Low Power Low Dropout Middle Current Voltage Regulators

■ General Description

The LN6206 series are precise, low power consumption, high voltage; positive voltage regulators manufactured using CMOS and laser trimming technologies. The series provides large currents with a significantly small dropout voltage. The LN6206 consists of a current limiter circuit, a driver transistor, a precision reference voltage and an error correction circuit. The series is compatible with low ESR ceramic capacitors. The current limiter's feedback circuit also operates as a short protect for the output current limiter and the output pin. Output voltage can be set internally by laser trimming technologies. It is selectable in 100mV increments within a range of 1.2V to 5.0V. SOT-89-3, SOT-23-3 and SOT23-3B packages are available.

■ Features

- Output voltage range: 1.2V to 5.0V (selectable in 100mV steps)
- Highly optional accurate: ± 1% or ± 2%
- Dropout voltage: 160mV @ 50mA (3.0V type)
- Low power consumption: 8μA (TYP.)
- Maximum output current: 250mA (Vin≥Vout+1V)
- Internal protector current limiter and short protector
- Small packages : SOT-89-3,SOT-23-3, SOT23-3B and other required

■ Package

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

■ Applications

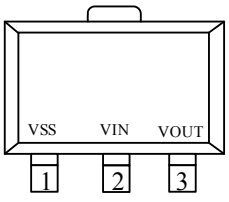
- Battery powered equipment
- Reference voltage sources
- Cameras, video cameras
- Mobile phones
- Communication tools

■ Ordering Information

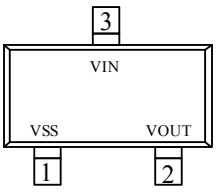
LN6206P ①②③④⑤

Designator	Symbol	Description	Designator	Symbol	Description
① ②	Integer	Output Voltage: e.g. ①=3，②=0 ⇨ 3.0V	④	P	SOT-89-3
				V	SOT-23-3B
③	1	Accuracy: within±1%	⑤	R	Embossed Tape: standard Feed
	2	Accuracy: within±2%			
④		Package		L	Embossed Tape: reverse Feed
	M	SOT-23-3			

■ Pin Configuration



SOT-89-3L
(TOP VIEW)

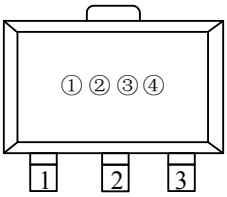


SOT-23-3L/SOT-23-3B
(TOP VIEW)

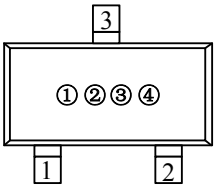
Pin number		Pin Name	Function
SOT-23-3L/B	SOT-89-3L		
3	2	VIN	Power Supply
1	1	VSS	Ground
2	3	VOUT	Output Pin

■ Marking Rule

- SOT-89 -3 and SOT-23L/B



SOT-89-3L
(Top View)



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

① **Represents product series**

Symbol	Product Series
6	LN6206P◆◆◆◆◆

② **Represents the type of regulator**

Voltage(V)	0.1～3.0	3.1～6.0	6.1～9.0
± 2%	5	6	7
± 1%	A	B	C

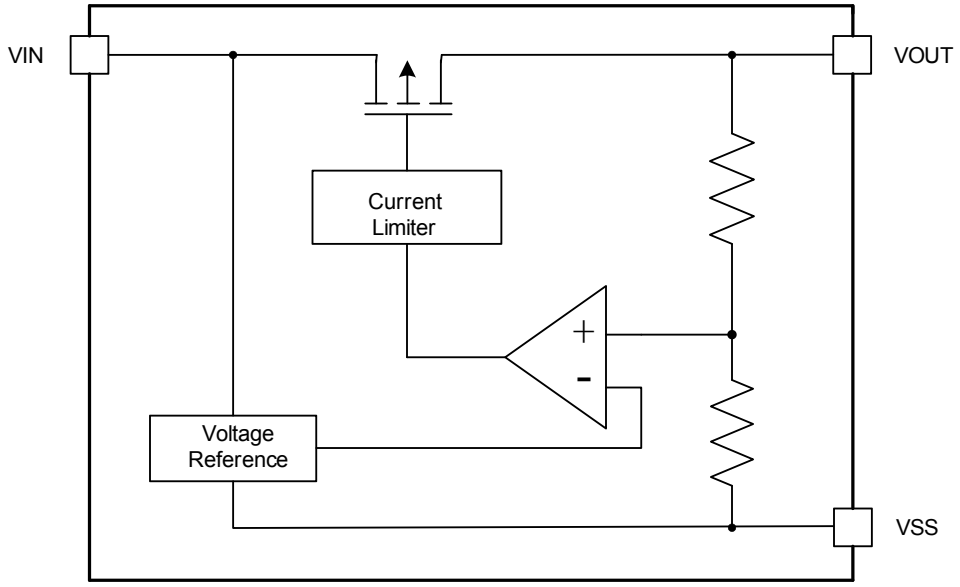
③ **Represents the Output Voltage**

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



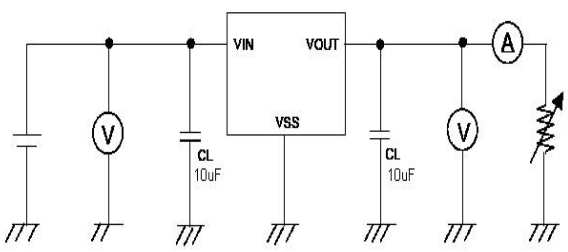
■ Absolute Maximum Ratings

Parameter	Symbol	Maximum Rating		Unit
Input Voltage	V_{IN}	V_{SS}-0.3～V_{SS}+6		V
Output Current	V_{OUT}	V_{SS}-0.3～V_{IN}+0.3		
Power Dissipation	P_D	SOT-23-3L	250	mW
		SOT23-3B	150	
		SOT-89-3	500	
Operating Ambient Temperature	Topr	-40～+85		°C
Storage Temperature	Tstg	-40～+125		

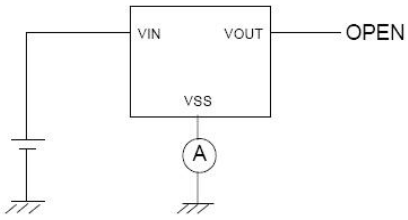
Caution: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

■ Test Circuits

Circuit ①

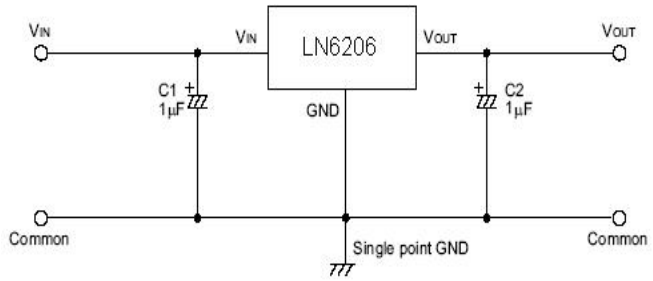


Circuit ②

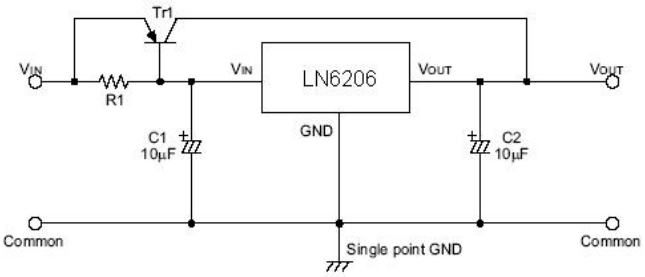


■ Typical Application Circuit

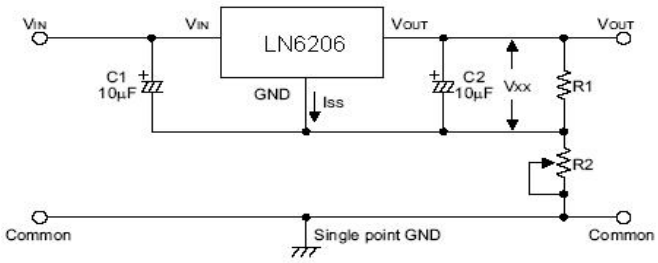
1、Basic circuit



2、High output current positive voltage regulator

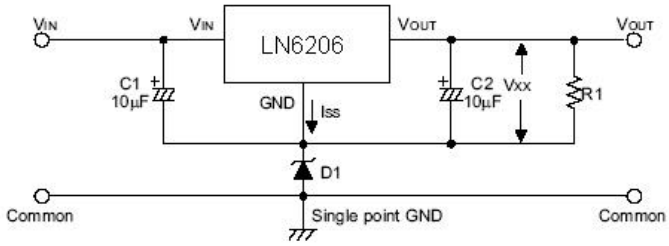


3、Circuit for increasing output voltage



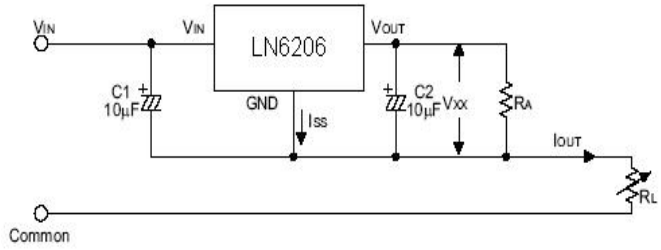
$$V_{OUT} = V_{XX} \left(1 + \frac{R2}{R1}\right) + I_{SS} R2$$

4、Circuit for increasing output voltage



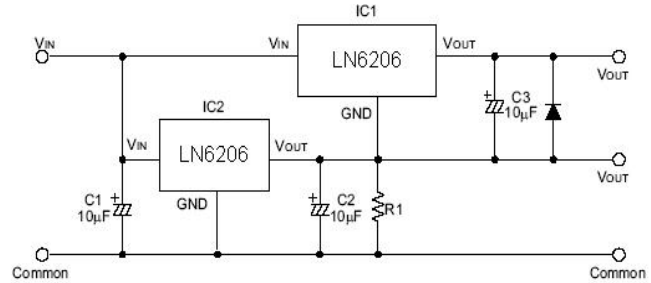
$$V_{OUT} = V_{XX} + V_{D1}$$

5、Constant current regulator



$$I_{OUT} = \frac{V_{XX}}{R_A} + I_{SS}$$

6、Dual supply



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):0.1 μF or more (tantalum capacitor)

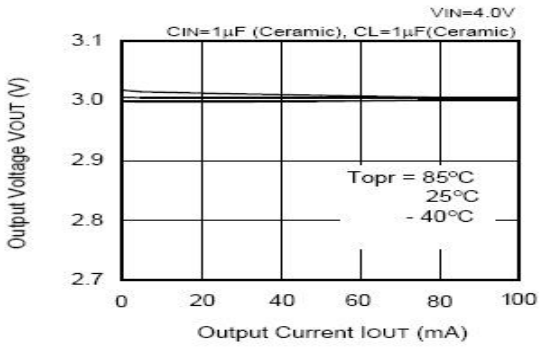
Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ Electrical Characteristics

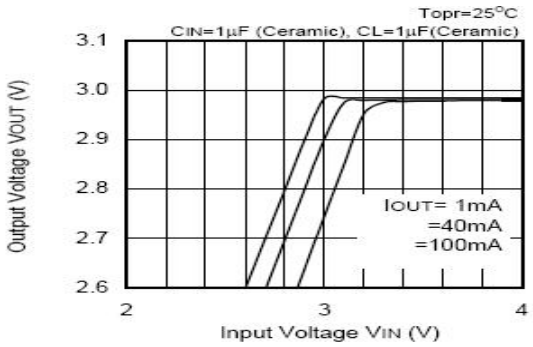
Item	Symbol	Condition		Min	Typ	Max	Unit	Circuit
Output Voltage	$V_{OUT(E)1}$	V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=1 mA, ± 2%		$V_{OUT(S)}$ ×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.02	V	1
		V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=1 mA, ± 1%		$V_{OUT(S)}$ ×0.99	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.01	V	
Output Current	I_{OUT}	V_{IN}≥$V_{OUT(S)}$+1.0 V		100 *5	—	—	mA	1
Dropout Voltage	V_{drop}	I_{OUT}=50 mA	1.5 V ≤$V_{OUT(S)}$≤2.5 V	—	0.20	0.28	V	1
			2.6 V ≤$V_{OUT(S)}$≤3.3 V	—	0.16	0.24		
			3.4 V ≤$V_{OUT(S)}$≤5.0 V	—	0.12	0.20		
Line Regulations	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}$+0.5 V ≤V_{IN}≤5.5 V I_{OUT}=1 mA		—	0.05	0.2	%/V	
Input Voltage	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+1.0 V 1.0 mA ≤I_{OUT} ≤50 mA		—	20	40	mV	
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta Ta \bullet V_{OUT}}$	V_{IN}=$V_{OUT(S)}$+1.0 V, I_{OUT}=10 mA -40°C ≤ Ta ≤85°C		—	±100	—	ppm/℃	
Supply Current	I_{SS1}	V_{IN}=$V_{OUT(S)}$+1.0 V		—	2	—	μA	2
Input Voltage	V_{IN}	——		1.8	—	6	V	—
Ripple-Rejection	|RR|	V_{IN}=$V_{OUT(S)}$+1.0 V，f=1.0 kHz Vrip=0.5 Vrms, I_{OUT}=10 mA		—	40	—	dB	1
Short current	I_{short}	V_{IN}=$V_{OUT(S)}$+1.5 V,		—	30	—	mA	1
Current Limiter	I_{lim}	V_{IN}=$V_{OUT(S)}$+1.5 V,		—	380	—	mA	1

■ Typical Performance Characteristics（3.0V output）

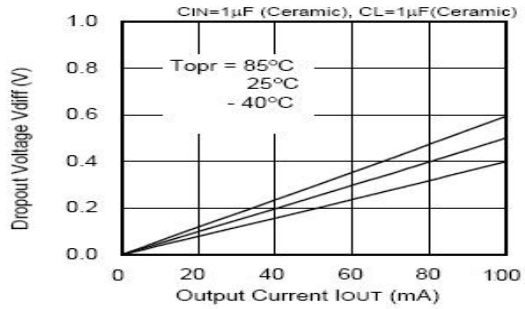
1. Output Voltage vs. Output Current



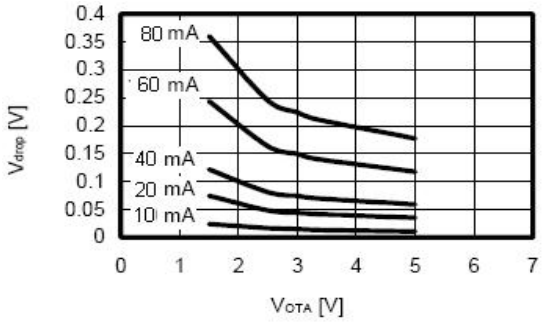
2. Output Voltage vs. Input Voltage



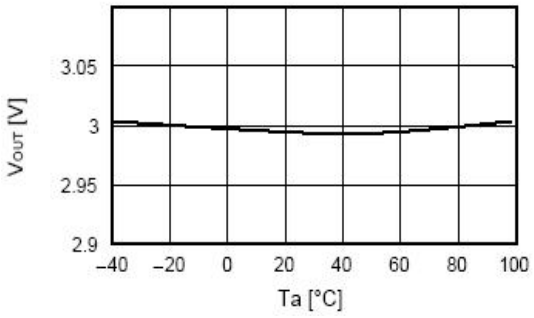
3. Dropout Voltage vs. Output Current



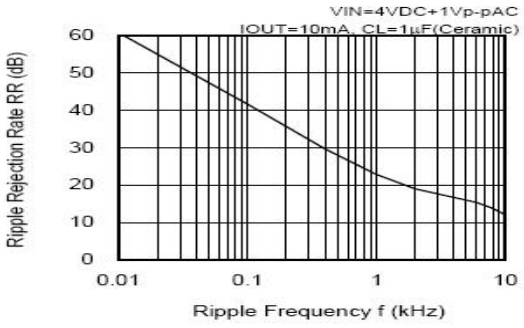
4、Dropout Voltage vs. Output Voltage



5. Output Voltage vs. Ambient Temperature



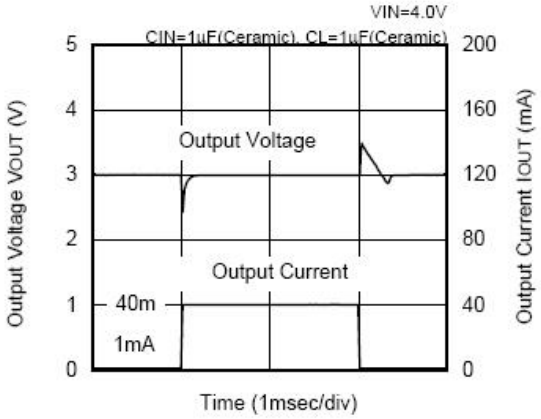
6. Ripple Rejection Rate

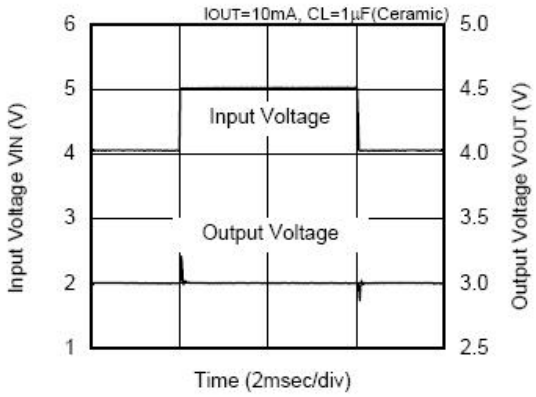


7. Transient Response

Input Transient Response

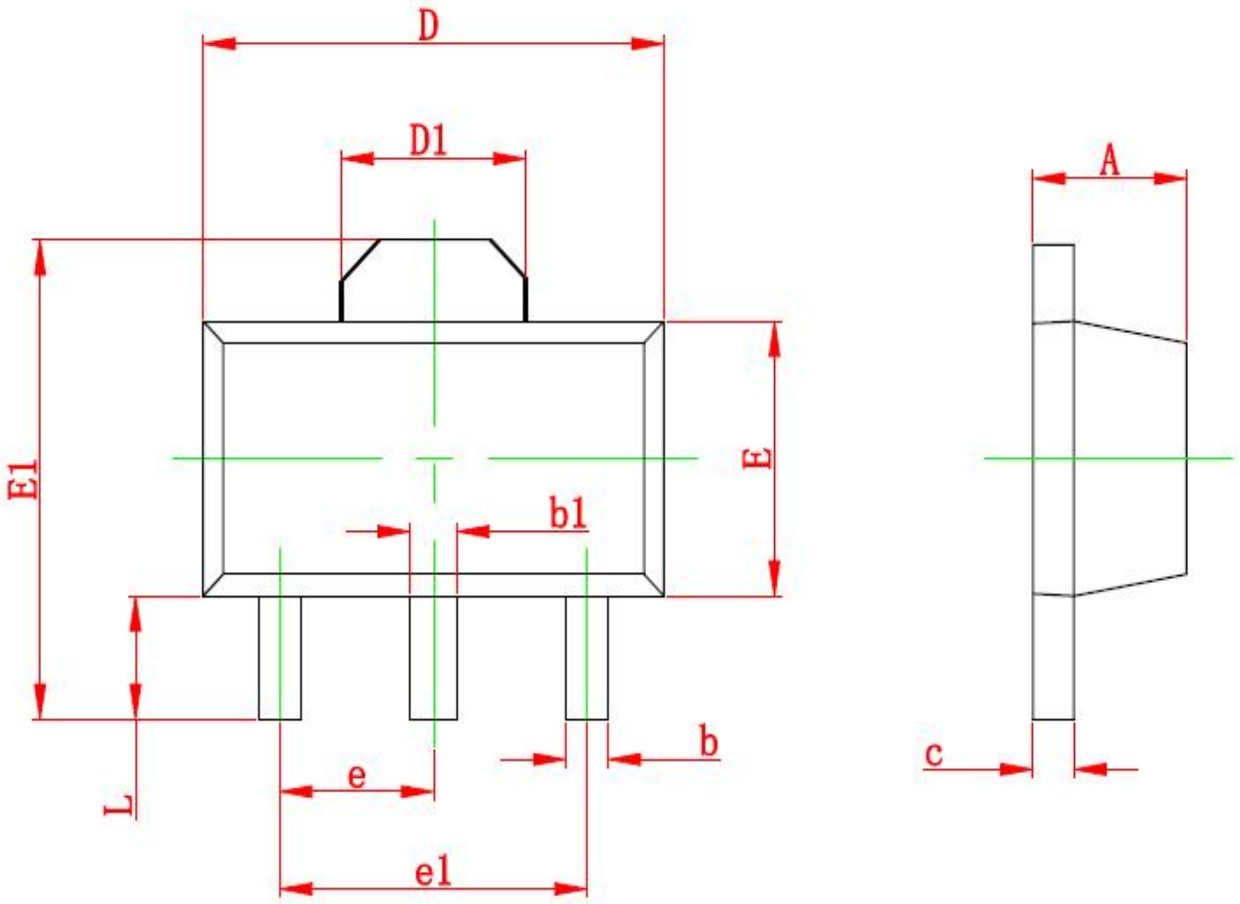
Load Transient Response


VIN=4.0V
CIN=1uF(Ceramic), CL=1uF(Ceramic)
Output Voltage
Output Current
40m
1mA
Output Voltage VOUT (V)
Output Current IOUT (mA)
Time (1msec/div)
0
1
2
3
4
5
0
40
80
120
160
200


IOUT=10mA, CL=1μF(Ceramic)
Input Voltage
Output Voltage
Input Voltage VIN (V)
Output Voltage VOUT (V)
Time (2msec/div)
1
2
3
4
5
6
2.5
3.0
3.5
4.0
4.5
5.0

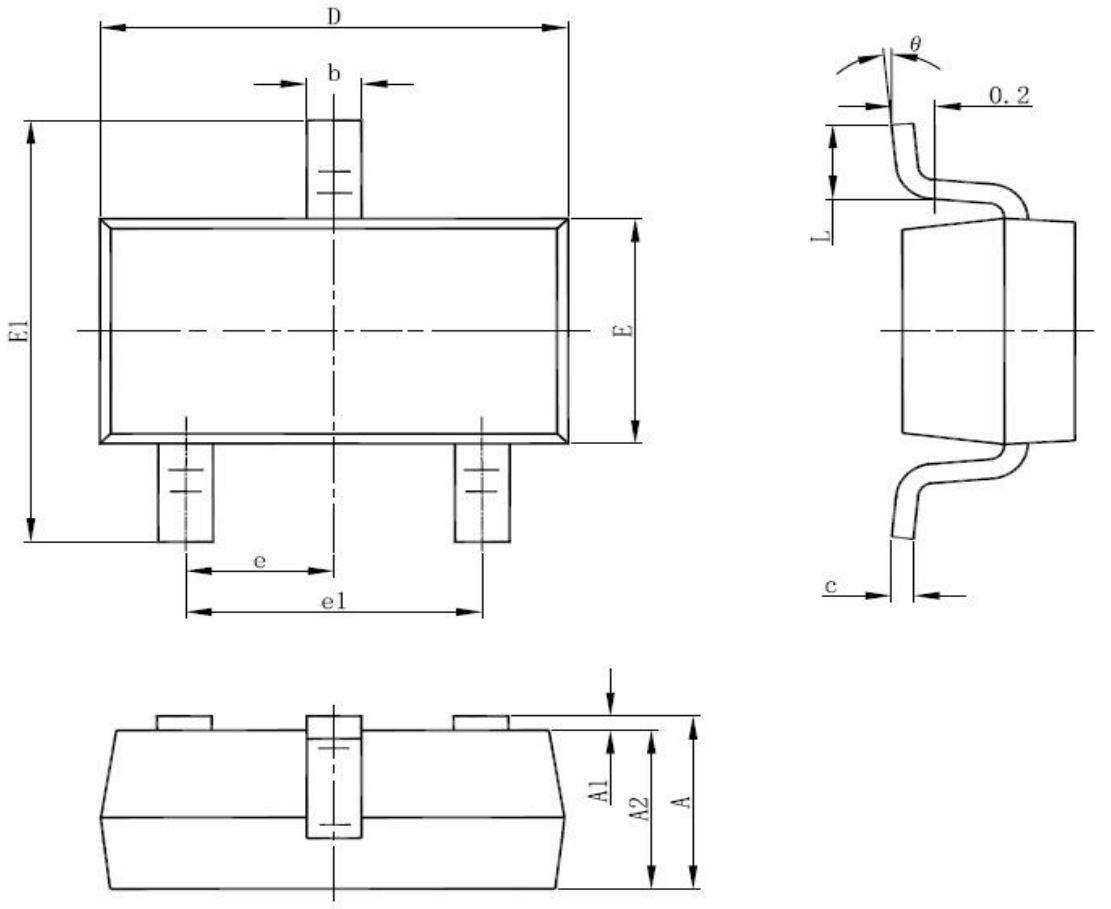
■ Packaging Information

- **SOT-89-3**



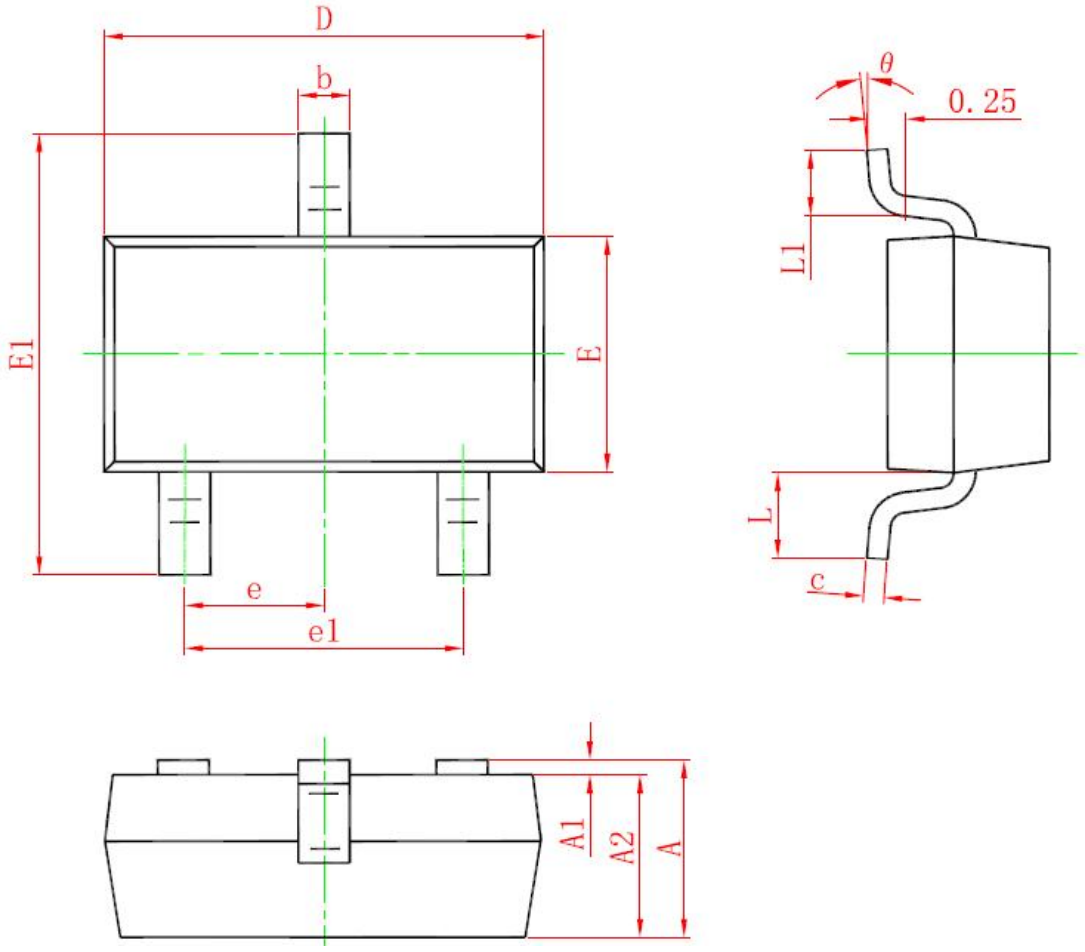
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060TYP	
e1	3.000 TYP		0.118TYP	
L	0.900	1.200	0.035	0.047

- **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°