

## RS432

### Adjustable Precision Shunt Regulator

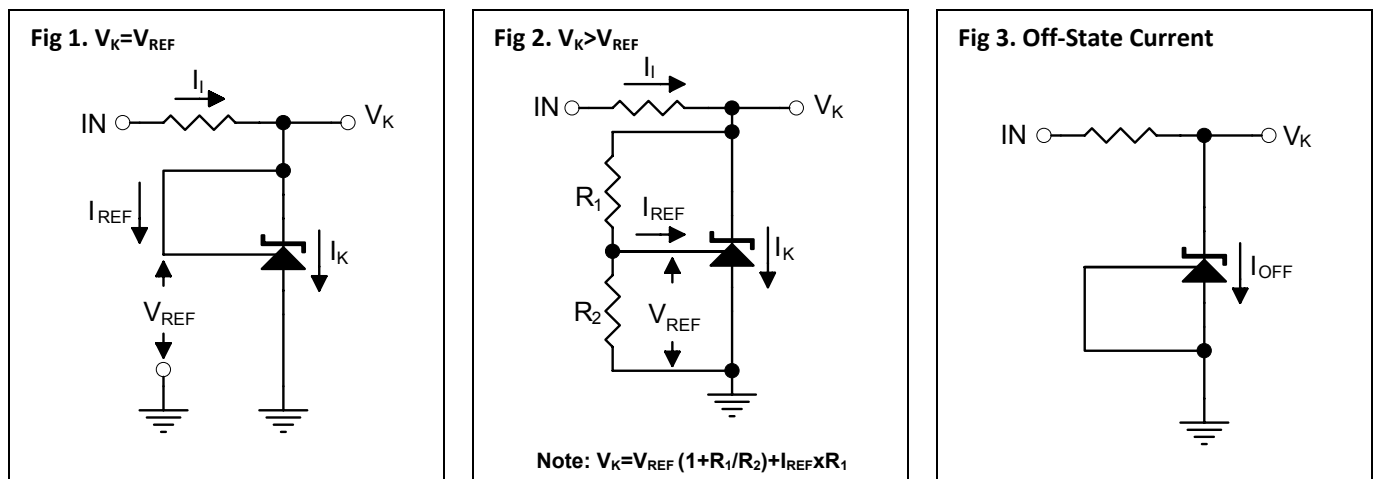
#### General Description

The RS432 series are three-terminal adjustable regulators with guaranteed thermal stability over applicable temperature ranges. The output voltage may be set to any value between  $V_{REF}$  (approximately 1.24 or 1.25 volts) and 18 volts with two external resistors. These devices have a typical dynamic output impedance of  $0.2\Omega$ . Active output circuitry provides a very sharp turn-on characteristic, making these devices excellent replacement for zener diodes in many applications.

#### Features

- Programmable Precise Output Voltage from 1.24V or 1.25V to 16V
- High Stability under Capacitive Load
- Low Dynamic Output Resistance:  $0.2\Omega$  Typical
- Fast turn on response
- Low Output Noise
- Wide Operating Range of  $-40$  to  $125^\circ\text{C}$
- Low Equivalent Full-range Temperature Coefficient with  $50\text{ppm}/^\circ\text{C}$  Typical
- SOT-23, SOT-89 and TO-92 Packages
- RoHS Compliant and 100% Lead (Pb)-Free and Green (Halogen Free with Commercial Standard)

#### Application Circuits

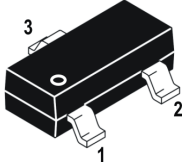


This integrated circuit can be damaged by ESD. Orister Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

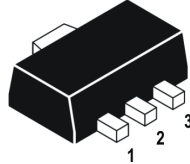
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## Pin Assignments

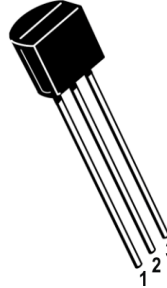
SOT-23



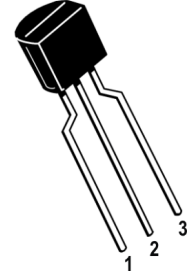
SOT-89



TO-92  
(STRAIGHT LEAD OPTION)



TO-92  
(FORMED LEAD OPTION)



PACKAGE	PIN	DESCRIPTION
SOT-23	1	REFERENCE
	2	CATHODE
	3	ANODE

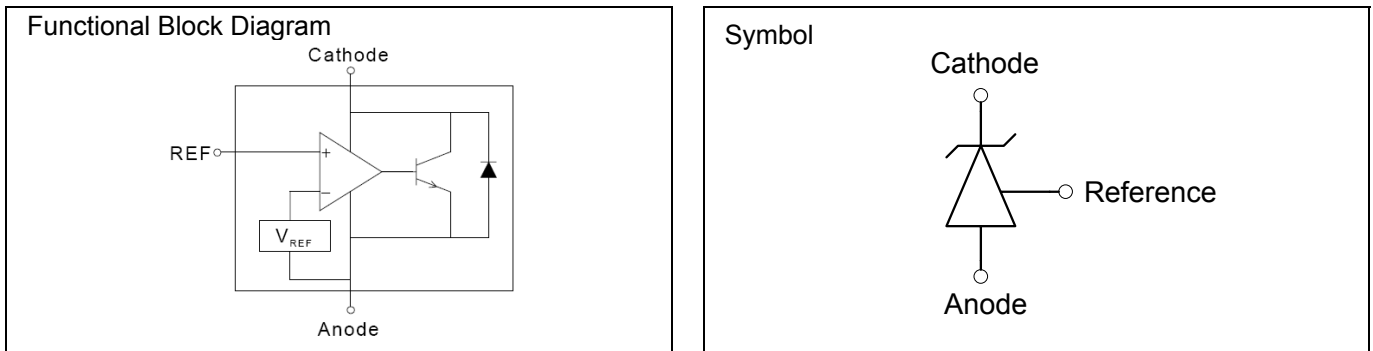
PACKAGE	PIN	DESCRIPTION
SOT-89	1	REFERENCE
	2	ANODE
	3	CATHODE

PACKAGE	PIN	DESCRIPTION
TO-92	1	REFERENCE
	2	ANODE
	3	CATHODE

## Ordering Information

DEVICE	DEVICE CODE
RS432 X YY Z	<p><b>X</b> is Reference voltage precision designator:</p> <p>A: 1.24V ±2.0%</p> <p>B: 1.24V ±1.0%</p> <p>C: 1.24V ±0.5%</p> <p>D: 1.25V ±2.0%</p> <p>E: 1.25V ±1.0%</p> <p>F: 1.25V ±0.5%</p> <p><b>YY</b> is package designator :</p> <p>N: SOT-23</p> <p>M: SOT-89</p> <p>A: TO-92 (Straight lead option)</p> <p>AT: TO-92 (Formed lead option)</p> <p><b>Z</b> is Lead Free designator :</p> <p>P: Commercial Standard, Lead (Pb) Free and Phosphorous (P) Free Package</p> <p>G: Green (Halogen Free with Commercial Standard)</p>

## Block Diagram



## Absolute Maximum Ratings (Operating temperature range applies unless otherwise specified)

Characteristics	Symbol	Value		Unit
Cathode Voltage	$V_{KA}$	18		V
Cathode Current Range (Continuous)	$I_K$	20		mA
Reference Input Current Range	$I_{REF}$	10		mA
Power Dissipation	$P_D$	SOT-23	370	mW
		SOT-89	770	
		TO-92	770	
		--	--	
Operating Temperature Range (Max.)	$T_{OPR}$	-40 - +125		°C
Storage Temperature Range	$T_{STG}$	-65 - +150		°C

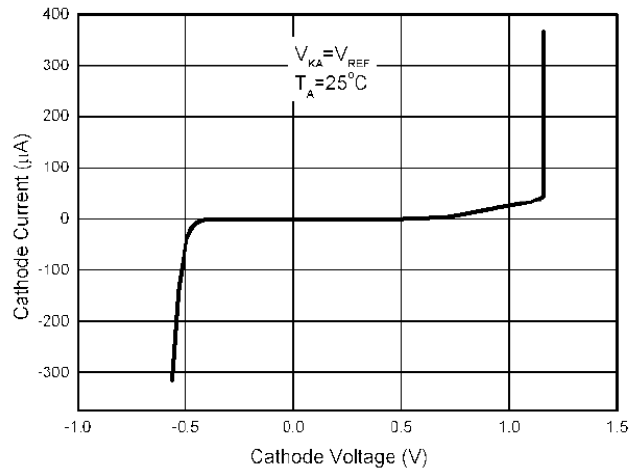
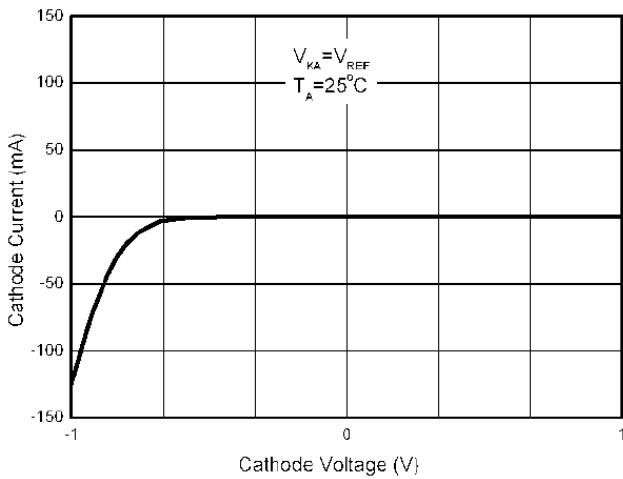
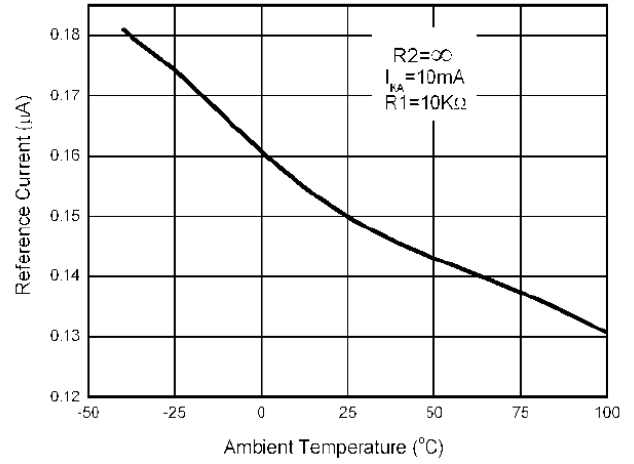
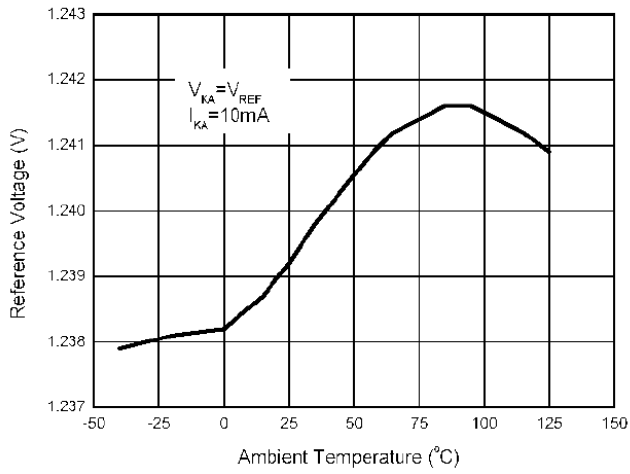
## Operating Conditions

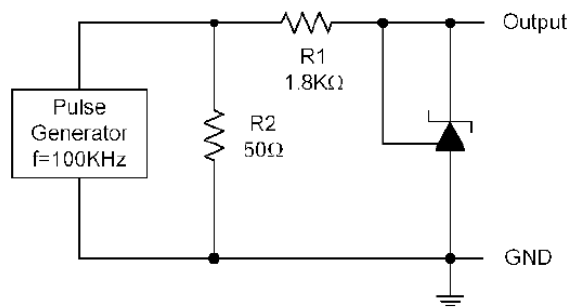
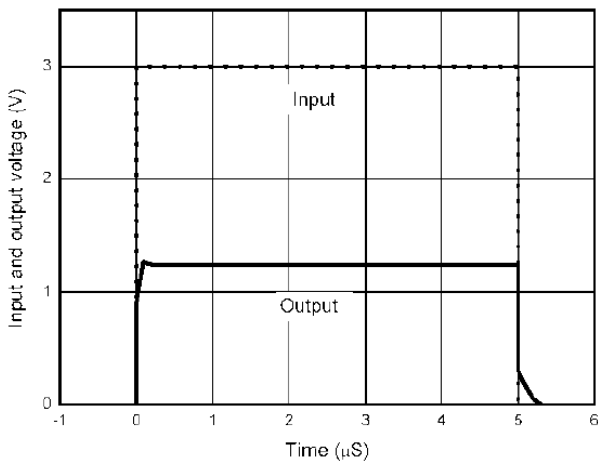
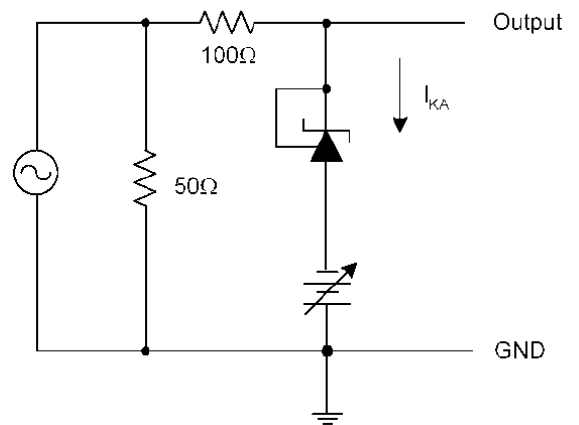
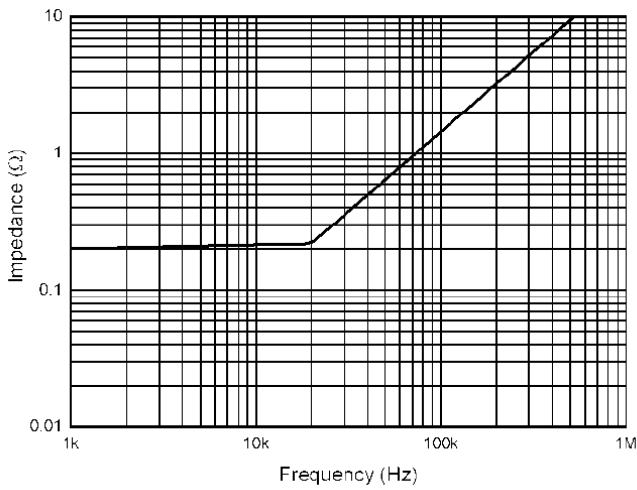
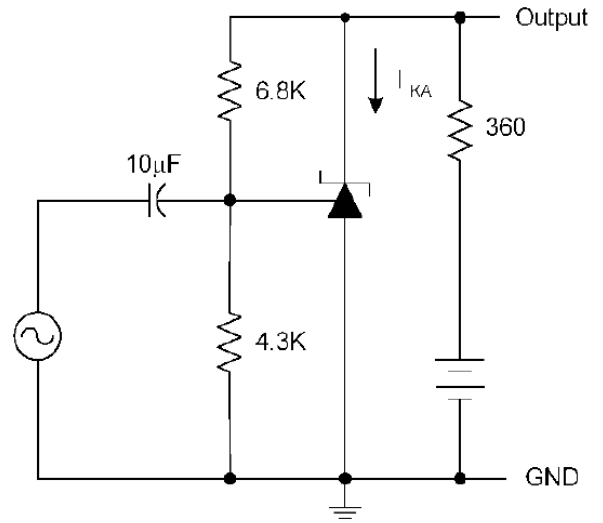
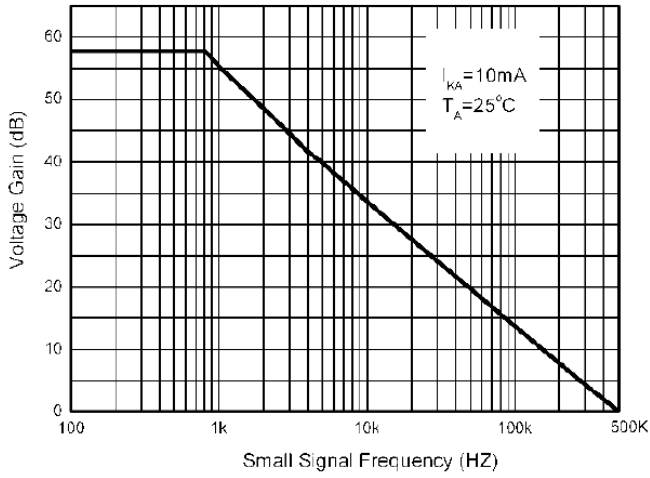
Characteristics	Symbol	Min.	Max.	Unit
Cathode Voltage	$V_{KA}$	$V_{REF}$	16	V
Cathode Current Range (Continuous)	$I_K$	0.1	20	mA
Operating Ambient Temperature Range	$T_{OPR}$	-40	125	°C

## Electrical Characteristics ( $T_A=25^\circ\text{C}$ , unless otherwise specified)

Characteristics	Symbol	Test Conditions	Min	Typ	Max	Unit	
Reference Input Voltage (Fig1)	$V_{REF}$	$V_K=V_{REF}, I_K=10\text{mA}$	1.24V $\pm$ 2.0%	1.215	1.24	1.265	V
			1.24V $\pm$ 1.0%	1.228	1.24	1.252	
			1.24V $\pm$ 0.5%	1.234	1.24	1.246	
			1.25V $\pm$ 2.0%	1.225	1.25	1.275	
			1.25V $\pm$ 1.0%	1.238	1.25	1.262	
			1.25V $\pm$ 0.5%	1.244	1.25	1.256	
Ratio of Change in Reference Input Voltage to the Change in Cathode Voltage (Fig2)	$\Delta V_{REF}/\Delta V_K$	$I_K=10\text{mA}, \Delta V_K=18\text{V to } V_{REF}$	-	1.0	2.7	mV/V	
Reference Input Current (Fig2)	$I_{REF}$	$I_K=10\text{mA}, R1=10\text{K}\Omega, R2=\infty$	-	0.15	0.5	$\mu\text{A}$	
Minimum Cathode Current for Regulation (Fig1)	$I_{K(\text{min})}$	$V_K=V_{REF}$	-	20	80	$\mu\text{A}$	
Off-State Cathode Current (Fig3)	$I_{K(\text{off})}$	$V_K=6\text{V}, V_{REF}=0$	-	0.01	0.05	$\mu\text{A}$	
		$V_K=16\text{V}, V_{REF}=0$	-	0.04	0.15		
Dynamic Output Impedance (Fig1)	$Z_K$	$V_K=V_{REF}, f \leq 1\text{kHz}, I_K=100\mu\text{A to } 20\text{mA}$	-	0.2	0.4	$\Omega$	

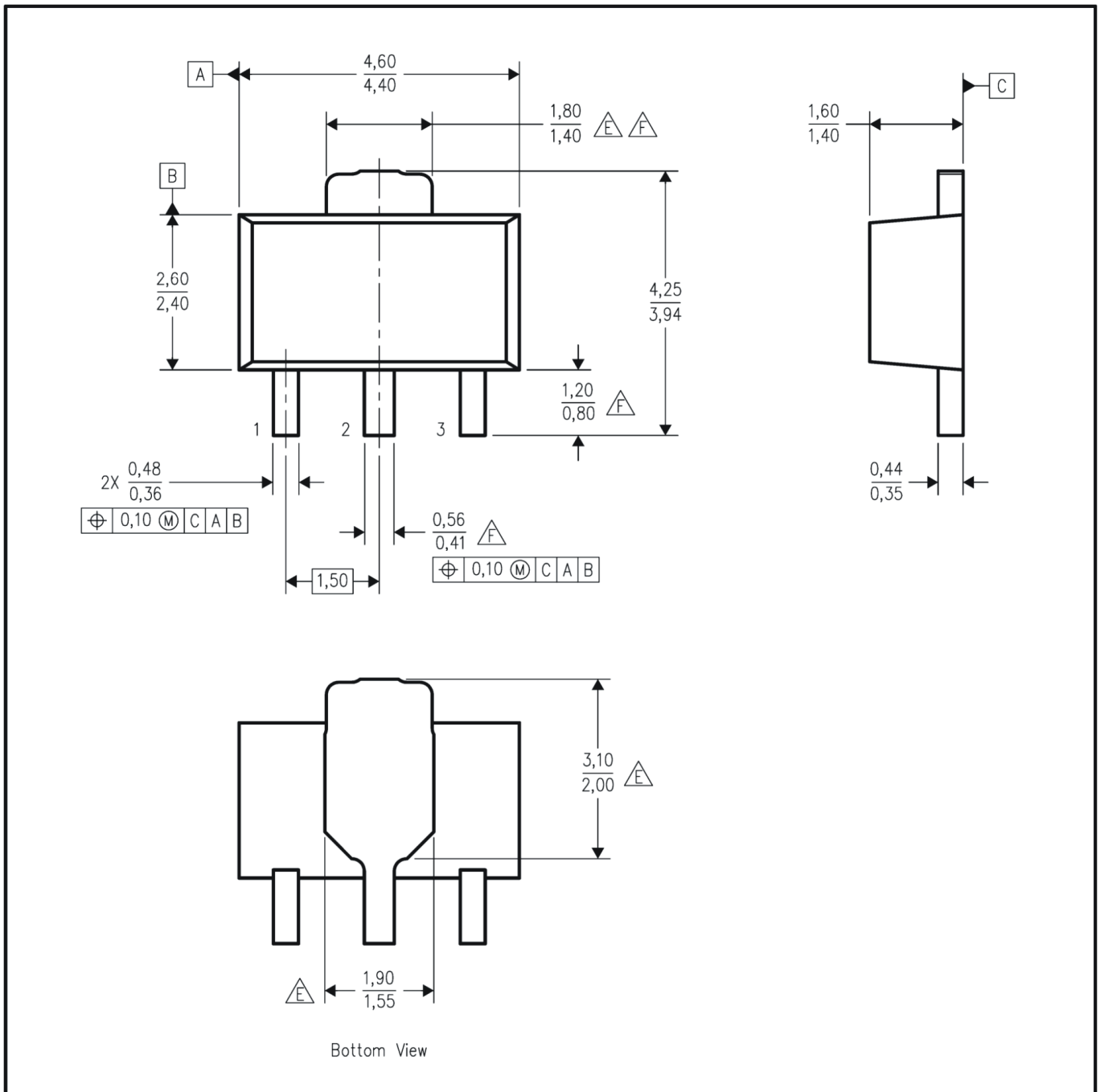
## Typical Performance Characteristics







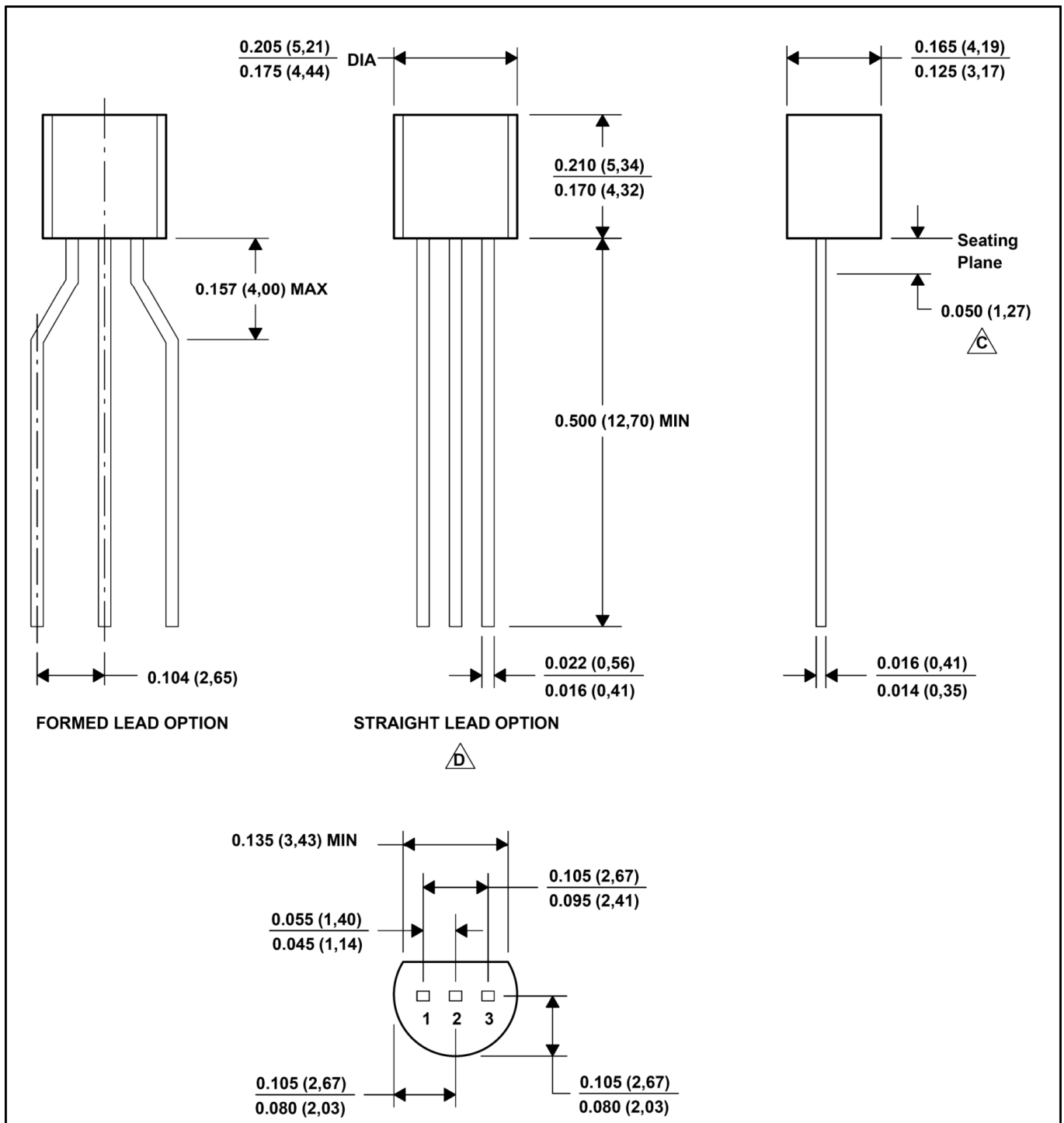
## SOT-89 Dimension



### NOTES:

- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. The center lead is in electrical contact with the tab.
- D. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
- E. Thermal pad contour optional within these dimensions.
- F. Falls within JEDEC TO-243 variation AA, except minimum lead length, pin 2 minimum lead width, minimum tab width.

## TO-92 Dimension



**NOTES:**

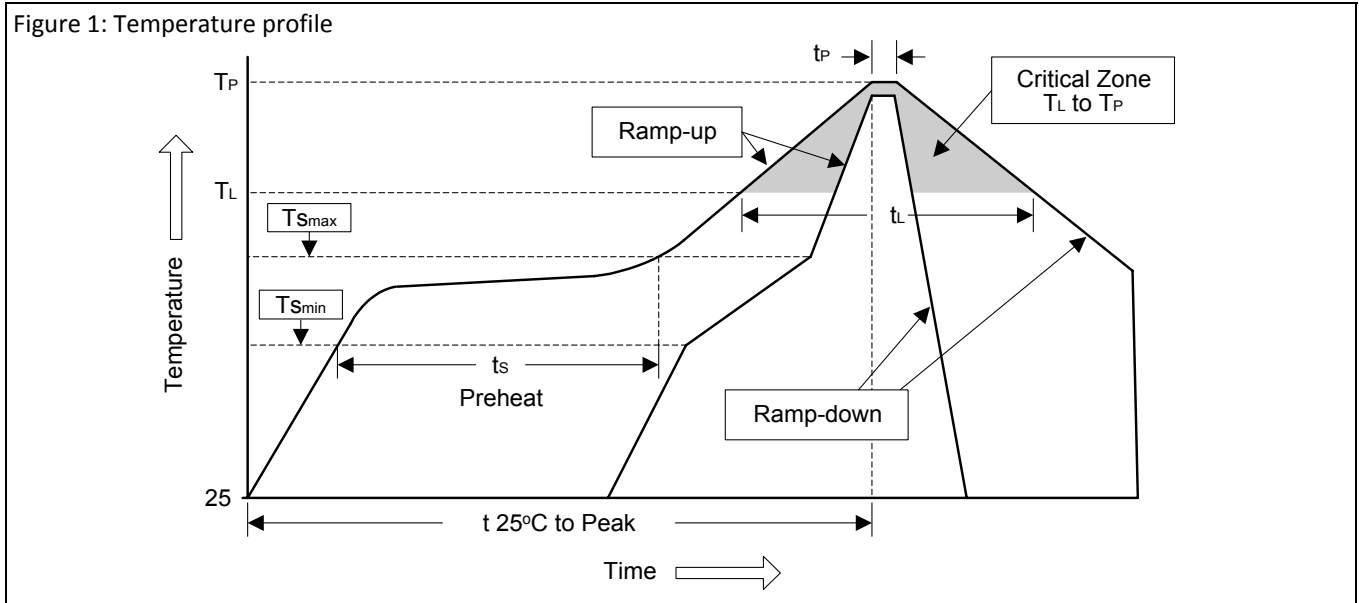
- G. All linear dimensions are in inches (millimeters).
- H. This drawing is subject to change without notice.
- I. Lead dimensions are not controlled within this area.
- J. Falls within JEDEC TO-226 variation AA (TO-226 replaces TO-92)
- K. Shipping Method:
  - Straight lead option available in bulk pack only.
  - Formed lead option available in tape & reel or ammo pack.



## Soldering Methods for Orister's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%
2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	<3°C/sec	<3°C/sec
Preheat		
- Temperature Min ( $T_{Smin}$ )	100°C	150°C
- Temperature Max ( $T_{Smax}$ )	150°C	200°C
- Time (min to max) ( $t_s$ )	60~120 sec	60~180 sec
$T_{Smax}$ to $T_L$		
- Ramp-up Rate	<3°C/sec	<3°C/sec
Time maintained above:		
- Temperature ( $T_L$ )	183°C	217°C
- Time ( $t_L$ )	60~150 sec	60~150 sec
Peak Temperature ( $T_P$ )	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

### 3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec

## ***Important Notice:***

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