

300mA Low Dropout CMOS Voltage Regulator

General Description

The LN1231 series are highly precise, low power consumption, positive voltage regulators manufactured using CMOS and laser trimming technologies. The series provides large currents with a significantly small dropout voltage. The LN1231 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error amplifier. Output voltage is selectable in 0.1V steps between 1.3V ~ 6.0V. SOT-23 and SOT-89 packages are available.

Applications

- Power supply for DVD and CD-ROM drives
- Power supply for battery-powered devices
- Power supply for personal communication devices
- Power supply for note PCs

Ordering Information

LN1231 P ③④⑤⑥


Features

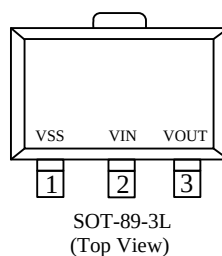
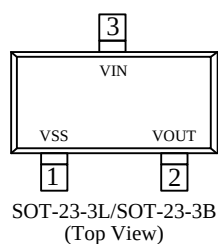
- Output voltage: 1.2V to 6.0V (selectable in 100mV steps)
- High-accuracy output voltage: $\pm 2.0\%$
- Low dropout voltage: 160mV @100mA (3.0 type)
- Low current consumption: 4.0 μ A (typ.)
- Maximum Output Current : 300mA ($V_{in} \geq V_{out} + 1V$)
- Internal protector: current limiter and short protector
- Maximum Operating voltage: 10V
- Small packages: SOT-89-3, SOT-23 and other required

Package

- SOT-23-3L
- SOT-23-3B
- SOT-89-3L

Designator	Symbol	Description	Designator	Symbol	Description
①	31	Product number	④	1/2	Output voltage accuracy: 1: $\pm 1\%$; 2: $\pm 2\%$
②	P	3 pin package	⑤	M	SOT-23-3L
				V	SOT-23-3B
				P	SOT-89-3L
③	12-60	Output voltage eg: 30 represents 3.0V 50 represents 5.0V	⑥	R	Embossed Tape : Standard Feed
				L	Embossed Tape : Reverse Feed

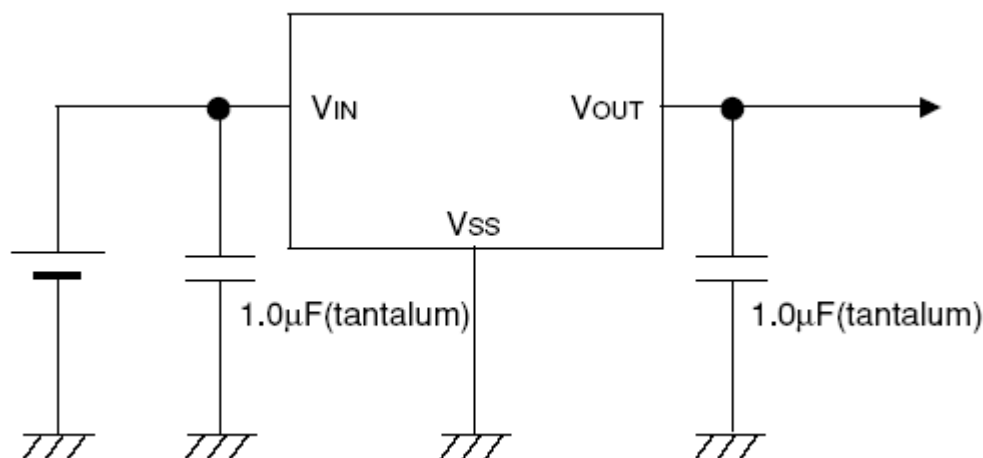
Pin Configuration



Pin Assignment

Pin Number		Pin Name	Function Description
SOT-23-3L/SOT-23-3B	SOT-89-3L		
2	3	Vout	Output pin
1	1	Vss	Ground
3	2	Vin	Input pin

Typical Application Circuit



Caution: The above connection diagram and constant will not guarantee successful operation. Perform thorough evaluation using the actual application to set the constant.

Application Conditions

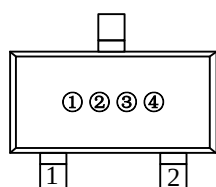
Input capacitor (CIN): 1.0μF or more

Output capacitor (CL): 0.1μF or more (tantalum capacitor)

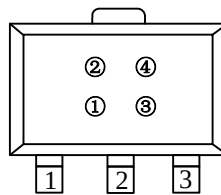
Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ Marking Rule

- SOT-23-3B, SOT-23-3L, SOT-89-3L



SOT-23-3B/SOT-23-3L
(Top View)



SOT-89-3L
(Top View)

- ① Represents the product name

Symbol	Product Name
1H	LN1231P◆◆◆◆

- ② Represents the range of output voltage

Voltage(V)	0.1~3.0	3.1~6.0	6.1~9.0
Symbol	5	6	7

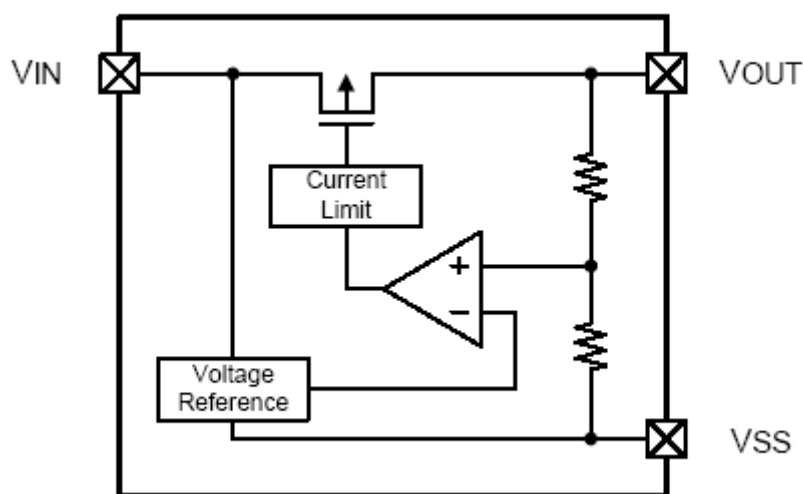
- ③ Represents the output Voltage

Symbol	Output Voltage (V)			Symbol	Output Voltage (V)		
0	-	3.1	-	F	1.6	4.6	-
1	-	3.2	-	H	1.7	4.7	-
2	-	3.3	-	K	1.8	4.8	-
3	-	3.4	-	L	1.9	4.9	-
4	-	3.5	-	M	2	5.0	-
5	-	3.6	-	N	2.1	5.1	-
6	-	3.7	-	P	2.2	5.2	-
7	-	3.8	-	R	2.3	5.3	-
8	-	3.9	-	S	2.4	5.4	-
9	-	4	-	T	2.5	5.5	-
A	-	4.1	-	U	2.6	5.6	-
B	1.2	4.2	-	V	2.7	5.7	-
C	1.3	4.3	-	X	2.8	5.8	-
D	1.4	4.4	-	Y	2.9	5.9	-
E	1.5	4.5	-	Z	3	6.0	-

- ④ Represents the assembly lot no.

0~9, A~Z repeated (G, I, J, O, Q, W excepted)

Function Block Diagram

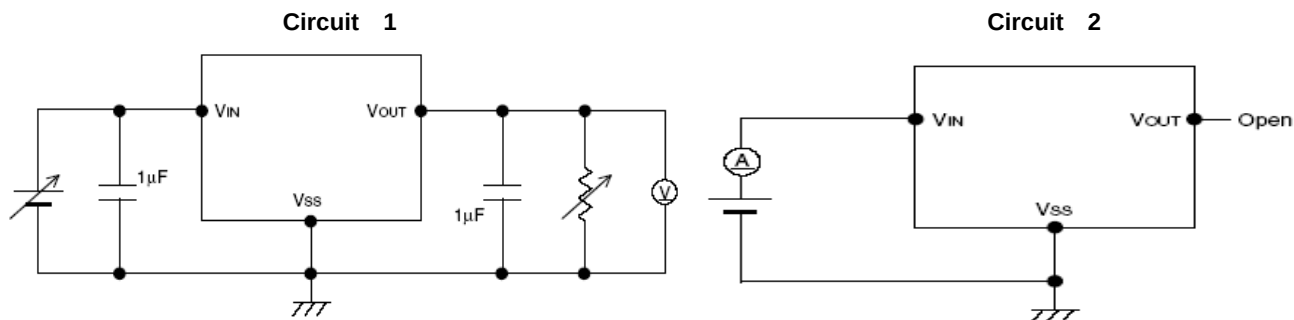


Absolute Maximum Ratings

Item	Symbol	Absolute Maximum Rating		Unit
Input voltage	V _{IN}	V _{SS} -0.3~V _{SS} +10		V
Output voltage	V _{OUT}	V _{SS} -0.3~V _{IN} +0.3		
Power dissipation	P _D	SOT-89-3	500	mW
		SOT-23-3	250	
Operating ambient temperature	Topr	-40~+85		°C
Storage temperature	Tstg	-40~+125		

Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

Test Circuits

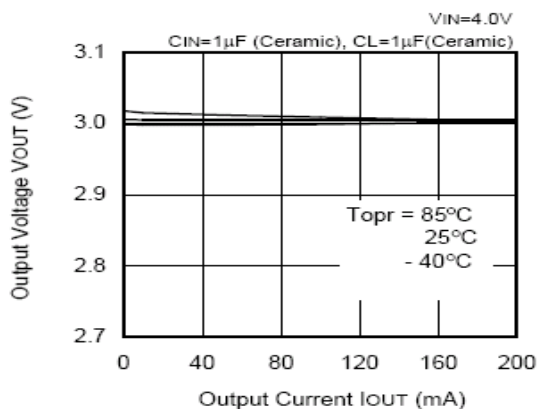


■ Electrical Characteristics

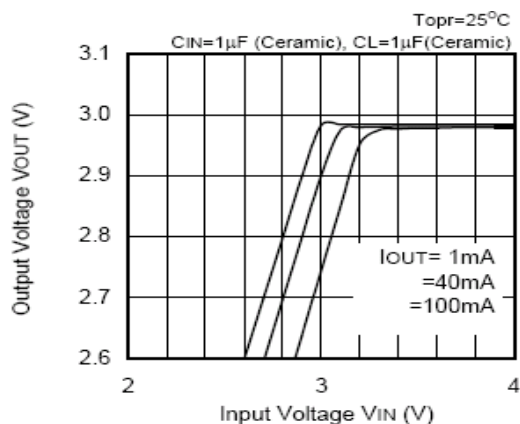
Item	Symbol	Condition	Min	Typ	Max	Unit	Test circuit
Output voltage	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$, $I_{OUT} = 40 \text{ mA}$	$V_{OUT(S)} \times 0.98$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.02$	V	1
Output current	I_{OUT}	$V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$	300	—	—	mA	1
Dropout voltage	V_{drop}	$I_{OUT} = 100 \text{ mA}$	$2.2 \text{ V} \leq V_{OUT(S)} \leq 2.5 \text{ V}$	—	0.20	0.28	V
			$2.6 \text{ V} \leq V_{OUT(S)} \leq 3.3 \text{ V}$	—	0.16	0.24	
			$3.4 \text{ V} \leq V_{OUT(S)} \leq 5.5 \text{ V}$	—	0.12	0.20	
Line regulation	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)} + 0.5 \text{ V} \leq V_{IN} \leq 9 \text{ V}$ $I_{OUT} = 80 \text{ mA}$	—	0.05	0.3	%/V	1
Load regulation	ΔV_{OUT2}	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ $1.0 \text{ mA} \leq I_{OUT} \leq 80 \text{ mA}$	—	20	40	mV	
temperature coefficient	$\frac{\Delta V_{OUT}}{\Delta T_a \bullet V_{OUT}}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$, $I_{OUT} = 10 \text{ mA}$ $-40^\circ\text{C} \leq T_a \leq 85^\circ\text{C}$	—	± 100	—	ppm/ $^\circ\text{C}$	
Current consumption during operation	I_{SS1}	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$,	—	4	8	μA	2
Input voltage	V_{IN}	—	1.8	—	9.0	V	—
Ripple rejection	PSRR	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$, $f = 1.0 \text{ kHz}$ $V_{rip} = 0.5 \text{ V}_{rms}$, $I_{OUT} = 80 \text{ mA}$	—	50	—	dB	1
Short-circuit current	I_{short}	$V_{IN} = V_{OUT(S)} + 1.5 \text{ V}$	—	60	—	mA	1
Current Limiter	I_{LIM}	$V_{IN} = V_{OUT(S)} + 1.5 \text{ V}$	—	380	—	mA	1

Typical Performance Characteristics (3.0V output)

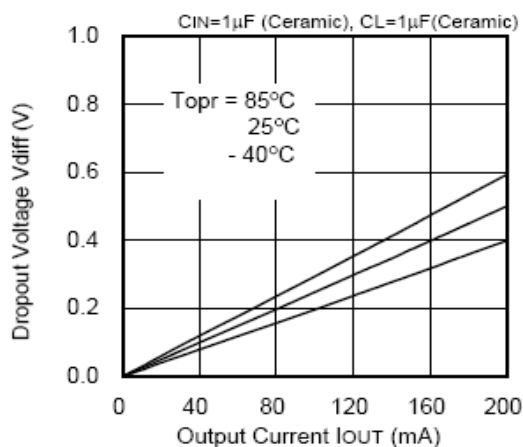
1、Output voltage vs. output current



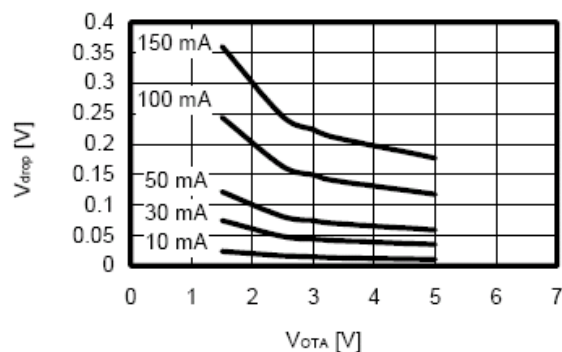
2、Output voltage vs. input voltage



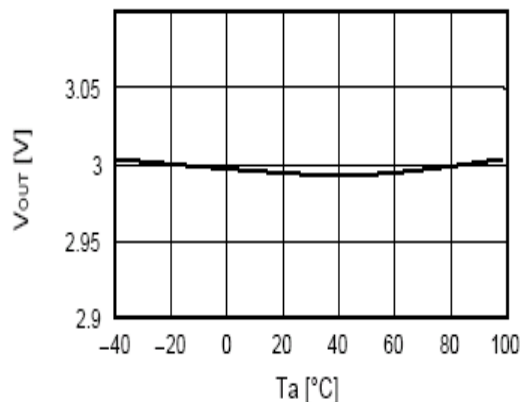
3、Dropout voltage vs. output current



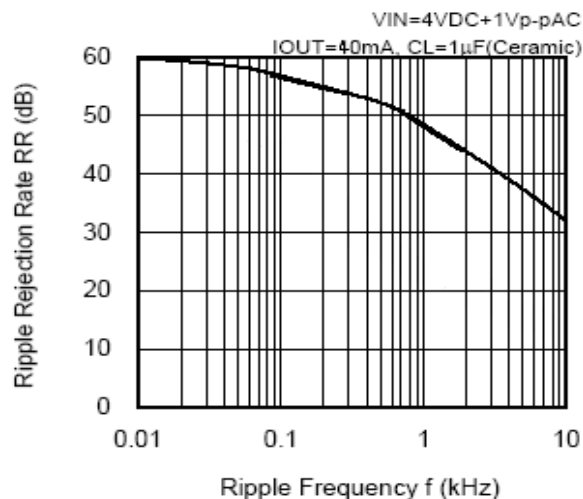
4、Dropout voltage vs. output voltage



5、Output voltage vs. ambient temperature

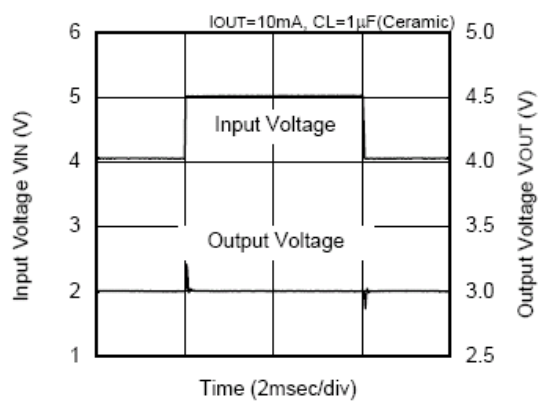


6、Ripple rejection rate

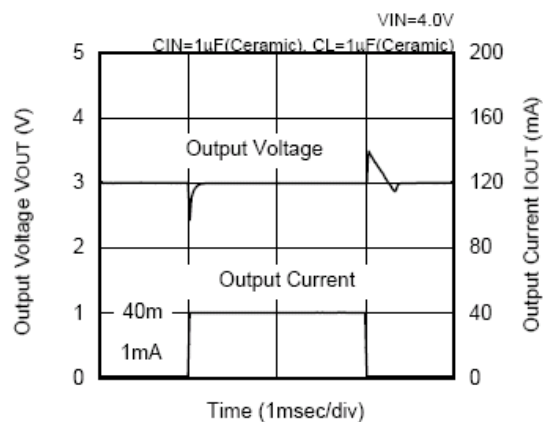


7、Transient response

Input Transient Response

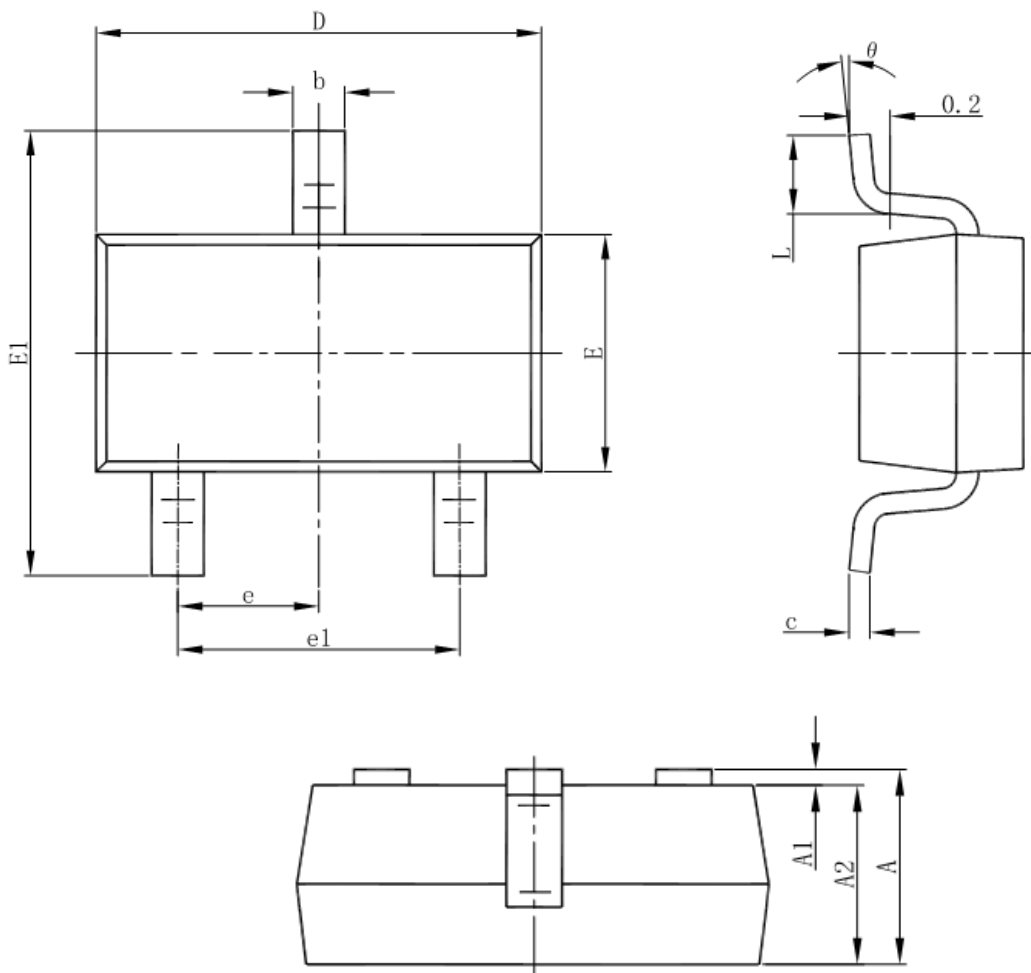


Load transient response



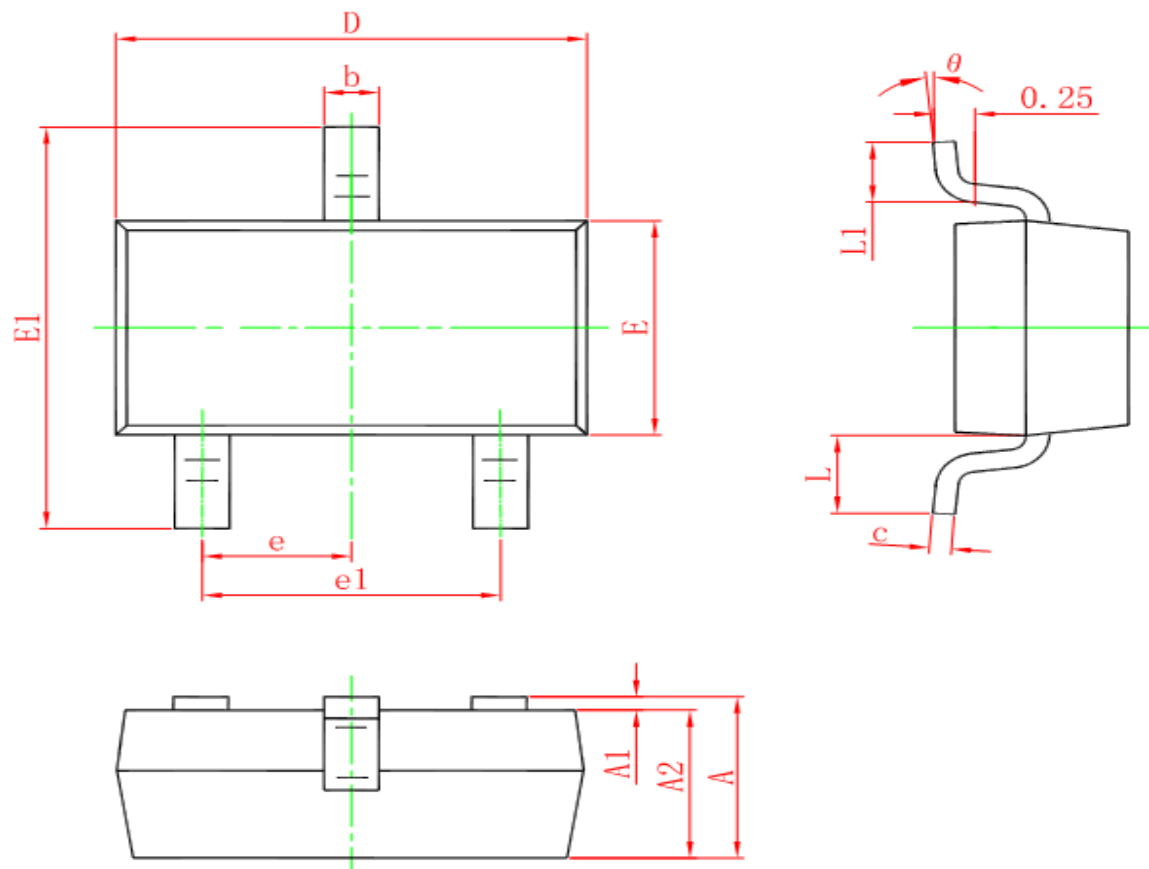
Package Information

SOT-23-3L



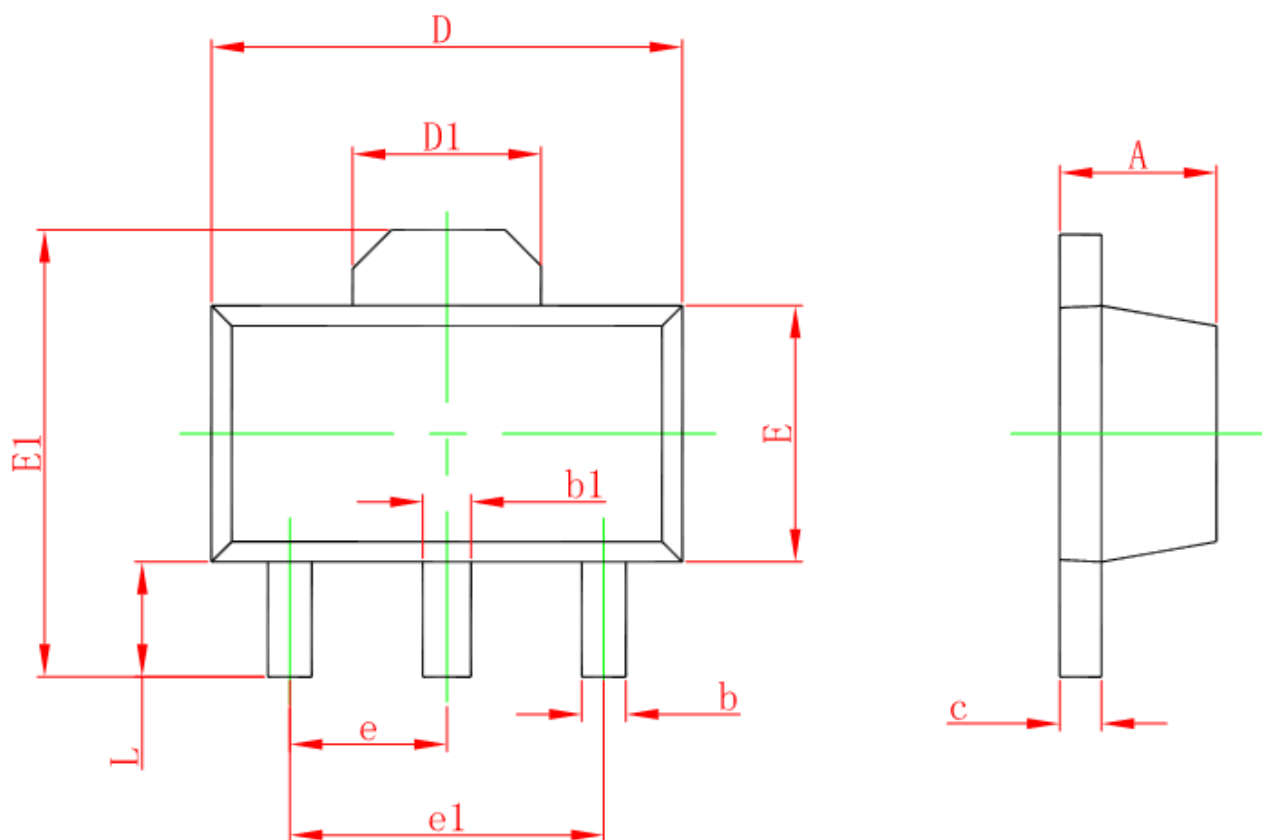
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

● SOT-23-3B



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°

● SOT-89-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.020
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF.		0.061 REF.	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP.		0.060 TYP.	
e1	3.000 TYP.		0.118 TYP.	
L	0.900	1.200	0.035	0.047