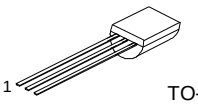
3-TERMINAL 0.1A POSITIVE VOLTAGE REGULATORS

DESCRIPTION

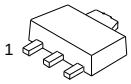
The 78LXX series of fixed voltage monolithic integrated circuit voltage regulators are suitable for applications that required supply up to 100mA.

FEATURE

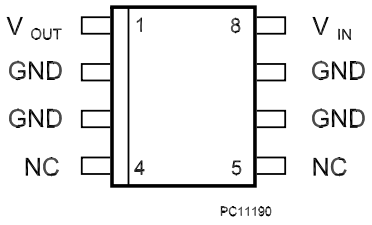
*Maximum output current of 100mA
*Output voltage of 5V,6V,8V,9V,10V,12V,15V and 24V
*Thermal overload protection
*Short circuit current limiting



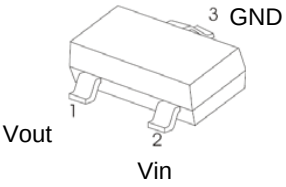
TO-92



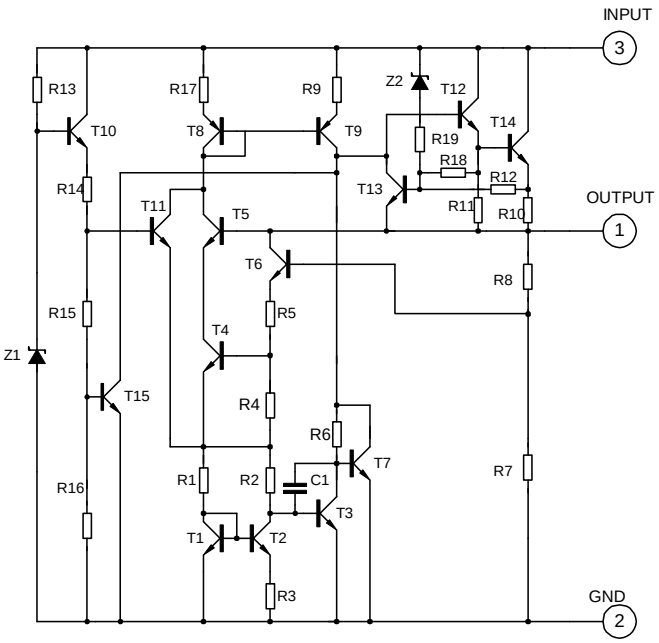
SOT-89-3



SO-8



BLOCK DIAGRAM



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

CHARACTERISTICS	SYMBOL	VALUE		UNITS
Input voltage(for Vo=5,8V) (for Vo=12,15V)	V_I V_I	30 35		V V
High power dissipation	Pd	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<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	4.8	5.0	5.2	V
		7.5V≤V_I≤20V,I_O=1mA~40mA	4.75		5.25	V
		7.5V≤V_I≤V_{MAX},I_O=1mA~70mA	4.75		5.25	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	4.9	5.0	5.1	V
		7.5V≤V_I≤20V,I_O=1mA~40mA	4.85		5.15	V
		7.5V≤V_I≤V_{MAX},I_O=1mA~70mA	4.85		5.15	V (note 2)
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~100mA		11	60	mV
		Tj=25°C, I_O=1mA~40mA		5.0	30	mV
Line regulation	ΔVo	7V≤V_I≤20V,Tj=25°C		8	150	mV
		8V≤V_I≤20V,Tj=25°C		6	100	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	8V≤V_I≤20V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		40		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.65		mV/°C
Ripple Rejection	RR	8V≤V_I≤20V,f=120Hz,Tj=25°C	40	49		dB
Dropout Voltage	Vd	Tj=25°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	V_O	Tj=25°C	7.7	8.0	8.3	V
		10.5V≤V_I≤23V,I_O=1mA~40mA	7.6		8.4	V
		10.5V≤V_I≤V_{MAX}, I_O=1mA~70mA	7.6		8.4	V (note 2)
Output Voltage(note 3)	V_O	Tj=25°C	7.84	8.0	8.16	V
		10.5V≤V_I≤23V,I_O=1mA~40mA	7.76		8.24	V
		10.5V≤V_I≤V_{MAX}, I_O=1mA~70mA	7.76		8.24	V (note 2)
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~100mA		15	80	mV
		Tj=25°C, I_O=1mA~70mA		8.0	40	mV
Line regulation	ΔVo	10.5V≤V_I≤23V,Tj=25°C		10	175	mV
		11V≤V_I≤23V,Tj=25°C		8	125	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	11V≤V_I≤23V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	11V≤V_I≤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	V_O	Tj=25°C	8.64	9.0	9.36	V
		11.5V≤V_I≤24V,I_O=1mA~40mA	8.55		9.45	V
		11.5V≤V_I≤V_{MAX},I_O=1mA~70mA	8.55		9.45	V (note 2)
Output Voltage(note 3)	V_O	Tj=25°C	8.82	9.0	9.18	V
		11.5V≤V_I≤24V,I_O=1mA~40mA	8.73		9.27	V
		11.5V≤V_I≤V_{MAX},I_O=1mA~70mA	8.73		9.27	V (note 2)
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~100mA		20	90	mV
		Tj=25°C, I_O=1mA~40mA		10	45	mV
Line regulation	ΔVo	11.5V≤V_I≤24V,Tj=25°C		90	200	mV
		13V≤V_I≤24V,Tj=25°C		100	150	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	13V≤V_I≤24V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		49		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		0.75		mV/°C
Ripple Rejection	RR	12V≤V_I≤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	V_O	Tj=25°C	11.5	12	12.6	V
		14.5V≤V_I≤27V,I_O=1mA~40mA	11.4		12.6	V
		14.5V≤V_I≤V_{MAX},I_O=1mA~70mA	11.4		12.6	V (note 2)
Output Voltage(note 3)	V_O	Tj=25°C	11.76	12.0	12.24	V
		14.5V≤V_I≤27V,I_O=1mA~40mA	11.64		12.36	V
		14.5V≤V_I≤V_{MAX},I_O=1mA~70mA	11.64		12.36	V (note 2)
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~100mA		25	150	mV
		Tj=25°C, I_O=1mA~40mA		12	75	mV
Line regulation	ΔVo	14.5V≤V_I≤27V,Tj=25°C		25	300	mV
		16V≤V_I≤27V,Tj=25°C		20	250	mV
Quiescent Current	Iq			2.0	5.5	mA
Quiescent Current Change	ΔIq	16V≤V_I≤27V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		80		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.0		mV/°C
Ripple Rejection	RR	15V≤V_I≤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	V_O	Tj=25°C	14.4	15	15.6	V
		17.5V≤V_I≤30V,I_O=1mA~40mA	14.25		15.75	V
		17.5V≤V_I≤V_{MAX},I_O=1mA~70mA	14.25		15.75	V (note 2)
Output Voltage(note 3)	V_O	Tj=25°C	14.7	15.0	15.3	V
		17.5V≤V_I≤30V,I_O=1mA~40mA	14.55		15.45	V
		17.5V≤V_I≤V_{MAX},I_O=1mA~70mA	14.55		15.45	V (note 2)
Load Regulation	ΔVo	Tj=25°C,I_O=1mA~100mA		20	150	mV
		Tj=25°C,I_O=1mA~70mA		25	150	mV
Line regulation	ΔVo	17.5V≤V_I≤30V,Tj=25°C		25	150	mV
		20V≤V_I≤30V,Tj=25°C		15	75	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	20V≤V_I≤30V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		90		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.3		mV/°C
Ripple Rejection	RR	18.5V≤V_I≤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	V_O	Tj=25°C	17.3	18	18.7	V
		21V≤V_I≤33V,I_O=1mA~40mA	17.1		18.9	V
		21V≤V_I≤V_{MAX},I_O=1mA~70mA	17.1		18.9	V (note 2)
Output Voltage(note 3)	V_O	Tj=25°C	17.64	18.0	18.36	V
		21V≤V_I≤33V,I_O=1mA~40mA	17.46		18.54	V
		21V≤V_I≤V_{MAX},I_O=1mA~70mA	17.46		18.54	V (note 2)
Load Regulation	ΔVo	Tj=25°C, I_O=1mA~100mA		30	170	mV
		Tj=25°C, I_O=1mA~40mA		15	85	mV
Line regulation	ΔVo	21V≤V_I≤33V,Tj=25°C		145	300	mV
		22V≤V_I≤33V,Tj=25°C		135	250	mV
Quiescent Current	Iq			2.2	6.0	mA
Quiescent Current Change	ΔIq	21V≤V_I≤33V			1.5	mA
	ΔIq	1mA≤V_I≤40mA			0.1	mA
Output Noise Voltage	V_N	10Hz≤f≤100kHz		150		μV
Temperature coefficient of Vo	ΔVo/ΔT	Io=5mA		1.8		mV/°C
Ripple Rejection	RR	23V≤V_I≤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)

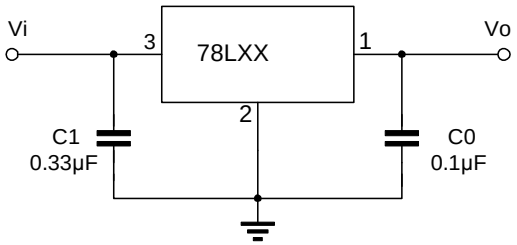
Characteristic	Symbol	Test conditions	MIN	TYP	MAX	UNIT
Output Voltage	Vo	Tj=25°C	23	24	25	V
		27V≤VI≤38V,IO=1mA~40mA	22.8		25.2	V
		27V≤VI≤VMAX,IO=1mA~70mA	22.8		25.2	V (note 2)
Output Voltage(note 3)	Vo	Tj=25°C	23.5	24	24.5	V
		27V≤VI≤38V,IO=1mA~40mA	23.25		24.75	V
		27V≤VI≤VMAX,IO=1mA~70mA	23.25		24.75	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 respresent 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,substitue 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.

Fig .1 78L05/12 Output Voltage vs Ambient Temperature

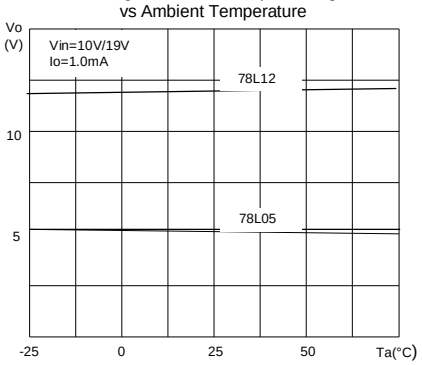


Fig 2 78L05/12 Quiescent Current vs Output Current

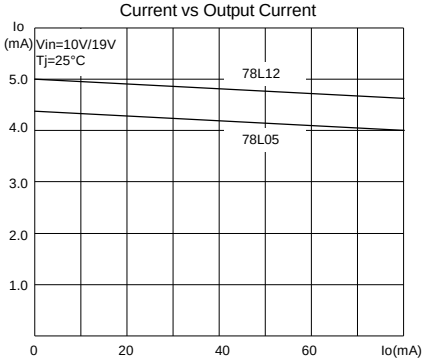


Fig.3 78L05 Quiescent Current vs Input

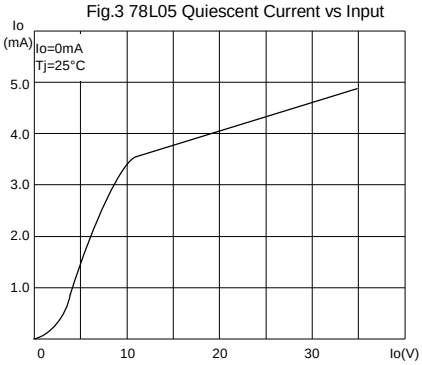


Fig.4 78L05/12/24 Thermal Shutdown

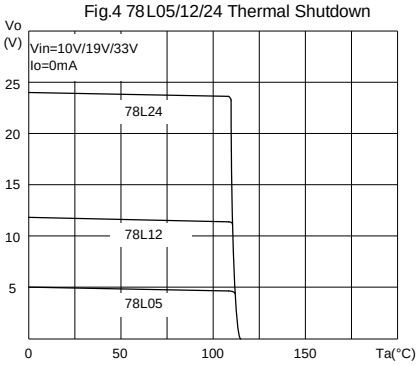


Fig.5 78 L05/12/24 Output Characteristics

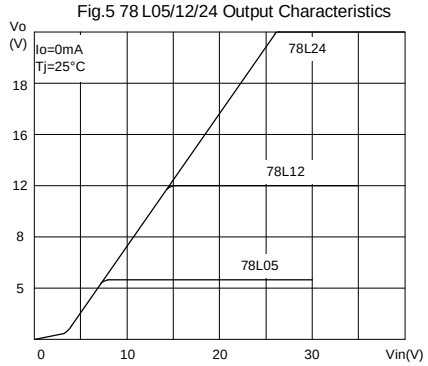
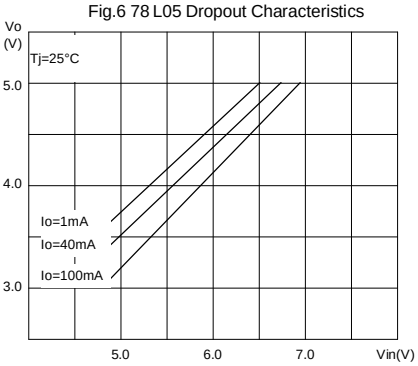
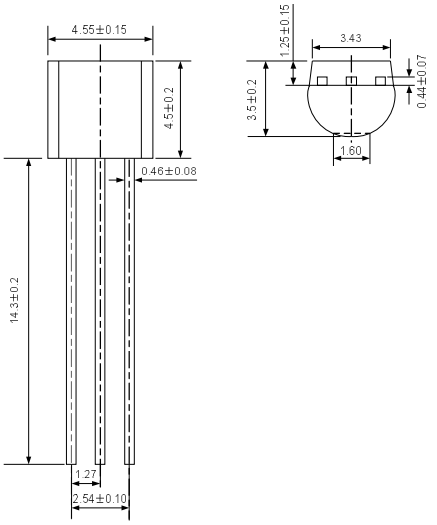


Fig.6 78 L05 Dropout Characteristics

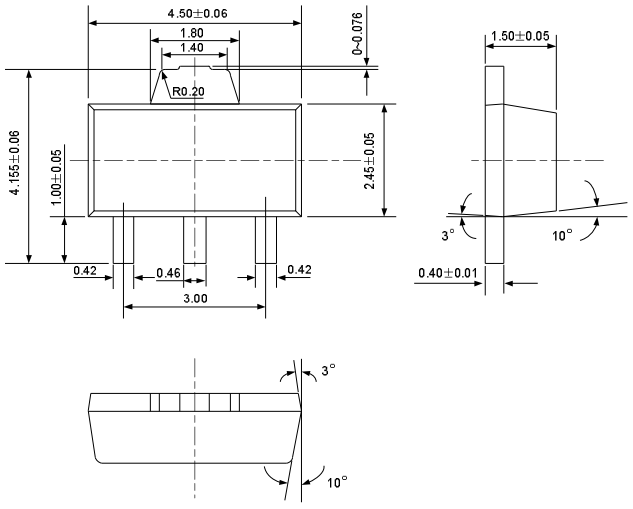


PACKAGE OTLINE

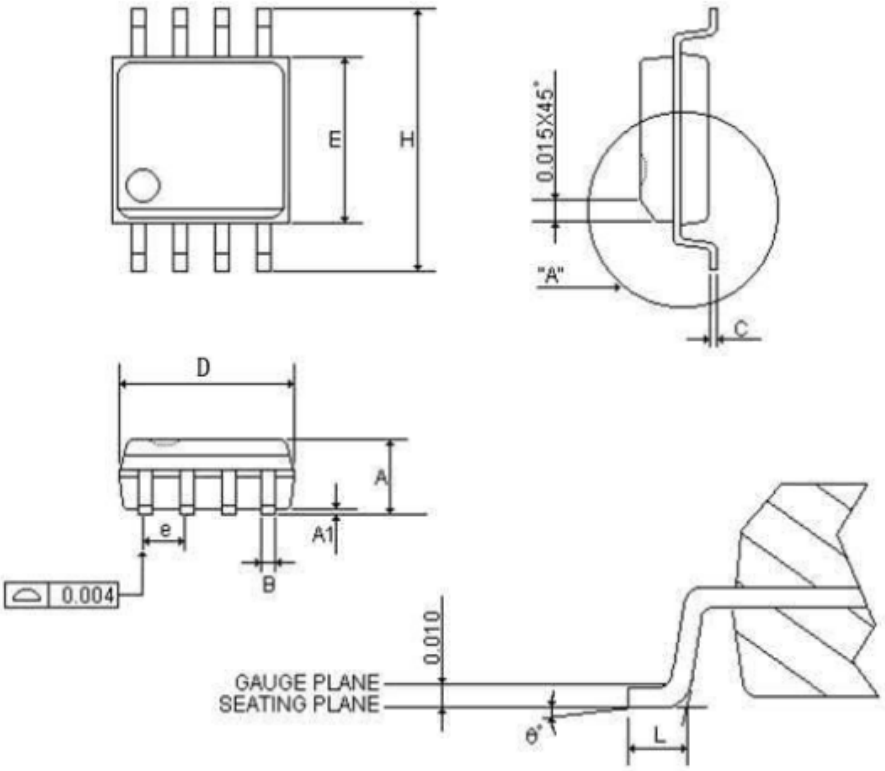
TO-92 UNIT：mm



SOT-89 UNIT：mm

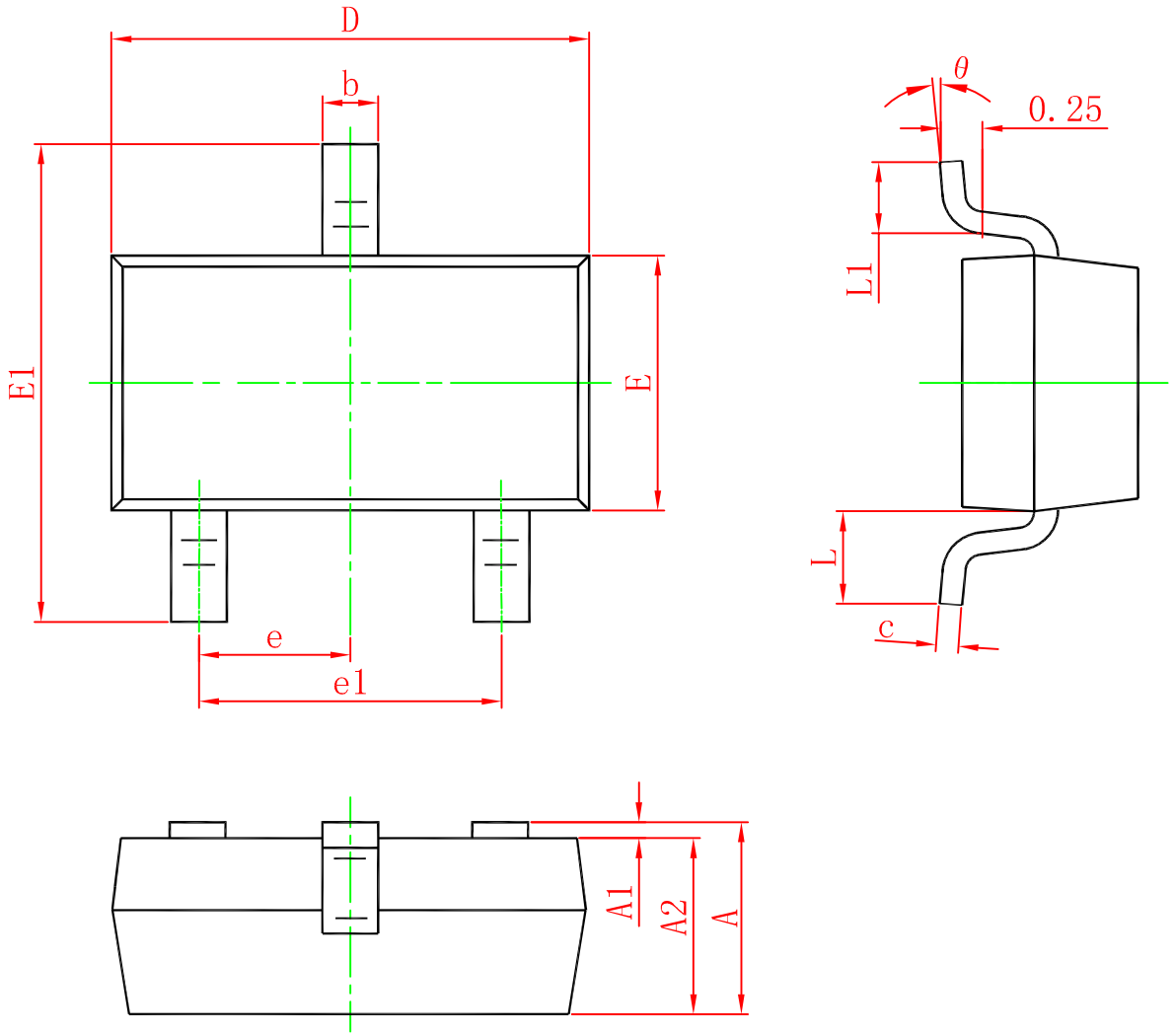


SOP 8



SYMBOLS	MIN	NOR	MAX	MIN	NOR	MAX
	(inch)			(mm)		
A	0.058	0.064	0.068	1.4732	1.6256	1.7272
A1	0.004	-	0.010	0.1016	-	0.254
B	0.013	0.016	0.020	0.3302	0.4064	0.508
C	0.0075	0.008	0.0098	0.1905	0.2032	0.2490
D	0.186	0.191	0.196	5.9944	6.1214	6.1976
E	0.150	0.154	0.157	3.81	3.9116	3.9878
e	-	0.050	-	-	1.27	-
H	0.228	0.236	0.244	5.7912	5.9944	6.1976
L	0.015	0.025	0.050	0.381	0.635	1.27
0^o	0^o	-	8^o	0^o	-	8^o

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°