500mA Low Dropout CMOS Voltage Regulators

■ General Description

The LN6214 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 LN6214 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 between1.5V~6.0V.

■ Features

- Output Voltage Range:1.5V to 6.0V (selectable in 100mV steps)
- Highly Accurate: ± 2%
- Dropout Voltage : 500mV @ 500mA (3.3V type)
- Low Power Consumption: 8.0μA (TYP.)
- Maximum Output Current : 500mA (Vin≥Vout+1V)
- Internal protector: current limiter and short protector
- Maximum Operating voltage: 7.0V
- Small packages: SOT-89-3,SOT-26

■ Applications

- DVD,CD-ROM,HDD drive equipment
- Wireless Communication equipment (Mobile & Cordless phone, etc.)
- Network equipment (Wireless LAN etc.)
- Desktop computers, Note book computer, PDAs
- Portable AV equipment
- Reference voltage
- Battery powered equipment

■ Package

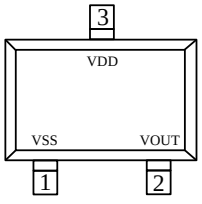
- SOT-89-3L
- SOT-23-6L
- SOT23-3L

■ Ordering Information

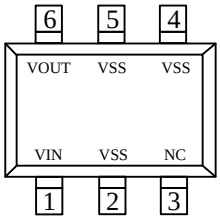
LN6214P ①②③④⑤

Designator	Symbol	Description	Designator	Symbol	Description
①②	31	Output Voltage e.g. 30: 3.0V 50: 5.0V	④	M	SOT23-3L
				P	SOT-89
				N	SOT23-6L
③	1/2	Output Voltage Accuracy e.g.1: ±1% 2: ±2%	⑤	R	Embossed tape, standard feed
				L	Embossed tape, reverse feed

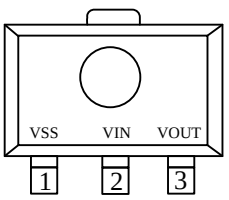
■ Pin Configuration



SOT-23-3L
(Top View)



SOT-23-6L
(Top View)

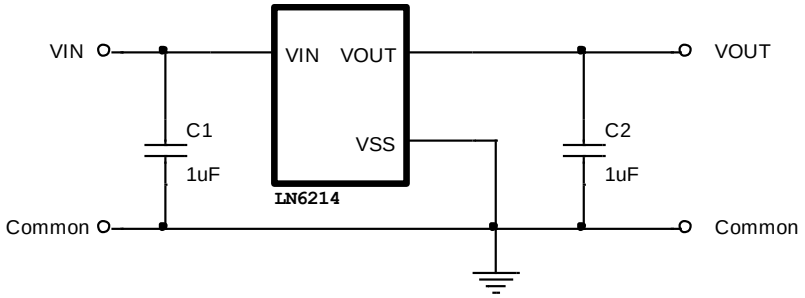


SOT-89-3L
(Top View)

■ Pin Assignment

Pin Number		Pin Name	Function
SOT26	SOT89-3		
6	3	Vout	OUTPUT
2，4，5	1	Vss	GROUND
1	2	Vin	POWER INPUT
3	-	NC	No Connection

■ 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.

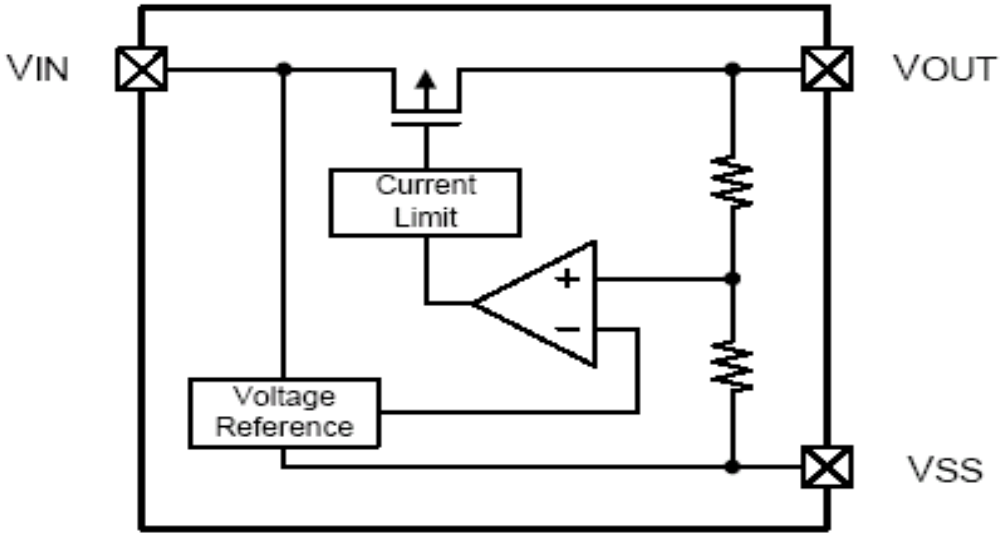
■ Application Conditions

Input capacitor (CIN): 1.0μF or more

Output capacitor (CL): 1.0μF or more (tantalum capacitor)

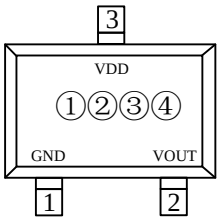
Caution A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

■ Function Block Diagram

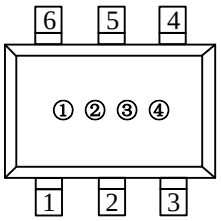


■ Marking Rule

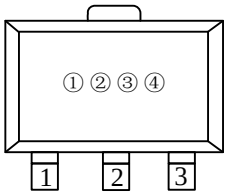
- SOT-89-3L , SOT-23-6L,SOT23-3L



SOT-23-3L
(Top View)



SOT-23-6L
(Top View)



SOT-89-3L
(Top View)

① Represents the product name

Symbol	Product Name
N	LN6214P◆◆2◆◆

② Represents the range of output voltage

Voltage(V)	0.1～3.0	3.1～6.0
Symbol	5	6

③ Represents the Output Voltage

Symbol	Output Voltage（V）	
0	-	3.1
1	-	3.2
2	-	3.3
3	-	3.4
4	-	3.5
5	-	3.6
6	-	3.7
7	-	3.8
8	-	3.9
9	-	4.0
A	-	4.1
B	-	4.2
C	-	4.3
D	-	4.4
E	1.5	4.5

Symbol	Output Voltage（V）	
F	1.6	4.6
H	1.7	4.7
K	1.8	4.8
L	1.9	4.9
M	2.0	5.0
N	2.1	5.1
P	2.2	5.2
R	2.3	5.3
S	2.4	5.4
T	2.5	5.5
U	2.6	5.6
V	2.7	5.7
X	2.8	5.8
Y	2.9	5.9
Z	3.0	6.0

④ Represents the assembly lot no.

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

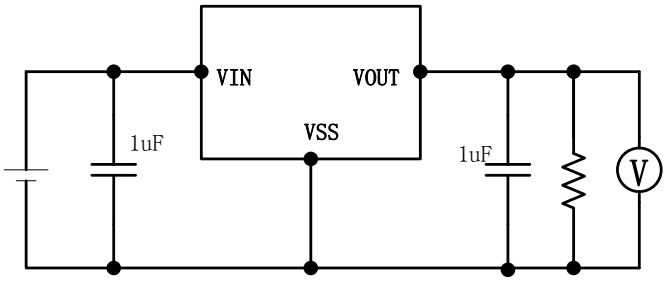
■ Absolute Maximum Ratings

Parameter	Symbol	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		
Output Current	I_{OUT}	800*		mA
Power Dissipation	P_D	SOT-26	500	mW
		SOT-89-3	500	
Operating Ambient Temperature	Topr	-40～+85		°C
Storage Temperature	Tstg	-55～+125		

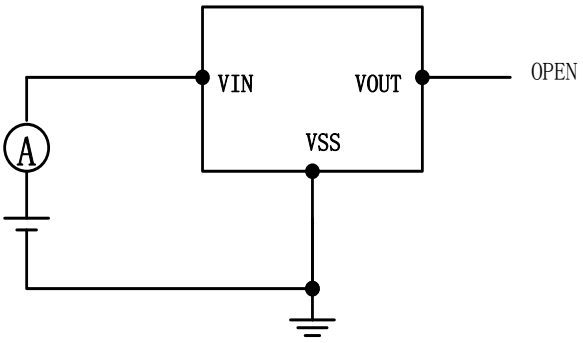
* $I_{OUT} \geqq Pd/(V_{IN}-V_{OUT})$

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



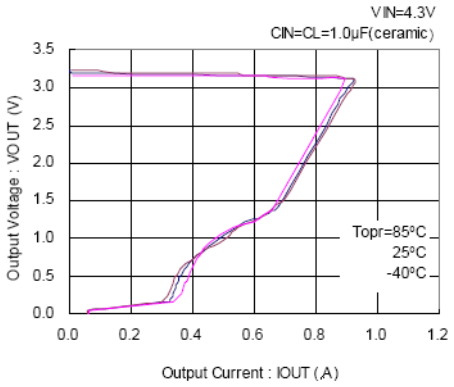
Circuit 2

■ Electrical Characteristics

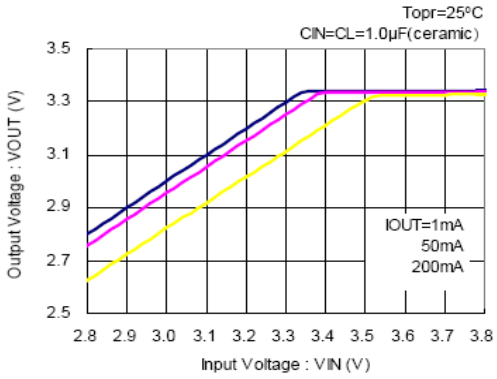
Item	Symbol	Condition		Min	Typ	Max	Unit	Circuit
Output Voltage	$V_{OUT(E)}$	V_{IN} =$V_{OUT(S)}$+1.0 V, I_{OUT}=50 mA		$V_{OUT(S)}$ ×0.98	$V_{OUT(S)}$	$V_{OUT(S)}$ ×1.02	V	1
Output Current	I_{OUT}	V_{IN}≥$V_{OUT(S)}$+1.0 V		500	—	—	mA	1
Dropout Voltage	V_{drop}	I_{OUT}=500 mA	2.2 V ≤$V_{OUT(S)}$≤2.5 V	—	0.65	1.05	V	1
			2.6 V ≤$V_{OUT(S)}$≤3.3 V	—	0.55	0.82		
			3.4 V ≤$V_{OUT(S)}$≤5.5 V	—	0.48	0.76		
Line Regulations	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \bullet V_{OUT}}$	$V_{OUT(S)}$+0.5 V ≤V_{IN}≤7 V I_{OUT}=80 mA		—	0.05	0.3	%/V	
Input Voltage	ΔV_{OUT2}	V_{IN}=$V_{OUT(S)}$+1.0 V 1.0 mA ≤I_{OUT} ≤200 mA		—	20	50	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		—	8	15	μA	2
Input Voltage	V_{IN}	——		1.8	—	7	V	—
Ripple-Rejection	|RR|	V_{IN}=$V_{OUT(S)}$+1.0 V，f=1.0 kHz Vrip=0.5 Vrms, I_{OUT}=80 mA		—	50	—	dB	1
Short current	I_{short}	V_{IN}=$V_{OUT(S)}$+1.5 V,		—	50	—	mA	1
Current Limiter	I_{lim}	V_{IN}=$V_{OUT(S)}$+1.5 V,		—	800	—	mA	1

■ Typical Performance Characteristics （3.3V output）

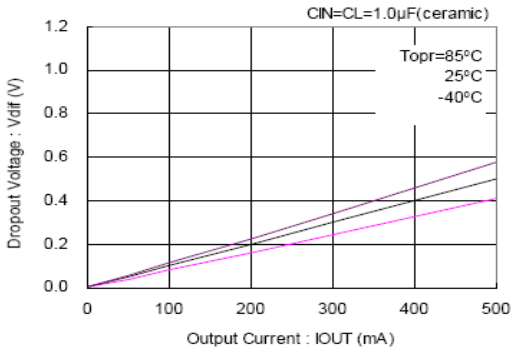
1、Output Voltage vs. Output Current



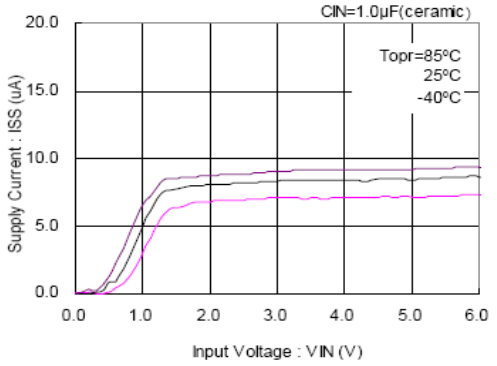
2、Output Voltage vs. Input Voltage (Contd.)



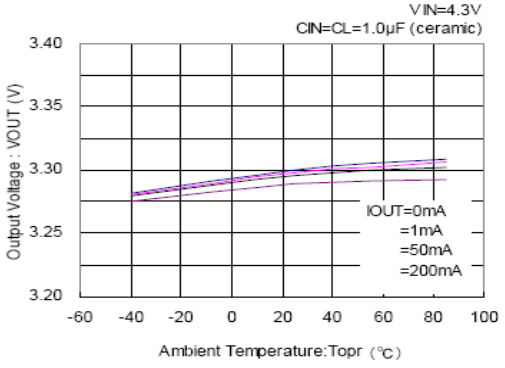
3、Dropout Voltage vs. Output Current



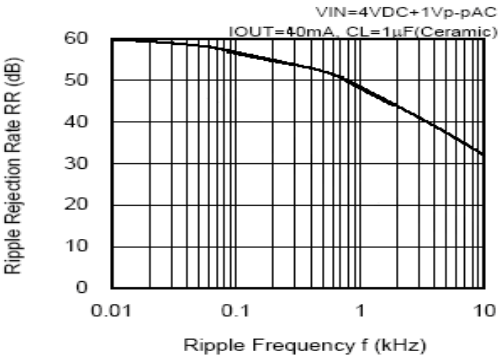
4. Supply Current vs. Supply Voltage



5、Output Voltage vs. Ambient Temperature

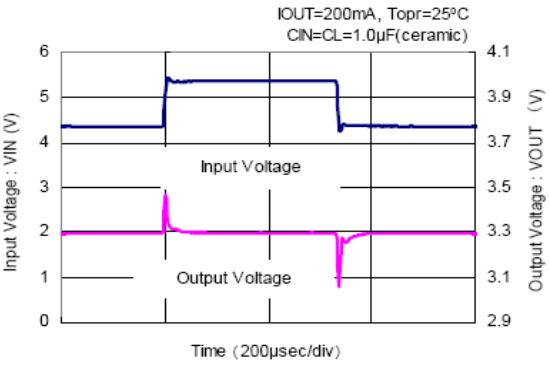


6、Ripple Rejection Rate

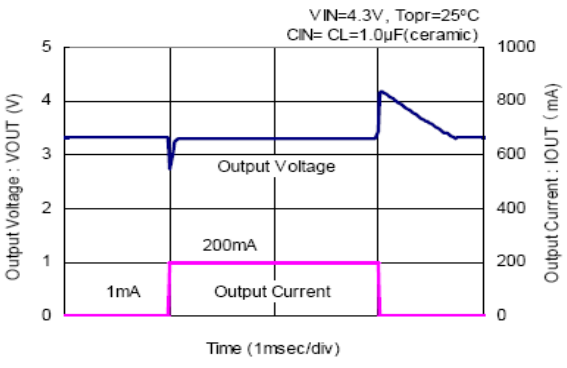


7、Transient Response

Input Transient Response

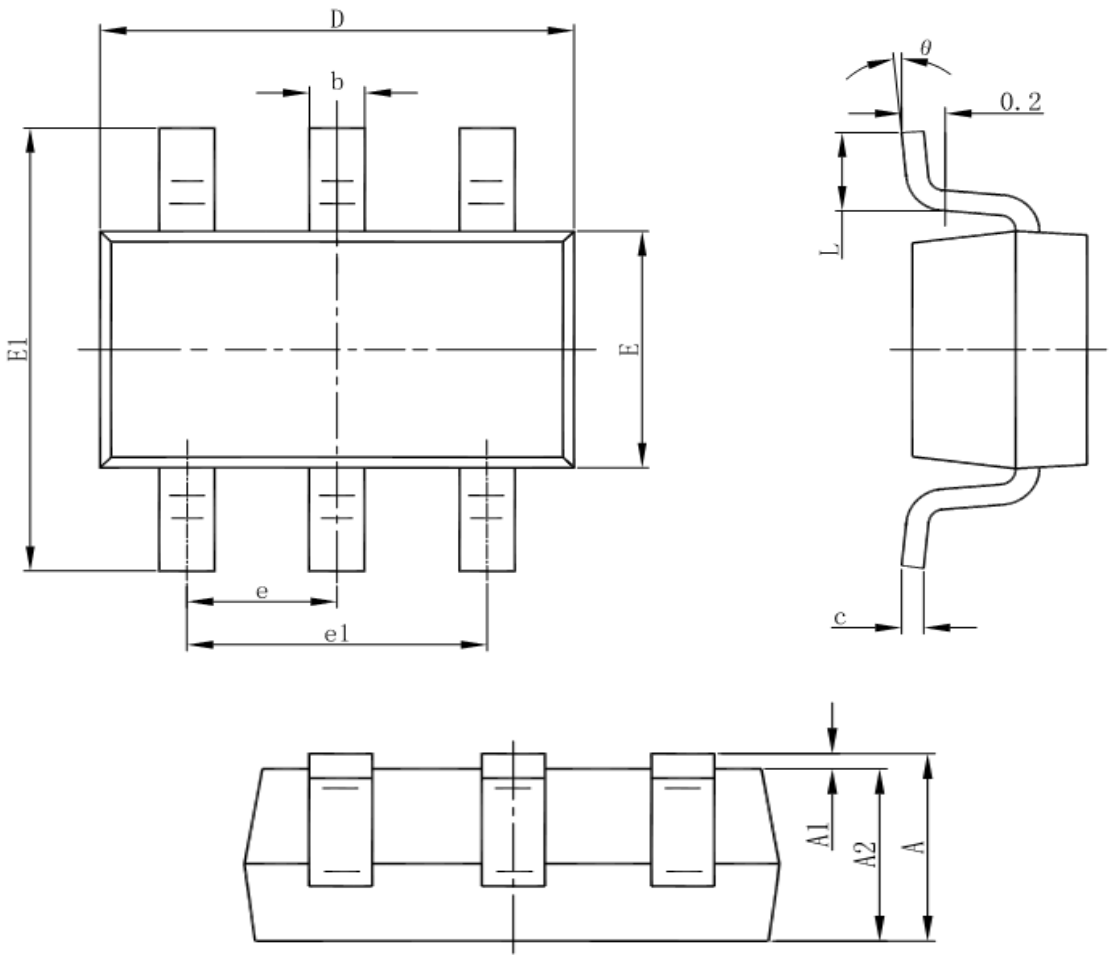


Load Transient Response



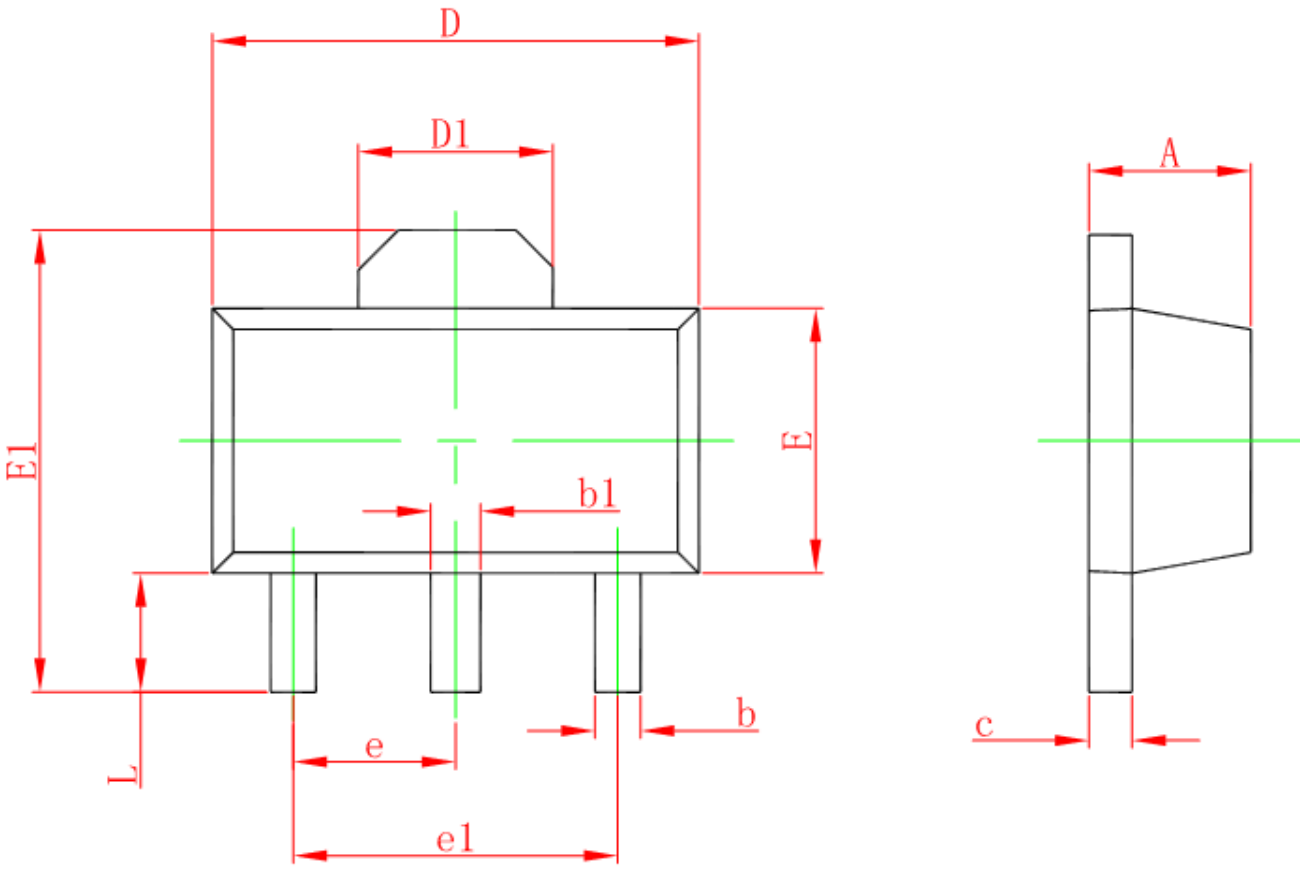
■ Package Information

- **SOT-23-6L**



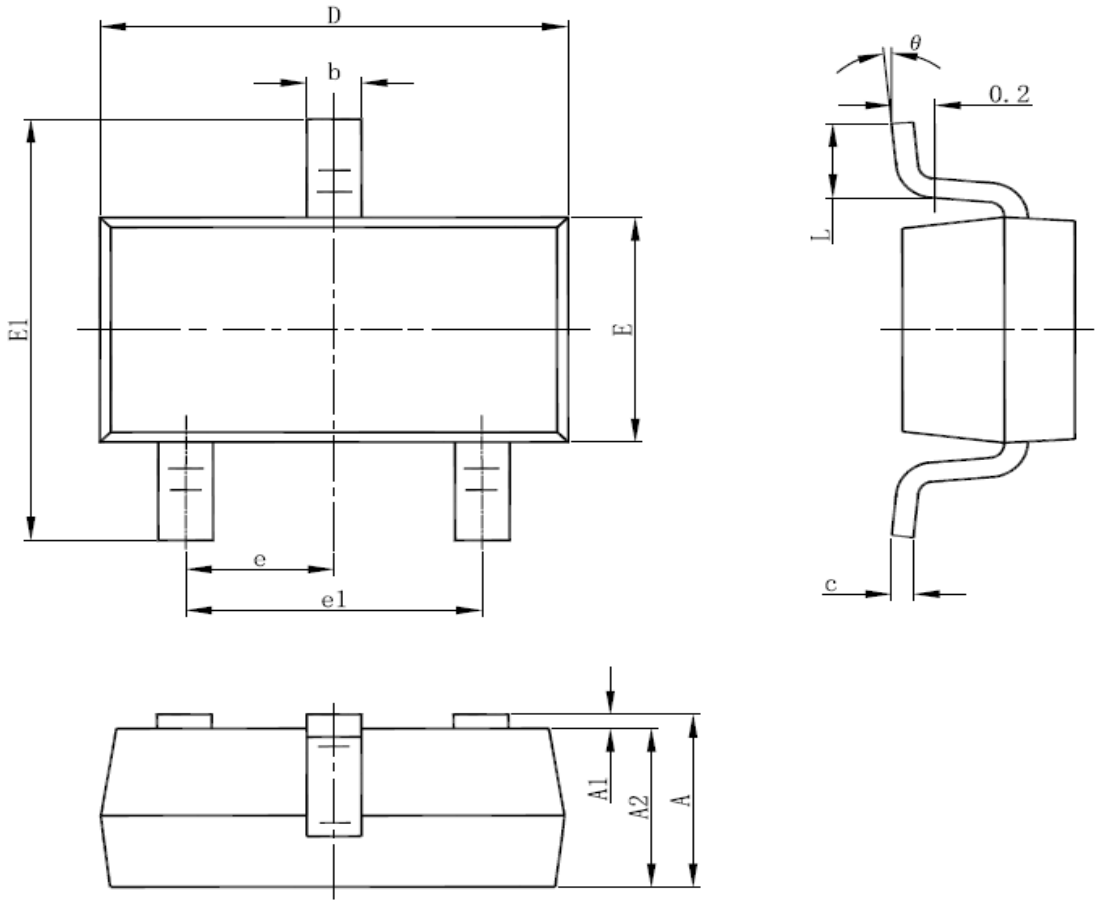
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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

- **SOT-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

- **SOT23-3L**



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°