Thick Film Chip Resistors

Features

- Small size and light weight
- Reliability, high quality
- Compatible with all soldering process
- Reduction of assembly costs and space on the PCB

Application

- Smartphones, tablets, laptops.
- Automotive control management and safety features.
- Machinery control systems, robotics and automation equipment.
- Networking equipment, monitoring devices, etc.
- Medical diagnostic devices.
- Circuit boards in desktops, servers and embedded systems.

Part number system

EXAMPLE: AKPC0805W4J0101T5 (0805 100Ω 5% 1/4W)

Company Code	Type code	Size	Power	Tolerance	Resistance	Type of reel	Packing
AKP	C	0805	W4	J	0101	T	5
Akyga	C: STANDARD SERIES	0201 0402 0603 0805 1206 1210 1218 1812 2010 2512	WH = 1/32W WM = 1/20W WG = 1/16W WA = 1/10W W8 = 1/8W W4 = 1/4W W2 = 1/2W 07 = 3/4W 1W = 1W	B: ±0,1% C: ±0.25% D: ±0.5% F: ±1% J: ±5% P: Jumper	**±5%** the 1st digit is"0";the 2nd and 3rd digits are for the significant figures of the resistance and the 4th indicate the number of zeros following *0102 = 1kΩ* *01R0 = 1Ω* When 2 decimal places for resistance value: **2R55 = 2.55Ω** **±1%** the first 3 digits are for the significant figures of the resistance and the 4th indicate the number of zeros following *1001 = 1kΩ* *1R00 = 1Ω* When 2 decimal places for resistance value: 1R55 = 1.55**Ω**	T: 7" reel Q: 10" reel R: 13" reel	4 = 4000 pcs. 5 = 5000 pcs. A = 10000pcs. B = 15000 pcs. C = 20000 pcs. D = 40000 pcs. E = 50000 pcs.

Marking

For 0201 and 0402 size, no marking on the body due to the small size of the resistor		472 = 47x10^2 = 4.7KΩ
±5% tolerance product: the marking is 3 digits, the first 2 digits are significant figures of resistance value and the 3rd one denotes the power number of 10, (10X)		5R6 = 5.6Ω Below 10Ω: 5R6 = 5.6Ω
±0.5%, ±1%,±2% tolerance product: the marking is 4 digits, the first 3 digits are significant figures of resistance value and the 4th one denotes the power number of 10, (10X)		4992 = 400 x 10^2 = 49.9KΩ
Standard E96 series values of 0603 ±1%: due to the small size of the resistor's body, use 3digits code to indicate the resistance value.		6R81 = 6.81Ω Below 100Ω: 6R81 = 6.81Ω
All type and tolerance of Jumper products used 1 digit code to indicate the value,I.e.0		0Ω = 0

Standard E96 Series Resistance Value Code for 0603 ±1% Marking

Code	Value	Code	Value	Code	Value	Code	Value	Code	Value	Code	Value
1	100	17	147	33	215	49	316	65	464	81	681
2	102	18	150	34	221	50	324	66	475	82	698
3	105	19	154	35	226	51	332	67	487	83	715
4	107	20	158	36	232	52	340	68	499	84	732
5	110	21	162	37	237	53	348	69	511	85	750
6	113	22	165	38	243	54	357	70	523	86	768
7	115	23	169	39	249	55	365	71	536	87	787
8	118	24	174	40	255	56	374	72	549	88	806
9	121	25	178	41	261	57	383	73	562	89	825
10	124	26	182	42	267	58	392	74	576	90	845
11	127	27	187	43	274	59	402	75	590	91	866
12	130	28	191	44	280	60	412	76	604	92	887
13	133	29	196	45	287	61	422	77	619	93	909
14	137	30	200	46	294	62	432	78	634	94	931
15	140	31	205	47	301	63	442	79	649	95	953
16	143	32	210	48	309	64	453	80	665	96	976

Multiplier Code for 0603 ±1% Marking

Code	Y	X	A	B	C	D	E	F
Multipier	10^{-2}	10^{-1}	10^{0}	10^{1}	10^{2}	10^{3}	10^{4}	10^{5}

So the resistance value are marked as the following examples

10D=124x10^{3}=124KΩ

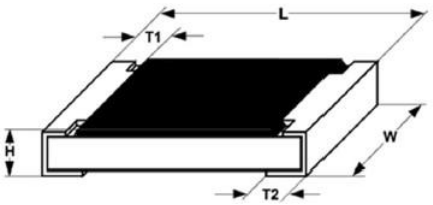
38Y=243x10^{-2}=2.42Ω

Standard E24 and not belong to E96 series value of 0603 ±1%, the marking is the same as 5% tolerance but marking as underline

331=33x101=330Ω

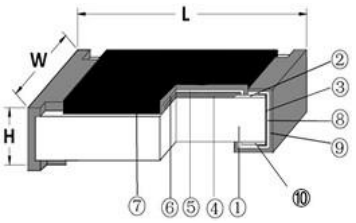
560=56x100=56Ω

Dimensions

Dimensions (unit: mm)					
Type	L	W	H	T1	T2
0201	0.60±0.03	0.30±0.03	0.23±0.03	0.10±0.05	0.15±0.05
0402	1.00±0.05	0.50±0.05	0.35±0.05	0.20±0.10	0.25±0.10
0603	1.60±0.10	0.80±0.10	0.45±0.10	0.25±0.15	0.25±0.15
0805	2.00±0.10	1.25±0.10	0.50±0.10	0.35±0.20	0.35±0.20
1206	3.10±0.10	1.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1210	3.10±0.10	2.60±0.15	0.55±0.10	0.45±0.15	0.50±0.20
1218	3.10±0.10	4.60±0.10	0.55±0.10	0.45±0.20	0.40±0.20
1812	4.50±0.20	3.10±0.20	0.55±0.10	0.55±0.20	0.70±0.20
2010	5.00±0.10	2.50±0.15	0.55±0.10	0.45±0.15	0.50±0.20
2512	6.35±0.10	3.10±0.15	0.55±0.10	0.60±0.20	0.50±0.20

Construction

NO.	Construction	Major material
1	Ceramic substrate	Al_2O_3
2	Conductive layer (TOP)	Ag
3	Side conductive layer	NiCr
4	Resitive layer	RuO_2 + glass
5	Inner protective layer	Glass
6	Outer Protective layer	Epoxy
7	Marking	Epoxy
8	Ni plating layer	NiCr
9	Sn plating layer	Matte Tin
10	Conductive later (BACK)	Ag



Electrical characteristics

Type	0201	0402	0603	0805	1206	1210	1218	1812	2010	2512
Rated power	1/20W	1/16W	1/10W	1/8W	1/4W	1/2W	1W	3/4W	3/4W	1W
Max Working Voltage	25V	50V	75V	150V	200V	200V	200V	200V	200V	200V
Max Overload Voltage	50V	100V	150V	300V	400V	400V	500V	400V	400V	400V
Dielectric Withstanding Voltage	-	100V	100V	300V	500V	500V	500V	500V	500V	500V
±1% Resistance Value of Jumper ±1%	-	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ	<30mΩ
±5% Resistance Value of Jumper ±5%	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ	<50mΩ
Rated Current of Jumper	0.5A	1A	1A	2A	2A	2A	6A	2A	2A	2A
Max Current of Jumper	1A	2A	2A	5A	10A	10A	10A	10A	10A	10A

The rated voltage is calculated by the following formula:

E= $\sqrt{RP}$

E: Rated voltage (V)

P: Rated Power (W)

R: Resistance (ohm)

In case the value calculated by the formula exceed the maximum working voltage as above table 8, the maximum working voltage shall be regarded as rated voltage.

Standard Electrical Specifications

Type	Power Rating at 70 °C	Max. RCWV	Max. Overload Voltage	T.C.R (PPM/°C)	Resitance Range
0201	1/20W	25V	50V	±400	1Ω~10Ω
				±200	10Ω~10MΩ
0402	1/16W	50V	100V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
0603	1/10W	75V	150V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
0805	1/8W	150V	300V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
1206	1/4W	200V	400V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
1210	1/2W	200V	400V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
1218	1W	200V	500V	±200	1Ω~10Ω
				±100	10Ω~1MΩ
1812	3/4W	200V	400V	±200	1Ω~10Ω
				±100	10Ω~10MΩ
2010	3/4W	200V	400V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ
2512	1W	200V	400V	±200	1Ω~10Ω
					10MΩ~22MΩ
				±100	10Ω~10MΩ

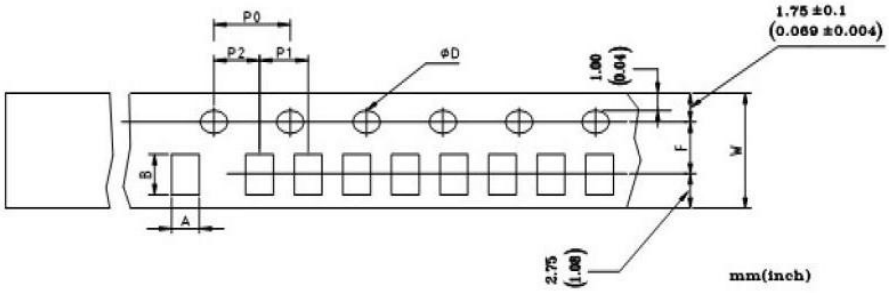
Performance Specifications

Item	Test Methods	Test Conditions	Specification
Temperature Coefficient	JIS C 5201 4.8	TCR = (R-R0) / (t-t0) R0 ×106 (ppm) R0 (resistance at room temperature) R (resistance at 125℃ or -55℃) t0 (room temperature) t (test temperature 125℃ or -55℃)	0201 1Ω≦R≦10Ω: ±400PPM/℃ 10Ω<R≦10MΩ: ±200PPM/℃ 0402~2512 1Ω≦R≦10Ω: ±200PPM/℃ 10Ω<R≦10MΩ: ±100PPM/℃ 10MΩ<R≦100MΩ: ±200PPM/℃
Short-time overload	JIS C 5201 4.13	Applied 2.5 times of rated voltage for 5 second. Measure the variation of resistance.	±(1.00% + 0.05Ω)
Solderability	JIS C 5201 4.17	Dip the terminal in a flux and then dip into a soldering bath at 245℃ ±5℃ for 3± 0.5sec.	> 95% coverage
Resist to soldering heat	JIS C 5201 4.18	Dip the terminal in a flux and then dip into a soldering bath at 260℃ ±5℃ for 10± 0.5sec. Measure the variation of resistance.	±(1.00% + 0.05Ω)
Insulation resistance	JIS C 5201 4.6	Applied the dielectric withstanding voltage on the center of body for 60± 5 seconds. Then measure insulation resistance.	>10GΩ
Dielectric withstanding voltage	JIS C 5201 4.7	Applied the dielectric withstanding voltage on the center of body for 60± 5 seconds. Then measure insulation resistance.	No evidence of flashover, mechanical damage arcing or insulation breakdown.
Terminal bending	JIS C 5201 4.33	Specimen shall be mounted on test board, then bend the board and maintained for 20± 1s. The distance of bending is 5+0.2/0 mm for resistors which size no larger than 1206 or 2+0.2/9 mm which size larger than 1206. Measure the variation of resistance.	±(1.00% + 0.05Ω)

Item	Test Methods	Test Conditions	Specification
Temperature Cycling	JIS C 5201 4.19	Put specimen in a chamber which temperature can be changed to 155±2℃ or -55±3℃, repeated 5 times. Measure the variation of resistance.	±(2.00% +0.05Ω)
Humidity	JIS C 5201 4.24	Put the specimen in a chamber at 40±2℃ temperature and 90~95% relative humidity, then applied rated voltage for 1.5H and rested for 0.5H repeatedly till total test time is $1000^{+48}/_{-0}$ H. Measure the variation of resistance.	±(2.00% +0.05Ω)
Load life	JIS C 5201 4.25.1	Put the specimen in a chamber at 70±2℃ temperature, ON TIME:1.5H， OFF TIME:0.5H， and applied rated voltage for 1000 +24/-0H. Measure the variation of resistance.	±(2.00% +0.05Ω)
Moisture resistance	MIL-STD-202 METHOD 106	25°C~65°C,90~100%RH, 2.5H; 65°C 90~100%RH, 3H; 65°C~25°C 80~100%RH, 2.5H, 10 cycles, Measurement at 24±4 hours after test conclusion.	±(2.00% +0.05Ω)

Taping Specification (reel dimensions)

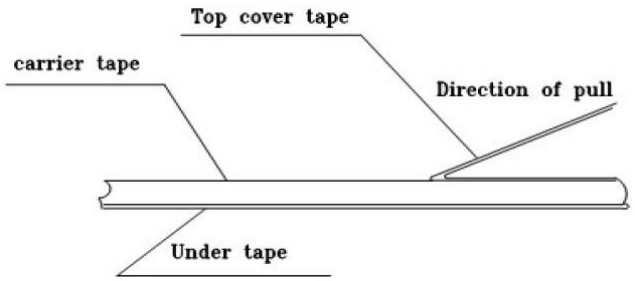
Type	Size		Unit	A	B	C	F	W
0201	7"	10K/Reel 15K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0402	7"	10K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
	13"	40K/ Reel 50K/Reel	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
0603/0805/1206	7"	5K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
	10"	10K/Reel	mm	254±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
	13"	20K/Reel	mm	330±2.0	100.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
1210	7"	5K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	11.4±0.1	9.00±0.3
1218/1812/2010/2512	7"	4K/Reel	mm	178±2.0	60.0±1.0	13.5±0.5	15.4±1.0	13.0±0.3



Dimensions	A	B	F	P0	P1	P2	W
0201	0.38±0.05	0.68±0.05	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
0402	0.65±0.10	1.15±0.10	3.50±0.05	4.00±0.10	2.00±0.10	2.00±0.05	8.00±0.20
0603	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
0805	1.65±0.20	2.40±0.20	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1206	1.90±0.20	3.50±0.20	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1210	2.80±0.20	3.50±0.20	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.20
1218	2.80±0.20	4.60±0.20	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
1812	3.30±0.20	4.60±0.20	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2010	2.90±0.10	5.30±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10
2512	3.40±0.10	6.60±0.10	5.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	12.0±0.10

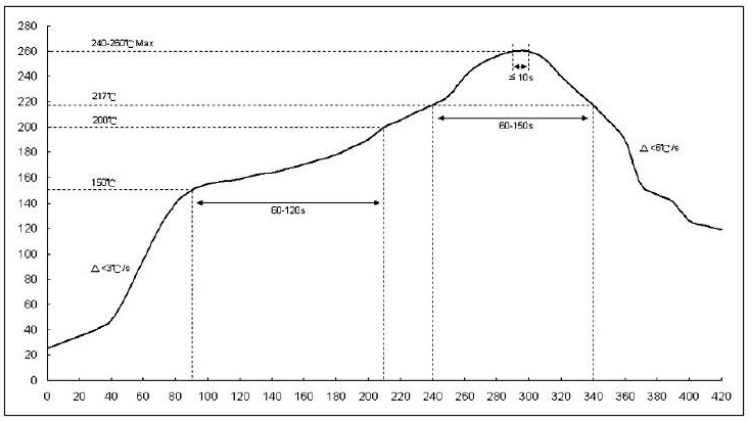
Peel force of top cover tape

The top cover tape is pulled at a speed of 200mm/min with the angle between the tape during peel and the direction of unreeling maintained at 165 to 180 degree as following picture. The peel force of paper carrier tape shall be 0.1N to 0.7N (10 to 70g), the peel force of plastic carrier tape shall be 0.3N to 1N (30 to 100g).

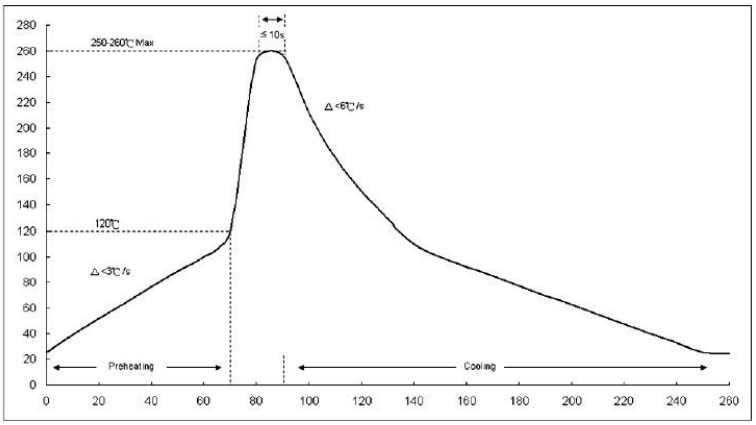


Soldering

1. Recommend reflow soldering profile



2. Recommend wave soldering profile



3. Hand soldering temperature.
   The iron temperature is 350±10℃, hand soldering time less than 3S.
   Avoid solder iron tip direct touch the components body.

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