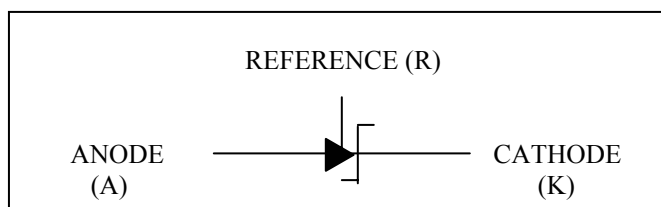


The PJ432 is a three-terminal adjustable shunt regulator with specified thermal stability. The output voltage may be set to any value between Vref (approximately 1.24V) and 18V with two external resistors. The PJ432 has a typical output impedance of 0.15 Ω . Active output circuitry provides a very sharp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

FEATURES

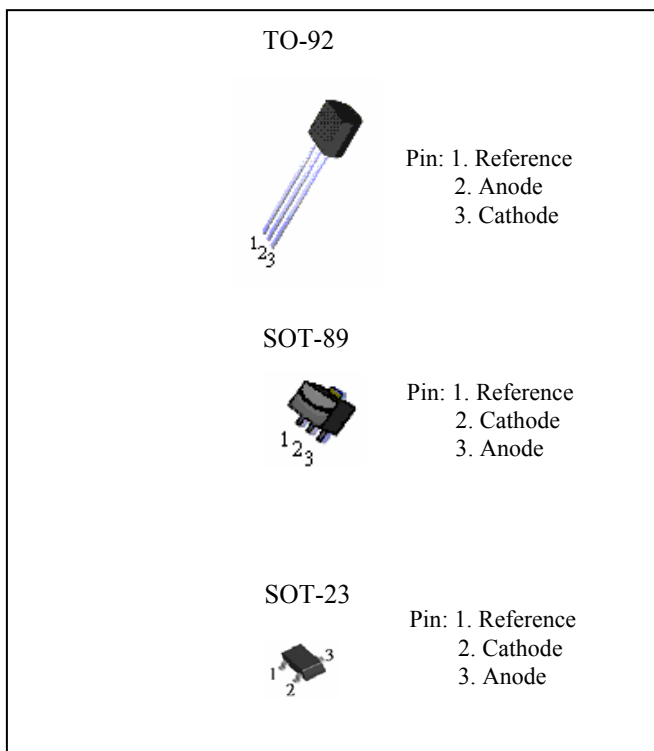
- Equivalent Full-Range Temperature Coefficient 50 ppm/°C
- Temperature Compensated for Operation over Full Rated
- Operating Temperature Range
- Adjustable Output Voltage
- Fast Turn-On Response
- Sink Current Capability of 1.0 to 100 mA
- Low(0.15 Ω Type) Dynamic Output Impedance
- Low Output Noise

SYMBOL



ORDERING INFORMATION

Device	Operating Temperature (Ambient)	Package
PJ432/A/B CT	-20°C to +85°C	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	°C
Storage Temperature	-60 to +150	
Lead temperature 1.6mm from case for 10 seconds	260	
Power Dissipation (see Note 2,3)		W
TO-92	0.625	
SOT-89	0.80	
SOT-23	0.30	

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

Note 2: Tj Max = 150°C

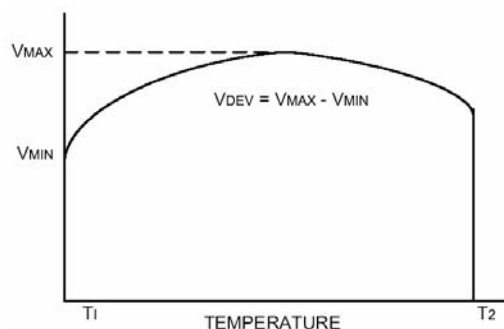
Note 3: Rating apply to ambient temperature at 25°C

RECOMMENDED OPERATING CONDITIONS

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

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

Parameter	Symbol	Test Conditions	MIN	Typ	MAX	UNIT
Reference Voltage PJ432A PJ432 PJ432B	V_{ref}	$V_{KA}=V_{ref}, I_K=10mA$ $T_A = +25^{\circ}C$	1.233 1.227 1.215	1.240 1.240 1.240	1.246 1.252 1.264	V
V_{ref} Temp. Deviation	V_{DEV}	$T_A=-40to+85^{\circ}C$ $V_{KA}=V_{ref}, I_K=10mA$	--	10	25	mV
Reference Input Current	I_{ref}	$R1=10K\Omega, R2=\infty, I_K=10mA$	--	0.15	4.0	μA
Radio of change in V_{ref} to Change in Cathode Voltage	$\frac{\Delta V_{ref}}{\Delta V_{KA}}$	$I_K=10mA, \Delta V_{KA}=16V$ to V_{ref}	--	-1.0	-2.7	mV/V
I_{ref} Temp. Deviation	$I_{ref(DEV)}$	$T_A=-40$ to $+85^{\circ}C$ $R1=10K\Omega, R2=\infty, I_K=10mA$	--	0.1	4.0	μA
Minimum Operating Current	I_{min}	$V_{KA}=V_{ref}$	--	60	200	μA
Off-state Cathode Current	I_{off}	$V_{ref}=0V$ $V_{KA}=6V$ $V_{KA}=16V$	-- --	0.5 0.5	2.0 2.0	μA
Dynamic Output Impedance	$ Z_{KA} $	$f<1KHz, V_{KA}=V_{ref}$ $I_K=100\mu A$ 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 αV_{ref} is defined as:

$$|\alpha V_{REF}| = \frac{(\frac{V_{DEV}}{V_{REF}(25^{\circ}C)}) \cdot 10^6}{T_2 - T_1} \dots\dots\dots (PPM/^{\circ}C)$$

Where :

T_2-T_1 =full temperature change.

αV_{ref} can be positive or negative depending on whether the slope is positive or negative.

Note 4. The dynamic output impedance, R_z , is defined as :

$$|Z_{KA}| = \frac{\Delta V_{KA}}{\Delta I_{KA}}$$

When the device is programmed with two external resistors $R1$ and $R2$ (see Figure 2). The dynamic output impedance of the overall circuit, is defined as :

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

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

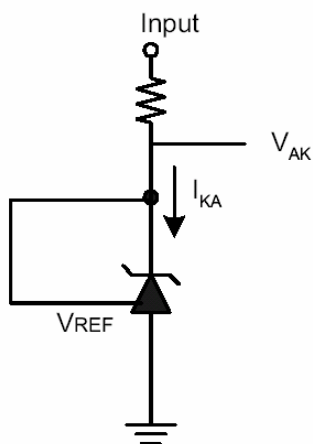


FIGURE 2. TEST CIRCUIT FOR $V_{KA} > V_{REF}$

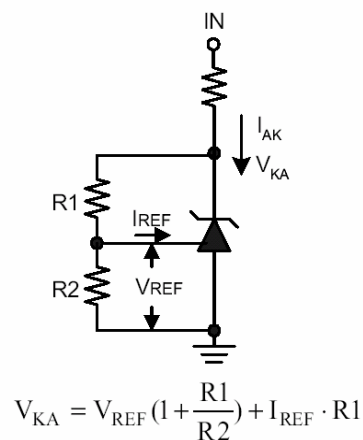


FIGURE 3. TEST CIRCUIT FOR off-state CURRENT

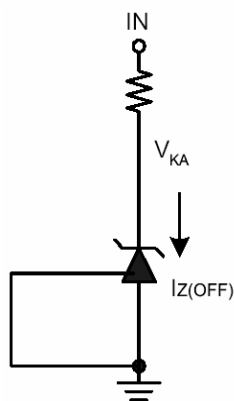


FIGURE 4. CATHODE CURRENT versus CATHODE VOLTAGE

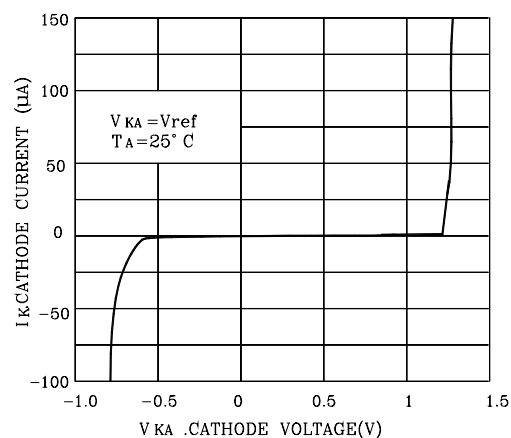


FIGURE 5. CATHODE CURRENT versus CATHODE VOLTAGE

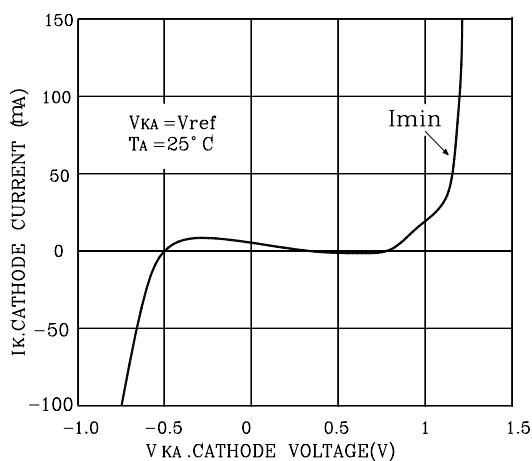


FIGURE 6. SHUNT REGULATOR

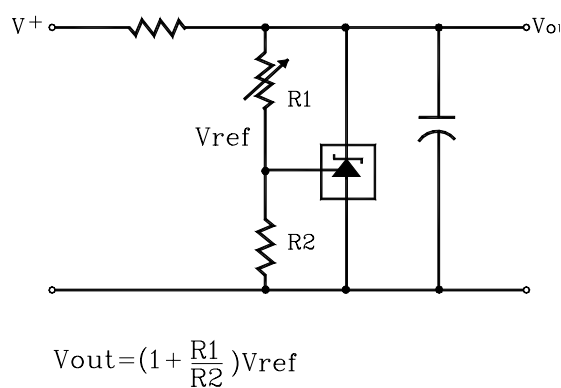
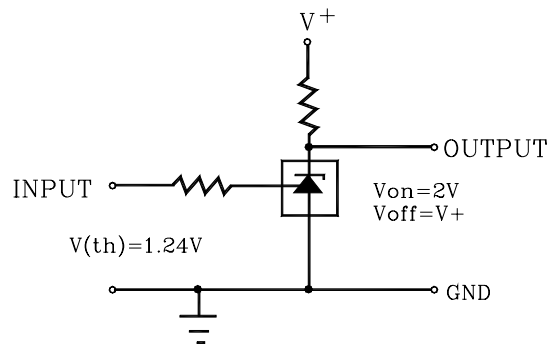
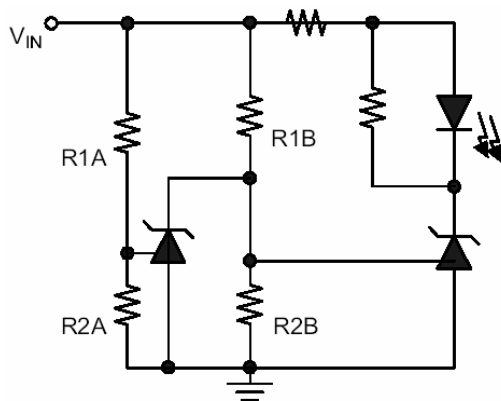


FIGURE 7. SINGLE-SUPPLY COMPARATOR WITH TEMPERATURE COMPENATED THRESHOLD



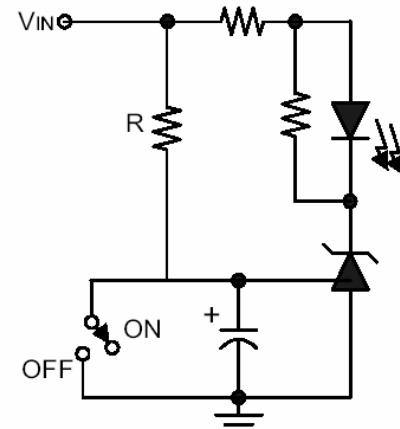
APPLICATION EXAMPLE

FIGURE 8. VOLTAGE MONITOR



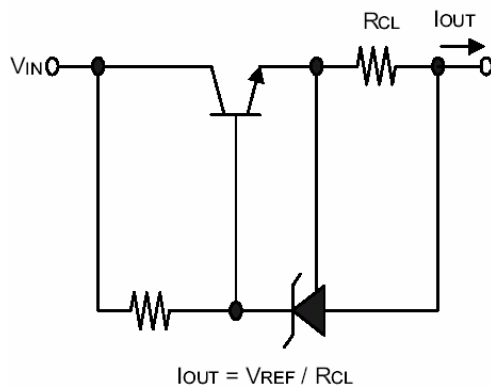
LED on when Low Limit $< V_{IN} <$ High Limit
Low Limit $\approx V_{REF} (1 + R1B/R2B)$
High Limit $\approx V_{REF} (1 + R1A/R2A)$

FIGURE 9. DELAY TIMER



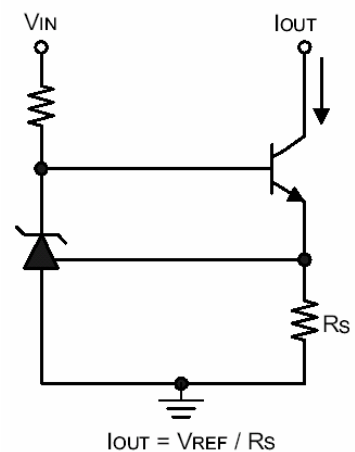
$$\text{Delay} = RC \times \ln\left(\frac{V_{IN}}{V_{IN} - V_{REF}}\right)$$

FIGURE 10. CURRENT LIMITER OR CURRENT SOURCE



$$I_{OUT} = V_{REF} / R_{CL}$$

FIGURE 11. CONTACT-CURRENT SINK



$$I_{OUT} = V_{REF} / R_s$$

FIGURE 12. HIGHER-CURRENT SHUNT REGULATOR

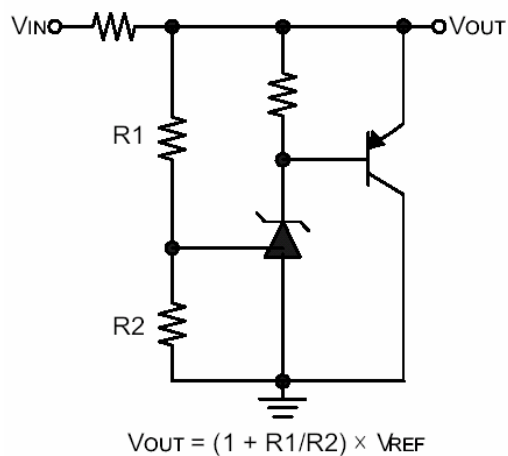


FIGURE 13. CROW BAR

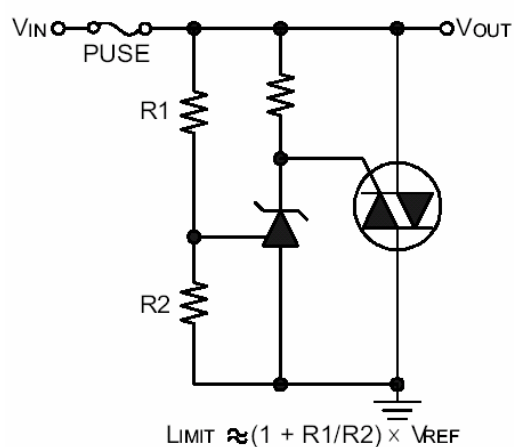
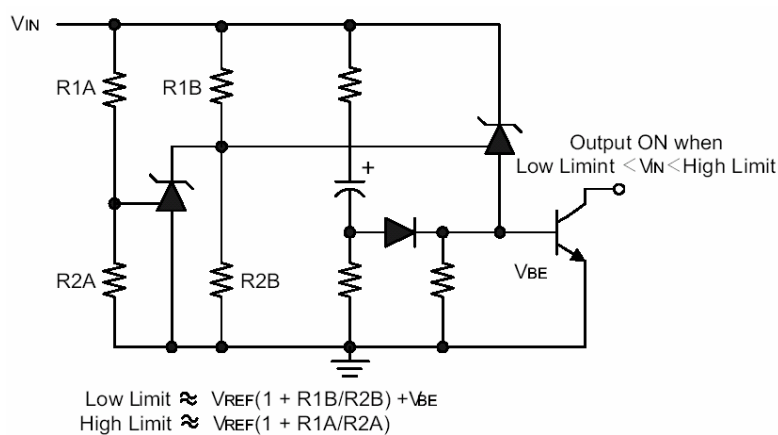
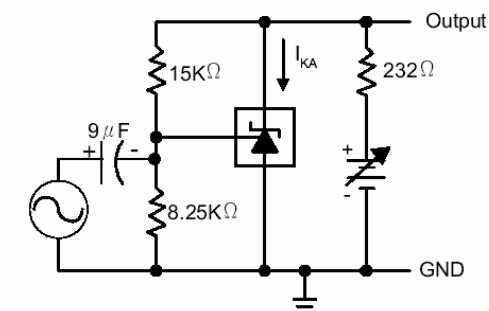
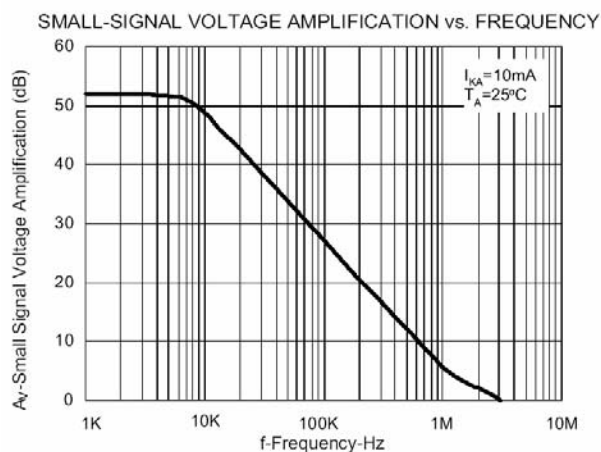


FIGURE 14. OVER-VOLTAGE/UNDER-VOLTAGE PROTECTION

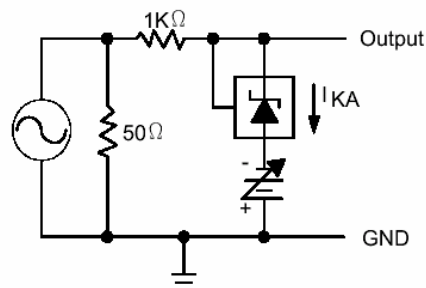
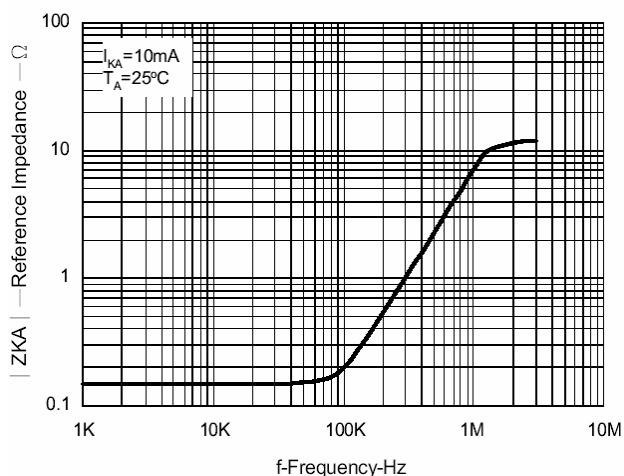


TYPICAL PERFORMANCE CHARACTERISTICS



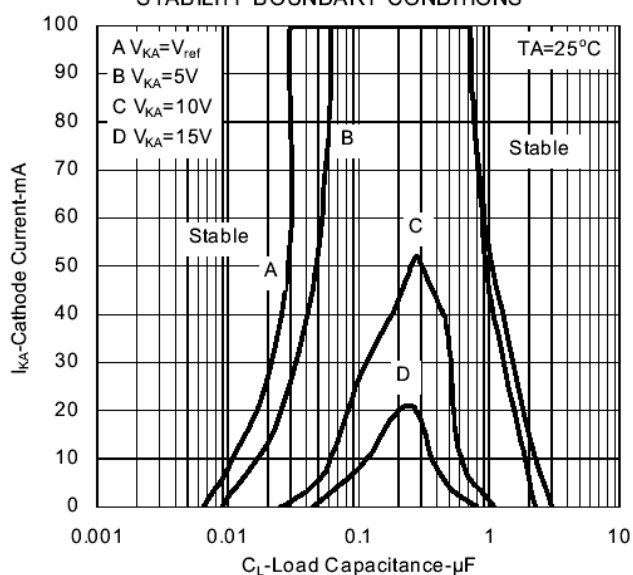
TEST CIRCUIT FOR VOLTAGE AMPLIFICATION

REFERENCE IMPEDANCE vs. FREQUENCY

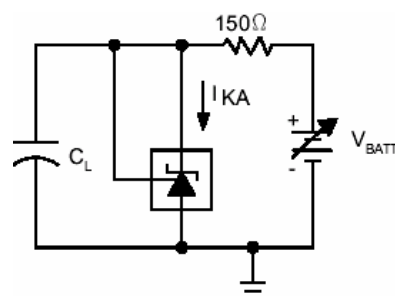


TEST CIRCUIT FOR REFERENCE IMPEDANCE

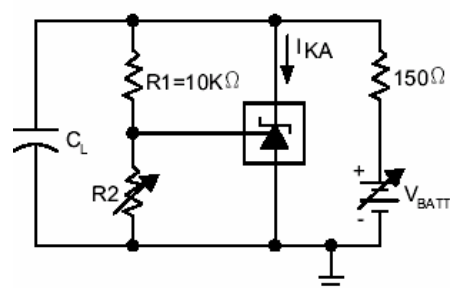
STABILITY BOUNDARY CONDITIONS†



†The areas under the curves represent conditions that may cause the device to oscillate. For curves B, C, and D, R_2 and V_+ were adjusted to establish the initial V_{KA} and I_{KA} conditions with $C_L = 0.1\mu\text{F}$ and V_{BATT} were then adjusted to determine the ranges of stability.



TEST CIRCUIT FOR CURVE A

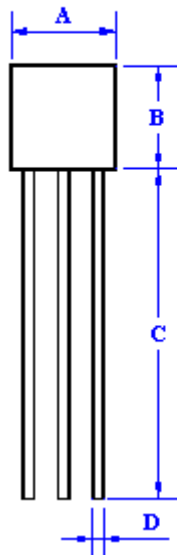


TEST CIRCUIT FOR CURVE B, C, AND D

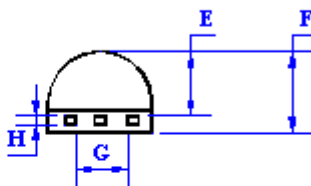
TO-92 Mechanical drawing

TO-92 Unit:mm

1.Top View



2 Side View



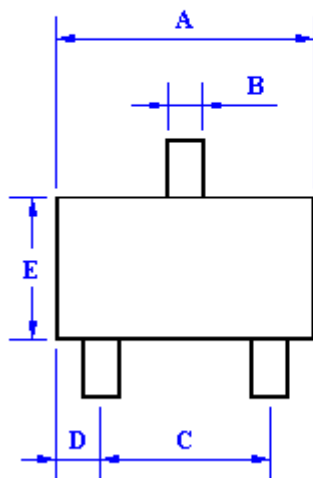
TO-92 DIMENSION

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

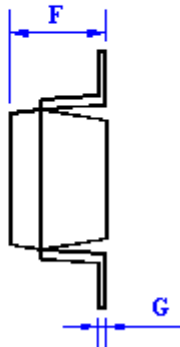
SOT-23 Mechanical drawing

SOT-23 Unit:mm

1.Top View



2. Side View



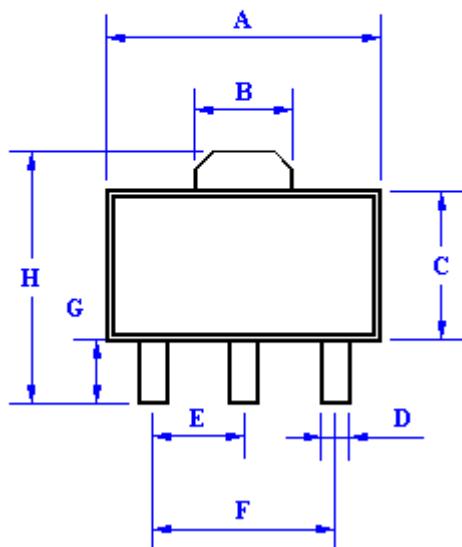
SOT-23 DIMENSION

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

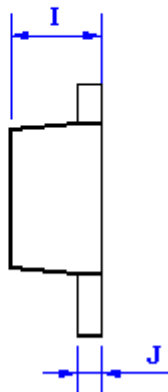
SOT-89 Mechanical drawing

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