

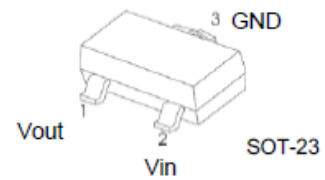
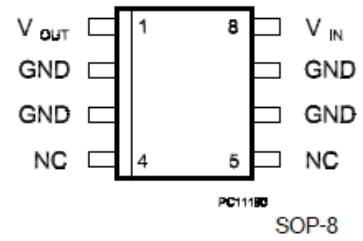
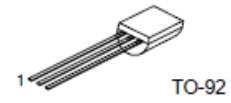
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

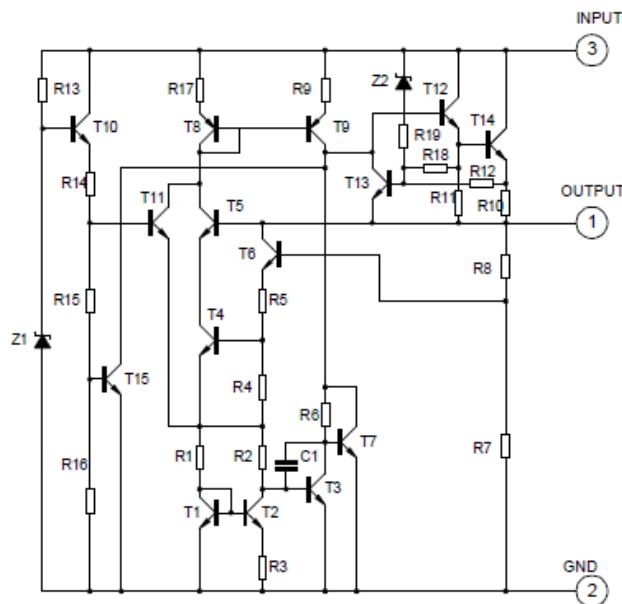
The 78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 100mA.

FEATURE

- *Maximum output current of 100mA
- *Output voltage of 5V,6V,8V,9V,10V,12V,15V and 24V
- *Thermal overload protection
- *Short circuit current limiting



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Operating temperature range applies unless otherwise specified)

CHARACTERISTICS	SYMBOL	VALUE		UNITS
Input voltage(for $V_o=5,8V$) (for $V_o=12,15V$)	V_i	30		V
	V_i	35		V
High power dissipation	P_d	TO-92	700	mW
		SOT-23	300	
		SOT-89	400	
		SOP-8	400	
Operating Junction Temperature Range	T_{opr}	-20~+120		°C
Storage Temperature Range	T_{stg}	-55~+150		°C

78L05 ELECTRICAL CHARACTERISTICS
 $(V_i=10V, I_o=40mA, 0 < T_j < 125^\circ C, C_1=0.33\mu F, C_o=0.1\mu F, \text{ unless otherwise specified})(\text{Note 1})$

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	V_o	$T_j=25^\circ C$	4.8	5.0	5.2	V
		$7.5V \leq V_i \leq 20V, I_o=1mA \sim 40mA$	4.75		5.25	V
		$7.5V \leq V_i \leq V_{MAX}, I_o=1mA \sim 70mA$	4.75		5.25	V (note 2)
Output Voltage(note 3)	V_o	$T_j=25^\circ C$	4.9	5.0	5.1	V
		$7.5V \leq V_i \leq 20V, I_o=1mA \sim 40mA$	4.85		5.15	V
		$7.5V \leq V_i \leq V_{MAX}, I_o=1mA \sim 70mA$	4.85		5.15	V (note 2)
Load Regulation	ΔV_o	$T_j=25^\circ C, I_o=1mA \sim 100mA$		11	60	mV
		$T_j=25^\circ C, I_o=1mA \sim 40mA$		5.0	30	mV
Line regulation	ΔV_o	$7V \leq V_i \leq 20V, T_j=25^\circ C$		8	150	mV
		$8V \leq V_i \leq 20V, T_j=25^\circ C$		6	100	mV
Quiescent Current	I_q		2.0	5.5	mA	
Quiescent Current Change	ΔI_q	$8V \leq V_i \leq 20V$			1.5	mA
	ΔI_q	$1mA \leq I_o \leq 40mA$			0.1	mA
Output Noise Voltage	V_N	$10Hz \leq f \leq 100kHz$		40		μV
Temperature coefficient of V_o	$\Delta V_o / \Delta T$	$I_o=5mA$		0.65		$mV/^\circ C$
Ripple Rejection	RR	$8V \leq V_i \leq 20V, f=120Hz, T_j=25^\circ C$	40	49		dB
Dropout Voltage	V_d	$T_j=25^\circ C$		1.7		V

78L06 ELECTRICAL CHARACTERISTICS

(VI=12V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	5.75	6.0	6.25	V
		8.5V≤Vi≤20V, Io=1mA~40mA	5.7		6.3	V
		8.5V≤Vi≤VMAX, Io=1mA~70mA	5.7		6.3	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	5.88	6.0	6.12	V
		8.5V≤Vi≤20V, Io=1mA~40mA	5.82		6.18	V
		8.5V≤Vi≤VMAX, Io=1mA~70mA	5.82		6.18	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		12.8	80	mV
		Tj=25°C, Io=1mA~70mA		5.8	40	mV
Line regulation	ΔVo	8.5V≤Vi≤20V, Tj=25°C		64	175	mV
		9V≤Vi≤20V, Tj=25°C		54	125	mV
Quiescent Current	Iq		2.0	5.5	mA	
Quiescent Current Change	ΔIq	9V≤Vi≤20V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	10V≤Vi≤20V, f=120Hz, Tj=25°C	38	46		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L08 ELECTRICAL CHARACTERISTICS

(VI=14V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	7.7	8.0	8.3	V
		10.5V≤Vi≤23V, Io=1mA~40mA	7.6		8.4	V
		10.5V≤Vi≤VMAX, Io=1mA~70mA	7.6		8.4	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	7.84	8.0	8.16	V
		10.5V≤Vi≤23V, Io=1mA~40mA	7.76		8.24	V
		10.5V≤Vi≤VMAX, Io=1mA~70mA	7.76		8.24	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		15	80	mV
		Tj=25°C, Io=1mA~70mA		8.0	40	mV
Line regulation	ΔVo	10.5V≤Vi≤23V, Tj=25°C		10	175	mV
		11V≤Vi≤23V, Tj=25°C		8	125	mV
Quiescent Current	Iq		2.0	5.5	mA	
Quiescent Current Change	ΔIq	11V≤Vi≤23V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	11V≤Vi≤23V, f=120Hz, Tj=25°C	36	45		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L09 ELECTRICAL CHARACTERISTICS

(VI=15V, IO=40mA, 0<Tj<125°C, C1=0.33µF, Co=0.1µF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	8.64	9.0	9.36	V
		11.5V≤Vi≤24V, IO=1mA~40mA	8.55		9.45	V
		11.5V≤Vi≤VMAX, IO=1mA~70mA	8.55		9.45	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	8.82	9.0	9.18	V
		11.5V≤Vi≤24V, IO=1mA~40mA	8.73		9.27	V
		11.5V≤Vi≤VMAX, IO=1mA~70mA	8.73		9.27	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		20	90	mV
		Tj=25°C, IO=1mA~40mA		10	45	mV
Line regulation	ΔVo	11.5V≤Vi≤24V, Tj=25°C		90	200	mV
		13V≤Vi≤24V, Tj=25°C		100	150	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	13V≤Vi≤24V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		µV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		0.75		mV/°C
Ripple Rejection	RR	12V≤Vi≤23V, f=120Hz, Tj=25°C	36	44		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L10 ELECTRICAL CHARACTERISTICS

(VI=15V, IO=40mA, 0<Tj<125°C, C1=0.33µF, Co=0.1µF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	9.61	10	10.4	V
		12.5V≤Vi≤24V, IO=1mA~40mA	9.55		10.45	V
		12.5V≤Vi≤VMAX, IO=1mA~70mA	9.55		10.45	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	9.8	10	10.2	V
		12.5V≤Vi≤24V, IO=1mA~40mA	9.7		10.3	V
		12.5V≤Vi≤VMAX, IO=1mA~70mA	9.7		10.3	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		20	90	mV
		Tj=25°C, IO=1mA~40mA		10	45	mV
Line regulation	ΔVo	≤Vi≤24V, Tj=25°C		90	200	mV
		13V≤Vi≤24V, Tj=25°C		100	150	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	13V≤Vi≤24V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		49		µV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		0.75		mV/°C
Ripple Rejection	RR	12V≤Vi≤23V, f=120Hz, Tj=25°C	36	44		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L12 ELECTRICAL CHARACTERISTICS
(VI=19V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	11.5	12	12.6	V
		14.5V≤Vi≤27V, Io=1mA~40mA	11.4		12.6	V
		14.5V≤Vi≤VMAX, Io=1mA~70mA	11.4		12.6	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	11.76	12.0	12.24	V
		14.5V≤Vi≤27V, Io=1mA~40mA	11.64		12.36	V
		14.5V≤Vi≤VMAX, Io=1mA~70mA	11.64		12.36	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		25	150	mV
		Tj=25°C, Io=1mA~40mA		12	75	mV
Line regulation	ΔVo	14.5V≤Vi≤27V, Tj=25°C		25	300	mV
		16V≤Vi≤27V, Tj=25°C		20	250	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	16V≤Vi≤27V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		80		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.0		mV/°C
Ripple Rejection	RR	15V≤Vi≤25V, f=120Hz, Tj=25°C	36	42		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L15 ELECTRICAL CHARACTERISTICS
(VI=23V, Io=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	14.4	15	15.6	V
		17.5V≤Vi≤30V, Io=1mA~40mA	14.25		15.75	V
		17.5V≤Vi≤VMAX, Io=1mA~70mA	14.25		15.75	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	14.7	15.0	15.3	V
		17.5V≤Vi≤30V, Io=1mA~40mA	14.55		15.45	V
		17.5V≤Vi≤VMAX, Io=1mA~70mA	14.55		15.45	V (note 2)
Load Regulation	ΔVo	Tj=25°C, Io=1mA~100mA		20	150	mV
		Tj=25°C, Io=1mA~70mA		25	150	mV
Line regulation	ΔVo	17.5V≤Vi≤30V, Tj=25°C		25	150	mV
		20V≤Vi≤30V, Tj=25°C		15	75	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	20V≤Vi≤30V			1.5	mA
	ΔIq	1mA≤Vi≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.3		mV/°C
Ripple Rejection	RR	18.5V≤Vi≤28.5V, f=120Hz, Tj=25°C	33	39		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

78L18 ELECTRICAL CHARACTERISTICS

(VI=27V, IO=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	17.3	18	18.7	V
		21V≤VI≤33V, IO=1mA~40mA	17.1		18.9	V
		21V≤VI≤VMAX, IO=1mA~70mA	17.1		18.9	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	17.64	18.0	18.36	V
		21V≤VI≤33V, IO=1mA~40mA	17.46		18.54	V
		21V≤VI≤VMAX, IO=1mA~70mA	17.46		18.54	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		30	170	mV
		Tj=25°C, IO=1mA~40mA		15	85	mV
Line regulation	ΔVo	21V≤VI≤33V, Tj=25°C		145	300	mV
		22V≤VI≤33V, Tj=25°C		135	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	21V≤VI≤33V			1.5	mA
	ΔIq	1mA≤VI≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		1.8		mV/°C
Ripple Rejection	RR	23V≤VI≤33V, f=120Hz, Tj=25°C	32	38		dB
Dropout Voltage	Vd	Tj=250°C		1.7		V

78L24 ELECTRICAL CHARACTERISTICS

(VI=33V, IO=40mA, 0<Tj<125°C, C1=0.33μF, Co=0.1μF, unless otherwise specified)(Note 1)

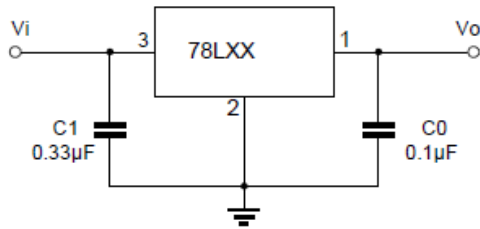
Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	23	24	25	V
		27V≤VI≤38V, IO=1mA~40mA	22.8		25.2	V
		27V≤VI≤VMAX, IO=1mA~70mA	22.8		25.2	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	23.5	24	24.5	V
		27V≤VI≤38V, IO=1mA~40mA	23.25		24.75	V
		27V≤VI≤VMAX, IO=1mA~70mA	23.25		24.75	V (note 2)
Load Regulation	ΔVo	Tj=25°C, IO=1mA~100mA		40	200	mV
		Tj=25°C, IO=1mA~40mA		20	100	mV
Line regulation	ΔVo	27V≤VI≤38V, Tj=25°C		160	300	mV
		28V≤VI≤38V, Tj=25°C		150	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	27V≤VI≤38V			1.5	mA
	ΔIq	1mA≤VI≤40mA			0.1	mA
Output Noise Voltage	VN	10Hz≤f≤100kHz		200		μV
Temperature coefficient of Vo	ΔVo/ΔT	IO=5mA		2.0		mV/°C
Ripple Rejection	RR	27V≤VI≤38V, f=120Hz, Tj=25°C	30	37		dB
Dropout Voltage	Vd	Tj=25°C		1.7		V

Note 1: The Maximum steady state usable output current and input voltage are very dependent on the heating sinking and/or lead temperature length of the package. The date above represent pulse test conditions with junction temperatures as indicated at the initiation of test.

Note 2: Power dissipation<0.75W.

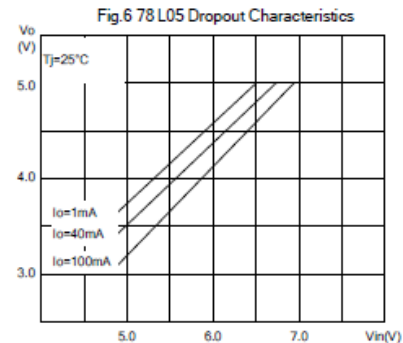
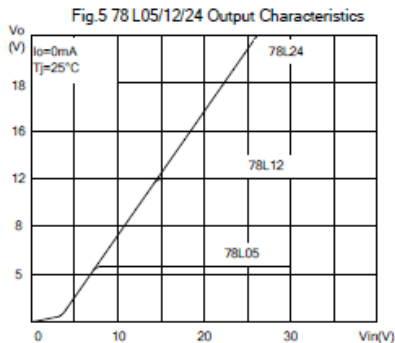
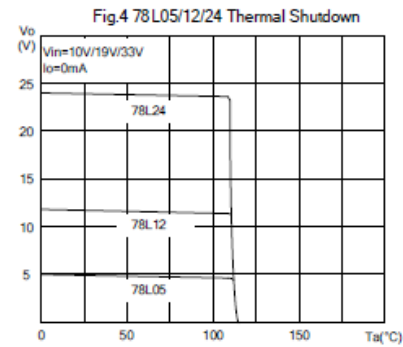
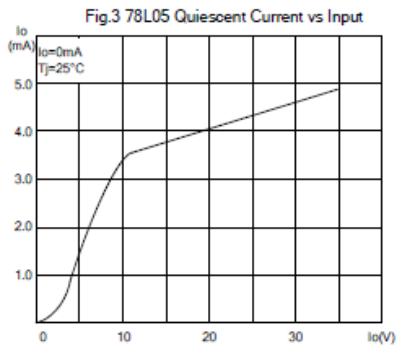
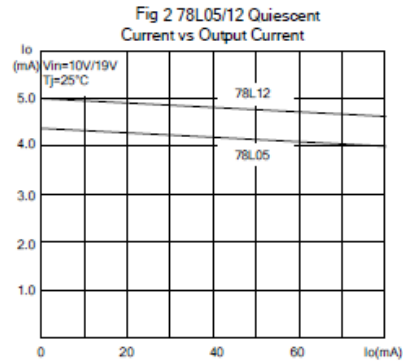
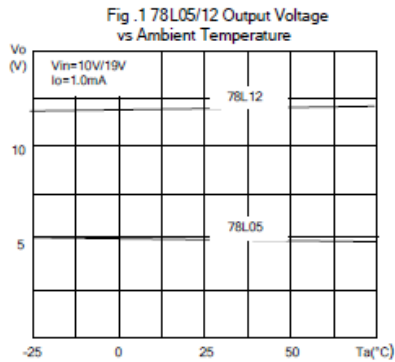
Note 3: Output voltage of 78LXXA.

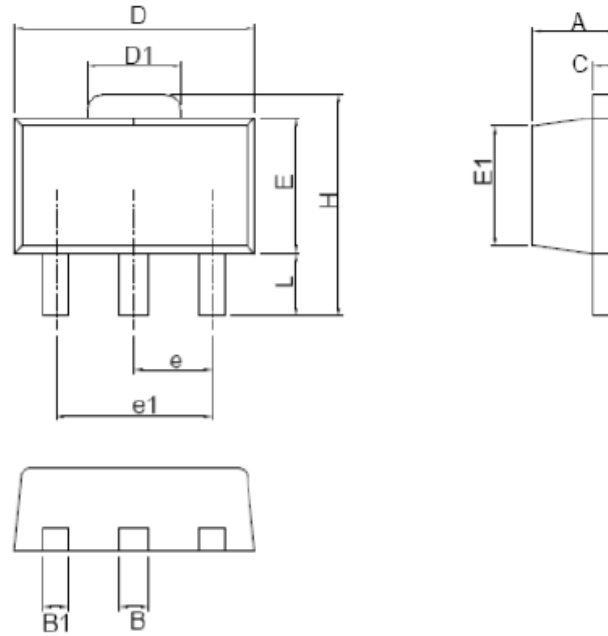
TYPICAL APPLICATION



Note 1: To specify an output voltage, substitute voltage value for "XX".

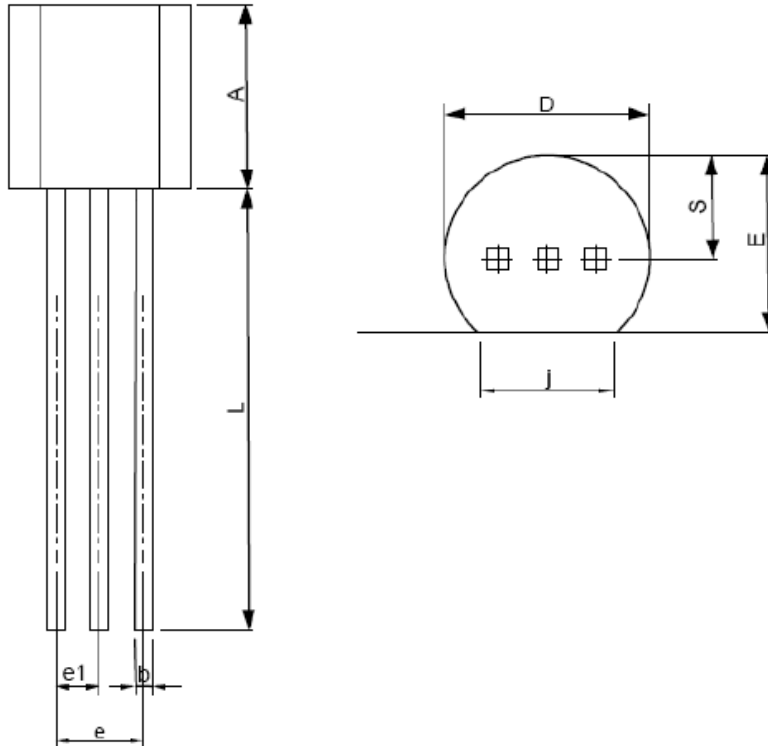
Note 2: Bypass capacitors are recommended for optimum stability and transient response and should be located as close as possible to the regulators.



SOT-89


SYMBOL	SOT-89			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	1.40	1.60	0.055	0.063
B	0.44	0.56	0.017	0.022
B1	0.36	0.48	0.014	0.019
C	0.35	0.44	0.014	0.017
D	4.40	4.60	0.173	0.181
D1	1.62	1.83	0.064	0.072
E	2.29	2.60	0.090	0.102
E1	2.13	2.29	0.084	0.090
e	1.50 BSC		0.059 BSC	
e1	3.00 BSC		0.118 BSC	
H	3.94	4.25	0.155	0.167
L	0.89	1.20	0.035	0.047

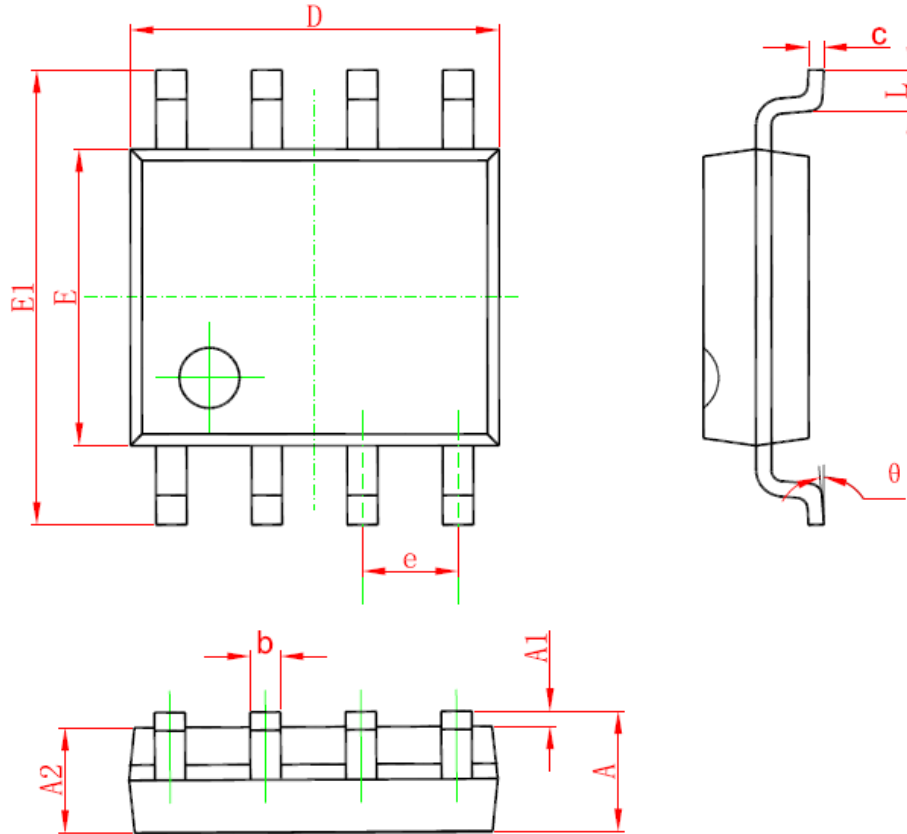
TO-92



SYMBOL	TO-92			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.32	5.33	0.170	0.210
b	0.41	0.53	0.016	0.021
D	4.45	5.20	0.175	0.205
E	3.18	4.19	0.125	0.165
e	2.42	2.66	0.095	0.105
e1	1.15	1.39	0.045	0.055
j	3.43	4.00	0.135	0.157
L	12.70	15.00	0.500	0.591
S	2.03	2.66	0.080	0.105

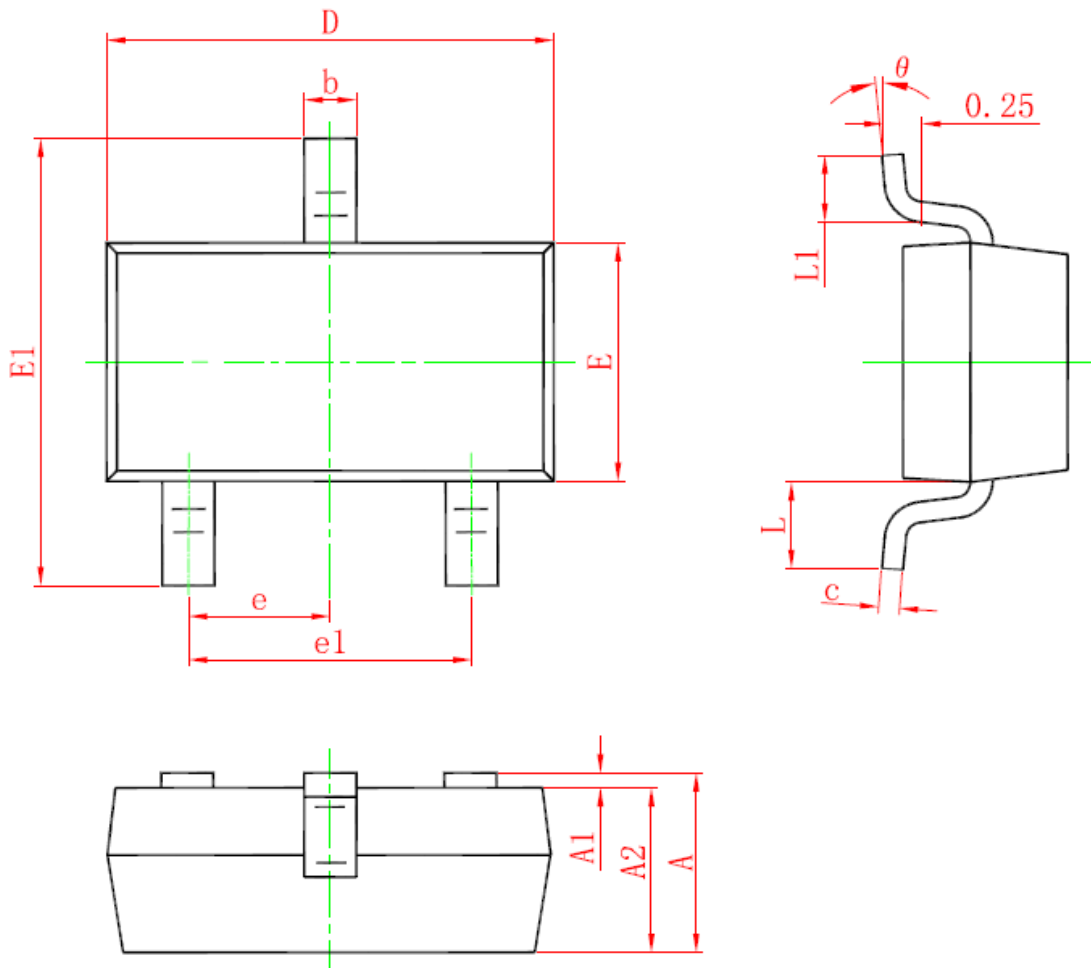
Note : Follow JEDEC TO-92.

SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

SOT-23



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

ORDERING INFORMATION

Order code	Package	Baseqty	Deliverymode	Marking
UMW L78LxxA	SOP-8	2500	Tape and reel	L78LxxA
UMW 78LxxS	SOT-23	3000	Tape and reel	Lxx.
UMW 78LxxL	TO-92	1000	Bulk Bag	78LxxL
UMW 78Lxx	SOT-89	1000	Tape and reel	78Lxx

Disclaimer

Akyga semi reserves the right to make changes without notice to any product specification herein, to make corrections, modifications, enhancements or other changes. Akyga semi or anyone on its behalf assumes no responsibility or liability for any errors or inaccuracies. Data sheet specifications and its information contained are intended to provide a product description only. "Typical" parameters which may be included on Akyga semi data sheets and/ or specifications can and do vary in different applications and actual performance may vary over time. Akyga semi does not assume any liability arising out of the application or use of any product or circuit. Akyga semi products are not designed, intended or authorized for use in medical, life-saving implant or other applications intended for life-sustaining or other related applications where a failure or malfunction of component or circuitry may directly or indirectly cause injury or threaten a life without expressed written approval of Akyga semi. Customers using or selling Akyga semi components for use in such applications do so at their own risk and shall agree to fully indemnify Akyga semi and its subsidiaries harmless against all claims, damages and expenditures.