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 0.2Ω. 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: 0.2Ω Typical
- Fast turn on response
- Low Output Noise
- Wide Operating Range of -40 to 125°C
- Low Equivalent Full-range Temperature Coefficient with 50ppm/°C Typical
- SOT-23, SOT-89 and TO-92 Packages
- RoHS Compliant and 100% Lead (Pb)-Freeand Green (Halogen Free with CommercialStandard)

Application Circuits

Fig 1. $V_K=V_{REF}$

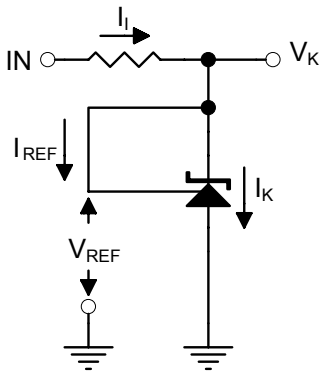
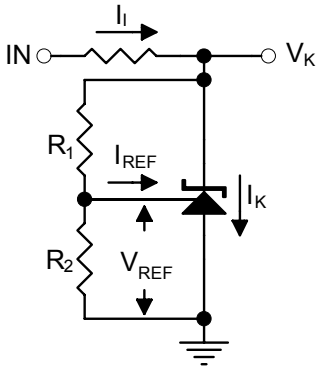
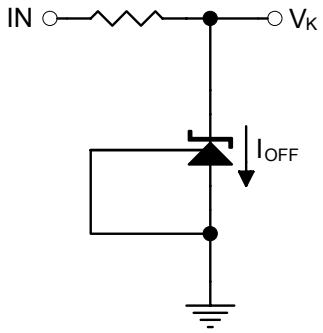


Fig 2. $V_K>V_{REF}$



Note: $V_K=V_{REF}(1+R_1/R_2)+I_{REF}xR_1$

Fig 3. Off-State Current



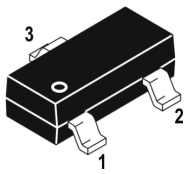


This integrated circuit can be damaged by ESD. Orister Corporation recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

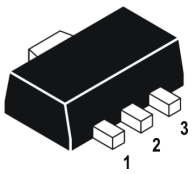
ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

Pin Assignments

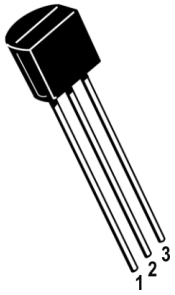
SOT-23



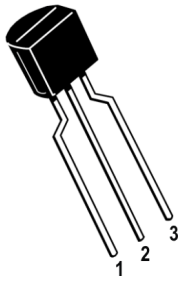
SOT-89



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

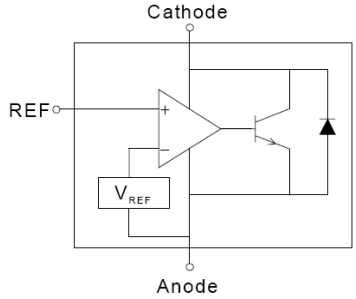
PACKAGE	PIN	DESCRIPTION
TO-92	1	REFERENCE
	2	ANODE
	3	CATHODE

Ordering Information

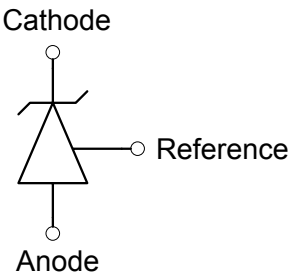
DEVICE	DEVICE CODE
RS432 X YY Z	**X** is Reference voltage precision designator: A: 1.24V ±2.0% B: 1.24V ±1.0% C: 1.24V ±0.5% D: 1.25V ±2.0% E: 1.25V ±1.0% F: 1.25V ±0..5% **YY** is package designator : N: SOT-23 M: SOT-89 A: TO-92 (Straight lead option) AT: TO-92 (Formed lead option) **Z** is Lead Free designator : P: Commercial Standard, Lead (Pb) Free and Phosphorous (P) Free Package G: Green (Halogen Free with Commercial Standard)

Block Diagram

Functional Block Diagram



Symbol



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

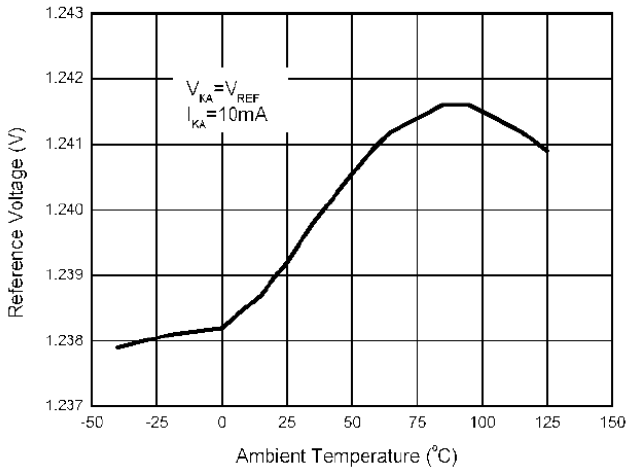
Operating Conditions

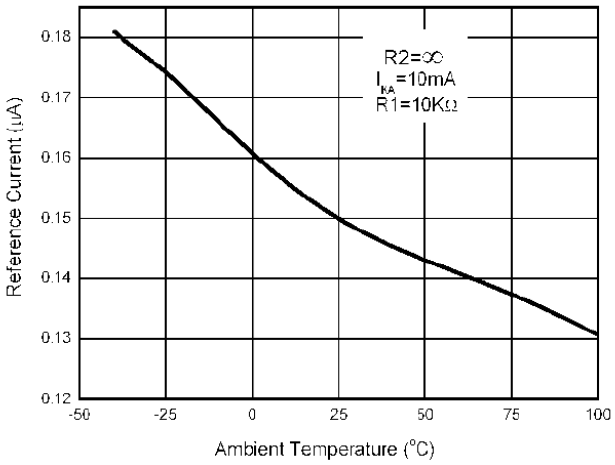
Characteristics	Symbol	Min.	Max.	Unit
Cathode Voltage	V_{KA}	V_{REF}	16	V
Cathode Current Range (Continuous)	I_K	0.1	20	mA
Operating Ambient Temperature Range	T_{OPR}	-40	125	°C

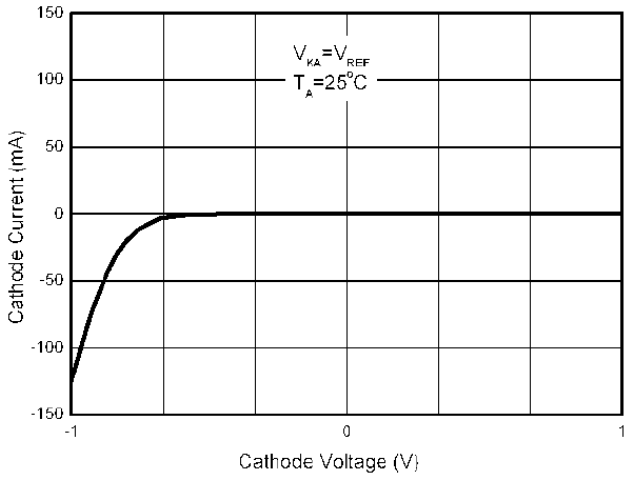
Electrical Characteristics (T_A=25°C, unless otherwise specified)

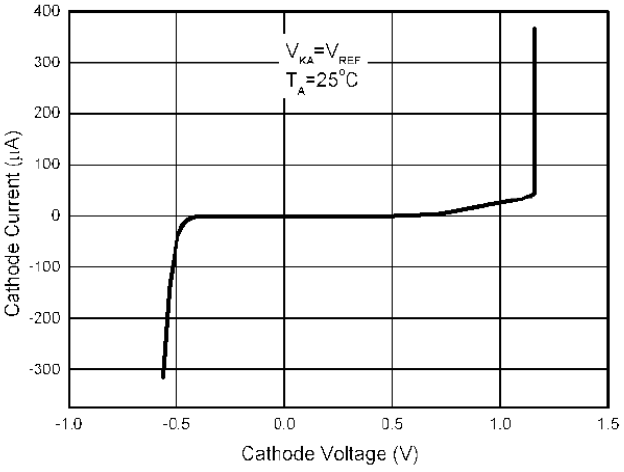
Characteristics		Symbol	Test Conditions	Min	Typ	Max	Unit
Reference Input Voltage (Fig1)	1.24V ±2.0%	V_{REF}	V_K=V_{REF}, I_K=10mA	1.215	1.24	1.265	V
	1.24V ±1.0%			1.228	1.24	1.252	
	1.24V ±0.5%			1.234	1.24	1.246	
	1.25V ±2.0%			1.225	1.25	1.275	
	1.25V ±1.0%			1.238	1.25	1.262	
	1.25V ±0.5%			1.244	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=10mA,, ΔV_K=18V to V_{REF}	-	1.0	2.7	mV/V
Reference Input Current (Fig2)		I_{REF}	I_K=10mA, R1=10KΩ, R2=∞	-	0.15	0.5	uA
Minimum Cathode Current for Regulation (Fig1)		$I_{K(min)}$	V_K=V_{REF}	-	20	80	uA
Off-State Cathode Current (Fig3)		$I_{K(off)}$	V_K=6V, V_{REF}=0	-	0.01	0.05	uA
			V_K=16V, V_{REF}=0		0.04	0.15	
Dynamic Output Impedance (Fig1)		Z_K	V_K=V_{REF}, f≤1kHz, I_K=100uA to 20mA	-	0.2	0.4	Ω

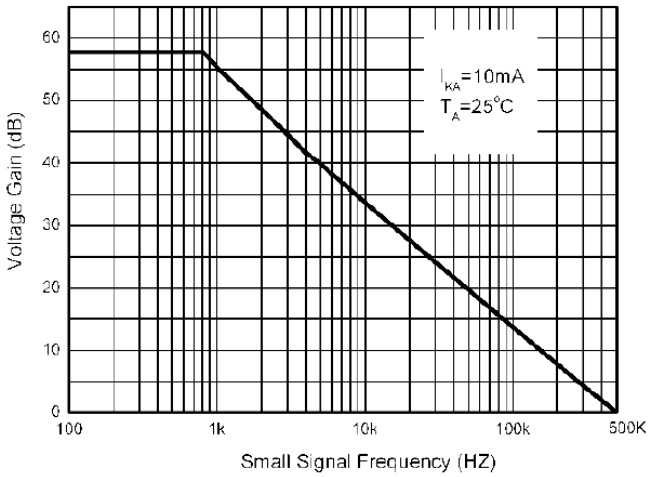
Typical Performance Characteristics

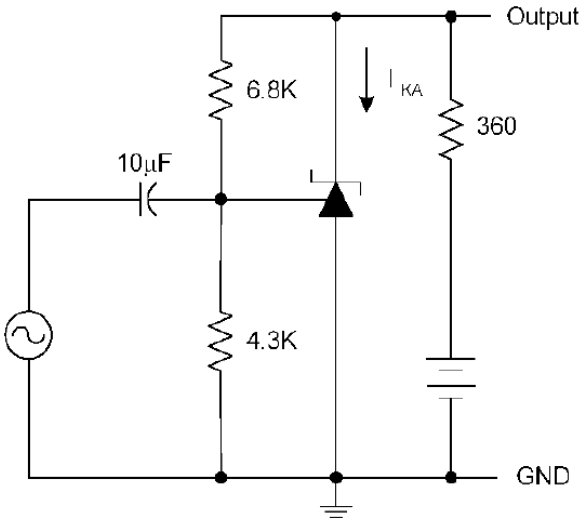


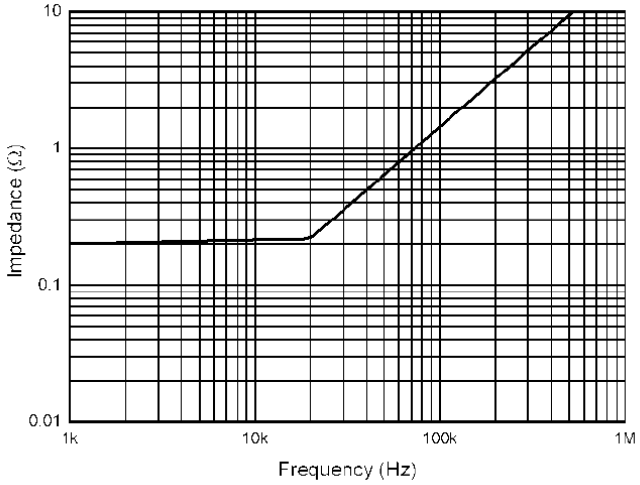


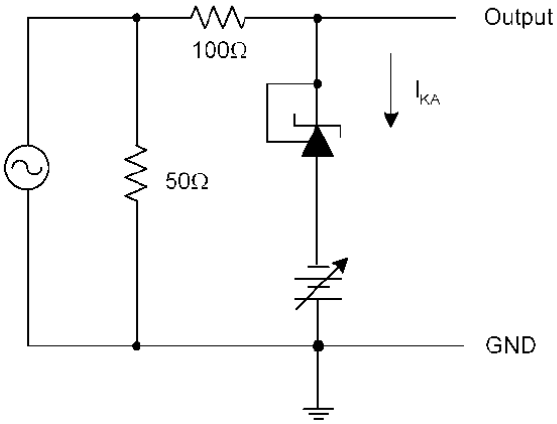


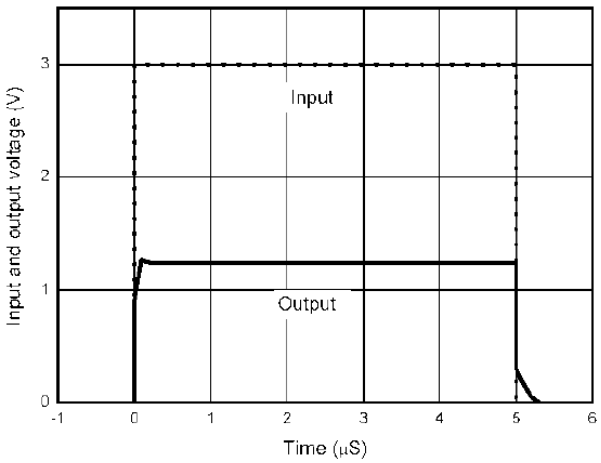


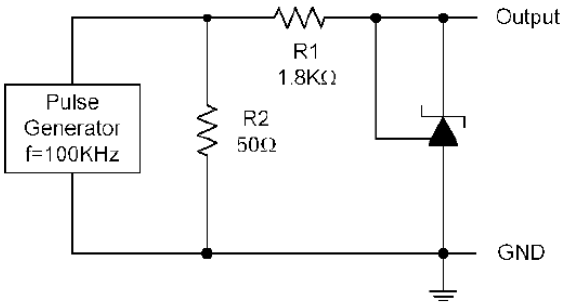

Voltage Gain (dB)
60
50
40
30
20
10
0
100
1k
10k
100k
500K
Small Signal Frequency (HZ)
I_{KA}=10mA
T_A=25°C


Output
6.8K
I_{KA}
360
10μF
4.3K
GND

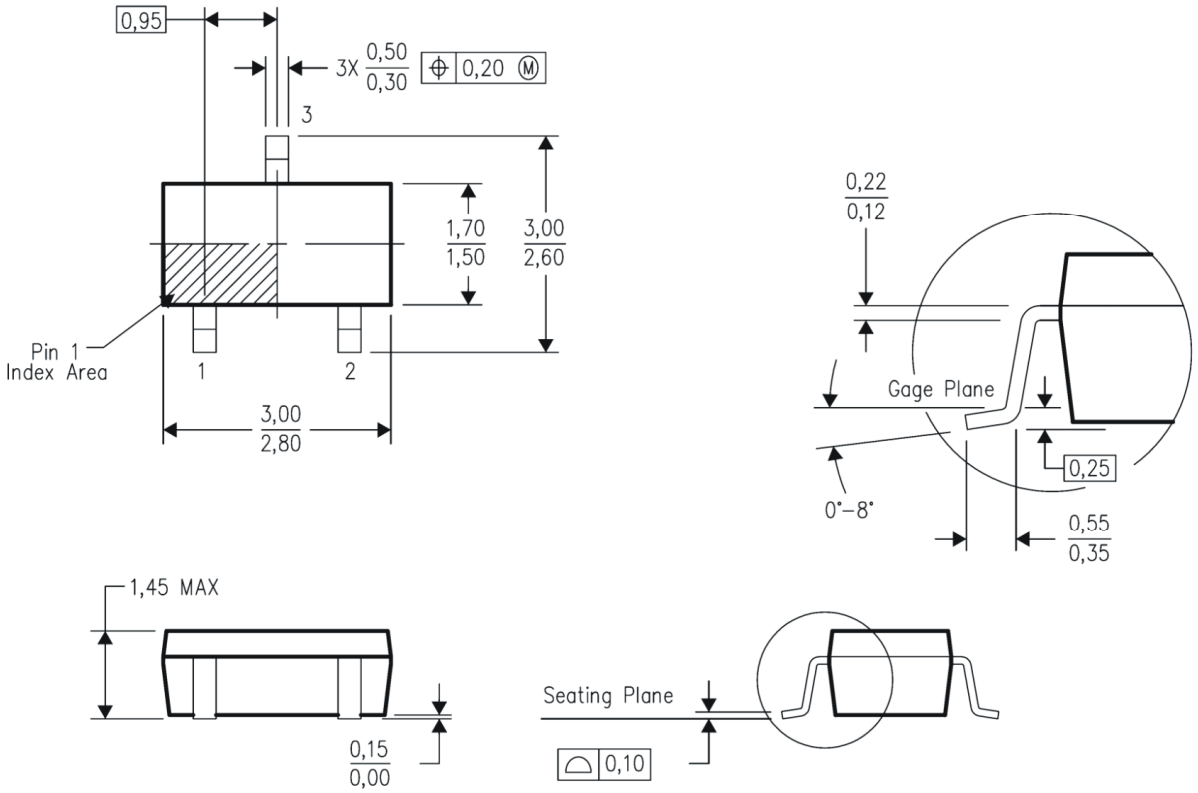

Impedance (Ω)
10
1
0.1
0.01
1k
10k
100k
1M
Frequency (Hz)


Output
100Ω
I_{KA}
50Ω
GND


Input and output voltage (V)
3
2
1
0
-1
0
1
2
3
4
5
6
Input
Output
Time (μS)


Output
R1
1.8KΩ
Pulse
Generator
f=100KHz
R2
50Ω
GND

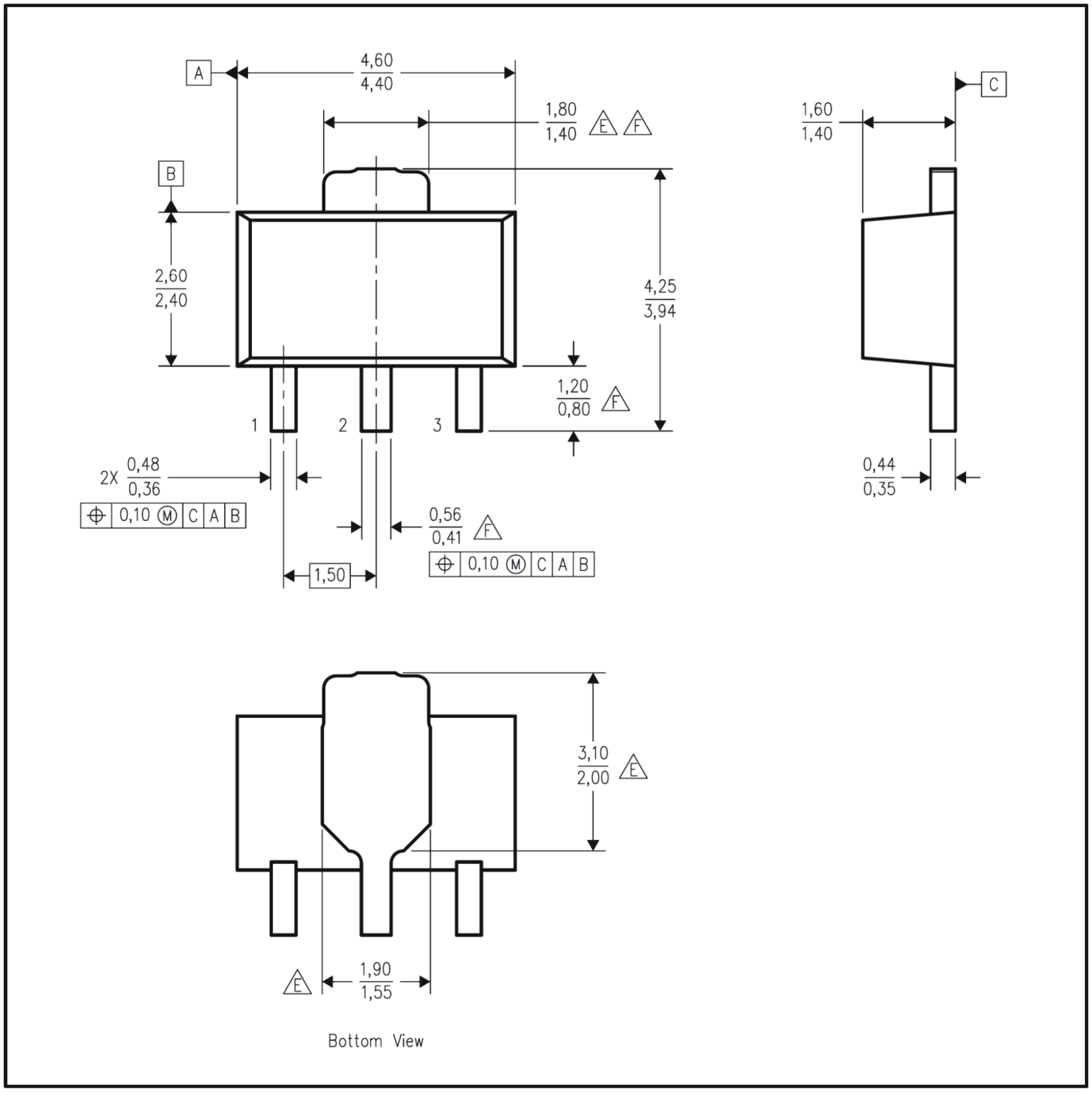
SOT-23 Dimension



NOTES:

A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.

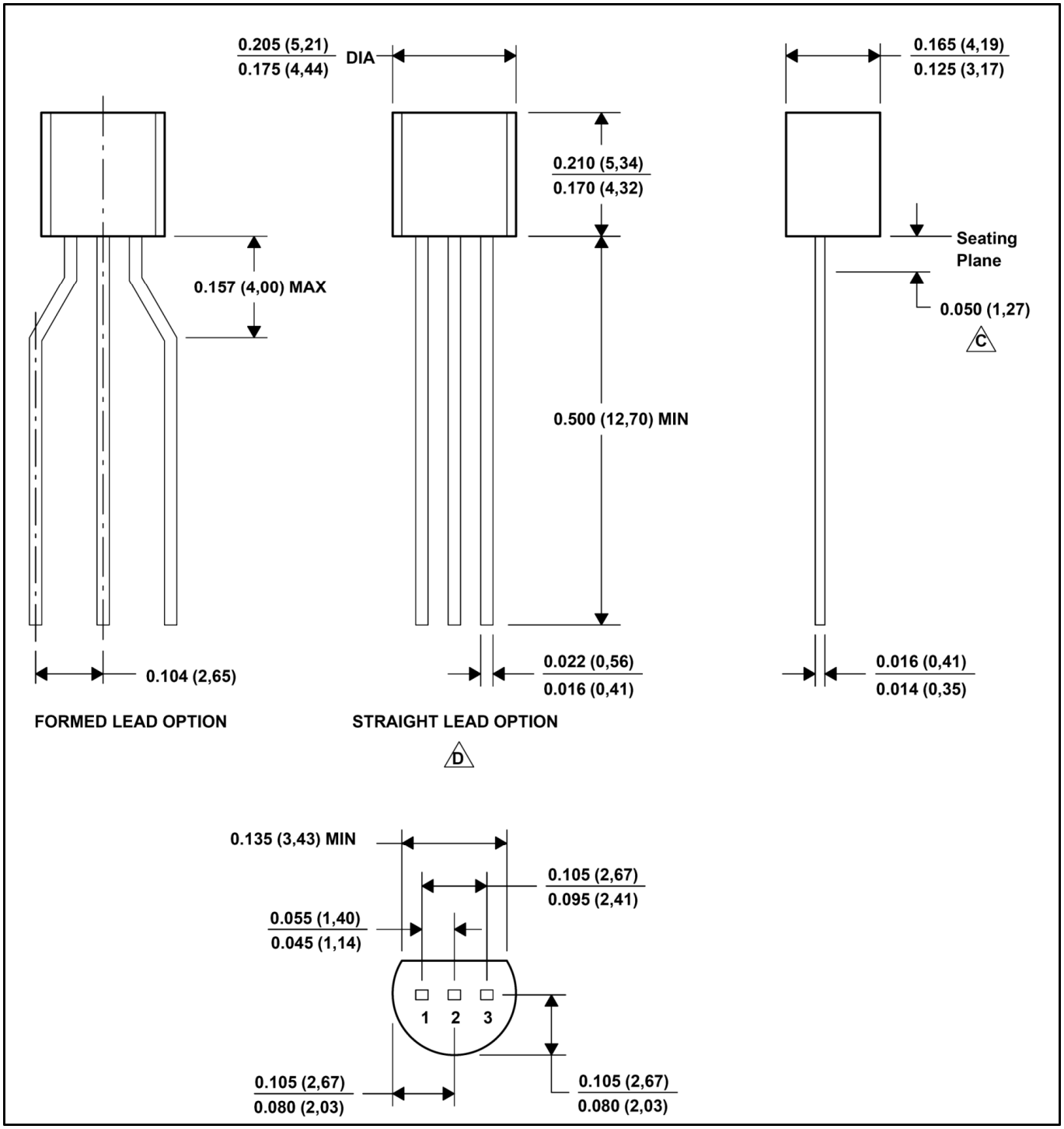
SOT-89 Dimension



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:

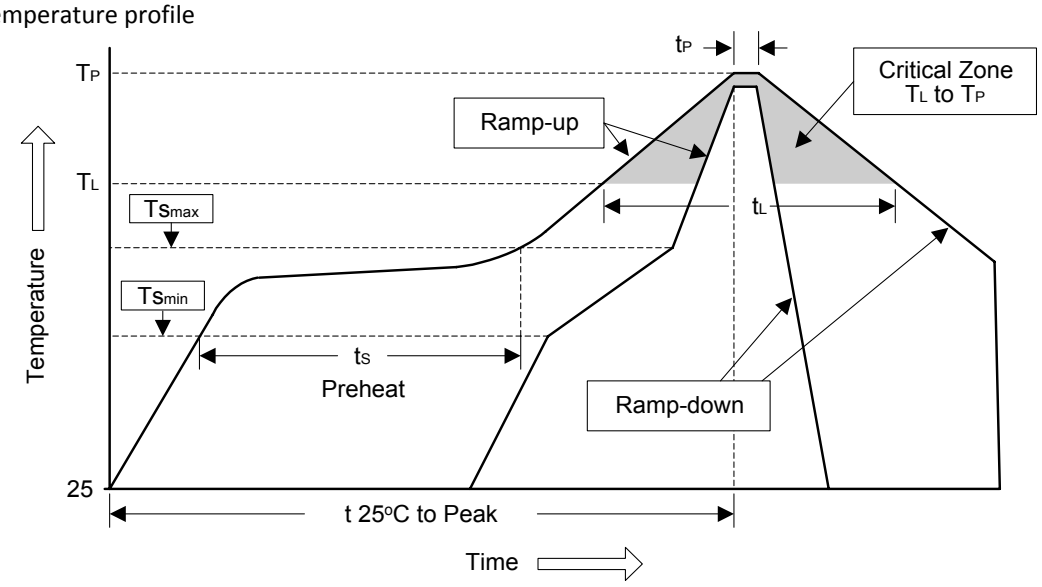
G. All linear dimensions are in inches (millimeters).
H. This drawing is subject to change without notice.
I. Lead dimensions are not controlled within this area.
J. Falls within JEDEC TO-226 variation AA (TO-226 replaces TO-92)
K. Shipping Method:
   Straight lead option available in bulk pack only.
   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 (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 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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