs assured.

Solvent-proof

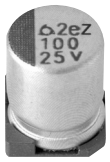
WV ≦ 80VDC

- Vertical SMD type.
- Wide Temp., Low ESR.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

• AEC-Q200 compliant : Please contact us for more details, test data, information.

CLA → CLZ

Low ESR



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 400 VDC
Operating Temperature Range	-40 ~ +125℃
Capacitance Tolerance	±20%(M)
Leakage Current	Rated voltage(VDC) | 10~100 | 160~400 Max. Leakage current (μA) | I=0.01CV(μA) or 3μA, whichever is greater. (at 20℃, 2 minutes) | 0.04CV + 100(μA) (at 20℃, 2 minutes) Where, C : Nominal capacitance(μF), V : Rated voltage(VDC)
Dissipation Factor(Tanδ)	Rated voltage(VDC) | 10 | 16 | 25 | 35 | 50~80 | 100 | 160~250 | 400 Tanδ(Max.) | 0.22 | 0.19 | 0.16 | 0.14 | 0.12 | 0.10 | 0.20 | 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC) | 10 | 16 | 25 | 35~100 | 160~250 | 400 Z(-25℃)/Z(+20℃) | 4 | 3 | 2 | 2 | 3 | 6 Z(-40℃)/Z(+20℃) | 8 | 6 | 4 | 3 | 6 | 10 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 125℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value Case Code | 10~80V | 100V | 160~400V D55~F60 | 1,000Hrs | - | - H63 | 3,000Hrs | - | - H10 | 5,000Hrs | 2,000Hrs | - J10 | 5,000Hrs | 2,000Hrs | 2,000Hrs K14~M22 | 5,000Hrs | 5,000Hrs | 2,000Hrs
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. (Where, D55 ~ F60 is 500 hours) Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value (where, 500% for ≧ WV 80 VDC)
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLZ 16 VC 330 M J10 TP

- TP : With tape
- J10 : Case code
- M : Capacitance tolerance(±20%)
- 330 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 16 : Rated voltage
- CLZ : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Rated Voltage(VDC)	Size code	Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
10 ~ 100	D55 ~ J10	10	0.66	0.86	0.93	1.00
		22 ~ 470	0.93	0.97	1.00	1.00
	K14 ~ M22	47 ~ 100	0.40	0.75	0.90	1.00
		220 ~ 1,000	0.50	0.85	0.94	1.00
		2,200 ~ 3,300	0.75	0.90	0.95	1.00
		4,700	0.85	0.95	0.98	1.00
160 ~ 400	J10 ~ M22	2.2 ~ 33	1.00	1.50	1.75	1.80
		47 ~ 68	1.00	1.30	1.40	1.50

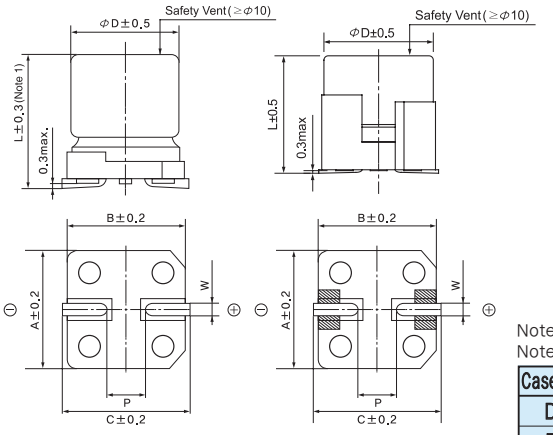
DIMENSIONS OF CLZ Series

Unit(mm)

DIMENSIONS

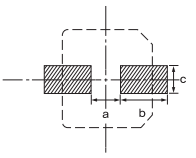
● Vibration Resistance

〈Size code:D55～M22〉 〈Size code:H10～M22〉



▨ : Dummy terminals

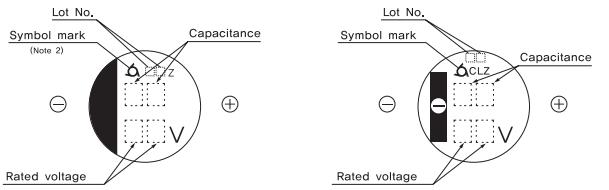
Recommended solder land on PC board



▨ : Solder land on PC board

※Please inquire beforehand for 16, 18ø size

MARKING



〈D55～J10〉 〈K14～M22〉

Note 1 : L±0.5 for 8×6.3(H63)～18×21.5(M22)
Note 2 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark.

Case code	øD	L	A	B	C	W	P	a	b	c	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5～0.8	1.0	1.0	2.6	1.6			
E55	5	5.2	5.3	5.3	5.9	0.5～0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5～0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0～1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3
L17	16	16.5	17.0	17.0	18.0	1.0～1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0～1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0～1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0～1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF CLZ Series

VDC / μF	10				16				25				35				50				63				80				100			
10					D55	7.00	105	12	E55	3.30	49.5	23	F60	1.60	24.0	69	F60	2.80	42.0	51	H63	2.00	110	60	H10	1.20	80.4	70	H10	1.60	107.2	70
22	E55	3.30	49.5	23	E55	3.30	49.5	23	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	1.60	30.0	83	H10	1.00	50.0	70	J10	0.55	35.0	115	J10	1.00	64.0	95
33	E55	3.30	49.5	23	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	0.90	14.0	110	H10	0.70	11.0	160	J10	0.55	27.5	115	J10	0.55	35.0	115	J10	0.80	51.2	115
47	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	0.90	14.0	110	H10	0.40	6.0	220	J10	0.50	7.5	247	J10	0.55	27.5	115	K14	0.33	21.1	450	K14	0.33	19.8	450
100	H63	0.90	14.0	110	H63	0.90	14.0	110	H10	0.40	6.0	220	H10	0.40	6.0	220	J10	0.50	7.5	247	K14	0.33	16.5	450	L17	0.24	15.4	650	K14	0.33	19.8	450
220	H10	0.40	6.0	220	H10	0.40	6.0	220	J10	0.30	4.5	296	J10	0.30	4.5	296	K14	0.23	3.5	550	L17	0.24	12.0	650	M17	0.16	10.2	950				
330	J10	0.30	4.5	296	J10	0.30	4.5	296	K14	0.14	2.1	750	K14	0.14	2.1	750	L17	0.15	2.3	850	L17	0.24	12.0	650								
470	J10	0.30	4.5	296	K14	0.14	2.1	750	L17	0.10	1.5	1,000	M17	0.10	1.5	1,000	M17	0.15	2.3	920	L22	0.16	8.0	950								
1,000	K14	0.14	2.1	750	M17	0.10	1.5	1,200	M22	0.058	0.87	1,550																				
2,200	L17	0.10	1.5	1,000																												
3,300	M17	0.10	1.5	1,200																												
4,700	M22	0.058	0.87	1,550																												

Rated Ripple Current (mArms/125℃, 100kHz)
ESR (Ω max./-40℃, 100kHz)
ESR (Ω max./20℃, 100kHz)
Case code

VDC / μF	160		200		250		400	
2.2							J10	26
3.3							J10	37
4.7							K14	70
10	K14	100	K14	100	L17	120	L22	140
22	L17	180	L17	180	M17	205		
33	M17	245	M17	245	M22	260		
47	M22	315	M22	315				
68	M22	380						

Rated Ripple Current (mArms/125℃, 120Hz)
Case code

CLX Series

• 125℃ 2,000~4000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Wide Temp., Low ESR.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

CLZ → CLX
Low ESR

• AEC-Q200 compliant : Please contact us for more details, test data, information.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +125 ℃
Capacitance Tolerance	±20%(M)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF),V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.16 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35, 50 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃): 10 / 8 / 6 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. H10:2,000hours, J10:3,000hours, K14:4,000hours at 125℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLX 16 VC 330 M J10 TP

- TP: With tape
- J10: Case code
- M: Capacitance tolerance(±20%)
- 330: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- CLX: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Size code \ Freq.(Hz)	120	1K	10K	100K
H10 ~ J10	0.93	0.97	1.00	1.00
K14	0.50	0.85	0.94	1.00

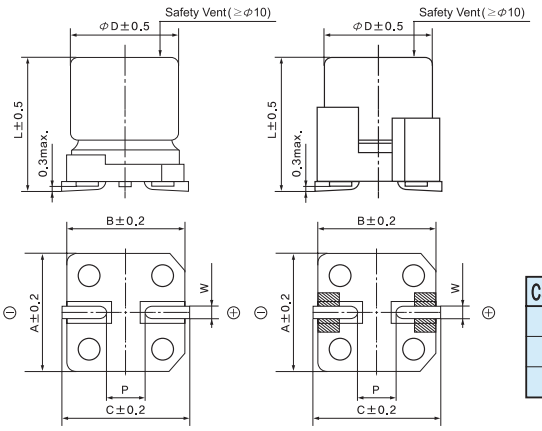
DIMENSIONS OF CLX Series

Unit(mm)

DIMENSIONS

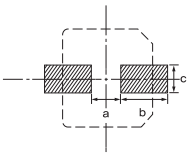
● Vibration Resistance

〈Size code:H10～K14〉 〈Size code:H10～K14〉



▨ : Dummy terminals

Recommended solder land on PC board



▨ : Solder land on PC board

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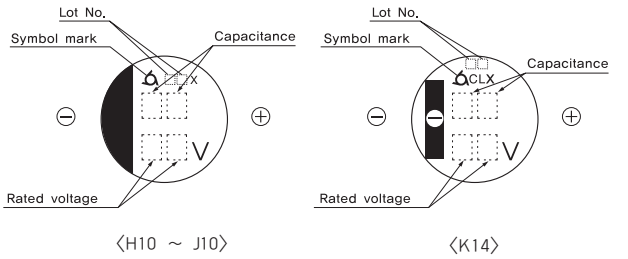


Case code	ø D	L	A	B	C	W	P	a	b	c	a	b	c
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0～1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3

● Vibration Resistance

RATINGS OF CLX Series

VDC / μF	10				16				25				35				50			
33																	H10	0.53	8.0	192
47													H10	0.30	4.5	264	J10	0.38	5.7	296
100									H10	0.30	4.5	264	H10	0.30	4.5	264	J10	0.38	5.7	296
220	H10	0.30	4.5	264	H10	0.30	4.5	264	J10	0.23	3.5	355	J10	0.23	3.5	355	K14	0.18	2.7	650
330	J10	0.23	3.5	355	J10	0.23	3.5	355	K14	0.11	1.7	950	K14	0.11	1.7	950				
470	J10	0.23	3.5	355	K14	0.11	1.7	950												
1,000	K14	0.11	1.7	950																

Rated Ripple Current (mArms/ 125℃, 100kHz)
ESR (Ω max./-40℃, 100kHz)
ESR (Ω max./20℃, 100kHz)
Case code

CLS Series

• 125℃ 2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Wide Temp., Low ESR.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

• AEC-Q200 compliant : Please contact us for more details, test data, information.

CLX → CLS

Low ESR

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 VDC
Operating Temperature Range	-40 ~ +125 ℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.30 / 0.23 / 0.18 / 0.16 / 0.16 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 4 / 3 / 3 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 125℃. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLS 16 VC 220 M F80 TP

- TP : With tape
- F80 : Case code
- M : Capacitance tolerance(±20%)
- 220 : Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC : Lead type
- 16 : Rated voltage
- CLS : Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
47 ~ 150	0.40	0.75	0.90	1.00
220 ~ 470	0.50	0.85	0.94	1.00

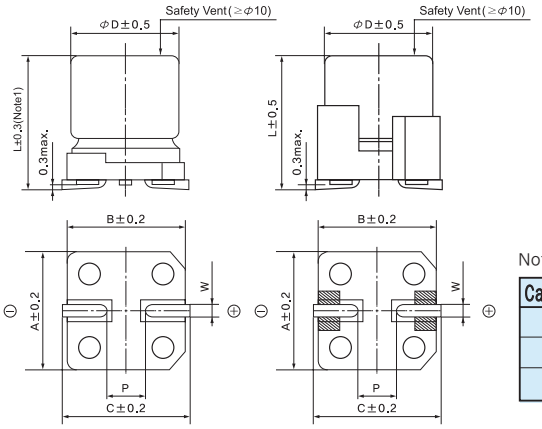
DIMENSIONS OF CLS Series

Unit(mm)

DIMENSIONS

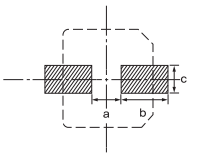
● Vibration Resistance

〈Size code:F80～J10〉 〈Size code:H10～J10〉



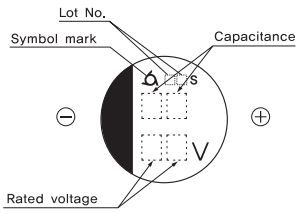
▨: Dummy terminals

Recommended solder land on PC board



▨: Solder land on PC board

MARKING



Note 1 : L±0.5 for 8×10(H10)～10×10(J10)

Case code	ø D	L	A	B	C	W	P	a	b	c	a	b	c
F80	6.3	7.7	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5

● Vibration Resistance

RATINGS OF CLS Series

WV (VDC)	Cap.(μF)	Case code	ESR(Ω max./100kHz)		Rated Ripple Current (mArms / 125℃, 100kHz)
			20℃	-40℃	
10	220	H10	0.150	3.0	350
	330	H10	0.150	3.0	350
		J10	0.120	2.0	550
	470	J10	0.120	2.0	550
16	220	F80	0.300	3.0	240
		H10	0.150	3.0	350
	330	H10	0.150	3.0	350
	470	J10	0.120	2.0	550
25	150	F80	0.300	3.0	240
	220	H10	0.150	3.0	350
	330	J10	0.120	2.0	550
35	47	F80	0.300	3.0	240
	68	F80	0.300	3.0	240
	100	F80	0.300	3.0	240
		H10	0.150	3.0	350
	220	J10	0.120	2.0	550
50	100	H10	0.360	5.4	320
	150	J10	0.300	4.5	500

CLU Series

• 125℃ 3000~5,000Hrs assured.

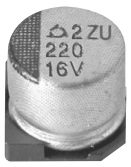
Solvent-proof

- Vertical SMD type.
- Wide Temp. Low ESR, Long Life
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

• AEC-Q200 compliant : Please contact us for more details, test data, information.

CLS → CLU

Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +125 ℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.30 / 0.23 / 0.18 / 0.16 / 0.16 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 4 / 3 / 3 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 5,000hours(3,000hours for F80 size) at 125℃. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposin them for 1,000 hours at 125℃ without voltage applied. The rated volage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLU 35 VC 330 M J10 TP

- TP: With tape
- J10: Case code
- M: Capacitance tolerance(±20%)
- 330: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 35: Rated voltage
- CLU: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1K	10K	100K
47 ~ 100	0.40	0.75	0.90	1.00
220 ~ 680	0.50	0.85	0.94	1.00

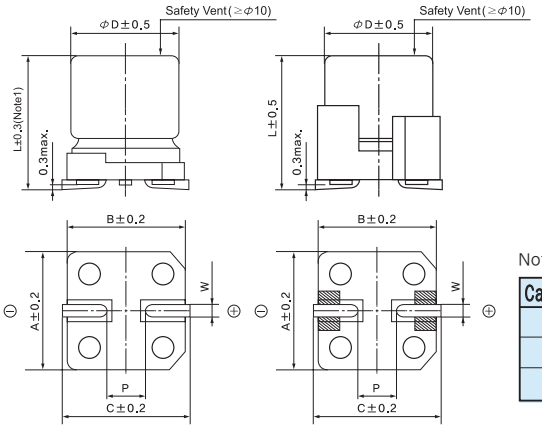
DIMENSIONS OF CLU Series

Unit(mm)

DIMENSIONS

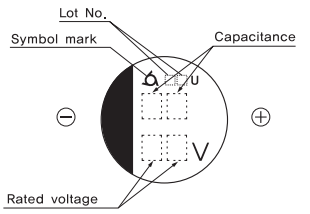
● Vibration Resistance

〈Size code:F80～J10〉 〈Size code:F80～J10〉



▨: Dummy terminals

MARKING

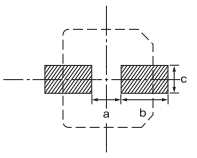


Note 1 : L±0.5 for H10 , J10

Case code	ø D	L	A	B	C	W	P	a	b	c	a	b	c
F80	6.3	7.7	6.6	6.6	7.2	0.5～0.8	1.9	1.9	3.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7～1.1	3.1	3.1	4.2	2.2	3.1	4.2	3.5
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5

● Vibration Resistance

Recommended solder land on PC board



▨: Solder land on PC board

RATINGS OF CLU Series

VDC	Cap.(μF)	Case Code	ESR (Ωmax./20℃,100㎑)	Rated Ripple Current (mArms/105℃,100㎑)
10	220	F80	0.30	240
	470	H10	0.20	350
	680	J10	0.15	550
16	220	F80	0.30	240
	330	H10	0.20	350
	680	J10	0.15	550
25	100	F80	0.30	240
	220	H10	0.20	350
	330	J10	0.15	550
35	100	F80	0.30	240
	220	H10	0.20	350
	330	J10	0.15	550
50	47	F80	0.50	190
	150	H10	0.30	320
	220	J10	0.20	500

VDA Series

• 150℃ 1,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Wide Temperature range.
- Suitable to fit for automotive equipment.
- Ecological capacitors are also available.
- **Halogen-free capacitors are also available.**

CDA → VDA
Wide Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +150 ℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.14 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(+20℃): 6 / 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃): 12 / 10 / 8 / 6 / 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 150℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 150℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

VDA 16 VC 330 M J10 TP

- TP: With tape
- J10: Case code
- M: Capacitance tolerance(±20%)
- 330: Nominal capacitance code (ex. 0.1μF:R1, 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- VDA: Series name

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1K	10K	100K
Factor	1.00	1.36	1.50	1.50

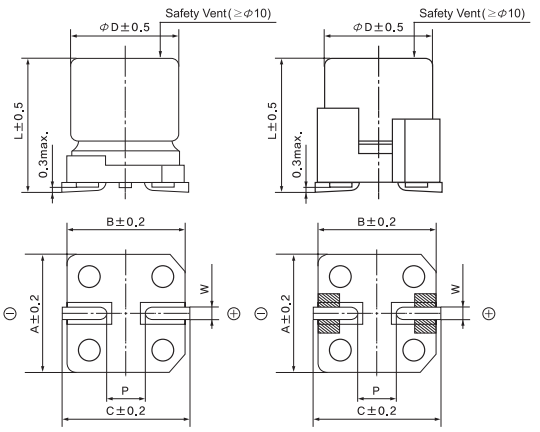
DIMENSIONS OF VDA Series

Unit(mm)

DIMENSIONS

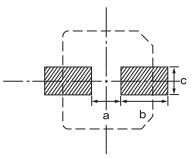
● Vibration Resistance

〈Size code:J10～K14〉 〈Size code:J10～K14〉



▨ : Dummy terminals

Recommended solder land on PC board



▨ : Solder land on PC board

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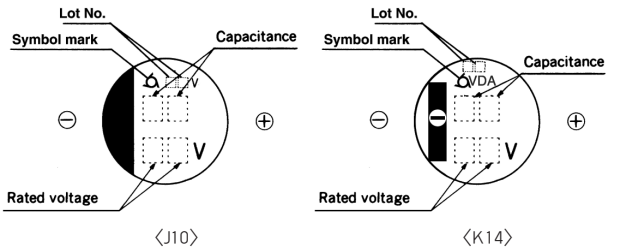


Case code	ø D	L	A	B	C	W	P	a	b	c	a	b	c
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2	4.5	4.4	3.5
K14	12.5	13.5	13.0	13.0	13.7	1.0～1.3	4.2	4.0	5.7	2.5	3.4	6.3	9.3

● Vibration Resistance

RATINGS OF VDA Series

VDC / μF	10		16		25		35		50	
47							J10	90	J10	90
100					J10	123	J10	132	K14	167
220			J10	163	J10	183	K14	249		
330	J10	183	J10	200	K14	285				
470	J10	218	K14	304						
1,000	K14	405								

Rated Ripple Current (mArms/150℃, 120Hz)

Case code

MVG(MV)-BP Series

• 85℃ 2,000Hrs assured.

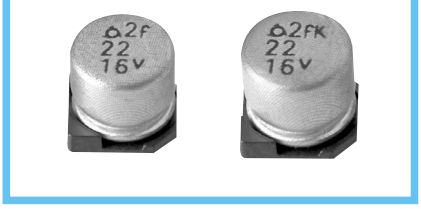
- Vertical SMD type.
- Bi-polarized.
- For LED MT / TV.
- RoHS compliant.
- Halogen-free capacitors are also available.

BDS(MVK)-BP Series

• 105℃ 1,000Hrs assured.

- Vertical SMD type.
- Bi-polarized.
- Wide Temperature Range.
- For LED MT / TV.
- RoHS compliant.
- Halogen-free capacitors are also available.

Solvent-proof



MV → MVG(MV) -BP → BDS(MVK) -BP

Bi-polarized Wide Temp.

SPECIFICATIONS

Item	Characteristics	
Series Name	MVG(MV)-BP	BDS(MVK)-BP
Rated Voltage Range	4 ~ 50 VDC	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +85℃	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current (In both directions)	I=0.05CV(μA) or 10μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, after 2 minutes)	

Dissipation Factor(Tanδ)

Rated Voltage(VDC)	4	6.3	10	16	25	35~50
MV-BP	0.45	0.32	0.26	0.24	0.22	0.20
MVK-BP	-	0.35	0.26	0.24	0.20	0.18

(at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(VDC)	4	6.3	10	16	25	35~50
Z(-25℃)/Z(20℃)	7	4	3	2	2	2
Z(-40℃)/Z(20℃)	15	10	8	6	4	3

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions with its polarization reversed every 250 hours.

Series Name	MVG(MV)-BP	BDS(MVK)-BP
Test time & temperature	2,000 hours at 85℃	1,000 hours at 105℃
Capacitance change	≦±20% of the initial value	≦±30% of the initial value
Tanδ	≦200% of the initial specified value	≦300% of the initial specified value
Leakage current	≦The initial specified value	≦The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 85℃(**MVG(MV)-BP**) or 105℃(**BDS(MVK)-BP**) without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Series Name	MVG(MV)-BP	BDS(MVK)-BP
Capacitance change	≦±15% of the initial value	≦±25% of the initial value
Tanδ	≦150% of the initial specified value	≦200% of the initial specified value
Leakage current	≦The initial specified value	≦The initial specified value

Others

Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

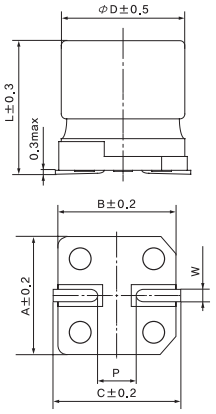
MVG 16 VC 22 M BP F55 TP

- TP: With tape
- F55: Case code
- BP: Bi-polar type
- M: Capacitance tolerance(±20%)
- 22: Nominal capacitance code (ex. 1.0μF:1, 4.7μF:4R7, 10μF:10)
- VC: Lead type
- 16: Rated voltage
- MVG: Series name

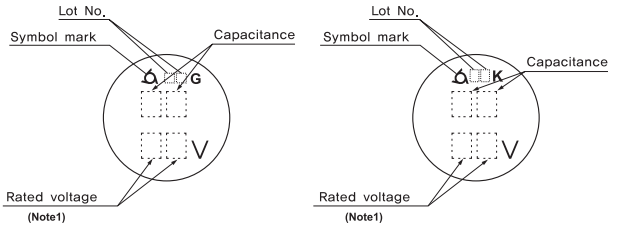
DIMENSIONS OF MVG(MV)-BP, BDS(MVK)-BP Series

Unit(mm)

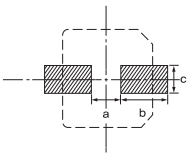
DIMENSIONS



MARKING



Recommended solder land on PC board



▨ : Solder land on PC board

Note 1 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6

RATINGS OF MVG(MV)-BP, BDS(MVK)-BP Series

MVG(MV)-BP

μF \ VDC	4		6.3		10		16		25		35		50	
1.0													D55	5.5
(1.5)													D55	6.5
2.2											D55	8	E55	9
3.3									D55	9	→		E55	11
4.7							D55	11	→		E55	13	F55	14
(6.8)					D55	12	→		E55	15	F55	17		
10			D55	13	→		E55	18	→		F55	21		
(15)	D55	14	→		E55	21	→		F55	24				
22	→		E55	23	→		F55	28						
33	→		→		F55	33								
47	→		F55	36										

↑ Rated Ripple Current(mArms/ 85℃, 120Hz)
↑ Case code

BDS(MVK)-BP

μF \ VDC	6.3		10		16		25		35		50	
1.0											D55	5.3
(1.5)											D55	7.2
2.2									D55	7	E55	9.0
3.3							D55	8	→		E55	12
4.7					D55	10	→		E55	14	F60	16
(6.8)			D55	11	→		E55	16	→		F60	20
10	D55	12	→		E55	18	→		F60	23		
(15)	→		E55	20	→		F60	28				
22	E55	23	→		F60	32						
33	→		F60	35								
47	F60	39										

↑ Rated Ripple Current (mA rms/105℃, 120Hz)
↑ Case code

Note : → Use next higher voltage part.
Parenthesized capacitance is not standard part.

PRECAUTIONS TO USERS

Soldering method
The capacitors of Alchip have no capability to withstand such dip or wave soldering as totally immerses a components into a solder bath.

Reflow soldering
Use the capacitors within the Recommended Reflow Soldering Conditions, and also make sure to check the temperature stress to the capacitors because the following makes a difference in the stress to the capacitors. If any other reflow soldering conditions are applied, please consult us.

① Location of components. (The edge sides of a PC board increases its temperature more than the center does.)
② Population of components. The less the component population is the more the temperature is increased.
③ Material of printed circuit board. As a ceramic board needs heating up more than a glass epoxy board to reach the same board temperature, the capacitors may be damaged.
④ Thickness of PC board. A thick PC board needs heating up more than a thin board. It may damage the capacitors.
⑤ Size of PC board. A large PC board needs heating up more than a small board, and it may damage the capacitors.
⑥ Location of infrared ray lamps. On IR reflow as well as hot plate reflow, heating only the reverse side of the PC board will reduce a stress to the capacitors.

Rework of soldering
Avoid soldering more than once by reflow. Use a soldering iron for rework of solder, and do not exceed an iron tip temperature of 300℃ and a max. exposure time of 5 seconds.

Mechanical stress
Do not lift up or push the capacitor after soldering. Avoid curvature of the PC board. These may damage the capacitor.

Cleaning of assembly board
For the cleaning conditions, see page 46~47.
Immediately after solvent cleaning, evaporate a residual solvent for at least 10 minutes with a hot forced air. If the assembly board is inadequately dried after a washing process, the capacitors will keep suffering from a residual solvent for long periods of time, and will be corroded while in service.

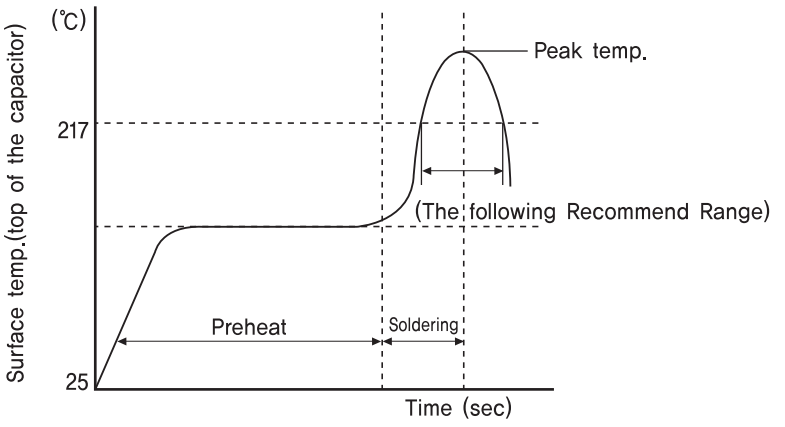
Coating on assembly board
① Before coating, evaporate cleaning solvents from the assembly board.
② Before the conformal coating, using a buffer pre-coat which does not contain chloride is recommanded to reduce stress to the capacitors.

Molding by resin
Inner pressure of a capacitor slowly increases over the service life of the capacitor with gas being produced by internal chemical reaction. If the end seal of the capacitor is completely be in danger. Also if the resin contains a large amount of chlorine ion, it will penetrate into the end seal, get into the inside element of the capacitor, and damage the capacitor while in service.

Others
The Precautions to Users for Aluminum Electrolytic Capacitors shall be applied. (page 44)

RECOMMENDED PB-FREE REFLOW SOLDERING CONDITIONS

The following conditions are recomended for air or infrared reflow soldering of the surface mount capacitors onto a glass epoxy circuit board of 90×50×0.8mm (with resist) by cream solder (eutectic solder) . The temperatures shown are the surface temperature values of the top of the capacitor.



TEMPERATURE PROFILE

CASE CODE	Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
B55, D55, D56 E55, E56, F55, F56, F60, F80 H63, H10, J85, J10, K14	60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250℃ (10 Sec ↓)	1 TIME
L17, L22 M17, M22	60 ~ 100 Sec	50 ~ 60 Sec	-	230℃ (10 Sec ↓)	1 TIME

GSA Series

- Non-solvent proof.
- Height 7mm.
- For CAR-Audio, Tuner.

- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

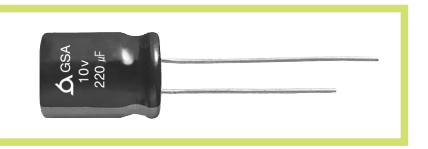
GZA Series

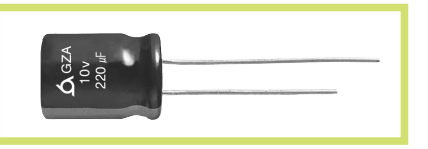
- Solvent proof.
- Height 7mm.
- For CAR-Audio, Tuner.

- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

SRA → GSA (Downsized)

GZA (Solvent-proof) — Reflow Application



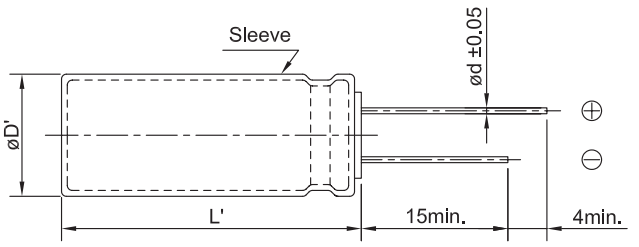


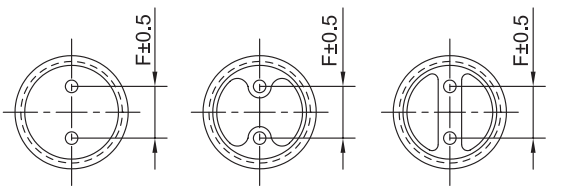
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 63 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. where, I:Max. Leakage current(μA) C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.11 / 0.08 ※6.3 VB 220(0.27) , 16 VB 100(0.19) (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50~63 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±25% of the initial value (where, ±20% for GZA Series) Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied.The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF GSA/GZA Series

Unit(mm)





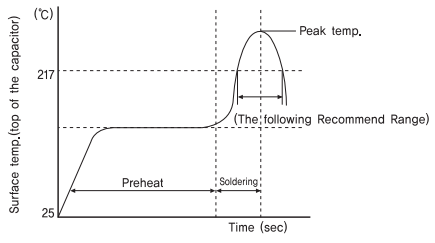
ø D	4	5	6.3	8
ø d	0.45			
F	1.5	2.0	2.5	3.5
ø D′	ø D+0.5 max.			
L′	L+1.0 max.			

Marking- GSA : BLACK SLEEVE, WHITE INK
GZA : GREEN SLEEVE, BLACK INK

RATINGS OF GSA / GZA Series

μF \ VDC	6.3	10	16	25	35	50	63
0.1						4×7 1.3	4×7 1.3
0.15						4×7 2.0	4×7 2.0
0.22						4×7 2.9	4×7 3.0
0.33						4×7 3.5	4×7 3.7
0.47						4×7 5.0	4×7 5.4
0.68						4×7 7.1	4×7 7.6
1						4×7 10	4×7 11
1.5						4×7 12	4×7 13
2.2						4×7 15	4×7 17
3.3					4×7 17	4×7 18	4×7 20
4.7				4×7 19	4×7 20	4×7 22	4×7 25
6.8				4×7 20	4×7 23	5×7 25	5×7 28
10			4×7 25	4×7 26	4×7 27	5×7 31	6.3×7 38
15			4×7 28	4×7 30	5×7 36	6.3×7 48	6.3×7 51
22	4×7 31	4×7 32	4×7 34	5×7 41	5×7 44	6.3×7 58	6.3×7 62
33	4×7 35	4×7 38	5×7 45	5×7 50	6.3×7 64	6.3×7 68	8×7 72
47	4×7 42	5×7 50	5×7 55	6.3×7 65	6.3×7 70	8×7 84	
68	4×7 56	5×7 60	6.3×7 83	6.3×7 85	8×7 91		
100	5×7 68	6.3×7 80	6.3×7 95	6.3×7 101			
150	6.3×7 90	6.3×7 95	8×7 116	8×7 127			
220	6.3×7 120	6.3×7 122	8×7 140				
330	6.3×7 141	8×7 152					
470	8×7 168	← Case Size ø D × L (mm) ← Rated Ripple Current (mArms/85℃, 120Hz)					

RECOMMENDED REFLOW SOLDERING CONDITIONS(For GZA Series)



TEMPERATURE PROFILE

Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250℃ (10 Sec ↓)	1 TIME

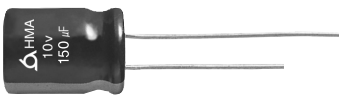
HMA Series

• 105℃ 2,000Hrs assured.

Solvent-proof

- Height 7mm.
- Wide Temperature range.
- Long Life.
- For CAR-Audio, Tuner.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

HSA (KMA) → HMA
Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(+20℃) 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃) 8 / 6 / 6 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value(where, ±25% for 6.3 V_{DC}~16 V_{DC}) Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied.The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of initial value(where, ±25% for 6.3 V_{DC}~16 V_{DC}) Tanδ ≦ 200% of initial specified value Leakage current ≦ 200% of initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

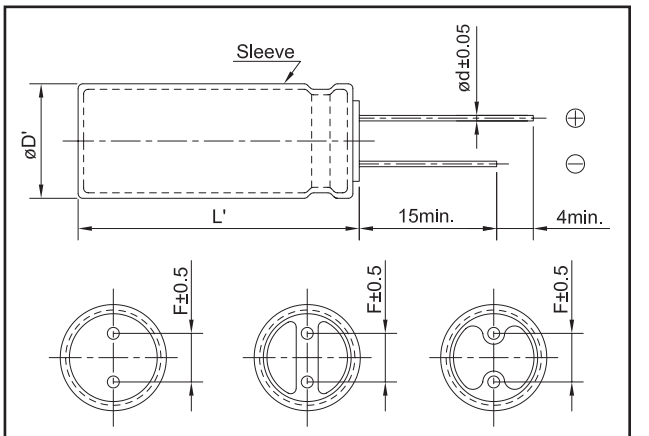
RATINGS OF HMA Series

μF \ V_{DC}	6.3		10		16		25		35		50	
0.1											4×7	1.3
0.15											4×7	2.0
0.22											4×7	2.9
0.33											4×7	3.5
0.47											4×7	5.0
0.68											4×7	7.1
1											4×7	10
1.5											4×7	12
2.2											4×7	15
3.3									4×7	17	4×7	18
4.7							4×7	19	4×7	20	5×7	23
6.8					4×7	20	5×7	23	5×7	24	6.3×7	28
10					4×7	25	5×7	28	4×7 5×7	23 30	6.3×7	34
15			4×7	28	5×7	31	6.3×7	35	6.3×7	37	6.3×7	41
22	4×7	31	5×7	35	5×7	39	6.3×7	43	6.3×7	47	6.3×7	52
33	5×7	39	5×7	43	6.3×7	49	6.3×7	53	8×7	62	8×7	68
47	5×7	47	6.3×7	53	6.3×7	59	8×7	68				
68	6.3×7	57	6.3×7	63	8×7	76						
100	6.3×7	71	6.3×7	80								
150	8×7	94	8×7	94								

Rated Ripple Current (mArms/105℃, 120Hz)
Case Size øD×L(mm)

DIMENSIONS OF HMA Series

Unit(mm)



Marking: BROWN SLEEVE, WHITE INK

ø D	4	5	6.3	8
ø d	0.45			
F	1.5	2.0	2.5	3.5
ø D'	ø D+0.5 max.			
L'	L+1.0 max.			

HXB Series

• 105℃ 1,000~2,000Hrs assured.

- Non-solvent proof.
- Low Impedance, Long Life.
- Height 7mm~9mm.
- For LED TV PSU, DVD Driver.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

HXA → HXB

Low Imp. Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. (where 1,000 hours for ø4) Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

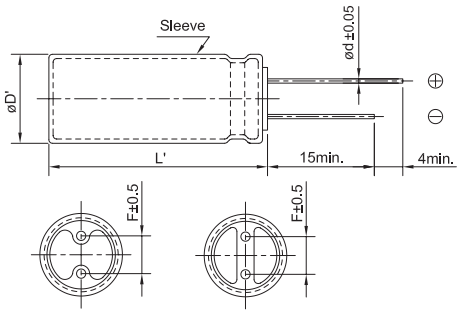
RATINGS OF HXB Series

μF \ V_{DC}	6.3			10			16			25			35			50		
1																4X7	3.00	53
																5X7	2.20	80
2.2																4X7	2.50	70
																5X7	1.15	120
4.7																4X7	2.00	85
																5X7	0.70	165
10																6.3X7	0.35	260
22													5X7	0.70	165	6.3X7	0.35	260
33	4X7	1.50	130	4X7	1.50	130	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450
	5X7	0.70	165	5X7	0.70	165												
47	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450	8X7	0.17	450
68	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500
100	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500			
150	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500						
220	8X7	0.17	450	8X7	0.17	450	8X9	0.15	500									
330	8X7	0.17	450	8X9	0.15	500												
390	8X9	0.15	500															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size øD×L(mm)

DIMENSIONS OF HXB Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ø D	4	5	6.3	8
ø d	0.45			
F	1.5	2.0	2.5	3.5
ø D'	ø D+0.5 max.			
L'	L+1.0 max.			

※ ø8 X 9L, ød=0.60

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
1~150	0.40	0.75	0.90	0.95	1.00
220~390	0.50	0.85	0.94	0.97	1.00

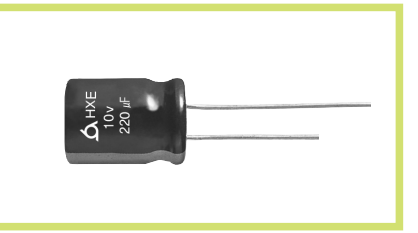
HXE Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Ultra Low Impedance.
- Height 7mm~9mm.
- For LED TV PSU, DVD Driver.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

HXB → HXE

Low Imp.

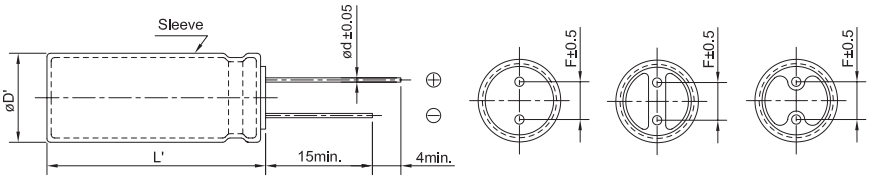


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16~35 Z(-25℃)/Z(20℃): 2 / 2 / 2 Z(-40℃)/Z(20℃): 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≤ ±25% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±25% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF HXE Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	4	5	6.3	8
ød	0.45			
F	1.5	2.0	2.5	3.5
øD′	øD+0.5 max.			
L′	L+1.0 max.			

※ ø8 X 9L, ød=0.60

RATINGS OF HXE Series

WV (V)	Cap. (μF)	ø D×L(mm)	IMP.(Ω max. / 100kHz)		Rated Ripple Current (mArms/105℃, 100kHz)
			20℃	-10℃	
6.3	33	4×7	0.56	1.70	230
	47	5×7	0.26	0.86	350
	100	6.3×7	0.15	0.50	480
	330	8×7	0.10	0.35	800
	390	8×9	0.08	0.30	850
10	33	4×7	0.56	1.70	230
	47	5×7	0.26	0.86	350
	150	6.3×7	0.15	0.50	480
	220	8×7	0.10	0.35	800
	330	8×9	0.08	0.30	850
16	22	4×7	0.56	1.70	230
	33	5×7	0.26	0.86	350
	47	5×7	0.26	0.86	350
	100	6.3×7	0.15	0.50	480
	150	8×7	0.10	0.35	800
	220	8×9	0.08	0.30	850
25	10	4×7	0.56	1.70	230
	33	5×7	0.26	0.86	350
	47	6.3×7	0.15	0.50	480
	68	6.3×7	0.15	0.50	480
	100	8×7	0.10	0.35	800
	150	8×9	0.08	0.30	850
35	4.7	4×7	0.64	2.10	230
	10	5×7	0.33	1.10	350
	22	5×7	0.33	1.10	350
	33	6.3×7	0.15	0.50	480
	68	8×7	0.10	0.35	800
	100	8×9	0.08	0.30	850

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
4.7 ~ 150	0.40	0.75	0.90	0.95	1.00
220 ~ 390	0.50	0.85	0.94	0.97	1.00

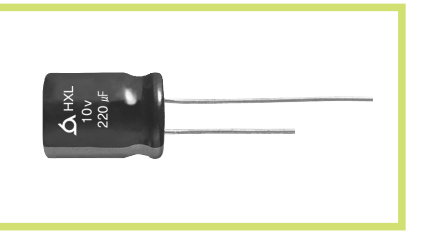
HXL Series

• 105℃ 2,000~3,000Hrs assured.

- Non-solvent proof.
- Low Impedance, Long Life.
- Height 7mm~9mm.
- For LED TV PSU, DVD Driver.
- RoHS compliant.
- Halogen-free capacitors are also available.

HXB → HXL

Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. (where 2,000 hours for ø4) Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

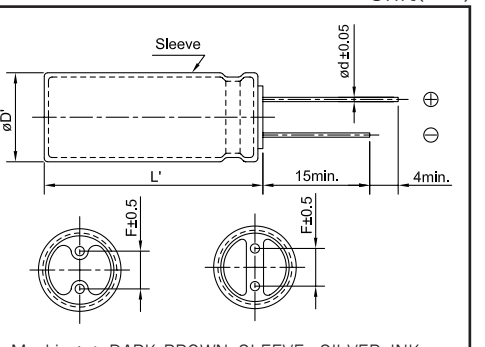
RATINGS OF HXL Series

μF \ VDC	6.3			10			16			25			35			50		
1																4X7	3.00	53
																5X7	2.20	80
2.2																4X7	2.50	70
																5X7	1.15	120
4.7																4X7	2.00	85
																5X7	0.70	165
10																6.3X7	0.35	260
22													5X7	0.70	165	6.3X7	0.35	260
33	4X7	1.50	130	4X7	1.50	130							6.3X7	0.35	260	8X7	0.17	450
	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165						
47	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450	8X7	0.17	450
68	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500
100	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500			
150	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450	8X9	0.15	500						
220	8X7	0.17	450	8X7	0.17	450	8X9	0.15	500									
330	8X7	0.17	450	8X9	0.15	500												
390	8X9	0.15	500															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size øD×L(mm)

DIMENSIONS OF HXL Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	4	5	6.3	8
ød	0.45			
F	1.5	2.0	2.5	3.5
øD'	øD+0.5max			
L'	L+1.0max			

※ ø8 x 9L, ød=0.60

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
1~150	0.40	0.75	0.90	0.95	1.00
220~390	0.50	0.85	0.94	0.97	1.00

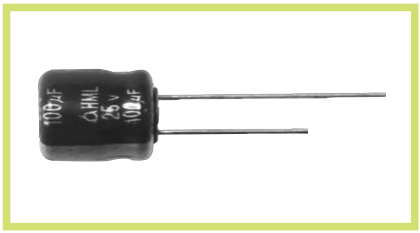
HML Series

• 105℃ 3,000Hrs~5,000Hrs assured.

- Non-solvent proof.
- Long Life.
- Height 7mm~9mm.
- For LED TV PSU, DVD Driver.
- RoHS compliant.
- Halogen-free capacitors are also available.

HXL → HML

Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(+20℃): 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 5,000 hours at 105℃.(where 3,000 hours for ø4, 4,000 hours for ø5) Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF HML Series

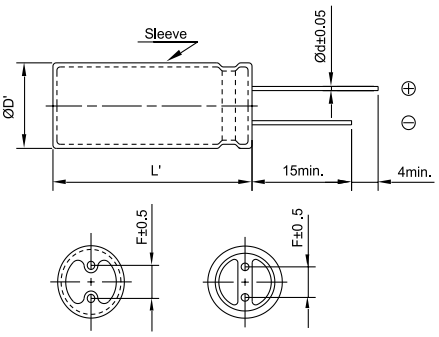
μF \ VDC	6.3		10		16		25		35		50	
1											4X7	53
											5X7	80
2.2											4X7	70
											5X7	120
4.7											4X7	85
											5X7	165
10											6.3X7	260
22									5X7	165	6.3X7	260
33	4X7	130	4X7	130	5X7	165	5X7	165	6.3X7	260	8X7	450
	5X7	165	5X7	165								
47	5X7	165	5X7	165	5X7	165	6.3X7	260	8X7	450	8X7	450
68	6.3X7	260	6.3X7	260	6.3X7	260	6.3X7	260	8X7	450	8X9	500
100	6.3X7	260	6.3X7	260	6.3X7	260	8X7	450	8X9	500		
150	6.3X7	260	6.3X7	260	8X7	450	8X9	500				
220	8X7	450	8X7	450	8X9	500						
330	8X7	450	8X9	500								
390	8X9	500										

Rated Ripple Current (mArms/105℃, 100kHz)

Case Size øD×L(mm)

DIMENSIONS OF HML Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	4	5	6.3	8
Ød	0.45			
F	1.5	2.0	2.5	3.5
ØD′	ØD+0.5max			
L′	L+1.0max			

※ ø8 X 9L, Ød=0.60

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
1~150	0.40	0.75	0.90	0.95	1.00
220~390	0.50	0.85	0.94	0.97	1.00

MHA Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For Digital Household Appliance.
- RoHS compliant.
- Halogen-free capacitors are also available.

SHL → MHA
Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 500 VDC
Operating Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)	
Leakage Current	After 1 minute: I=0.03CV(㎂) or 4㎂, whichever is greater. After 2 minutes: I=0.01CV(㎂) or 3㎂, whichever is greater. Where, I: Max. Leakage current(㎂), C: Nominal capacitance(㎌), V: Rated voltage(VDC) (at 20℃)	

	After 1 minute		After 5 minutes	
	CV≦1,000	CV>1,000	CV≦1,000	CV>1,000
	0.1CV+40	0.04CV+100	0.03CV+15	0.02CV+25

Dissipation Factor (Tanδ)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63	100	160~250	350~500
Tanδ(Max.)	0.34	0.24	0.20	0.16	0.14	0.12	0.10	0.09	0.20	0.24

When the capacitance exceeds 1,000㎌, 0.02 shall be added every 1,000㎌ increase. (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63~100	160	200~250	350~500
Z(-25℃)/Z(20℃)	5	4	3	2	2	2	3	4	8	16
Z(-40℃)/Z(20℃)	12	10	8	5	4	3	4	-	-	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃.

Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

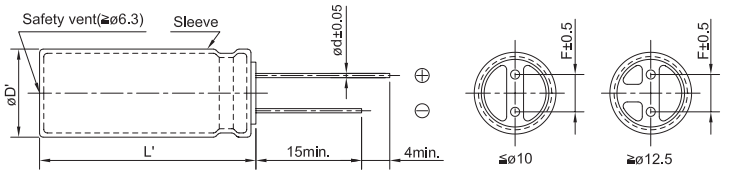
Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value (where, 200% for ≧ WV 160 VDC)

Others

Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF MHA Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

※ø8 X 9L, øD'≤D+0.5 and L'≤L+1.0

RATINGS OF MHA Series

μF \ Vdc	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450	500
1						5×11 22	5×11 24	5×11 24	5×11 20 6.3×11 23	5×11 20 6.3×11 23	5×11 24 6.3×11 27	6.3×11 28	6.3×11 29	6.3×11 24	
2.2						5×11 34	5×11 35	5×11 37	5×11 29 6.3×11 33	5×11 34 6.3×11 39	6.3×11 41	6.3×11 43	6.3×11 44	6.3×11 34 8×11.5 40	8×11.5 34
3.3						5×11 41	5×11 43	5×11 44	6.3×11 46	6.3×11 47	6.3×11 48	6.3×11 48 8×11.5 56	6.3×11 51 8×11.5 59	8×11 46 10×12.5 54	8×11 43 10×12.5 50
4.7					5×11 35	5×11 48	5×11 53	5×11 55	6.3×11 56	6.3×11 57	6.3×11 58 8×11.5 66	8×11.5 68	8×11 70 10×12.5 73	10×12.5 65	10×16 68
6.8					5×11 46	5×11 59	5×11 63	5×11 64	6.3×11 67 8×11.5 78	6.3×11 69 8×11.5 80	8×11.5 82	8×11 79 10×12.5 92	10×12.5 95	10×16 83	10×16 78
10			5×11 39	5×11 49	5×11 53	5×11 71	5×11 76	5×11 76	6.3×11 78 8×11.5 82	8×11.5 96	8x11 97 10×12.5 113	10×12.5 106	10×16 123	12.5×16 111	12.5×16 101
22		5×11 52	5×11 68	5×11 73	5×11 80	5×11 106	5×11 113	6.3×11 130	10×12.5 136	10×12.5 152	10×16 182	12.5×16 205	10×25 229	16×20 216	16×20 140
33	5×11 41	5×11 70	5×11 80	5×11 83	5×11 100	5×11 129 8×9 98	6.3×11 159	8×11.5 187	10×16 224	10×16 226	12.5×16 262	12.5×20 275	12.5×20 294	16×20 297	16×25 204
47	5×11 59	5×11 88	5×11 120	5×11 126	5×11 138 8×9 98	6.3×11 177 8×9 110	6.3×11 190	8×11 223 8×15 246	10×16 277	12.5×16 315	12.5×20 340	16×20 395	16×20 407	16×25 368	18×25 233
68	5×11 90	5×11 110	5×11 130	5×11 151	5×11 168 6.3×11 191	6.3×11 213	8×11.5 269	10×12.5 311	12.5×16 377	12.5×20 441	16×20 490	16×25 500	16×25 522	16×31.5 544	18×31.5 269
100	5×11 135	5×11 150	5×11 170	5×11 184 8×9 115	6.3×11 231	8×11.5 306	8×11.5 321	10×16 416	12.5×20 496	16×20 543	16×20 550	16×31.5 674	18×31.5 698	18×35.5 620	
220	5×11 211	5×11 229 8×9 150	5×11 256 6.3×11 290	6.3×11 318	8×11.5 405	10×12.5 506	10×16 615	12.5×20 742	16×25 906	16×31.5 1,029	18×31.5 1,040	22×35 1,074	22×45 1,150		
330	5×11 262 6.3×11 297	6.3×11 322	6.3×11 360	8×11.5 453	8×11 494 8×15 547	10×16 706	10×20 823	12.5×25 987	18×31.5 1,304	18×31.5 1,281	22×35 1,333				
470	6.3×11 355 8×9 241	6.3×11 384	8×11.5 499	8×11 540 8×15 597	10×12.5 682	10×20 918	12.5×20 1,039	16×20 1,299	22×30 1,421	22×35 1,459					
680	8×11.5 503	8×11.5 546	8×11 584 8×15 655	10×16 826	10×16 909	12.5×16 1,190	12.5×25 1,512	16×31.5 1,587	22×40 1,680						
1,000	8×11.5 610	8×11 679 8×15 751	10×12.5 840	10×16 1,007	10×20 1,163	12.5×25 1,715	16×20 1,724	18×31.5 1,932							
2,200	10×16 1,059	10×16 1,129	10×20 1,340	12.5×20 1,651	12.5×30 1,933	16×31.5 2,320	18×31.5 2,654								
3,300	10×20 1,350	10×25 1,657	10×30 1,804	12.5×30 2,159	16×25 2,314	18×31.5 3,118									
4,700	12.5×20 1,822	12.5×20 1,929	16×20 2,200	16×25 2,464	16×35.5 3,061										
6,800	12.5×20 2,235	12.5×30 2,545	16×25 2,690	16×31.5 2,992											
10,000	16×20 2,571	16×25 2,742	16 ×31.5 3,420												
15,000	16×31.5 3,453	18×31.5 3,707	◀		Case Size ø D×L(mm) Rated Ripple Current(mArms/85℃, 120Hz)										

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	60	120	300	1k	10k~
1~6.8	0.65	1.00	1.35	1.75	2.30
10~68	0.75	1.00	1.25	1.50	1.75
100~1,000	0.80	1.00	1.15	1.30	1.40
2,200~15,000	0.85	1.00	1.03	1.05	1.08

NHA Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

WV≦100VDC

- For Digital Household Appliance.
- RoHS compliant.
- Halogen-free capacitors are also available.

KMG → NHA

Downsized

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 400 VDC	450 ~ 500 VDC
Operating Temperature Range	-55 ~ +105℃	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20% (M)		(at 20℃, 120Hz)
Leakage Current	After 1 minute: I=0.03CV(μA) or 4μA, whichever is greater. After 2 minutes: I=0.01CV(μA) or 3μA, whichever is greater.		

After 1 minute		After 5 minutes	
CV≦1,000	CV>1,000	CV≦1,000	CV>1,000
0.1CV+40	0.04CV+100	0.03CV+15	0.02CV+25

Where, I: Max. Leakage current(μA), C: Nominal capacitance(μF), V: Rated voltage(VDC) (at 20℃)

Dissipation Factor (Tanδ)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63	100	160~250	350~500
Tanδ(Max.)	0.34	0.24	0.20	0.16	0.14	0.12	0.10	0.09	0.20	0.24

When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63~100	160	200~400	450~500
Z(-25℃)/Z(20℃)	5	4	3	2	2	2	3	3	6	6
Z(-40℃)/Z(20℃)	12	10	8	5	4	3	4	5	6	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃.(where, 1,000 hours ≤ ø8)

Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied.(where, 500 hours ≤ ø8)
The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

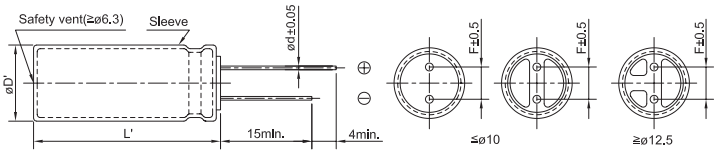
Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value (where, 200% for ≧ WV 160 VDC)

Others

Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NHA Series

Unit(mm)



Marking : BROWN SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

RATINGS OF NHA Series

μF \ Vdc	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450	500
1						5×11 13	5×11 15	5×11 16	5×11 12 6.3×11 14	5×11 13 6.3×11 15	5×11 15 6.3×11 17	6.3×11 18	6.3×11 19	6.3×11 14	
2.2						5×11 18	5×11 19	5×11 21	5×11 17 6.3×11 20	6.3×11 24	6.3×11 27	6.3×11 28 8×11.5 29	6.3×11 28 8×11.5 30	6.3×11 22 8×11.5 25	8×11.5 22
3.3						5×11 30	5×11 33	5×11 34	6.3×11 35	6.3×11 36	6.3×11 37	6.3×11 38 8×11.5 38	8×11 39 10×12.5 41	8×11 30 10×12.5 35	10×12.5 29
4.7				5×11 25	5×11 27	5×11 37	5×11 39	5×11 40	6.3×11 41	6.3×11 43	6.3×11 44 8×11.5 45	8×11.5 45	8×11.5 46 10 ×12.5 48	10×12.5 38	10×12.5 36
6.8				5×11 31	5×11 33	5×11 44	5×11 48	5×11 49	8×11.5 52	8×11.5 54	8×11.5 56	10×12.5 58	10×12.5 59	10×16 54	10×16 50
10			5×11 35	5×11 37	5×11 40	5×11 54	5×11 59	5×11 59	8×11.5 60	8×11.5 62	10×12.5 67	10×16 73	10×16 79	10×16 70	12.5×16 66
22		5×11 48	5×11 53	5×11 56	5×11 67	5×11 79	5×11 87	6.3×11 100	10×12.5 101	10 ×12.5 102	10×16 117	12.5×16 138	10×25 157	12.5×20 125	16×20 123
33	5×11 52	5×11 56	5×11 60	5×11 75	5×11 80	5×11 97	6.3×11 122	8×11.5 144	10×16 143	10 ×16 145	12.5×16 169	12.5×25 189	16×20 210	12.5×30 189	16×25 165
47	5×11 61	5×11 66	5×11 77	5×11 80	5×11 101	6.3×11 133	6.3×11 146	8×11.5 171 8×15 189	10×20 202	12.5 ×16 206	12.5×20 218	16×20 246	16×25 280	16×25 222	18×25 188
68	5×11 69	5×11 83	5×11 92	5×11 113	5×11 122 6.3×11 138	6.3×11 156	8×11.5 207	10×12.5 239	12.5×16 252	12.5×20 265	16×20 300	16×25 322	16×31.5 376	18×31.5 338	
100	5×11 90	5×11 100	5×11 125	5 x 11 141 6.3× 11 159	6.3×11 168	8×11.5 229	8×11.5 216 10 ×12.5 251	10×16 321	12.5×25 360	16×20 366	16×25 405	16×35.5 447	18×35.5 453	22×30 414	
220	5×11 153	5×11 170	6.3×11 213	6.3×11 238	8×11.5 294	10×12.5 395	10×16 474	12.5×20 572	16×25 656	16×31.5 684	18×35.5 719	22×45 780			
330	6.3×11 216	6.3×11 239	6.3×11 265	8×11.5 340	8×11 360 8×15 398	10×16 529	10×20 633	16×20 810	18×31.5 848	18×35.5 866	22×35 880				
470	6.3×11 258	6.3×11 286	8×11.5 366	8×11.5 406 8×15 447	10×16 547	10×20 690	12.5×20 886	16×25 1,072	22×35 1,130	22×40 1,156					
680	8×11.5 365	8×11.5 405	8×11.5 413 8×15 455	10×16 620	12.5×16 777	12.5×20 973	12.5×25 1,160	16×31.5 1,364	22×45 1,463						
1,000	8×11.5 443	8×15 542	10×16 680	10×16 756	12.5×16 940	12.5×25 1,287	16×25 1,565	18×35.5 1,987							
2,200	10×16 772	10×20 886	12.5×16 1,019	12.5×20 1,188	16×20 1,394	16×31.5 1,724	18×35.5 1,938								
3,300	10×20 1,032	12.5×20 1,205	12.5×20 1,275	16×20 1,535	16×31.5 1,808	18 ×31.5 2,190									
4,700	12.5×20 1,280	12.5×25 1,492	16×20 1,610	16×25 1,865	18×31.5 2,262										
6,800	12.5×25 1,554	16×20 1,699	16 ×25 1,929	18×31.5 2,374	18×40 2,642										
10,000	16×25 1,897	16×31.5 2,082	18×31.5 2,365	18×35.5 2,649											
15,000	16×31.5 2,297		◀ Case Size ØD×L(mm) ◀ Rated Ripple Current(mArms/105℃, 120Hz)												

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	60	120	300	1k	10k~
1~6.8	0.65	1.00	1.35	1.75	2.30
10~68	0.75	1.00	1.25	1.50	1.75
100~1,000	0.80	1.00	1.15	1.30	1.40
2,200~15,000	0.85	1.00	1.03	1.05	1.08

* SMT Products are available upon request.
Please check with us about individual characteristics.

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

GSA-LL Series

- 85℃ 2,000Hrs assured.
- Non-solvent proof.
- Height 7mm.
- Low leakage current.
- For CAR-Audio.
- RoHS compliant.
- Halogen-free capacitors are also available.

GSA → GSA-LL

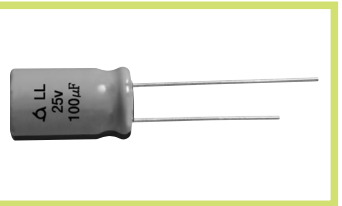
Low Leakage current

LL Series

- 85℃ 2,000Hrs assured.
- Non-solvent proof.
- Very low leakage current.
- For CAR-Audio.
- RoHS compliant.
- Halogen-free capacitors are also available.

MHA → LL

Low Leakage current



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current(Max.)	GSA-LL Series : I=0.004CV(μA) or 0.4μA, whichever is greater. LL Series : I=0.002CV(μA) or 0.2μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	(at 20℃, 120Hz)

Rated Voltage(V_{DC})	6.3	10	16	25	35	50~63	100
Tan δ(Max.)	0.24	0.20	0.16	0.14	0.12	0.10	0.07

Temperature Characteristics (Max. Impedance ratio) (at 120Hz)

Rated Voltage(V_{DC})	GSA-LL Series	LL Series				
	—	6.3	10	16	25	35~100
Z(-25℃)/Z(+20℃)	4	4	3	2	2	2
Z(-40℃)/Z(+20℃)	8	8	6	4	3	3

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃.

Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

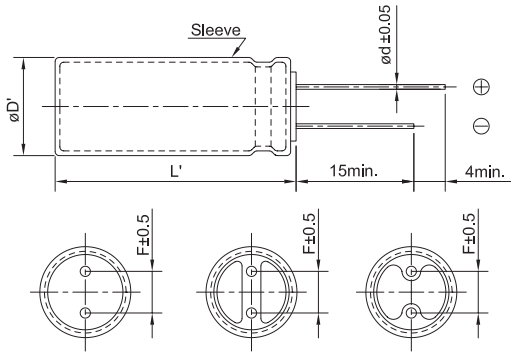
Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

Others

Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF GSA-LL Series

Unit(mm)

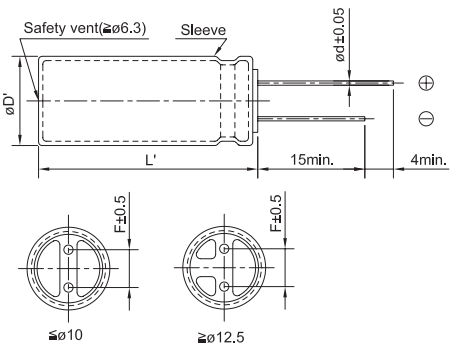


Marking:ORANGE SLEEVE, BLACK INK

ø D	4	5	6.3
ø d	0.45		
F	1.5	2.0	2.5
ø D′	ø D+0.5 max.		
L′	L+1.0 max.		

DIMENSIONS OF LL Series

Unit(mm)



Marking : ORANGE SLEEVE, BLACK INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD′	øD+0.5 max.						
L′	L+1.5 max.			L+2.0 max.			

RATINGS OF GSA-LL Series

μF \ VDC	6.3		10		16		25		35		50	
1					4×7	9.2					4×7	12
1.5					4×7	11					4×7	14
2.2					4×7	12					4×7	17
3.3					4×7	15	4×7	17	4×7	18	5×7	21
4.7					4×7	20	4×7	21	5×7	22	6.3×7	25
6.8					5×7	23	5×7	25	6.3×7	28	6.3×7	31
10			4×7	25	5×7	27	5×7	30	6.3×7	33	6.3×7	40
15	4×7	28	5×7	30	6.3×7	33	6.3×7	37	6.3×7	39		
22	5×7	33	5×7	37	6.3×7	42	6.3×7	45	6.3×7	49		
33	5×7	41	6.3×7	45	6.3×7	52	6.3×7	55				
47	6.3×7	49	6.3×7	55	6.3×7	62						
68	6.3×7	59	6.3×7	65								
100	6.3×7	73										

Rated Ripple Current (mArms/85℃, 120Hz)
Case Size ø D×L(mm)

RATINGS OF LL Series

μF \ VDC	6.3		10		16		25		35		50		63		100	
1											5×11	16			5×11	19
2.2											5×11	23			6.3×11	31
3.3											5×11	28			8×11.5	44
4.7							5×11	28	5×11	31	6.3×11	38			8×11.5	52
10					5×11	39	6.3×11	47	6.3×11	51	8×11.5	64	8×11.5	64	10×16	100
22			5×11	51	6.3×11	66	8×11.5	80	8×11.5	87	10×12.5	112	10×16	124	10×20	160
33			6.3×11	72	6.3×11	80	8×11.5	98	10×12.5	125	10×16	151	10×16	151	12.5×20	217
47			6.3×11	86	8×11.5	110	10×12.5	138	10×12.5	149	10×16	181	10×20	196	12.5×25	282
100			8×11.5	143	10×12.5	189	10×16	223	10×20	260	12.5×20	316	12.5×25	344	16×25	455
220	10×12.5	229	10×16	276	10×20	335	12.5×20	397	12.5×25	466	16×25	564	16×31.5	607	18×35.5	775
330	10×16	309	10×20	367	12.5×20	454	12.5×25	528	12.5×25	631	16×31.5	744	16×35.5	761	18×40	964
470	10×20	399	12.5×20	485	12.5×20	542	16×25	697	16×25	753	16×35.5	908	18×35.5	948		
1,000	12.5×25	702	12.5×25	769	16×25	951	18×35.5	1,120	16×25	1,262	18×40	1,404				
2,200	16×25	1,107	16×31.5	1,295	18×35.5	1,529	18×40	1,647								
3,300	16×35.5	1,438	16×35.5	1,554	18×40	1,804										
4,700	18×35.5	1,676	18×40	1,820												

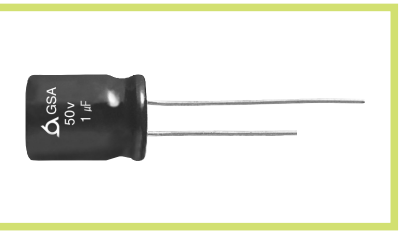
Rated Ripple Current (mArms/85℃, 120Hz)
Case Size ø D×L(mm)

GSA-BP Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Height 7mm.
- Bi-polarized.
- For CAR-Audio, VCR.
- RoHS compliant.
- Halogen-free capacitors are also available.

GSA → GSA-BP
Bi-polarized



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current (In both directions)	I=0.06CV(μA) or 10μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.) 0.24 / 0.20 / 0.17 / 0.16 / 0.15 / 0.14 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35~50 Z(-25℃)/Z(20℃) 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃) 10 / 8 / 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated is voltage for 2,000 hours at 85℃. During the test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

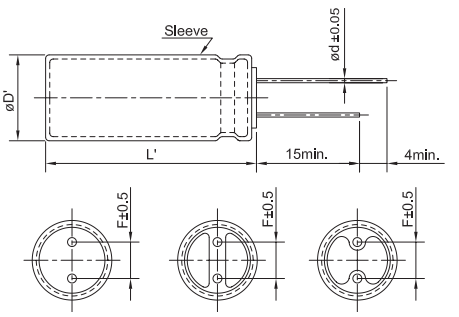
RATINGS OF GSA-BP Series

μF \ V_{DC}	6.3		10		16		25		35		50	
1											4×7	9.7
2.2									4×7	13	4×7	14
3.3							4×7	15	4×7	15	4×7	17
4.7					4×7	18	4×7	18	5×7	20	5×7	21
10			4×7	23	4×7	25	5×7	27	6.3×7	33	6.3×7	35
22	4×7	31	4×7	35	5×7	39	6.3×7	44				
33	5×7	40	5×7	48	6.3×7	49						
47	6.3×7	49	6.3×7	53								

Rated Ripple Current(mArms/85℃, 120Hz)
Case Size ø D×L(mm)

DIMENSIONS OF GSA-BP Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

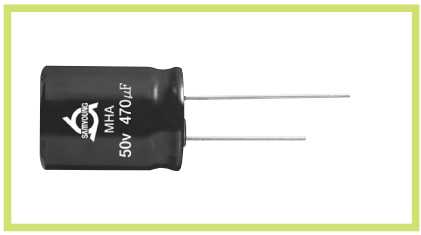
ø D	4	5	6.3
ø d	0.45		
F	1.5	2.0	2.5
ø D′	ø D + 0.5max.		
L′	L + 1.0max.		

MHA-BP Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Bi-polarized.
- For Digital Household Appliances.
- RoHS compliant.
- Halogen-free capacitors are also available.

MHA → MHA-BP
Bi-polarized

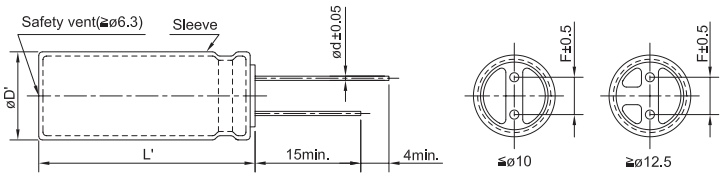


SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 250 VDC
Operating Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)	
Leakage Current (In both directions)	I=0.03CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)	
Dissipation Factor (Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16~25 / 35 / 50 / 63~100 / 160 / 200~250 Tanδ(Max.): 0.25 / 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.15 / 0.20 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25~100 / 160 / 200~250 Z(-25℃)/Z(20℃): 4 / 3 / 2 / 2 / 4 / 6 Z(-40℃)/Z(20℃): 10 / 8 / 6 / 4 / - / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. During this test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF MHA-BP Series

Unit(mm)



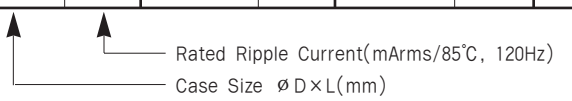
Marking : BLACK SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF MHA-BP Series

μF \ VDC	6.3		10		16		25		35		50	
10									5×11	50	5×11	52
22							5×11	66	6.3×11	71	6.3×11	89
33							6.3×11	90	6.3×11	104	8×11.5	124
47			5×11	86	5×11	89	6.3×11	107	8×11.5	142	10×12.5	174
100	5×11	126	6.3×11	144	6.3×11	148	8×11.5	179	10×12.5	244	10×16	284
220	6.3×11	213	8×11.5	244	10×12.5	295	10×16	345	10×20	432	12.5×20	500
330	8×11.5	298	10×12.5	352	10×16	399	10×20	458	12.5×20	543	16×20	666
470	10×12.5	420	10×16	463	10×20	515	12.5×20	606	12.5×25	704	16×25	877
1,000	10×20	732	12.5×20	791	12.5×25	882	16×20	961	16×31.5	1,223	18×35.5	1,409
2,200	12.5×25	1,291	16×20	1,275	16×31.5	1,557	18×31.5	1,699	18×40	1,838		
3,300	16×20	1,581	16×31.5	1,859	18×35.5	2,034	18×40	2,122				
4,700	16×31.5	2,219	18×31.5	2,290								
6,800	18×31.5	2,754	18×40	2,890								

μF \ VDC	63		100		160		200		250	
3.3			5×11	35					10×12.5	48
4.7	5×11	40	6.3×11	48			10×12.5	58	10×16	65
10	6.3×11	63	8×11.5	80	10×16	104	10×20	96	12.5×20	107
22	8×11.5	106	10×12.5	140	12.5×20	185	12.5×25	180	16×20	190
33	8×11.5	137	10×16	189	12.5×25	247	16×20	239	16×25	257
47	10×12.5	183	10×20	244	16×25	325	16×25	325	18×31.5	324
100	10×20	327	12.5×25	430	18×31.5	450	18×40	496		
220	12.5×25	585	16×31.5	759						
330	16×25	791	18×35.5	934						
470	16×31.5	992								
1,000	18×40	1,431								



NHA-BP Series

• 105℃ 1,000Hrs assured.

Solvent-proof

WV≦100VDC

- Bi-polarized.
- For Digital Household Appliances.
- RoHS compliant.
- Halogen-free capacitors are also available.

NHA → NHA-BP

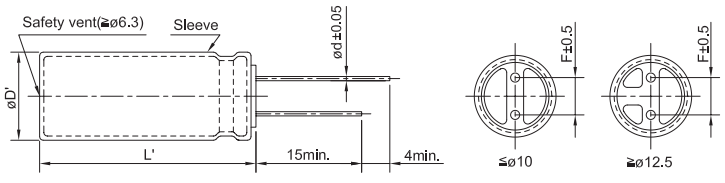
Bi-polarized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 250 VDC
Operating Temperature Range	-55 ~ +105℃	-40 ~ +105℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current (In both directions)	I=0.03CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)	
Dissipation Factor (Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16~25 / 35 / 50 / 63~100 / 160 / 200~250 Tanδ(Max.): 0.25 / 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.15 / 0.20 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25~100 / 160~250 Z(-25℃)/Z(20℃): 4 / 3 / 2 / 2 / 3 Z(-40℃)/Z(20℃): 8 / 6 / 4 / 3 / 4 (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 105℃. During this test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NHA-BP Series

Unit(mm)



Marking : BROWN SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NHA-BP Series

μF \ VDC	6.3		10		16		25		35		50	
10									5×11	33	5×11	37
22							5×11	47	6.3×11	55	6.3×11	63
33							6.3×11	66	6.3×11	68	8×11.5	88
47			5×11	57	5×11	64	6.3×11	78	8×11.5	93	10×12.5	123
100	5×11	79	6.3×11	94	6.3×11	107	8×11.5	131	10×12.5	159	10×16	198
220	6.3×11	134	8×11.5	160	10×12.5	215	10×16	252	10×20	283	12.5×20	354
330	8×11.5	188	10×12.5	231	10×16	290	10×20	335	12.5×20	371	16×20	471
470	10×12.5	264	10×16	304	10×20	375	12.5×20	429	12.5×25	481	16×25	620
1,000	10×20	460	12.5×20	533	12.5×25	623	16×20	679	16×31.5	836	18×35.5	996
2,200	12.5×25	823	16×20	859	16×31.5	1,101	18×31.5	1,238	18×40	1,342		
3,300	16×20	1,008	16×31.5	1,253	18×35.5	1,438	18×40	1,592				
4,700	16×31.5	1,432	18×31.5	1,544								
6,800	18×31.5	1,778	18×40	1,949								

μF \ VDC	63		100		160		200		250	
3.3			5×11	25					10×12.5	34
4.7	5×11	28	6.3×11	34			10×12.5	41	10×16	45
10	6.3×11	47	8×11.5	57	10×16	66	10×20	71	12.5×20	79
22	8×11.5	79	10×12.5	99	12.5×20	117	12.5×25	125	16×20	127
33	8×11.5	97	10×16	134	12.5×25	154	16×20	156	16×25	172
47	10×12.5	136	10×20	173	16×25	206	16×25	206	18×31.5	229
100	10×20	238	12.5×25	304	18×31.5	334	18×40	350		
220	12.5×25	403	16×31.5	537						
330	16×25	545	18×35.5	661						
470	16×31.5	702								
1,000	18×40	1,108								

Rated Ripple Current(mArms/105℃, 120Hz)

Case Size ø D×L(mm)

NXL(LXV) Series

• 105℃ 2,000~5,000Hrs assured.

Solvent-proof

- Low Impedance.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

KXL → NXL (LXV)

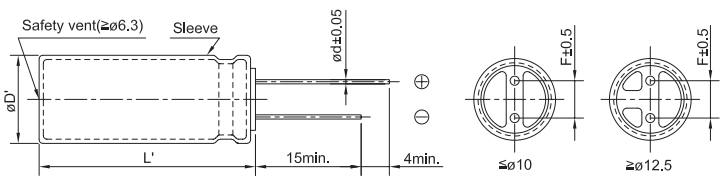
Low Imp. Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.07 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10~100 Capacitance change(Max.) : ΔC(-55℃)/C(20℃): 30% Impedance ratio(Max.) : Z(-55℃)/Z(20℃): 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: Life Time: Ø5, 6.3: 2,000 hours; Ø8, 10: 3,000 hours; Ø12.5~: 5,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXL(LXV) Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXL(LXV) Series

WV / μF	6.3				10				16			
	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple
120	5×11	0.72	1.8	165	82	5×11	0.72	1.8	165	56	5×11	0.72	1.8	165
220	6.3×11	0.38	0.95	255	180	6.3×11	0.38	0.95	255	120	6.3×11	0.38	0.95	255
330	6.3×15	0.27	0.68	330	270	6.3×15	0.27	0.68	330	180	6.3×15	0.27	0.68	330
330	8×11.5	0.19	0.48	485	270	8×11.5	0.19	0.48	485	180	8×11.5	0.19	0.48	485
470	10×12	0.12	0.30	625	470	8×11.5	0.27	0.68	330	270	10×12	0.12	0.30	625
470	10×12.5	0.12	0.30	625						270	10×12.5	0.12	0.30	625
560	8×15	0.16	0.40	495	470	8×15	0.16	0.40	495	330	8×15	0.16	0.40	495
680	10×16	0.084	0.21	825	680	8×20	0.11	0.28	640	470	8×20	0.11	0.28	640
820	8×20	0.110	0.28	640	680	10×16	0.084	0.21	825	470	10×16	0.084	0.21	825
1,200	10×20	0.062	0.16	1,040	1,000	10×20	0.062	0.16	1,040	680	10×20	0.062	0.16	1,040
1,500	10×25	0.052	0.13	1,260	1,200	10×25	0.052	0.13	1,260	820	10×25	0.052	0.13	1,260
2,200	10×30	0.044	0.11	1,440	1,500	10×30	0.044	0.11	1,440	1,200	10×30	0.044	0.11	1,440
2,200	12.5×20	0.046	0.12	1,340	1,800	12.5×20	0.046	0.12	1,340	1,200	12.5×20	0.046	0.12	1,340
2,700	12.5×25	0.034	0.085	1,690	2,200	12.5×25	0.034	0.085	1,690	1,500	12.5×25	0.034	0.085	1,690
3,900	12.5×30	0.030	0.075	1,950	2,700	12.5×30	0.030	0.075	1,950	2,200	12.5×30	0.030	0.075	1,950
3,900	16×20	0.039	0.098	1,630	3,300	12.5×35	0.027	0.068	2,200	2,200	16×20	0.039	0.098	1,630
4,700	12.5×35	0.027	0.068	2,200	3,300	16×20	0.039	0.098	1,630	2,700	12.5×35	0.027	0.068	2,200
5,600	12.5×42.5	0.024	0.060	2,390	3,900	12.5×42.5	0.024	0.060	2,390	2,700	16×25	0.029	0.072	2,070
5,600	16×25	0.029	0.072	2,070	3,900	16×25	0.029	0.072	2,070	3,300	12.5×42.5	0.024	0.060	2,390
5,600	18×20	0.038	0.095	1,750	3,900	18×20	0.038	0.095	1,750	3,300	18×20	0.038	0.095	1,750
6,800	16×31.5	0.026	0.066	2,350	5,600	16×31.5	0.026	0.066	2,350	3,900	16×31.5	0.026	0.066	2,350
6,800	18×25	0.029	0.073	2,130	5,600	18×25	0.029	0.073	2,130	3,900	18×25	0.029	0.073	2,130
8,200	16×35.5	0.023	0.058	2,550	6,800	16×35.5	0.023	0.058	2,550	4,700	16×35.5	0.023	0.058	2,550
10,000	18×31.5	0.026	0.065	2,410	6,800	18×31.5	0.026	0.065	2,410	5,600	18×31.5	0.026	0.065	2,410
12,000	18×35.5	0.023	0.058	2,660	8,200	18×35.5	0.023	0.058	2,660	6,800	18×35.5	0.023	0.058	2,660
15,000	18×40	0.019	0.048	3,010	10,000	18×40	0.019	0.048	3,010	8,200	18×40	0.019	0.048	3,010

WV / μF	25				35				50			
	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple
									4.7	5×11	3.0	9.0	100
									10	5×11	1.40	4.2	124
39	5×11	0.72	1.8	165	27	5×11	0.72	1.8	165	18	5×11	1.10	3.3	130
47	5×11	0.72	1.8	194	47	6.3×11	0.50	1.25	233	22	6.3×11	0.91	2.6	180
82	6.3×11	0.38	0.95	255	56	6.3×11	0.38	0.95	255	39	6.3×11	0.56	1.6	220
100	6.3×11	0.35	0.88	280	68	6.3×11	0.38	0.95	255	47	6.3×11	0.56	1.6	300
120	6.3×15	0.27	0.68	330	82	6.3×15	0.27	0.68	330	56	6.3×15	0.41	1.2	310
120	8×11.5	0.19	0.48	485	82	8×11.5	0.19	0.48	485	56	8×11.5	0.33	0.96	368
180	10×12	0.12	0.30	625	120	10×12	0.12	0.30	625	82	8×15	0.25	0.75	470
180	10×12.5	0.12	0.30	625	120	10×12.5	0.12	0.30	625	82	10×12	0.16	0.40	480
220	8×15	0.16	0.40	495	180	8×15	0.16	0.40	495	82	10×12.5	0.16	0.40	480
330	8×20	0.11	0.28	640	220	8×20	0.11	0.28	640	120	8×20	0.18	0.52	610
330	10×16	0.084	0.21	825	220	10×16	0.084	0.21	825	120	10×16	0.12	0.30	755
470	10×20	0.062	0.16	1,150	330	10×20	0.062	0.16	1,040	180	10×20	0.088	0.22	945
560	10×25	0.052	0.13	1,260	390	10×25	0.052	0.13	1,260	220	10×25	0.068	0.17	1,150
820	10×30	0.044	0.11	1,440	560	10×30	0.044	0.11	1,440	330	10×30	0.059	0.15	1,260
820	12.5×20	0.046	0.12	1,340	560	12.5×20	0.046	0.12	1,340	330	12.5×20	0.059	0.15	1,190
1,000	12.5×25	0.034	0.085	1,690	680	12.5×25	0.034	0.085	1,690	470	12.5×25	0.045	0.11	1,490
1,500	12.5×30	0.030	0.075	1,950	1,000	12.5×25	0.040	0.10	1,690	560	12.5×30	0.039	0.098	1,720
1,500	16×20	0.039	0.098	1,630	1,000	12.5×30	0.030	0.075	1,950	680	12.5×35	0.038	0.096	1,890
1,800	12.5×35	0.027	0.068	2,200	1,200	12.5×35	0.027	0.068	2,200	680	16×20	0.044	0.12	1,420
1,800	16×25	0.029	0.073	2,070	1,200	16×25	0.029	0.073	2,070	820	12.5×42.5	0.029	0.073	2,030
2,200	12.5×42.5	0.024	0.060	2,390	1,500	12.5×42.5	0.024	0.060	2,390	820	16×25	0.034	0.085	1,880
2,200	18×20	0.038	0.095	1,750	1,500	18×20	0.038	0.095	1,750	820	18×20	0.041	0.103	1,520
2,700	16×31.5	0.026	0.066	2,350	1,800	16×31.5	0.026	0.066	2,350	1,000	16×31.5	0.030	0.076	1,250
2,700	18×25	0.029	0.073	2,130	1,800	18×25	0.029	0.073	2,130	1,000	18×25	0.032	0.080	1,930
3,300	16×35.5	0.023	0.058	2,550	2,200	16×35.5	0.023	0.058	2,550	1,200	16×35.5	0.026	0.065	2,320
3,300	18×31.5	0.026	0.065	2,410	2,200	18×31.5	0.026	0.065	2,410	1,500	18×31.5	0.028	0.070	2,200
3,900	18×35.5	0.023	0.058	2,660	2,700	18×35.5	0.023	0.058	2,660	1,800	18×35.5	0.025	0.063	2,400
4,700	18×40	0.019	0.048	3,010	3,300	18×40	0.019	0.048	3,010	2,200	18×40	0.022	0.055	2,610

RATINGS OF NXL(LXV) Series

WV (Vdc) / Cap (μF)	63				100			
	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple	ø D×L(mm)	IMP. 20℃	IMP. -10℃	Ripple
1	5×11	31.5	79.6	53	5×11	14.7	39.5	53
1.5	5×11	22.4	56.6	65	5×11	9.8	26.3	65
2.2	5×11	15.2	38.4	78	5×11	5.4	14.5	78
3.3	5×11	11.1	28.1	98	5×11	4.6	12.3	98
4.7	5×11	10.8	27.3	115	5×11	3.9	10.5	115
6.8	5×11	4.3	10.9	120	6.3×11	3.2	8.7	128
10	5×11	2.9	7.3	134	6.3×11	1.7	4.6	154
15	6.3×11	2.7	6.9	188	8×11.5	1.2	3.4	222
22	6.3×11	1.36	3.5	228	8×11.5	0.82	2.3	270
33	8×11.5	0.66	1.8	330	10×12	0.41	1.1	384
47	10×12	0.58	1.7	327	10×12.5	0.41	1.1	384
47	10×12.5	0.58	1.7	327	10×16	0.37	1.0	400
68	10×16	0.36	0.88	431	10×20	0.27	0.73	470
100	10×20	0.29	0.73	570	12.5×20	0.27	0.74	670
150	10×25	0.20	0.51	765	12.5×25	0.21	0.57	894
220	12.5×20	0.16	0.41	994	16×25	0.17	0.46	1,201
330	12.5×25	0.10	0.26	1,327	16×31.5	0.11	0.30	1,471
470	16×31.5	0.091	0.24	1,518	16×35.5	0.091	0.25	1,681
680	16×35.5	0.065	0.19	2,060	18×40	0.072	0.19	2,122
1,000	16×35.5	0.049	0.14	2,250	18×40	0.051	0.14	2,897

Rated Ripple Current(mArms/105℃, 100kHz)
Impedance(Ω max./100kHz)
Case Size ø D×L(mm)

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Rated Voltage (Vdc)	øD (mm)	Freq.(Hz) 120	1k	10k	50k	100k
6.3～10	ø5～ø8	0.65	0.83	0.95	0.97	1.00
	ø10～ø12.5	0.70	0.85	0.96	0.98	1.00
	ø16～ø18	0.85	0.92	0.97	0.99	1.00
16～25	ø5～ø8	0.55	0.76	0.91	0.95	1.00
	ø10～ø12.5	0.65	0.83	0.93	0.96	1.00
	ø16～ø18	0.70	0.87	0.96	0.98	1.00
35～50	ø5～ø8	0.40	0.66	0.85	0.90	1.00
	ø10～ø12.5	0.50	0.73	0.89	0.94	1.00
	ø16～ø18	0.60	0.81	0.94	0.97	1.00
63～100	ø5～ø8	0.20	0.55	0.80	0.88	1.00
	ø10～ø12.5	0.35	0.65	0.85	0.92	1.00
	ø16～ø18	0.50	0.75	0.90	0.95	1.00

NXP(LXZ) Series

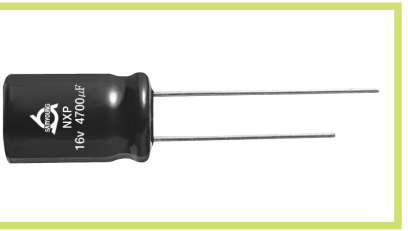
• 105℃ 2,000 ~ 5,000Hrs assured.

Solvent-proof

- Low Impedance.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NXL (LXV) → NXP (LXZ)

Low Imp. Downsized

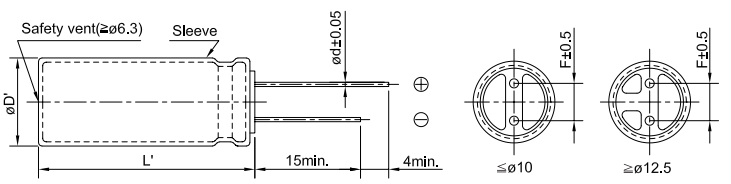


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 0.01CV (μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 TANδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value ØD: Life Time — Ø5, 6.3: 2,000 hours; Ø8: 3,000 hours; Ø10~: 5,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXP(LXZ) Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.				L+2.0 max.		

※ Ø10 x 12L, L'≦ L+1.5

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
22 ~ 180	0.40	0.75	0.90	0.93	1.00
220 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,900	0.75	0.90	0.95	0.97	1.00
4,700 ~ 18,000	0.85	0.95	0.98	0.99	1.00

RATINGS OF NXP(LXZ) Series

WVDC / ØD×L(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	150	0.50	1.0	175	100	0.50	1.0	175	47	0.50	1.0	175
6.3×11	330	0.25	0.50	290	220	0.25	0.50	290	100	0.25	0.50	290
6.3×15	470	0.18	0.36	400	330	0.18	0.36	400	220	0.18	0.36	400
8×11.5	680	0.12	0.24	555	470	0.12	0.24	555	330	0.12	0.24	555
8×15	1,000	0.090	0.18	730	680	0.090	0.18	730	470	0.090	0.18	730
8×20	1,200	0.080	0.16	810	1,000	0.080	0.16	810	560	0.080	0.16	810
10×12	820	0.090	0.18	760	680	0.090	0.18	760	470	0.090	0.18	760
10×12.5	820	0.090	0.18	760	680	0.090	0.18	760	470	0.090	0.18	760
10×16	1,200	0.068	0.14	1,050	1,000	0.068	0.14	1,050	680	0.068	0.14	1,050
10×20	1,500	0.052	0.10	1,220	1,200	0.052	0.10	1,220	1,000	0.052	0.10	1,220
10×25	2,200	0.045	0.090	1,440	1,500	0.045	0.090	1,440	1,200	0.045	0.090	1,440
10×30	2,700	0.037	0.074	1,690	1,800	0.037	0.074	1,690	1,500	0.037	0.074	1,690
12.5×20	3,300	0.038	0.076	1,660	2,200	0.038	0.076	1,660	1,500	0.038	0.076	1,660
12.5×25	3,900	0.030	0.060	1,950	3,300	0.030	0.060	1,950	2,200	0.030	0.060	1,950
12.5×30	4,700	0.025	0.050	2,310	3,900	0.025	0.050	2,310	2,700	0.025	0.050	2,310
12.5×35	5,600	0.022	0.044	2,510	4,700	0.022	0.044	2,510	3,300	0.022	0.044	2,510
12.5×42.5	6,800	0.019	0.038	2,870	5,600	0.019	0.038	2,870	3,900	0.019	0.038	2,870
16×20	5,600	0.031	0.064	2,210	3,900	0.031	0.064	2,210	2,700	0.031	0.064	2,210
16×25	6,800	0.024	0.048	2,560	5,600	0.024	0.048	2,560	3,900	0.024	0.048	2,560
16×31.5	8,200	0.021	0.042	3,010	6,800	0.021	0.042	3,010	4,700	0.021	0.042	3,010
16×35.5	10,000	0.019	0.038	3,150	8,200	0.019	0.038	3,150	5,600	0.019	0.038	3,150
18×20	6,800	0.031	0.062	2,490	5,600	0.031	0.062	2,490	3,900	0.031	0.062	2,490
18×25	10,000	0.023	0.046	2,740	6,800	0.023	0.046	2,740	4,700	0.023	0.046	2,740
18×31.5	12,000	0.021	0.042	3,330	8,200	0.021	0.042	3,330	5,600	0.021	0.042	3,330
18×35.5	15,000	0.019	0.038	3,680	10,000	0.019	0.038	3,680	8,200	0.019	0.038	3,680
18×40	18,000	0.018	0.036	3,800	12,000	0.018	0.036	3,800	10,000	0.018	0.036	3,800

WVDC / ØD×L(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	47	0.50	1.0	175	33	0.50	1.0	175	22	0.70	1.4	155
6.3×11	82	0.30	0.60	260	47	0.25	0.50	265	33	0.45	0.90	170
6.3×11	100	0.25	0.50	290	56	0.25	0.50	290	47	0.45	0.90	180
6.3×15	150	0.18	0.36	400	100	0.18	0.36	400	68	0.31	0.62	360
8×11.5	220	0.12	0.24	555	150	0.12	0.24	555	100	0.18	0.36	485
8×15	330	0.090	0.18	730	220	0.090	0.18	730	120	0.16	0.32	635
8×20	390	0.080	0.16	810	270	0.080	0.16	810	180	0.12	0.24	730
10×12	330	0.090	0.18	760	220	0.090	0.18	760	120	0.16	0.32	620
10×12.5	330	0.090	0.18	760	220	0.090	0.18	760	120	0.16	0.32	620
10×16	470	0.068	0.14	1,050	330	0.068	0.14	1,050	180	0.13	0.26	850
	680	0.068	0.14	1,130								
10×20	680	0.052	0.10	1,220	470	0.052	0.11	1,220	220	0.088	0.18	1,050
	820	0.052	0.10	1,320								
10×25	820	0.045	0.090	1,440	560	0.045	0.090	1,440	330	0.073	0.15	1,250
10×30	1,000	0.037	0.074	1,690	680	0.037	0.074	1,690	390	0.054	0.11	1,500
12.5×20	1,000	0.038	0.076	1,660	680	0.038	0.076	1,660	390	0.059	0.12	1,480
12.5×25	1,500	0.030	0.060	1,950	1,000	0.030	0.060	1,950	560	0.044	0.088	1,840
					1,500	0.030	0.060	2,200				
12.5×30	1,800	0.025	0.050	2,310	1,200	0.025	0.050	2,310	680	0.039	0.078	2,220
12.5×35	2,200	0.022	0.044	2,510	1,500	0.022	0.044	2,510	820	0.033	0.066	2,290
12.5×42.5	2,700	0.019	0.038	2,870	1,800	0.019	0.038	2,870	1,000	0.029	0.058	2,500
16×20	1,800	0.031	0.064	2,210	1,200	0.031	0.064	2,210	680	0.048	0.096	1,840
16×25	2,700	0.024	0.048	2,560	1,800	0.024	0.048	2,560	1,000	0.034	0.068	2,240
16×31.5	3,300	0.021	0.042	3,010	2,200	0.021	0.042	3,010	1,200	0.028	0.056	2,700
16×35.5	3,900	0.019	0.038	3,150	2,700	0.019	0.038	3,150	1,500	0.026	0.052	2,800
18×20	2,200	0.031	0.062	2,490	1,800	0.031	0.100	2,490	820	0.042	0.084	1,980
18×25	3,300	0.023	0.046	2,740	2,200	0.023	0.046	2,740	1,200	0.029	0.058	2,610
18×31.5	3,900	0.021	0.042	3,330	2,700	0.021	0.042	3,330	1,800	0.027	0.054	2,750
18×35.5	4,700	0.019	0.038	3,680	3,300	0.019	0.038	3,680	2,200	0.025	0.050	2,900
18×40	5,600	0.018	0.036	3,800	3,900	0.018	0.036	3,800	2,700	0.022	0.044	3,200

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./100kHz)
Nominal Capacitance(μF)

NXR Series

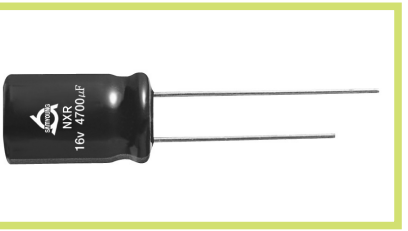
• 105℃ 4,000 ~ 7,000Hrs assured.

Solvent-proof

- Low Impedance.
- For SMPS, IP-Board, Adaptor, Automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NXP (LXZ) → NXR

Low Imp.
Downsized

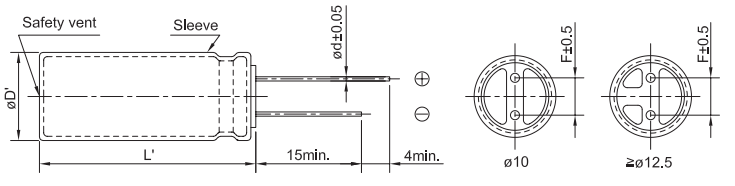


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 0.01CV (μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 TANδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Z(-55℃)/Z(+20℃): 4 / 3 / 3 / 3 / 3 (at 20℃, 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage Current ≤ The initial specified value ØD: Life Time Ø10: 4,000 hours Ø12.5: 5,000 hours Ø16, 18: 7,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage Current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXR Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	10	12.5	16	18
Ød	0.6	0.6	0.8	0.8
F	5.0	5.0	7.5	7.5
ØD′	ØD+0.5 max.			
L′	L+2.0 max.			

RATINGS OF NXR Series

WVDC / ØDXL(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
10×12.5	1,500	0.063	960	1,000	0.063	960	820	0.063	960
10×16	2,200	0.049	1,240	1,800	0.049	1,240	1,200	0.049	1,240
10×20	3,300	0.035	1,550	2,200	0.035	1,550	1,800	0.035	1,550
10×25	3,900	0.033	1,740	2,700	0.033	1,740	2,200	0.033	1,740
12.5×20	4,700	0.029	1,890	3,900	0.029	1,890	2,700	0.029	1,890
12.5×25	5,600	0.022	2,350	4,700	0.022	2,350	3,300	0.022	2,350
16×20	6,800	0.026	2,330	4,700	0.026	2,330	3,900	0.026	2,330
18×20	8,200	0.025	2,640	6,800	0.025	2,640	5,600	0.025	2,640
16×25	10,000	0.019	2,760	6,800	0.019	2,760	5,600	0.019	2,760
18×25	12,000	0.018	2,850	8,200	0.018	2,850	8,200	0.018	2,850

WVDC / ØDXL(mm)	25			35		
	μF	IMP.	Ripple	μF	IMP.	Ripple
10×12.5	470	0.063	960	330	0.063	960
10×16	820	0.049	1,240	680	0.049	1,240
10×20	1,200	0.035	1,550	820	0.035	1,550
10×25	1,500	0.033	1,740	1,200	0.033	1,740
12.5×20	1,800	0.029	1,890	1,500	0.029	1,890
12.5×25	2,700	0.022	2,350	1,800	0.022	2,350
16×20	2,700	0.026	2,330	1,800	0.026	2,330
18×20	3,300	0.025	2,640	2,200	0.025	2,640
16×25	3,900	0.019	2,760	2,700	0.019	2,760
18×25	4,700	0.018	2,850	3,300	0.018	2,850

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
330 ~ 470	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,900	0.75	0.90	0.95	0.97	1.00
4,700 ~ 12,000	0.85	0.95	0.98	0.99	1.00

NXA Series

• 105℃ 4,000 ~ 10,000Hrs assured.

- Non-solvent proof.
- Low Impedance, Long Life.
- For SMPS, IP-Board, Adaptor, Noise Filter, Charger.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

KMG → NXA

Low Imp.
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

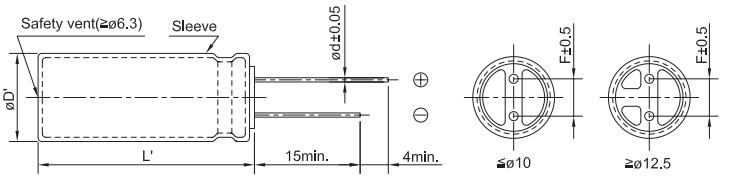
Rated Voltage(V_{DC})	6.3	10	16	25	35	50	63	80	100
Tanδ(Max.)	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.09	0.08

Rated Voltage(V_{DC})	6.3	10	16	25	35	50	63	80	100
Z(-25℃)/Z(+20℃)	4	3	2	2	2	2	2	2	2
Z(-40℃)/Z(+20℃)	8	6	4	3	3	3	3	3	3

V_{DC}	ø5~ø6.3	ø8~ø10	ø12.5~ø18
6.3~10(V)	4,000 hours	6,000 hours	8,000 hours
16~100(V)	5,000 hours	7,000 hours	10,000 hours

DIMENSIONS OF NXA Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD′	ØD+0.5 max.						
L′	L+1.5 max.			L+2.0 max.			

※ Ø10 x 12L, L′≦ L+1.5

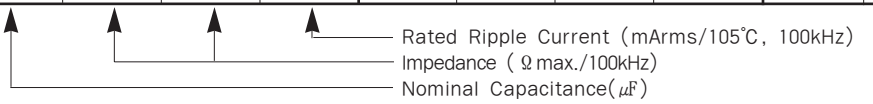
RATINGS OF NXA Series

WVDC / ØD×L(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	150	0.58	2.3	210	100	0.58	2.3	210	56	0.58	2.3	210
6.3×11	330	0.22	0.87	340	220	0.22	0.87	340	120	0.22	0.87	340
8×11.5	680	0.130	0.52	640	470	0.130	0.52	640	330	0.130	0.52	640
8×15	1,000	0.087	0.35	840	680	0.087	0.35	840	470	0.087	0.35	840
8×20	1,200	0.069	0.27	1,050	1,000	0.069	0.27	1,050	680	0.069	0.27	1,050
10×12	820	0.080	0.32	865	680	0.080	0.32	865	470	0.080	0.32	865
10×12.5	820	0.080	0.32	865	680	0.080	0.32	865	470	0.080	0.32	865
10×16	1,200	0.060	0.24	1,210	1,000	0.060	0.24	1,210	680	0.060	0.24	1,210
10×20	1,500	0.046	0.18	1,400	1,200	0.046	0.18	1,400	1,000	0.046	0.18	1,400
10×25	2,200	0.042	0.17	1,650	1,500	0.042	0.17	1,650	1,200	0.042	0.17	1,650
10×30	2,700	0.031	0.12	1,910	2,200	0.031	0.12	1,910	1,500	0.031	0.12	1,910
12.5×16	1,800	0.049	0.16	1,450	1,500	0.049	0.16	1,450	1,000	0.049	0.16	1,450
12.5×20	3,300	0.035	0.12	1,900	2,200	0.035	0.12	1,900	1,500	0.035	0.12	1,900
12.5×25	3,900	0.027	0.089	2,230	3,300	0.027	0.089	2,230	2,200	0.027	0.089	2,230
12.5×30	4,700	0.024	0.078	2,650	3,900	0.024	0.078	2,650	2,700	0.024	0.078	2,650
12.5×35	5,600	0.020	0.065	2,880	4,700	0.020	0.065	2,880	3,300	0.020	0.065	2,880
16×15	2,700	0.042	0.12	1,940	2,200	0.042	0.12	1,940	1,500	0.042	0.12	1,940
16×20	5,600	0.027	0.078	2,530	3,900	0.027	0.078	2,530	2,700	0.027	0.078	2,530
16×25	6,800	0.021	0.060	2,930	5,600	0.021	0.06	2,930	3,900	0.021	0.06	2,930
16×31.5	8,200	0.017	0.050	3,450	6,800	0.017	0.05	3,450	4,700	0.017	0.05	3,450
16×35.5	10,000	0.015	0.044	3,610	8,200	0.015	0.044	3,610	5,600	0.015	0.044	3,610
16×40	12,000	0.013	0.038	4,080	10,000	0.013	0.038	4,080	6,800	0.013	0.038	4,080
18×20	6,800	0.026	0.067	2,860	5,600	0.026	0.067	2,860	3,900	0.026	0.067	2,860
18×25	10,000	0.019	0.049	3,140	6,800	0.019	0.049	3,140	4,700	0.019	0.049	3,140
18×31.5	12,000	0.017	0.047	4,170	8,200	0.017	0.047	4,170	5,600	0.017	0.047	4,170
18×35.5	15,000	0.016	0.045	4,220	10,000	0.016	0.045	4,220	8,200	0.016	0.045	4,220
18×40	18,000	0.015	0.043	4,280	12,000	0.015	0.043	4,280	10,000	0.015	0.043	4,280

WVDC / ØD×L(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	47	0.58	2.3	210	33	0.58	2.3	210	1	4.0	16.0	50
									2.2	2.5	10.0	51
									3.3	2.2	8.8	53
									4.7	3.0	12.0	80
									10	1.5	6.0	100
									22	0.70	2.8	180
6.3×11	100	0.22	0.87	340	56	0.22	0.87	340	22	0.30	1.2	295
									47	0.30	1.2	340
8×11.5	220	0.13	0.52	640	150	0.13	0.52	640	100	0.17	0.68	555
8×15	330	0.087	0.35	840	220	0.087	0.35	840	120	0.12	0.48	730
8×20	470	0.069	0.27	1,050	270	0.069	0.27	1,050	180	0.090	0.36	910
10×12	330	0.080	0.32	865	220	0.080	0.32	865	150	0.12	0.48	760
10×12.5	330	0.080	0.32	865	220	0.080	0.32	865	150	0.12	0.48	760
10×16	470	0.060	0.24	1,210	330	0.060	0.24	1,210	220	0.084	0.34	1,050
10×20	680	0.046	0.18	1,400	470	0.046	0.18	1,400	270	0.060	0.24	1,220
10×25	820	0.042	0.17	1,650	560	0.042	0.17	1,650	330	0.055	0.22	1,440
10×30	1,000	0.031	0.12	1,910	680	0.031	0.12	1,910	470	0.043	0.17	1,690
12.5×16	680	0.049	0.16	1,450	470	0.049	0.16	1,450	270	0.061	0.20	1,260
12.5×20	1,000	0.035	0.12	1,900	680	0.035	0.12	1,900	470	0.045	0.15	1,660
12.5×25	1,500	0.027	0.089	2,230	1,000	0.027	0.089	2,230	560	0.034	0.11	1,950
12.5×30	1,800	0.024	0.078	2,650	1,200	0.024	0.078	2,650	680	0.030	0.10	2,310
12.5×35	2,200	0.020	0.065	2,880	1,500	0.020	0.065	2,880	820	0.025	0.083	2,510
16×15	1,000	0.042	0.12	1,940	680	0.042	0.12	1,940	470	0.055	0.17	1,690
16×20	1,800	0.027	0.078	2,530	1,200	0.027	0.078	2,530	820	0.034	0.10	2,210
16×25	2,700	0.021	0.060	2,930	1,800	0.021	0.060	2,930	1,000	0.025	0.075	2,555
16×31.5	3,300	0.017	0.050	3,450	2,200	0.017	0.050	3,450	1,200	0.022	0.066	3,010
16×35.5	3,900	0.015	0.044	3,610	2,700	0.015	0.044	3,610	1,500	0.019	0.057	3,150
16×40	4,700	0.013	0.038	4,080	3,300	0.013	0.038	4,080	1,800	0.016	0.048	3,710
18×20	2,200	0.026	0.067	2,860	1,800	0.026	0.067	2,860	1,000	0.036	0.097	2,490
18×25	3,300	0.019	0.049	3,140	2,200	0.019	0.049	3,140	1,200	0.026	0.070	2,740
18×31.5	3,900	0.017	0.047	4,170	2,700	0.017	0.047	4,170	1,800	0.021	0.057	3,635
18×35.5	4,700	0.016	0.045	4,220	3,300	0.016	0.045	4,220	2,200	0.017	0.046	3,680
18×40	5,600	0.015	0.043	4,280	3,900	0.015	0.043	4,280	2,700	0.016	0.045	3,800

RATINGS OF NXA Series

Vdc / ØD×L(mm)	63				80				100			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	15	0.88	3.5	165					4.7	1.5	6.0	105
									6.8	1.4	5.6	125
6.3×11	33	0.35	1.4	265					15	0.57	2.3	205
8×11.5	47	0.22	0.88	500					22	0.50	1.9	310
	56	0.22	0.88	500					27	0.36	1.4	355
8×15	82	0.16	0.64	665					39	0.25	1.0	450
8×20	120	0.12	0.48	820					68	0.19	0.76	565
10×12	82	0.11	0.44	690	68	0.17	0.66	480	47	0.17	0.66	480
10×12.5	82	0.11	0.44	690	68	0.17	0.66	480	47	0.17	0.66	480
10×16	120	0.076	0.31	950	100	0.11	0.47	600	68	0.11	0.47	600
10×20	180	0.056	0.23	1,150	120	0.084	0.34	800	82	0.084	0.34	800
									100	0.084	0.34	800
10×25	220	0.046	0.19	1,350	150	0.069	0.28	900	100	0.069	0.28	900
									120	0.069	0.28	900
12.5×16	180	0.072	0.29	1,150	150	0.11	0.34	750	100	0.11	0.34	750
12.5×20	270	0.041	0.13	1,500	220	0.062	0.18	1,100	150	0.062	0.18	1,100
12.5×25	390	0.031	0.093	1,900	330	0.047	0.14	1,250	220	0.047	0.14	1,250
12.5×30	470	0.028	0.084	2,300	390	0.042	0.13	1,500	270	0.042	0.13	1,500
12.5×35	560	0.024	0.072	2,500	470	0.036	0.11	1,650	330	0.036	0.11	1,650
									390	0.036	0.11	1,650
16×20	470	0.032	0.096	2,000	330	0.048	0.15	1,350	220	0.048	0.15	1,350
16×25	680	0.025	0.075	2,600	470	0.038	0.12	1,700	330	0.036	0.11	1,650
16×31.5	820	0.021	0.063	2,850	680	0.032	0.095	1,850	470	0.032	0.095	1,850
16×35.5	1,000	0.019	0.057	2,900	820	0.029	0.086	2,000	560	0.029	0.086	2,000
16×40	1,200	0.018	0.054	3,400	1,000	0.027	0.081	2,200	680	0.027	0.081	2,200
18×20	680	0.030	0.090	2,500	470	0.038	0.12	1,700	330	0.045	0.14	1,500
18×25	1,000	0.024	0.072	2,800	680	0.036	0.11	1,750	470	0.036	0.11	1,750
18×31.5	1,200	0.020	0.060	3,300	820	0.030	0.090	1,900	560	0.030	0.09	1,900
18×35.5	1,500	0.018	0.054	3,400	1,000	0.027	0.081	2,200	680	0.027	0.081	2,200
18×40	1,800	0.017	0.051	3,500	1,200	0.026	0.077	2,700	820	0.026	0.077	2,700



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50K	100k
1 ~ 180	0.40	0.75	0.90	0.95	1.00
220 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,900	0.75	0.90	0.95	0.97	1.00
4,700 ~ 18,000	0.85	0.95	0.98	0.99	1.00

NXB Series

• 105℃ 2,000~5,000Hrs assured.

- Non-solvent proof.
- Very Low Impedance.
- For SMPS, IP-Board, Adaptor, Noise Filter, Charger.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXA → NXB
Low Imp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 120 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	See table below
Temperature Characteristics (Max. Impedance ratio)	See table below
Load Life	See table below
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

Dissipation Factor(Tanδ)

Rated voltage(VDC)	6.3	10	16	25	35	50	63	100	120
Tanδ(Max)	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.08

When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Z(-25℃)/Z(20℃)	2
Z(-40℃)/Z(20℃)	3

(at 120Hz)

Load Life

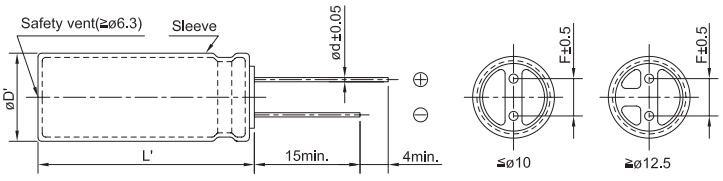
The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time.

Capacitance change ≦ ±25% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

ØD	Life Time
Ø5, 6.3	2,000 hours
Ø8	3,000 hours
Ø10	4,000 hours
Ø12.5 ~	5,000 hours

DIMENSIONS OF NXB Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXB Series

Vdc / ØDxL(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	220	0.30	1.0	250	150	0.30	1.00	250	100	0.30	1.0	250
6.3×11	470	0.13	0.41	405	330	0.13	0.41	405	100	0.15	0.41	385
									220	0.13	0.36	405
6.3×15	560	0.10	0.32	646	470	0.10	0.32	646	330	0.10	0.32	646
8×11.5	820	0.072	0.22	760	330	0.094	0.28	600	470	0.072	0.22	760
					680	0.072	0.22	760				
8×15	1,200	0.060	0.18	818	1,000	0.060	0.18	818	680	0.060	0.18	818
8×20	1,500	0.050	0.16	1,260	1,200	0.050	0.16	1,260	1,000	0.050	0.16	1,260
10×12	1,200	0.053	0.16	1,360	820	0.053	0.16	1,360	680	0.053	0.16	1,360
					1000	0.053	0.16	1,360				
10×12.5	1,200	0.053	0.16	1,360	820	0.053	0.16	1,360	680	0.053	0.16	1,360
					1000	0.053	0.16	1,360				
10×16	1,800	0.038	0.12	1,430	1,000	0.038	0.12	1,430	1,000	0.038	0.12	1,430
					1,500	0.038	0.12	1,430				
10×20	2,200	0.023	0.069	1,820	1,500	0.023	0.069	1,820	1,500	0.023	0.069	1,820
10×25	3,300	0.022	0.066	2,150	2,200	0.022	0.066	2,150	1,800	0.022	0.066	2,150
12.5×16	1,800	0.031	0.078	1,452	1,500	0.031	0.078	1,452	1,000	0.031	0.078	1,452
12.5×20	3,900	0.021	0.053	2,360	3,300	0.021	0.053	2,360	2,200	0.021	0.053	2,360
12.5×25	4,700	0.020	0.050	2,770	3,900	0.020	0.050	2,770	2,700	0.020	0.050	2,770
12.5×30	5,600	0.018	0.046	3,290	4,700	0.018	0.046	3,290	3,300	0.018	0.046	3,290
12.5×35	6,800	0.017	0.044	3,400	5,600	0.017	0.044	3,400	3,900	0.017	0.044	3,400
16×15	2,700	0.040	0.101	1,375	1,800	0.040	0.101	1,375	1,200	0.040	0.101	1,375
16×20	5,600	0.021	0.053	3,140	4,700	0.021	0.053	3,140	3,300	0.021	0.053	3,140
16×25	6,800	0.019	0.051	3,460	5,600	0.019	0.051	3,460	4,700	0.019	0.051	3,460
16×31.5	8,200	0.013	0.035	3,680	6,800	0.013	0.035	3,680	5,600	0.013	0.035	3,680
18×20	5,600	0.020	0.052	3,265	4,700	0.020	0.052	3,265	3,300	0.020	0.052	3,265
18×25	8,200	0.018	0.049	3,611	5,600	0.018	0.049	3,611	3,900	0.018	0.049	3,611

Vdc / ØDxL(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	68	0.30	1.0	250	47	0.30	1.0	250	1	2.50	8.68	53
									2.2	2.50	8.68	56
									4.7	1.50	5.21	82
									10	1.0	3.47	250
									22	0.30	1.04	250
									27	0.30	1.04	250
6.3×11	150	0.13	0.41	405	100	0.13	0.41	405	47	0.14	0.50	350
									56	0.14	0.50	385
6.3×15	220	0.10	0.32	646	150	0.10	0.32	646	100	0.10	0.32	646
8×11.5	220	0.072	0.22	760	150	0.072	0.22	760	100	0.072	0.21	724
8×15	390	0.060	0.18	818	270	0.060	0.18	818	120	0.060	0.24	818
8×20	560	0.050	0.16	1,260	390	0.050	0.16	1,260	180	0.050	0.18	1,260
10×12	330	0.053	0.16	1,360	220	0.053	0.16	1,360	150	0.061	0.18	979
	470	0.053	0.16	1,360	330	0.053	0.16	1,360				
10×12.5	330	0.053	0.16	1,360	220	0.053	0.16	1,360	150	0.061	0.18	979
	470	0.053	0.16	1,360	330	0.053	0.16	1,360				
10×16	470	0.038	0.12	1,430	470	0.038	0.12	1,430	220	0.042	0.12	1,370
	680	0.038	0.12	1,430								
10×20	680	0.023	0.069	1,820	560	0.023	0.069	1,820	330	0.030	0.090	1,580
	820	0.023	0.069	2,000	680	0.023	0.069	1,820				
	1,000	0.025	0.075	1,900								
10×25	1,000	0.022	0.066	2,150	680	0.022	0.066	2,150	470	0.028	0.085	1,870
12.5×16	680	0.031	0.078	1,452	470	0.031	0.078	1,452	270	0.042	0.078	1,071
12.5×20	1,500	0.021	0.053	2,360	1,000	0.021	0.053	2,360	470	0.027	0.068	2,050
12.5×25	1,800	0.020	0.050	2,770	1,000	0.020	0.050	2,770	560	0.023	0.059	2,410
	2,200	0.020	0.050	3,000	1,200	0.020	0.050	2,770				
12.5×30	2,200	0.018	0.046	3,290	1,500	0.018	0.046	3,290	680	0.021	0.052	2,860
12.5×35	2,700	0.017	0.044	3,400	1,800	0.017	0.044	3,400	820	0.019	0.051	2,960
16×15	820	0.040	0.101	1,375	560	0.040	0.101	1,375	390	0.046	0.114	1,196
16×20	2,200	0.021	0.053	3,140	1,500	0.021	0.053	3,140	820	0.023	0.059	2,730
16×25	3,300	0.019	0.051	3,460	1,800	0.019	0.051	3,460	1,000	0.021	0.056	3,010
					2,200	0.019	0.051	3,460				
16×31.5	3,300	0.013	0.035	3,680	2,200	0.013	0.035	3,680	1,500	0.014	0.037	3,201
18×20	2,200	0.020	0.052	3,265	1,500	0.020	0.052	3,265	1,000	0.022	0.059	2,850
18×25	2,700	0.018	0.049	3,611	1,800	0.018	0.049	3,611	1,200	0.020	0.053	3,140

RATINGS OF NXB Series

WV / ØD×L(mm)	63			
	μF	IMP.		Ripple
		20℃	-10℃	
5×11	10	0.45	1.8	165
6.3×11	33	0.30	1.2	265
6.3×15	47	0.25	1.0	420
8×11.5	47	0.20	0.80	500
	68	0.20	0.80	500
10×12	68	0.16	0.64	600
10×12.5	68	0.16	0.64	600
10×16	100	0.10	0.40	945
10×20	150	0.080	0.32	1,100
10×25	220	0.070	0.28	1,300
12.5×20	330	0.040	0.16	1,495
16×20	470	0.035	0.14	1,990
16×25	680	0.030	0.12	2,780
16×31.5	1,000	0.020	0.080	2,835

WV / ØD×L(mm)	100				120			
	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃	
5×11	3.3	2.0	8.0	125				
5×11	4.7	2.0	8.0	125				
6.3×11	10	0.50	2.0	205				
6.3×15	22	0.40	1.6	300				
8×11.5	22	0.30	1.2	355	22	0.30	1.2	472
10×12	33	0.25	1.0	450	33	0.25	1.0	599
10×12.5	33	0.25	1.0	450	33	0.25	1.0	599
10×16	47	0.20	0.80	580	47	0.20	0.80	771
12.5×20	100	0.10	0.40	1,045	100	0.10	0.40	1,400
12.5×25	150	0.070	0.28	1,195	120	0.070	0.28	1,589
16×25	220	0.060	0.24	1,600	220	0.060	0.24	2,128
16×31.5	330	0.040	0.16	1,750	270	0.040	0.16	2,328
	470	0.040	0.16	1,750				
18×40	820	0.030	0.12	2,060	560	0.036	0.144	2,740

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./100kHz)
Nominal Capacitance(μF)

RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

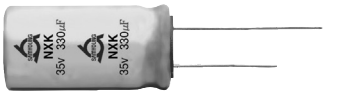
Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
1 ~ 180	0.40	0.75	0.90	0.95	1.00
220 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,900	0.75	0.90	0.95	0.97	1.00
4,700 ~ 8,200	0.85	0.95	0.98	0.99	1.00

NXK Series

• 105℃ 4,000~5,000Hrs assured.

- Non-solvent proof.
- Low Impedance.
- High Ripple.
- For LED TV BLU Inverter, SMPS, IP-Board, Adaptor.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXB → NXK
High Ripple



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(+20℃): 2 Z(-40℃)/ Z(+20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time.
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.
Others	Satisfied characteristics KS C IEC 60384-4

Load Life

Rated voltage(V_{DC})	10	16~50
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	≦ 200% of the initial specified value	
Leakage current	≦ The initial specified value	

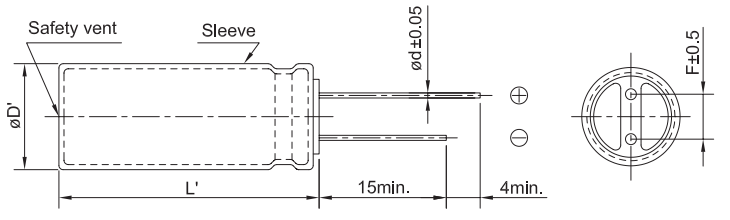
Case Size(øD)	Life Time
ø8 ø10x12~12.5L	4,000Hrs
ø10	5,000Hrs

Shelf Life

Rated voltage(V_{DC})	10	16~50
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	±200% of the initial specified value	
Leakage current	≦ The initial specified value	

DIMENSIONS OF NXK Series

Unit(mm)



Marking : YELLOW SLEEVE, BLACK INK

øD	8	10
ød	0.6	0.6
F	3.5	5.0
øD′	øD+0.5 max.	
L′	L+1.5 max.	L+2.0 max.

※ ø10 x 12L, L′≦ L+1.5

RATINGS OF NXK series

WVDC	10			
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)	IMP. (Ω max./-10℃, 100kHz)
680	8×11.5	1,417	0.073	0.29
1,000	8×15	2,050	0.059	0.24
1,000	10×12	2,190	0.053	0.21
1,000	10×12.5	2,190	0.053	0.21
1,500	8×20	2,380	0.041	0.16
1,500	10×16	2,550	0.038	0.15
1,800	10×20	2,880	0.028	0.112
2,200	10×25	3,160	0.024	0.096
2,700	10×33	3,570	0.020	0.080

WVDC	16			
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)	IMP. (Ω max./-10℃, 100kHz)
470	8×11.5	1,417	0.073	0.29
680	8×15	2,050	0.059	0.24
680	10×12	2,190	0.053	0.21
680	10×12.5	2,190	0.053	0.21
1,000	8×20	2,380	0.041	0.16
1,000	10×16	2,550	0.038	0.15
1,500	10×20	2,880	0.028	0.112
1,800	10×25	3,160	0.024	0.096
2,200	10×33	3,570	0.020	0.080

WVDC	25			
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)	IMP. (Ω max./-10℃, 100kHz)
330	8×11.5	1,417	0.073	0.29
390	8×15	2,050	0.059	0.24
470	10×12	2,190	0.053	0.21
470	10×12.5	2,190	0.053	0.21
560	8×20	2,380	0.041	0.16
680	10×16	2,550	0.038	0.15
820	10×20	2,880	0.028	0.112
1,000	10×25	3,160	0.024	0.096
1,200	10×33	3,570	0.020	0.080

WVDC	35			
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)	IMP. (Ω max./-10℃, 100kHz)
220	8×11.5	1,417	0.073	0.29
270	8×15	2,050	0.059	0.24
330	10×12	2,190	0.053	0.21
330	10×12.5	2,190	0.053	0.21
390	8×20	2,380	0.041	0.16
470	10×16	2,550	0.038	0.15
560	10×20	2,880	0.028	0.112
680	10×25	3,160	0.024	0.096
1,000	10×33	3,570	0.020	0.080

WVDC	50			
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)	IMP. (Ω max./-10℃, 100kHz)
100	8×11.5	1,086	0.096	0.38
120	8×15	1,558	0.080	0.32
150	10×12	1,612	0.083	0.33
150	10×12.5	1,612	0.083	0.33
180	8×20	1,888	0.065	0.26
220	10×16	1,985	0.057	0.23
270	10×20	2,322	0.042	0.17
330	10×25	2,626	0.037	0.15
470	10×33	2,954	0.033	0.13

RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

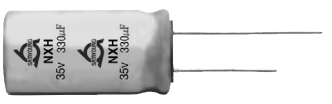
Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
100 ~ 270	0.50	0.73	0.92	0.95	1.00
330 ~ 680	0.55	0.77	0.94	0.96	1.00
820 ~ 1,800	0.60	0.80	0.96	0.97	1.00
2,200 ~ 2,700	0.70	0.85	0.98	0.99	1.00

NXH Series

• 105℃ 6,000~10,000Hrs assured.

- Non-solvent proof.
- Low Impedance.
- Long Life.
- For LED TV BLU Inverter, SMPS, IP-Board, Adaptor.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXB → NXH
Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	See table below
Temperature Characteristics (Max. Impedance ratio)	See table below
Load Life	See table below
Shelf Life	See table below
Others	Satisfied characteristics KS C IEC 60384-4

Dissipation Factor(Tanδ)

Rated voltage(VDC)	6.3	10	16	25	35	50	63	80	100
Tanδ(Max.)	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.08

When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Z(-25℃)/Z(+20℃)	2
Z(-40℃)/Z(+20℃)	3

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time.

Rated voltage(VDC)	6.3~10	16~100
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	≦200% of the initial specified value	
Leakage current	≦The initial specified value	

ØD	Life Time
Ø5~ Ø6.3	6,000 hours
Ø8	8,000 hours
Ø10~	10,000 hours

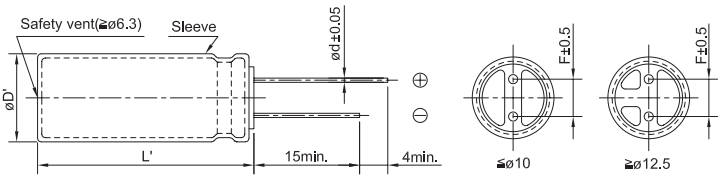
Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Rated voltage(VDC)	6.3~10	16~100
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	≦200% of the initial specified value	
Leakage current	≦The initial specified value	

DIMENSIONS OF NXH Series

Unit(mm)



Marking : YELLOW SLEEVE, BLACK INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXH Series

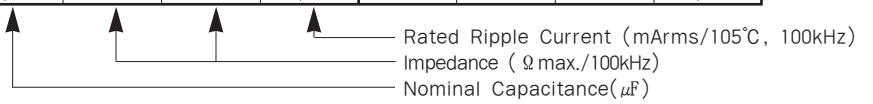
WV / ØD×L(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	220	0.22	0.80	345	150	0.22	0.80	345	100	0.22	0.80	345
5×15	470	0.13	0.47	480	330	0.13	0.47	480	220	0.13	0.47	480
6.3×11	470	0.094	0.35	540	330	0.094	0.35	540	220	0.094	0.35	540
6.3×15	560	0.084	0.31	620	470	0.084	0.31	620	330	0.084	0.31	620
8×11.5	820	0.056	0.19	945	680	0.056	0.19	945	470	0.056	0.19	945
8×15	1,200	0.045	0.15	1,250	1,000	0.045	0.15	1,250	680	0.045	0.15	1,250
8×20	1,500	0.029	0.11	1,500	1,500	0.029	0.11	1,500	1,000	0.029	0.11	1,500
10×12	1,200	0.039	0.14	1,330	1,000	0.039	0.14	1,330	680	0.039	0.14	1,330
10×12.5	1,200	0.039	0.14	1,330	1,000	0.039	0.14	1,330	680	0.039	0.14	1,330
10×16	1,800	0.028	0.10	1,760	1,500	0.028	0.10	1,760	1,000	0.028	0.10	1,760
10×20	2,200	0.020	0.060	1,960	1,800	0.020	0.060	1,960	1,500	0.020	0.060	1,960
10×25	2,700	0.018	0.054	2,250	2,200	0.018	0.054	2,250	1,800	0.018	0.054	2,250
10×33	3,300	0.015	0.045	2,550	2,700	0.015	0.045	2,550	2,200	0.015	0.045	2,550
12.5×20	3,900	0.017	0.043	2,480	3,300	0.017	0.043	2,480	2,200	0.017	0.043	2,480
12.5×25	4,700	0.015	0.038	2,900	3,900	0.015	0.038	2,900	2,700	0.015	0.038	2,900
12.5×30	5,600	0.013	0.033	3,450	4,700	0.013	0.033	3,450	3,300	0.013	0.033	3,450
12.5×35	6,800	0.012	0.031	3,570	5,600	0.012	0.031	3,570	3,900	0.012	0.031	3,570
16×20	6,800	0.015	0.038	3,250	4,700	0.015	0.038	3,250	3,300	0.015	0.038	3,250
16×25	8,200	0.013	0.035	3,630	6,800	0.013	0.035	3,630	4,700	0.013	0.035	3,630
18×25	10,000	0.012	0.031	3,650	8,200	0.012	0.031	3,650	5,600	0.012	0.031	3,650

WV / ØD×L(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	68	0.22	0.80	345	47	0.22	0.80	345	2.2	2.5	8.68	120
									4.7	2.5	8.68	120
									10	1.0	3.47	145
									22	0.40	1.39	195
									27	0.34	1.18	238
5×15	150	0.13	0.47	480	100	0.13	0.47	480	56	0.16	0.56	350
6.3×11	150	0.094	0.35	540	100	0.094	0.35	540	33	0.20	0.71	320
									47	0.14	0.50	450
									56	0.14	0.50	450
6.3×15	220	0.084	0.31	620	150	0.084	0.31	620	100	0.12	0.43	586
8×11.5	330	0.056	0.19	945	220	0.056	0.19	945	100	0.074	0.22	724
8×15	390	0.045	0.15	1,250	270	0.045	0.15	1,250	120	0.061	0.18	950
	470	0.045	0.15	1,330								
8×20	560	0.029	0.11	1,500	390	0.029	0.11	1,500	180	0.046	0.14	1,190
					470	0.029		1,600				
10×12	470	0.039	0.14	1,330	330	0.039	0.14	1,330	68	0.070	0.21	750
									150	0.061	0.18	979
10×12.5	470	0.039	0.14	1,330	330	0.039	0.14	1,330	68	0.070	0.21	750
									150	0.061	0.18	979
10×16	680	0.028	0.10	1,760	470	0.028	0.10	1,760	220	0.042	0.12	1,370
10×20	820	0.020	0.060	1,960	560	0.020	0.060	1,960	270	0.030	0.090	1,580
	1,000	0.020	0.060	1,960	680	0.025	0.075	1,850				
10×25	1,000	0.018	0.054	2,250	680	0.018	0.054	2,250	330	0.028	0.085	1,870
10×33	1,200	0.015	0.045	2,550	1,000	0.015	0.045	2,550	470	0.025	0.076	2,110
12.5×20	1,000	0.018	0.045	2,500	1,000	0.017	0.043	2,480	470	0.027	0.068	2,050
	1,500	0.017	0.043	2,550								
12.5×25	1,800	0.015	0.038	2,900	1,200	0.015	0.038	2,900	560	0.023	0.059	2,410
12.5×30	2,200	0.013	0.033	3,450	1,500	0.013	0.033	3,450	680	0.021	0.052	2,860
12.5×35	2,700	0.012	0.031	3,570	1,800	0.012	0.031	3,570	820	0.019	0.051	2,960
16×20	2,200	0.015	0.038	3,250	1,500	0.015	0.038	3,250	820	0.023	0.059	2,730
	2,700	0.015	0.038	3,250					1,000	0.023	0.059	2,730
16×25	3,300	0.013	0.035	3,630	2,200	0.013	0.035	3,630	1,000	0.021	0.056	3,010
18×25	3,900	0.012	0.031	3,650	2,700	0.012	0.031	3,650	1,500	0.019	0.051	3,290

RATINGS OF NXH Series

Vdc / ØD×L(mm)	63			
	μF	IMP.		Ripple
		20℃	-10℃	
5×11	18	0.45	1.8	173
6.3×11	47	0.30	1.2	278
8×11.5	82	0.20	0.80	525
8×15	100	0.18	0.72	688
8×20	150	0.16	0.64	861
10×12	120	0.16	0.64	725
10×12.5	120	0.16	0.64	725
10×16	180	0.10	0.40	998
10×20	270	0.080	0.32	1,200
10×25	330	0.070	0.28	1,410
12.5×20	390	0.050	0.20	1,570
12.5×25	470	0.037	0.15	1,990
12.5×30	560	0.032	0.13	2,410
12.5×35	680	0.030	0.12	2,620
16×20	560	0.035	0.14	2,100
16×25	820	0.030	0.12	2,430

Vdc / ØD×L(mm)	80				100			
	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃	
5×11	12	1.2	5.33	163	8.2	1.2	5.33	163
6.3×11	33	0.46	2.03	267	18	0.46	2.03	267
8×11.5	56	0.29	1.31	462	33	0.29	1.31	462
8×15	68	0.20	0.90	585	47	0.20	0.90	585
8×20	100	0.16	0.72	735	68	0.16	0.72	735
10×12	82	0.17	0.68	624	47	0.17	0.68	624
10×12.5	82	0.17	0.68	624	47	0.17	0.68	624
10×16	120	0.11	0.44	780	68	0.11	0.44	780
10×20	180	0.084	0.35	1,040	100	0.084	0.35	1,040
10×25	220	0.069	0.28	1,170	120	0.069	0.28	1,170
12.5×16	180	0.11	0.33	975	100	0.11	0.33	975
12.5×20	270	0.062	0.19	1,430	150	0.062	0.19	1,430
12.5×25	330	0.047	0.15	1,620	220	0.047	0.15	1,620
12.5×30	390	0.042	0.14	1,950	270	0.042	0.14	1,950
12.5×35	470	0.036	0.11	2,140	330	0.036	0.11	2,140
12.5 x 40	560	0.032	0.096	2,340	390	0.032	0.096	2340
16×20	390	0.048	0.16	1,750	270	0.048	0.16	1,750
16×25	560	0.038	0.11	2,210	390	0.038	0.11	2,210
16×31.5	680	0.032	0.096	2,400	470	0.032	0.096	2,400
16×35.5	820	0.029	0.087	2,600	560	0.029	0.087	2,600
16×40	1,000	0.027	0.081	2,860	680	0.027	0.081	2,860
18×20	560	0.045	0.14	1,950	390	0.045	0.14	1,950
18×25	820	0.036	0.11	2,270	470	0.036	0.11	2,270
18×31.5	1,000	0.030	0.090	2,470	560	0.030	0.090	2,470
18×35.5	1,200	0.027	0.081	2,860	680	0.027	0.081	2,860
18×40	1,500	0.026	0.078	3,510	820	0.026	0.078	3,510



RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
2.2 ~ 22	0.40	0.66	0.85	0.90	1.00
27 ~ 33	0.42	0.70	0.90	0.93	1.00
39 ~ 270	0.50	0.73	0.92	0.95	1.00
330 ~ 680	0.55	0.77	0.94	0.96	1.00
820 ~ 1,800	0.60	0.80	0.96	0.97	1.00
2,200 ~ 10,000	0.70	0.85	0.98	0.99	1.00

NXQ Series

• 105℃ 6,000 ~ 10,000Hrs assured.

- Non-solvent proof.
- Low Impedance, High Ripple.
- For LED TV BLU Inverter, IP-Board, Adaptor, LED Lighting.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXH → NXQ

High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 120 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2minutes)
Dissipation Factor (Tanδ)	See table below
Temperature Characteristics (Max. Impedance ratio)	See table below
Load Life	See table below
Shelf Life	See table below
Others	Satisfied characteristics KS C IEC 60384-4

Dissipation Factor (Tanδ)

Rated Voltage(V_{DC})	6.3	10	16	25	35	50	63	80	100	120
Tanδ(Max.)	0.22	0.19	0.16	0.14	0.12	0.10	0.09	0.08	0.08	0.08

When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Z(-25℃)/Z(+20℃)	2
Z(-40℃)/Z(+20℃)	3

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time.

Rated voltage(V_{DC})	6.3~10	16~120
Capacitance change	≦ ±30% of the initial value	≦ ±25% of the initial value
Tanδ	≦ 200% of the initial specified value	
Leakage current	≦ The initial specified value	

Case Size(ØD)	Life Time		
	6.3V_{DC}	10~50V_{DC}	63~120V_{DC}
Ø5~Ø6.3	6,000hours	7,000hours	6,000hours
Ø8 X 11.5L	8,000hours	9,000hours	8,000hours
Ø8 X 15L~20L	9,000hours	10,000hours	9,000hours
Ø10 X 10~12.5L	9,000hours		
Ø10 X 16L~25L Ø12.5~	10,000hours		

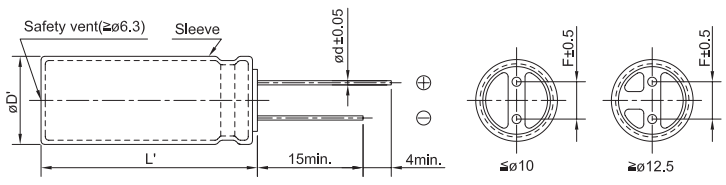
Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied.
The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Rated voltage(V_{DC})	6.3~10	16~120
Capacitance change	≦ ±30% of the initial value	≦ ±25% of the initial value
Tanδ	≦ 200% of the initial specified value	
Leakage current	≦ The initial specified value	

DIMENSIONS OF NXQ Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXQ Series

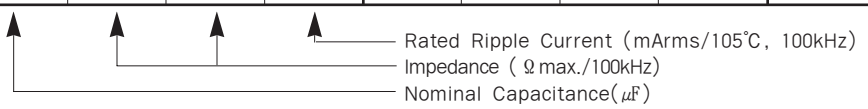
Vdc / ØD×L(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	220	0.40	1.30	345	150	0.40	1.30	450	120	0.40	1.30	450
6.3×11	470	0.17	0.51	540	330	0.17	0.51	700	270	0.17	0.51	700
8×11.5	820	0.075	0.23	945	560	0.075	0.23	1,200	470	0.075	0.23	1,200
8×15	1,000	0.059	0.18	1,250	680	0.059	0.18	1,600	560	0.059	0.18	1,600
8×20	1,500	0.041	0.13	1,500	1,000	0.041	0.13	1,960	820	0.041	0.13	1,960
10×12	1,200	0.053	0.16	1,500	820	0.053	0.16	1,700	680	0.053	0.16	1,700
10×12.5	1,200	0.053	0.16	1,500	820	0.053	0.16	1,700	680	0.053	0.16	1,700
10×16	1,800	0.038	0.12	1,760	1,200	0.038	0.12	2,000	1,000	0.038	0.12	2,000
10×20	2,700	0.028	0.084	1,960	1,800	0.028	0.084	2,500	1,500	0.028	0.084	2,500
10×25	3,300	0.024	0.072	2,250	2,200	0.024	0.072	2,900	1,800	0.024	0.072	2,900
12.5×20	3,900	0.025	0.075	2,480	2,700	0.025	0.075	2,600	2,200	0.025	0.075	2,600
12.5×25	4,700	0.019	0.057	2,900	3,300	0.019	0.057	3,050	2,700	0.019	0.057	3,050
12.5×30	5,600	0.018	0.054	3,450	4,700	0.018	0.054	3,500	3,300	0.018	0.054	3,500
12.5×35	6,800	0.016	0.048	3,570	5,600	0.016	0.048	3,600	3,900	0.016	0.048	3,600
16×20	6,800	0.021	0.063	3,250	4,700	0.021	0.063	3,250	3,300	0.021	0.063	3,250
16×25	8,200	0.017	0.051	3,630	5,600	0.017	0.051	3,630	4,700	0.017	0.051	3,630

Vdc / ØD×L(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	68	0.40	1.30	450	47	0.40	1.30	450	27	0.48	1.56	310
6.3×11	150	0.17	0.51	700	100	0.17	0.51	700	56	0.22	0.66	500
8×11.5	330	0.075	0.23	1,200	180	0.075	0.23	1,200	100	0.12	0.37	950
8×15	390	0.059	0.18	1,600	220	0.059	0.18	1,600	120	0.082	0.25	1,230
8×20	560	0.041	0.13	1,960	330	0.041	0.13	1,960	180	0.058	0.19	1,580
10×10	390	0.063	0.20	1,500	270	0.063	0.20	1,500				
10×12	470	0.053	0.16	1,700	270	0.053	0.16	1,700	150	0.073	0.22	1,280
10×12.5	470	0.053	0.16	1,700	270	0.053	0.16	1,700	150	0.073	0.22	1,280
10×16	680	0.038	0.12	2,000	390	0.038	0.12	2,000	220	0.053	0.16	1,650
10×20	1,000	0.028	0.084	2,500	560	0.028	0.084	2,500	330	0.038	0.12	2,060
10×25	1,200	0.024	0.072	2,900	680	0.024	0.072	2,900	390	0.032	0.10	2,240
12.5×20	1,500	0.025	0.075	2,600	820	0.025	0.075	2,600	470	0.032	0.10	2,200
12.5×25	1,800	0.019	0.057	3,050	1,200	0.019	0.057	3,050	680	0.025	0.080	2,500
12.5×30	2,200	0.018	0.054	3,500	1,500	0.018	0.054	3,500	820	0.023	0.074	3,100
12.5×35	2,700	0.016	0.048	3,600	1,800	0.016	0.048	3,600	1,000	0.021	0.067	3,250
16×20	2,200	0.021	0.063	3,250	1,500	0.021	0.063	3,250	820	0.026	0.084	2,730
16×25	3,300	0.017	0.051	3,630	1,800	0.017	0.051	3,630	1,000	0.022	0.070	3,010

Vdc / ØD×L(mm)	63			
	μF	IMP.		Ripple
		20℃	-10℃	
5×11	18	0.71	3.10	240
6.3×11	47	0.28	1.30	420
8×11.5	82	0.18	0.82	720
8×15	100	0.13	0.59	990
8×20	150	0.096	0.44	1,200
10×12	120	0.11	0.44	990
10×12.5	120	0.11	0.44	990
10×16	180	0.076	0.31	1,200
10×20	270	0.056	0.22	1,570
10×25	330	0.046	0.15	1,990
12.5×20	390	0.041	0.12	1,990
12.5×25	470	0.031	0.095	2,460
12.5×30	560	0.028	0.088	2,760
12.5×35	680	0.024	0.074	3,040
16×20	560	0.032	0.101	2,150
16×25	820	0.025	0.075	2,550

RATINGS OF NXQ Series

Vdc / ØD×L(mm)	80				100				120			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	12	1.20	5.33	220	8.2	1.20	5.33	220				
6.3×11	27	0.46	2.03	370	18	0.46	2.03	370				
8×11.5	47	0.29	1.31	620	33	0.29	1.31	620	22	0.29	1.31	620
8×15	56	0.20	0.90	780	47	0.20	0.90	780	33	0.20	0.90	780
8×20	82	0.16	0.72	1,040	68	0.16	0.72	1,040	47	0.16	0.72	1,040
10×10					39	0.26	1.17	680				
10×12	68	0.17	0.68	780	47	0.17	0.68	780	33	0.17	0.68	780
					56	0.17	0.68	780				
10×12.5	68	0.17	0.68	780	47	0.17	0.68	780	33	0.17	0.68	780
					56	0.17	0.68	780				
10×16	100	0.11	0.44	1,040	68	0.11	0.44	1,040	47	0.11	0.44	1,040
10×20	150	0.084	0.35	1,430	100	0.084	0.35	1,430	68	0.084	0.35	1,430
10×25	180	0.069	0.28	1,620	120	0.069	0.28	1,620	100	0.069	0.28	1,620
12.5×16	150	0.11	0.33	1,430	100	0.11	0.33	1,430	68	0.11	0.33	1,430
12.5×20	220	0.062	0.19	1,750	150	0.062	0.19	1,750	100	0.062	0.19	1,750
12.5×25	270	0.047	0.15	2,210	220	0.047	0.15	2,210	120	0.047	0.15	2,210
12.5×30	330	0.042	0.14	2,400	270	0.042	0.14	2,400	150	0.042	0.14	2,400
12.5×35	390	0.036	0.11	2,600	330	0.036	0.11	2,600	180	0.036	0.11	2,600
12.5 x 40	470	0.032	0.096	2,860	390	0.032	0.096	2,860	220	0.032	0.096	2,860
16×20	330	0.048	0.16	1,950	270	0.048	0.16	1,950	150	0.048	0.16	1,950
16×25	470	0.038	0.11	2,430	390	0.038	0.11	2,430	220	0.038	0.11	2,430
16×31.5	560	0.032	0.096	2,640	470	0.032	0.096	2,640	270	0.032	0.096	2,640
16×35.5	680	0.029	0.087	2,860	560	0.029	0.087	2,860	330	0.029	0.087	2,860
16×40	820	0.027	0.081	3,510	680	0.027	0.081	3,510	390	0.027	0.081	3,510
18×20	470	0.045	0.14	2,270	390	0.045	0.14	2,270	220	0.045	0.14	2,270
18×25	680	0.036	0.11	2,500	470	0.036	0.11	2,500	270	0.036	0.11	2,500
18×31.5	820	0.030	0.090	2,860	560	0.030	0.090	2,860	390	0.030	0.090	2,860
18×35.5	1,000	0.027	0.081	3,510	680	0.027	0.081	3,510	470	0.027	0.081	3,510
18×40	1,200	0.026	0.078	3,860	820	0.026	0.078	3,860	560	0.026	0.078	3,860



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
8.2 ~ 33	0.42	0.70	0.90	0.93	1.00
47 ~ 270	0.50	0.73	0.92	0.95	1.00
330 ~ 680	0.55	0.77	0.94	0.96	1.00
820 ~ 1,800	0.60	0.80	0.96	0.97	1.00
2,200 ~ 8,200	0.70	0.85	0.98	0.99	1.00

NXW Series

• 105℃ 6,000~10,000Hrs assured.

- Non-solvent proof.
- Low Impedance, High ripple
- For LED TV BLU Inverter, IP-Board, Adaptor, LED Lighting
- RoHS compliant.
- Halogen-free capacitors are also available.

NXQ → NXW
High Ripple

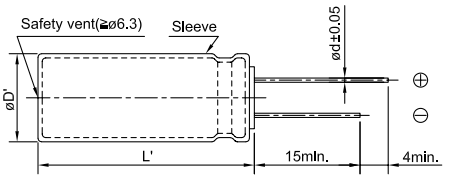
SPECIFICATIONS

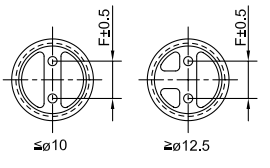
Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(㎂) or 3㎂, whichever is greater. Where, I : Max. Leakage current(㎂), C : Nominal capacitance(㎌), V : Rated voltage(V_{DC}) (at 20℃, 2minutes)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 Where the capacitance exceeds 1,000㎌, 0.02 shall be added every 1,000㎌ increase (at 20℃, 120㎐)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/Z(+20℃) 2 Z(-40℃)/Z(+20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≤ ±30 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

Case Size	Life Time
ø5~ø6.3	6,000hours
ø8	8,000hours
ø10 X 12L~12.5L	9,000hours
ø10 X 16L~25L ø12.5~	10,000hours

DIMENSIONS OF NXW Series

Unit(mm)





Marking : DARK BROWN SLEEVE, SILVER INK

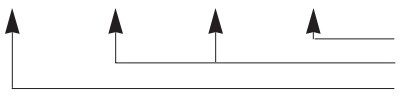
ØD	5	6.3	8	10	12.5	16
Ød	0.5	0.5	0.6	0.6	0.6	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5
ØD'	ØD+0.5 max.					
L'	L+1.5 max.			L+2.0 max.		

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NXW Series

Vdc / ØD×L(mm)	6.3				10				16			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	220	0.34	1.11	380	150	0.34	1.11	495	120	0.34	1.11	495
6.3×11	470	0.14	0.47	594	330	0.14	0.47	770	270	0.14	0.47	770
8×11.5	820	0.064	0.21	1,040	560	0.064	0.21	1,320	470	0.064	0.21	1,320
8×15	1,000	0.050	0.16	1,375	680	0.050	0.16	1,760	560	0.050	0.16	1,760
8×20	1,500	0.035	0.11	1,650	1,000	0.035	0.11	2,156	820	0.035	0.11	2,156
10×12	1,200	0.045	0.14	1,620	820	0.045	0.14	1,836	680	0.045	0.14	1,836
10×12.5	1,200	0.045	0.14	1,620	820	0.045	0.14	1,836	680	0.045	0.14	1,836
10×16	1,800	0.032	0.10	1,901	1,200	0.032	0.10	2,160	1,000	0.032	0.10	2,160
10×20	2,700	0.024	0.074	2,117	1,800	0.024	0.074	2,700	1,500	0.024	0.074	2,700
10×25	3,300	0.020	0.063	2,430	2,200	0.020	0.063	3,132	1,800	0.020	0.063	3,132
12.5×20	3,900	0.021	0.066	2,678	2,700	0.021	0.066	2,808	2,200	0.021	0.066	2,808
12.5×25	4,700	0.016	0.050	3,132	3,300	0.016	0.050	3,294	2,700	0.016	0.050	3,294
12.5×30	5,600	0.015	0.047	3,726	4,700	0.015	0.047	3,780	3,300	0.015	0.047	3,780
12.5×35	6,800	0.014	0.042	3,856	5,600	0.014	0.042	3,888	3,900	0.014	0.042	3,888
16×20	6,800	0.018	0.055	3,413	4,700	0.018	0.055	3,413	3,300	0.018	0.055	3,413
16×25	8,200	0.014	0.045	3,812	5,600	0.014	0.045	3,812	4,700	0.014	0.045	3,812

Vdc / ØD×L(mm)	25				35				50			
	μF	IMP.		Ripple	μF	IMP.		Ripple	μF	IMP.		Ripple
		20℃	-10℃			20℃	-10℃			20℃	-10℃	
5×11	68	0.34	1.11	495	47	0.34	1.11	495	27	0.43	1.39	341
6.3×11	150	0.14	0.47	770	100	0.14	0.47	770	56	0.20	0.64	550
8×11.5	330	0.064	0.21	1,320	180	0.064	0.21	1,320	100	0.11	0.36	1,045
8×15	390	0.050	0.16	1,760	220	0.050	0.16	1,760	120	0.074	0.24	1,353
8×20	560	0.035	0.11	2,156	330	0.035	0.11	2,156	180	0.053	0.17	1,738
10×12	470	0.045	0.14	1,836	270	0.045	0.14	1,836	150	0.062	0.19	1,382
10×12.5	470	0.045	0.14	1,836	270	0.045	0.14	1,836	150	0.062	0.19	1,382
10×16	680	0.032	0.10	2,160	390	0.032	0.10	2,160	220	0.045	0.14	1,782
10×20	1,000	0.024	0.074	2,700	560	0.024	0.074	2,700	330	0.032	0.10	2,305
10×25	1,200	0.020	0.063	3,132	680	0.020	0.063	3,132	390	0.027	0.08	2,419
12.5×20	1,500	0.021	0.066	2,808	820	0.021	0.066	2,808	470	0.027	0.08	2,376
12.5×25	1,800	0.016	0.050	3,294	1,200	0.016	0.050	3,294	680	0.021	0.066	2,700
12.5×30	2,200	0.015	0.047	3,780	1,500	0.015	0.047	3,780	820	0.020	0.061	3,348
12.5×35	2,700	0.014	0.042	3,888	1,800	0.014	0.042	3,888	1,000	0.018	0.055	3,510
16×20	2,200	0.018	0.055	3,413	1,500	0.018	0.055	3,413	820	0.022	0.069	2,867
16×25	3,300	0.014	0.045	3,812	1,800	0.014	0.045	3,812	1,000	0.019	0.058	3,161



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
27～33	0.42	0.70	0.90	0.93	1.00
47～270	0.50	0.73	0.92	0.95	1.00
330～680	0.55	0.77	0.94	0.96	1.00
820～1,800	0.60	0.80	0.96	0.97	1.00
2,200～8,200	0.70	0.85	0.98	0.99	1.00

NXE Series

• 105℃ 3,000~4,000Hrs assured.

- Non-solvent proof.
- Ultra Low ESR, Long Life.
- For MAIN-Board, SMPS.
- RoHS compliant.
- Halogen-free capacitors are also available.

NXC → NXE

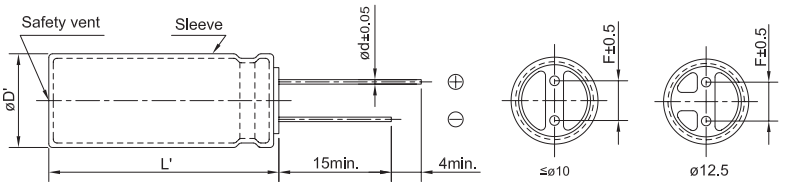
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.03CV(μA) or 4μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(20℃): 2 Z(-40℃)/ Z(20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the specified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: Life Time — Ø8: 3,000 hours; Ø10~: 4,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXE Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10	12.5
Ød	0.6	0.6	0.6
F	3.5	5.0	5.0
ØD'	ØD+0.5 max.		
L'	L+1.5max.	L+2.0max.	

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXE series

WVDC	6.3			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
820	8×11.5	1,140	0.036	0.11
1,200	8×15	1,490	0.028	0.085
1,800	8×20	1,870	0.019	0.057
1,500	10×12	1,540	0.030	0.091
1,500	10×12.5	1,540	0.030	0.091
1,800	10×16	2,000	0.019	0.057
2,200	10×20	2,550	0.013	0.039
3,300	10×25	2,800	0.012	0.036

WVDC	10			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
680	8×11.5	1,140	0.036	0.11
1,000	8×15	1,490	0.028	0.085
1,500	8×20	1,870	0.019	0.057
1,000	10×12	1,540	0.030	0.091
1,000	10×12.5	1,540	0.030	0.091
1,200	10×16	2,000	0.019	0.057
1,500	10×16	2,000	0.019	0.057
1,800	10×20	2,550	0.013	0.039
2,200	10×25	2,800	0.012	0.036

WVDC	16			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
470	8×11.5	1,140	0.036	0.11
680	8×15	1,490	0.028	0.085
1,000	8×20	1,870	0.019	0.057
680	10×12	1,540	0.030	0.091
680	10×12.5	1,540	0.030	0.091
1,000	10×16	2,000	0.019	0.057
1,500	10×20	2,550	0.013	0.039
1,800	10×25	2,800	0.012	0.036

WVDC	25			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
220	8×11.5	1,140	0.036	0.11
390	8×15	1,490	0.028	0.085
560	8×20	1,870	0.019	0.057
470	10×12	1,540	0.030	0.091
470	10×12.5	1,540	0.030	0.091
680	10×16	2,000	0.019	0.057
820	10×20	2,550	0.013	0.039
1,000	10×25	2,800	0.012	0.036
1,200	12.5×20	3,000	0.014	0.042

WVDC	35			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
150	8×11.5	1,140	0.036	0.11
270	8×15	1,490	0.028	0.085
390	8×20	1,870	0.019	0.057
330	10×12	1,540	0.030	0.091
330	10×12.5	1,540	0.030	0.091
470	10×16	2,000	0.019	0.057
560	10×20	2,550	0.013	0.039
680	10×25	2,800	0.012	0.036

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

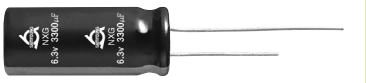
Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
150 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,300	0.75	0.90	0.95	0.97	1.00

NXG Series

• 105℃ 3,000~4,000Hrs assured.

- Non-solvent proof.
- Ultra Low Impedance/ESR, High Ripple, Long Life.
- For LED TV BLU Inverter, SMPS, IP-Board, Adaptor.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXE → NXG
High Ripple

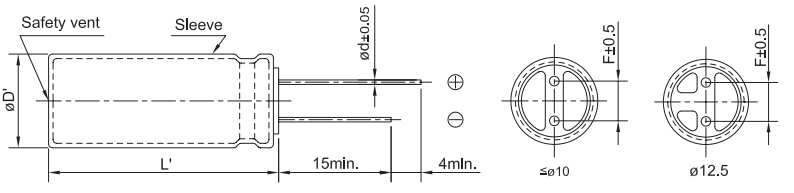


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.03CV(μA) or 4μA, Whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(+20℃): 2 Z(-40℃)/ Z(+20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the spcified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: Life Time — Ø8: 3,000 hours; Ø10~: 4,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXG Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10	12.5
Ød	0.6	0.6	0.6
F	3.5	5.0	5.0
ØD'	ØD+0.5 max.		
L'	L+1.5 max.	L+2.0 max.	

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NXG series

WVDC	6.3			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
820	8×11.5	1,700	0.036	0.11
1,200	8×15	2,300	0.028	0.085
1,800	8×20	2,600	0.019	0.057
1,500	10×12	2,200	0.030	0.091
1,500	10×12.5	2,200	0.030	0.091
1,800	10×16	2,800	0.019	0.057
2,200	10×20	3,000	0.013	0.039
3,300	10×25	3,270	0.012	0.036

WVDC	10			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
680	8×11.5	1,700	0.036	0.11
1,000	8×15	2,300	0.028	0.085
1,500	8×20	2,600	0.019	0.057
1,000	10×12	2,200	0.030	0.091
1,000	10×12.5	2,200	0.030	0.091
1,200	10×16	2,800	0.019	0.057
1,500	10×16	2,800	0.019	0.057
1,800	10×20	3,000	0.013	0.039
2,200	10×25	3,270	0.012	0.036

WVDC	16			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
470	8×11.5	1,700	0.036	0.11
680	8×15	2,300	0.028	0.085
1,000	8×20	2,600	0.019	0.057
680	10×12	2,200	0.030	0.091
680	10×12.5	2,200	0.030	0.091
1,000	10×16	2,800	0.019	0.057
1,500	10×20	3,000	0.013	0.039
1,800	10×25	3,270	0.012	0.036

WVDC	25			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
220	8×11.5	1,700	0.036	0.11
390	8×15	2,300	0.028	0.085
560	8×20	2,600	0.019	0.057
470	10×12	2,200	0.030	0.091
470	10×12.5	2,200	0.030	0.091
680	10×16	2,800	0.019	0.057
820	10×20	3,000	0.013	0.039
1,000	10×25	3,270	0.012	0.036
1,200	12.5×20	3,510	0.014	0.042

WVDC	35			
Items / μF	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR	
			(Ω max./20℃, 100kHz)	(Ω max./-10℃, 100kHz)
150	8×11.5	1,700	0.036	0.11
270	8×15	2,300	0.028	0.085
390	8×20	2,600	0.019	0.057
330	10×12	2,200	0.030	0.091
330	10×12.5	2,200	0.030	0.091
470	10×16	2,800	0.019	0.057
560	10×20	3,000	0.013	0.039
680	10×25	3,270	0.012	0.036

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
150 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,300	0.75	0.90	0.95	0.97	1.00

MLB Series

• 85℃ 8,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For LED TV Power, SMPS.
- RoHS compliant.
- Halogen-free capacitors are also available.

MHA → MLB

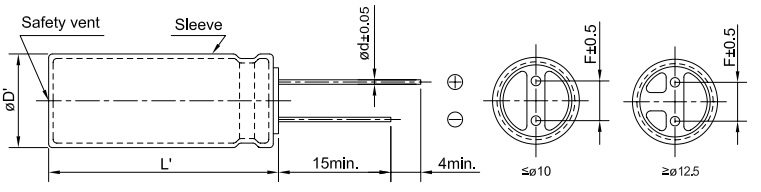
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	400 VDC	420 ~ 500 VDC
Operating Temperature Range	-40 ~ + 85℃	-25 ~ + 85℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current	C·V \ Time: ≦ 1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); 〉1000 → I=0.04CV+100 (After 1 minute), I=0.02CV+25 (After 5 minutes). Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC)	(at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 400 ~ 500; Tanδ(Max.): 0.24	(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 400 / 420~500; Z(-25℃)/Z(+20℃): 5 / 6; Z(-40℃)/Z(+20℃): 6 / -	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage)for 8,000 hours at 85℃. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF MLB Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

ØD	10	12.5	16	18
Ød	0.6	0.6	0.8	0.8
F	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.			
L'	L+2.0 max.			

※ Ø16 x 60L, L'≦ L+3.0

RATINGS OF MLB Series

Vdc	Cap.(μF)	Case size ø D×L(mm)	Rated Ripple Current (mArms/85℃)				
			120Hz	1KHz	10KHz	50KHz	100KHz
400	68	16 X 31.5	563	704	845	985	1,126
		18 X 25	544	680	816	952	1,088
	82	16 X 35.5	650	813	975	1,138	1,300
		18 X 31.5	650	813	975	1,138	1,300
	100	16 X 40	780	975	1,170	1,365	1,560
		18 X 31.5	700	875	1,050	1,225	1,400
	120	16 X 45	889	1,111	1,334	1,556	1,778
		18 X 35.5	830	1,038	1,245	1,453	1,660
	150	16 X 50	980	1,225	1,470	1,715	1,960
420	68	16 X 31.5	550	688	825	963	1,100
		18 X 25	533	666	800	933	1,066
	82	16 X 35.5	630	788	945	1,103	1,260
		18 X 31.5	630	788	945	1,103	1,260
	100	16 X 40	750	938	1,125	1,500	1,575
		18 X 35.5	720	900	1,080	1,440	1,512
	120	16 X 45	840	1,050	1,260	1,700	1,730
		18 X 40	840	1,050	1,260	1,700	1,730
	150	16 X 50	920	1,150	1,380	1,760	1,840
450	47	10 X 50	420	525	630	735	840
	56	12.5 X 40	470	588	705	823	940
	68	12.5 X 45	540	675	810	945	1,080
		16 X 31.5	550	688	825	1,476	1,476
		16 X 35.5	578	723	867	1,012	1,156
		18 X 31.5	560	700	840	980	1,120
	82	12.5 X 50	620	775	930	1,085	1,240
		16 X 35.5	630	788	945	1,103	1,260
		16 X 40	656	820	984	1,500	1,500
		18 X 31.5	630	788	945	1,103	1,260
	100	12.5 X 60	710	888	1,065	1,243	1,420
		16 X 40	720	900	1,080	1,940	1,940
		16 X 45	760	950	1,140	1,940	1,940
		18 X 35.5	720	900	1,080	1,440	1,512
	120	16 X 50	865	1,081	1,298	2,112	2,112
		18 X 40	840	1,050	1,260	1,700	1,730
	150	16 X 50	920	1,150	1,380	1,760	1,840
500	10	12.5 X 16	115	144	173	201	230
	22	16 X 25	230	288	345	403	460
	33	10 X 50	310	388	465	543	620
	47	12.5 X 40	380	475	570	665	760
		16 X 35.5	435	544	653	761	870
	56	12.5 X 45	460	575	690	805	920
		16 X 40	491	614	737	859	982
	68	12.5 X 50	510	638	765	893	1,020
		16 X 40	523	654	785	1,460	1,460
		16 X 45	563	704	845	985	1,126
	82	12.5 X 60	600	750	900	1,050	1,200
		16 X 40	580	725	870	1,480	1,480
		16 X 45	610	763	915	1,500	1,500
		16 X 50	630	788	945	1,103	1,260
	100	16 X 50	700	875	1,050	1,848	1,848
		18 X 45	700	875	1,050	1,410	1,500
	120	16 X 60	830	1,038	1,245	2,070	2,070
		18 X 50	830	1,038	1,245	1,700	1,730

MLC Series

• 85℃ 10,000Hrs assured.

- Non-solvent proof.
- Long life.
- For LED TV Power, SMPS.
- RoHS compliant.
- Halogen-free capacitors are also available.

MLB → MLC

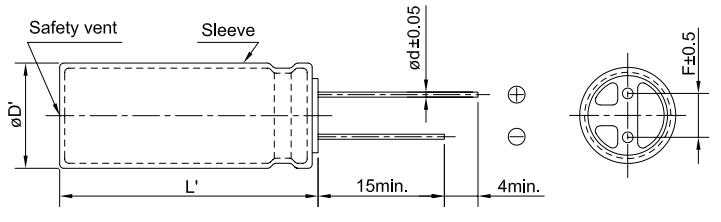
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	400 V_{DC}	420 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ + 85℃	-25 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 400~500 Tanδ(Max.): 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 400 / 420~500 Z(-25℃)/Z(+20℃): 5 / 6 Z(-40℃)/Z(+20℃): 6 / - (at 120Hz)	
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 10,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours an not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF MLC Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	12.5	16	18
ød	0.6	0.8	0.8
F	5.0	7.5	7.5
øD'	øD+0.5 max.		
L'	L+2.0 max.		

RATINGS OF MLC Series

Vdc	Cap.(μF)	Case size ø D×L(mm)	Rated Ripple Current (mArms/85°C)				
			120Hz	1KHz	10KHz	50KHz	100KHz
400	68	16×31.5	676	946	1,013	1,351	1,892
		18×25	653	914	979	1,306	1,828
	82	16×35.5	780	1,092	1,170	1,560	2,184
		18×31.5	780	1,092	1,170	1,560	2,184
	100	16×40	936	1,310	1,404	1,872	2,621
		18×31.5	840	1,176	1,260	1,680	2,352
	120	16×45	1,067	1,494	1,600	2,134	2,987
		18×35.5	996	1,394	1,494	1,992	2,789
	150	16×50	1,176	1,646	1,764	2,352	3,293
420	68	16×31.5	660	924	990	1,320	1,320
		18×25	640	896	960	1,280	1,280
	82	16×35.5	765	1,071	1,148	1,530	1,530
		18×31.5	765	1,071	1,148	1,530	1,530
	100	16×40	870	1,218	1,305	1,740	1,740
		18×35.5	830	1,162	1,245	1,660	1,660
	120	16×45	1,020	1,428	1,530	2,040	2,040
		18×40	1,020	1,428	1,530	2,040	2,040
	150	16×50	1,104	1,546	1,656	2,208	2,208
450	68	16×35.5	670	838	1,005	1,340	1,340
		18×31.5	644	902	966	1,288	1,288
	82	16×40	760	1,064	1,140	1,520	1,520
		18×31.5	760	1,064	1,140	1,520	1,520
	100	16×40	900	1,125	1,350	1,800	1,800
		16×45	912	1,277	1,368	1,824	1,824
		18×35.5	900	1,260	1,350	1,800	1,800
	120	16×50	960	1,344	1,440	1,920	1,920
		18×40	966	1,352	1,449	1,932	1,932
	150	16×50	1,040	1,456	1,560	2,080	2,080
500	10	12.5×16	129	180	193	258	258
	22	16×25	258	361	386	515	515
	47	16×35.5	430	602	645	860	860
	56	16×40	500	700	750	1,000	1,000
	68	16×40	590	738	885	1,180	1,180
		16×45	600	840	900	1,200	1,200
	82	16×45	630	882	945	1,260	1,260
		16×50	680	952	1,020	1,360	1,360
	100	16×45	840	1,050	1,260	1,680	1,680
		16×50	840	1,176	1,260	1,680	1,680
		18×45	840	1,176	1,260	1,680	1,680

NZE Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized, High Ripple.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFD (KMF) → NZE

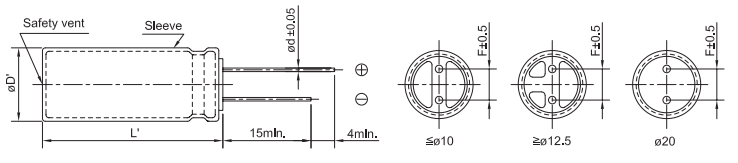
Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 V_{DC}	420 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ + 105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I = 0.1CV + 40 / I = 0.03CV + 15 〉 1000: I = 0.04CV + 100 / I = 0.02CV + 25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 420~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage)for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NZE Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	6.3	8	10	12.5	16	18	20	22	25.4
ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
øD'	øD + 0.5 max.								
L'	L+1.5max.	L+2.0max.							

RATINGS OF NZE Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	22	10 × 20	211
	33	10 × 20	260
	47	10 × 25	338
	68	12.5 × 20	413
	82	12.5 × 25	494
	100	12.5 × 30	589
	120	16 × 20	615
	150	12.5 × 35	710
		16 × 25	738
	180	16 × 25	809
	220	16 × 31.5	964
	270	16 × 35.5	1091
	330	18 × 31.5	1221
		22 × 25	1230
	390	18 × 35.5	1371
		22 × 30	1410
	470	25.4 × 30	1660
	560	22 × 35	1780
		22 × 40	1870
	680	22 × 45	2150
		25.4 × 35	2100
	820	22 × 50	2450
		25.4 × 40	2420
	1000	25.4 × 50	2880
200	3.3	6.3 × 11	45
	4.7	8 × 11.5	64
	6.8	8 × 11.5	77
	10	8 × 11.5	94
	22	8 × 20	160
	33	10 × 20	260
	47	10 × 25	338
	68	12.5 × 25	413
	82	12.5 × 25	494
	100	12.5 × 30	589
	120	16 × 25	660
	150	16 × 25	738
	180	16 × 31.5	872
	220	16 × 31.5	964
		22 × 25	1030
	270	16 × 35.5	1091
		18 × 31.5	1104
	330	16 × 40	1245
		18 × 35.5	1261
		22 × 30	1290
		25.4 × 30	1280
	390	18 × 40	1393
		22 × 35	1370
	470	22 × 40	1580
		25.4 × 35	1610
	560	22 × 45	1790
		22 × 50	1860
		25.4 × 40	1840
	820	25.4 × 50	2400

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	4.7	8 × 11.5	72
	6.8	8 × 11.5	86
	10	8 × 15	108
	22	10 × 20	211
	33	10 × 25	284
	47	12.5 × 20	343
	68	12.5 × 30	488
	82	16 × 25	546
	100	16 × 25	603
	120	16 × 25	660
	150	16 × 31.5	796
	180	16 × 35.5	891
		18 × 31.5	901
		22 × 25	830
	220	16 × 40	1016
		18 × 35.5	1030
		22 × 30	1050
	270	18 × 40	1158
		22 × 35	1140
		25.4 × 30	1160
	330	18 × 45	1267
		22 × 40	1320
		25.4 × 35	1350
	390	22 × 45	1500
		25.4 × 40	1530
	470	22 × 50	1710
	560	25.4 × 50	1990
350	10	10 × 16	118
	15	10 × 20	169
	22	10 × 25	228
	33	12.5 × 25	304
	39	10 × 40	374
	47	16 × 25	400
	56	16 × 25	437
	68	16 × 31.5	510
		18 × 25	502
	82	16 × 35.5	582
		18 × 31.5	590
	100	18 × 31.5	632
		22 × 25	630
	120	18 × 35.5	716
		22 × 30	730
	150	25.4 × 30	880
	180	22 × 35	950
	200	22 × 40	1050
		25.4 × 35	1070
	220	22 × 45	1150
	270	22 × 50	1320
		25.4 × 40	1300
	330	25.4 × 50	1560

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1K	10K	50K	100K
Factor	1.00	1.25	1.50	1.60	1.75

RATINGS OF NZE Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	4.7	6.3 × 15	55
	6.8	8 × 11	101
		8 × 15	102
	8.2	8 × 15	105
		8 × 20	110
	10	8 × 20	115
		10 × 16	118
	15	10 × 20	169
	22	10 × 25	228
	33	12.5 × 25	304
	39	12.5 × 30	355
	47	16 × 25	400
	56	16 × 25	437
	68	16 × 31.5	510
	82	16 × 35.5	582
		18 × 31.5	590
		22 × 25	590
	100	16 × 40	645
		18 × 35.5	786
	120	18 × 40	801
		22 × 30	790
	150	18 × 40	872
		22 × 35	900
		25.4 × 30	920
	180	22 × 40	1040
		25.4 × 35	1060
	200	22 × 45	1140
	220	22 × 50	1250
		25.4 × 40	1110
	270	25.4 × 50	1400
	330	25.4 × 50	1450
420	10	10 × 20	129
	15	12.5 × 16	161
	22	12.5 × 20	207
	33	16 × 20	265
	47	16 × 25	374
	56	16 × 31.5	440
	68	18 × 25	492
		18 × 31.5	520
	82	18 × 31.5	640
		22 × 25	550
	100	16 × 45	750
		18 × 35.5	750
		22 × 30	650
	120	16 × 45	780
		18 × 40	819
		22 × 35	750
		25.4 × 30	760
	150	18 × 45	840
		20 × 40	845
		22 × 40	880
		25.4 × 35	890
	180	22 × 45	1000
	200	25.4 × 40	1080
	220	22 × 50	1150
	270	25.4 × 50	1360

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	4.7	8 × 20	80
	8.2	10 × 16	108
	10	10 × 20	129
	15	12.5 × 20	173
	22	12.5 × 25	232
	33	12.5 × 30	292
		16 × 25	306
	39	10 × 45	330
	47	16 × 25	374
	53	10 × 50	424
	56	16 × 31.5	440
	68	16 × 35.5	514
		18 × 31.5	520
		22 × 25	500
	82	12.5 × 50	670
		16 × 40	640
		18 × 31.5	640
	100	12.5 × 60	790
		16 × 45	750
		18 × 35.5	750
		22 × 30	740
	120	16 × 50	819
		18 × 40	819
		22 × 35	750
		25.4 × 30	760
	150	18 × 45	840
		20 × 40	845
		22 × 40	880
		25.4 × 35	890
	180	22 × 45	1000
		25.4 × 40	1030
	200	22 × 50	1100
	220	25.4 × 50	1230
500	22	12.5 × 30	238
	33	12.5 × 45	327
	39	12.5 × 50	376
	47	16 × 35.5	385
		18 × 31.5	389
	56	12.5 × 60	473
		16 × 40	452
		22 × 25	450
	60	12.5 × 60	494
	68	16 × 45	567
		18 × 35.5	546
		22 × 30	530
	82	16 × 50	599
		18 × 40	588
		25.4 × 30	620
	100	18 × 45	700
		20 × 40	700
		22 × 35	680
		22 × 40	710
	120	18 × 50	800
		22 × 45	900
		25.4 × 35	800
		25.4 × 40	830
	150	22 × 50	950
	180	25.4 × 50	1100

NZL Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Downsized, High Ripple, Long life.
- For SMPS, IP-Board, Adaptor.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NZE → NZL

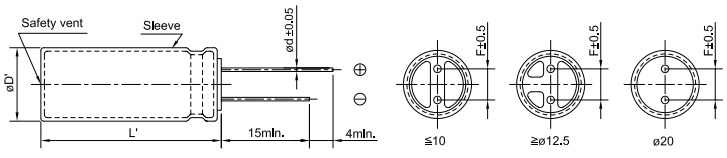
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	400 V_{DC}	420 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ + 105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: ≦ 1000 → I = 0.1CV + 40 (After 1 minute), I = 0.03CV + 15 (After 5 minutes); 〉 1000 → I = 0.04CV + 100 (After 1 minute), I = 0.02CV + 25 (After 5 minutes). Where, I: Max. Leakage current(μA) C: Nominal capacitance(μF) V: Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 400~500; Tanδ(Max.): 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 400 / 420~500; Z(-25℃)/Z(+20℃): 5 / 6; Z(-40℃)/Z(+20℃): 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NZL Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	10	12.5	16	18	20
Ød	0.6	0.6	0.8	0.8	0.8
F	5.0	5.0	7.5	7.5	7.5
ØD′	ØD + 0.5 max.				
L′	L + 2.0 max.				

RATINGS OF NZL Series

Vdc	400		420		450	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
10	10 × 16	118	10 × 20	129	10 × 20	129
15	10×20	169	12.5 × 16	161	12.5 × 20	173
22	10 × 25	228	12.5 × 20	207	12.5 × 25	263
33	12.5 × 25	304	16 × 20	265	16 × 25	306
47	16 × 25	400	16 × 25	374	16 × 25	374
56	16 × 25	437	16 × 31.5	440	16 × 31.5	440
68	16 × 31.5	550	18 × 25	492	16 × 35.5	514
			18 × 31.5	520	18 × 31.5	520
82	16 × 35.5	582	18 x 31.5	640	16 × 40	640
	18 × 31.5	590			18 × 31.5	
100	16 × 40	645	16 x 40	710	16 x 40	710
	18 × 35.5	786	18 × 35.5	750	18 × 35.5	750
120	18 × 40	801	16 x 45	780	16 × 50	819
			18 × 40	819	18 × 40	
150	18 × 40	872	18 × 45	840	18 × 45	840
			20 × 40	845	20 × 40	845

Vdc	500	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
22	12.5 × 30	238
33	18 × 25	310
47	16 × 35.5	385
56	16 × 40	452
68	16 × 45	567
	18 × 35.5	546
82	16 × 50	599
	18 × 40	588
100	18 × 45	700
	20 × 40	
120	18 × 50	800

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	50k	100k
Factor	1.00	1.25	1.50	1.75	2.00

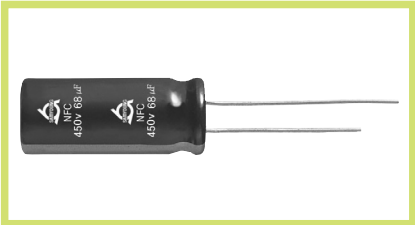
NFC Series

• 105℃ 2,000~5,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

NZE → NFC

Long Life

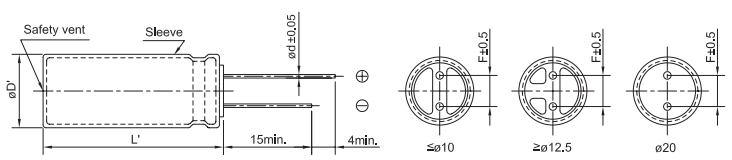


SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 VDC	420~ 500 VDC
Operating Temperature Range	-40 ~+ 105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: ≦ 1000 → After 1 minute: I=0.1CV+40, After 5 minutes: I=0.03CV+15; 〉1000 → After 1 minute: I=0.04CV+100, After 5 minutes: I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance (μF) V:Rated voltage (VDC)(at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 160~250 → Tanδ(Max.): 0.20; 350~500 → 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 160~250 / 350~400 / 420~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. (where, 2,000 hours for Ø6.3) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFC Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	6.3	8	10	12.5	16	18	20	22	25.4
Ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
ØD′	ØD+0.5 max.								
L′	L+1.5max.	L+2.0 max.							

※ Ø8 x 50L, L′≦ L+2.0

RATINGS OF NFC Series

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	22	8 × 20	135
		10 × 20	192
	33	10 × 20	236
	47	12.5 × 20	312
	68	10 × 20	380
		12.5 × 25	409
	82	8 × 50	360
	100	16 × 25	548
	150	16 × 25	701
	220	16 × 31.5	876
	330	18 × 31.5	1110
		22 × 25	1120
	390	22 × 30	1300
	470	25.4 × 30	1520
	560	22 × 35	1640
		22 × 40	1720
	680	22 × 45	1970
		25.4 × 35	1930
	820	22 × 50	2250
		25.4 × 40	2220
	1000	25.4 × 50	2650
200	3.3	6.3 × 11	36
	10	8 × 11.5	75
	22	8 × 20	135
		10 × 20	192
	33	12.5 × 20	262
	47	12.5 × 20	312
	68	8 × 50	320
		12.5 × 25	409
	82	16 × 20	462
	100	16 × 25	548
	150	16 × 25	701
	220	18 × 31.5	906
		22 × 25	910
	330	22 × 30	1190
		25.4 × 30	1270
	390	22 × 35	1370
	470	22 × 40	1570
		25.4 × 35	1600
	560	22 × 45	1790
		22 × 50	1860
		25.4 × 40	1830
	820	25.4 × 50	2400

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	6.8	8 × 11.5	70
	10	8 × 20	95
		10 × 20	130
	22	10 × 20	193
		12.5 × 20	214
	33	12.5 × 25	285
	47	8 × 50	250
		12.5 × 25	340
	68	16 × 25	452
	100	16 × 31.5	591
	150	18 × 31.5	748
	180	22 × 25	780
	220	18 × 35.5	936
		22 × 30	920
	270	22 × 35	1070
		25.4 × 30	1090
	330	20 × 40	1196
		22 × 40	1240
		25.4 × 35	1270
	390	22 × 45	1410
		25.4 × 40	1440
	470	22 × 50	1610
	560	25.4 × 50	1870
350	6.8	8 × 15	65
	10	8 × 20	90
		10 × 20	126
	22	12.5 × 20	207
	33	8 × 50	245
		16 × 20	284
	47	16 × 25	364
	68	16 × 31.5	472
	100	18 × 31.5	591
		22 × 25	530
	120	22 × 30	620
	150	18 × 40	760
		25.4 × 30	740
	180	22 × 35	800
	200	22 × 40	880
		25.4 × 35	900
	220	22 × 45	970
	270	22 × 50	1110
		25.4 × 40	1090
	330	25.4 × 50	1310

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1K	10K	50K	100K
Factor	1.00	1.25	1.50	1.60	1.75

RATINGS OF NFC Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	1	6.3 × 11	19
	3.3	8 × 11.5	42
	6.8	8 × 15	66
	8.2	8 × 20	80
	10	10 × 16	85
	22	12.5 × 25	225
	27	8 × 50	240
	33	16 × 20	284
	47	16 × 25	364
	68	16 × 31.5	472
	82	18 × 31.5	536
		22 × 25	490
	100	18 × 35.5	611
	120	18 × 40	680
		22 × 30	670
	150	18 × 40	760
		22 × 35	750
		25.4 × 30	760
	180	20 × 40	855
		22 × 40	860
		25.4 × 35	880
	200	22 × 45	940
	220	22 × 45	996
		22 × 50	1030
		25.4 × 40	1010
	270	25.4 × 50	1220
	330	25.4 × 50	1260
420	68	18 × 31.5	500
	82	18 × 31.5	560
		22 × 25	490
	100	18 × 35.5	720
		22 × 30	580
	120	18 × 40	740
		22 × 35	670
		25.4 × 30	680
	150	18 × 45	753
		22 × 40	780
		25.4 × 35	800
	180	22 × 45	900
	200	25.4 × 40	970
	220	22 × 50	1030
	270	25.4 × 50	1200

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	1	6.3 × 11	12
	1.5	8 × 11.5	23
	2.2	8 × 15	38
	3.3	8 × 15	42
	4.7	8 × 20	62
	6.8	10 × 20	100
	8.2	10 × 25	121
	10	12.5 × 20	135
	22	8 × 50	230
	27	16 × 25	267
	33	16 × 31.5	319
	47	10 × 50	334
		18 × 25	368
	68	12.5 × 42.5	476
		18 × 31.5	500
		22 × 25	440
	82	12.5 × 50	473
		18 × 31.5	594
	100	12.5 × 60	630
		18 × 35.5	720
		22 × 30	620
	120	18 × 40	740
		22 × 35	650
		25.4 × 30	660
	150	18 × 45	753
		20 × 40	757
		22 × 40	780
		25.4 × 35	780
	180	22 × 45	870
		22 × 50	910
		25.4 × 40	890
	200	22 × 50	950
	220	25.4 × 50	1070
500	6.8	10 × 20	100
	10	12.5 × 20	135
	15	12.5 × 25	182
	22	12.5 × 30	210
	27	10 × 50	253
	33	16 × 31.5	319
		18 × 25	308
	39	12.5 × 50	358
	40	12.5 × 50	360
	47	18 × 31.5	393
	56	12.5 × 60	440
		22 × 25	390
	60	12.5 × 60	455
	68	18 × 35.5	489
		22 × 30	450
	82	18 × 40	594
		25.4 × 30	530
	100	18 × 45	620
		20 × 40	618
		22 × 35	580
		22 × 40	610
	120	22 × 45	702
		25.4 × 35	680
		25.4 × 40	710
	150	22 × 50	827
	180	25.4 × 50	950

NFK Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFC → NFK

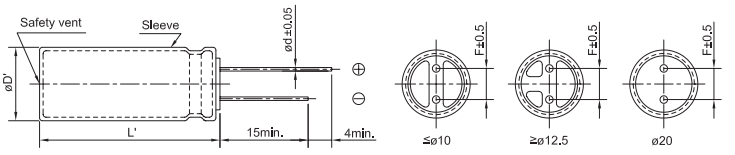
High Ripple

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 V_{DC}	420 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance (μF) V:Rated voltage (V_{DC})(at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 420~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFK Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10	12.5	16	18	20	22	25.4
Ød	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
ØD'	ØD+0.5 max.							
L'	L+1.5max.	L+2.0max.						

※ Ø10 x 12L, L'≦ L+1.5

RATINGS OF NFK Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	27	10 × 12	240
		10 × 12.5	240
	33	10 × 20	250
	47	12.5 × 20	340
	68	12.5 × 20	400
		12.5 × 25	436
	100	12.5 × 30	550
	150	16 × 25	736
	220	16 × 31.5	912
	330	18 × 31.5	1200
		22 × 25	1190
	390	22 × 30	1370
	470	25.4 × 30	1610
	560	22 × 35	1740
		22 × 40	1820
	680	22 × 45	2090
		25.4 × 35	2050
	820	22 × 50	2390
		25.4 × 40	2350
	1000	25.4 × 50	2810
200	22	10 × 12	162
		10 × 12.5	162
	25	8 × 20	160
	33	10 × 20	250
	47	12.5 × 20	340
	68	12.5 × 25	436
	100	12.5 × 30	550
	150	16 × 25	736
	220	18 × 31.5	985
		22 × 25	990
	330	22 × 30	1290
	390	22 × 35	1480
		25.4 × 30	1510
	470	22 × 40	1710
		25.4 × 35	1740
	560	22 × 45	1940
		22 × 50	2020
		25.4 × 40	1990
	820	25.4 × 50	2610

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1K	10K	50K	100K
Factor	1.00	1.25	1.50	1.75	2.00

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	6.8	10 × 12	86
		10 × 12.5	86
	10	8 × 15	95
		10 × 12.5	105
	15	10 × 12	128
		10 × 12.5	128
	22	10 × 16	165
	33	12.5 × 20	250
	47	12.5 × 20	320
		12.5 × 25	375
	68	10 × 40	465
		12.5 × 30	463
	82	12.5 × 35	515
	100	10 × 50	585
		16 × 25	591
	150	18 × 25	721
	180	12.5 × 50	860
		18 × 31.5	813
		22 × 25	820
	220	18 × 31.5	925
		22 × 30	960
	270	22 × 35	1130
		25.4 × 30	1140
	330	22 × 40	1300
		25.4 × 35	1330
	390	22 × 45	1480
		25.4 × 40	1510
	470	22 × 50	1690
	560	25.4 × 50	1960
350	10	8 × 20	120
		10 × 16	125
		10 × 20	130
	22	12.5 × 20	225
	33	12.5 × 20	249
		12.5 × 25	260
	47	12.5 × 30	380
	68	12.5 × 40	516
		16 × 25	510
	82	18 × 25	620
	100	18 × 31.5	743
		22 × 25	720
	120	22 × 30	840
	150	18 × 35.5	942
		25.4 × 30	1010
	180	18 × 40	1048
		22 × 35	1090
	200	22 × 40	1200
		25.4 × 35	1230
	220	22 × 45	1320
	270	22 × 50	1510
		25.4 × 40	1490
	330	25.4 × 50	1780

RATINGS OF NFK Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	6.8	8 × 15	90
	8.2	8 × 20	105
		10 × 12	98
		10 × 12.5	98
	10	10 × 16	125
	15	10 × 20	150
		12.5 × 16	140
	22	10 × 25	200
	27	12.5 × 20	250
	33	12.5 × 25	295
		16 × 20	305
	47	10 × 45	352
		12.5 × 35	375
		16 × 25	436
	68	12.5 × 40	475
		18 × 25	472
	82	18 × 31.5	700
		22 × 25	590
	100	18 × 35.5	795
	120	18 × 40	912
		22 × 30	760
	150	18 × 40	1020
		22 × 35	900
		25.4 × 30	920
	180	20 × 40	1080
		22 × 40	1040
		25.4 × 35	1060
	200	22 × 45	1140
	220	22 × 45	1200
		22 × 50	1240
		25.4 × 40	1220
	270	25.4 × 50	1470
	330	25.4 × 50	1520
420	22	10 × 20	135
	27	12.5 × 20	215
	33	16 × 20	340
	47	16 × 25	368
		18 × 20	375
	68	18 × 25	500
	82	18 × 31.5	660
		22 × 25	580
	100	18 × 35.5	750
		22 × 30	690
	120	18 × 40	830
		22 × 35	800
		25.4 × 30	810
	150	18 × 45	950
		22 × 40	940
		25.4 × 35	980
	180	22 × 45	1080
	200	25.4 × 40	1150
	220	22 × 50	1230
	270	25.4 × 50	1450

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	4.7	8 × 20	79
	6.8	10 × 16	100
	8.2	10 × 16	122
	10	10 × 20	135
	15	10 × 25	185
	22	10 × 33	215
	27	12.5 × 25	260
	33	12.5 × 30	335
		16 × 20	340
	39	10 × 45	353
	47	10 × 50	400
		12.5 × 40	405
		16 × 25	368
	68	18 × 25	500
		22 × 25	530
	82	12.5 × 50	670
		18 × 31.5	650
	100	12.5 × 60	750
		16 × 45	750
		18 × 35.5	750
		22 × 30	680
	120	16 × 50	800
		18 × 40	800
		22 × 35	790
		25.4 × 30	800
	150	18 × 45	920
		20 × 40	930
		22 × 40	950
		25.4 × 35	980
	180	22 × 45	1070
		22 × 50	1100
		25.4 × 40	1080
	200	22 × 50	1150
	220	25.4 × 50	1290
500	22	12.5 × 30	220
	27	10 × 50	305
	33	12.5 × 45	365
	39	12.5 × 50	425
	47	18 × 31.5	468
	56	22 × 25	470
	60	12.5 × 60	515
	68	16 × 45	585
		18 × 35.5	585
		22 × 30	550
	82	16 × 50	653
		18 × 35.5	640
		18 × 40	653
		25.4 × 30	640
	100	18 × 45	750
		20 × 40	800
		22 × 35	700
		22 × 40	730
	120	18 × 50	850
		22 × 45	900
		25.4 × 35	820
		25.4 × 40	860
	150	22 × 50	980
	180	25.4 × 50	1140

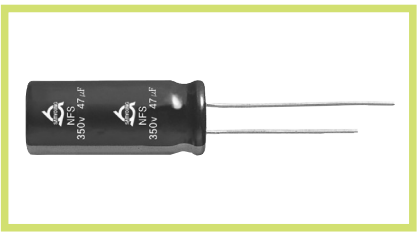
NFS Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFK → NFS

High Ripple

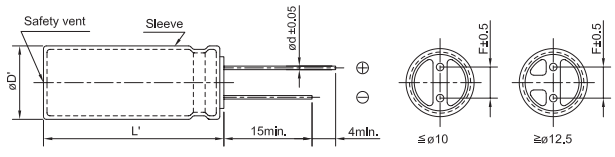


SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	200～400 V_{DC}	420～500 V_{DC}
Operating Temperature Range	-40～+105℃	-25～+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 200～250 / 350～500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 200～250 / 350～400 / 420～500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFS Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10	12.5	16	18
ød	0.6	0.6	0.6	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.				
L'	L+1.5max.	L+2.0 max.			

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NFS Series

VDC	Cap.(μF)	Case size ø D×L(mm)	Rated Ripple Current(mArms/105℃)				
			120Hz	1kHz	10kHz	50kHz	100kHz
200	22	8×20	120	240	270	285	300
		10×20	184	440	495	523	550
	33	12.5×20	300	560	630	665	700
	47	12.5×20	340	780	878	926	975
	68	12.5×20	369	880	990	1,045	1,100
		12.5×25	436	1,040	1,170	1,235	1,300
	100	12.5×30	550	775	1,395	1,473	1,550
		16×25	600	1,304	1,467	1,549	1,630
250	6.8	10×12	88	189	213	225	280
	10	10×16	165	224	288	304	320
	22	10×20	200	440	495	523	550
	33	12.5×20	250	476	612	646	680
	47	12.5×20	340	720	810	855	900
	68	16×25	540	1,080	1,215	1,283	1,350
	82	12.5×30	510	1,160	1,305	1,378	1,450
350	10	8×20	120	210	270	285	300
		10×20	135	245	315	333	350
	22	12.5×20	225	520	585	618	650
		12.5×25	270	544	612	646	680
	47	18×20	360	920	1,035	1,093	1,150
	68	16×31.5	520	1,120	1,260	1,330	1,400
400	8.2	8×20	105	293	376	397	418
	10	10×20	120	301	387	409	430
	22	12.5×25	250	624	702	741	780
	33	16×25	325	736	828	874	920
420	10	10×16	98	245	315	333	350
	22	12.5×20	215	384	432	456	480
	33	16×20	340	568	639	675	710
	47	18×20	375	600	675	713	750
	56	18×20	400	640	720	760	800
	68	18×25	500	840	945	998	1,050
	82	18×25	560	880	990	1,045	1,100
	100	18×31.5	700	1,136	1,278	1,349	1,420
	120	18×31.5	740	1,160	1,305	1,378	1,450
		18×35.5	760	1,240	1,395	1,473	1,550
	150	18×40	800	1,304	1,467	1,549	1,630
450	22	12.5×25	235	420	473	499	525
	33	16×20	340	568	639	675	710
	47	16×25	375	600	675	713	750
	68	18×25	500	840	945	998	1,050
	82	18×31.5	650	1,092	1,229	1,297	1,365
	100	18×35.5	750	1,260	1,418	1,496	1,575
	120	18×40	800	1,344	1,512	1,596	1,680
500	68	18×35.5	585	983	1,106	1,167	1,229
	82	18×40	653	1,097	1,234	1,303	1,371
	100	18×45	750	1,260	1,418	1,496	1,575

NBA Series

• 105℃ 3,000~5,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NFS → NBA

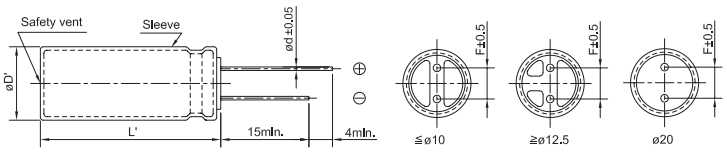
High Ripple, Low Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160~500 V_{DC}
Operating Temperature Range	-40~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~500 Z(-25℃)/Z(20℃): 3 Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. (where 3,000hour for ø6.3) Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBA Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	6.3	8	10	12.5	16	18	20	22	25.4
ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
øD'	øD+0.5 max.								
L'	L+1.5max.		L+2.0max.						

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NBA Series

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	6.8	8 × 11.5	90
	8.2	5 × 15	85
	10	6.3 × 15	106
		8 × 15	121
	15	8 × 15	148
	22	10 × 10	205
		10 × 12	221
		10 × 12.5	221
		10 × 16	243
	27	10 × 12	240
		10 × 12.5	240
		10 × 16	264
	33	10 × 16	270
	39	10 × 16	292
	47	10 × 20	369
	68	10 × 20	400
	82	10 × 25	455
		12.5 × 20	495
	100	12.5 × 20	561
	120	10 × 33	638
		12.5 × 25	638
	150	16 × 25	825
	180	16 × 25	891
	220	16 × 31.5	968
		18 × 25	968
	270	16 × 35.5	1100
	330	16 × 40	1256
		18 × 31.5	1231
		22 × 25	1200
	390	22 × 30	1380
	470	18 × 40	1541
		25.4 × 30	1630
	560	22 × 35	1750
		22 × 40	1830
	680	22 × 45	2110
		25.4 × 35	2060
	820	22 × 50	2400
		25.4 × 40	2370
	1000	25.4 × 50	2830
200	4.7	8 × 11.5	77
	8.2	6.3 × 15	101
	10	8 × 11.5	113
		8 × 20	140
	15	8 × 15	148
	22	10 × 12	221
		10 × 12.5	221
		10 × 16	243
	27	10 × 16	264
	33	10 × 20	308
	39	10 × 20	336
	47	10 × 20	369
		12.5 × 20	440
	68	12.5 × 20	492
		12.5 × 25	594
	82	12.5 × 25	616
		16 × 20	616
	100	12.5 × 30	700
		16 × 25	717
	120	12.5 × 35	815
		16 × 25	785
	150	16 × 25	836
	180	16 × 31.5	935
	220	18 × 31.5	1100
		22 × 25	1100
	270	18 × 35.5	1265
	330	18 × 40	1375
		22 × 30	1190
	390	22 × 35	1360
		25.4 × 30	1380
	470	22 × 40	1570
		25.4 × 35	1600
	560	22 × 45	1780
		22 × 50	1850
		25.4 × 40	1830
	820	25.4 × 50	2390

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	4.7	8 × 15	80
	6.8	8 × 20	106
		10 × 12	119
		10 × 12.5	119
	10	10 × 12	160
		10 × 12.5	160
	15	10 × 12	174
		10 × 12.5	174
	22	10 × 16	230
	27	10 × 20	270
	33	12.5 × 20	323
	39	12.5 × 20	354
	47	12.5 × 20	440
	68	12.5 × 25	594
	82	12.5 × 30	660
	100	16 × 25	717
	120	16 × 25	785
	150	18 × 25	902
	180	18 × 31.5	1012
		22 × 25	900
	220	18 × 31.5	1100
		22 × 30	1060
	270	22 × 35	1240
		25.4 × 30	1260
	330	22 × 40	1440
		25.4 × 35	1460
	390	22 × 45	1620
		25.4 × 40	1660
	470	22 × 50	1860
	560	25.4 × 50	2160
350	4.7	8 × 11.5	93
	6.8	8 × 15	101
	10	10 × 12	153
		10 × 12.5	153
		10 × 16	158
	15	10 × 20	197
	22	12.5 × 20	297
	27	12.5 × 20	314
	33	12.5 × 20	319
	39	12.5 × 25	352
	47	12.5 × 30	451
	68	16 × 25	605
	82	18 × 25	688
	100	18 × 31.5	817
		22 × 25	800
	120	18 × 35.5	924
		22 × 30	930
	150	18 × 35.5	1036
		25.4 × 30	1110
	180	18 × 40	1155
		22 × 35	1200
	200	22 × 40	1330
		25.4 × 35	1350
	220	22 × 45	1450
	270	22 × 50	1670
		25.4 × 40	1650
	330	25.4 × 50	1970

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1K	10K	50K	100K
1～82	1.00	1.75	2.25	2.35	2.50
100～1000	1.00	1.67	2.05	2.15	2.25

RATINGS OF NBA Series

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	1	6.3 × 11	22
	1.5	6.3 × 15	32
		8 × 11.5	34
	2.2	8 × 11.5	41
	3.3	8 × 11.5	50
	4.7	8 × 11.5	60
	6.8	8 × 15	94
	8.2	8 × 20	119
		10 × 12	132
		10 × 12.5	132
	10	10 × 16	145
	22	12.5 × 20	297
	27	12.5 × 20	314
	33	12.5 × 25	343
	39	12.5 × 25	352
		12.5 × 30	378
	47	12.5 × 35	462
		16 × 25	480
	68	12.5 × 40	550
		18 × 25	627
	82	18 × 31.5	770
		22 × 25	710
	100	18 × 31.5	817
		18 × 35.5	875
	120	18 × 35.5	924
		18 × 40	1003
		22 × 30	910
	150	18 × 40	1122
		22 × 35	1170
		25.4 × 30	1180
	180	18 × 45	1188
		20 × 40	1188
		22 × 40	1230
		25.4 × 35	1250
	200	22 × 45	1360
	220	22 × 50	1480
		25.4 × 40	1460
	270	25.4 × 50	1750
	330	25.4 × 50	1810
420	1	6.3 × 11	17
	1.5	6.3 × 15	24
		8 × 11.5	26
	2.2	8 × 11.5	30
	3.3	8 × 11.5	37
	4.7	8 × 11.5	44
	6.8	8 × 20	105
	8.2	10 × 16	113
	10	10 × 20	135
	22	12.5 × 20	225
	27	12.5 × 20	254
	33	12.5 × 30	340
		16 × 20	345
	39	12.5 × 35	380
		16 × 25	400
	47	12.5 × 40	450
		16 × 25	450
	68	18 × 25	520
		18 × 31.5	580
	82	18 × 25	600
		18 × 31.5	650
		22 × 25	630
	100	16 × 45	770
		18 × 35.5	770
		22 × 30	740
	120	16 × 50	850
		18 × 40	850
		22 × 35	860
		25.4 × 30	870
	150	18 × 45	1000
		20 × 40	1000
		22 × 40	1000
		25.4 × 35	1020
	180	22 × 45	1150
	200	25.4 × 40	1240
	220	22 × 50	1320
	270	25.4 × 50	1560

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	1	6.3 × 11	17
	1.5	6.3 × 15	24
		8 × 11.5	26
	2.2	8 × 15	33
	3.3	8 × 11.5	37
	4.7	10 × 12	76
		10 × 12.5	76
	6.8	8 × 20	105
	8.2	10 × 16	113
	10	10 × 20	135
	22	12.5 × 25	250
	27	12.5 × 25	265
	33	12.5 × 30	340
		16 × 20	345
	39	12.5 × 35	380
		16 × 25	400
	47	12.5 × 40	450
		16 × 25	450
	68	18 × 25	560
		18 × 31.5	590
		22 × 25	560
	82	16 × 40	650
		18 × 31.5	650
		22 × 30	660
	100	16 × 45	770
		18 × 35.5	770
		25.4 × 30	780
	120	16 × 50	850
		18 × 40	850
		22 × 35	850
		22 × 40	880
		25.4 × 35	900
	150	22 × 45	1030
		25.4 × 40	1050
	180	22 × 50	1170
	220	25.4 × 50	1380
500	3.3	10 × 12	63
		10 × 12.5	63
	4.7	10 × 12	75
		10 × 12.5	75
	6.8	10 × 16	110
	8.2	10 × 20	141
	10	12.5 × 20	165
	22	12.5 × 30	260
	27	12.5 × 40	329
	33	12.5 × 45	370
		16 × 25	350
	39	12.5 × 50	420
		16 × 31.5	413
	47	16 × 35.5	462
		18 × 31.5	468
	56	22 × 25	510
	68	16 × 45	630
		18 × 35.5	600
		22 × 30	600
	82	16 × 50	685
		18 × 40	670
		25.4 × 30	700
	100	18 × 45	800
		20 × 40	800
		22 × 35	800
		22 × 40	800
	120	18 × 50	920
		22 × 45	920
		25.4 × 35	900
		25.4 × 40	940
	150	22 × 50	980
	180	25.4 × 50	1250

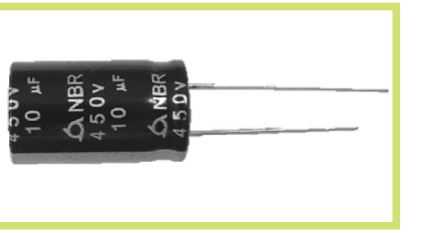
NBR Series

• 105℃ 3,000~5,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- RoHS compliant.
- Halogen-free capacitors are also available.

NBA → NBR

High Ripple

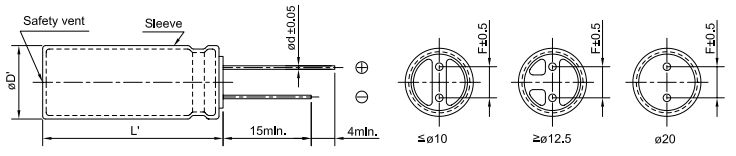


SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160~500 VDC	550 VDC
Operating Temperature Range	-40~+105℃	-25~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: ≦1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); 〉1000 → I=0.04CV+100, I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 160~250 / 350~550 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 160~500 / 550 Z(-25℃)/Z(+20℃): 3 / 6 Z(-40℃)/Z(+20℃): 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. (where 3,000hour for ø6.3) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NBR Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	6.3	8	10	12.5	16	18	20	22
ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5max.	L+2.0 max.						

※ ø10 x 12L, L'≦ L+1.5

※ ø16 x 60L, L'≦ L+3.0

RATINGS OF NBR Series

WV	160		200		250		350	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
4.7			8×11.5	85	8×15	88	8×11.5	102
6.8	8×11.5	99	8×15	113	8×20	117	8×15	111
					10×12	149		
					10×12.5	131		
10	8×15	133	8×11.5	124	10×12	176	10×12	160
							10×12.5	160
			8×20	154	10×12.5	176	10×16	168
15	8×15	163	8×15	163	10×12	191	10×20	217
					10×12.5	191		
22	10×12	260	10×12	243	10×16	253	12.5×20	327
	10×12.5	260	10×12.5	243				
	10×16	316	10×16	267				
27	10×12	300	10×16	291	10×20	297	12.5×20	345
	10×12.5	300						
	10×16	343						
33	10×16	345	10×20	339	12.5×20	356	12.5×20	351
39	10×16	350	10×20	369	12.5×20	390	12.5×25	387
47	10×20	405	10×20	405	12.5×20	484	12.5×30	496
			12.5×20	484				
68	10×20	484	12.5×20	541	12.5×25	653	16×25	666
			12.5×25	653				
82	10×25	545	12.5×25	678	12.5×30	726	18×25	756
	12.5×20	545	16×20	678				
100	12.5×20	617	12.5×30	770	16×25	789	18×31.5	899
			16×25	789				
120	10×33	702	12.5×35	897	16×25	864	18×35.5	1016
	12.5×25	702	16×25	864				
150	16×25	908	16×25	920	18×25	992	18×35.5	1140
180	16×25	980	16×31.5	1029	18×31.5	1113	18×40	1272
220	16×31.5	1065	18×31.5	1210	18×31.5	1210		
	18×25	1065						
270	16×35.5	1210	18×35.5	1392				
330	16×40	1382	18×40	1513				
	18×31.5	1354						
470	18×40	1695						

WV	400		420		450		500	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
1	6.3×11	24	6.3×11	19	6.3×11	19		
1.5	6.3×15	35	6.3×15	26	6.3×15	26		
	8×11.5	37	8×11.5	29	8×11.5	29		
2.2	8×11.5	45	8×11.5	33	8×15	36		
3.3	8×11.5	55	8×11.5	41	8×11.5	41	10×12	69
							10×12.5	69
4.7	8×11.5	66	8×11.5	48	10×12	84	10×12	83
					10×12.5	84	10×12.5	83
6.8	8×15	103	8×20	116	8×20	116	10×16	121
8.2	8×20	131	10×16	124	10×16	124	10×20	155
	10×12	145						
	10×12.5	145						
10	10×16	160	10×20	149	10×20	149	12.5×20	182
22	12.5×20	327	12.5×20	248	12.5×25	275	12.5×30	286
27	12.5×20	345	12.5×20	279	12.5×25	292	12.5×40	362
33	12.5×25	378	12.5×30	374	12.5×30	374	12.5×45	407
			16×20	380	16×20	380	16×25	385
39	12.5×25	387	12.5×35	418	12.5×35	418	12.5×50	462
	12.5×30	416	16×25	440	16×25	440	16×31.5	454
47	12.5×35	508	12.5×40	495	12.5×40	495	16×35.5	508
	16×25	528	16×25	495	16×25	495	18×31.5	515
68	12.5×40	605	18×25	572	18×25	616	16×45	693
	18×25	690	18×31.5	638	18×31.5	649	18×35.5	660
82	18×31.5	847	18×25	660	16×40	715	16×50	754
			18×31.5	715	18×31.5	715	18×40	737
100	18×31.5	899	16×45	847	16×45	847	18×45	880
	18×35.5	962	18×35.5	847	18×35.5	847	20×40	880
							22×35	880
120	18×35.5	1,016	16×50	935	16×50	935	18×50	1012
	18×40	1,104	18×40	935	18×40	935		
150	18×40	1,234	18×45	1,100				
			20×40	1,100				
180	18×45	1,307						
	20×40	1,307						

RATINGS OF NBR Series

WVDC	550	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
3.3	10x12	46
	10x12.5	46
4.7	10x16	60
6.8	10x20	78
8.2	10x20	85
10	10x25	102
	12.5x20	104
22	12.5x30	178
27	12.5x35	207
	16x25	207
33	12.5x40	241
	16x31.5	241
	18x25	241
39	12.5x50	281
	16x35.5	281
47	16x40	312
	18x31.5	312
68	16x50	408
	18x40	408
82	16x60	486
	18x50	486

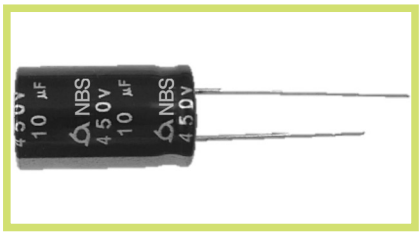
RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1～82	1.00	1.75	2.25	2.35	2.50
100～470	1.00	1.67	2.05	2.15	2.25

NBS Series

• 105℃ 5,000Hrs assured



- Non-solvent proof.
- High ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NBR → NBS

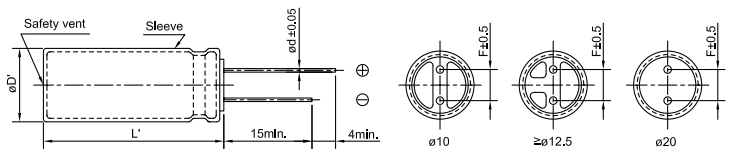
High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	CV \ Time: ≤ 1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); > 1000 → I=0.04CV+100, I=0.02CV+25 Where, I : Max. Leakage current(μA) C : Nominal capacitance(μF) V : Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160 ~ 250 / 350 ~ 500; Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160 ~ 500; Z(-25℃)/Z(+20℃): 3; Z(-40℃)/Z(+20℃): 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBS Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

ØD	10	12.5	16	18	20	22
Ød	0.6	0.6	0.8	0.8	0.8	1.0
F	5.0	5.0	7.5	7.5	7.5	10.0
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NBS Series

Vdc	160		200		250		350	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
10					10×12	180	10×12	168
							10×12.5	168
					10×12.5	180	10×16	176
15					10×12	204	10×20	228
					10×12.5	204		
22	10×12	286	10×12	276	10×16	278	12.5×20	343
	10×12.5	286	10×12.5	276				
	10×16	335	10×16	290				
27	10×12	330	10×16	315	10×20	327	12.5×20	362
	10×12.5	330						
	10×16	368						
33	10×16	360	10×20	373	12.5×20	391	12.5×20	369
39	10×16	365	10×20	405	12.5×20	429	12.5×25	406
47	10×20	436	10×20	436	12.5×20	494	12.5×30	521
			12.5×20	494				
68	10×20	515	12.5×20	595	12.5×25	665	16×25	699
			12.5×25	665				
82	10×25	575	12.5×25	711	12.5×30	782	18×25	794
	12.5×20	575	16×20	711				
100	12.5×20	650	12.5×30	835	16×25	828	18×31.5	944
			16×25	835				
120	10×33	745	12.5×35	965	16×25	907	18×35.5	1067
	12.5×25	745	16×25	927				
150	16×25	935	16×25	953	18×25	1042	18×35.5	1197
180	16×25	1029	16×31.5	1080	18×31.5	1169	18×40	1336
220	16×31.5	1118	18×31.5	1310	18×31.5	1271		
	18×25	1118						
270	16×35.5	1271	18×35.5	1461				
330	16×40	1451	18×40	1588				
	18×31.5	1422						
470	18×40	1780						

Vdc	400		420		450		500	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
6.8							10×16	125
8.2	10×12	152	10×16	130	10×16	130	10×20	158
	10×12.5	152						
10	10×16	168	10×20	160	10×20	160	12.5×20	185
22	12.5×20	343	12.5×20	260	12.5×25	285	12.5×30	290
27	12.5×20	362	12.5×20	288	12.5×25	325	12.5×40	368
33	12.5×25	397	12.5×30	385	12.5×30	385	12.5×45	415
			16×20	390	16×20	390	16×25	395
39	12.5×25	406	12.5×35	428	12.5×35	428	12.5×50	470
	12.5×30	437	16×25	450	16×25	450	16×31.5	460
47	12.5×35	533	12.5×40	520	12.5×40	520	16×35.5	525
	16×25	554	16×25	520	16×25	520	18×31.5	525
68	12.5×40	635	18×25	620	18×25	620	16×45	700
	18×25	725			18×31.5	660	18×35.5	685
82	18×31.5	889	18×25	678	16×40	730	16×50	760
			18×31.5	730	18×31.5	730	18×40	745
100	18×31.5	944	16×45	860	16×45	855	18×45	900
	18×35.5	1,010	18×35.5	860	18×35.5	855	20×40	900
							22×35	900
120	18×35.5	1,067	16×50	950	16×50	950	18×50	1050
	18×40	1,159	18×40	950	18×40	950		
150	18×40	1,296	16×50	1,150				
			18×45	1,150				
180	18×45	1,372						
	20×40	1,372						

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1~82	1.00	1.75	2.25	2.35	2.50
100~470	1.00	1.67	2.05	2.15	2.25

NFA Series

• 105℃ 7,000~10,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For ballasts stabilizer.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFC → NFA

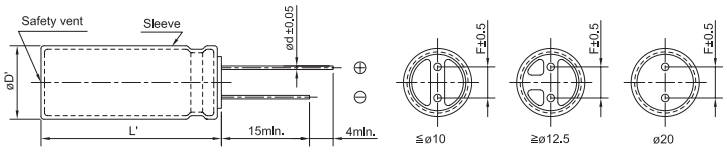
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160~400 VDC	420~500 VDC
Operating Temperature Range	-40~+105℃	-25~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 160~250 / 350~400 / 420~500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 10,000 hours at 105℃. (where, 7,000 hours for ø8, 8,000 hours for ø10) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFA Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10	12.5	16	18	20	22	25.4
ød	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
øD'	øD+0.5 max.							
L'	L+1.5max.	L+2.0 max.						

RATINGS OF NFA Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	22	10 × 20	192
	33	10 × 20	236
	47	12.5 × 20	312
	68	12.5 × 25	409
	100	16 × 25	548
	150	16 × 31.5	724
	220	16 × 31.5	876
	330	16 × 35.5	1110
		22 × 25	1130
	390	22 × 30	1310
	470	25.4 × 30	1540
	560	22 × 35	1650
		22 × 40	1730
	680	22 × 45	1990
		25.4 × 35	1950
	820	22 × 50	2270
		25.4 × 40	2240
	1000	25.4 × 50	2670
200	22	10 × 20	192
	33	10 × 20	236
		12.5 × 20	262
	47	12.5 × 20	312
	68	10 × 33	409
		12.5 × 25	409
	100	16 × 25	548
	150	12.5 × 35	600
		16 × 31.5	701
	220	12.5 × 45	700
		16 × 31.5	800
		18 × 31.5	906
		22 × 25	730
	330	16 × 45	1100
		22 × 30	1090
	390	22 × 35	1250
		25.4 × 30	1270
	470	22 × 40	1440
		25.4 × 35	1470
	560	22 × 45	1640
		22 × 50	1710
		25.4 × 40	1680
	820	25.4 × 50	2200

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	10	10 × 20	130
	22	12.5 × 20	214
	33	12.5 × 25	285
	47	12.5 × 25	340
	56	10 × 33	350
	68	16 × 25	452
	100	16 × 31.5	591
	150	18 × 25	700
	180	22 × 25	770
	220	18 × 31.5	850
		22 × 30	910
	270	22 × 35	1060
		25.4 × 30	1080
	330	20 × 40	1196
		22 × 40	1230
		25.4 × 35	1260
	390	22 × 45	1400
		25.4 × 40	1430
	470	22 × 50	1600
	560	25.4 × 50	1860
350	10	10 × 20	126
	22	12.5 × 20	207
	33	16 × 20	284
	47	16 × 25	364
	68	16 × 31.5	472
	100	18 × 31.5	591
		22 × 25	530
	120	22 × 30	620
	150	18 × 40	760
		25.4 × 30	740
	180	22 × 35	800
	200	22 × 40	880
		25.4 × 35	900
	220	22 × 45	970
	270	22 × 50	1110
		25.4 × 40	1090
	330	25.4 × 50	1310

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1K	10K	50K	100K
Factor	1.00	1.25	1.50	1.60	1.75

RATINGS OF NFA Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	2.2	8 × 11.5	27
	3.3	8 × 11.5	33
	4.7	8 × 11.5	39
	6.8	8 × 15	63
	8.2	8 × 20	75
	10	10 × 20	126
	15	10 × 20	154
	22	12.5 × 25	225
	33	16 × 20	284
	47	16 × 25	364
	68	16 × 31.5	472
	82	18 × 31.5	536
		22 × 25	490
	100	18 × 35.5	611
	120	18 × 40	680
		22 × 30	630
	150	18 × 40	760
		22 × 35	750
		25.4 × 30	800
	180	20 × 40	855
		22 × 40	860
		25.4 × 35	880
	200	22 × 45	940
	220	22 × 45	996
		22 × 50	1030
		25.4 × 40	1010
	270	25.4 × 50	1220
	330	25.4 × 50	1260
420	2.2	8 × 11.5	25
	3.3	8 × 11.5	31
	4.7	8 × 11.5	37
	6.8	8 × 20	76
	8.2	10 × 16	87
	10	10 × 20	116
	15	10 × 25	155
	22	12.5 × 20	191
	33	16 × 20	262
	47	16 × 25	335
	68	18 × 25	435
	82	16 × 31.5	507
		22 × 25	490
	100	18 × 31.5	580
		22 × 30	580
	120	18 × 40	659
		22 × 35	670
		25.4 × 30	680
	150	18 × 45	757
		22 × 40	790
		25.4 × 35	800
	180	22 × 45	900
	200	25.4 × 40	970
	220	22 × 50	1030
	270	25.4 × 50	1200

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	2.2	8 × 15	44
	3.3	10 × 16	63
	4.7	10 × 16	74
	6.8	10 × 20	96
	8.2	10 × 20	106
	10	10 × 20	108
		12.5 × 20	114
	22	16 × 25	241
	33	12.5 × 30	315
		16 × 31.5	319
	47	18 × 25	368
	56	16 × 31.5	410
	68	18 × 25	435
		18 × 31.5	473
		22 × 25	440
	82	18 × 35.5	537
	100	18 × 40	602
		22 × 30	570
	120	18 × 40	659
		22 × 35	660
		25.4 × 30	670
	150	20 × 40	757
		22 × 40	780
		25.4 × 35	790
	180	22 × 45	892
		25.4 × 40	910
	200	22 × 50	970
	220	25.4 × 50	1090
500	3.3	10 × 12.5	52
	4.7	10 × 12.5	62
	6.8	10 × 16	83
	8.2	10 × 20	98
	10	12.5 × 20	120
	22	16 × 25	228
	33	18 × 20	230
		18 × 25	260
	47	18 × 31.5	393
	56	18 × 31.5	393
		22 × 25	390
	68	16 × 45	625
		18 × 35.5	550
		22 × 30	460
	82	25.4 × 30	540
	100	22 × 35	590
		22 × 40	620
	120	22 × 45	710
		25.4 × 35	690
		25.4 × 40	720
	150	22 × 50	827
	180	25.4 × 50	960

NFL Series

• 105℃ 8,000~12,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For ballasts stabilizer and other long life required applications.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFA → NFL

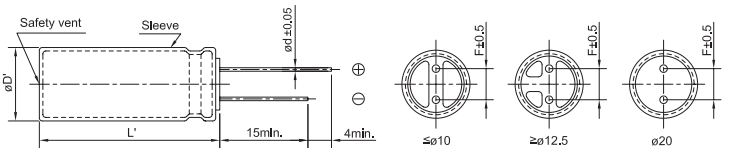
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160~400 V_{DC}	450~500 V_{DC}
Operating Temperature Range	-40~+105℃	-25~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉 1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 12,000 hours at 105℃. (where, 8,000 hours for Ø8, 10,000 hours for Ø10, Ø8x50L) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measuremensts. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFL Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10	12.5	16	18	20
Ød	0.6	0.6	0.6	0.8	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5	7.5
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

※ Ø8 x 11.5~20L, L'≦ L+1.5

RATINGS OF NFL Series

Vdc	160		200	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
27			10×16	200
39	10×16	237	10×20	256
47	10×20	280	12.5×20	312
56	10×25	335	12.5×25	371
68	12.5×20	375	12.5×25	409
100	10×45	562	10×50	591
	12.5×25	496	16×25	550
150	16×31.5	724	12.5×50	786
			16×25	671
220	12.5×50	952	18×31.5	905
	16×31.5	876		
270	16×35.5	992	18×35.5	1,036
330	16×40	1,132	18×40	1,164
	18×31.5	1,109		
390	18×35.5	1,246		
470	18×40	1,389		

Vdc	250		350	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
10	10×16	120	10×16	110
22	10×20	192	12.5×20	213
33	10×25	257	8×50	245
			12.5×25	285
39	10×30	290	10×40	340
47	8×50	250	10×50	405
	12.5×20	312	16×25	375
68	10×40	450	16×31.5	503
	12.5×30	441	18×25	488
82	10×50	536	12.5×45	571
100	10×50	585	18×31.5	610
	16×25	548		
150	18×25	748		
180	12.5×50	800		
220	18×31.5	905		

Vdc	400		450	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
3.3	8×11.5	33		
4.7	8×15	42	10×16	70
6.8	8×20	59	10×20	90
10	10×20	110	12.5×20	120
22	12.5×20	208	8×50	230
			16×25	228
27	8×50	154		
33	16×20	261	16×31.5	270
39	10×45	340	10×50	305
47	16×25	335	18×31.5	360
68	12.5×45	482	12.5×50	473
	16×31.5	460	18×35.5	500
82	12.5×50	527	18×35.5	549
	18×31.5	520		
100	18×35.5	630	12.5×60	626
			18×35.5	660
			18×40	670
120	18×40	700	20×40	720

RATINGS OF NFL Series

Vdc	500	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃,120Hz)
10	12.5×20	150
22	16×25	228
27	10×50	253
33	16×31.5	270
	18×25	260
39	12.5×50	358
47	18×31.5	360
60	12.5×60	467
68	18×35.5	500
82	18×40	606
100	20×40	657

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	50k	100k
Factor	1.00	1.25	1.50	1.60	1.75

NFR Series

• 105℃ 8,000~12,000Hrs assured.

- Non-solvent proof.
- High Ripple, Long Life.
- For Ballasts stabilizer and other long life required applications.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NFL → NFR

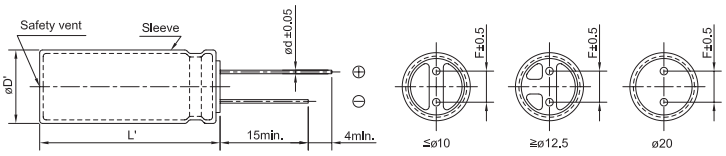
High Ripple

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	160~400 V_{DC}	420~500 V_{DC}	
Operating Temperature Range	-40~+105℃	-25~+105℃	
Capacitance Tolerance	±20%(M)		(at 20℃, 120Hz)
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC})		(at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24		(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 420~500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / -		(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 12,000 hours at 105℃. (where, 8,000 hours for Ø8, 10,000 hours for Ø10, Ø8x50L) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value		
Others	Satisfied characteristics KS C IEC 60384-4		

DIMENSIONS OF NFR Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10	12.5	16	18	20
Ød	0.6	0.6	0.6	0.8	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5	7.5
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

※ Ø8×11.5~20L, L' ≦ L+1.5

RATINGS OF NFR Series

Vdc	160		200	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)
10	10×16	320	10×16	320
22	10×16	450	10×16	450
25	10×16	478	8×20	465
			10×16	478
27	10×16	500	10×16	500
33	10×16	600	10×20	650
39	10×16	613	10×20	670
47	10×20	750	12.5×20	850
56	10×20	788	12.5×25	1,013
68	10×20	900	10×33	1,200
	12.5×20	950	12.5×25	1,070
82	12.5×25	1,025	16×20	1,250
100	12.5×25	1,125	16×25	1,300
	16×20	1,125		
120	16×25	1,339	16×25	1,339
150	16×25	1,510	16×25	1,510
220	16×31.5	1,933	18×31.5	2,030
	18×25	1,870		
270	16×35.5	2,189	18×35.5	2,300
330	16×40	2,516	18×40	2,586
	18×31.5	2,446		
390	18×35.5	2,745		
470	18×40	3,064		

Vdc	250		350	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)
4.7	8×11.5	160		
6.8	8×11.5	180		
	10×12.5	250		
10	8×15	240	8×20	350
	10×16	350	10×16	330
22	10×16	470	12.5×20	650
	10×20	500		
33	12.5×16	613	10×33	700
			12.5×25	750
	12.5×20	688	16×20	750
47	8×50	875	10×50	950
	12.5×20	850	16×20	950
68	10×40	1,125	16×31.5	1,300
	12.5×25	1,070	18×25	1,300
82	12.5×30	1,340	18×25	1,400
	16×20	1,340		
100	16×25	1,400	18×31.5	1,550
	18×20	1,400		
120	18×20	1,450		
150	18×25	1,740		
180	12.5×50	1,910		
	18×31.5	1,960		
220	18×31.5	2,040		

RATINGS OF NFR Series

WVDC	400		420	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)
1	8×11.5	60		
2.2	8×11.5	100		
3.3	8×11.5	130		
	10×12.5	150		
4.7	8×11.5	145		
	10×12.5	170		
6.8	8×15	180		
	10×16	280		
10	8×20	350	10×20	360
	10×16	350		
15	10×20	410	12.5×20	450
	12.5×16	410		
22	10×25	500	12.5×25	580
	12.5×20	550	16×20	725
33	12.5×25	780	12.5×30	750
	16×20	800	16×25	920
47	16×25	980	12.5×40	920
	18×20	980	16×25	980
56			18×20	950
68	18×25	1,350	18×25	1,100
82	18×31.5	1,500	18×31.5	1,300
100	18×35.5	1,650	18×35.5	1,400
120	18×40	1,850	18×35.5	1,600
			18×40	1,750
150	18×45	1,900		
180	18×45	2,000		

WVDC	450		500	
Items / μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)
4.7	8×20	220		
	10×16	220		
6.8	10×16	250		
	10×20	280		
10	10×20	360	12.5×20	440
15	10×20	400	12.5×25	500
	12.5×20	450	16×20	500
22	12.5×25	580	12.5×30	600
	16×20	725	16×25	600
			18×20	600
33	12.5×30	750	16×31.5	700
	16×25	920	18×25	700
40			12.5×50	860
47	10×50	900	18×31.5	880
	12.5×40	920		
	16×25	980		
60			12.5×60	1,180
68	18×25	1,100	18×35.5	1,200
82	18×31.5	1,300	18×40	1,300
100	18×35.5	1,400	18×45	1,500
			20×40	1,500
120	18×40	1,650		
150	18×45	1,800		
	20×40	1,800		

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1~15	0.35	0.65	0.90	0.95	1.00
22~82	0.40	0.70	0.90	0.95	1.00
100~470	0.45	0.75	0.90	0.95	1.00

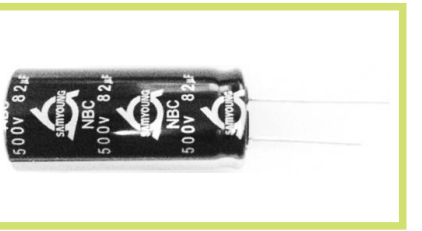
NBC Series

• 105℃ 5,000~12,000Hrs assured.

- Non-solvent proof
- High Ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NFR → NBC

High Ripple, Low Temp.

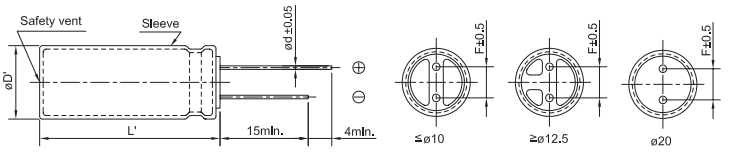


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160~500 V_{DC}
Operating Temperature Range	-40~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: ≤ 1000 → After 1 minute: I=0.1CV+40, After 5 minutes: I=0.03CV+15; 〉1000 → I=0.04CV+100, I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~500 Z(-25℃)/Z(20℃): 3 Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 12,000 hours at 105℃. (where 5,000 hours for ø6.3, 8,000 hours for ø8, 10,000 hours for ø10) Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBC Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	6.3	8	10	12.5	16	18	20	22	25.4
ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	1.0	1.0
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0	10.0
øD'	øD+0.5 max.								
L'	L+1.5max.	L+2.0 max.							

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NBC Series

Vdc	Capacitance (μF)	ø D×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
160	6.8	8 × 11.5	90
	8.2	5 × 15	85
	10	6.3 × 15	106
		8 × 15	121
	15	8 × 15	148
	22	10 × 12	221
		10 × 12.5	221
		10 × 16	243
	27	10 × 12	240
		10 × 12.5	240
		10 × 16	264
	33	10 × 16	270
	39	10 × 16	292
	47	10 × 20	369
	68	10 × 20	400
	82	10 × 25	455
		12.5 × 20	495
	100	12.5 × 20	561
	120	10 × 33	638
		12.5 × 25	638
	150	16 × 25	825
	180	16 × 25	891
	220	16 × 31.5	968
		18 × 25	968
	270	16 × 35.5	1100
	330	16 × 40	1256
		18 × 31.5	1231
		22 × 25	1200
	390	22 × 30	1380
	470	18 × 40	1541
		25.4 × 30	1630
	560	22 × 35	1750
		22 × 40	1830
	680	22 × 45	2110
		25.4 × 35	2060
	820	22 × 50	2400
		25.4 × 40	2370
	1000	25.4 × 50	2830
200	4.7	8 × 11.5	77
	8.2	6.3 × 15	101
	10	8 × 11.5	113
		8 × 20	140
	15	8 × 15	148
	22	10 × 12	221
		10 × 12.5	221
		10 × 16	243
	27	10 × 16	264
	33	10 × 20	308
	39	10 × 20	336
	47	10 × 20	369
		12.5 × 20	440
	68	12.5 × 20	492
		12.5 × 25	594
	82	12.5 × 25	616
		16 × 20	616
	100	12.5 × 30	700
		16 × 25	717
	120	12.5 × 35	815
		16 × 25	785
	150	16 × 25	836
	180	16 × 31.5	935
	220	18 × 31.5	1100
		22 × 25	1100
	270	18 × 35.5	1265
		22 × 30	1070
	330	18 × 40	1375
	390	22 × 35	1360
		25.4 × 30	1380
	470	22 × 40	1570
		25.4 × 35	1600
	560	22 × 45	1780
		22 × 50	1850
		25.4 × 40	1830
	820	25.4 × 50	2390

Vdc	Capacitance (μF)	ø D×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
250	4.7	8 × 15	80
	6.8	8 × 20	106
		10 × 12	119
		10 × 12.5	119
	10	10 × 12	160
		10 × 12.5	160
	15	10 × 12	174
		10 × 12.5	174
	22	10 × 16	230
	27	10 × 20	270
	33	12.5 × 20	323
	39	12.5 × 20	354
	47	12.5 × 20	440
	68	12.5 × 25	594
	82	12.5 × 30	660
	100	16 × 25	717
	120	16 × 25	785
	150	18 × 25	902
	180	18 × 31.5	1012
		22 × 25	900
	220	18 × 31.5	1100
		22 × 30	1060
	270	22 × 35	1240
		25.4 × 30	1260
	330	22 × 40	1440
		25.4 × 35	1460
	390	22 × 45	1620
		25.4 × 40	1660
	470	22 × 50	1860
	560	25.4 × 50	2160
350	4.7	8 × 11.5	93
	6.8	8 × 15	101
	10	10 × 12	153
		10 × 12.5	153
		10 × 16	158
	15	10 × 20	197
	22	12.5 × 20	297
	27	12.5 × 20	314
	33	12.5 × 20	319
	39	12.5 × 25	352
	47	12.5 × 30	451
	68	16 × 25	605
	82	18 × 25	688
	100	18 × 31.5	817
		22 × 25	800
	120	18 × 35.5	924
		22 × 30	930
	150	18 × 35.5	1036
		25.4 × 30	1110
	180	18 × 40	1155
		22 × 35	1200
	200	22 × 40	1330
		25.4 × 35	1350
	220	22 × 45	1450
	270	22 × 50	1670
		25.4 × 40	1650
	330	25.4 × 50	1970

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1K	10K	50K	100K
1～82	1.00	1.75	2.25	2.35	2.50
100～1000	1.00	1.67	2.05	2.15	2.25

RATINGS OF NBC Series

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
400	1	6.3 × 11	22
	1.5	6.3 × 15	32
		8 × 11.5	34
	2.2	8 × 11.5	41
	3.3	8 × 11.5	50
	4.7	8 × 11.5	60
	6.8	8 × 15	94
	8.2	8 × 20	119
		10 × 12	132
		10 × 12.5	132
	10	10 × 16	145
	22	12.5 × 20	297
	27	12.5 × 20	314
	33	12.5 × 25	343
	39	12.5 × 25	352
		12.5 × 30	378
	47	12.5 × 35	462
		16 × 25	480
	68	12.5 × 40	550
		18 × 25	627
	82	18 × 25	770
		18 × 31.5	770
		22 × 25	710
	100	18 × 31.5	817
		18 × 35.5	875
	120	18 × 35.5	924
		18 × 40	1003
		22 × 30	910
	150	18 × 40	1122
		22 × 35	1100
		25.4 × 30	1150
	180	18 × 45	1188
		20 × 40	1188
		22 × 40	1230
		25.4 × 35	1250
	200	22 × 45	1360
	220	22 × 50	1480
		25.4 × 40	1460
	270	25.4 × 50	1750
	330	25.4 × 50	1810
420	1	6.3 × 11	17
	1.5	6.3 × 15	24
		8 × 11.5	26
	2.2	8 × 11.5	30
	3.3	8 × 11.5	37
	4.7	8 × 11.5	44
	6.8	8 × 20	105
	8.2	10 × 16	113
	10	10 × 20	135
	22	12.5 × 20	225
	27	12.5 × 20	254
	33	12.5 × 30	340
		16 × 20	345
	39	12.5 × 35	380
		16 × 25	400
	47	12.5 × 40	450
		16 × 25	450
	68	18 × 25	520
		18 × 31.5	580
	82	18 × 25	600
		18 × 31.5	650
		22 × 25	630
	100	16 × 45	770
		18 × 35.5	770
		22 × 30	740
	120	16 × 50	850
		18 × 40	850
		22 × 35	860
		25.4 × 30	870
	150	18 × 45	1000
		20 × 40	1000
		22 × 40	1000
		25.4 × 35	1020
	180	22 × 45	1150
	200	25.4 × 40	1240
	220	22 × 50	1320
	270	25.4 × 50	1560

VDC	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃, 120Hz)
450	1	6.3 × 11	17
	1.5	6.3 × 15	24
		8 × 11.5	26
	2.2	8 × 15	33
	3.3	8 × 11.5	37
	4.7	10 × 12	76
		10 × 12.5	76
	6.8	8 × 20	105
	8.2	10 × 16	113
	10	10 × 20	135
	22	12.5 × 25	250
	27	12.5 × 25	265
	33	12.5 × 30	340
		16 × 20	345
	39	12.5 × 35	380
		16 × 25	400
	47	12.5 × 40	450
		16 × 25	450
	56	16 × 31.5	520
	68	18 × 25	560
		18 × 31.5	590
		22 × 25	560
	82	16 × 40	650
		18 × 31.5	650
		22 × 30	660
	100	16 × 45	770
		18 × 35.5	770
		25.4 × 30	780
	120	16 × 50	850
		18 × 40	850
		22 × 35	850
		22 × 40	880
		25.4 × 35	900
	150	22 × 45	1030
		25.4 × 40	1050
	180	22 × 50	1170
	220	25.4 × 50	1380
500	3.3	10 × 12	63
		10 × 12.5	63
	4.7	10 × 12	75
		10 × 12.5	75
	6.8	10 × 16	110
	8.2	10 × 20	141
	10	12.5 × 20	165
	22	12.5 × 30	260
	27	12.5 × 40	329
	33	12.5 × 45	370
		16 × 25	350
	39	12.5 × 50	420
		16 × 31.5	413
	47	16 × 35.5	462
		18 × 31.5	468
	56	22 × 25	510
	68	16 × 45	630
		18 × 35.5	600
		22 × 30	600
	82	16 × 50	685
		18 × 40	670
		25.4 × 30	700
	100	18 × 45	800
		20 × 40	800
		22 × 35	800
		22 × 40	800
	120	18 × 50	920
		22 × 45	920
		25.4 × 35	900
		25.4 × 40	940
	150	22 × 50	980
	180	25.4 × 50	1250

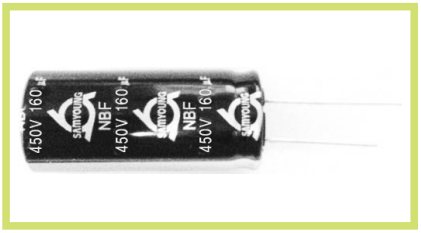
NBF Series

• 105℃ 12,000Hrs assured.

- Non-solvent proof
- High Ripple, Long Life, Low Temp.
- Suitable to fit for automotive equipment
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NBC → NBF

High Ripple, Downsized

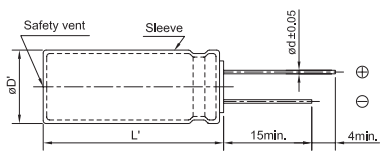


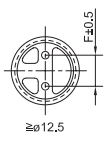
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	450～500
Operating Temperature Range	-40～+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: ≤ 1000 → After 1 minute: I=0.1CV+40; After 5 minutes: I=0.03CV+15; 〉1000 → After 1 minute: I=0.04CV+100; After 5 minutes: I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 450～500; Tanδ(Max.): 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 450～500; Z(-25℃)/Z(20℃): 3; Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcation sshall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak volrage shall not exceed the rated voltage) for 12,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ Capacitancechange
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing then for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBF Series

Unit(mm)





Marking : BLACK SLEEVE, WHITE INK

øD	16	18
ød	0.8	0.8
F	7.5	7.5
øD'	øD+0.5 max.	
L'	L+2.0 max.	

RATINGS OF NBF Series

Vdc	Capacitance (μF)	ØD×L(㎜)	Rated Ripple Current (mArms/105℃,120㎑)
450	47	16 × 20	400
	62	16 × 25	510
		18 × 20	510
	82	16 × 31.5	650
		18 × 25	640
	100	16 × 35.5	750
	110	18 × 31.5	800
	120	16 × 45	860
	130	18 × 35.5	920
	160	18 × 40	980
	180	18 × 45	1020
500	33	16 × 20	340
	39	16 × 25	390
	52	16 × 31.5	490
		18 × 25	480
	82	16 × 45	710
		18 × 31.5	660
		18 × 35.5	690
	100	16 × 50	810
		18 × 40	790

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1～82	1.00	1.75	2.25	2.35	2.50
100～1000	1.00	1.67	2.05	2.15	2.25

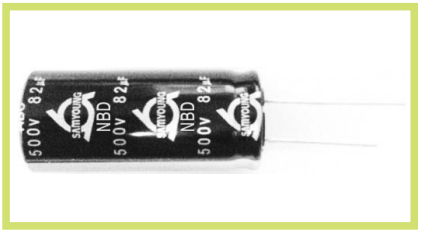
NBD Series

• 105℃ 10,000~12,000Hrs assured.

- Non-solvent proof
- High Ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NBC → NBD

High Ripple

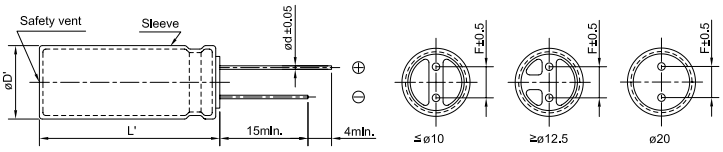


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160~500 V_{DC}
Operating Temperature Range	-40~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: ≤ 1000: After 1 minute I=0.1CV+40, After 5 minutes I=0.03CV+15; 〉1000: After 1 minute I=0.04CV+100, After 5 minutes I=0.02CV+25. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500; Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~500; Z(-25℃)/Z(20℃): 3; Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 12,000 hours at 105℃. (where 10,000 hours for ø10) Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value Tanδ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBD Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

ØD	10	12.5	16	18	20	22
Ød	0.6	0.6	0.8	0.8	0.8	1.0
F	5.0	5.0	7.5	7.5	7.5	10.0
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NBD Series

WVDC	160		200		250		350	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
10					10 x 12	180	10 x 12	168
							10 x 12.5	168
					10 x 12.5	180	10 x 16	176
15					10 x 12	204	10 x 20	228
					10 x 12.5	204		
22	10 x 12	286	10 x 12	276	10 x 16	278	12.5 x 20	343
	10 x 12.5	286	10 x 12.5	276				
	10 x 16	335	10 x 16	290				
27	10 x 12	330	10 x 16	315	10 x 20	327	12.5 x 20	362
	10 x 12.5	330						
	10 x 16	368						
33	10 x 16	360	10 x 20	373	12.5 x 20	391	12.5 x 20	369
39	10 x 16	365	10 x 20	405	12.5 x 20	429	12.5 x 25	406
47	10 x 20	436	10 x 20	436	12.5 x 20	494	12.5 x 30	521
			12.5 x 20	494				
68	10 x 20	515	12.5 x 20	595	12.5 x 25	665	16 x 25	699
			12.5 x 25	665				
82	10 x 25	575	12.5 x 25	711	12.5 x 30	782	18 x 25	794
	12.5 x 20	575	16 x 20	711				
100	12.5 x 20	650	12.5 x 30	835	16 x 25	828	18 x 31.5	944
			16 x 25	835				
120	10 x 33	745	12.5 x 35	965	16 x 25	907	18 x 35.5	1067
	12.5 x 25	745	16 x 25	927				
150	16 x 25	935	16 x 25	953	18 x 25	1042	18 x 35.5	1197
180	16 x 25	1029	16 x 31.5	1080	18 x 31.5	1169	18 x 40	1336
220	16 x 31.5	1118	18 x 31.5	1310	18 x 31.5	1271		
	18 x 25	1118						
270	16 x 35.5	1271	18 x 35.5	1461				
330	16 x 40	1451	18 x 40	1588				
	18 x 31.5	1422						
470	18 x 40	1780						

WVDC	400		420		450		500	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
6.8							10 × 16	125
8.2	10 x 12	152	10 x 16	130	10 x 16	130	10 × 20	158
	10 x 12.5	152						
10	10 x 16	168	10 x 20	160	10 x 20	160	12.5 x 20	185
22	12.5 x 20	343	12.5 x 20	260	12.5 x 25	285	12.5 x 30	290
27	12.5 x 20	362	12.5 x 20	288	12.5 x 25	325	12.5 x 40	368
33	12.5 x 25	397	12.5 x 30	385	12.5 x 30	385	12.5 x 45	415
			16 x 20	390	16 x 20	390	16 x 25	395
39	12.5 x 25	406	12.5 x 35	428	12.5 x 35	428	12.5 x 50	470
	12.5 x 30	437	16 x 25	450	16 x 25	450	16 x 31.5	460
47	12.5 x 35	533	12.5 x 40	520	12.5 x 40	520	16 x 35.5	525
	16 x 25	554	16 x 25	520	16 x 25	520	18 x 31.5	525
68	12.5 x 40	635	18 x 25	620	18 x 25	620	16 x 45	700
	18 x 25	725			18 x 31.5	660	18 x 35.5	685
82	18 x 31.5	889	18 x 25	678	16 x 40	730	16 x 50	760
			18 x 31.5	730	18 x 31.5	730	18 x 40	745
100	18 x 31.5	944	16 x 45	860	16 x 45	855	18 x 45	900
	18 x 35.5	1,010	18 x 35.5	860	18 x 35.5	855	20 x 40	900
							22 x 35	900
120	18 x 35.5	1,067	16 x 50	950	16 x 50	950	18 x 50	1050
	18 x 40	1,159	18 x 40	950	18 x 40	950		
150	18 x 40	1,296	16 x 50	1,150				
			18 x 45	1,150				
180	18 x 45	1,372						
	20 x 40	1,372						

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
6.8～82	1.00	1.75	2.25	2.35	2.50
100～470	1.00	1.67	2.05	2.15	2.25

NBL Series

• 105℃ 15,000~20,000Hrs assured.

- Non-solvent proof
- High Ripple, Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NBC → NBL

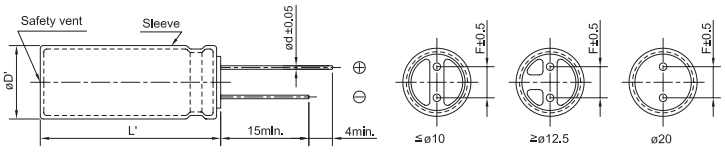
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160~500 V_{DC}
Operating Temperature Range	-40~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≤ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~500 Z(-25℃)/Z(20℃): 3 Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 20,000 hours at 105℃. (where 15,000 hours for ø10, ø12.5) Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBL Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

ØD	10	12.5	16	18	20	22
Ød	0.6	0.6	0.8	0.8	0.8	1.0
F	5.0	5.0	7.5	7.5	7.5	10.0
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

※ ø10 x 12L, L'≦ L+1.5

RATINGS OF NBL Series

WVDC	160		200		250		350	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
6.8					10×12	119	10×12	105
					10×12.5	119	10×12.5	105
10					10×12	160	10×16	149
					10×12.5	160		
15			10×12	150	10×16	220	10×20	197
			10×12.5	150				
22	10×12	221	10×16	243	10×20	240	12.5×20	297
	10×12.5	221						
	10×16	243						
27	10×16	264	10×20	280	10×20	270	12.5×20	314
33	10×16	270	10×20	308	12.5×20	323	12.5×25	325
39	10×20	320	10×25	350	12.5×20	354	12.5×25	352
47	10×20	369	10×33	450	12.5×25	460	12.5×30	451
			12.5×20	440				
68	10×33	480	12.5×25	594	12.5×30	610	16×31.5	623
82	10×33	520	12.5×30	640	12.5×35	680	18×25	688
	12.5×25	525	16×20	616				
100	12.5×25	575	12.5×35	740	16×25	717	18×31.5	817
			16×25	717				
120	10×50	700	12.5×40	850	16×31.5	804	18×35.5	924
	12.5×30	670	16×25	785				
150	16×25	825	16×31.5	813	16×35.5	902	18×40	1,083
180	16×25	891	16×35.5	951	18×31.5	1,012	18×45	1,230
220	16×31.5	968	18×31.5	1,100	18×35.5	1,121		
	18×25	968						
270	16×35.5	1,100	18×40	1,290				
330	18×31.5	1,231	18×45	1,390				
470	18×45	1,626						

WVDC	400		420		450		500	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
3.3							10×12	63
							10×12.5	63
4.7					10×12	76	10×16	83
					10×12.5	76		
6.8					10×16	110	10×20	119
8.2	10×16	140	10×16	113	10×20	122	10×20	141
10	10×16	145	10×20	135	10×20	135	12.5×20	165
22	12.5×20	297	12.5×25	250	12.5×25	250	12.5×35	260
27	12.5×25	330	12.5×25	265	12.5×30	280	12.5×40	329
33	12.5×30	355	12.5×30	340	12.5×35	360	12.5×45	370
			16×20	345	16×25	361	16×31.5	380
39	12.5×35	400	12.5×35	380	12.5×40	400	12.5×50	420
			16×25	400	16×31.5	423	16×35.5	434
47	12.5×40	485	12.5×40	450	12.5×50	470	18×31.5	468
	16×25	480	16×25	450	16×31.5	478		
68	12.5×50	575	18×31.5	580	18×31.5	580	18×40	630
	16×35.5	627						
82	16×40	770	16×40	620	18×35.5	650	18×45	685
100	18×35.5	875	18×35.5	770	18×40	794	22×40	800
120	18×40	1,003	18×45	900	18×50	940	22×50	960
150	18×50	1,192						

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
3.3～82	1.00	1.75	2.25	2.35	2.50
100～470	1.00	1.67	2.05	2.15	2.25

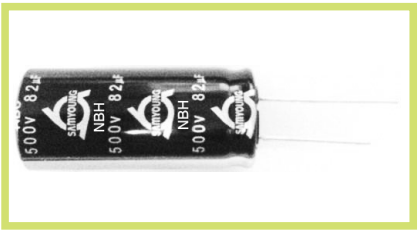
NBH Series

• 105℃ 20,000Hrs assured.

- Non-solvent proof
- High Ripple and Long Life, Low Temp.
- For SMPS, IP-Board, Adaptor, LED Lighting
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NBL → NBH

High Ripple

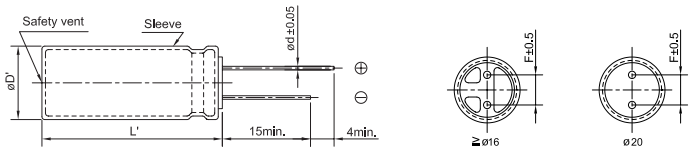


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160～500 V_{DC}
Operating Temperature Range	-40～+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	C·V \ Time: ≤ 1000: After 1 minute I=0.1CV+40, After 5 minutes I=0.03CV+15; 〉1000: After 1 minute I=0.04CV+100, After 5 minutes I=0.02CV+25. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 160～250 / 350～500; Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160～500; Z(-25℃)/Z(20℃): 3; Z(-40℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 20,000 hours at 105℃. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NBH Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	16	18	20	22
ød	0.8	0.8	0.8	1.0
F	7.5	7.5	7.5	10.0
øD'	øD+0.5 max.			
L'	L+2.0 max.			

RATINGS OF NBH Series

WVDC	160		200		250		350	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
68							16×31.5	685
82			16×20	678			18×25	756
100			16×25	789	16×25	789	18×31.5	899
120			16×25	864	16×31.5	884	18×35.5	1,016
150	16×25	908	16×31.5	894	16×35.5	992	18×40	1,191
180	16×25	980	16×35.5	1,046	18×31.5	1,113	18×45	1,353
220	16×31.5	1,065	18×31.5	1,210	18×35.5	1,233		
	18×25	1,065						
270	16×35.5	1,210	18×40	1,419				
330	18×31.5	1,354	18×45	1,529				
470	18×40	1,789						

WVDC	400		420		450		500	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/105℃, 120Hz)
33			16×20	380	16×25	397	16×31.5	418
39			16×25	440	16×31.5	465	16×35.5	477
47	16×25	528	16×25	495	16×31.5	526	18×31.5	515
68	16×35.5	690	18×31.5	638	18×31.5	638	18×40	693
82	16×40	847	16×40	682	18×35.5	715	18×45	754
100	18×35.5	962	18×35.5	847	18×40	873	22×35	820
120	18×40	1,100	18×45	990	18×50	1,000	22×45	950
150	18×50	1,300					22×50	1,030

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
33~82	1.00	1.75	2.25	2.35	2.50
100~470	1.00	1.67	2.05	2.15	2.25

NLA Series

• 105℃ 4,000~10,000Hrs assured.

Solvent-proof

- Low impedance.
- Long Life.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

LXA → NLA

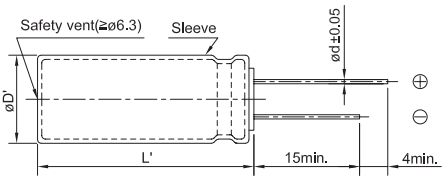
Low Imp.
Long Life

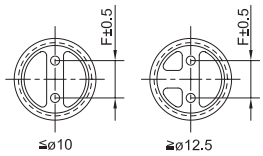
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) at 105℃ for the following test time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: 6.3~10V / 16~50V Ø5~6.3: 4,000 hours / 5,000 hours Ø8~10: 6,000 hours / 7,000 hours Ø12.5~: 8,000 hours / 10,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NLA Series

Unit(mm)





Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.				L+2.0 max		

RATINGS OF NLA Series

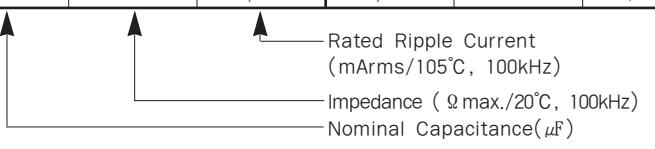
ØD×L(mm) \ Vdc	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.50	175	100	0.50	175	47	0.50	175
6.3×11	330	0.25	290	220	0.25	290	100	0.25	290
8×11.5	680	0.12	555	470	0.12	555	330	0.12	555
8×15	1,000	0.090	730	680	0.090	730	470	0.090	730
8×20	1,200	0.080	810	1,000	0.080	810	560	0.080	810
10×12.5	820	0.090	760	680	0.090	760	470	0.090	760
10×16	1,200	0.068	1,050	1,000	0.068	1,050	680	0.068	1,050
10×20	1,500	0.052	1,220	1,200	0.052	1,220	1,000	0.052	1,220
10×25	2,200	0.045	1,440	1,500	0.045	1,440	1,200	0.045	1,440
10×30	2,700	0.037	1,690	1,800	0.037	1,690	1,500	0.037	1,690
12.5×16	1,800	0.053	1,270	1,500	0.053	1,270	1,000	0.053	1,270
12.5×20	3,300	0.038	1,660	2,200	0.038	1,660	1,500	0.038	1,660
12.5×25	3,900	0.030	2,310	3,300	0.030	2,310	2,200	0,030	2,310
12.5×30	4,700	0.025	2,510	3,900	0.025	2,510	2,700	0.025	2,510
12.5×35	5,600	0.022	2,870	4,700	0.022	2,870	3,300	0.022	2,870
16×15	2,700	0.048	1,690	2,200	0.048	1,690	1,500	0.048	1,690
16×20	5,600	0.031	2,210	3,900	0.031	2,210	2,700	0.031	2,210
16×25	6,800	0.024	2,560	5,600	0.024	2,560	3.900	0.024	2,560
16×31.5	8,200	0.021	3,010	6,800	0.021	3,010	4,700	0.021	3,010
16×35	10,000	0.019	3,250	8,200	0.019	3,250	5,600	0.019	3,250
16×40	12,000	0.016	3,560	10,000	0.016	3,560	6,800	0.016	3,560
18×20	6,800	0.031	2,490	5,600	0.031	2,490	3,900	0.031	2,490
18×25	10,000	0.023	2,740	6,800	0.023	2,740	4,700	0.023	2,740
18×31.5	12,000	0.021	3,330	8,200	0.021	3,330	5,600	0.021	3,330
18×35.5	15,000	0.019	3,680	10,000	0.019	3,680	8,200	0.019	3,680
18×40	18,000	0.018	3,800	12,000	0.018	3,800	10,000	0.012	4,280

ØD×L(mm) \ Vdc	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	47	0.50	175	33	0.50	175	10	2.0	100
6.3×11	100	0.25	290	56	0.25	290	22	1.6	150
8×11.5	220	0.12	555	150	0.12	555	47	0.80	180
8×15	330	0.090	730	220	0.090	730	100	0.50	230
8×20	390	0.080	810	270	0.080	810	120	0.30	360
10×12.5	330	0.090	760	220	0.090	760	100	0.28	380
10×16	470	0.068	1,050	330	0.068	1,050	150	0.19	525
10×20	680	0.052	1,220	470	0.052	1,220	220	0.14	610
10×25	820	0.045	1,440	560	0.045	1,440	270	0.11	720
10×30	1,000	0.037	1,690	680	0.037	1,690	330	0.091	845
12.5×16	680	0.053	1,270	470	0.053	1,270	220	0.15	630
12.5×20	1,000	0.038	1,660	680	0.038	1,660	330	0.098	830
12.5×25	1,500	0.030	2,310	1,000	0.030	2,310	470	0.074	975
12.5×30	1,800	0.025	2,510	1,200	0.025	2,510	680	0.062	1,150
12.5×35	2,200	0.022	2,870	1,500	0.022	2,870	820	0.052	1,250
16×15	1,000	0.048	1,690	680	0.048	1,690	390	0.11	845
16×20	1,800	0.031	2,210	1,200	0.031	2,210	680	0.070	1,100
16×25	2,700	0.024	2,560	1,800	0.024	2,560	820	0.052	1,280
16×31.5	3,300	0.021	3,010	2,200	0.021	3,010	1,000	0.045	1,500
16×35	3,900	0.019	3,250	2,700	0.019	3,250	1,200	0.039	1,680
16×40	4,700	0.016	3,560	3,300	0.016	3,560	1,500	0.033	1,850
18×20	2,200	0.031	2,490	1,800	0.031	2,490	680	0.074	1,250
18×25	3,300	0.023	2,740	2,200	0.023	2,740	1,000	0.054	1,370
18×31.5	3,900	0.021	3,330	2,700	0.021	3,330	1,200	0.043	1,810
18×35.5	4,700	0.019	3,680	3,300	0.019	3,680	1,500	0.035	1,850
18×40	5,600	0.012	4,280	3,900	0.012	4,280	1,800	0.029	1,900

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	50k	100k
10 ~ 150	0.40	0.75	0.90	0.93	1.00
220 ~ 560	0.50	0.85	0.94	0.96	1.00
680 ~ 1,800	0.60	0.87	0.95	0.97	1.00
2,200 ~ 3,900	0.75	0.90	0.95	0.97	1.00
4,700 ~18,000	0.85	0.95	0.98	0.99	1.00



NLC Series

• 105℃ 10,000Hrs assured.

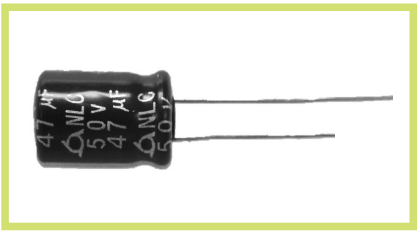
- Low impedance.
- Long Life.
- For SMPS, IP-Board, Adaptor.
- RoHS compliant.
- Halogen-free capacitors are also available.

Solvent-proof

WV ≦ 50VDC

NLA → NLC

ø8↓ Long Life

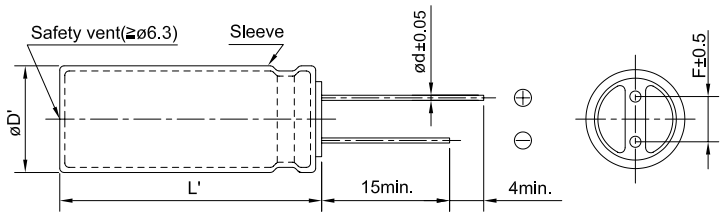


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.17 / 0.15 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25~35 / 50~100 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 10,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value(where, 300% for ≥WV63VDC) Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NLC Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8
ød	0.5	0.5	0.6
F	2.0	2.5	3.5
øD'	øD+0.5 max.		
L'	L+1.5max.		

RATINGS OF NLC Series

VDC / ØD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.70	175	100	0.70	175	47	0.70	175
6.3×11	330	0.50	252	220	0.50	250	100	0.50	252
8×11.5	680	0.24	400	470	0.24	400	330	0.24	400

VDC / ØD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11							1	4.0	32
5×11							2.2	3.0	43
5×11							3.3	2.5	84
5×11							4.7	2.5	100
5×11	47	0.70	175	33	0.70	175	10	2.0	110
6.3×11	100	0.50	252	47	0.60	252	22	1.6	228
6.3×11				56	0.50	252	33	1.6	228
8×11.5	220	0.24	400	150	0.24	400	47	0.80	330
8×15				220	0.18	520	100	0.50	400

Impedance (Ω max./20℃, 100kHz)

VDC / ØD×L(mm)	63		100	
	μF	Ripple	μF	Ripple
8×11.5	47	270	33	240

Rated Ripple Current (mArms/105℃, 100kHz)

Nominal Capacitance(μF)

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1~150	0.40	0.75	0.90	0.93	1.00
220~470	0.50	0.85	0.94	0.96	1.00
680	0.60	0.87	0.95	0.97	1.00

PXB Series

• 125℃ 2,000~5,000Hrs assured.

Solvent-proof

WV ≦ 80V$_{DC}$

- Low impedance.
- Wide Temperature range.
- Long Life.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

PXA → PXB

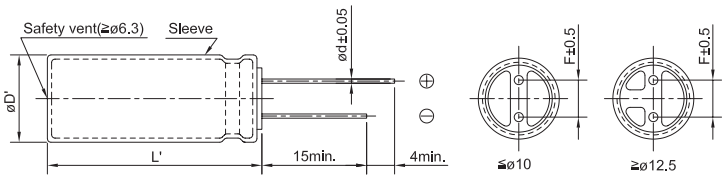
Long Life

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	10 ~ 100 V$_{DC}$	160 ~ 400 V$_{DC}$	450 V$_{DC}$
Operating Temperature Range	-40 ~ +125℃	-40 ~ +125℃	-25 ~ +125℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)		
Leakage Current	I=0.03CV (μA) or 4μA, whichever is greater.	CV≤1,000: I=0.1CV+40; CV 〉 1,000: I=0.04CV+100	
	Where, I : Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage(V$_{DC}$) (at 20℃, 1 minute)		
Dissipation Factor(Tan δ)	Rated voltage(V$_{DC}$): 10 / 16 / 25 / 35 / 50~63 / 80~100 / 160~250 / 350~450 Tanδ(Max.): 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.20 / 0.24 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)		
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V$_{DC}$): 10 / 16~35 / 50~80 / 100 / 160~250 / 350~400 / 450 Z(-25℃)/Z(+20℃): 3 / 2 / 3 / 3 / 3 / 6 / 6 Z(-40℃)/Z(+20℃): 6 / 4 / 5 / 6 / 6 / 10 / - (at 120Hz)		
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 125℃. Capacitance change ≦ ±30% of the initial value (where, ±20% for ≧ WV 160V$_{DC}$) Tanδ ≦ 300% of the initial specified value (where, 200% for ≧ WV 160V$_{DC}$) Leakage current ≦ The initial specified value	ØD: 10~100V / 160~450V Ø5~6.3: 2,000 hours / - Ø8: 3,000 hours / 5,000 hours Ø10~: 5,000 hours / 5,000 hours	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value (where, ±20% for ≧ WV 160V$_{DC}$) Tanδ ≦ 300% of the initial specified value (where, 200% for ≧ WV 160V$_{DC}$) Leakage current ≦ The initial specified value (where, 500% for ≧ WV 160V$_{DC}$)		
Others	Satisfied characteristics KS C IEC 60384-4		

DIMENSIONS OF PXB Series

Unit(mm)



Marking : GREEN SLEEVE, BLACK INK

ØD	5	6.3	8	10	12.5	16
Ød	0.5	0.5	0.6	0.6	0.6	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5
ØD'	ØD+0.5 max.					
L'	L+1.5max.			L+2.0max.		

RATINGS OF PXB Series

WV(DC)	10			16			25			35		
Items / μF	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)
22										5×11	3.0	128
33							5×11	3.0	128	6.3×11	1.0	180
47				5×11	3.0	128	6.3×11	1.0	180	6.3×11	1.0	220
68	5×11	3.0	128	6.3×11	1.0	180	6.3×11	1.0	220	8×11.5	0.35	307
100	5×11	3.0	150	6.3×11	1.0	220	8×11.5	0.35	325	8×11.5	0.35	325
	6.3×11	1.0	180	8×11.5	0.35	325				10×12.5	0.25	480
220	6.3×11	1.0	220	8×11.5	0.35	368	10×12.5	0.25	480	10×16	0.15	625
	8×11.5	0.35	325	10×12.5	0.25	480						
330	10×12.5	0.25	480	10×12.5	0.25	480	10×16	0.15	625	10×20	0.11	799
470	10×12.5	0.25	480	10×16	0.15	625	10×20	0.11	799	12.5×20	0.068	997
1,000	10×20	0.11	799	12.5×20	0.068	997	12.5×25	0.058	1,121	16×25	0.040	1,426
2,200	12.5×25	0.058	997	16×25	0.040	1,426	16×31.5	0.034	1,595			
3,300	16×25	0.040	1,426	16×31.5	0.034	1,595						
4,700	16×31.5	0.034	1,595									

WV(DC)	50			63			80			100		
Items / μF	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)
1	5×11	5.2	29									
1.5	5×11	5.2	38									
2.2	5×11	5.2	45									
3.3	5×11	5.2	55									
4.7	5×11	5.2	67									
6.8	5×11	5.2	75									
10	5×11	2.5	92									
	8×11.5	0.75	180							8×11.5	1.7	140
22	5×11	2.5	162				8×11.5	1.5	150	10×12.5	0.94	440
	8×11.5	0.50	250									
33	8×11.5	0.50	280	8×11.5	1.5	150	10×12.5	0.80	480	10×12.5	0.94	440
47	8×11.5	0.50	280	10×12.5	0.80	480	10×12.5	0.80	480	10×16	0.68	600
100	10×12.5	0.25	480	10×16	0.58	650	10×20	0.39	790	12.5×20	0.32	870
220	10×20	0.15	625	12.5×20	0.27	950	12.5×25	0.18	1,240	16×25	0.14	1,320
330	12.5×20	0.081	990	12.5×25	0.18	1,240	12.5×30	0.16	1,390	16×31.5	0.12	1,400
470	12.5×25	0.070	1,150	12.5×30	0.16	1,390	16×25	0.11	1,500			
1,000	16×31.5	0.032	1,590	16×31.5	0.090	1,650						

WV(DC)	160		200		250		350		400		450	
Items / μF	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)
3.3									8×11.5	48		
4.7			8×11.5	53			8×11.5	56	10×12.5	65		
6.8			8×15	71	8×11.5	70	8×15	75	10×16	86	10×16	80
10	8×11.5	80	8×15	86	10×12.5	91	10×16	105	10×20	112	10×20	108
15	8×15	108	10×12.5	110	10×16	115	10×20	139	12.5×20	153	12.5×20	150
22	10×12.5	135	10×20	159	12.5×20	167	12.5×25	204	12.5×25	202	16×25	242
	10×16	151							12.5×30	217		
33	10×20	204	12.5×20	216	12.5×25	223	16×25	276	16×25	273	16×31.5	321
47	12.5×20	242	12.5×25	281	16×25	294	16×31.5	355	16×31.5	351		
68	12.5×25	317	16×20	348	16×31.5	381						
100	16×25	424	16×25	452								
150	16×31.5	481										

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

(10～100V_{DC})

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
1～100	0.40	0.75	0.90	0.93	1.00
220～470	0.50	0.85	0.94	0.96	1.00
1,000	0.60	0.87	0.95	0.97	1.00
2,200～3,300	0.75	0.90	0.95	0.97	1.00
4,700	0.85	0.95	0.98	0.99	1.00

(160～450V_{DC})

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
3.3～33	1.00	1.50	1.75	1.76	1.80
47～150	1.00	1.30	1.40	1.43	1.50

PXD Series

• 125℃ 2,000~5,000Hrs assured.

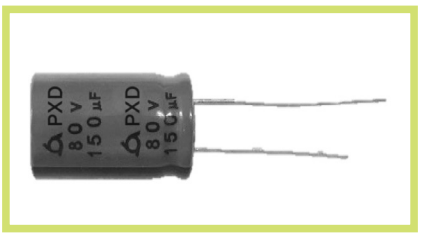
Solvent-proof

WV ≦ 80VDC

- Ultra Low Impedance.
- Wide Temperature range.
- Long Life.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

PXC → PXD

Low Imp.

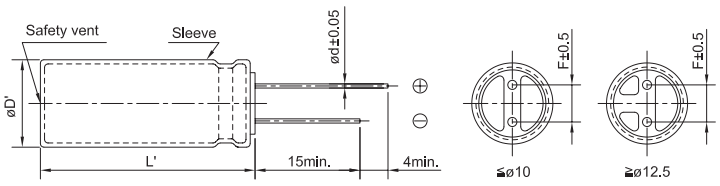


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 80 VDC
Operating Temperature Range	-40 ~ +125℃
Capacitance Tolerance	±20%(M) (at 20℃,120Hz)
Leakage Current	I = 0.03CV (μA) or 4μA, whichever is greater. Where, I:Max. Leakage current(μA),C:Nominal capacitance(μF),V:Rated voltage(VDC) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Volatag(VDC): 10 / 16 / 25 / 35 / 50~63 / 80 TANδ(Max.): 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃,120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 10 / 16 ~ 35 / 50 / 63~80 Z(-25℃)/Z(+20℃): 3 / 2 / 3 / 2 Z(-40℃)/Z(+20℃): 6 / 4 / 5 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 125℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value ØD: 10~50V / 63~80V 8Ø: 2,000 / - 10Ø~: 4,000 / 5,000
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PXD Series

Unit(mm)



Marking : GREEN SLEEVE, BLACK INK

ØD	8	10	12.5	16	18
Ød	0.6	0.6	0.6	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.				
L'	L+1.5max.	L+2.0max.			

PXD Series

RATINGS OF PXD Series

WVDC	10				16				25			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)
100					8×11.5	0.24	3.6	400				
220	8×11.5	0.24	3.6	400	10×12.5	0.11	1.1	720	10×12.5	0.11	1.1	720
330	10×12.5	0.11	1.1	720	10×12.5	0.11	1.1	720	10×16	0.071	0.71	950
470	10×12.5	0.11	1.1	720	10×16	0.071	0.71	950	10×20	0.056	0.56	1,100
1,000	10×20	0.056	0.56	1,100	12.5×20	0.044	0.31	1,250	12.5×25	0.030	0.21	1,550
2,200	12.5×25	0.030	0.21	1,550	16×25	0.023	0.16	2,000	16×31.5	0.019	0.13	2,500
3,300	16×25	0.023	0.16	2,000	16×31.5	0.019	0.13	2,500				
4,700	16×31.5	0.019	0.13	2,500								

WVDC	35				50				63			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)
10					8×11.5	0.30	4.5	230				
22					8×11.5	0.30	4.5	320				
33					8×11.5	0.30	4.5	340				
47					8×11.5	0.30	4.5	340				
100	8×11.5	0.24	3.60	400	10×12.5	0.18	1.5	590				
	10×12.5	0.11	1.10	720								
220	10×16	0.071	0.71	950	10×20	0.074	0.74	950	12.5 X 20	0.19	1.5	950
330	10×20	0.056	0.56	1,100	12.5×20	0.061	0.43	1,150	12.5 X 25	0.15	1.2	1,450
470	12.5×20	0.044	0.31	1,250	12.5×25	0.040	0.28	1,400	12.5 X 30	0.090	0.71	1,700
1,000	16×25	0.023	0.16	2,000	16×31.5	0.028	0.15	2,200	16 X 31.5	0.058	0.46	2,100

WVDC	80			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)
220	12.5 X 25	0.15	1.2	1,450
330	12.5 X 30	0.090	0.71	1,700
	16 X 20	0.085	0.58	1,790
470	12.5 X 35	0.070	0.55	2,000
	16 X 25	0.061	0.48	2,030
560	18 X 25	0.049	0.34	2,280
680	18 X 30	0.041	0.26	2,580
820	18 X 35.5	0.035	0.21	2,890

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
10～100	0.40	0.75	0.90	0.93	1.00
220～470	0.50	0.85	0.94	0.96	1.00
1,000	0.60	0.87	0.95	0.97	1.00
2,200～3,300	0.75	0.90	0.95	0.97	1.00
4,700	0.85	0.95	0.98	0.99	1.00

PFA Series

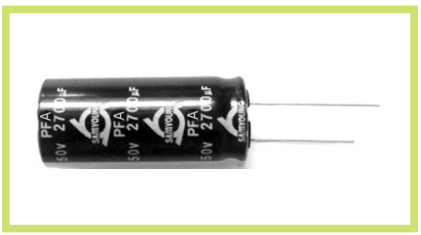
• 135℃ 2,000Hrs assured.

Solvent-proof

- Low ESR.
- Wide Temperature range.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

PXD → PFA

Wide Temp.

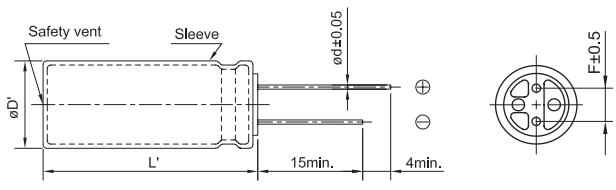


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +135℃
Capacitance Tolerance	±20%(M) (at 20℃,120Hz)
Leakage Current	I = 0.03CV (μA) or 4μA, whichever is greater. Where, I:Max. Leakage current(μA),C:Nominal capacitance(μF),V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 10 / 16 / 25 / 35 / 50~63 / 80~100 Tanδ(Max.) 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃,120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 10 / 16~35 / 50~80 / 100 Z(-25℃)/Z(20℃) 3 / 2 / 3 / 3 Z(-40℃)/Z(20℃) 6 / 4 / 5 / 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 135℃. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage Current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 135℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PFA Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	12.5	16	18
ød	0.6	0.8	0.8
F	5.0	7.5	7.5
øD'	øD+0.5 max.		
L'	L+2.0max.		

RATINGS OF PFA Series

WVDC / ØD×L(mm)	10				16				25			
	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(135℃,100kHz)		20℃	-40℃	(135℃,100kHz)		20℃	-40℃	(135℃,100kHz)
12.5×20	2,400	0.045	0.51	1,220	1,700	0.045	0.51	1,220	1,500	0.045	0.51	1,220
12.5×25	3,000	0.041	0.37	1,540	2,100	0.041	0.37	1,540	1,900	0.041	0.37	1,540
12.5×35	4,500	0.032	0.27	2,720	3,100	0.032	0.27	2,720	2,700	0.032	0.27	2,720
12.5×40	5,500	0.027	0.21	3,000	3,800	0.027	0.21	3,000	3,300	0.027	0.21	3,000
16×20	4,100	0.038	0.29	1,390	2,900	0.038	0.29	1,390	2,200	0.038	0.29	1,390
16×25	5,400	0.031	0.24	2,400	3,700	0.031	0.24	2,400	3,300	0.031	0.24	2,400
16×35.5	8,300	0.023	0.16	3,160	5,700	0.023	0.16	3,160	4,700	0.023	0.16	3,160
16×40	9,500	0.022	0.14	3,460	6,600	0.022	0.14	3,460	5,600	0.022	0.14	3,460
18×20	5,600	0.037	0.24	1,400	3,900	0.037	0.24	1,400	3,300	0.037	0.24	1,400
18×25	5,200	0.030	0.21	2,430	5,700	0.030	0.21	2,430	4,700	0.030	0.21	2,430
18×35.5	11,000	0.022	0.14	3,280	7,800	0.022	0.14	3,280	6,800	0.022	0.14	3,280
18×40	14,000	0.021	0.12	3,610	9,600	0.021	0.12	3,610	8,200	0.021	0.12	3,610

WVDC / ØD×L(mm)	35				50				63			
	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(135℃,100kHz)		20℃	-40℃	(135℃,100kHz)		20℃	-40℃	(135℃,100kHz)
12.5×20	1,000	0.045	0.51	1,220	560	0.073	0.88	1,000	330	0.110	1.33	900
12.5×25	1,200	0.041	0.37	1,540	680	0.066	0.76	1,790	470	0.100	1.16	1,611
12.5×35	1,800	0.032	0.27	2,720	1,000	0.049	0.51	2,310	680	0.083	0.87	2,079
12.5×40	2,200	0.027	0.21	3,000	1,200	0.040	0.39	2,550	820	0.068	0.66	2,295
16×20	1,500	0.038	0.29	1,390	820	0.053	0.58	1,400	560	0.090	0.99	1,260
16×25	1,800	0.031	0.24	2,400	1,200	0.045	0.47	2,030	820	0.077	0.80	1,827
16×35.5	2,700	0.023	0.16	3,160	1,800	0.030	0.28	2,690	1,200	0.054	0.47	2,421
16×40	3,300	0.022	0.14	3,460	2,200	0.032	0.28	2,950	1,500	0.051	0.48	2,655
18×20	1,800	0.038	0.25	1,400	1,000	0.046	0.48	1,640	680	0.078	0.82	1,476
18×25	2,400	0.030	0.21	2,430	1,500	0.036	0.35	2,060	1,000	0.061	0.59	1,854
18×35.5	3,900	0.022	0.14	3,280	2,200	0.027	0.23	2,920	1,500	0.046	0.38	2,628
18×40	4,700	0.021	0.12	3,610	2,700	0.026	0.18	3,230	1,800	0.044	0.31	2,907

WVDC / ØD×L(mm)	80				100			
	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)	μF	ESR (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(135℃,100kHz)		20℃	-40℃	(135℃,100kHz)
12.5×20	220	0.120	1.45	800	150	0.120	1.45	800
12.5×25	330	0.105	1.21	1,432	180	0.105	1.21	1,432
12.5×35	470	0.088	0.92	1,848	330	0.088	0.92	1,848
12.5×40	560	0.072	0.70	2,040	390	0.072	0.70	2,040
16×20	390	0.095	1.05	1,120	270	0.095	1.05	1,120
16×25	560	0.081	0.85	1,624	330	0.081	0.85	1,624
16×35.5	820	0.058	0.50	2,152	470	0.058	0.50	2,152
16×40	1,000	0.054	0.51	2,360	680	0.054	0.51	2,360
18×20	520	0.083	0.87	1,312	330	0.083	0.87	1,312
18×25	680	0.065	0.63	1,648	470	0.065	0.63	1,648
18×35.5	1,000	0.049	0.41	2,336	760	0.049	0.41	2,336
18×40	1,200	0.047	0.33	2,584	820	0.047	0.33	2,584

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
180~2,100	0.40	0.75	0.90	0.93	1.00
2,200~3,900	0.50	0.90	0.95	0.96	1.00
4,100~14,000	0.85	0.95	0.98	0.99	1.00

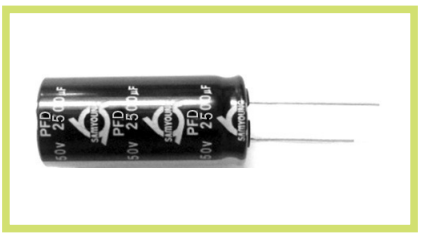
PFD Series

• 135℃ 2,000Hrs, 125℃ 5,000Hrs assured.

- Low ESR.
- Wide Temperature range.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

PFA → PFD

High ripple, Downsized

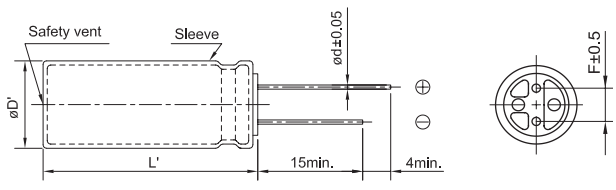


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	50 ~ 80 V_{DC}
Operating Temperature Range	-40 ~ +135℃
Capacitance Tolerance	±20%(M) (at 20℃,120Hz)
Leakage Current	I = 0.03CV (㎂) or 4㎂, whichever is greater. Where, I:Max. Leakage current(㎂),C:Nominal capacitance(㎌),V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 50~80 Tanδ(Max.) 0.10 When the capacitance exceeds 1,000㎌, 0.02 shall be added every 1,000㎌ increase. (at 20℃,120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC) 50~80 Z(-25℃)/Z(+20℃) 3 Z(-40℃)/Z(+20℃) 6 (at 120Hz)
Load Life	The following specifcations shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak volrage shall not exceed the rated voltage) for 2,000 hours at 135℃, 5,000 hours at 125℃. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage Current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing for 1,000 hours at 135℃, 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PFD Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	16	18
ød	0.8	0.8
F	7.5	7.5
øD'	øD+0.5 max.	
L'	L+2.0 max.	

RATINGS OF PFD Series

Vdc	Capacitance (μF)	ØD×L(㎜)	ESR (Ω max./100kHz)		Rated Ripple Current (mArms/125℃,100㎑)	Rated Ripple Current (mArms/135℃,100㎑)
			20℃	-40℃		
50	1000	16 x 20	0.050	0.550	2960	1870
	1300	16 x 25	0.042	0.440	4040	2500
		18 x 20	0.042	0.440	3130	2110
	1600	16 x 31.5	0.035	0.360	5130	2960
	1800	18 x 25	0.033	0.320	4230	2530
	2200	16 x 35.5	0.029	0.270	5480	3160
	2400	18 x 31.5	0.028	0.250	5240	3020
	2500	16 x 40	0.025	0.220	5930	3420
	3000	18 x 35.5	0.024	0.200	5870	3390
	3600	18 x 40	0.023	0.160	6420	3700
63	680	16 x 20	0.053	0.340	2140	1910
	820	16 x 25	0.038	0.230	2940	2680
	910	18 x 20	0.044	0.260	2350	2100
	1200	16 x 31.5	0.034	0.200	3860	3050
		18 x 25	0.033	0.190	3080	2810
	1400	16 x 35.5	0.027	0.150	4590	3420
	1600	16 x 40	0.025	0.140	5190	3670
		18 x 31.5	0.028	0.150	4080	3220
	2000	18 x 35.5	0.022	0.120	5220	3690
	2300	18 x 40	0.021	0.110	5660	3820
80	470	16 x 20	0.053	0.340	2140	1910
	620	18 x 20	0.044	0.260	2350	2100
	680	16 x 25	0.038	0.230	2940	2680
	820	16 x 31.5	0.034	0.200	3860	3050
		18 x 25	0.033	0.190	3080	2810
	1000	16 x 35.5	0.027	0.150	4590	3420
	1200	18 x 31.5	0.028	0.150	4080	3220
	1300	16 x 40	0.025	0.140	5190	3670
		18 x 35.5	0.022	0.120	5220	3690
	1600	18 x 40	0.021	0.110	5660	3820

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
470~910	0.50	0.85	0.94	0.96	1.00
1,000~2,000	0.60	0.87	0.95	0.97	1.00
2200~4,300	0.75	0.90	0.95	0.97	1.00
4700~12,000	0.85	0.95	0.98	0.99	1.00

PFB Series

• 130℃ 8,000~10,000Hrs assured.

- Non-solvent proof
- Wide Temperature range.
- Long Life.
- Applicable to compact sized Adaptor for TV power
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

PXB → PFB

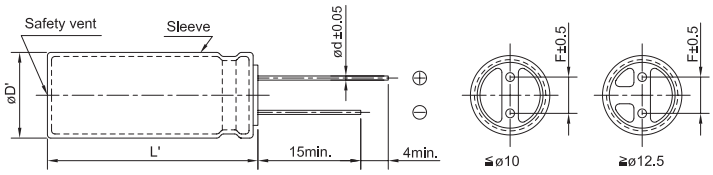
Wide Temp., Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	400 ~ 500 V_{DC}
Operating Temperature Range	-25 ~ +130℃
Capacitance Tolerance	±20%(M) (at 20℃,120Hz)
Leakage Current	CV ≤ 1000: I=0.1CV+40 (After 1 minute); I=0.03CV+15 (After 5 minutes) CV > 1000: I=0.04CV+100 (After 1 minute); I=0.02CV+25 (After 5 minutes) Where, I:Max. Leakage current(μA),C:Nominal capacitance(μF),V:Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 400 / 420 ~ 500 Tanδ(Max.): 0.20 / 0.24 (at 20℃,120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 400 ~ 500 Z(-25℃)/Z(+20℃): 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied(the peak voltage shall not exceed the rated voltage) for 10,000 hours at 130℃(Where 8,000 hours for ø10, ø12.5) Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage Current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 130℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±30% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PFB Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	10	12.5	16	18
ød	0.6	0.6	0.8	0.8
F	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.			
L'	L+2.0max.			

RATINGS OF PFB Series

WVDC / ØD×L(mm)	400		420	
	μF	Rated Ripple Current (mArms/130℃,120㎐)	μF	Rated Ripple Current (mArms/130℃,120㎐)
10×50	33	230	33	210
12.5×50	56	330	56	310
12.5×60	68	390	68	360
16×20	27	180	27	170
16×25	39	240	39	220
16×31.5	56	310	56	290
16×35.5	68	350	68	330
16×40	68	370	68	350
16×45	82	420	82	400
16×50	100	490	100	460
18×20	39	230	39	220
18×25	56	300	56	280
18×31.5	82	390	82	370
18×35.5	82	410	82	390
18×40	100	470	100	450
18×45	120	540	120	510
18×50	150	630	150	590

WVDC / ØD×L(mm)	450		500	
	μF	Rated Ripple Current (mArms/130℃,120㎐)	μF	Rated Ripple Current (mArms/130℃,120㎐)
10×50	27	160	22	140
12.5×50	47	230	39	210
12.5×60	56	270	47	250
16×20	22	120	18	110
16×25	33	170	22	130
16×31.5	39	200	33	180
16×35.5	47	230	39	210
16×40	56	260	47	240
16×45	68	300	53	260
16×50	82	340	56	280
18×20	27	150	22	130
18×25	39	190	33	180
18×31.5	56	250	47	230
18×35.5	68	290	53	250
18×40	82	330	56	270
18×45	82	350	68	310
18×50	100	400	82	360

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
18~150	1.00	1.30	1.40	1.43	1.50

PHA Series

• 150℃ 2,000Hrs assured.

Solvent-proof

- Wide Temperature range.
- Suitable to fit for automotive equipment.
- RoHS compliant.
- Halogen-free capacitors are also available.

PXA → PHA

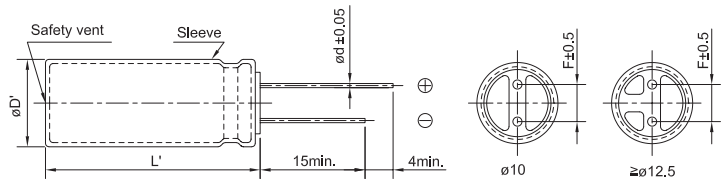
Wide Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +150℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 0.03CV (μA) or 4μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.12 (at 20℃,120Hz)
Temperature Characteristics (Max. impedance ratio)	Rate Voltage(V_{DC}): 10 ~ 50 Z(-25℃)/Z(+20℃): 2 Z(-40℃)/Z(+20℃): 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 150℃ for 2,000 hours. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 150℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PHA Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	10	12.5	16
ød	0.6	0.6	0.8
F	5.0	5.0	7.5
øD'	øD+0.5 max.		
L'	L+2.0 max.		

RATINGS OF PHA Series

WVDC	10		16		25	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)
220					10×16	370
330			10×16	370	12.5×20	600
470	10×16	370	12.5×20	600	16×31.5	1,100
1,000	12.5×20	600	16×31.5	1,100	16×35.5	1,150
2,200	16×31.5	1,100	16×35.5	1,150		
3,300	16×35.5	1,150				

WVDC	35		50	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)
100	10×16	370	10×20	300
220	10×20	460	12.5×20	400
330	12.5×20	600	12.5×25	500
470	12.5×25	750	16×35.5	700
1,000	16×35.5	1,150		

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
100 ~ 1,000	1.00	1.15	1.30	1.33	1.40
2,200 ~ 3,300	1.00	1.03	1.05	1.06	1.08

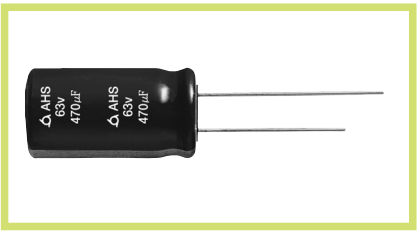
AHS Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For Hi-Fi Audio.
- RoHS compliant.
- Halogen-free capacitors are also available.

AH → AHS

Downsized

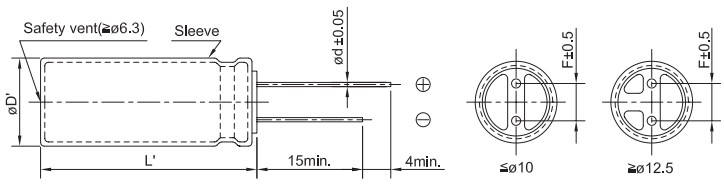


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.03CV (μA) or 4μA whichever is greater. Where, I: Max. Leakage current(μA) C: Nominal capacitance (μF) V: Rated Voltage (V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max.): 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35~100 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 8 / 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃. for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF AHS Series

Unit(mm)



Marking : DARK BROWN SLEEVE, GOLD INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF AHS Series

WVDC / μF	10		16		25		35		50	
1									5×11	14
2.2									5×11	21
3.3									5×11	26
4.7							5×11	28	5×11	31
10					5×11	39	5×11	41	5×11	45
22	5×11	49	5×11	54	5×11	58	5×11	61	5×11	66
33	5×11	59	5×11	66	5×11	70	5×11	75	6.3×11	93
47	5×11	71	5×11	78	5×11	84	6.3×11	103	6.3×11	111
100	5×11	103	6.3×11	132	6.3×11	140	8×11.5	171	8×11.5	185
220	6.3×11	177	8×11.5	224	8×11.5	237	10×12.5	299	10×16	357
330	8×11.5	248	8×11.5	274	10×12.5	343	10×16	404	10×20	473
470	8×11.5	296	10×12.5	386	10×16	451	10×20	523	12.5×20	626
1,000	10×16	538	10×20	638	12.5×20	746	12.5×25	860	16×25	1,017
2,200	12.5×20	920	12.5×25	1,087	16×25	1,262	16×31.5	1,413	18×35.5	1,621
3,300	12.5×25	1,180	16×25	1,411	16×31.5	1,586	18×35.5	1,776		
4,700	16×25	1,458	16×31.5	1,678	18×35.5	2,120				
6,800	16×31.5	1,780	18×35.5	2,016						
10,000	18×35.5	2,134								

Rated Ripple Current (mArms/85℃, 120Hz)

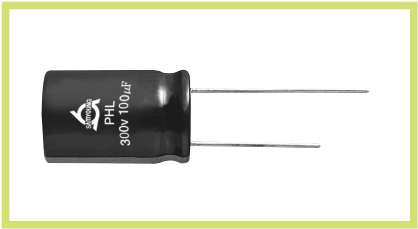
Case Size øD×L(mm)

WVDC / μF	63		100	
1			5×11	16
2.2			5×11	23
3.3			5×11	28
4.7	5×11	34	5×11	34
10	5×11	49	6.3×11	56
22	6.3×11	83	8×11.5	95
33	6.3×11	102	10×12.5	137
47	8×11.5	136	10×16	181
100	10×12.5	239	12.5×20	316
220	10×20	423	16×25	564
330	12.5×20	575	16×25	691
470	12.5×25	745	16×31.5	891
1,000	16×31.5	1,182		

PHL Series

• 5~35℃ 5,000Times.

- Non-solvent proof.
- For Photo Flash.
- RoHS compliant.
- Halogen-free capacitors are also available.



SPECIFICATIONS

Item	Characteristics
Rated Voltage	300 ~ 330 VDC
Operating Temperature Range	-20~+55℃
Capacitance Tolerance	-10~+20%(V) (at 20℃, 120Hz)
Leakage Current	ØD(mm) | Ø5~8 | Ø10~ LC(Max.) | I=2.0×C | I=1.0×C Where, I:Max.Leakage current(μA) C: Nominal capacitance (μF) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	ØD(mm) | Ø5~8 | Ø10~ Tanδ(Max.) | 0.085 | 0.06 (at 20℃, 120Hz)
Charge and Discharge Characteristics	The following specifications shall be satisfied when the capacitors are restored to 20℃ after charge and discharge are repeated 5,000 times at room temperature (5 to 35℃) Discharge resistance or Xenon tube: 0.7~1.0Ω. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1000 hours at 55℃ without voltage applied. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Others	Satisfied characteristics EIAJ RC - 3801A

RATINGS OF PHL Series

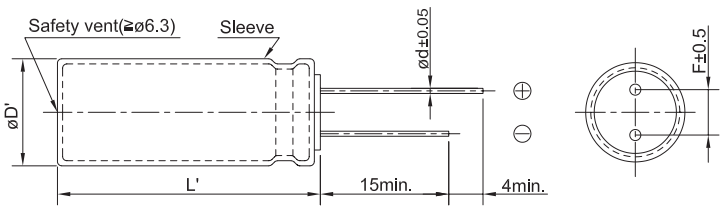
μF \ VDC	300			315			330		
5				5×16	6.3×10				
6.8					6.3×11				
10					6.3×15	8×11.5			
12.5					6.3×20	8×15			
15						8×17			
20						8×20			
30						8×23			
60	11.8×22						11.8×24		
80	11.8×27	13×25					11.8×29	13×27	
100	11.8×32	13×29	13.5×26				11.8×35	13×32	13.5×28
120		13×34	13.5×30					13×37	13.5×33
140		13×38	13.5×34					13×42	13.5×37
160		13×43	13.5×38						13.5×41

Note : Other case sizes, rated voltage or capacitance are also available upon request.

Case Size ØD×L(mm)

DIMENSIONS OF PHL Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

ØD	5	6.3	8	11.8	13	13.5
Ød	0.5	0.5	0.6	0.6	0.6	0.8
F	2.0	2.5	3.5	5.0	5.0	5.0
ØD'	ØD+0.5 max.					
L'	L+1.0 max.					

NZD Series

• 105℃ 5,000Hrs assured.

Solvent-proof

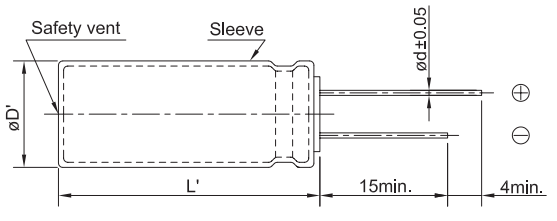
- For car air bag circuit.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

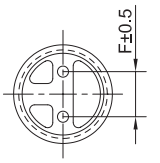
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	25 ~ 35 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	0% ~ 30%(S) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 25 35 Tanδ(Max.) 0.14 0.12 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 25 35 Z(-55℃)/Z(20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NZD Series

Unit(mm)





Marking : DARK BROWN SLEEVE, SILVER INK

øD	12.5	16	18
ød	0.6	0.8	0.8
F	5.0	7.5	7.5
øD'	øD+0.5 max.		
L'	L+2.0 max.		

RATINGS OF NZD Series

VDC	25		
μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	Impedance (Ω max./20℃, 100kHz)
1,800	12.5×20	1,700	0.055
2,400	12.5×25	2,000	0.045
3,600	16×20	2,200	0.041
4,800	18×20	2,400	0.036
5,200	16×25	2,500	0.033
6,700	18×25	2,700	0.028
	16×31.5		
8,200	16×35.5	3,050	0.026
9,200	18×31.5	3,200	0.024
	16×40		
11,000	18×35.5	3,500	0.019
13,000	18×40	3,800	0.017
15,000	18×45	4,000	0.015

VDC	35		
μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	Impedance (Ω max./20℃, 100kHz)
1,100	12.5×20	1,500	0.057
1,400	12.5×25	1,700	0.054
2,100	16×20	2,000	0.047
2,700	18×20	2,250	0.042
3,300	16×25	2,400	0.037
4,200	18×25	2,550	0.033
	16×31.5		
5,200	16×35.5	2,800	0.031
6,000	18×31.5	2,950	0.029
7,100	18×35.5	3,050	0.027
8,400	18×40	3,200	0.025
9,600	18×45	3,400	0.023

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
1,100～1,800	0.60	0.87	0.95	1.00
2,100～3,600	0.75	0.90	0.95	1.00
4,200～15,000	0.85	0.95	0.98	1.00

NZK Series

• 105℃ 5,000Hrs assured.

- For car air bag circuit.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

NZD → NZK

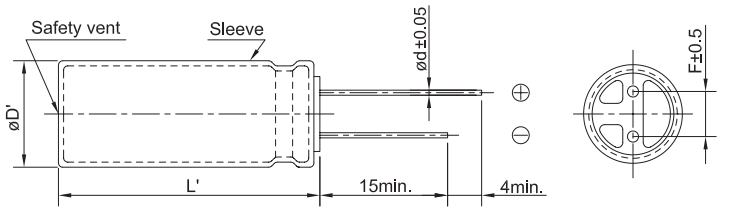
Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	25 ~ 35 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	0% ~ 30%(S) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 25 35 Tanδ(Max.) 0.20 0.16 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 25~35 Z(-55℃)/Z(+20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NZK Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	16	18
ød	0.8	0.8
F	7.5	7.5
øD'	øD+0.5 max.	
L'	L+2.0 max.	

RATINGS OF NZK Series

VDC	Capacitance (μF)	ØD×L(mm)	ESR (Ω max./20°C, 100kHz)	Rated Ripple Current (mArms/105°C,100㎑)
25	4400	16 × 20	0.030	2200
	5700	16 × 25	0.024	2500
	5900	18 × 20	0.028	2400
	7300	16 × 31.5	0.020	2700
	7700	18 × 25	0.022	2700
	9000	16 × 35.5	0.018	3050
	10000	16 × 40	0.016	3200
	12000	18 × 35.5	0.016	3500
	14000	18 × 40	0.015	3800
35	2800	16 × 20	0.030	2000
	3600	16 × 25	0.024	2400
	3700	18 × 20	0.028	2250
	4700	16 × 31.5	0.020	2550
	4800	18 × 25	0.022	2550
	5700	16 × 35.5	0.018	2800
	6500	16 × 40	0.016	2900
	6800	18 × 31.5	0.018	2950
	7800	18 × 35.5	0.016	3050
	9000	18 × 40	0.015	3200

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
2,100～3,700	0.75	0.90	0.95	1.00
4,200～15,000	0.85	0.95	0.98	1.00

NZH Series

• 105℃ 2,000Hrs assured.

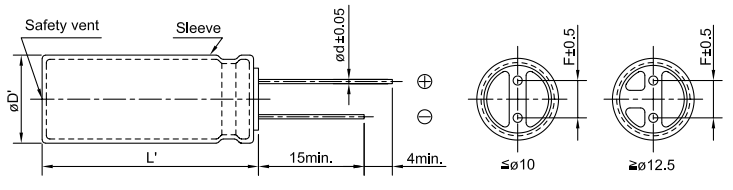
- Non-solvent proof
- High ripple and High surge voltage
- For LED TV Power , SMPS
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

SPECIFICATIONS

Item	Characteristics
Rated Voltage	450 V_{DC}
Surge Voltage	550 V_{DC}
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	CV \ Time: After 1 minute / After 5 minutes ≤ 1000: I=0.1CV+40 / I=0.03CV+15 > 1000: I=0.04CV+100 / I=0.02CV+25 Where, I : Max. Leakage current(μA) C : Nominal capacitance(μF) V : Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 450; Tanδ(Max.): 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 450; Z(-25℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours an not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NZH Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	8	10	12.5	16	18
ød	0.6	0.6	0.6	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.				
L'	L+2.0 max				

※ ø16 x 60L, L'≦ L+3.0

RATINGS OF NZH Series

WVDC	450	
Items / μF	øD×L(mm)	Rated Ripple Current (mArms/105℃,120Hz)
18	8 X 50	240
39	10 X 50	400
47	12.5 X 40	460
	16 X 25	460
56	12.5 X 50	550
	16 X 31.5	550
	18 X 25	550
68	12.5 X 50	690
	16 X 35.5	690
	18 X 31.5	690
82	12.5 X 60	750
	16 X 40	750
	18 X 31.5	750
100	16 X 45	800
	18 X 35.5	800
120	16 X 50	950
	18 X 40	950
150	16 X 60	1,300
	18 X 50	1,300

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
18 ~ 150	1.00	1.25	1.50	1.75	2.00

NZR Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof
- High ripple and High surge voltage
- For LED TV Power , SMPS
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NZH → NZR

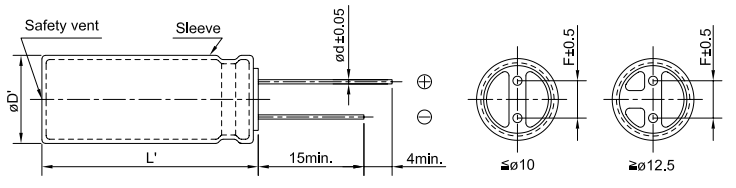
High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage	450 VDC
Surge Voltage	550 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	CV \ Time: ≤ 1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); > 1000 → I=0.04CV+100 (After 1 minute), I=0.02CV+25 (After 5 minutes). Where, I : Max. Leakage current(μA) C : Nominal capacitance(μF) V : Rated voltage(VDC) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 450; Tanδ(Max.): 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 450; Z(-25℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours an not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NZR Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	8	10	12.5	16	18
ød	0.6	0.6	0.6	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.				
L'	L+2.0 max				

※ ø16 x 60L, L'≦ L+3.0

RATINGS OF NZR Series

Vdc	450	
Items / μF	øD×L(mm)	Rated Ripple Current (mArms/105℃,120Hz)
23	8 X 50	300
39	10 X 50	450
51		480
62	10 X 60	570
68	12.5 X 50	750
	16 X 35.5	750
	18 X 31.5	750
82	12.5 X 60	800
	16 X 40	800
	18 X 31.5	800
100	16 X 45	900
	18 X 35.5	900
120	16 X 50	1,000
	18 X 40	1,000
150	16 X 60	1,400
	18 X 50	1,400

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	50k	100k
23 ~ 150	1.00	1.25	1.50	1.75	2.00

NLF Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof
- This series adopts the electrolyte which was excellent in fire retardancy compared with the conventional series
- For LED TV Power, SMPS, IP-Board
- **RoHS compliant.**
- **Halogen-free capacitors are also available**

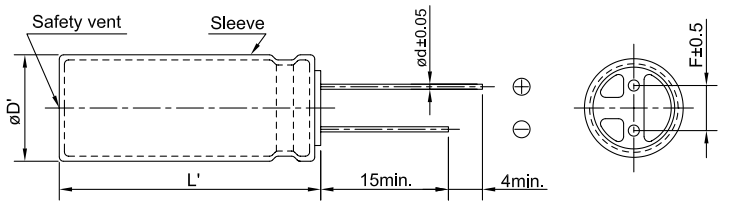
SPECIFICATIONS

Item	Characteristics
Rated Voltage	400～500 V_{DC}
Operating Temperature Range	-25 ～ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	After 1 minute: CV≤1,000 → I = 0.03CV + 40; After 5 minutes: CV 〉 1,000 → I = 0.06CV + 100 Where, I : Max. Leakage current(μA) C : Nominal capacitance(μF) V : Rated voltage(V_{DC}) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 400～500; Tanδ(Max.): 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 400～500; Z(-25℃)/Z(20℃): 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 5,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

■ The specifications and the size depend on the safety requirement.(flame retardant)
Please consult us for any further details.

DIMENSIONS OF NLF Series

Unit(mm)



Marking : DARK BLUE SLEEVE, SILVER INK

øD	16	18
ød	0.8	0.8
F	7.5	7.5
øD′	øD + 0.5 max.	
L′	L + 2.0 max.	

RDC Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

RDA → RDC

Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ～ 100 VDC	160 ～ 500 VDC
Operating Temperature Range	-40 ～ +85℃	-25 ～ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, at 120Hz)	
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)	
※ Dissipation Factor(Tanδ)		

Rated Voltage(VDC)	16	25	35	50～63	100	160～250	315～400	450～500
Tanδ(Max.)	0.40	0.35	0.30	0.25	0.20	0.15	0.15	0.20

(at 20℃, 120Hz)

Temperature Characteristics (Max.Impedance ratio)

Rated Voltage(VDC)	16	25	35	50～63	100	160～250	315～400	450～500
Z(-25℃)/Z(20℃)	4	3	3	2	2	4	4	8
Z(-40℃)/Z(20℃)	15	10	8	6	5	-	-	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃.

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 25 hours and not more than 48 hours before the measurements.

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Others: Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceed 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

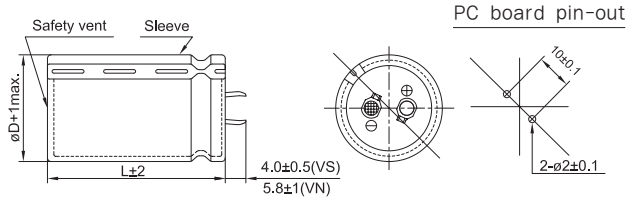
Frequency multiplying factor

VDC \ Freq.(Hz)	60	120	300	1k	10k～
16～50VDC	0.95	1.00	1.03	1.05	1.08
63～100VDC	0.92	1.00	1.07	1.13	1.19
160～250VDC	0.81	1.00	1.17	1.32	1.45
315～500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RDC Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RDC Series

VDC / μF \ ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,900									22×25 2.22			
4,700									22×30 2.41	25.4×25 2.42		
5,600					22×25 2.21				22×35 2.75	25.4×25 2.64		
6,800					22×30 2.40	25.4×25 2.56			22×40 2.80	25.4×30 2.74	30×25 2.97	
8,200	22×25 2.51				22×35 2.72	25.4×25 2.80			22×45 3.11	25.4×35 3.10	30×30 3.13	
10,000	22×25 2.77				22×40 3.09	25.4×30 3.12	30×25 3.21			25.4×40 3.53	30×30 3.46	35×25 3.20
12,000	22×30 2.86	25.4×25 2.95			22×45 3.48	25.4×35 3.43	30×30 3.86	35×25 3.54		25.4×45 3.98	30×35 4.01	35×30 4.02
15,000	22×35 3.29	25.4×30 3.46	30×25 3.66		22×50 4.00	25.4×40 3.95	30×30 4.00	35×25 3.95			30×40 4.90	35×35 5.01
18,000	22×40 3.72	25.4×35 3.98	30×30 3.98			25.4×45 4.45	30×35 4.46	35×30 4.63			30×45 5.43	35×40 5.54
22,000	22×50 4.37	25.4×40 4.26	30×30 4.21			25.4×50 5.02	30×45 5.21	35×35 5.16				35×45 6.04
27,000		25.4×45 4.72	30×35 4.82				30×50 5.94	35×40 5.92				35×50 6.89
33,000			30×40 5.36	35×30 5.15				35×45 6.75				
39,000			30×45 6.01	35×35 5.95				35×50 7.56				
47,000			30×50 6.79	35×40 6.76								
56,000				35×45 7.62								

VDC / μF \ ø D	50				63				100			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
820									22×25 1.86			
1,000									22×30 1.93			
1,200									22×30 2.09	25.4×25 2.10		
1,500									22×35 2.41	25.4×30 2.34	30×25 2.46	
1,800					22×25 1.82				22×40 2.71	25.4×35 2.75	30×25 2.72	
2,200	22×25 1.91				22×30 2.31	25.4×25 2.30			22×45 3.08	25.4×40 3.13	30×30 3.09	35×25 3.14
2,700	22×30 2.11	25.4×25 2.13			22×35 2.43	25.4×30 2.43				25.4×45 3.57	30×35 3.55	35×30 3.71
3,300	22×30 2.37	25.4×25 2.38			22×35 2.62	25.4×30 2.64	30×25 2.78			25.4×50 4.06	30×40 4.05	35×30 4.05
3,900	22×35 2.65	25.4×30 2.68			22×40 2.93	25.4×35 2.97	30×30 3.00				30×45 4.54	35×35 4.49
4,700	22×40 2.99	25.4×35 3.03	30×25 2.81		22×50 3.39	25.4×40 3.36	30×30 3.32	35×25 3.36			30×50 5.11	35×40 5.11
5,600	22×45 3.36	25.4×35 3.31	30×30 3.37	35×25 3.42		25.4×45 3.77	30×35 3.75	35×25 3.76				35×45 5.75
6,800	22×50 3.81	25.4×40 3.81	30×35 3.85	35×30 3.85		25.4×50 4.27	30×40 4.27	35×30 4.15				
8,200		25.4×50 4.37	30×40 4.36	35×30 4.41			30×45 4.83	35×35 4.79				
10,000			30×45 4.97	35×35 4.92			30×50 5.49	35×40 5.47				
12,000			30×50 5.60	35×40 5.58				35×45 6.19				
15,000				35×45 6.44								
18,000				35×50 6.71	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85°C, 120Hz)							

RATINGS OF RDC Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
330									22×30 1.49	25.4×25 1.51	30×20 1.48	
390									22×35 1.67	25.4×30 1.63	30×25 1.66	
470					22×30 1.78	25.4×25 1.80			22×40 1.88	25.4×30 1.86	30×25 1.89	35×20 1.89
560	22×30 1.95				22×35 2.00	25.4×30 1.97	30×25 2.01		22×45 2.13	25.4×35 2.09	30×30 2.14	35×25 2.09
680	22×30 2.15				22×40 2.27	25.4×30 2.24	30×25 2.28			25.4×50 2.44	30×35 2.43	35×25 2.46
820	22×35 2.42	25.4×30 2.45			22×45 2.58	25.4×35 2.53	30×30 2.59				30×40 2.75	35×30 2.77
1,000	22×40 2.75	25.4×35 2.79				25.4×40 2.88	30×35 2.95	35×25 2.90			30×45 3.31	35×35 3.22
1,200		25.4×40 3.15	30×30 3.13	35×25 3.27			30×40 3.34	35×30 3.31				35×40 3.42
1,500		25.4×45 3.60	30×35 3.63	35×30 3.57			30×45 3.84	35×35 3.82				35×45 4.06
1,800			30×40 4.09	35×30 4.05				35×40 4.33				
2,200				35×35 4.63				35×45 4.92				
2,700				35×40 5.30								

μF \ VDC / ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
150	22×25 0.98								22×30 1.02			
180	22×30 1.10				22×30 1.11				22×35 1.14			
220	22×35 1.26	25.4×25 1.23	30×20 1.25		22×35 1.26				22×40 1.29	25.4×30 1.27	30×25 1.30	
270	22×40 1.43	25.4×30 1.41	30×25 1.43	35×20 1.45	22×40 1.49	25.4×30 1.46	30×25 1.49		22×45 1.48	25.4×35 1.45	30×30 1.48	
330	22×45 1.62	25.4×35 1.61	30×25 1.62	35×20 1.61	22×45 1.66	25.4×35 1.63	30×30 1.67			25.4×40 1.65	30×30 1.65	35×25 1.67
390		25.4×40 1.79	30×30 1.78	35×25 1.86		25.4×40 1.88	30×30 1.88	35×25 1.94		25.4×45 1.84	30×35 1.85	35×30 1.88
470			30×35 2.02	35×30 2.07		25.4×45 2.18	30×35 2.20	35×30 2.25			30×40 2.09	35×30 2.07
560			30×40 2.28	35×35 2.33			30×45 2.40	35×30 2.37				35×35 2.34
680				35×40 2.66				35×35 2.78				35×45 2.74
820				35×45 3.00				35×40 3.15	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85°C, 120Hz)			

RATINGS OF RDC Series

VDC / μF \ ø D	450				500			
	22	25.4	30	35	22	25.4	30	35
68					22 × 30 0.40			
82					22 × 30 0.51	25.4 × 25 0.53		
100						25.4 × 35 0.69		
120	22 × 30 0.91	25.4 × 25 0.91				25.4 × 40 0.86		
150	22 × 35 1.04	25.4 × 30 1.05				25.4 × 45 0.91	30 × 30 0.88	
180	22 × 40 1.18	25.4 × 30 1.15	30 × 25 1.17			25.4 × 50 0.96	30 × 35 0.99	
220	22 × 45 1.33	25.4 × 35 1.31	30 × 30 1.36				30 × 40 1.15	
270		25.4 × 40 1.55	30 × 35 1.60	35 × 25 1.59			30 × 50 1.44	35 × 35 1.36
330			30 × 40 1.90	35 × 30 1.88				35 × 40 1.49
390			30 × 45 2.09	35 × 35 2.08				35 × 45 1.71
470				35 × 40 2.40				35 × 50 2.08
560				35 × 45 2.70	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85°C, 120Hz)			

TDA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

KMH → TDA

Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ~ 100 VDC	160 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20% (M)	(at 20℃, at 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)	
※ Dissipation Factor(Tanδ)	Rated Voltage(VDC): 16 / 25~35 / 50~63 / 100 / 160~400 / 420~500 Tanδ(Max.): 0.40 / 0.35 / 0.25 / 0.20 / 0.15 / 0.20 (at 20℃, 120Hz)	
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(VDC): 16 / 25 / 35 / 50~63 / 100 / 160~400 / 420~500 Z(-25℃)/Z(20℃): 4 / 3 / 3 / 2 / 2 / 4 / 8 Z(-40℃)/Z(20℃): 15 / 10 / 8 / 6 / 5 / - / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

※ For capacitors with CV products > 100,000 Higher Tanδ value may apply.
When the capacitors exceed 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

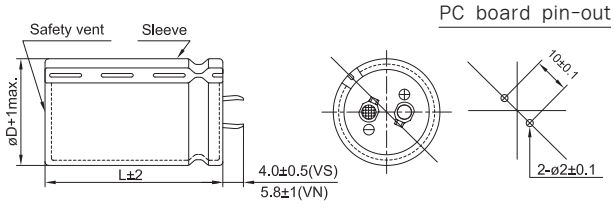
VDC \ Freq.(Hz)	60	120	300	1k	10k~
16~50VDC	0.95	1.00	1.03	1.05	1.08
63~100VDC	0.92	1.00	1.07	1.13	1.19
160~250VDC	0.81	1.00	1.17	1.32	1.45
315~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TDA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TDA Series

μF \ VDC / ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,300									22×25 1.40			
3,900									22×30 1.57			
4,700					22×25 1.50				22×30 1.72	25.4×25 1.80		
5,600					22×25 1.63				22×35 1.95	25.4×30 1.96	30×25 1.99	
6,800	22×25 1.57				22×30 1.86	25.4×25 1.87			22×40 2.20	25.4×35 2.23	30×25 2.19	
8,200	22×30 1.73				22×35 2.11	25.4×30 2.12	30×25 2.15		22×50 2.55	25.4×40 2.53	30×30 2.53	
10,000	22×30 1.97	25.4×25 1.97			22×40 2.39	25.4×35 2.42	30×25 2.39			25.4×45 2.87	30×35 2.90	35×30 2.75
12,000	22×35 2.22	25.4×30 2.24			22×45 2.69	25.4×40 2.74	30×30 2.70	35×25 2.74		25.4×50 3.24	30×40 3.23	35×30 3.23
15,000	22×40 2.55	25.4×35 2.58				25.4×45 3.15	30×35 3.13	35×30 3.27			30×45 3.72	35×35 3.67
18,000	22×45 2.87	25.4×40 2.92	30×30 2.88			25.4×50 3.54	30×40 3.54	35×30 3.50				35×40 4.37
22,000		25.4×45 3.32	30×35 3.29				30×45 4.04	35×35 3.97				35×50 4.92
27,000		25.4×50 3.78	30×40 3.77	35×30 3.45				35×45 4.73				
33,000			30×45 4.30	35×35 4.26				35×50 5.39				
39,000			30×50 4.81	35×40 4.79								
47,000				35×50 5.43								

μF \ VDC / ø D	50				63				100			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
560									22×25 1.06			
820									22×30 1.32	25.4×25 1.33		
1,000									22×35 1.50	25.4×30 1.51		
1,200					22×25 1.19				22×40 1.69	25.4×35 1.71	30×25 1.68	
1,500					22×25 1.33				22×45 1.94	25.4×40 1.98	30×30 1.95	
1,800	22×25 1.33				22×30 1.51	25.4×25 1.52				25.4×45 2.23	30×35 2.26	35×25 2.17
2,200	22×30 1.50				22×35 1.73	25.4×30 1.74				25.4×50 2.53	30×40 2.57	35×30 2.50
2,700	22×30 1.69	25.4×25 1.70			22×40 1.97	25.4×35 1.99	30×25 1.91				30×45 2.88	35×35 2.86
3.300	22×35 1.93	25.4×30 1.85			22×50 2.29	25.4×40 2.27	30×30 2.24				30×50 3.28	35×40 3.27
3,900	22×40 2.16	25.4×35 2.18	30×25 2.15			25.4×45 2.54	30×35 2.56	35×25 2.56				35×45 3.67
4,700	22×45 2.43	25.4×35 2.39	30×30 2.35	35×25 2.48		25.4×50 2.86	30×40 2.86	35×30 2.79				35×50 3.80
5,600	22×50 2.75	25.4×40 2.70	30×35 2.76	35×25 2.70			30×45 3.22	35×35 3.19				
6,800		25.4×50 3.30	30×40 3.30	35×30 3.25			30×50 3.66	35×40 3.64				
8,200			30×45 3.60	35×35 3.56				35×45 3.90				
10,000			30×50 4.04	35×40 4.03				35×50 4.40				
12,000				35×45 4.56	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)							

RATINGS OF TDA Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100												
120										25.4×20 0.48		
150					22×20 0.53					25.4×20 0.59		
180					22×20 0.62	25.4×20 0.64			22×25 0.78	25.4×20 0.75		
220		25.4×20 0.66			22×25 0.70	25.4×20 0.70			22×30 0.96	25.4×25 0.95	30×20 0.93	
270		25.4×20 0.80			22×25 0.87	25.4×20 0.83			22×30 1.11	25.4×25 1.10	30×20 1.10	
330	22×25 1.20	25.4×20 1.10			22×30 1.20	25.4×25 1.21	30×20 1.20		22×35 1.20	25.4×30 1.20	30×25 1.26	35×20 1.17
390	22×30 1.30	25.4×25 1.29	30×20 1.19		22×30 1.28	25.4×25 1.27	30×25 1.25		22×40 1.45	25.4×35 1.49	30×25 1.44	35×25 1.49
470	22×30 1.36	25.4×25 1.39	30×20 1.31	35×20 1.35	22×35 1.41	25.4×30 1.41	30×25 1.50	35×20 1.30	22×45 1.53	25.4×35 1.50	30×30 1.57	35×25 1.57
560	22×35 1.46	25.4×30 1.51	30×25 1.54	35×20 1.41	22×45 1.56	25.4×35 1.53	30×30 1.57	35×25 1.52	22×50 1.77	25.4×40 1.74	30×30 1.73	35×25 1.72
680	22×40 1.66	25.4×30 1.65	30×25 1.68	35×20 1.69	22×45 1.73	25.4×35 1.69	30×30 1.74	35×25 1.72		25.4×50 1.84	30×35 1.94	35×30 1.97
820	22×45 1.99	25.4×30 1.95	30×30 2.00	35×25 1.91		25.4×45 1.99	30×35 2.00	35×30 2.04		25.4×60 2.20	30×40 2.10	35×35 1.98
1,000	22×50 2.18	25.4×40 2.14	30×30 2.15	35×25 2.17		25.4×50 2.21	30×40 2.23	35×35 2.30			30×50 2.31	35×40 2.30
1,200		25.4×45 2.39	30×35 2.37	35×30 2.41		25.4×60 2.57	30×45 2.53	35×35 2.57			30×60 2.50	35×45 2.43
1,500		25.4×60 2.87	30×40 2.74	35×35 2.79			30×50 3.01	35×40 2.99				35×50 2.80
1,800			30×45 3.14	35×35 3.11			30×60 3.47	35×45 3.38				
2,200			30×60 3.76	35×45 3.66				35×60 3.60				

μF \ VDC / ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×20 0.22			
68									22×25 0.51	25.4×20 0.46		
82	22×25 0.64				22×25 0.56				22×25 0.55	25.4×20 0.53		
100	22×30 0.68				22×25 0.67				22×30 0.67	25.4×25 0.67	30×20 0.60	
120	22×30 0.75	25.4×25 0.76			22×30 0.73	25.4×25 0.73			22×35 0.76	25.4×30 0.76	30×25 0.76	35×20 0.70
150	22×35 0.82	25.4×30 0.83			22×35 0.83	25.4×30 0.83	30×25 0.83		22×40 0.82	25.4×30 0.80	30×25 0.82	35×20 0.80
180	22×40 0.91	25.4×30 0.88	30×25 0.85		22×40 0.89	25.4×30 0.89	30×25 0.91		22×45 0.88	25.4×35 0.88	30×30 0.89	35×25 0.90
220	22×45 0.94	25.4×35 0.96	30×30 1.00		22×45 0.98	25.4×35 0.98	30×30 0.98	35×25 0.96	22×50 1.01	25.4×40 0.99	30×30 0.98	35×25 1.02
270		25.4×45 1.13	30×35 1.12	35×25 1.06	22×50 1.12	25.4×40 1.10	30×30 1.08	35×25 1.12		25.4×45 1.12	30×35 1.12	35×30 1.16
330		25.4×50 1.28	30×40 1.28	35×30 1.30		25.4×45 1.24	30×40 1.24	35×30 1.29		25.4×50 1.27	30×40 1.28	35×35 1.35
390			30×45 1.44	35×35 1.42		25.4×60 1.47	30×40 1.40	35×35 1.47		25.4×60 1.51	30×45 1.49	35×35 1.47
470			30×50 1.63	35×40 1.64		25.4×60 1.70	30×45 1.67	35×35 1.65			30×50 1.63	35×40 1.62
560				35×45 1.87			30×50 1.87	35×40 1.86			30×60 1.88	35×50 1.88
680				35×50 2.07			30×60 2.18	35×50 2.18				35×60 2.19
820								35×60 2.53	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RATINGS OF TDA Series

μF \ VDC / ø D	420				450				500			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
56					22×25 0.40				22×35 0.46	25.4×30 0.46	30×30 0.48	
68	22×25 0.50				22×30 0.50	25.4×25 0.50			22×40 0.53	25.4×35 0.53	30×30 0.55	
82	22×25 0.51	25.4×25 0.63			22×30 0.55	25.4×25 0.54			22×45 0.56	25.4×35 0.58	30×35 0.58	
100	22×30 0.58	25.4×30 0.69			22×35 0.62	25.4×30 0.62	30×25 0.64			25.4×40 0.65	30×35 0.66	
120	22×35 0.72	25.4×30 0.73	30×25 0.75		22×40 0.70	25.4×35 0.71	30×30 0.72	35×25 0.73		25.4×45 0.75	30×40 0.76	35×30 0.78
150	22×45 0.79	25.4×35 0.74	30×25 0.75	35×25 0.81	22×45 0.77	25.4×40 0.75	30×30 0.74	35×25 0.75			30×45 0.80	35×35 0.81
180	22×50 0.89	25.4×40 0.89	30×30 0.88	35×25 0.87		25.4×45 0.84	30×35 0.87	35×30 0.88			30×50 0.90	35×40 0.93
220		25.4×45 1.01	30×35 1.00	35×30 1.05		25.4×50 0.98	30×40 0.98	35×30 1.00			30×60 1.10	35×45 1.11
270			30×45 1.19	35×35 1.19		25.4×60 1.17	30×45 1.15	35×35 1.17				35×50 1.28
330			30×50 1.36	35×40 1.39			30×50 1.38	35×40 1.38				35×60 1.50
390				35×45 1.57			30×60 1.60	35×45 1.56				
470				35×50 1.73				35×50 1.72				
560								35×60 1.98	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

TDC Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

TDA → TDC

Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ～ 500 V_{DC}
Operating Temperature Range	-25 ～ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage current(㎂) C:Nominal capacitance(㎌) V:Rated voltage(V_{DC}) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 160～400 420～500 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(V_{DC}) 160～400 420～500 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000㎌, 0.01 shall be added every 1,000㎌ increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

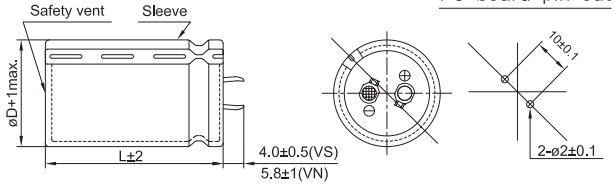
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k～
160～250V_{DC}	0.81	1.00	1.17	1.32	1.45
315～500V_{DC}	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TDC Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TDC Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22×20 0.78			
220									22×25 1.00	25.4×20 0.95		
270					22×25 1.20					25.4×20 1.10		
330	22×20 1.20				22×25 1.28	25.4×20 1.27				25.4×25 1.20	30×20 1.26	35×20 1.30
390	22×25 1.32	25.4×20 1.39	30×20 1.31		22×25 1.31	25.4×20 1.43	30×20 1.43				30×25 1.44	35×20 1.49
470	22×30 1.46	25.4×25 1.51	30×20 1.54		22×30 1.45	25.4×25 1.53	30×20 1.53				30×25 1.57	35×20 1.57
560	22×30 1.66	25.4×25 1.68	30×25 1.68		22×40 1.67	25.4×30 1.67	30×25 1.67	35×20 1.67			30×30 1.80	35×25 1.72
680	22×35 1.87	25.4×30 1.88	30×25 1.96		22×45 1.75	25.4×35 1.75	30×25 1.74	35×20 1.72			30×30 1.94	35×30 2.10
820	22×40 2.09	25.4×30 2.14	30×25 2.15	35×25 2.04	22×50 2.04	25.4×40 2.04	30×30 2.04	35×25 2.04			30×35 2.29	35×30 2.36
1,000		25.4×35 2.38	30×30 2.40	35×25 2.55			30×35 2.30	35×30 2.30			30×45 2.59	35×35 2.63
1,200		25.4×40 2.66	30×35 2.69	35×30 2.86				35×30 2.65				

μF \ VDC / ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
82									22×20 0.55			
100	22×25 0.75								22×25 0.66	25.4×20 0.67		
120	22×25 0.82				22×25 0.72					25.4×25 0.76		
150	22×30 0.91	25.4×25 0.94			22×30 0.84	25.4×25 0.89				25.4×25 0.86	30×20 0.89	
180		25.4×25 1.13			22×35 0.98	25.4×30 0.94				25.4×30 0.97	30×25 1.02	35×20 1.02
220		25.4×30 1.19	30×25 1.17		22×40 1.04	25.4×30 1.07	30×25 1.13			25.4×35 1.12	30×30 1.12	35×20 1.11
270		25.4×40 1.41	30×30 1.28	35×20 1.30		25.4×35 1.24	30×30 1.27			25.4×40 1.26	30×30 1.27	35×25 1.27
330			30×35 1.40	35×30 1.49		25.4×40 1.39	30×35 1.43	35×25 1.49		25.4×45 1.44	30×35 1.43	35×30 1.44
390			30×40 1.44	35×30 1.64		25.4×50 1.55	30×40 1.60	35×30 1.66		25.4×50 1.51	30×40 1.60	35×30 1.63
470			30×45 1.71	35×35 1.82		25.4×50 1.72	30×45 1.81	35×30 1.83			30×45 1.81	35×35 1.80
560				35×40 2.00				35×35 2.07	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RATINGS OF TDC Series

VDC / μF \ ø D	420				450				500			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
68					22×20 0.50				22×35 0.50			
82	22×20 0.58				22×25 0.59	25.4×25 0.62			22×40 0.53	25.4×30 0.55		
100	22×25 0.66	25.4×25 0.69				25.4×25 0.70			22×45 0.61	25.4×35 0.64		
120	22×30 0.75	25.4×25 0.77	30×20 0.75			25.4×30 0.75			22×50 0.66	25.4×40 0.71	30×30 0.73	
150	22×40 0.86	25.4×30 0.88	30×25 0.88			25.4×30 0.88	30×25 0.87			25.4×45 0.81	30×35 0.80	
180	22×45 0.96	25.4×35 0.97	30×30 1.02	35×20 1.05		25.4×35 1.01	30×25 1.00			25.4×50 0.86	30×40 0.93	35×30 0.95
220	22×50 1.11	25.4×40 1.14	30×30 1.14	35×25 1.12			30×35 1.10				30×45 0.94	35×35 0.98
270		25.4×45 1.29	30×40 1.30	35×30 1.35			30×40 1.24	35×30 1.25			30×50 1.07	35×40 1.13
330			30×45 1.48	35×35 1.49				35×35 1.42			30×60 1.28	35×45 1.29
390				35×40 1.64				35×40 1.63				35×50 1.47
470				35×45 1.79				35×45 1.78	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			35×60 1.71

TEA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Height 15mm.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → TEA
Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 400 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I: Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 160~400; Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160~400; Z(-25℃)/Z(20℃): 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

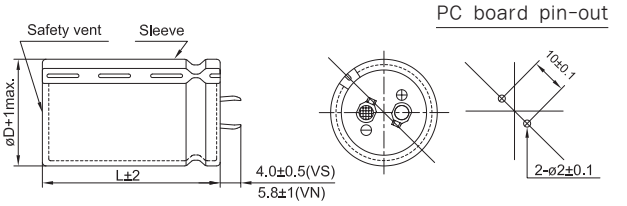
Frequency multiplying factor

Freq.(Hz) / VDC	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
350~400VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TEA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TEA series

μF \ VDC / ø D	160				200			
	22	25.4	30	35	22	25.4	30	35
120					22×15 0.61			
150	22×15 0.68					25.4×15 0.73		
180		25.4×15 0.79					30×15 0.79	
220		25.4×15 0.88					30×15 0.90	
270			30×15 0.96					35×15 1.00
330			30×15 1.06					35×15 1.07
390				35×15 1.20				

μF \ VDC / ø D	250				400			
	22	25.4	30	35	22	25.4	30	35
39					22×15 0.35			
47						25.4×15 0.40		
56						25.4×15 0.44		
68							30×15 0.46	
82	22×15 0.50						30×15 0.51	
100		25.4×15 0.59						35×15 0.56
120		25.4×15 0.65						35×15 0.62
150			30×15 0.71					
180			30×15 0.79					
220				35×15 0.90	← Case Size øD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RLS Series

• 85℃ 3,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

RDC → RLS

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ～ 500 VDC
Operating Temperature Range	-25 ～ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated Voltage(VDC) 160～400 450～500 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(VDC) 160～400 450～500 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃. for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurement. Capacitance change ≦ ±15% of the initial value Tanδ ≦ 150% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

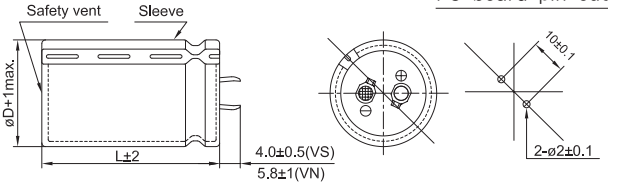
VDC \ Freq.(Hz)	60	120	300	1k	10k～
160～250VDC	0.81	1.00	1.17	1.32	1.45
350～500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RLS Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RLS Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
150									22×20 0.97			
180									22×20 1.06			
220					22×20 1.18				22×25 1.24	25.4×20 1.22		
270	22×20 1.30				22×20 1.37	25.4×20 1.35			22×30 1.54	25.4×20 1.32		
330	22×25 1.50				22×25 1.51	25.4×20 1.49			22×30 1.66	25.4×25 1.61	30×20 1.58	
390	22×25 1.62	25.4×20 1.62			22×30 1.73	25.4×25 1.71	30×20 1.71		22×35 1.88	25.4×30 1.88	30×25 1.86	35×20 1.71
470	22×30 1.86	25.4×25 1.86			22×30 1.97	25.4×25 1.95	30×20 1.88			25.4×35 2.15	30×25 2.05	35×20 1.88
560	22×30 2.15	25.4×25 2.15	30×20 2.05		22×40 2.18	25.4×30 2.15	30×25 2.15	35×20 2.05		25.4×35 2.35	30×30 2.36	35×25 2.35
680	22×35 2.35	25.4×30 2.33	30×25 2.33	35×20 2.26	22×40 2.48	25.4×30 2.48	30×25 2.48	35×20 2.36			30×30 2.71	35×25 2.58
820	22×40 2.68	25.4×30 2.65	30×25 2.64	35×20 2.49	22×45 2.81	25.4×40 2.79	30×30 2.80	35×25 2.83			30×35 2.98	35×30 2.88
1,000	22×45 3.02	25.4×35 3.00	30×30 2.96	35×25 3.31	22×50 3.28	25.4×40 3.28	30×35 3.15	35×30 3.26			30×40 3.56	35×35 3.48
1,200	22×50 3.47	25.4×40 3.43	30×30 3.41	35×25 3.40		25.4×45 3.61	30×35 3.61	35×30 3.57				

μF \ VDC / ø D	350				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×20 0.54			
56									22×20 0.59			
68					22×20 0.65				22×25 0.71	25.4×20 0.68		
82	22×20 0.72				22×25 0.84	25.4×20 0.74			22×25 0.86	25.4×20 0.74	30×20 0.79	
100	22×25 0.80				22×25 0.99	25.4×20 0.82			22×30 0.95	25.4×25 0.97	30×20 0.87	
120	22×25 1.04	25.4×20 0.90			22×30 1.09	25.4×25 1.13	30×20 0.95		22×35 1.07	25.4×30 1.09	30×25 1.12	35×20 0.99
150	22×30 1.2	25.4×25 1.22	30×20 1.06		22×35 1.24	25.4×30 1.27	30×25 1.20		22×40 1.18	25.4×30 1.25	30×25 1.29	35×20 1.06
180	22×30 1.34	25.4×25 1.37	30×20 1.16		22×40 1.41	25.4×30 1.44	30×25 1.52	35×20 1.16	22×45 1.32	25.4×35 1.40	30×30 1.45	35×25 1.33
220	22×35 1.47	25.4×30 1.53	30×25 1.54	35×20 1.29	22×45 1.58	25.4×35 1.64	30×30 1.66	35×20 1.47	22×50 1.48	25.4×40 1.59	30×30 1.64	35×25 1.66
270		25.4×35 1.73	30×25 1.8	35×25 1.49	22×50 1.65	25.4×40 1.79	30×30 1.82	35×25 1.63		25.4×45 1.73	30×35 1.89	35×30 1.90
330			30×30 2.03	35×25 1.80		25.4×45 2.00	30×35 2.05	35×30 2.05		25.4×50 2.12	30×40 2.12	35×35 2.15
390			30×35 2.23	35×30 2.30		25.4×50 2.12	30×40 2.26	35×35 2.28			30×45 2.35	35×40 2.38
470			30×35 2.53	35×30 2.55			30×45 2.51	35×35 2.54			30×50 2.65	35×45 2.68
560				35×35 2.75			30×50 2.85	35×40 2.85				35×50 2.88
680				35×40 3.15	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)							

RATINGS OF RLS Series

μF \ VDC / ø D	500			
	22	25.4	30	35
56	22 × 35 0.42			
68	22 × 40 0.49	25.4 × 30 0.49		
82	22 × 45 0.57	25.4 × 35 0.58		
100	22 × 50 0.66	25.4 × 40 0.68	30 × 30 0.68	
120		25.4 × 45 0.78	30 × 35 0.79	
150		25.4 × 50 0.92	30 × 40 0.94	35 × 30 0.91
180			30 × 45 1.08	35 × 35 1.06
220			30 × 50 1.25	35 × 40 1.23
270			30 × 60 1.51	35 × 45 1.43
330				35 × 50 1.66
390	Case Size ø D×L(mm) → Rated Ripple Current(Arms/85℃, 120Hz) →			35 × 60 1.95

RLB Series

• 85℃ 3,000Hrs assured.

- Non-solvent proof.
- High Ripple, Low Temp.
- For high ripple current application such as air conditioning system
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

RLS → RLB

High Ripple, Low Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	400 ～ 500 VDC
Operating Temperature Range	-40 ～ +85℃
Capacitance Tolerance	±10% (K) (at 20℃, 120Hz)
Leakage Current	I = 3√CV (μA) Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
※ Dissipation Factor (Tanδ)	Rated Voltage (VDC): 400 / 450～500 Tanδ (Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage (VDC): 400 / 450～500 Z(-25℃)/Z(20℃): 4 / 8 Z(-40℃)/Z(20℃): 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 85℃ Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±15% of the initial value Tanδ ≤ 150% of the initial specified value Leakage Current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

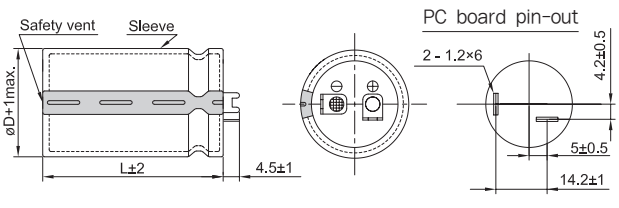
Frequency multiplying factor

VDC \ Freq.(Hz)	60	120	300	1k	10k～
400～500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RLB Series

Unit(mm)

ø D= ø 30~ ø 35 LI type



Marking : GOLD SLEEVE, BLACK INK
The standard design has no bottom plate.

RATINGS OF RLB Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85°C,120Hz)
400	100	30 × 20	1.01
	150	30 × 25	1.35
		35 × 20	
	220	30 × 30	1.84
		35 × 25	1.83
	270	30 × 35	2.11
	330	30 × 40	2.47
		35 × 30	2.45
	390	35 × 35	2.84
	470	30 × 50	3.32
		35 × 40	3.30
	560	35 × 45	3.70
	680	30 × 60	4.00
		35 × 50	
	820	35 × 60	4.50
450	82	30 × 20	0.94
	120	30 × 25	1.23
		35 × 20	
	180	30 × 30	1.67
		35 × 25	1.66
	220	30 × 35	1.95
	270	30 × 40	2.29
	330	35 × 35	2.64
	390	30 × 50	3.03
		35 × 40	3.01
	470	30 × 60	3.61
		35 × 45	3.50
	560	35 × 50	4.00
	680	35 × 60	4.40
	820	35 × 70	4.80
	1,000	35 × 80	5.20

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85°C,120Hz)
500	82	30 × 25	0.69
	100	30 × 30	0.80
		35 × 25	0.79
	120	30 × 35	0.93
	150	30 × 40	1.09
		35 × 30	1.07
	180	35 × 35	1.24
	220	30 × 50	1.45
		35 × 40	1.44
	270	30 × 60	1.72
		35 × 45	1.68
	330	35 × 50	1.94
	390	35 × 60	2.26
	470	35 × 70	2.55

RLC Series

• 85℃ 5,000Hrs assured.

- Non-solvent proof
- Long Life.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

RLS → RLC

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ～ 500 V_{DC}
Operating Temperature Range	-25 ～ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 160～400 450～500 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(V_{DC}) 160～400 450～500 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 85℃. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±15% of the initial value Tanδ ≤ 150% of the initial specified value Leakage Current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

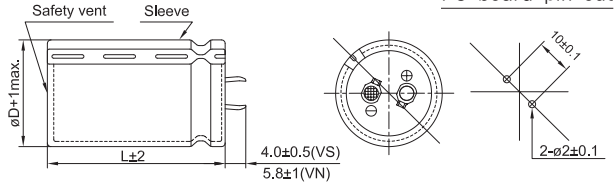
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k～
160～250	0.81	1.00	1.17	1.32	1.45
350～500	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RLC Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RLC Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85°C,120Hz)
160	270	22×25	1.46
	390	22×30	1.69
		25.4×25	1.69
	470	22×35	1.95
	560	22×40	2.21
		25.4×30	2.11
		30×25	2.11
	680	22×45	2.49
		25.4×35	2.47
	820	22×50	2.86
		25.4×40	2.83
		30×30	2.68
		35×25	2.99
	1,000	25.4×45	3.13
		30×35	2.96
	1,200	25.4×50	3.43
		30×40	3.24
		35×30	3.62
	1,500	30×45	3.62
		35×35	4.05
	1,800	30×50	3.97
		35×40	4.44
	2,200	35×45	4.75
200	220	22×25	1.23
	330	22×30	1.59
		25.4×25	1.57
	390	22×35	1.84
	470	22×40	1.99
		25.4×30	1.97
		30×25	1.97
	560	22×45	2.32
		25.4×35	2.30
	680	25.4×40	2.54
		30×30	2.55
		35×25	2.57
	820	25.4×45	2.98
		30×35	2.85
	1,000	30×40	3.15
		35×30	3.15
	1,200	30×45	3.45
		35×35	3.45
	1,500	35×40	3.86
	1,800	35×50	4.23
250	150	22×25	1.07
	220	22×30	1.46
		25.4×25	1.38
	270	22×35	1.64
	330	22×40	1.81
		25.4×30	1.81
		30×25	1.86
	390	22×45	1.92
		25.4×35	2.05
	470	22×50	2.11
		25.4×40	2.27
		30×30	2.27
		35×25	2.18
	560	25.4×45	2.42
		30×35	2.58
	680	25.4×50	2.66

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85°C,120Hz)
250	680	30×40	3.08
		35×30	2.66
	820	30×45	3.37
		35×35	3.20
	1,000	30×50	3.51
		35×40	3.54
	1,200	35×45	3.78
	1,500	35×50	4.08
350	82	22×25	0.76
	120	22×30	1.12
		25.4×25	1.14
	150	22×35	1.27
	180	22×40	1.40
		25.4×30	1.45
		30×25	1.45
	220	22×45	1.51
		25.4×35	1.64
	270	22×50	1.68
		25.4×40	1.83
		30×30	1.91
		35×25	1.70
	330	25.4×45	1.97
		30×35	2.15
	390	25.4×50	2.15
		30×40	2.35
		35×30	2.42
	470	30×45	2.52
		35×35	2.64
	560	30×50	2.74
		35×40	2.99
	680	35×45	3.29
	820	35×50	3.40
400	82	22×25	0.68
	120	22×30	0.89
		25.4×25	0.89
	150	22×35	1.07
	180	22×40	1.24
		25.4×30	1.18
		30×25	1.22
	220	22×45	1.44
		25.4×35	1.39
	270	22×50	1.68
		25.4×40	1.63
		30×30	1.61
		35×25	1.65
	330	25.4×45	1.90
		30×35	1.89
	390	30×40	2.18
		35×30	2.12
	470	30×45	2.51
		35×35	2.48
	560	30×50	3.00
		35×40	2.86
	680	30×60	3.50
		35×45	3.31
	820	30×70	4.00
		35×50	3.80
	1,000	35×60	4.54
	1,200	35×70	5.32

RATINGS OF RLC Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85℃,120Hz)
450	68	22×25	0.52
	100	22×30	0.68
		25.4×25	0.69
	120	22×35	0.80
	150	22×40	0.94
		25.4×30	0.91
		30×25	0.94
	180	22×45	1.09
		25.4×35	1.06
	220	22×50	1.26
		25.4×40	1.24
		30×30	1.22
		35×25	1.24
	270	25.4×45	1.45
		30×35	1.44
	330	30×40	1.69
		35×30	1.63
	390	30×45	1.93
		35×35	1.89
	470	30×50	2.22
		35×40	2.19
	560	30×60	2.60
		35×45	2.51
	680	30×70	3.10
		35×50	2.89
	820	35×60	3.43
	1,000	35×70	4.06

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/85℃,120Hz)
500	39	22×25	0.30
	56	22×30	0.39
		25.4×25	0.39
	68	22×35	0.46
	82	22×40	0.53
		25.4×30	0.51
		30×25	0.53
	100	22×45	0.62
		25.4×35	0.60
	120	22×50	0.71
		25.4×40	0.70
		30×30	0.69
		35×25	0.70
	150	25.4×45	0.83
		30×35	0.82
	180	30×40	0.95
		35×30	0.92
	220	30×45	1.10
		35×35	1.08
	270	30×60	1.31
		35×40	1.27
	330	30×70	1.64
		35×50	1.54
	390	35×60	1.81
	470	35×70	2.13

TLA Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → TLA

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 500 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 160~500; Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160~400 / 420~500; Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

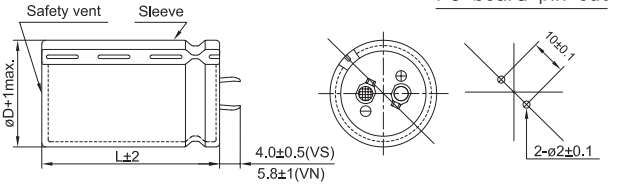
VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLA Series

VDC / μF \ øD	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22×25 0.78			
220									22×30 1.00	25.4×25 0.95		
270					22×25 1.10				22×30 1.18	25.4×25 1.18		
330	22×25 1.20				22×30 1.25	25.4×25 1.25			22×35 1.30	25.4×35 1.30	30×25 1.30	
390	22×25 1.26	25.4×25 1.30			22×30 1.35	25.4×25 1.35			22×40 1.49	25.4×35 1.49	30×25 1.49	
470	22×30 1.33	25.4×25 1.33			22×40 1.50	25.4×30 1.50	30×25 1.50		22×45 1.65	25.4×35 1.65	30×30 1.65	35×25 1.65
560	22×35 1.60	25.4×30 1.60	30×25 1.60		22×45 1.67	25.4×30 1.60	30×25 1.60		22×50 1.67	25.4×40 1.80	30×30 1.80	35×25 1.80
680	22×40 1.82	25.4×30 1.82	30×25 1.82		22×45 1.78	25.4×35 1.78	30×30 1.78	35×25 1.78		25.4×50 2.00	30×35 2.00	35×30 2.00
820	22×45 2.04	25.4×35 2.04	30×30 2.04	35×25 2.04		25.4×45 2.04	30×30 2.04	35×25 2.04		25.4×60 2.20	30×40 2.30	35×35 2.30
1,000	22×50 2.25	25.4×40 2.25	30×30 2.25	35×25 2.25		25.4×50 2.30	30×35 2.30	35×30 2.30			30×50 2.47	35×40 2.47
1,200		25.4×45 2.49	30×35 2.49	35×30 2.49		25.4×60 2.66	30×40 2.65	35×35 2.65			30×60 2.85	35×45 2.60
1,500		25.4×60 2.97	30×40 2.84	35×30 2.84			30×50 3.08	35×40 3.08				35×50 3.00
1,800			30×45 3.32	35×35 3.00			30×60 3.49	35×45 3.48				35×60 3.42
2,200			30×60 3.86	35×45 3.50				35×50 3.78	← Case Size øD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

VDC / μF \ øD	350				400			
	22	25.4	30	35	22	25.4	30	35
68					22×25 0.55			
82	22×25 0.55				22×25 0.64			
100	22×25 0.69				22×30 0.70	25.4×25 0.70		
120	22×30 0.75	25.4×25 0.75			22×35 0.75	25.4×25 0.75	30×25 0.80	
150	22×35 0.82	25.4×30 0.83	30×25 0.82		22×40 0.88	25.4×30 0.88	30×25 0.88	
180	22×40 0.92	25.4×30 0.92	30×25 0.90		22×45 0.98	25.4×35 0.98	30×30 0.98	35×25 0.98
220	22×45 1.05	25.4×35 1.04	30×30 1.02	35×25 1.04	22×50 1.10	25.4×40 1.10	30×30 1.10	35×25 1.0
270	22×50 1.16	25.4×40 1.18	30×30 1.17	35×25 1.20		25.4×45 1.22	30×35 1.22	35×30 1.22
330		25.4×45 1.29	30×35 1.34	35×30 1.22		25.4×50 1.44	30×40 1.44	35×30 1.44
390		25.4×50 1.51	30×40 1.51	35×35 1.47		25.4×60 1.51	30×45 1.60	35×35 1.60
470		25.4×60 1.66	30×45 1.65	35×35 1.69			30×50 1.90	35×40 1.90
560			30×50 1.85	35×40 1.90			30×60 2.10	35×45 2.12
680			30×60 2.15	35×50 1.99				35×60 2.27

RATINGS OF TLA Series

VDC / ØD / μF	420				450			
	22	25.4	30	35	22	25.4	30	35
56					22×25 0.40			
68	22×25 0.50				22×30 0.53	25.4×25 0.50		
82	22×25 0.64	25.4×25 0.58			22×30 0.64	25.4×25 0.64		
100	22×30 0.70	25.4×25 0.70			22×35 0.69	25.4×30 0.69	30×25 0.64	
120	22×35 0.75	25.4×30 0.75	30×25 0.73		22×40 0.80	25.4×30 0.80	30×25 0.80	35×25 0.73
150	22×40 0.88	25.4×35 0.88	30×25 0.88		22×45 0.88	25.4×35 0.88	30×30 0.88	35×25 0.75
180	22×45 0.95	25.4×35 0.95	30×30 0.95	35×25 0.94	22×50 1.00	25.4×40 1.00	30×30 1.00	
220	22×50 1.10	25.4×45 1.10	30×35 1.10	35×25 1.10		25.4×45 1.12	30×35 1.12	35×30 1.12
270		25.4×50 1.22	30×40 1.22	35×30 1.22		25.4×50 1.18	30×40 1.28	35×35 1.28
330		25.4×60 1.41	30×45 1.45	35×35 1.45			30×50 1.45	35×40 1.45
390			30×50 1.55	35×40 1.55			30×60 1.51	35×40 1.55
470			30×60 1.79	35×45 1.90	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			35×50 1.85

VDC / ØD / μF	500			
	22	25.4	30	35
56	22×35 0.46	25.4×30 0.46	30×30 0.48	
68	22×40 0.50	25.4×35 0.53	30×30 0.55	
82	22×45 0.56	25.4×35 0.58	30×35 0.58	
100		25.4×40 0.65	30×35 0.66	
120		25.4×45 0.75	30×40 0.76	35×30 0.78
150			30×45 0.80	35×35 0.81
180			30×50 0.90	35×40 0.93
220			30×60 1.10	35×45 1.11
270				35×50 1.28
330				35×60 1.50

TLS Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Downsized.
- High Ripple Capability.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

TLA → TLS

Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 550 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 160~400 / 450~550 Tanδ(Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160~400 / 450~550 Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

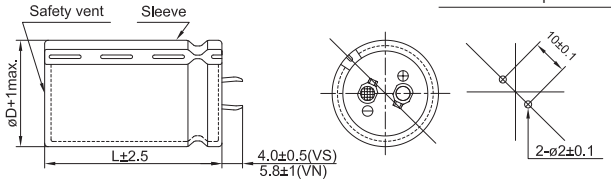
VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
315~550VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLS Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLS Series

VDC / ØD / μF	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
270									22×25 1.11			
330					22×25 1.23				22×30 1.29			
390					22×30 1.40				22×35 1.44	25.4×25 1.40		
470	22×25 1.47				22×30 1.54				22×40 1.61	25.4×30 1.57		
560	22×30 1.68				22×35 1.72	25.4×25 1.67			22×45 1.79	25.4×35 1.79	30×25 1.87	
680	22×35 1.86	25.4×25 1.84			22×40 1.94	25.4×30 1.89	30×25 2.05		22×50 2.02	25.4×40 2.02	30×30 2.08	35×25 2.19
820	22×40 2.12	25.4×30 2.08			22×45 2.17	25.4×35 2.17	30×30 2.28			25.4×45 2.26	30×35 2.34	35×30 2.44
1,000	22×45 2.40	25.4×35 2.40	30×25 2.50			25.4×40 2.45	30×30 2.52	35×25 2.66		25.4×50 2.53	30×40 2.66	35×30 2.70
1,200	22×50 2.69	25.4×40 2.68	30×30 2.77	35×25 2.91		25.4×45 2.78	30×35 2.83	35×30 2.96			30×45 2.99	35×35 3.00
1,500		25.4×45 3.05	30×35 3.17	35×30 3.30			30×40 3.26	35×35 3.36				35×40 3.48
1,800		25.4×50 3.40	30×40 3.57	35×30 3.62			30×50 3.72	35×40 3.81				35×50 3.98
2,200			30×45 4.05	35×35 4.07				35×45 4.32				
2,700			30×50 4.56	35×40 4.67				35×50 4.88				
3,300				35×50 5.40								

VDC / ØD / μF	315				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100									22×25 0.70			
120					22×25 0.77				22×30 0.81			
150					22×30 0.90				22×35 0.92	25.4×25 0.90		
180	22×25 0.95				22×35 1.02	25.4×25 0.99			22×40 1.02	25.4×35 1.05	30×25 1.06	
220	22×30 1.10				22×40 1.15	25.4×30 1.13			22×45 1.17	25.4×35 1.16	30×30 1.18	
270	22×35 1.24	25.4×25 1.21			22×45 1.29	25.4×35 1.30	30×25 1.29			25.4×40 1.32	30×30 1.30	35×25 1.37
330	22×40 1.40	25.4×30 1.38	30×25 1.43		22×50 1.47	25.4×40 1.47	30×30 1.45			25.4×45 1.48	30×35 1.51	35×30 1.54
390	22×45 1.56	25.4×35 1.57	30×30 1.57			25.4×45 1.63	30×35 1.61	35×25 1.65		25.4×50 1.65	30×40 1.65	35×30 1.67
470	22×50 1.70	25.4×40 1.76	30×30 1.73	35×25 1.82		25.4×50 1.82	30×40 1.82	35×30 1.85			30×45 1.86	35×35 1.87
560		25.4×45 1.96	30×35 1.93	35×30 2.02			30×45 2.04	35×35 2.05				35×40 2.05
680			30×40 2.19	35×30 2.20			30×50 2.30	35×40 2.34				35×50 2.44
820			30×45 2.47	35×35 2.48				35×45 2.63				
1,000				35×40 2.83				35×50 2.96				
1,200				35×45 3.18	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/105°C, 120Hz)							

RATINGS OF TLS Series

μF \ VDC / ø D	500				550		
	22	25.4	30	35	25.4	30	35
56	22×35 0.41						
68	22×40 0.48	25.4×30 0.46					
82	22×45 0.56	25.4×35 0.54			25.4×40 0.52		
100	22×50 0.64	25.4×40 0.63	30×30 0.61		25.4×50 0.60	30×35 0.55	
120		25.4×45 0.73	30×35 0.72		25.4×50 0.72	30×40 0.70	
150		25.4×50 0.78	30×40 0.85	35×30 0.83		30×45 0.80	35×35 0.75
180			30×45 0.98	35×35 0.96		30×50 0.90	35×40 0.93
220			30×50 1.03	35×40 1.13		30×60 0.95	35×50 0.95
270			30×60 1.24	35×45 1.31		30×70 1.00	35×55 1.05
330				35×50 1.38			35×60 1.15
390	Case Size øD×L(mm) → Rated Ripple Current(Arms/105℃, 120Hz) →			35×60 1.63			35×70 1.50

TLG Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof
- High Ripple, Low Temp.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

TLA → TLG

High Ripple, Low Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 3 $\sqrt{CV}$ (μA) Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 160~400 / 450~500 Tanδ(Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160~400 / 450~500 Z(-25℃)/Z(20℃): 4 / 8 Z(-40℃)/Z(20℃): 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 105℃ Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

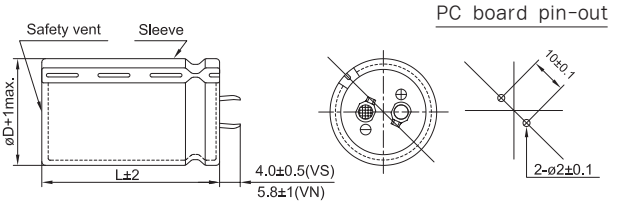
VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250	0.81	1.00	1.17	1.32	1.45
350~500	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLG Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLG Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
160	330	22×25	1.20
	470	22×30	1.47
		25.4×25	1.46
	560	22×35	1.66
	680	22×40	1.87
		25.4×30	1.82
		30×25	1.85
	820	22×45	2.11
		25.4×35	2.06
	1,000	22×50	2.31
		25.4×40	2.28
		30×30	2.27
		35×25	2.29
	1,200	25.4×45	2.57
		30×35	2.57
	1,500	30×40	2.96
		35×30	2.91
	1,800	30×45	3.34
		35×35	3.30
	2,200	35×45	3.78
	2,700	35×50	4.07
200	270	22×25	1.15
	390	22×30	1.43
		25.4×25	1.42
	470	22×35	1.60
	560	22×40	1.80
		25.4×30	1.75
		30×25	1.80
	680	22×45	2.04
		25.4×35	1.99
	820	22×50	2.17
		25.4×40	2.26
		30×30	2.26
		35×25	2.27
	1,000	25.4×50	2.48
		30×35	2.49
	1,200	30×40	2.81
		35×30	2.77
	1,500	30×50	3.23
		35×40	3.32
	1,800	35×45	3.75
	2,200	35×50	4.01
250	180	22×25	0.97
	270	22×30	1.23
		25.4×25	1.22
	330	22×35	1.39
	390	22×40	1.55
		25.4×30	1.51
		30×25	1.54
	470	22×45	1.75
		25.4×35	1.71
	560	22×50	1.96
		25.4×40	1.92
		30×30	1.91
		35×25	1.93
	680	25.4×50	2.24
		30×35	2.18
		35×30	2.22
	820	30×40	2.47
		35×35	2.52
	1,000	30×50	2.89
		35×40	2.87
	1,200	35×45	3.25
	1,500	35×50	3.73

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
350	100	22×25	0.73
	150	22×30	0.91
		25.4×25	0.91
	180	22×35	1.03
	220	22×40	1.16
		25.4×30	1.14
		30×25	1.16
	270	22×50	1.36
		25.4×40	1.33
		30×30	1.33
		35×25	1.34
	330	25.4×45	1.52
	390	25.4×50	1.69
		30×35	1.65
		35×30	1.68
	470	30×40	1.87
		35×35	1.91
	560	30×50	2.16
		35×40	2.15
	680	35×45	2.44
	820	35×50	2.76
400	100	22×25	0.73
	120	22×30	0.82
		25.4×25	0.81
	150	22×35	0.94
	180	22×40	1.05
		25.4×30	1.03
		30×25	1.05
	220	22×45	1.20
		25.4×35	1.17
	270	22×50	1.36
		25.4×40	1.33
		30×30	1.33
		35×25	1.34
	330	25.4×45	1.52
		30×35	1.52
	390	25.4×50	1.69
		30×40	1.70
		35×30	1.68
	470	30×45	1.93
		35×35	1.91
	560	30×50	2.16
		35×40	2.15
	680	35×45	2.44
	820	35×50	2.76
450	68	22×25	0.57
	100	22×30	0.71
		25.4×25	0.71
	120	22×35	0.80
	150	22×40	0.92
		25.4×30	0.90
		30×25	0.92
	180	22×45	1.04
		25.4×35	1.01
	220	25.4×40	1.15
		30×30	1.15
		35×25	1.16
	270	25.4×50	1.35
		30×40	1.36
		35×30	1.34
	330	30×45	1.55
		35×35	1.53
	390	30×50	1.73
		35×40	1.72

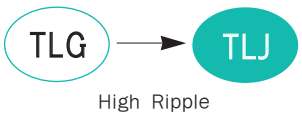
RATINGS OF TLG Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
450	470	35 × 45	1.95
	560	35 × 50	2.18
500	47	22 × 25	0.43
	56	22 × 30	0.52
		25.4 × 25	0.50
	68	22 × 35	0.60
	82	22 × 40	0.65
		25.4 × 30	0.67
		30 × 25	0.72
	100	22 × 45	0.74
		25.4 × 35	0.77
	120	22 × 50	0.85
		25.4 × 40	0.85
		30 × 30	0.86
		35 × 25	0.88
	150	25.4 × 45	0.98
		30 × 35	0.97
	180	25.4 × 50	1.12
		30 × 40	1.13
		35 × 30	1.15
	220	30 × 45	1.22
		35 × 35	1.24
	270	30 × 50	1.34
		35 × 40	1.37
	330	35 × 45	1.62
	390	35 × 50	1.84

TLJ Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof
- High Ripple, Low Temp.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	400 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 3√CV or 3mA, Whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※Dissipation Factor(Tanδ)	Rated voltage(VDC): 400 / 420~500 Tanδ(Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 400 / 420~500 Z(-25℃)/Z(20℃): 4 / 8 Z(-40℃)/Z(20℃): 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 105℃ Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

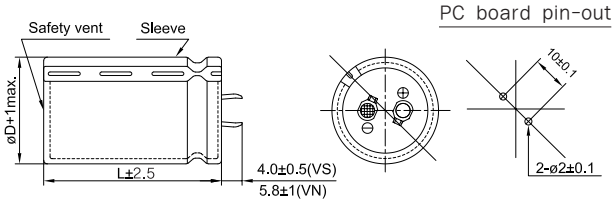
VDC \ Freq.(Hz)	60	120	300	1k	10k~
400~500	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLJ Series

Unit(mm)

ø D= ø 25.4~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLJ Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
400	120	25.4×25	1.05
	180	25.4×30	1.34
		30×25	1.37
	220	25.4×35	1.52
	270	25.4×40	1.73
		30×30	1.73
		35×25	1.74
	330	25.4×50	1.98
		30×35	1.96
		35×30	1.96
	390	30×40	2.21
		35×35	2.20
	470	30×50	2.61
		35×40	2.58
	560	35×45	3.07
	680	35×50	3.39
420	100	25.4×25	0.92
	150	25.4×30	1.10
		30×25	1.20
	180	25.4×35	1.24
	220	25.4×40	1.43
		30×30	1.43
		35×25	1.44
	270	25.4×45	1.69
		30×35	1.70
	330	35×30	1.74
		30×40	1.95
	390	30×45	2.18
		35×35	2.17
	470	30×50	2.55
		35×45	2.54
	560	35×50	2.83

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
450	100	25.4×25	0.92
	150	25.4×35	1.17
		30×25	1.20
	180	25.4×40	1.31
	220	25.4×45	1.50
		30×35	1.50
		35×25	1.51
	270	25.4×50	1.76
		30×40	1.77
		35×30	1.74
	330	30×45	2.02
		35×35	1.99
	390	30×50	2.25
		35×40	2.24
	470	35×45	2.54
	560	35×50	2.83
500	56	25.4×25	0.66
	68	25.4×25	0.69
	82	25.4×30	0.87
		30×25	0.94
	100	25.4×35	1.00
	120	25.4×40	1.11
		30×30	1.12
		35×25	1.14
	150	30×35	1.26
	180	25.4×50	1.45
		30×40	1.47
		35×30	1.50
	220	30×45	1.59
		35×35	1.61
	270	35×40	1.73
	330	35×50	1.89

TLK Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof
- High Ripple, Wide Temp.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**
- AEC-Q200 compliant : Please contact us for more details, test data, information.

TLJ → TLK

High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	400 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 3 $\sqrt{CV}$ or 3mA, Whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 5minutes)
※Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 400 / 420~500; Tanδ(Max.) 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 400 / 420~500; Z(-25℃)/Z(20℃) 4 / 8; Z(-40℃)/Z(20℃) 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 105℃ Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

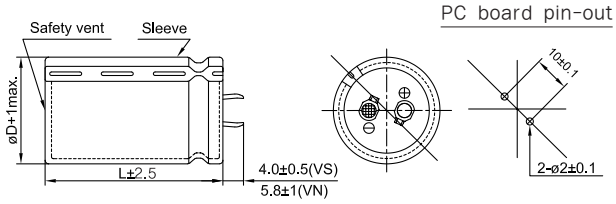
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k~
400~500	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLK Series

Unit(mm)

ø D= ø 25.4~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLK Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
400	120	25.4×25	1.16
	180	25.4×30	1.47
		30×25	1.51
	220	25.4×35	1.67
	270	25.4×40	1.90
		30×30	1.90
		35×25	1.91
	330	25.4×50	2.18
		30×35	2.16
		35×30	2.16
	390	30×40	2.43
		35×35	2.42
	470	30×50	2.87
		35×40	2.83
	560	35×45	3.37
	680	35×50	3.73
420	100	25.4×25	1.10
	150	25.4×30	1.32
		30×25	1.44
	180	25.4×35	1.48
	220	25.4×40	1.71
		30×30	1.71
		35×25	1.72
	270	25.4×45	2.01
		30×35	2.01
	330	35×30	2.09
		30×40	2.34
	390	30×45	2.61
		35×35	2.60
	470	30×50	3.06
		35×45	3.05
	560	35×50	3.40

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
450	100	25.4×25	1.01
	150	25.4×35	1.28
		30×25	1.32
	180	25.4×40	1.46
	220	25.4×45	1.63
		30×35	1.63
		35×25	1.61
	270	25.4×50	1.91
		30×40	1.89
		35×30	1.86
	330	30×45	2.26
		35×35	2.13
	390	30×50	2.42
		35×40	2.41
	470	35×45	2.58
	560	35×50	2.85
500	56	25.4×25	0.74
	68	25.4×25	0.78
	82	25.4×30	0.98
		30×25	1.05
	100	25.4×35	1.12
	120	25.4×40	1.24
		30×30	1.25
		35×25	1.27
	150	30×35	1.51
	180	25.4×50	1.62
		30×40	1.64
		35×30	1.68
	220	30×45	1.78
		35×35	1.80
	270	35×40	1.93
	330	35×50	2.27

TLR Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof
- High Ripple, Wide Temp.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

TLK → TLR

High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	400 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	$I = 3\sqrt{CV}$ or 3mA, Whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 5minutes)
※Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 400 / 420~500 Tanδ(Max.) 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 400 / 420~500 Z(-25℃)/Z(20℃) 4 / 8 Z(-40℃)/Z(20℃) 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 3,000 hours at 105℃ Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 200% of the initial specified value Leakage current ≤ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

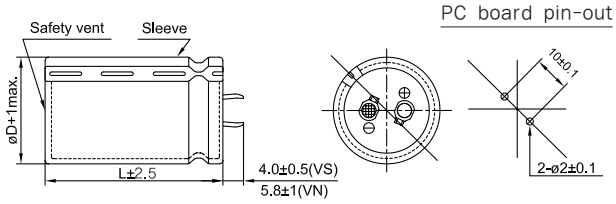
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k~
400~500	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLR Series

Unit(mm)

ø D= ø 25.4~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLR Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
400	150	25.4×25	1.19
	220	25.4×30	1.55
		30×25	1.57
	270	25.4×35	1.76
	330	30×30	2.00
		35×25	2.10
	390	25.4×50	2.28
		30×35	2.29
		35×30	2.29
	470	30×40	2.60
		35×35	2.57
	560	30×50	3.10
		35×40	3.00
	680	35×45	3.60
	820	35×50	3.90
420	120	25.4×25	1.18
	180	25.4×30	1.39
		30×25	1.50
	220	25.4×35	1.58
	270	25.4×40	1.80
		30×30	1.80
		35×25	1.81
	330	25.4×50	2.17
		30×35	2.17
	390	35×30	2.20
		30×40	2.49
	470	35×35	2.75
		30×50	3.06
	560	35×40	3.10
		35×45	3.20
	680	35×50	3.68

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
450	120	25.4×25	1.08
	150	25.4×30	1.20
	180	30×25	1.39
		25.4×35	1.30
	220	25.4×40	1.50
		30×30	1.50
	270	35×25	1.70
	330	25.4×50	1.97
		30×40	1.95
	390	30×45	2.39
		35×35	2.36
	470	30×50	2.55
		35×40	2.54
	560	35×45	2.68
	680	35×50	2.95
500	82	25.4×25	0.83
	120	25.4×30	1.02
		30×25	1.02
	150	25.4×40	1.20
		30×30	1.20
	220	35×30	1.52
		25.4×50	1.55
		30×40	1.55
	270	30×45	1.65
		35×35	1.70
	330	35×40	1.83
	470	35×50	1.95

TLC(LXG) Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

TLA → TLC (LXG)

High Reliability
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	10 ~ 100 VDC	200 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)	
※ Dissipation Factor(Tanδ)	See table below	
Temperature Characteristics (Max.Impedance ratio)	See table below	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 250% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

Rated Voltage(VDC)	10	16	25	35	50	63~400	420~500
Tanδ(Max.)	0.60	0.45	0.30	0.25	0.20	0.15	0.20

(at 20℃,120Hz)

Rated Voltage(VDC)	10~16	25	35	50~63	80~100	200~400	420~500
Z(-25℃)/Z(20℃)	4	3	3	2	2	4	8
Z(-40℃)/Z(20℃)	15	10	8	6	5	-	-

(at 120Hz)

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF , 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

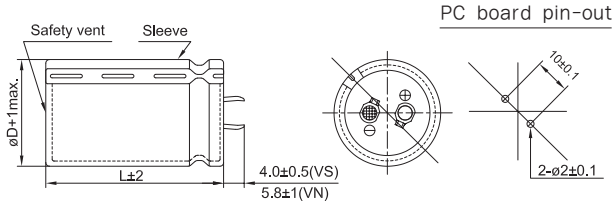
VDC \ Freq.(Hz)	60	120	300	1k	10k~
10~50VDC	0.95	1.00	1.03	1.05	1.08
63~100VDC	0.92	1.00	1.07	1.13	1.19
200~250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLC(LXG) Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLC(LXG) Series

VDC / μF \ ø D	10				16				25			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,900									22×25 1.31			
4,700									22×30 1.51	25.4×25 1.51		
5,600					22×25 1.44				22×35 1.70	25.4×30 1.69		
6,800	22×25 1.30				22×30 1.66	25.4×25 1.66			22×40 1.92	25.4×30 1.87	30×25 1.90	
8,200	22×30 1.49				22×35 1.87	25.4×30 1.87			22×45 2.05	25.4×35 2.14	30×30 2.15	35×25 2.19
10,000	22×30 1.65	25.4×25 1.64			22×40 2.12	25.4×30 2.07	30×25 2.11		22×50 2.45	25.4×40 2.43	30×30 2.31	35×25 2.35
12,000	22×35 1.85	25.4×30 1.85	30×25 1.89		22×45 2.32	25.4×35 2.37	30×30 2.37	35×25 2.42		25.4×50 2.78	30×35 2.70	35×30 2.76
15,000	22×40 2.12	25.4×35 2.16	30×25 2.06		22×50 2.74	25.4×40 2.71	30×30 2.58	35×25 2.63			30×40 3.13	35×35 3.16
18,000	22×50 2.45	25.4×40 2.43	30×30 2.37	35×25 2.42		25.4×50 3.11	30×35 3.02	35×30 3.09			30×50 3.64	35×40 3.61
22,000		25.4×45 2.62	30×35 2.73	35×30 2.79			30×40 3.46	35×35 3.49				35×45 4.00
27,000		25.4×50 3.11	30×40 3.13	35×30 3.00			30×50 4.07	35×40 4.04				35×50 4.70
33,000			30×45 3.34	35×35 3.49				35×45 4.29				
39,000			30×50 3.99	35×40 3.96				35×50 5.16				
47,000				35×50 4.62								

VDC / μF \ ø D	35				50				63			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
1,000									22×25 1.00			
1,200									22×30 1.15	25.4×25 1.15		
1,500					22×25 1.02				22×35 1.32	25.4×25 1.28		
1,800					22×30 1.17	25.4×25 1.17			22×40 1.49	25.4×30 1.45	30×25 1.48	
2,200	22×25 1.10				22×35 1.33	25.4×30 1.32			22×45 1.63	25.4×35 1.67	30×30 1.68	35×25 1.71
2,700	22×25 1.21				22×40 1.51	25.4×30 1.47	30×25 1.50		22×50 1.92	25.4×40 1.90	30×35 1.93	35×25 1.83
3,300	22×30 1.42	25.4×25 1.41			22×45 1.68	25.4×35 1.70	30×30 1.70	35×25 1.74		25.4×50 2.20	30×35 2.07	35×30 2.18
3,900	22×35 1.58	25.4×30 1.58			22×50 1.91	25.4×40 1.89	30×30 1.84	35×25 1.89			30×40 2.41	35×35 2.43
4,700	22×40 1.78	25.4×30 1.70	30×25 1.77			25.4×45 2.05	30×35 2.11	35×30 2.16			30×50 2.80	35×40 2.78
5,600	22×45 1.96	25.4×35 1.98	30×30 1.98	35×25 2.03		25.4×50 2.38	30×40 2.39	35×35 2.41				35×45 3.04
6,800	22×50 2.26	25.4×40 2.24	30×30 2.14	35×25 2.20			30×50 2.79	35×40 2.78				35×50 3.55
8,200		25.4×50 2.57	30×35 2.50	35×30 2.55				35×45 3.06				
10,000			30×40 2.86	35×35 2.88				35×50 3.57				
12,000			30×50 3.32	35×40 3.30								
18,000				35×50 4.29	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)							

RATINGS OF TLC(LXG) Series

μF \ VDC / ø D	80				100				200			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22×25 0.79			
270									22×30 1.01	25.4×25 1.01		
330									22×35 1.15	25.4×30 1.15	30×25 1.18	
390					22×25 0.78				22×40 1.28	25.4×30 1.25	30×25 1.28	
470					22×25 0.85				22×50 1.46	25.4×35 1.44	30×30 1.44	35×25 1.53
560					22×30 0.99	25.4×25 0.98				25.4×40 1.60	30×35 1.63	35×25 1.66
680	22×25 0.97				22×35 1.12	25.4×25 1.08				25.4×50 1.85	30×40 1.86	35×30 1.84
820	22×30 1.12				22×40 1.26	25.4×30 1.23	30×25 1.25				30×45 2.04	35×35 2.06
1,000	22×35 1.27	25.4×25 1.23			22×45 1.39	25.4×35 1.41	30×30 1.42	35×25 1.45			30×50 2.39	35×40 2.38
1,200	22×40 1.42	25.4×30 1.39	30×25 1.41		22×50 1.60	25.4×40 1.59	30×35 1.61	35×25 1.58				35×50 2.76
1,500	22×45 1.60	25.4×35 1.62	30×25 1.57			25.4×50 1.86	30×40 1.87	35×30 1.85				
1,800	22×50 1.84	25.4×40 1.82	30×30 1.78	35×25 1.82			30×45 2.07	35×35 2.07				
2,200		25.4×50 2.11	30×35 2.05	35×30 2.09			30×50 2.40	35×40 2.39				
2,700			30×40 2.35	35×35 2.37				35×50 2.81				
3,300			30×50 2.75	35×40 2.73								
4,700				35×50 3.46								

μF \ VDC / ø D	250				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
56									22×25 0.47			
68					22×25 0.49				22×30 0.57	25.4×25 0.53		
82					22×30 0.61				22×35 0.65	25.4×25 0.58		
100					22×35 0.65	25.4×25 0.64			22×35 0.71	25.4×30 0.71	30×25 0.71	
120					22×40 0.70	25.4×30 0.69	30×25 0.70		22×40 0.81	25.4×35 0.81	30×25 0.80	35×25 0.82
150	22×25 0.71				22×45 0.79	25.4×35 0.75	30×25 0.78	35×25 0.86	22×50 0.92	25.4×40 0.90	30×30 0.92	35×25 0.93
180	22×30 0.83	25.4×25 0.83			22×50 0.91	25.4×40 0.90	30×30 0.89	35×25 0.94		25.4×45 1.03	30×35 1.03	35×30 1.05
220	22×35 0.94	25.4×25 0.91				25.4×50 1.16	30×35 1.03	35×30 1.04		25.4×50 1.16	30×40 1.18	35×35 1.26
270	22×40 1.06	25.4×30 1.04	30×25 1.06				30×40 1.18	35×35 1.30			30×50 1.35	35×40 1.33
330	22×45 1.15	25.4×35 1.20	30×30 1.20	35×25 1.28			30×50 1.49	35×40 1.49				35×45 1.50
390	22×50 1.35	25.4×40 1.34	30×30 1.30	35×25 1.38				35×45 1.54				35×50 1.70
470		25.4×50 1.53	30×35 1.49	35×30 1.53				35×50 1.73				
560			30×40 1.69	35×35 1.70								
680			30×50 1.98	35×40 1.96								
1,000				35×50 2.53	← Case Size ø D×L (mm) ← Rated Ripple Current (Arms/105°C, 120Hz)							

RATINGS OF TLC(LXG) Series

μF \ VDC / ø D	420				450				500			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47					22×25 0.47				22×35 0.37			
56					22×30 0.53				22×35 0.44	25.4×30 0.41	30×30 0.45	
68	22×30 0.58				22×35 0.59	25.4×30 0.59			22×40 0.52	25.4×35 0.54	30×30 0.51	
82	22×30 0.65	25.4×30 0.66			22×35 0.66	25.4×30 0.66			22×45 0.62	25.4×35 0.62	30×35 0.58	
100	22×35 0.73	25.4×30 0.73			22×40 0.75	25.4×35 0.73	30×30 0.74			25.4×40 0.63	30×35 0.64	
120	22×40 0.83	25.4×35 0.83	30×30 0.83		22×45 0.84	25.4×35 0.83	30×30 0.83	35×30 0.84		25.4×45 0.71	30×40 0.71	35×30 0.72
150	22×45 0.95	25.4×40 0.95	30×30 0.95		22×50 0.95	25.4×40 0.95	30×35 0.95	35×30 0.96			30×45 0.76	35×30 0.80
180	22×50 1.07	25.4×40 1.07	30×35 1.07	35×30 1.08		25.4×45 1.07	30×35 1.07	35×30 1.08			30×50 0.89	35×40 0.90
220		25.4×50 1.21	30×40 1.21	35×30 1.22		25.4×50 1.21	30×40 1.21	35×35 1.22			30×60 1.05	35×45 1.01
270			30×45 1.38	35×35 1.41			30×45 1.38	35×40 1.41				35×50 1.44
330			30×50 1.60	35×40 1.60			30×50 1.60	35×45 1.61				35×60 1.55
390				35×45 1.80				35×50 1.80				
470				35×50 1.92					← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

TLB Series

• 105℃ 7,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For SMPS, Inverter.
- RoHS compliant.
- Halogen-free capacitors are also available.
- AEC-Q200 compliant : Please contact us for more details, test data, information.

TLC (LXG) → TLB
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 500 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I: Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※Dissipation Factor(Tanδ)	Rated voltage(VDC): 160 ~ 500 Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160 ~ 400 / 450 ~ 500 Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 7,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

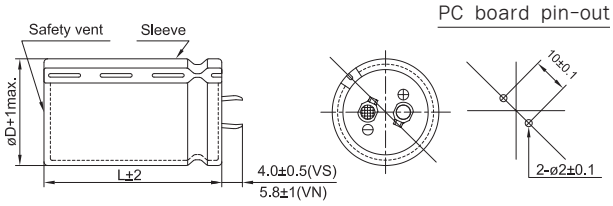
VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLB Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLB Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
220					22×25 0.90				22×30 0.95			
270					22×30 1.05				22×35 1.08	25.4×25 1.05		
330	22×25 1.11				22×30 1.16	25.4×25 1.16			22×40 1.22	25.4×30 1.19		
390	22×30 1.26				22×35 1.29	25.4×30 1.29			22×45 1.36	25.4×35 1.35	30×25 1.32	
470	22×30 1.39	25.4×25 1.38			22×40 1.46	25.4×30 1.42	30×25 1.45		22×50 1.49	25.4×40 1.52	30×30 1.49	
560	22×35 1.55	25.4×30 1.55			22×45 1.63	25.4×35 1.62	30×30 1.62			25.4×45 1.70	30×35 1.69	
680	22×40 1.75	25.4×35 1.78	30×25 1.74			25.4×40 1.83	30×30 1.79			25.4×50 1.91	30×40 1.93	35×30 1.90
820	22×50 1.97	25.4×40 2.01	30×30 1.96			25.4×45 2.06	30×35 2.04				30×45 2.19	35×35 2.13
1,000		25.4×45 2.27	30×35 2.26				30×45 2.42	35×30 2.30				35×40 2.46
1,200		25.4×50 2.54	30×40 2.56	35×30 2.52			30×50 2.71	35×45 2.70				35×50 2.86
1,500			30×45 2.96	35×35 2.89				35×45 3.11				
1,800			30×50 3.32	35×40 3.30				35×50 3.50				
2,200				35×50 3.87								

μF \ VDC / ø D	350				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×25 0.46			
56									22×30 0.52			
68					22×25 0.55				22×30 0.58	25.4×25 0.58		
82					22×30 0.63				22×35 0.65	25.4×30 0.65		
100	22×25 0.67				22×30 0.70	25.4×25 0.70			22×40 0.74	25.4×30 0.72	30×25 0.73	
120	22×30 0.77	25.4×25 0.76			22×35 0.79	25.4×30 0.79			22×45 0.83	25.4×35 0.82	30×30 0.82	
150	22×35 0.88	25.4×30 0.88			22×40 0.90	25.4×30 0.88	30×25 0.90			25.4×40 0.94	30×35 0.96	
180	22×40 0.99	25.4×30 0.96	30×25 0.98		22×45 0.99	25.4×35 1.01	30×30 1.01			25.4×45 1.06	30×35 1.05	35×30 1.07
220	22×45 1.12	25.4×35 1.11	30×30 1.11			25.4×40 1.14	30×35 1.16				30×40 1.20	35×35 1.21
270		25.4×40 1.26	30×35 1.28			25.4×50 1.32	30×40 1.33	35×30 1.31			30×50 1.41	35×40 1.40
330		25.4×45 1.40	30×35 1.42	35×30 1.45			30×45 1.52	35×35 1.48				35×45 1.60
390			30×40 1.60	35×35 1.61			30×50 1.69	35×40 1.68				35×50 1.79
470			30×50 1.86	35×40 1.85				35×45 1.91				
560				35×40 2.02				35×50 2.14				
680				35×50 2.36					← Case Size øD×L (mm) ← Rated Ripple Current (Arms/105°C, 120Hz)			

RATINGS OF TLB Series

μF \ VDC / ø D	500			
	22	25.4	30	35
56	22 × 35 0.33			
68	22 × 40 0.39	25.4 × 30 0.37		
82	22 × 45 0.45	25.4 × 35 0.44		
100	22 × 50 0.52	25.4 × 40 0.51	30 × 30 0.50	
120		25.4 × 45 0.59	30 × 35 0.58	
150		25.4 × 50 0.69	30 × 40 0.69	35 × 30 0.67
180			30 × 45 0.80	35 × 35 0.79
220			30 × 50 0.92	35 × 40 0.92
270			30 × 60 1.11	35 × 50 1.12
330	Case Size ø D × L(mm) → Rated Ripple Current(Arms/105℃, 120Hz) →			35 × 60 1.34

TLL Series

• 105℃ 10,000Hrs assured.

- Non-solvent proof.
- Long Life.
- For SMPS, Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

TLB → TLL
Long Life, Low Temp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	200 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 3 $\sqrt{CV}$ or 3mA, Whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※Dissipation Factor(Tanδ)	Rated voltage(VDC): 200 ~ 500; Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 200~400 / 420~500 Z(-25℃)/Z(20℃): 4 / 8 Z(-40℃)/Z(20℃): 8 / 16 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 10,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

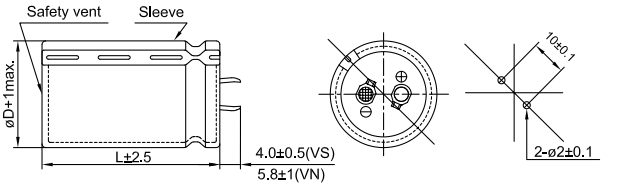
Frequency multiplying factor

VDC \ Freq.(Hz)	60	120	300	1k	10k~
200~250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLL Series

Unit(mm)

ø D= ø 22~ ø 40 VN/VS type PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLL Series

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
200	270	25.4×25	1.01
	390	25.4×30	1.24
	470	25.4×35	1.40
	560	25.4×40	1.55
		30×30	1.63
	680	25.4×50	1.87
		30×35	1.80
	820	30×40	2.01
		35×30	2.01
	1000	30×45	2.29
		35×35	2.29
		40×30	2.25
	1200	35×40	2.58
		40×35	2.51
	1500	35×50	3.01
	1800	40×50	3.33
250	330	25.4×30	1.15
	390	25.4×35	1.29
		30×30	1.32
	470	25.4×40	1.49
		30×35	1.51
	560	25.4×50	1.70
		35×30	1.69
	680	30×45	1.97
		35×35	1.92
	820	30×50	2.03
		35×40	2.01
		40×35	1.96
	1000	35×45	2.30
		40×40	2.55
	1200	35×50	2.60
	1500	40×50	3.21
400	100	25.4×25	0.63
	150	25.4×30	0.84
	180	25.4×35	0.97
	220	25.4×40	1.11
	270	25.4×50	1.25
		30×35	1.25
		35×30	1.26
	330	30×40	1.29
		35×35	1.46
	390	30×45	1.58
		40×30	1.53
	470	35×40	1.76
		40×35	1.76
	560	35×50	2.01
		40×40	2.02
	680	40×50	2.29
	820	40×60	2.61

VDC	Capacitance (μF)	øD×L(mm)	Rated Ripple Current (Arms/105℃,120Hz)
450	100	25.4×25	0.59
	120	25.4×30	0.68
	150	25.4×35	0.81
	180	25.4×40	0.93
	220	25.4×45	1.08
		30×40	1.20
	270	35×30	1.17
		30×45	1.21
		35×35	1.19
	330	30×50	1.40
	390	35×40	1.52
	470	35×50	1.79
	560	40×60	2.19
500	68	25.4×30	0.33
	82	25.4×35	0.37
	100	30×30	0.41
	120	25.4×45	0.47
		30×35	0.47
	150	30×40	0.54
		35×30	0.55
	180	30×45	0.61
		35×35	0.62
	220	35×40	0.71
	270	35×50	0.83

UDA Series

• 125℃ 1,000Hrs assured.

- Non-solvent proof.
- Wide Temperature range.
- For automotive and industrial machine.
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → UDA

Wide Temp.

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ~ 80 VDC	160 ~ 250 VDC
Operating Temperature Range	-40 ~ +125℃	-25 ~ +125℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)	
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)	
※ Dissipation Factor(Tanδ)	Rated Voltage(VDC): 16 / 25 / 35 / 50~80 / 160~250 Tanδ(Max.): 0.45 / 0.40 / 0.35 / 0.30 / 0.20 (at 20℃, 120Hz)	
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(VDC): 16 / 25 / 35 / 50~80 / 160~250 Z(-25℃)/Z(20℃): 4 / 3 / 3 / 2 / 4 Z(-40℃)/Z(20℃): 15 / 10 / 8 / 6 / - (120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 125℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurement. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

※ For capacitors with CV products > 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

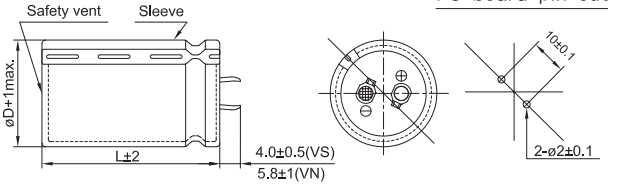
VDC \ Freq.(Hz)	60	120	300	1k	10k~
16~50VDC	0.95	1.00	1.03	1.05	1.08
63~100VDC	0.92	1.00	1.07	1.13	1.19
160~250VDC	0.81	1.00	1.17	1.32	1.45

DIMENSIONS OF UDA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : GREEN SLEEVE, BLACK INK
The standard design has no bottom plate.

RATINGS OF UDA Series

μF \ VDC / ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
1,000									22×30 0.85			
1,500					22×30 0.95				22×40 1.16	25.4×30 1.14		
2,200	22×30 1.00				22×40 1.28	25.4×30 1.41			22×50 1.54	25.4×40 1.54	30×30 1.50	
3,300	22×40 1.36	25.4×35 1.41			22×50 1.72	25.4×40 1.72	30×30 1.68				30×40 2.04	35×30 2.09
4,700	22×50 1.78	25.4×40 1.77	30×30 1.74			25.4×50 2.23	30×40 2.22	35×30 2.17				35×40 2.61
6,800			30×40 2.31	35×30 2.26			30×50 2.90	35×40 2.87				
10,000				35×45 3.14								

μF \ VDC / ø D	50				63				80			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
330					22×35 0.69	25.4×30 0.71			22×30 0.59			
470					22×40 0.87	25.4×35 0.91	30×30 0.93		22×40 0.79	25.4×35 0.82		
680	22×30 0.78					25.4×45 1.21	30×35 1.19	35×30 1.22		25.4×40 1.04	30×35 1.07	
1,000	22×40 1.06	25.4×30 1.04					30×45 1.60	35×40 1.65			30×45 1.42	35×35 1.40
1,500	22×50 1.42	25.4×40 1.42	30×30 1.39					35×50 2.16				35×45 1.86
2,200			30×40 1.86	35×35 1.91								
3,300				35×40 2.45								

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100									22×30 0.32			
150	22×30 0.37				22×35 0.42				22×40 0.44	25.4×30 0.43		
220	22×40 0.50	25.4×30 0.49			22×45 0.56	25.4×40 0.58	30×30 0.57		22×50 0.58	25.4×40 0.58	30×35 0.60	35×30 0.61
330	22×50 0.67	25.4×40 0.67	30×30 0.65			25.4×50 0.77	30×40 0.77	35×30 0.75			30×45 0.80	35×35 0.79
470		25.4×50 0.87	30×40 0.86	35×30 0.84				35×40 0.98				35×45 1.03
680			30×50 1.12	35×40 1.11				35×50 1.28				35×50 1.28
1,000				35×50 1.46	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/125℃, 120Hz)							

RVA Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- No sparks with DC overvoltage.
- For SMPS.(SET is specified Safety Standard)
- RoHS compliant.
- Halogen-free capacitors are also available.

RDA → RVA

High Reliability

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	200 ~ 450 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※Dissipation Factor(Tanδ)	Rated voltage(VDC) 200~400 450 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC) 200~400 450 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
DC Over Voltage Test	When an excessive DC voltage is applied to the capacitors under the test conditions on next page, the voltage shall operate and than the capacitors shall come to open-circuit without flaming materials.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

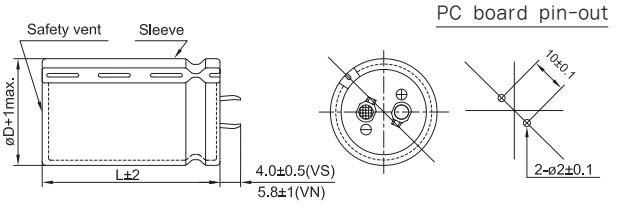
VDC \ Freq.(Hz)	60	120	300	1k	10k~
200~250VDC	0.81	1.00	1.17	1.32	1.45
350~450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RVA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RVA Series

μF \ VDC / ø D	200				250			
	22	25.4	30	35	22	25.4	30	35
120					22×20 0.80			
150	22×20 0.88				22×25 0.95	25.4×20 0.98		
180	22×25 1.05				22×25 1.12	25.4×20 1.13		
220	22×25 1.18	25.4×20 1.20			22×30 1.15	25.4×25 1.18	30×20 1.20	
270	22×30 1.27	25.4×25 1.24	30×20 1.26		22×35 1.31	25.4×30 1.32	30×20 1.28	
330	22×30 1.45	25.4×25 1.42	30×20 1.44		22×40 1.49	25.4×30 1.51	30×25 1.48	35×20 1.51
390	22×35 1.59	25.4×30 1.58	30×20 1.58	35×20 1.26	22×45 1.67	25.4×35 1.63	30×30 1.66	35×25 1.67
470	22×40 1.78	25.4×30 1.80	30×25 1.80	35×20 1.80	22×50 1.88	25.4×40 1.86	30×30 1.89	35×25 1.89
560	22×45 2.00	25.4×35 1.97	30×25 2.01	35×25 2.03		25.4×45 2.09	30×35 2.14	35×30 2.09
680	22×50 2.27	25.4×40 2.24	30×30 2.28	35×25 2.28		25.4×50 2.44	30×40 2.43	35×30 2.46
820		25.4×40 2.53	30×35 2.59	35×30 2.60			30×45 2.75	35×35 2.77
1,000		25.4×45 2.88	30×40 2.95	35×30 2.90			30×50 3.31	35×40 3.22
1,200			30×45 3.34	35×35 3.31				35×45 3.42
1,500			30×50 3.84	35×40 3.82				35×50 4.06
1,800				35×45 4.33				
2,200				35×50 4.92				

μF \ VDC / ø D	400				450			
	22	25.4	30	35	22	25.4	30	35
47	22×20 0.36							
56	22×20 0.40							
68	22×25 0.46	25.4×20 0.48			22×30 0.64			
82	22×30 0.71	25.4×20 0.72			22×30 0.70			
100	22×30 0.78	25.4×25 0.78	30×20 0.79		22×35 0.80	25.4×30 0.80		
120	22×35 0.88	25.4×30 0.87	30×25 0.90		22×40 0.91	25.4×30 0.91	30×25 0.92	
150	22×40 1.02	25.4×30 1.02	30×25 1.03	35×20 1.03	22×45 1.04	25.4×35 1.05	30×30 1.03	
180	22×45 1.14	25.4×35 1.11	30×30 1.13	35×25 1.14	22×50 1.18	25.4×40 1.15	30×30 1.17	35×25 1.20
220	22×50 1.29	25.4×40 1.27	30×30 1.30	35×25 1.27		25.4×45 1.31	30×35 1.36	35×30 1.35
270		25.4×45 1.45	30×35 1.48	35×30 1.49		25.4×50 1.55	30×40 1.60	35×35 1.59
330		25.4×50 1.65	30×40 1.65	35×30 1.67			30×45 1.90	35×40 1.88
390			30×45 1.85	35×35 1.88			30×50 2.09	35×45 2.08
470			30×50 2.09	35×40 2.07				35×50 2.40
560				35×45 2.34				
680				35×50 2.74	◀—Case Size ø D×L(mm) ◀—Rated Ripple Current(Arms/85℃, 120Hz)			

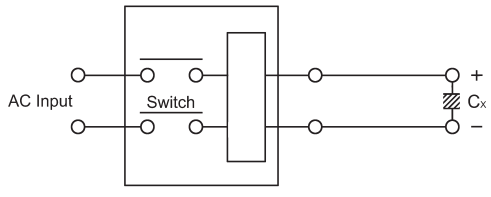
DC OVERVOLTAGE TEST CONDITIONS

The safety vent will operate and the capacitor shall become an open circuit without burning materials when the following excess DC voltage is applied.

● Test DC voltage

Rated voltage	Nominal capacitance	Current Limit	Test voltage
200VDC	〈 330μF	4A	300/375VDC
	330μF ≦C 〈 470μF	5A	
	≧470μF	7A	
250VDC	〈 100μF	4A	350/450VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	
400VDC	〈 100μF	4A	500/600VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	
450VDC	〈 100μF	4A	550/675VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	

● Test circuit



Constant DC voltage/ current power supply

TVA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- No sparks with DC overvoltage.
- For SMPS.(SET is specified Safety Standard)
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

TDA → TVA

High Reliability

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	200 ~ 450 V_{DC}
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 5 minutes)
※Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 200~400 450 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 200~400 450 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
DC Over Voltage Test	When an excessive DC voltage is applied to the capacitors under the test conditions on next page, the voltage shall operate and than the capacitors shall come to open-circuit without flaming materials.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

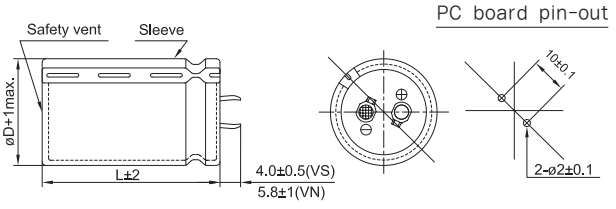
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k~
200~250V_{DC}	0.81	1.00	1.17	1.32	1.45
350~450V_{DC}	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TVA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TVA Series

μF \ VDC / ø D	200				250			
	22	25.4	30	35	22	25.4	30	35
120					22×20 0.68			
150					22×25 0.77			
180	22×25 0.82				22×30 0.87	25.4×25 0.93		
220	22×25 0.92				22×30 1.00	25.4×25 1.02		
270	22×30 1.02				22×35 1.14	25.4×30 1.13	30×25 1.25	
330	22×35 1.20	25.4×25 1.20			22×40 1.28	25.4×30 1.29	30×25 1.38	
390	22×40 1.35	25.4×30 1.35			22×45 1.42	25.4×35 1.46	30×30 1.52	35×25 1.62
470	22×45 1.52	25.4×30 1.45	30×25 1.47			25.4×40 1.64	30×30 1.67	35×25 1.81
560	22×50 1.74	25.4×35 1.60	30×30 1.60			25.4×45 1.82	30×35 1.87	35×30 1.99
680		25.4×40 1.82	30×30 1.81	35×25 1.86		25.4×50 1.96	30×40 2.12	35×30 2.19
820		25.4×50 2.11	30×35 2.11	35×30 2.11			30×45 2.39	35×35 2.42
1,000			30×40 2.40	35×30 2.40			30×50 2.52	35×40 2.57
1,200			30×50 2.65	35×35 2.65				35×45 2.70
1,500				35×45 3.08				35×50 3.00
1,800				35×50 3.31				

μF \ VDC / ø D	400				450			
	22	25.4	30	35	22	25.4	30	35
56	22×25 0.45							
68	22×30 0.51				22×30 0.53			
82	22×30 0.58				22×35 0.64			
100	22×35 0.66	25.4×25 0.66			22×40 0.69	25.4×30 0.69		
120	22×40 0.76	25.4×30 0.76			22×45 0.80	25.4×35 0.80		
150	22×45 0.85	25.4×35 0.85	30×30 0.85		22×50 0.88	25.4×40 0.88	30×30 0.88	
180	22×50 0.94	25.4×40 0.95	30×30 0.95			25.4×45 1.00	30×35 1.00	
220		25.4×45 1.24	30×35 1.24	35×30 1.24		25.4×50 1.12	30×40 1.12	35×30 1.12
270		25.4×50 1.30	30×40 1.30	35×30 1.30			30×45 1.28	35×35 1.28
330			30×45 1.47	35×35 1.47			30×50 1.45	35×40 1.45
390			30×50 1.62	35×40 1.62				35×45 1.55
470				35×45 1.90				35×50 1.85
560				35×50 2.12	◀—Case Size ø D×L(mm) ◀—Rated Ripple Current(Arms/105℃, 120Hz)			

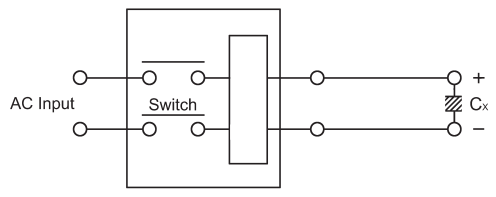
DC OVERVOLTAGE TEST CONDITIONS

The safety vent will operate and the capacitor shall become an open circuit without burning materials when the following excess DC voltage is applied.

● Test DC voltage

Rated voltage	Nominal capacitance	Current Limit	Test voltage
200VDC	〈 330μF	4A	300/375VDC
	330μF ≦C 〈 470μF	5A	
	≧470μF	7A	
250VDC	〈 100μF	4A	350/450VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	
400VDC	〈 100μF	4A	500/600VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	
450VDC	〈 100μF	4A	550/675VDC
	100μF ≦C 〈 220μF	5A	
	≧220μF	7A	

● Test circuit



Constant DC voltage/ current power supply

DL Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For AMP, AVR.
- General Audio grade.
- RoHS compliant..
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	50 ~ 100 VDC
Operating Temperature Range	-40~+85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 2mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	Refer to the below table. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/Z(20℃) 4 Z(-40℃)/Z(20℃) 15 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value.
Charge & Discharge	5,000 times (at 70℃) After this test is completed, the capacitors shall be satisfied the following specifications Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 150% of the initial specified value. Leakage current ≦ The initial specified value. where, Charge resistance : 2.2Ω Charge conditions: rated volt. 1(A) Discharge resistance: 100Ω Charge and discharge time:30 sec(each)
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF DL Series

μF \ VDC	50			63			80			100		
3,300	25.4×30	0.20	1.81	25.4×40	0.20	1.96	25.4×50	0.20	1.07	30×60	0.20	2.32
	30×25	0.20	1.86	30×30	0.25	1.75	30×40	0.20	1.08	35×50	0.20	2.32
							35×35	0.25	1.86	40×40	0.25	2.28
4,700	25.4×40	0.25	2.09	25.4×50	0.25	2.21	25.4×60	0.25	2.33	35×60	0.25	2.62
	30×30	0.25	2.09	30×40	0.25	2.22	30×50	0.25	2.35	40×50	0.25	2.61
				35×30	0.30	2.03	35×40	0.30	2.73			
6,800	25.4×50	0.25	2.65	30×50	0.30	2.58	30×60	0.30	2.72	40×60	0.25	3.29
	30×40	0.25	2.67	35×40	0.30	2.57	35×50	0.30	2.72			
	35×35	0.25	2.67				40×40	0.30	2.72			
8,200	30×50	0.35	2.63	30×60	0.35	2.77	35×60	0.30	3.16			
	35×40	0.35	2.61	35×50	0.35	2.77	40×50	0.30	3.15			
				40×40	0.35	2.77						
10,000	30×50	0.35	2.90	35×60	0.35	3.23	40×60	0.35	3.37			
	35×40	0.35	2.88	40×50	0.35	3.22						
12,000	30×60	0.35	3.32	35×60	0.40	3.31	50×50	0.40	3.50			
	35×50	0.35	3.34	40×50	0.40	3.30						
	40×40	0.35	3.35									
15,000	35×60	0.35	3.85	40×60	0.40	3.86						
	40×50	0.35	3.92									
22,000	40×60	0.35	5.00									

Rated Ripple Current (Arms/85℃, 120Hz)
Tanδ(Max.)
Case Size øD×L(mm)

DIMENSIONS : Refer to next page.

AHS Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Hi-Fi Audio grade.
- For Audio, AMP, AVR.
- RoHS compliant.
- Halogen-free capacitors are also available.

DL → AHS

High Reliability

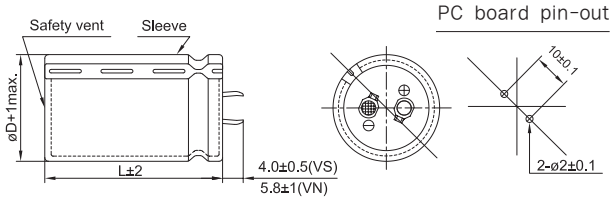
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	50 ~ 100 VDC
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 2mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	Tanδ shall not exceed the value shown in the table of RATINGS. (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Z(-25℃)/Z(20℃) 4 Z(-40℃)/Z(20℃) 15 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Charge & Discharge	5,000 times (at 70℃) After this test is completed, the capacitors shall be satisfied the following specifications. Capacitance change ≦ ±20% of the initial value. Tan δ ≦ 150% of the initial specified value. Leakage current ≦ The initial specified value No visible damage and no leakage electrolyte where, Charge resistance: 2.2Ω Charge conditions: rated volt. 1(A) Discharge resistance: 100Ω Charge and discharge time: 30 sec(each)
Others	Satisfied characteristics KS C IEC 60384-4

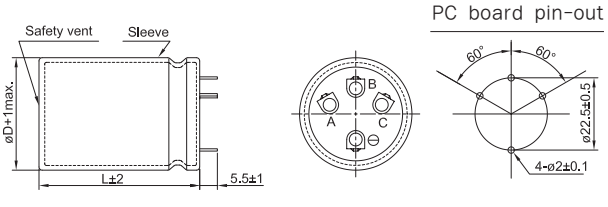
DIMENSIONS OF AHS/DL Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type



ø D= ø 35~ ø 40 VR type (4 terminals)



B: Positive terminal.
A, C: Terminals not connected electrically but used for mechanical support only. (Blank Termimals)

Marking : AHS-DARK BROWN SLEEVE, GOLD INK
DL-BLACK SLEEVE, SILVER INK

The standard design has no bottom plate.

Note: Sleeve has an insulating role.

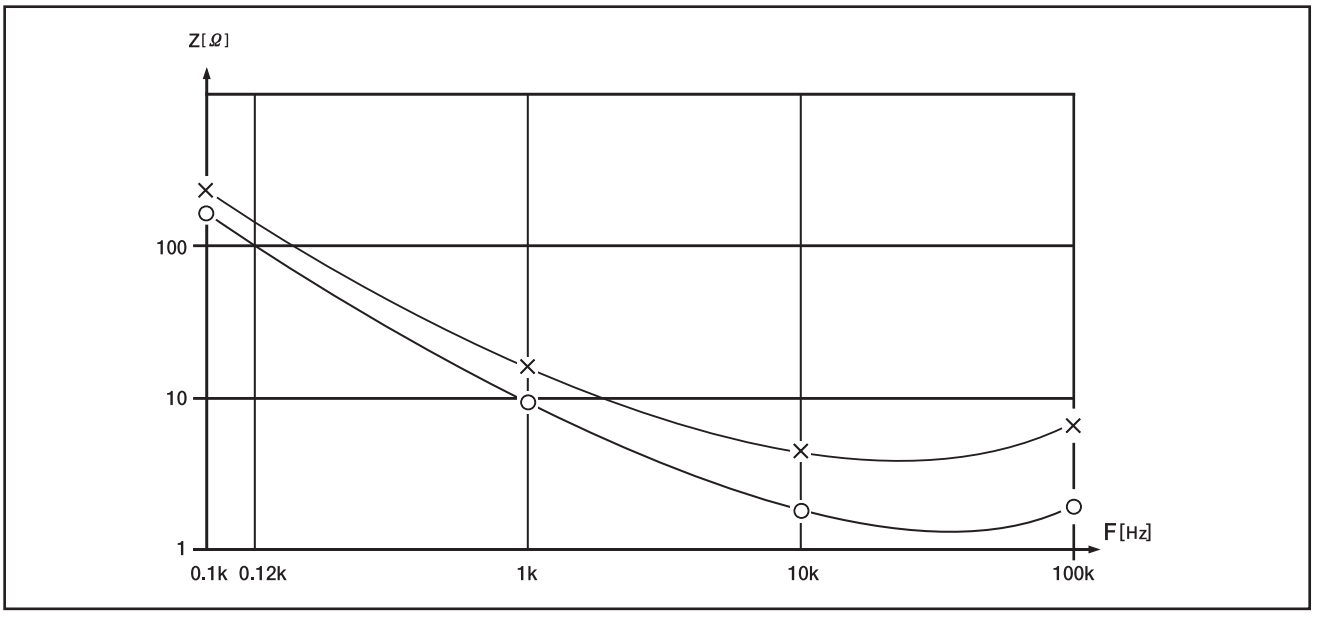
CAUTION: Please use the blank terminals for mechanical support only. The blank terminals must not be connected to a solder trace on the PC board, but be electrically isolated from negative or positive terminal.

RATINGS OF AHS Series

μF \ Vdc	50			63			80			100		
3,300	25.4×30	0.20	1.84	25.4×40	0.20	1.96	25.4×50	0.15	2.39	30×60	0.15	2.68
	30×25	0.20	1.86	30×30	0.20	1.96	30×40	0.15	2.40	35×50	0.15	2.69
							35×35	0.15	2.40	40×40	0.15	2.68
4,700	25.4×40	0.20	2.34	25.4×50	0.20	2.47	25.4×60	0.15	3.01	35×60	0.15	2.98
	30×30	0.20	2.36	30×40	0.20	2.48	30×50	0.15	3.04	40×50	0.20	2.92
				35×30	0.20	2.48	35×40	0.15	3.02			
6,800	25.4×50	0.22	2.83	30×50	0.22	3.02	30×60	0.15	3.35	40×60	0.20	3.68
	30×40	0.22	2.85	35×40	0.22	3.00	35×50	0.15	3.35			
	35×35	0.25	2.67				40×40	0.20	3.34			
8,200	30×50	0.25	3.11	30×60	0.25	3.27	35×60	0.20	3.87			
	35×40	0.25	3.09	35×50	0.25	3.28	40×50	0.20	3.86			
				40×40	0.25	3.28						
10,000	30×50	0.25	3.43	35×60	0.25	3.82	40×60	0.20	4.46			
	35×40	0.25	3.41	40×50	0.25	3.81						
12,000	30×60	0.25	3.66	35×60	0.25	4.19						
	35×50	0.30	3.62	40×50	0.25	4.18						
	40×40	0.30	3.62									
15,000	35×60	0.30	4.27	40×60	0.30	4.46						
	40×50	0.30	4.26									
22,000	40×60	0.30	5.40									

Rated Ripple Current (Arms/85℃, 120Hz)
Tanδ(Max.)
Case Size ØD×L(mm)

Frequency vs. Impedance Graph



o - o AHS 80 VR 8200
× - × DL 80 VR 8200

TZF Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof
- This series adopts the electrolyte which was excellent in fire retardancy compared with the conventional series
- For SMPS, Inverter
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

SPECIFICATIONS

Item	Characteristics
Rated Voltage	400～450 V_{DC}
Operating Temperature Range	-25 ～ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I : Max. Leakage current(μA) C : Nominal capacitance(μF) V : Rated voltage(V_{DC}) (at 20℃ , 5minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 400～450 Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 400～450 Z(-25℃)/Z(20℃): 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 105℃. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20 % of the initial value tan δ ≤ 200 % of the initial specified value Leakage current ≤ 500 % of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

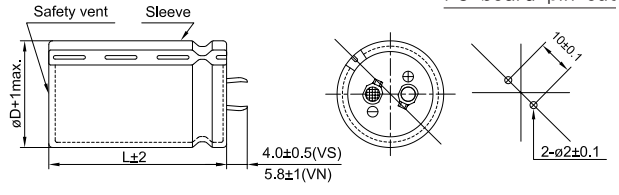
▣ The specifications and the size depend on the safety requirement.(flame retardant)
Please consult us for any further details.

DIMENSIONS OF TZF Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

TGA(KMH) Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Wide Temperature range.
- For UPS.
- RoHS compliant.

KME → TGA (KMH)

Downsized

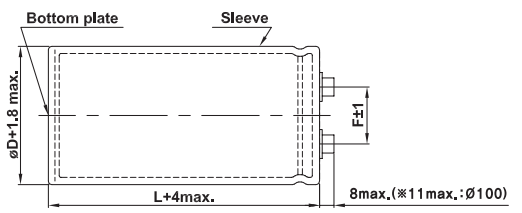
SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	10 ~ 100 VDC	160 ~ 450 VDC
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M)	(at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC)	(at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	Tanδ shall not exceed the values shown in the RATINGS.	(at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	Rated Voltage(VDC): 10~100 / 160~450 C(-25℃)/C(20℃): - / ≧0.7 C(-40℃)/C(20℃): ≧0.6 / -	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF TGA(KMH) Series

Unit(mm)

Marking : BROWN SLEEVE, SILVER INK

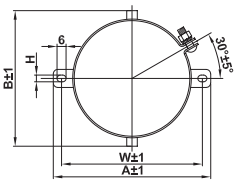


〈Screw specifications〉

øD=ø35 ~ ø89
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

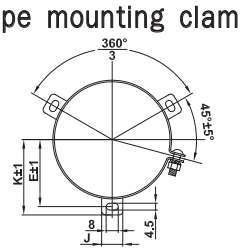
øD=ø100
- Cross-recessed head (Phillips) screw: M8×1.25×16 Spring washer, Washer
- Maximum screw tightening torque: 6.31N·m(64kg·cm)

B type mounting clamp



øD	A	B	W	H	F
35	58	44	48	3.5	12.7
50	78	64	68	4.5	22.4
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



øD	E	K	J	F
50	32.5	37.0	14	22.4
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5
100	56.5	63.4	18	41.5

RATINGS OF TGA(KMH) Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
10	22,000	35×50	0.70	4.9
	27,000	35×50	0.70	5.1
	33,000	35×60	0.70	5.9
	39,000	35×80	0.70	6.3
	47,000	35×80	0.70	6.9
	56,000	35×80	0.70	7.4
	68,000	35×100	0.70	8.5
	82,000	35×100	0.70	8.9
	100,000	35×120	0.70	10.7
	120,000	50×80	0.75	11.0
	150,000	50×100	0.80	13.2
	180,000	50×120	0.80	15.7
	220,000	50×120	0.85	16.8
	270,000	63.5×120	1.00	19.6
	330,000	63.5×120	1.20	19.7
	390,000	76.5×120	1.50	21.3
	470,000	76.5×120	1.80	21.4
	560,000	76.5×140	2.00	23.6
	680,000	89×140	2.40	26.0
16	18,000	35×50	0.45	4.2
	22,000	35×50	0.45	4.7
	27,000	35×60	0.45	5.5
	33,000	35×60	0.45	5.7
	39,000	35×80	0.45	6.8
	47,000	35×80	0.50	7.1
	56,000	35×100	0.50	8.4
	68,000	35×100	0.55	8.8
	82,000	50×80	0.55	10.7
	100,000	50×80	0.65	10.8
	120,000	50×100	0.65	13.1
	150,000	50×120	0.70	15.3
	180,000	50×120	0.80	15.7
	220,000	63.5×120	0.85	19.2
	270,000	63.5×120	1.00	19.6
	330,000	76.5×120	1.30	21.1
	390,000	76.5×120	1.50	21.3
	470,000	76.5×140	1.60	24.2
	560,000	89×140	2.00	28.1
	680,000	89×140	2.40	28.5
25	12,000	35×50	0.35	3.7
	15,000	35×50	0.35	4.1
	18,000	35×60	0.35	4.8
	22,000	35×60	0.35	5.3
	27,000	35×80	0.35	6.4
	33,000	35×80	0.40	6.7
	39,000	35×100	0.40	7.8
	47,000	35×120	0.40	9.3
	56,000	50×80	0.45	9.7
	68,000	50×100	0.45	10.7
	82,000	50×100	0.50	11.2
	100,000	50×120	0.50	14.8
	120,000	63.5×100	0.65	14.9
	150,000	63.5×120	0.65	17.9
	180,000	63.5×120	0.80	18.9
	220,000	76.5×120	0.85	21.3
	270,000	76.5×120	1.00	21.7
	330,000	76.5×140	1.20	23.1
	390,000	89×140	1.50	24.9
35	8,200	35×50	0.30	3.3
	10,000	35×50	0.30	3.6
	12,000	35×60	0.30	4.2
	15,000	35×60	0.30	4.7
	18,000	35×80	0.30	5.7
	22,000	35×80	0.30	6.8
	27,000	35×100	0.30	7.5
	33,000	35×120	0.30	9.0

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
35	39,000	50×80	0.35	9.2
	47,000	50×100	0.35	11.2
	56,000	50×100	0.40	11.4
	68,000	50×120	0.40	13.6
	82,000	63.5×100	0.45	14.8
	100,000	63.5×120	0.45	16.5
	120,000	63.5×120	0.55	17.6
	150,000	76.5×120	0.65	18.5
	180,000	76.5×120	0.80	19.8
	220,000	76.5×140	0.80	23.4
	270,000	89×140	1.00	25.5
50	3,900	35×50	0.20	2.8
	4,700	35×50	0.20	3.1
	5,600	35×50	0.20	3.3
	6,800	35×50	0.25	3.5
	8,200	35×60	0.25	3.8
	10,000	35×80	0.25	4.6
	12,000	35×80	0.25	5.1
	15,000	35×80	0.25	5.7
	18,000	35×80	0.25	6.0
	22,000	35×100	0.25	6.7
	27,000	50×80	0.25	9.1
	33,000	50×100	0.25	11.1
	39,000	50×120	0.25	13.1
	47,000	50×120	0.30	13.9
	56,000	63.5×100	0.35	14.9
	68,000	63.5×120	0.35	16.6
	82,000	76.5×120	0.40	18.9
	100,000	76.5×120	0.45	19.5
	120,000	76.5×120	0.55	21.0
	150,000	89×140	0.60	23.9
	180,000	89×140	0.75	24.0
63	2,700	35×50	0.20	2.3
	3,300	35×50	0.20	2.5
	3,900	35×50	0.20	2.8
	4,700	35×50	0.20	3.1
	5,600	35×60	0.20	3.5
	6,800	35×60	0.20	3.9
	8,200	35×80	0.20	4.7
	10,000	35×80	0.25	4.9
	12,000	35×100	0.25	5.5
	15,000	35×120	0.25	6.6
	18,000	35×120	0.25	6.9
	22,000	50×80	0.25	7.4
	27,000	50×120	0.25	10.9
	33,000	50×120	0.25	12.0
	39,000	63.5×100	0.30	12.5
	47,000	63.5×120	0.30	14.9
	56,000	63.5×120	0.30	16.3
	68,000	76.5×120	0.35	18.4
	82,000	76.5×140	0.40	20.0
	100,000	76.5×140	0.50	20.5
	120,000	89×140	0.60	21.8
80	2,200	35×50	0.15	2.4
	2,700	35×50	0.15	2.7
	3,300	35×50	0.15	3.0
	3,900	35×60	0.15	3.4
	4,700	35×60	0.15	3.7
	5,600	35×80	0.15	4.5
	6,800	35×80	0.15	4.9
	8,200	35×100	0.20	5.1
	10,000	35×120	0.20	6.1
	12,000	50×80	0.20	6.7
	15,000	50×100	0.20	8.3
	18,000	50×120	0.20	9.9
	22,000	50×120	0.20	11.0

RATINGS OF TGA(KMH) Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
80	27,000	63.5×100	0.25	11.4
	33,000	76.5×100	0.25	13.9
	39,000	76.5×100	0.30	14.5
	47,000	76.5×120	0.30	16.5
	56,000	76.5×120	0.30	18.1
	68,000	76.5×140	0.35	19.7
	82,000	89×140	0.40	22.1
100	1,800	35×50	0.10	2.7
	2,200	35×50	0.10	3.0
	2,700	35×60	0.10	3.5
	3,300	35×80	0.10	4.2
	3,900	35×80	0.12	4.5
	4,700	35×100	0.12	5.0
	5,600	35×100	0.12	5.4
	6,800	35×120	0.15	5.8
	8,200	50×80	0.15	6.4
	10,000	50×100	0.15	7.8
	12,000	50×120	0.15	9.3
	15,000	50×120	0.15	10.4
	18,000	63.5×100	0.20	11.0
	22,000	63.5×120	0.20	12.5
	27,000	76.5×120	0.25	13.7
	33,000	76.5×120	0.25	15.2
	39,000	76.5×140	0.30	16.1
	47,000	89×140	0.30	19.3
	56,000	89×140	0.30	21.1
160	560	35×50	0.15	1.2
	680	35×50	0.15	1.3
	820	35×50	0.15	1.4
	1,000	35×50	0.15	1.6
	1,200	35×60	0.15	1.9
	1,500	35×60	0.15	2.1
	1,800	35×80	0.15	2.5
	2,200	35×80	0.15	2.8
	2,700	35×100	0.15	3.3
	3,300	35×120	0.15	3.8
	3,900	50×80	0.20	3.9
	4,700	50×100	0.20	4.6
	5,600	50×100	0.20	5.1
	6,800	50×120	0.20	6.1
	8,200	63.5×100	0.20	7.0
	10,000	63.5×120	0.20	8.4
	12,000	76.5×100	0.20	9.4
	15,000	76.5×120	0.20	11.4
	18,000	76.5×140	0.20	13.4
	22,000	89×140	0.25	14.5
	27,000	89×140	0.25	16.0
200	330	35×50	0.15	0.9
	390	35×50	0.15	1.0
	470	35×50	0.15	1.1
	560	35×50	0.15	1.2
	680	35×50	0.15	1.3
	820	35×50	0.15	1.4
	1,000	35×60	0.15	1.7
	1,200	35×60	0.15	1.9
	1,500	35×80	0.15	2.3
	1,800	35×80	0.15	2.5
	2,200	35×100	0.15	2.7
	2,700	35×120	0.15	3.6
	3,300	50×80	0.15	4.1
	3,900	50×100	0.15	4.9
	4,700	63.5×100	0.20	5.3
	5,600	63.5×100	0.20	5.8
	6,800	63.5×120	0.20	6.9
	8,200	63.5×120	0.20	7.6
	10,000	76.5×120	0.20	9.3

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
200	12,000	76.5×120	0.20	10.2
	15,000	76.5×120	0.20	11.2
	18,000	89×140	0.25	13.1
250	270	35×50	0.15	0.8
	330	35×50	0.15	0.9
	390	35×50	0.15	1.0
	470	35×50	0.15	1.1
	560	35×50	0.15	1.2
	680	35×60	0.15	1.4
	820	35×80	0.15	1.6
	1,000	35×80	0.20	1.7
	1,200	35×80	0.20	1.8
	1,500	35×100	0.20	2.1
	1,800	35×120	0.20	2.5
	2,200	35×120	0.20	2.8
	2,700	50×100	0.20	3.5
	3,300	50×120	0.20	4.2
	3,900	50×120	0.20	4.6
	4,700	63.5×120	0.20	5.7
	5,600	63.5×120	0.20	6.3
	6,800	76.5×120	0.20	7.7
	8,200	76.5×120	0.20	8.4
	10,000	76.5×140	0.20	10.0
	12,000	89×140	0.20	11.9
	15,000	89×140	0.20	12.2
315	180	35×50	0.10	0.8
	220	35×50	0.10	0.9
	270	35×50	0.10	1.0
	330	35×50	0.10	1.1
	390	35×50	0.10	1.2
	470	35×60	0.10	1.4
	560	35×60	0.10	1.5
	680	35×80	0.10	1.6
	820	35×80	0.15	1.7
	1,000	35×100	0.15	2.0
	1,200	35×120	0.15	2.4
	1,500	50×80	0.15	2.7
	1,800	50×100	0.15	3.3
	2,200	50×100	0.15	4.0
	2,700	50×120	0.15	4.4
	3,300	63.5×100	0.15	5.1
	3,900	63.5×120	0.15	6.0
	4,700	76.5×100	0.15	6.8
	5,600	76.5×120	0.15	8.0
	6,800	89×130	0.15	9.2
	8,200	89×140	0.15	11.4
	10,000	89×140	0.15	12.6
350	180	35×50	0.10	0.8
	220	35×50	0.10	0.9
	270	35×50	0.10	1.0
	330	35×50	0.10	1.1
	390	35×50	0.10	1.1
	470	35×60	0.10	1.4
	560	35×80	0.10	1.6
	680	35×80	0.15	1.6
	820	35×100	0.15	1.8
	1,000	35×120	0.15	2.2
	1,200	50×80	0.15	2.4
	1,500	50×100	0.15	3.0
	1,800	50×120	0.15	3.6
	2,200	50×120	0.15	4.0
	2,700	63.5×100	0.15	4.6
	3,900	76.5×120	0.15	6.7
	5,600	76.5×130	0.15	8.3
	6,800	76.5×140	0.15	9.5
	8,200	89×140	0.15	11.4

RATINGS OF TGA(KMH) Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
400	180	35×50	0.10	0.8
	220	35×50	0.10	0.9
	270	35×50	0.10	1.0
	330	35×60	0.10	1.2
	390	35×60	0.10	1.2
	470	35×80	0.10	1.4
	560	35×80	0.15	1.4
	680	35×100	0.15	1.7
	820	35×120	0.15	2.0
	1,000	50×80	0.15	2.2
	1,200	50×100	0.15	2.7
	1,500	50×120	0.15	3.3
	2,200	63.5×100	0.15	4.2
	3,300	63.5×120	0.15	5.5
	4,700	76.5×130	0.15	7.6
	5,600	89×140	0.15	9.4
	6,800	89×140	0.15	10.4
	18,000	100×220	0.15	21.9
	22,000	100×250	0.15	25.6

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
450	1,000	50×80	0.15	2.0
	1,200	50×100	0.15	2.5
	1,500	50×120	0.15	3.1
	1,800	50×120	0.15	3.4
	2,200	63.5×100	0.15	3.9
	3,300	63.5×120	0.15	5.2
	3,900	76.5×120	0.15	5.9
	4,700	76.5×130	0.15	7.2
	5,600	89×140	0.15	8.9
	15,000	100×220	0.15	18.9
	18,000	100×250	0.15	22.0

RATED RIPPLE CURRENT

Frequency Multiplying Factor

VDC	øD(mm)	Frequency(Hz)				
		60	120	300	1k	10k~
10 ~ 50	ø35 ~ ø100	0.95	1.00	1.03	1.05	1.09
63 ~ 80	ø35	0.90	1.00	1.06	1.10	1.08
	ø50 ~ ø100	0.95	1.00	1.03	1.05	1.09
100	ø35	0.82	1.00	1.12	1.22	1.30
	ø50	0.90	1.00	1.06	1.10	1.18
	ø63.5 ~ ø100	0.95	1.00	1.03	1.05	1.09
160 ~ 250	ø35	0.80	1.00	1.19	1.34	1.46
	ø50 ~ ø63.5	0.81	1.00	1.14	1.26	1.36
	ø76.5 ~ ø100	0.82	1.00	1.12	1.22	1.30
315 ~ 450	ø35 ~ ø100	0.80	1.00	1.19	1.34	1.46

RGB Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- General.
- RoHS compliant.

RGA → RGB

Wide voltage

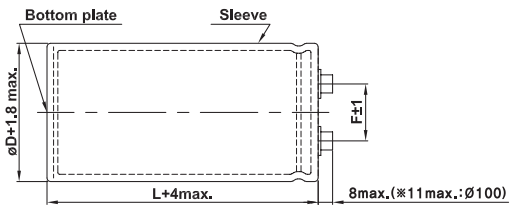
SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ~ 100 VDC	160 ~ 650 VDC
Operating Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)	
Dissipation Factor(Tanδ)	Tanδ shall not exceed the values shown in the RATINGS. (at 20℃, 120Hz)	
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃. after subjected to DC voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) 2,000 hours at 85℃. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≤ ±20% of the initial value Tanδ ≤ 300% of the initial specified value Leakage current ≤ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF RGB Series

Unit(mm)

Marking:BLACK SLEEVE, SILVER INK.

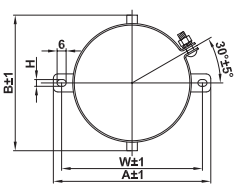


〈Screw specifications〉

ØD = Ø35 ~ Ø89
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

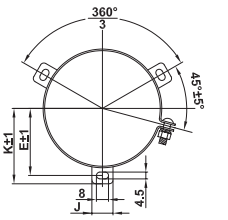
ØD = Ø100
- Cross-recessed head (Phillips) screw: M8×1.25×16
  Spring washer, Washer
- Maximum screw tightening torque: 6.31N · m(64kg · cm)

B type mounting clamp



ØD	A	B	W	H	F
35	58	44	48	3.5	12.7
50	78	64	68	4.5	22.4
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
50	32.5	37.0	14	22.4
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5
100	56.5	63.4	18	41.5

RATINGS OF RGB Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
16	47,000	35×80	0.70	8.8
	68,000	35×100	0.70	11.5
	100,000	50×80	1.00	12.9
	150,000	50×100	1.00	16.2
	220,000	50×130	1.00	21.3
	330,000	63.5×120	1.30	23.1
	470,000	76.5×120	2.00	24.7
	680,000	76.5×160	2.00	33.9
25	33,000	35×80	0.45	8.2
	47,000	35×100	0.45	10.8
	68,000	50×80	0.60	12.7
	100,000	50×100	0.60	14.5
	150,000	50×130	0.60	18.8
	220,000	63.5×120	0.80	22.0
	330,000	76.5×120	1.60	23.7
	470,000	76.5×160	1.60	29.5
35	22,000	35×70	0.45	7.0
	33,000	35×100	0.45	9.3
	47,000	35×120	0.45	12.2
	68,000	50×100	0.60	14.3
	100,000	50×120	0.60	17.1
	150,000	63.5×120	0.70	19.6
	220,000	76.5×120	0.90	23.3
	330,000	76.5×160	0.90	27.8
50	10,000	35×60	0.30	5.2
	15,000	35×80	0.30	6.6
	22,000	35×100	0.30	8.7
	33,000	35×120	0.30	11.4
	47,000	50×100	0.45	13.2
	68,000	50×120	0.45	15.9
	100,000	63.5×120	0.50	18.8
	150,000	76.5×120	0.70	21.5
	220,000	76.5×160	0.70	26.6
63	6,800	35×50	0.30	4.5
	10,000	35×60	0.30	5.4
	15,000	35×80	0.30	6.9
	22,000	35×120	0.30	9.8
	33,000	50×100	0.45	12.5
	47,000	50×120	0.45	14.8
	68,000	63.5×100	0.50	16.6
	100,000	76.5×120	0.70	20.6
	150,000	76.5×140	0.70	24.0

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
80	6,800	35×60	0.30	4.9
	10,000	35×80	0.30	6.3
	15,000	35×120	0.30	8.2
	22,000	50×80	0.35	9.3
	33,000	50×120	0.35	13.1
	47,000	63.5×100	0.40	15.5
	68,000	63.5×140	0.40	17.7
	100,000	76.5×140	0.45	23.6
100	4,700	35×60	0.20	4.5
	6,800	35×80	0.20	5.9
	10,000	35×100	0.20	7.7
	15,000	50×80	0.25	8.6
	22,000	50×100	0.25	11.3
	33,000	50×140	0.25	14.7
	47,000	63.5×140	0.30	17.0
	68,000	76.5×140	0.40	21.5
160	1,500	35×60	0.15	3.4
	2,200	35×80	0.15	4.6
	3,300	35×100	0.15	6.2
	4,700	50×80	0.15	7.7
	6,800	50×100	0.15	10.0
	10,000	50×140	0.15	14.1
	15,000	63.5×140	0.20	16.5
	22,000	76.5×140	0.25	17.6
200	1,000	35×60	0.15	2.8
	1,500	35×70	0.15	3.6
	2,200	35×100	0.15	5.1
	3,300	35×120	0.15	6.7
	4,700	50×100	0.15	8.3
	6,800	50×140	0.15	11.5
	10,000	63.5×120	0.20	12.1
	15,000	76.5×120	0.25	13.7
	22,000	76.5×160	0.25	18.6
250	680	35×50	0.15	2.1
	1,000	35×70	0.15	2.9
	1,500	35×80	0.15	3.8
	2,200	35×120	0.15	5.5
	3,300	50×100	0.15	7.0
	4,700	50×140	0.15	9.6
	6,800	63.5×120	0.20	10.0
	10,000	76.5×120	0.25	11.2
	15,000	76.5×160	0.25	15.3

RATED RIPPLE CURRENT

Frequency Multiplying Factor

VDC	øD(mm)	Frequency(Hz)				
		60	120	300	1k	10k~
16 ~ 50	ø35 ~ ø100	0.95	1.00	1.03	1.05	1.09
63 ~ 80	ø35	0.90	1.00	1.06	1.10	1.08
	ø50 ~ ø100	0.95	1.00	1.03	1.05	1.09
100	ø35	0.82	1.00	1.12	1.22	1.30
	ø50	0.90	1.00	1.06	1.10	1.18
	ø63.5 ~ ø100	0.95	1.00	1.03	1.05	1.09
160 ~ 250	ø35	0.80	1.00	1.19	1.34	1.46
	ø50 ~ ø63.5	0.81	1.00	1.14	1.26	1.36
	ø76.5 ~ ø100	0.82	1.00	1.12	1.22	1.30
350 ~ 650	ø35 ~ ø100	0.80	1.00	1.19	1.34	1.46

RATINGS OF RGB Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
350	390	35×50	0.25	1.9
	680	35×80	0.25	2.9
	1,000	35×100	0.25	3.8
	1,200	35×120	0.25	4.2
	1,500	50×75	0.25	4.7
	2,200	50×100	0.25	6.3
	3,300	50×130	0.25	8.8
	3,300	63.5×95	0.25	8.8
	3,900	63.5×120	0.25	10.3
	4,700	63.5×130	0.25	12.0
	4,700	76.5×100	0.25	11.7
	5,600	76.5×115	0.25	12.6
	6,800	76.5×130	0.25	15.9
	8,200	76.5×155	0.25	19.0
	12,000	89×155	0.25	22.5
	22,000	100×220	0.25	38.0
	27,000	100×250	0.25	44.6
400	330	35×50	0.25	1.7
	560	35×80	0.25	2.7
	820	35×100	0.25	3.4
	1,000	35×120	0.25	3.9
	1,200	50×75	0.25	4.2
	1,800	50×100	0.25	5.7
	2,200	50×130	0.25	7.2
	2,700	63.5×95	0.25	7.9
	3,300	63.5×120	0.25	9.5
	3,900	63.5×130	0.25	10.9
	3,900	76.5×100	0.25	10.6
	4,700	76.5×115	0.25	12.6
	5,600	76.5×130	0.25	14.5
	6,800	76.5×155	0.25	17.3
	10,000	89×155	0.25	20.5
	18,000	100×220	0.25	34.4
	22,000	100×250	0.25	40.3
450	270	35×50	0.25	1.6
	470	35×80	0.25	2.4
	680	35×100	0.25	3.1
	820	35×120	0.25	3.5
	1,000	50×75	0.25	3.9
	1,200	50×100	0.25	4.7
	1,500	50×115	0.25	5.6
	1,800	50×130	0.25	6.5
	2,200	63.5×95	0.25	7.2
	2,700	63.5×120	0.25	8.6
	3,300	63.5×130	0.25	10.0
	3,300	76.5×100	0.25	9.8
	3,900	76.5×115	0.25	11.5
	4,700	76.5×130	0.25	13.3
	5,600	76.5×155	0.25	15.7
	8,200	89×155	0.25	18.6
	15,000	100×220	0.25	31.4
	18,000	100×250	0.25	36.4
500	120	35×50	0.25	0.7
	270	35×80	0.25	1.2
	330	35×100	0.25	1.4
	390	35×120	0.25	1.7
	470	50×75	0.25	1.8
	680	50×90	0.25	2.5
	820	50×120	0.25	2.9
	1,000	50×130	0.25	3.4
	1,000	63.5×95	0.25	3.4
	1,500	63.5×120	0.25	4.5
	1,500	76.5×95	0.25	4.6
	1,800	63.5×130	0.25	5.2
	2,200	76.5×120	0.25	6.1
	2,700	76.5×160	0.25	7.7
	3,900	89×160	0.25	10.1
	12,000	100×220	0.25	21.7
	15,000	100×250	0.25	25.7

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
550	100	35×50	0.25	0.6
	180	35×80	0.25	1.0
	270	35×100	0.25	1.3
	330	35×120	0.25	1.6
	390	50×75	0.25	1.7
	560	50×95	0.25	2.1
	560	63.5×95	0.25	2.5
	680	50×115	0.25	2.7
	680	63.5×120	0.25	3.0
	820	50×130	0.25	3.1
	820	63.5×130	0.25	3.5
	1,200	76.5×95	0.25	4.2
	1,500	76.5×120	0.25	5.0
	1,800	76.5×130	0.25	5.8
	2,200	76.5×150	0.25	7.0
	3,300	89×160	0.25	9.3
	8,200	100×220	0.25	18.0
	10,000	100×250	0.25	21.2
600	180	35×100	0.25	1.1
	270	35×120	0.25	1.4
	330	50×75	0.25	1.7
	390	50×95	0.25	1.8
	390	63.5×95	0.25	2.1
	560	50×115	0.25	2.2
	560	63.5×115	0.25	2.6
	680	50×130	0.25	2.9
	680	63.5×130	0.25	3.2
	820	76.5×95	0.25	3.3
	1,200	76.5×115	0.25	4.4
	1,500	76.5×130	0.25	5.4
	1,800	76.5×150	0.25	6.5
	2,200	89×130	0.25	7.8
	2,700	89×155	0.25	8.9
	4,700	100×220	0.25	14.7
	5,600	100×250	0.25	17.0
650	82	35×60	0.25	0.6
	120	35×80	0.25	0.9
	390	50×80	0.25	1.8
	470	50×100	0.25	2.5
	820	63.5×100	0.25	3.2
	1,200	63.5×130	0.25	4.2
	1,500	63.5×170	0.25	5.0
	2,700	76.5×150	0.25	7.2
	3,300	76.5×190	0.25	8.3
	3,900	89×170	0.25	10.5
	4,700	89×190	0.25	12.0

Note : When long life performance is required in actual use, the rms ripple current has to be reduced.

RFC(RWF) Series

• 85℃ 5,000Hrs assured.

- Non-solvent proof.
- High Ripple Capability.
- Long Life.
- For UPS, Industrial Inverter.
- RoHS compliant.

RWA → RFC (RWF)

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 550 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	0.25max. (at 20℃, 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 5,000 hours at 85℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

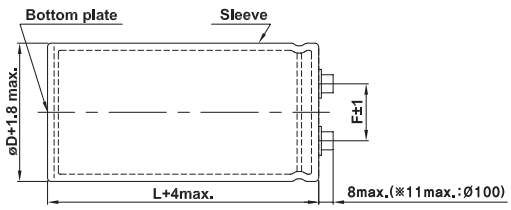
Frequency Multiplying Factor

Frequency(Hz)	60	120	300	1k	3k
Factor	0.8	1.0	1.1	1.3	1.4

DIMENSIONS OF RFC(RWF) Series

Unit(mm)

Marking : BLACK SLEEVE, GOLD INK

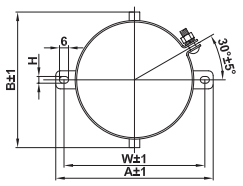


〈Screw specifications〉

ØD=Ø63 ~ Ø89
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

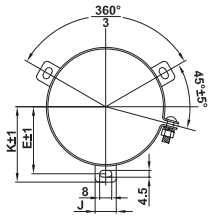
ØD=Ø100
- Cross-recessed head (Phillips) screw: M8×1.25×16 Spring washer, Washer
- Maximum screw tightening torque: 6.31N·m(64kg·cm)

B type mounting clamp



ØD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5
100	56.5	63.4	18	41.5

RATINGS OF RFC(RWF) Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
350	3,900	63.5×120	0.25	12.1
	4,700	63.5×130	0.25	14.0
	5,600	63.5×160	0.25	16.6
	5,600	76.5×120	0.25	16.1
	6,800	63.5×190	0.25	20.0
	6,800	76.5×130	0.25	18.6
	8,200	76.5×160	0.25	22.2
	10,000	76.5×170	0.25	25.2
	12,000	89×160	0.25	29.1
	15,000	89×190	0.25	35.7
	18,000	100×220	0.25	44.2
	22,000	100×250	0.25	51.8
400	3,300	63.5×120	0.25	11.1
	3,900	63.5×130	0.25	12.7
	4,700	63.5×160	0.25	15.2
	4,700	76.5×120	0.25	14.7
	5,600	63.5×190	0.25	18.2
	5,600	76.5×130	0.25	16.9
	6,800	76.5×160	0.25	20.2
	8,200	76.5×170	0.25	22.8
	10,000	89×160	0.25	26.6
	12,000	89×170	0.25	30.0
	18,000	100×220	0.25	43.8
	22,000	100×250	0.25	51.3
450	2,700	63.5×120	0.25	10.1
	3,300	63.5×130	0.25	11.7
	3,900	63.5×160	0.25	13.8
	3,900	76.5×120	0.25	13.4
	4,700	63.5×190	0.25	16.7
	4,700	76.5×130	0.25	15.5
	5,600	76.5×160	0.25	18.3
	6,800	76.5×170	0.25	20.7
	8,200	89×160	0.25	24.1
	10,000	89×170	0.25	27.8
	15,000	100×220	0.25	40.8
	18,000	100×250	0.25	47.3

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
500	1,500	63.5×90	0.25	6.3
	1,800	63.5×100	0.25	7.3
	2,200	63.5×120	0.25	8.4
	2,700	76.5×110	0.25	10.0
	3,300	76.5×130	0.25	11.3
	3,900	76.5×140	0.25	12.9
	4,700	76.5×150	0.25	14.3
	5,600	89×150	0.25	16.3
	6,800	89×170	0.25	19.2
	8,200	89×190	0.25	22.0
	12,000	100×220	0.25	30.2
	15,000	100×250	0.25	35.8
550	1,500	63.5×100	0.25	4.3
	1,800	63.5×120	0.25	5.3
	2,200	76.5×110	0.25	8.7
	2,700	76.5×130	0.25	9.3
	3,300	76.5×140	0.25	10.2
	3,900	76.5×150	0.25	11.3
	4,700	89×150	0.25	13.1
	5,600	89×170	0.25	15.2
	6,800	89×190	0.25	17.0
	8,200	100×220	0.25	21.3
	10,000	100×250	0.25	24.9

RFA Series

- 85℃ 20,000Hrs assured. (8,000Hrs for 550VDC)
- Non-solvent proof.
- High Ripple Capability.
- Long Life.
- For Elevator, Industrial Inverter.
- RoHS compliant.

RWF → RFA
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 550 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	0.25max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-25℃)/C(20℃)≧0.7 (at 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃. after the rated voltage with the rated ripple current is applied (the peak voltage shall not exceed the rated voltage) for 20,000 hours 85℃. (8,000Hrs for 550 VDC) Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

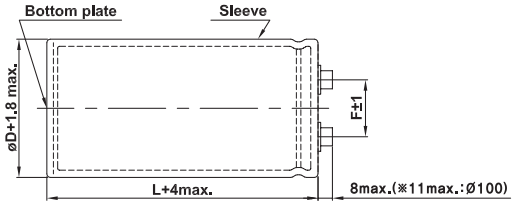
Frequency Multiplying Factor

Frequency(Hz)	60	120	300	1k	3k
Factor	0.8	1.0	1.1	1.3	1.4

DIMENSIONS OF RFA Series

Unit(mm)

Marking : BLACK SLEEVE, GOLD INK

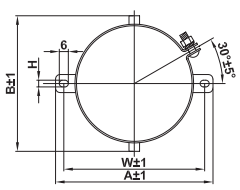


〈Screw specifications〉

ØD = Ø63 ~ Ø89
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

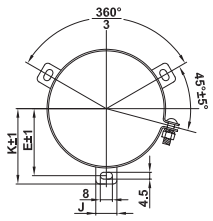
ØD = Ø100
- Cross-recessed head (Phillips) screw: M8×1.25×16 Spring washer, Washer
- Maximum screw tightening torque: 6.31N · m(64kg · cm)

B type mounting clamp



ØD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5
100	56.5	63.4	18	41.5

RATINGS OF RFA Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
350	3,300	63.5×120	0.25	11.1
	3,900	63.5×130	0.25	12.8
	4,700	63.5×160	0.25	15.2
	4,700	76.5×120	0.25	14.7
	5,600	63.5×170	0.25	17.3
	5,600	76.5×130	0.25	16.9
	6,800	63.5×190	0.25	20.0
	6,800	76.5×160	0.25	20.2
	8,200	76.5×170	0.25	23.1
	10,000	89×160	0.25	26.6
	12,000	89×190	0.25	32.0
	18,000	100×220	0.25	44.7
	22,000	100×250	0.25	52.3
400	2,700	63.5×120	0.25	10.1
	3,300	63.5×130	0.25	11.7
	3,900	63.5×160	0.25	13.5
	3,900	76.5×120	0.25	14.7
	4,700	63.5×170	0.25	15.8
	4,700	76.5×130	0.25	15.5
	5,600	63.5×190	0.25	18.2
	5,600	76.5×160	0.25	18.3
	6,800	76.5×170	0.25	21.0
	8,200	89×160	0.25	24.1
	10,000	89×190	0.25	29.1
	15,000	100×220	0.25	40.6
	18,000	100×250	0.25	47.1
450	2,200	63.5×120	0.25	9.1
	2,700	63.5×130	0.25	10.6
	2,700	76.5×120	0.25	11.2
	3,300	63.5×160	0.25	12.7
	3,300	76.5×130	0.25	13.0
	3,900	63.5×170	0.25	14.4
	4,700	76.5×160	0.25	16.7
	5,600	76.5×170	0.25	21.1
	5,600	89×160	0.25	19.9
	6,800	89×170	0.25	23.0
	8,200	89×190	0.25	26.4
	12,000	100×220	0.25	36.3
	15,000	100×250	0.25	42.9

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/85℃,120Hz)
500	1,200	63.5×90	0.25	5.3
	1,500	63.5×100	0.25	6.3
	1,800	63.5×120	0.25	7.4
	2,200	76.5×110	0.25	9.0
	2,700	76.5×130	0.25	10.3
	3,300	76.5×140	0.25	11.9
	3,900	76.5×150	0.25	13.3
	4,700	89×150	0.25	15.3
	5,600	89×170	0.25	18.2
	6,800	89×190	0.25	21.0
	10,000	100×220	0.25	29.0
	12,000	100×250	0.25	33.7
550	1,000	63.5×120	0.25	4.7
	1,200	63.5×130	0.25	5.3
	1,500	76.5×130	0.25	6.8
	2,200	89×130	0.25	9.4
	2,700	89×150	0.25	10.8
	3,300	89×170	0.25	12.6
	3,900	89×190	0.25	13.7
	4,700	89×220	0.25	15.1
	6,800	100×220	0.25	20.6
	8,200	100×250	0.25	24.9

Note : When long life performance is required in actual use, the rms ripple current has to be reduced.

TFA Series

- 105℃ 5,000Hrs assured. (2,000Hrs for 500~550VDC)
- Non-solvent proof.
- High Ripple Capability.
- Long Life.
- For Elevator, Industrial Inverter.
- RoHS compliant.

KMH → TFA
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 550 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	0.15max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-25℃)/C(20℃)≧0.7 (at 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after ther rated voltage with the rated ripple current is applied (the peak voltage shall not exceed th rated voltage) for 5,000 hours at 105℃. (2,000Hrs for 500~550VDC) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

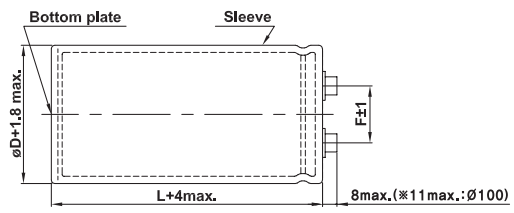
Frequency Multiplying Factor

Frequency(Hz)	120	300	1k	3k
Factor	1.0	1.1	1.3	1.4

DIMENSIONS OF TFA Series

Unit(mm)

Marking : BROWN SLEEVE, SILVER INK

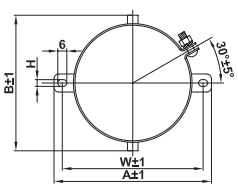


〈Screw specifications〉

ØD=Ø63 ~ Ø89
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

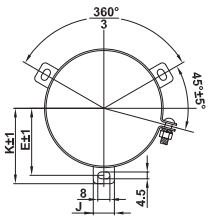
ØD=Ø100
- Cross-recessed head (Phillips) screw: M8×1.25×16 Spring washer, Washer
- Maximum screw tightening torque: 6.31N·m(64kg·cm)

B type mounting clamp



ØD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5
100	56.5	63.4	18	41.5

RATINGS OF TFA Series

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
350	3,300	63.5×120	0.15	14.4
	3,900	63.5×130	0.15	16.6
	4,700	63.5×160	0.15	19.8
	4,700	76.5×120	0.15	19.1
	5,600	63.5×170	0.15	22.5
	5,600	76.5×130	0.15	21.9
	6,800	76.5×160	0.15	26.2
	8,200	76.5×170	0.15	30.0
	8,200	89×160	0.15	29.2
	10,000	89×170	0.15	33.7
	18,000	100×220	0.15	53.1
	22,000	100×250	0.15	62.2
400	2,700	63.5×120	0.15	13.1
	3,300	63.5×130	0.15	15.2
	3,900	63.5×160	0.15	17.9
	3,900	76.5×120	0.15	18.2
	4,700	63.5×170	0.15	20.5
	4,700	76.5×130	0.15	20.1
	5,600	76.5×160	0.15	23.8
	6,800	76.5×170	0.15	27.3
	6,800	89×160	0.15	26.6
	8,200	89×170	0.15	30.5
	15,000	100×220	0.15	48.5
	18,000	100×250	0.15	56.2
450	2,200	63.5×120	0.15	11.8
	2,700	63.5×130	0.15	13.7
	2,700	76.5×120	0.15	14.5
	3,300	63.5×160	0.15	16.5
	3,300	76.5×130	0.15	16.9
	3,900	63.5×170	0.15	18.7
	4,700	76.5×160	0.15	21.7
	5,600	76.5×170	0.15	24.0
	5,600	89×160	0.15	24.1
	6,800	89×170	0.15	27.8
	8,200	89×190	0.15	32.0
	12,000	100×220	0.15	43.3
	15,000	100×250	0.15	51.3

VDC	Capacitance (μF)	øD×L(mm)	Tanδ	Rated Ripple Current (Arms/105℃,120Hz)
500	1,200	63.5×90	0.15	6.7
	1,500	63.5×100	0.15	7.8
	1,800	63.5×120	0.15	8.7
	2,200	76.5×110	0.15	9.9
	2,700	76.5×130	0.15	12.4
	3,300	76.5×140	0.15	13.9
	3,900	76.5×150	0.15	14.5
	4,700	89×150	0.15	15.8
	5,600	89×170	0.15	16.5
	6,800	89×190	0.15	18.8
	10,000	100×220	0.15	25.7
	12,000	100×250	0.15	29.9
550	1,000	63.5×120	0.15	6.6
	1,200	63.5×130	0.15	6.9
	1,500	76.5×130	0.15	8.5
	2,200	89×130	0.15	11.7
	2,700	89×150	0.15	13.4
	3,300	89×170	0.15	15.6
	3,900	89×190	0.15	17.0
	4,700	89×220	0.15	18.6
	6,800	100×220	0.15	21.2
	8,200	100×250	0.15	24.7

Note : When long life performance is required in actual use, the rms ripple current has to be reduced.

PH Series

• 5~35℃ 5,000Times.

- Non-solvent proof.
- For photo flash.
- RoHS compliant.

SPECIFICATIONS

Item	Characteristics
Rated Voltage	330 VDC
Operating Temperature Range	-20 ~ +55℃
Capacitance Tolerance	-10 ~ +20%(V) (at 20℃, 120Hz)
Leakage Current	I=1×C Where, I: Leakage current (μA) C: Nominal capacitance (μF) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	Cap. ≦600μF 0.10 Cap. >600μF 0.15 (at 20℃, 120Hz)
Charge and Discharge Characteristics	The following specifications shall be satisfied when the capacitors are restored to 20℃ after charge and discharge are repeated 5,000 times at room temperature. (5 to 35℃) Charge voltage: rated voltage Charge and discharge cycles:30 seconds Discharge resistance or Xenon tube:about 1 Ω Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 55℃ for 1,000 hours without voltage applied. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 300% of the initial specified value
Others	Satisfied EIAJ RC-3801A

RATINGS OF PH Series

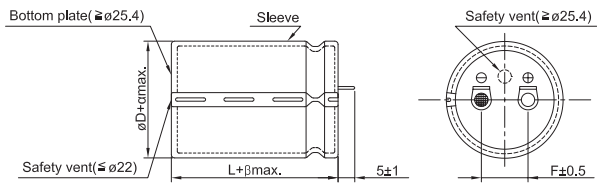
μF \ VDC / SV	330	350
165	16×27	
180	14.5×35, 18×29	
250	16×39	
260	16×45	
280	20×28	
320	22×40	
420	22×50	
500		25.4×54
700		30×54
950		35×50
1,000		35×50
1,500		35×60
2,000		35×80

Case Size øD×L(mm)

Note: Case sizes are changeable upon your requests.

DIMENSIONS

Unit(mm)



Marking : BLACK SLEEVE, SILVER INK

øD	14.5	16	18	20	22	25.4	30	35
F	5.5	5.5	6	7	7	10	10	14
α	0.5	0.5	0.5	1	1	1	1	1
β	1	1	1	2	2	2	2	2

DH Series

• 40℃ 1,000,000Times.

- Non-solvent proof.
- For Welding machine, Warning Light
- RoHS compliant.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	315, 475 VDC
Operating Temperature Range	-25 ~ +70℃
Capacitance Tolerance	-10 ~ +50%(T) (at 20℃, 120Hz)
Leakage Current	I = 0.06CV or 3㎃, whichever is smaller. Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)
Dissipation Factor(Tanδ)	0.10 Max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-10℃)/C(20℃) ≧ 0.8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 40℃ after the rated working voltage applied. And then charge and discharge (charge 0.8sec. discharge 0.2sec) are repeated 1,000,000 times. And then the capacitors are restored to 20℃ after the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ 200% of the initial specified value

RATINGS OF DH Series

μF \ VDC	315	475
100		35×110
150	35×100	
225		40×110
330	50×100	

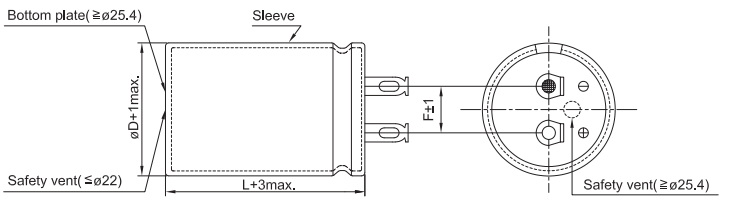
Case Size ØD×L(mm)

• Case sizes are changeable upon your requests.

Note: When long life performance is required in actual use, the rms ripple current has to be reduced.

DIMENSIONS

Unit(mm)



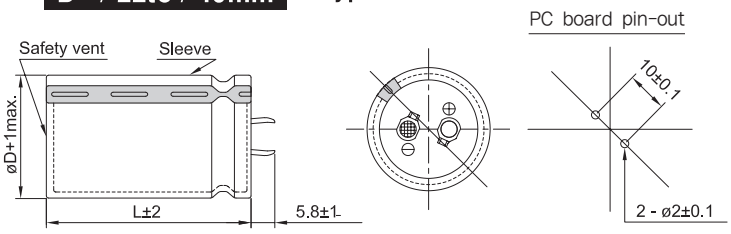
Marking : BLACK SLEEVE, SILVER INK

ø D	35	40	50
F	14	14 20	20

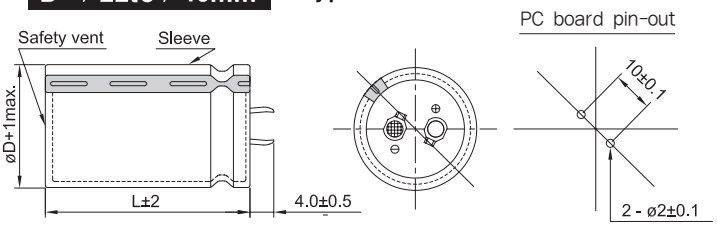
AVAILABLE TERMINALS

(mm)

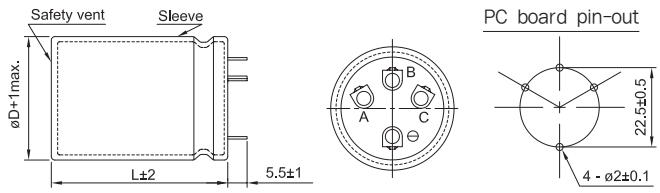
D=φ22toφ40mm Type : VN



D=φ22toφ40mm Type : VS

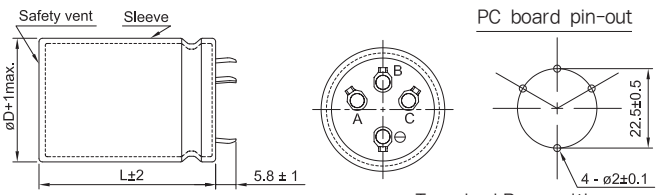


D=φ35toφ40mm Type : VR (4 Terminals)



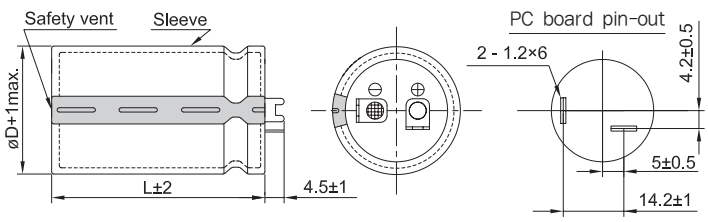
Terminal B = positive
Terminal A&C = blank

D=φ35toφ40mm Type : VN4T(4 Terminals)

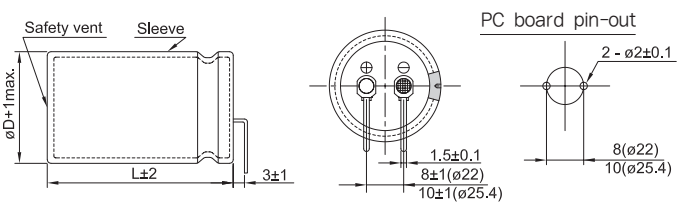


Terminal B = positive
Terminal A&C = blank

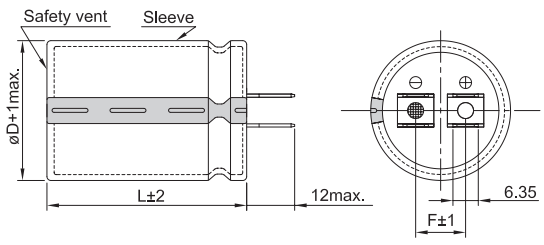
D=φ35toφ40mm Type : LI



D=φ22toφ25.4mm Type : VL



D=φ35toφ50mm Type : LR



CAUTION

Use the blank terminals for mechanical support only.
The blank terminals must not be connected any copper on PC board.
Be sure to electrically isolate from negative or positive terminals.

ø D	35	40	50
F	12.5	14	

Sales Office

▶ OVERSEAS

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(단위:mm)

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CAUTION FOR SAFETY

- Always read 「Notes on Use」 before using the product in order to enable you to use the product correctly and prevent any faults and accidents from ocurring.
- Request the 「Deliverly Specification」 on the product of SAMYOUNG ELECTRONICS CORPORATION to refer to it as well as this brochure prior to the order of the products.
  Some specific notes on use of the ordered product may be described in the specifications.