

Low Voltage Adjustable Precision Shunt Regulator

TL432

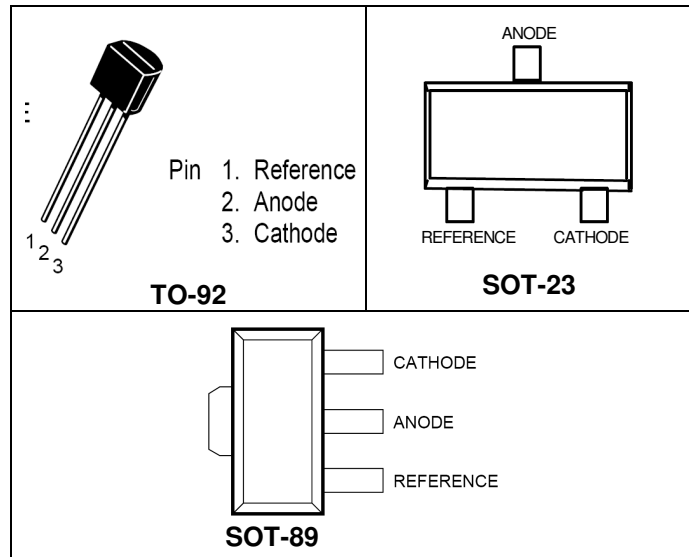
Features

- Precise Reference Voltage to 1.24V
- Guaranteed 2%, 1% , 0.5% Reference Voltage Tolerance
- Sink Current Capability, 80 μ A to 100mA
- Quick Turn-on
- Adjustable Output Voltage, $V_o = V_{REF}$ to 15V
- 0.2 Ω Typical Output Impedance
- TO-92, SOT-23, SOT-89 packages.

Applications

- Linear Regulator
- Adjustable Supplies
- Switching Power Supplies
- Battery Charger
- Instrumentation
- Computer Disk Drives

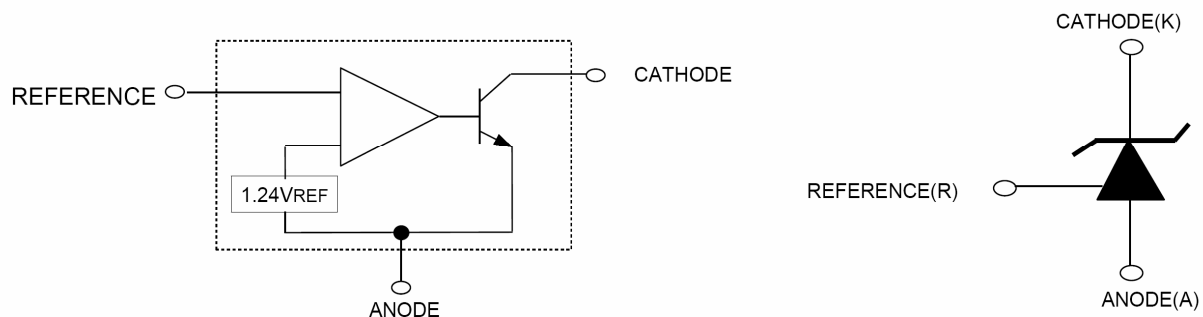
PIN CONNECTIONS



Ordering Information

Product Number	Reference Input Voltage	Package
TL432CLF	0.5%	TO-92
TL432CLS		SOT-23
TL432CS		SOT-89
TL432CP	1%	SOT-89
TL432ALF		TO-92
TL432ALS		SOT-23
TL432AS	2%	SOT-89
TL432AP		SOT-89
TL432LF	2%	TO-92
TL432LS		SOT-23
TL432S		SOT-89
TL432P		SOT-89

Block Diagram



Absolute Maximum Ratings

Symbol	Parameter	Symbol	Rating	Unit
V_{KA}	Cathode voltage	V_{KA}	18	V
I_K	Continuous cathode current range	I_K	100	mA
I_{REF}	Reference current range	I_{REF}	3	mA
T_j	Operating Junction Temperature Range	T_j	- 40 to 150	°C

Pad #	Description
1	REF
2	ANODE
3	CATHODE

Electrical Characteristics $T_a = 25^\circ\text{C}$ (unless otherwise noted)

Symbol	Parameter	Test Conditions	TL432			Unit
			Min	Typ	Max	
V_{REF}	Reference voltage	$V_{KA}=V_{REF}$, $I_K=10\text{mA}$ (Fig. 1) $T_A=25^\circ\text{C}$ TL432 (2%) TL432-A (1%) TL432-C (0.5%)	1.216 1.228 1.234	1.240 1.240 1.240	1.264 1.252 1.246	V
V_{DEV}	V_{REF} Temp Deviation	T_A =full range (see Note1) $V_{KA}=V_{REF}$, $I_K=10\text{mA}$ (Fig. 1)		10	25	mV
$\Delta V_{REF}/\Delta V_{KA}$	Ratio of Change in V_{REF} to Change in Cathode Voltage	$I_K=10\text{mA}$, $V_{KA}=15\text{V}$ to V_{REF} (Fig. 2)		-1	-2.7	mV / V
I_{REF}	Reference Input Current	$I_K=10\text{mA}$, $R_1 = 10\text{k}\Omega$ $R_2=\infty$ (Fig.2)		0.5	1.0	μA
$I_{REF(DEV)}$	I_{REF} Temp Deviation	T_K =full range (see Note 1), $R_1 = 10\text{k}\Omega$, $R_2=\infty$, $I_K=10\text{mA}$ (Fig. 2)		0.05	0.3	μA
$I_{k(off)}$	Off-state cathode current	$V_{REF}=0\text{V}$, (Fig.3) $V_k=15\text{V}$		0.04	0.5	μA
Z_{ka}	Dynamic Output Impedance	$V_{ka}=V_{ref}$, $I_k=1\text{mA}$ to 100mA $F \leq 1\text{kHz}$ (Fig. 1)		0.2	0.4	Ω
$I_{K(MIN)}$	Minimum Operating Current	$V_{KA}=V_{REF}$ (Fig. 1)		60	80	μA

Notes: 1. Full temperature range is -40°C to 105°C for TL432

TEST CIRCUITS

Fig. 1 Test Circuit for $V_{KA}=V_{REF}$

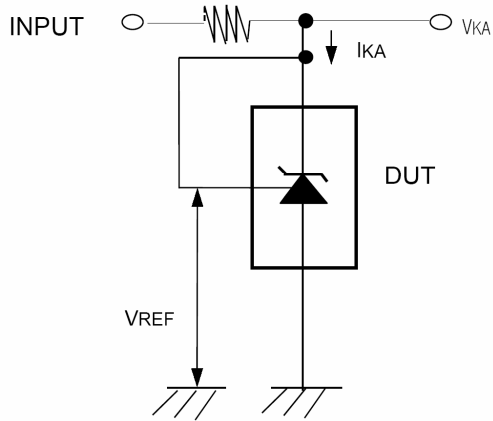


Fig. 2 Test Circuit for $V_{KA} \geq V_{REF}$

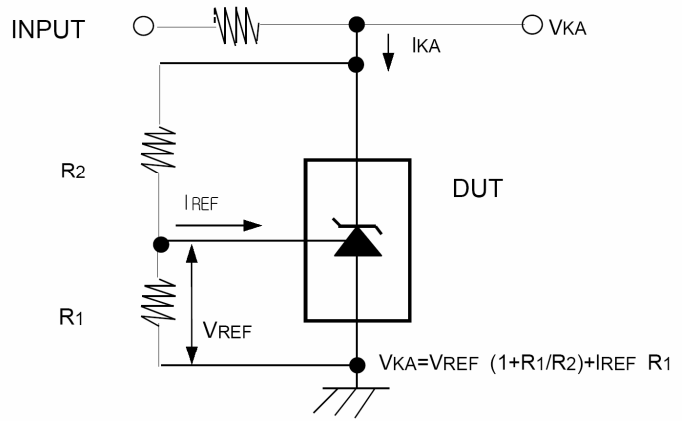
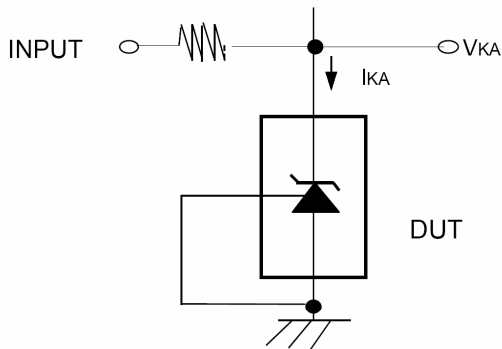
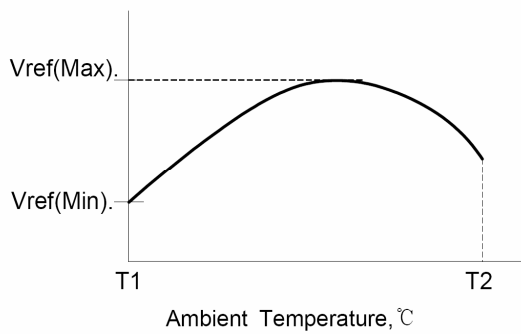


Fig. 3 Test Circuit for $I_{KA}(\text{off})$



Note1] The deviation parameter ΔV_{ref} is defined as the differences between the maximum and minimum values obtained over the full operating ambient temperature range that applies.



$$\Delta V_{ref} = V_{ref}(\text{Max.}) - V_{ref}(\text{Min.})$$

$$T_a = T_2 - T_1$$

The average temperature coefficient of the Reference input voltage, αV_{ref} , is defined as:

$$\alpha V_{ref} = \frac{\text{ppm}}{^{\circ}\text{C}} = \frac{\left(\frac{\Delta V_{ref}}{V_{ref} @ 25^{\circ}\text{C}} \right) \times 10^6}{\Delta T_a} = \frac{\Delta V_{ref} \times 10^6}{\Delta T_a (V_{ref} @ 25^{\circ}\text{C})}$$

αV_{ref} can be positive or negative depending on whether $V_{ref.Min.}$ or $V_{ref.Max.}$ occurs at the lower ambient temperature.

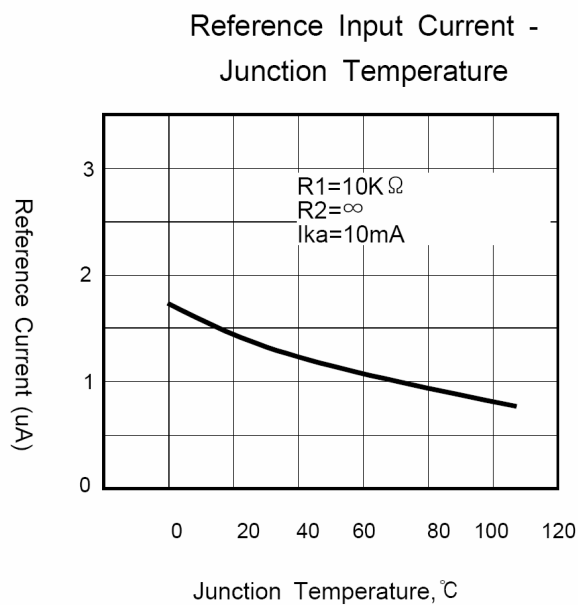
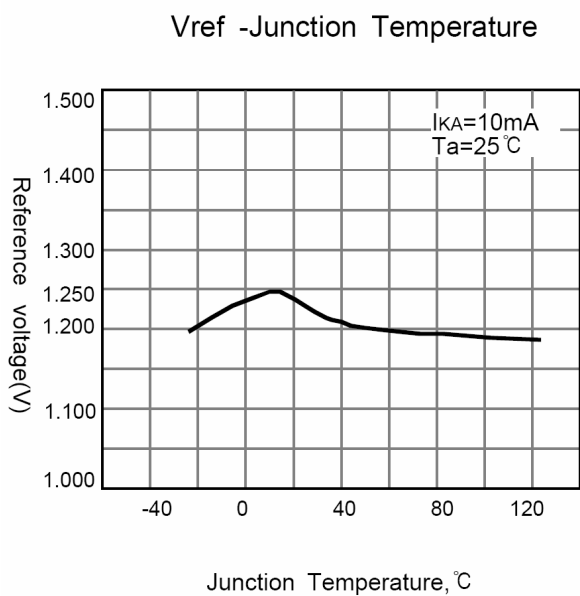
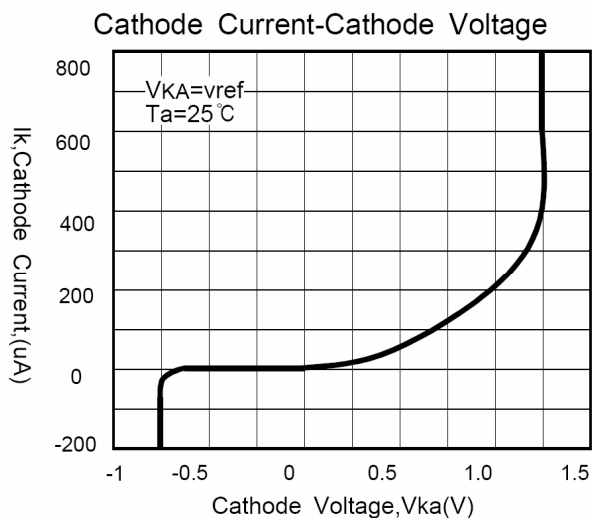
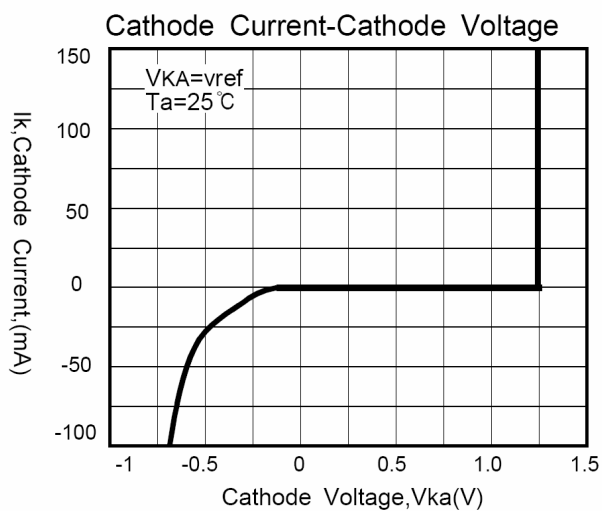
Note2] The dynamic impedance Z_{ka} is defined as:

$$|Z_{ka}| = \frac{\Delta V_{KA}}{\Delta I_K}$$

When the device is programmed with two external resistors, R_1 and R_2 , (Refer to Fig.2) the total dynamic impedance of the circuit is defined as :

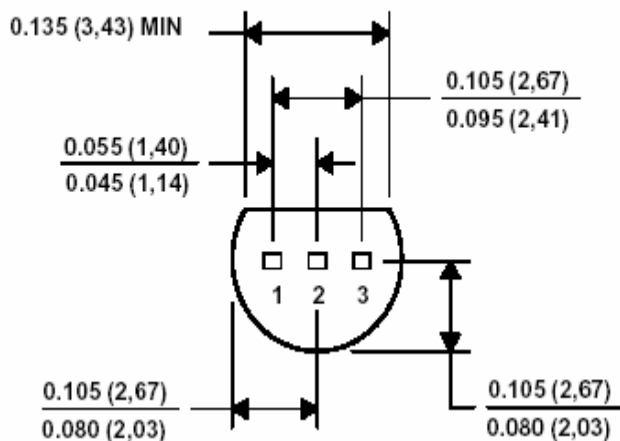
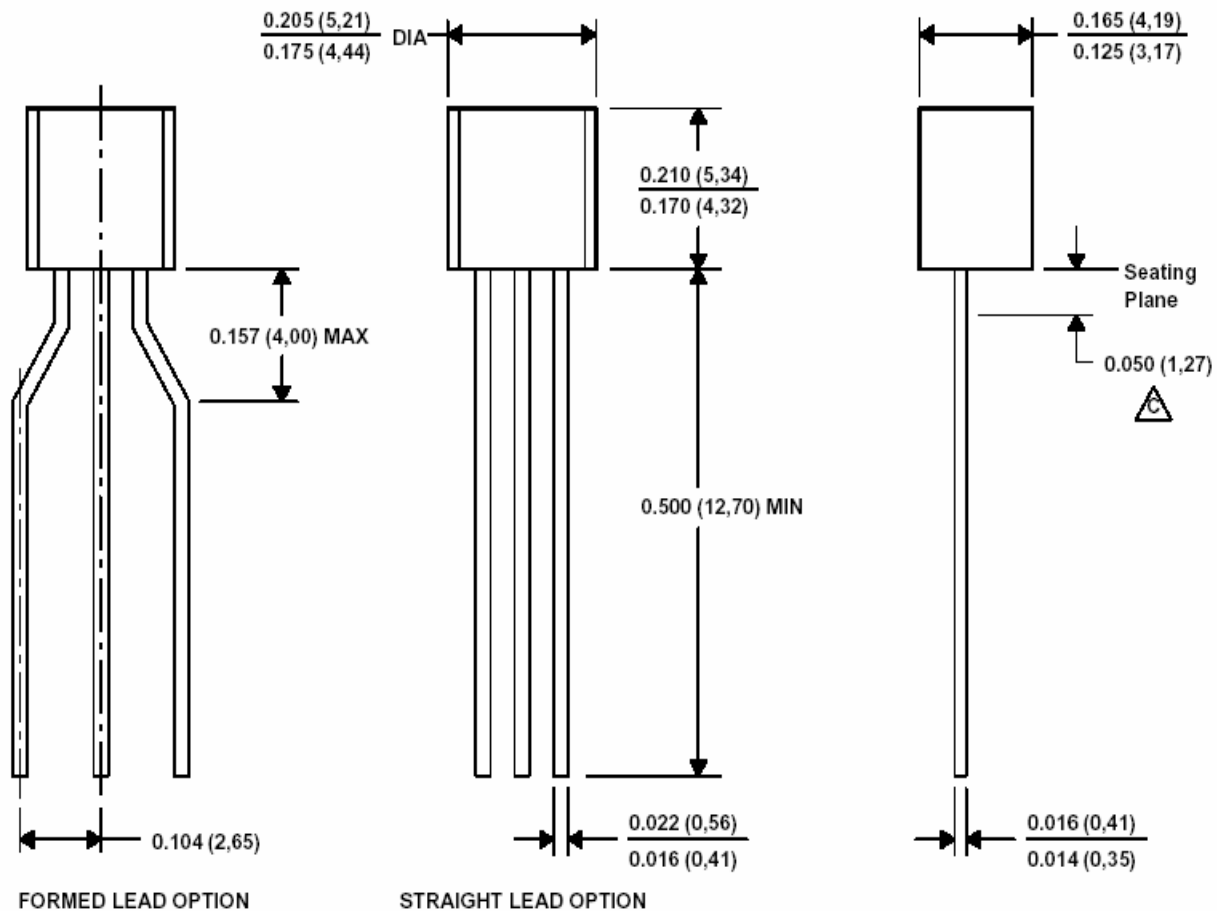
$$|Z_{ka}'| = |Z_{ka}| \left(1 + \frac{R_1}{R_2} \right)$$

TYPICAL PERFORMANCE CHARACTERISTICS

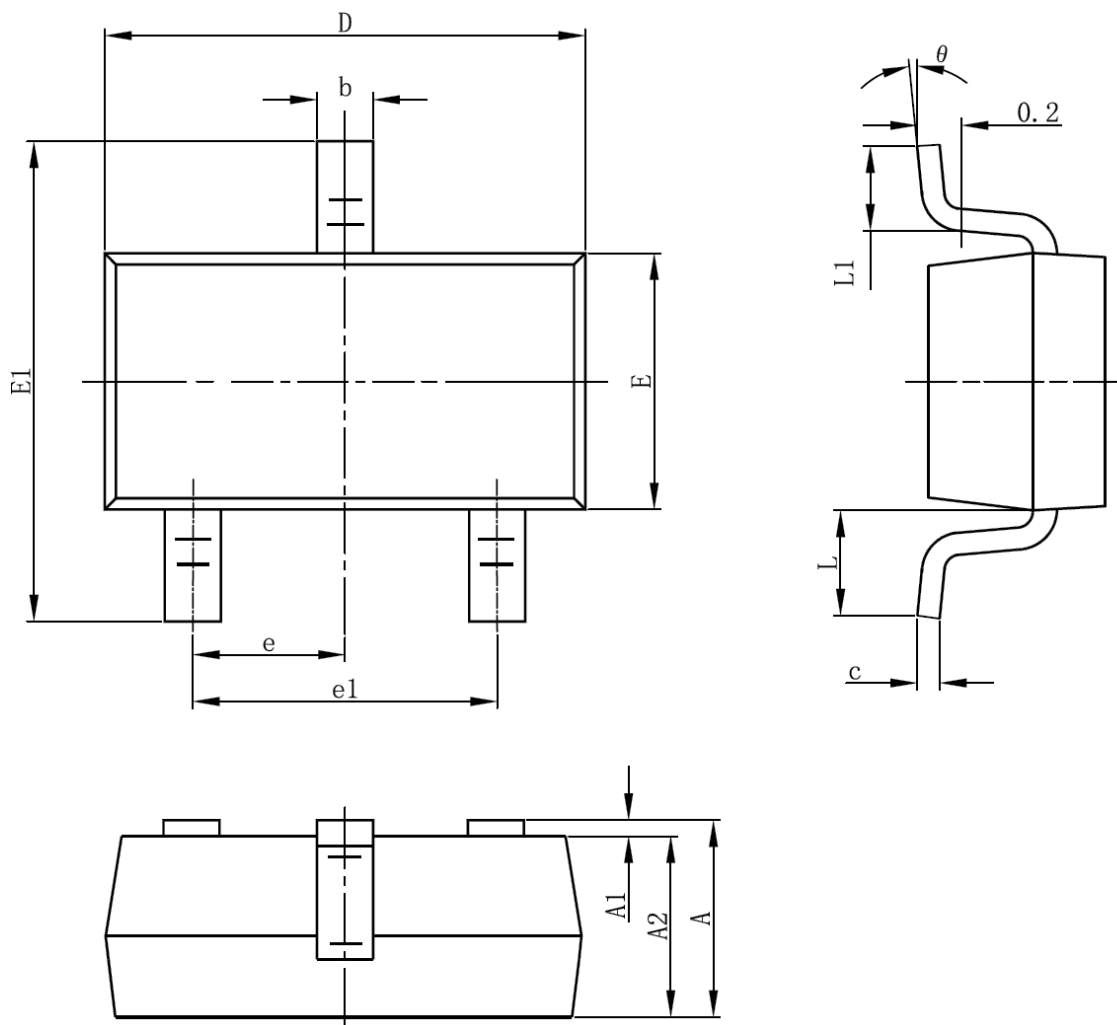


Package Dimensions

TO-92

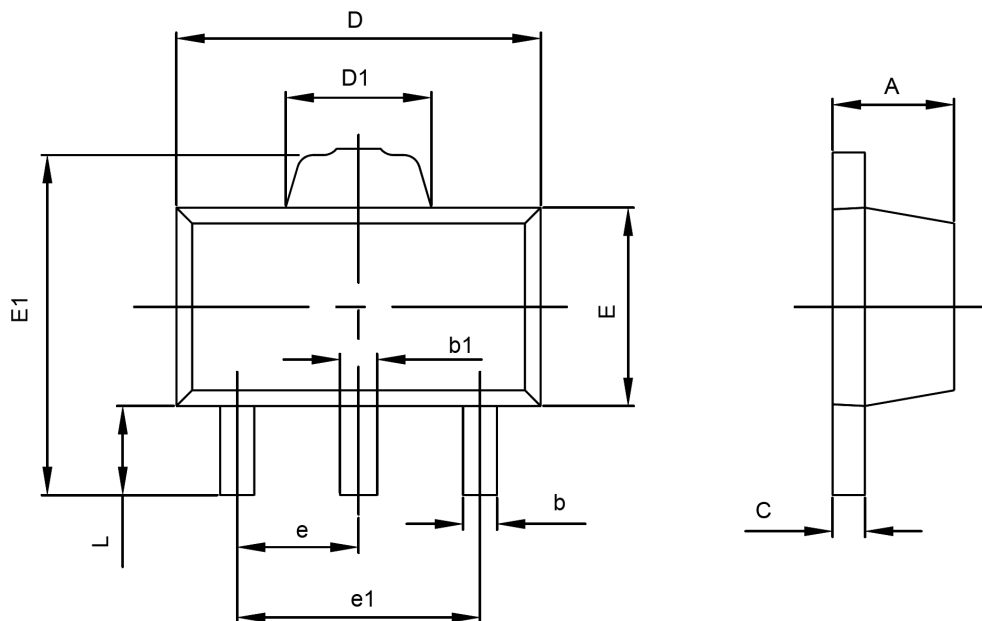


SOT-23-3L PACKAGE OUTLINE DIMENSIONS



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	0.400	0.012	0.016
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	0.950TYP		0.037TYP	
e1	1.800	2.000	0.071	0.079
L	0.700REF		0.028REF	
L1	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT-89-3L PACKAGE OUTLINE DIMENSIONS



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	0.360	0.560	0.014	0.022
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.400	1.800	0.055	0.071
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500TYP		0.060TYP	
e1	2.900	3.100	0.114	0.122
L	0.900	1.100	0.035	0.043