

◆ DESCRIPTION

The MT431 is a three terminal adjustable shunt regulator with a guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between V_{REF} (approximately 2.5 volts) to 36V with two external resistors.

The MT431 offers low output impedance of 80mΩ. Active output circuitry provides a very sharp turn on characteristic, making this device excellent replacement for Zener diodes in many applications.

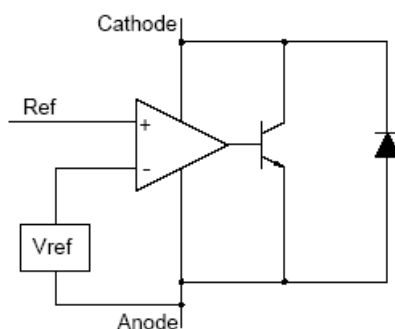
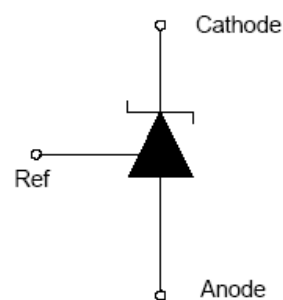
The MT431 is available in 3L-TO92 and surface mount SOT-23, SOT-89 and SOP-8 packages.

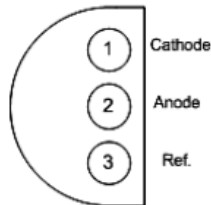
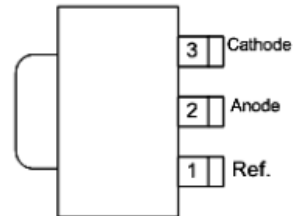
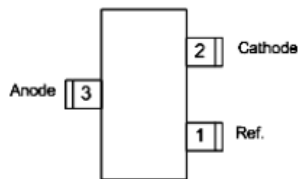
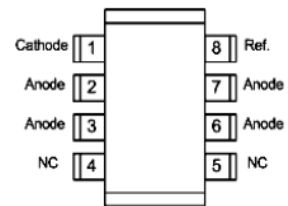
◆ FEATURES

- Wide operating current range 120μA to 100mA.
- Typical output dynamic impedance less than 80mΩ.
- Adjustable output voltage $V_O = V_{REF}$ to 36V
- Trimmed bandgap design up to $\pm 0.5\%$
- ESD rating is 6KV (Per MIL-STD-883D)

◆ APPLICATIONS

- Voltage Reference
- Precision shunt regulator
- Battery Operated Computers
- Linear Regulators
- Computer Disk Drives
- Switching Power Supplies

◆ BLOCK DIAGRAM

◆ SYMBOL DIAGRAM


◆ PIN CONFIGURATIONS
TO-92 (Top View)

MT431Z/BZ
SOT-89 (Top View)

MT431J/BJ
SOT-23-3 (Top View)

MT431S/BS
SOP-8 (Top View)

MT431M/BM
◆ ORDERING INFORMATION

Device	Package		Tolerance	Packing
MT431Z	Z	TO-92	0.5 %	Bulk
MT431BZ			1 %	
MT431Z-TR	Z	TO-92	0.5 %	Tape & Box
MT431BZ-TR			1 %	
MT431M	M	SOP-8	0.5 %	Tape & Reel
MT431BM			1 %	
MT431J	J	SOT-89	0.5 %	Tape & Reel
MT431BJ			1 %	
MT431S	S	SOT-23-3	0.5 %	Tape & Reel
MT431BS			1 %	

Precision Adjustable Shunt Voltage Reference
◆ ABSOLUTE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Maximum	Unit	
Cathode to Anode Voltage (Note 2)	V_{KA}	37	V	
Continuous Cathode Current	I_{KA}	-100 to 150	mA	
Reference Input Current	I_{REF}	0.05 to 10	mA	
Thermal resistance junction to ambient	θ_{JA}		$^{\circ}\text{C}/\text{W}$	
TO-92				156
SOP-8				240
SOT-89				71
SOT-23-3L		285		
Junction Temperature Range	T_J	0 to 150	$^{\circ}\text{C}$	
Operating Temperature Range	T_g	-25 to 150	$^{\circ}\text{C}$	
Storage Temperature Range	T_{STG}	-65 to 150	$^{\circ}\text{C}$	
Lead Temperature (Soldering) 10sec	T_{LEAD}	260	$^{\circ}\text{C}$	

Note 1: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground. Currents are positive into, negative out of the specified terminal.

Note 2: Voltage values are with respect to the anode terminal unless otherwise noted.

◆ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Maximum	Unit
Cathode to Anode Voltage	V_{KA}	V_{REF}	36	V
Continuous Cathode Current	I_{KA}	1.0	100	mA
Operating Ambient Temperature Range	T_A	-40	125	$^{\circ}\text{C}$

◆ POWER DISSIPATION TABLE

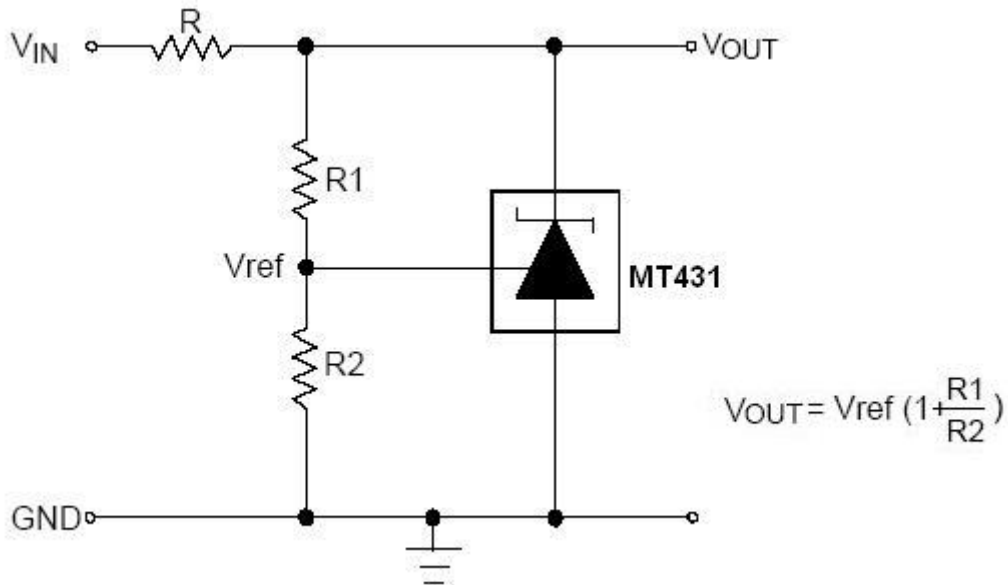
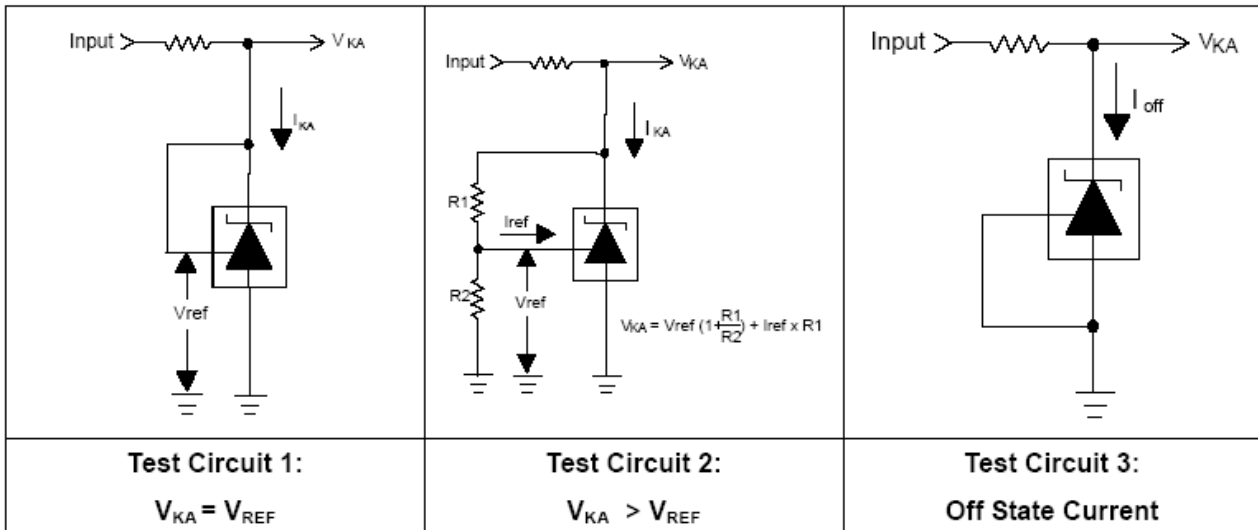
Package	θ_{JA} ($^{\circ}\text{C}/\text{W}$)	$T_A \leq 25^{\circ}\text{C}$ Power rating(mW)	$T_A = 70^{\circ}\text{C}$ Power rating(mW)	$T_A = 85^{\circ}\text{C}$ Power rating (mW)
Z	156	801	513	417
S	285	438	280	228
J	71	1763	1128	916

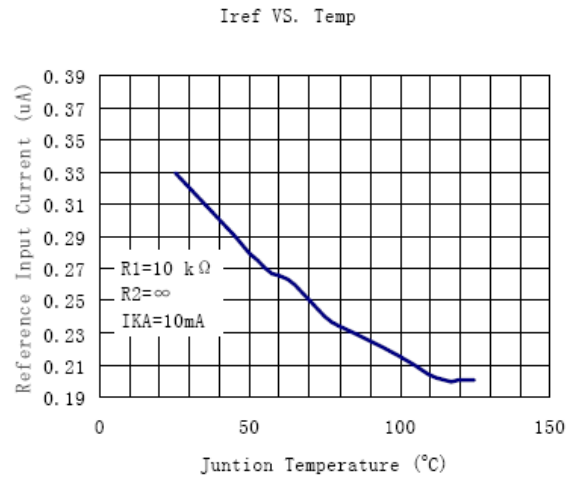
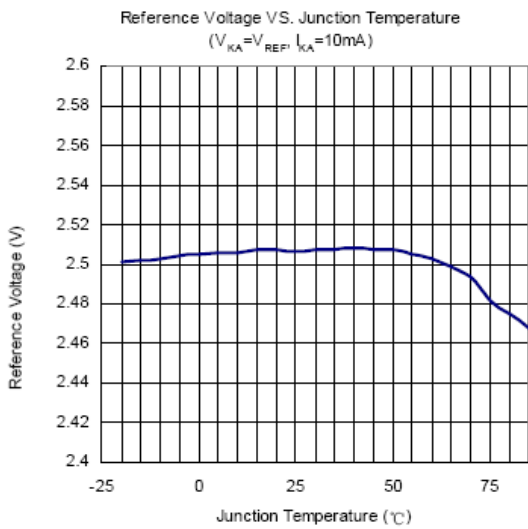
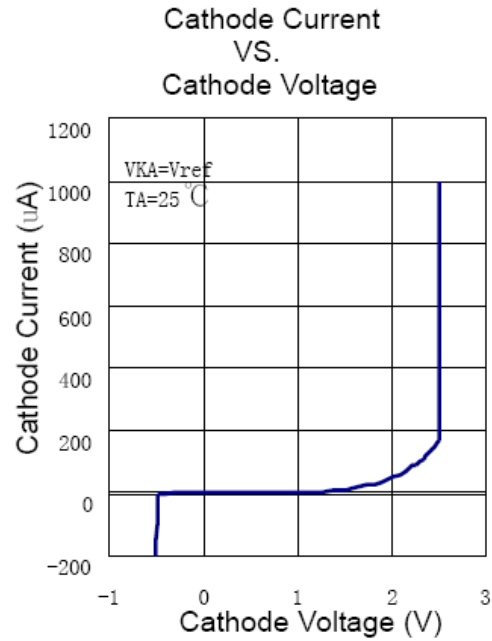
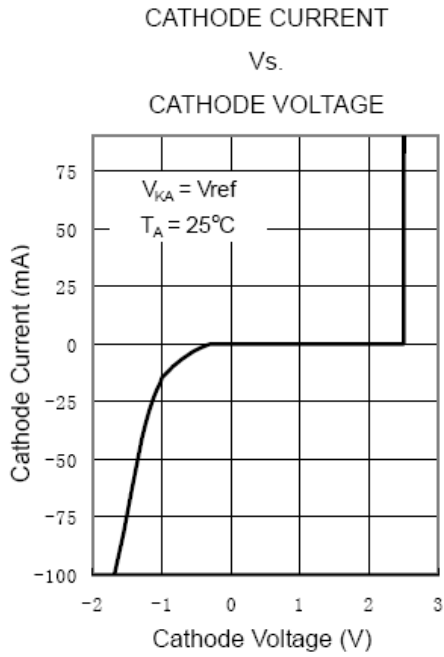
Note :

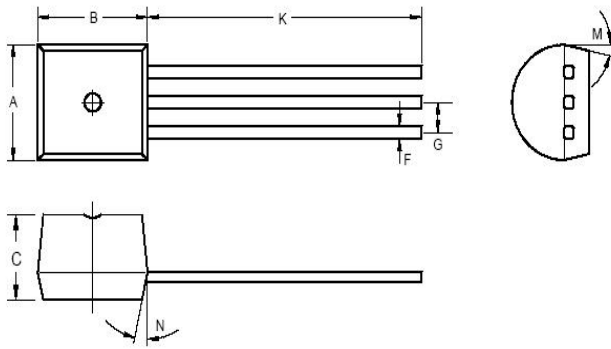
- Exceeding the maximum allowable power dissipation will result in excessive die temperature, and the regulator will go into Thermal shutdown
- T_J Junction Temperature Calculation: $T_J = T_A + (P_D \times \theta_{JA})$,
The θ_{JA} numbers are guidelines for the thermal performance of the device/PC-board system
All of the above assume no ambient airflow
- θ_{JA} : Thermal Resistance-Junction to Ambient, D_F : Derating factor, P_D : Power consumption.
- For SOT-89 package, Thermal Resistance-Junction to Tab (θ_{JT}) = $35^{\circ}\text{C}/\text{W}$. $T_J = T_{TAB} + (P_D \times \theta_{JT})$.

◆ ELECTRICAL CHARACTERISTICS

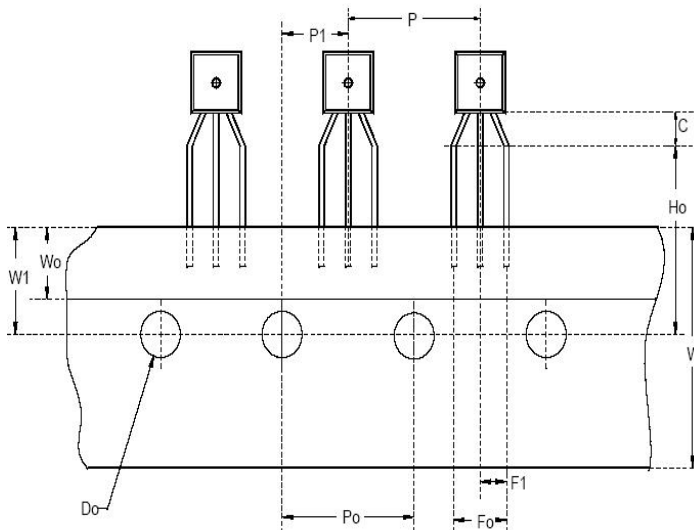
Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Reference Voltage	0.5%	V_{REF}	$V_{KA} = V_{REF}, I_{KA} = 10mA$	2.487	2.5	2.513	V
	1.0%			2.475	2.5	2.525	
Deviation of reference voltage over full temperature range		$V_{I(DEV)}$	$V_{KA} = V_{REF}, I_{KA} = 10mA$ $T_A = -40^{\circ}C$ to $125^{\circ}C$	-	4.5	17	mV
Ratio of change in reference voltage to the change in cathode voltage		$\frac{\Delta V_{REF}}{I \Delta V_{KA}}$	$I_{KA} = 3mA,$ $\Delta V_{KA} = 10V - V_{REF}$	-	-1.4	-2.7	mV/V
Reference current		I_{REF}	$I_{KA} = 10mA,$ $R1 = 10K\Omega, R2 = \infty$	-	1.5	4.0	μA
Deviation of Reference current over full temperature range		$I_{I(DEV)}$	$I_{KA} = 10mA, T_A = -40^{\circ}C$ to $125^{\circ}C$ $R1 = 10K\Omega, R2 = \infty$	-	-0.13	1.2	μA
Minimum cathode current for regulation		I_{MIN}	$V_{KA} = V_{REF}$	-	0.45	1.0	mA
Off-state cathode current		I_{OFF}	$V_{KA} = 36V, V_{REF} = 0$	-	0.05	1.0	μA
Dynamic impedance		Z_{KA}	$I_{KA} = 1mA$ to $100mA$ $V_{KA} = V_{REF}, f \leq 1KHz$	-	0.15	0.5	Ω

◆ TYPICAL APPLICATIONS

◆ TEST CIRCUITS


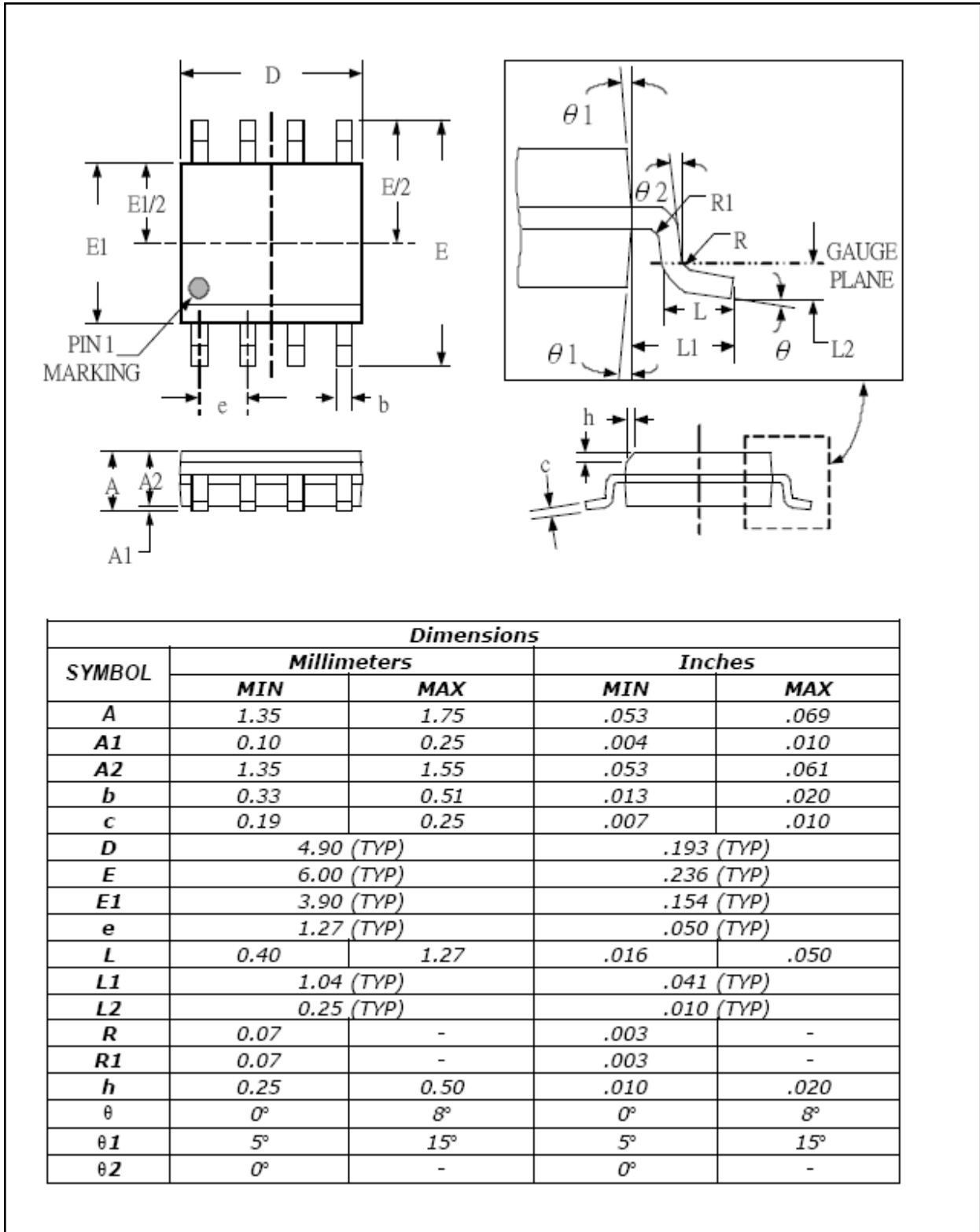
◆ Typical Performance Characteristics


◆ PHYSICAL DIMENSIONS
3-Pin Plastic TO-92(Z)


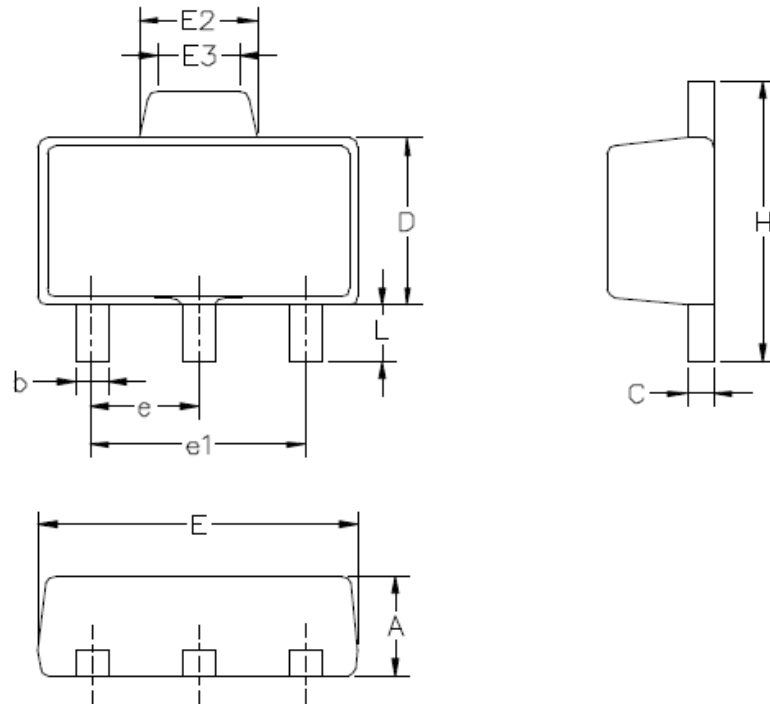
	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
A	0.175	0.180	0.205	4.45	4.57	5.21
B	0.170	0.180	0.210	4.32	4.57	5.33
C	0.125	0.142	0.165	3.18	3.62	4.19
F	-	0.015	-	-	0.38	-
G	-	0.050	-	-	1.27	-
J	-	0.150	-	-	3.81	-
K	0.500	0.580	-	12.70	14.73	-
M	-	5°	-	-	5°	-
N	-	5°	-	-	5°	-



	INCHES			MILLIMETERS		
	MIN	TYP	MAX	MIN	TYP	MAX
C	0.079	-	-	2.00	-	-
P	0.480	0.500	0.520	12.2	12.7	13.2
Po	0.488	0.500	0.512	12.4	12.7	13.0
Do	0.150	0.157	0.165	3.8	4.0	4.2
P1	0.230	0.250	0.256	5.85	6.35	6.85
Fo	0.165	0.197	0.220	4.2	5.0	5.6
W	0.669	0.709	0.748	17.0	18.0	19.0
Ho	0.610	0.630	0.649	15.5	16.0	16.5
W0	0.224	0.236	0.248	5.7	6.0	6.3
W1	0.335	0.354	0.374	8.5	9.0	9.5

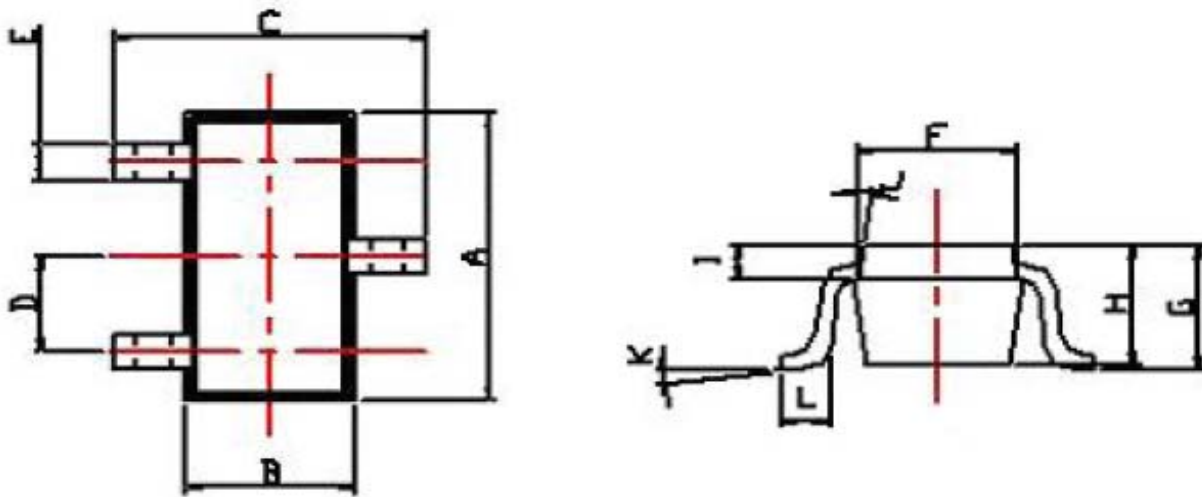
◆ PHYSICAL DIMENSIONS
8-Pin Plastic S.O.I.C. (M)


◆ **PHYSICAL DIMENSIONS**
 3-Pin surface Mount SOT-89(J)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Min
A	1.450	1.550	0.570	0.061
b	0.440	0.480	0.017	0.019
C	0.360	0.400	0.014	0.016
E	4.450	4.550	0.175	0.179
E2	1.500	1.700	0.059	0.067
E3	1.400 (TYP)		0.055 (TYP)	
e	1.500 (TYP)		0.059 (TYP)	
e1	3.000 (TYP)		0.118 (TYP)	
H	4.150	4.250	0.163	0.167
D	2.450	2.550	0.096	0.100
L	0.900	1.100	0.035	0.043

◆ **PHYSICAL DIMENSIONS**
3-Pin surface Mount SOT-23(S)



REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	2.70	3.10	G	0.9	1.4
B	1.20	1.66	H	0.8	1.30
C	2.37	2.90	I	0.25	0.7
D	0.85	1.15	J	7 ± 2°.	
E	0.350 + 0.15/-0.05		K	0 ~ 10°.	
F	1.07	1.53	L	0.2 (MIN)	