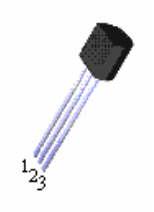
PJ432/PJ432A/PJ432B
Adjustable Precision Shunt

The PJ432 is a three-terminal adjustable shunt regulator with specified thermal stability. The output voltage may be set to any value between Vref (approximately 1.24V) and 18V with two external resistors. The PJ432 has a typical output impedance of 0.15 Ω. Active output circuitry provides a very sharp turn-on characteristic, making the PJ432 excellent replacement for zener diode in many applications.

TO-92



Pin: 1. Reference
2. Anode
3. Cathode

SOT-89

Pin: 1. Reference
2. Cathode
3. Anode

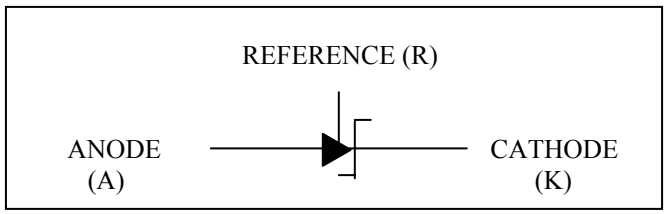
SOT-23

Pin: 1. Reference
2. Cathode
3. Anode

FEATURES

- Equivalent Full-Range Temperature Coefficient 50 ppm/℃
- Temperature Compensated for Operation over Full Rated
- Operating Temperature Range
- Adjustable Output Voltage
- Fast Turn-On Response
- Sink Current Capability of 1.0 to 100 mA
- Low(0.15 Ω Type) Dynamic Output Impedance
- Low Output Noise

SYMBOL



ORDERING INFORMATION

Device	Operating Temperature (Ambient)	Package
PJ432/A/B CT	-20℃ to +85℃	TO-92
PJ432/A/B CX		SOT-23
PJ432/A/B CY		SOT-89

ABSOLUTE MAXIMUM RATINGS OVER OPERATING FREE-AIR TEMPERATURE RANGE

(unless otherwise noted)

Parameter	Value	Units
Cathode voltage(see Note 1)	20	V
Continuous cathode current range	-10 to 250	mA
Reference input current range	10mA	mA
Operating free-air Temperature range	-20 to +85	℃
Storage Temperature	-60 to +150	
Lead temperature 1.6mm from case for 10 seconds	260	
Power Dissipation (see Note 2,3) TO-92 SOT-89 SOT-23	 0.625 0.80 0.30	W

Note 1:Voltage values are with respect to the anode terminal unless otherwise noted.

Note 2: T_J Max = 150℃

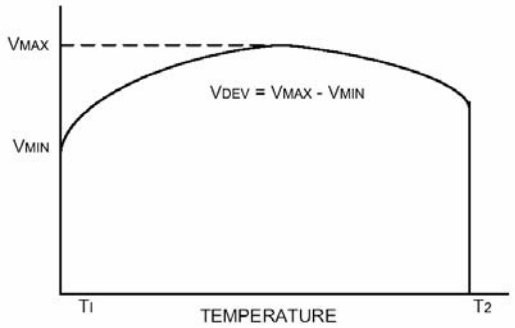
Note 3: Rating apply to ambient temperature at 25℃

RECOMMENDED OPERATING CONDITIONS

Parameter	MIN	MAX	TYP
Cathode voltage, V_{KA}	Vref	18	V
Cathode current, I_K(for regulation)	1	100	mA

ELECTRICAL CHARACTERISTICS AT 25℃ FREE-AIR TEMPERATURE（Unless Otherwise Noted）

Parameter	Symbol	Test Conditions	MIN	Typ	MAX	UNIT
Reference Voltage PJ432A PJ432 PJ432B	Vref	V_{KA}=Vref,I_K=10mA T_A =+25℃	 1.233 1.227 1.215	 1.240 1.240 1.240	 1.246 1.252 1.264	V
Vref Temp. Deviation	V_{DEV}	T_A=-40to+85℃ V_{KA}= Vref, I_K=10mA	--	10	25	mV
Reference Input Current	Iref	R1=10KΩ,R2=∞, I_K=10mA	--	0.15	4.0	μA
Radio of change in Vref to Change in Cathode Voltage	$\frac{\Delta Vref}{\Delta V_{KA}}$	I_K=10mA, ΔV_{KA} =16V to Vref	--	-1.0	-2.7	mV/V
Iref Temp. Deviation	Iref(DEV)	T_A=-40 to+85℃ R1=10KΩ,R2=∞, I_K=10mA	--	0.1	4.0	μA
Minimum Operating Current	Imin	V_{KA}=Vref	--	60	200	μA
Off-state Cathode Current	Ioff	Vref=0V, V_{KA}=6V	--	0.5	2.0	μA
		Vref=0V, V_{KA}=16V	--	0.5	2.0	
Dynamic Output Impedance	$\lvert Z_{KA}\rvert$	f<1KHz, V_{KA}=Vref I_K=100μA to 100mA	--	0.25	0.4	Ω



Note 4. Deviation of reference input voltage, V_{DEV}, is defined as the maximum variation of the reference over the full temperature range.

The average temperature coefficient of the reference input voltage α Vref is defined as:

$$\lvert \alpha V_{REF} \rvert = \frac{(\frac{V_{DEV}}{V_{REF}(25°C)}) \cdot 10^6}{T_2 - T_1} \quad \text{..... (PPM/℃)}$$

Where :

T2-T1=full temperature change.

α Vref can be positive or negativedepending on whether the slope is positive or negative.

Note 4. The dynamic output impedance, Rz, is defined as : $\lvert Z_{KA} \rvert = \frac{\Delta V_{KA}}{\Delta I_{KA}}$

When the device is programmed with two external resistors R1and R2(see Figure 2). The dynamic output impedance of the overall circuit, is defined as :

$$\lvert Z_{KA}' \rvert = \frac{\Delta v}{\Delta i} \approx \lvert Z_{KA} \rvert \cdot (1 + \frac{R1}{R2})$$

FIGURE 1. TEST CIRCUIT FOR $V_{KA} = V_{REF}$

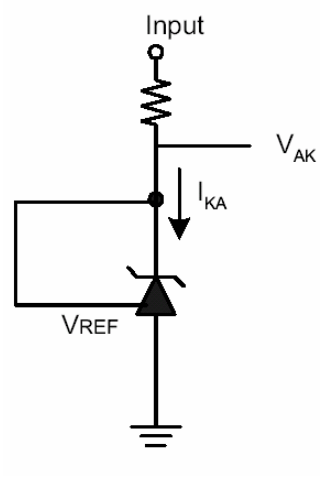
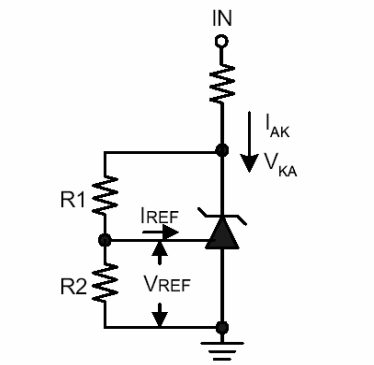


FIGURE 2. TEST CIRCUIT FOR $V_{KA} > V_{REF}$



$$V_{KA} = V_{REF}(1+\frac{R1}{R2}) + I_{REF} \cdot R1$$

FIGURE 3. TEST CIRCUIT FOR off-state CURRENT

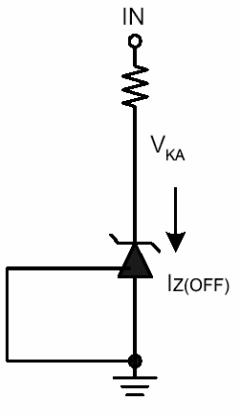


FIGURE 4.CATHODE CURRENT versus CATHODE VOLTAGE

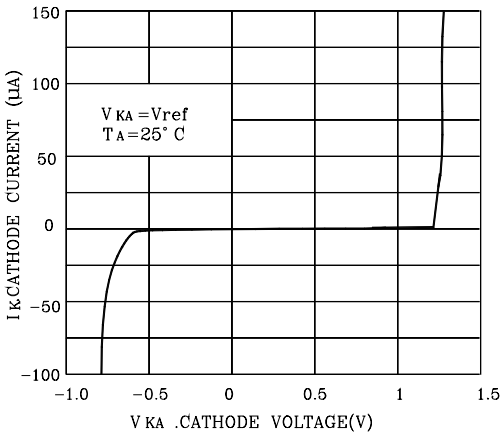


FIGURE 5.CATHODE CURRENT versus CATHODE VOLTAGE

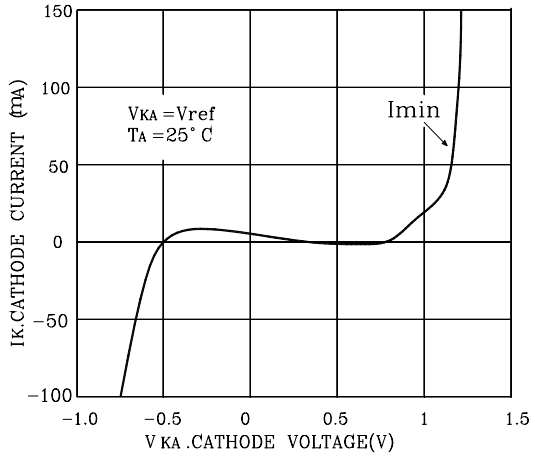
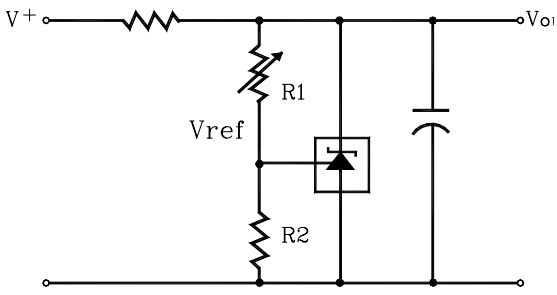
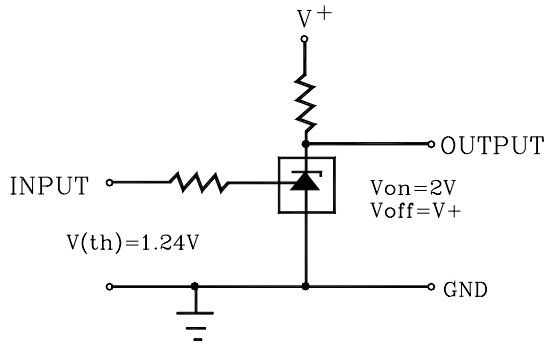


FIGURE 6.SHUNT REGULATOR



$$Vout = (1+\frac{R1}{R2})Vref$$

FIGURE 7. SINGLE-SUPPLY COMPARATOR WITH TEMPERATURE COMPENEATED THREEHOLD



APPLICATION EXAMPLE

FIGURE 8. VOLTAGE MONITOR

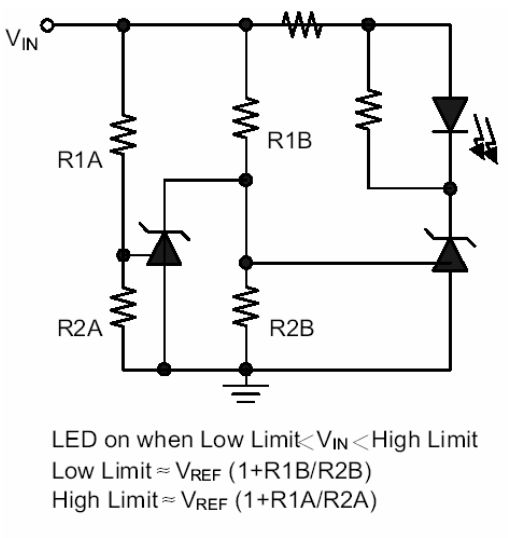


FIGURE 9. DELAY TIMER

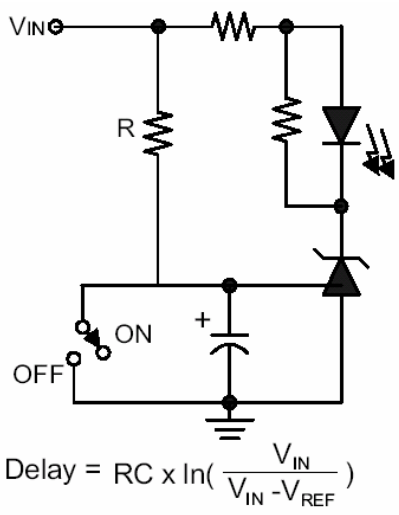


FIGURE 10. CURRENT LIMITER OR CURRENT SOURCE

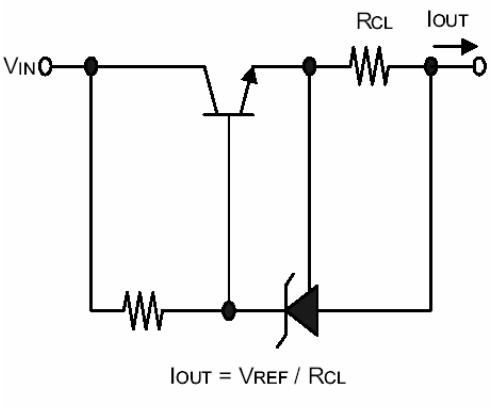


FIGURE 11. CONTACNT-CURRENT SINK

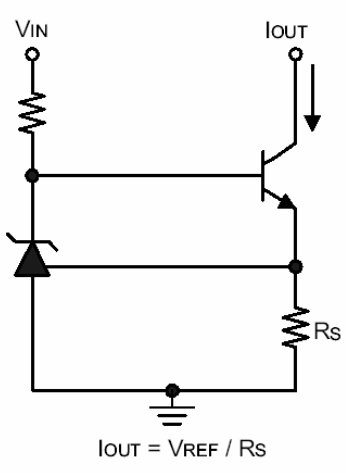


FIGURE 12. HIGHER-CURRENT SHOUNT REGULATOR

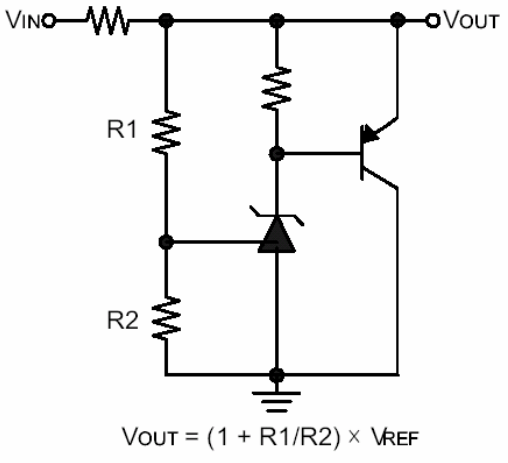


FIGURE 13. CROW BAR

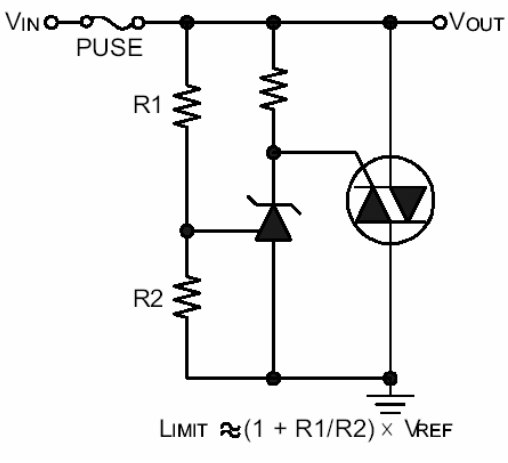
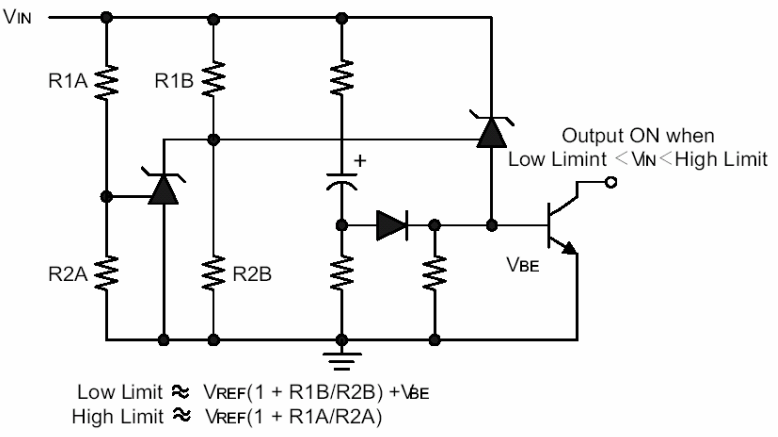
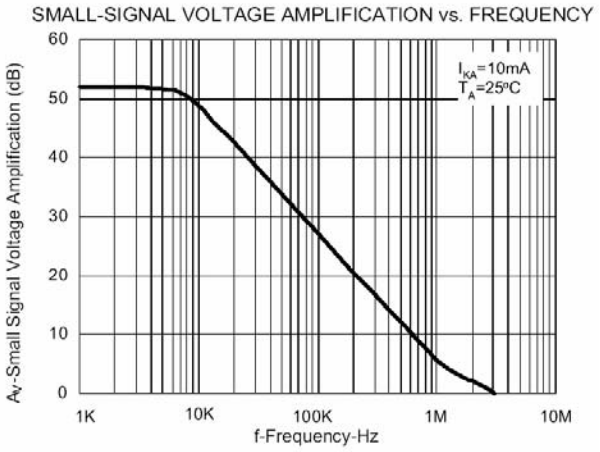
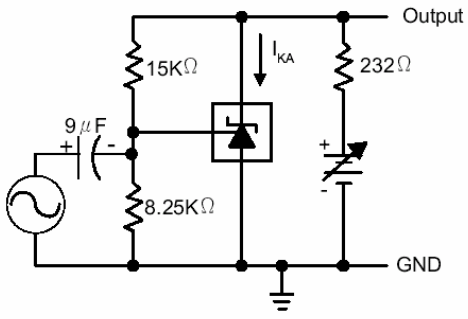


FIGURE 14. OVER-VOLTAGE/UNDER-VOLTAGE PROTECTION



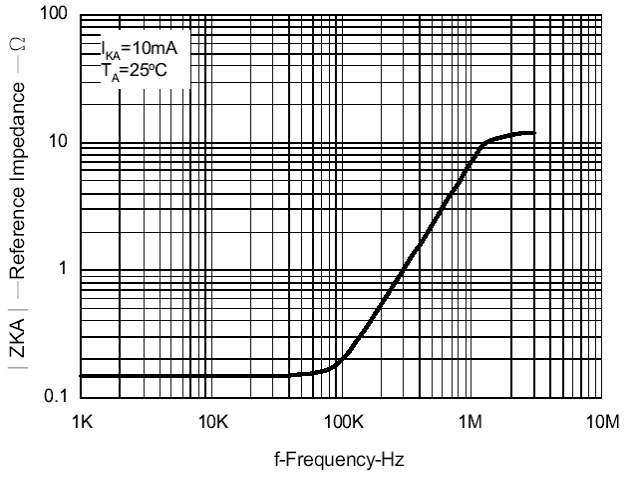
TYPICAL PERFORMANCE CHARACTERISTICS

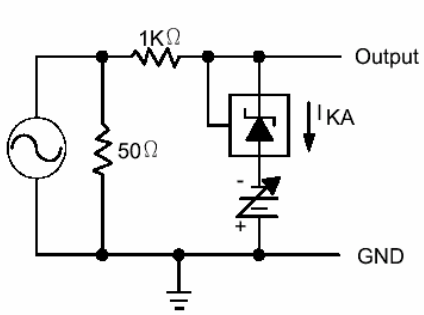




TEST CIRCUIT FOR VOLTAGE AMPLIFICATION

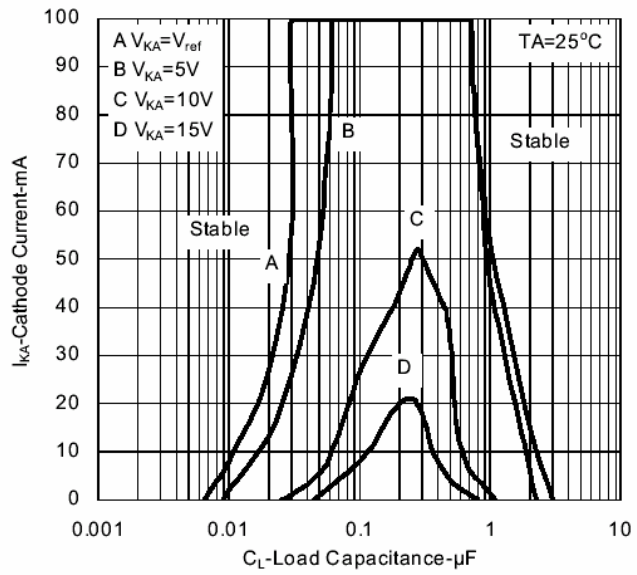
REFERENCE IMPEDANCE vs. FREQUENCY



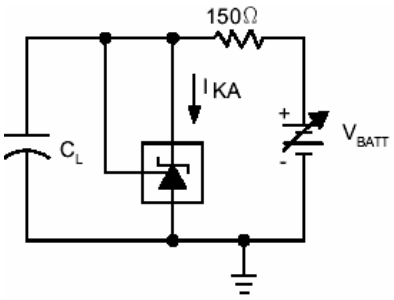


TEST CIRCUIT FOR REFERENCE IMPEDANCE

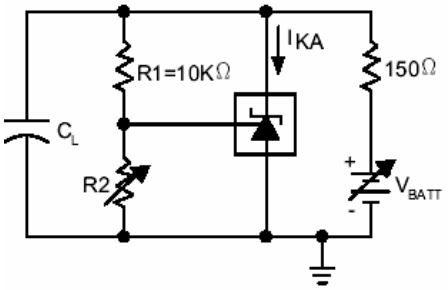
STABILITY BOUNDARY CONDITIONS†



†The areas under the curves represent conditions that may cause the device to oscillate. For curves B, C, and D, R2 and V+ were adjusted to establish the initial V_{KA} and I_{KA} conditions with C_L=0.V_{BATT} and C_L were then adjusted to determine the ranges of stability.



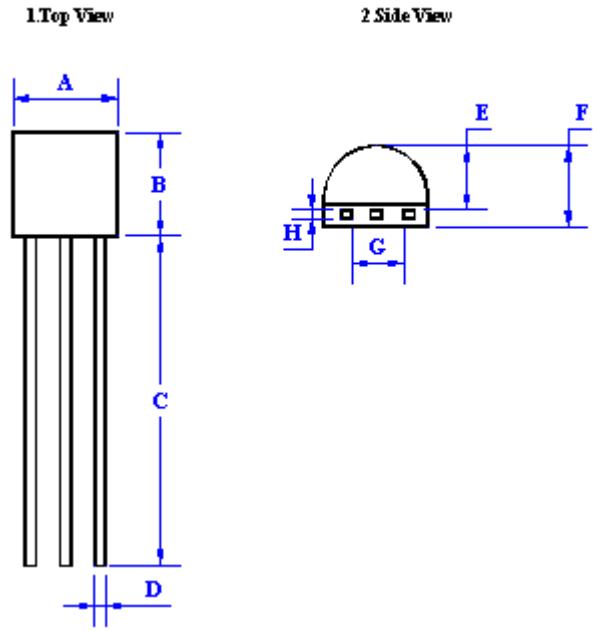
TEST CIRCUIT FOR CURVE A



TEST CIRCUIT FOR CURVE B, C, AND D

TO-92 Mechanical drawing

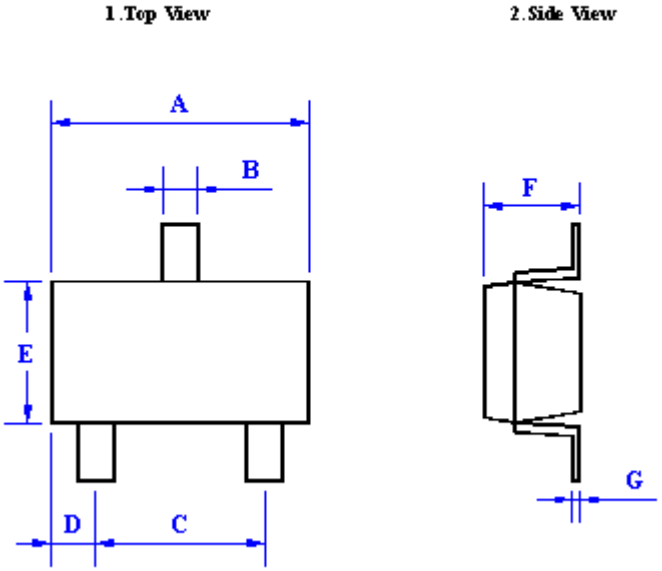
TO-92 Unit:mm



TO-92 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.3	4.7	0.169	0.185
B	4.3	4.7	0.169	0.185
C	14.3	14.3	0.563	0.563
D	0.435	0.485	0.017	0.019
E	2.19	2.81	0.086	0.111
F	3.3	3.7	0.130	0.146
G	2.42	2.66	0.095	0.105
H	0.375	0.425	0.015	0.107

SOT-23 Mechanical drawing

SOT-23 Unit:mm

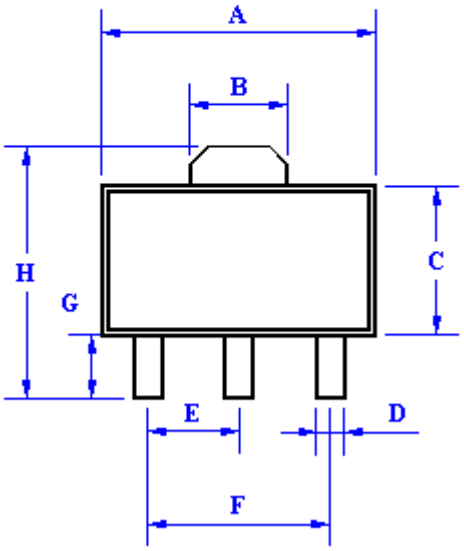


SOT-23 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.88	2.91	0.110	0.120
B	0.39	0.42	0.014	0.018
C	1.78	2.03	0.070	0.080
D	0.51	0.61	0.020	0.024
E	1.59	1.66	0.061	0.065
F	1.04	1.08	0.038	0.049
G	0.07	0.09	0.003	0.005

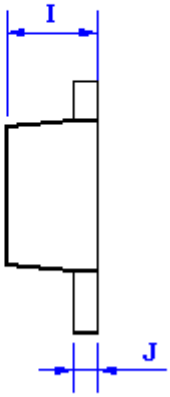
SOT-89 Mechanical drawing

SOT-89 Unit:mm

1.Top View



2.Side View



SOT-89 Dimension				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.4	4.6	0.173	0.181
B	1.5	1.7	0.059	0.070
C	2.30	2.60	0.090	0.102
D	0.40	0.52	0.016	0.020
E	1.50	1.50	0.059	0.059
F	3.00	3.00	0.118	0.118
G	0.89	1.20	0.035	0.047
H	4.05	4.25	0.159	0.167
I	1.4	1.6	0.055	0.063
J	0.35	0.44	0.014	0.017