

General Description

The AHK432 is a low voltage adjustable shunt reference with thermal stability guaranteed over the full industrial temperature range. This three-terminal regulator has an output voltage range that extends from V_{REF} (1.24V) to 20V, giving designers outstanding flexibility in the development of power supplies and instrumentation. With a low operating current of 60 μ A, the AHK432 is well suited for battery-powered portable electronic applications. It also has a sharp turn-on characteristic and a dynamic resistance of only 50m Ω , making it an excellent replacement for zener diodes in low tempco designs.

The AHK432 is available in the Pb-free, surface-mount 3- or 5-pin SOT23, as well as the through hole TO-92. Three voltage tolerance options are offered in each package: $\pm 0.5\%$, $\pm 1\%$, and $\pm 2\%$.

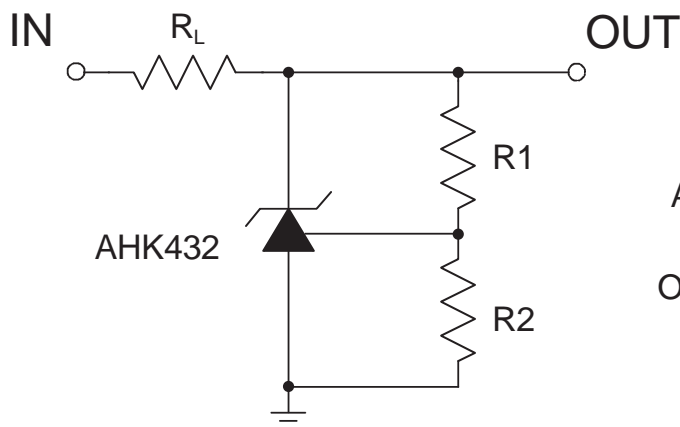
Features

- Wide Output Voltage Range (1.24V to 20V)
- Operating Current From 60 μ A to 100mA
- Low Dynamic Output Resistance of 50m Ω
- $\pm 0.5\%$ Trimmed Voltage Reference
- 10mV (Typical) V_{REF} Deviation, From -40°C to +105°C
- Surface Mount 3- or 5-Pin SOT23 or Through-Hole 3-Pin TO-92 Package

Applications

- Adjustable and Programmable Supplies
- Global Voltage Reference for Multiple Power Supplies
- Instrumentation
- Isolated Feedback in Switching Power Supplies
- Linear Regulators (External Reference)
- Medical Electronics (see Endnote, page 10)
- Notebook Computers

Typical Application



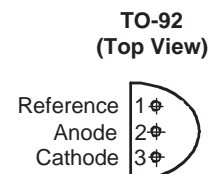
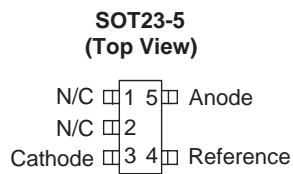
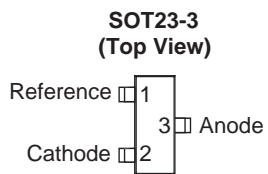
Adjustable regulator:

$$OUT = V_{REF} \left(\frac{R1 + R2}{R2} \right)$$

Pin Descriptions

Pin			Description
SOT23-3	SOT23-5	TO-92	
1	4	1	Reference.
2	3	3	Cathode.
3	5	2	Anode.
N/A	1, 2	N/A	Not internally connected.

Pin Configuration



Absolute Maximum Ratings¹

$T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Description	Value	Units
V_Z	Cathode Voltage	20	V
I_Z	Continuous Cathode Current	100	mA
I_{REF}	Reference Current	3	mA
T_J	Operating Junction Temperature Range	-40 to 150	$^\circ\text{C}$
T_{LEAD}	Maximum Soldering Temperature (at Leads)	260	$^\circ\text{C}$

Thermal Characteristics

Symbol	Description	Package	Value	Units
Θ_{JA}	Maximum Thermal Resistance	TO-92	160	$^\circ\text{C}/\text{W}$
		SOT23-3, SOT23-5	410	
P_D	Maximum Power Dissipation	TO-92	780	mW
		SOT23-3, SOT23-5	300	

1. Stresses above those listed in Absolute Maximum Ratings may cause permanent damage to the device. Functional operation at conditions other than the operating conditions specified is not implied. Only one Absolute Maximum Rating should be applied at any one time.

Electrical Characteristics

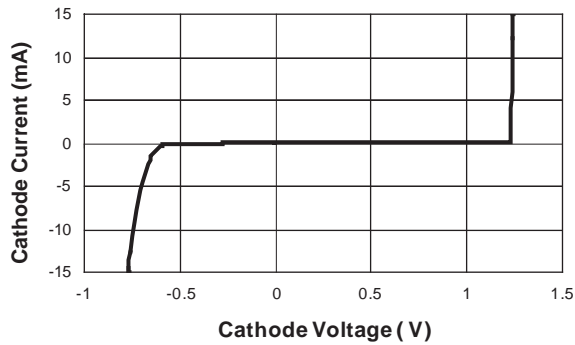
$T_A = 25^\circ\text{C}$, unless otherwise noted.

Symbol	Description	Conditions	AHK432 0.5%			AHK432 1.0%			AHK432 2.0%			Units	
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
V_{REF}	Reference Voltage	$V_Z = V_{REF}$ $I_Z = 10\text{mA}$ (test circuit 1)	$T_A = 25^\circ\text{C}$	1.234	1.240	1.246	1.228	1.240	1.252	1.215	1.240	1.265	V
			$T_A = -40$ to $+105^\circ\text{C}$	1.222		1.258	1.215		1.265	1.200		1.280	
V_{DEV}	V_{REF} Temp Deviation	$T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$, $V_Z = V_{REF}$, $I_Z = 10\text{mA}$ (test circuit 1)		10	25		10	25		10	25	mV	
$\frac{\Delta V_{REF}}{\Delta V_Z}$	Ratio of Change in V_{REF} to Change in Cathode Voltage	$I_Z = 10\text{mA}$, $\Delta V_Z = 16\text{V}$ to V_{REF} (test circuit 2)		-1.0	-2.7		-1.0	-2.7		-1.0	-2.7	mV/V	
I_{REF}	Reference Input Current	$R1 = 10\text{k}\Omega$, $R2 = \infty$, $I_Z = 10\text{mA}$ (test circuit 2)		0.15	0.5		0.15	0.5		0.15	0.5	μA	
$I_{REF(DEV)}$	I_{REF} Temp Deviation	$T_A = -40^\circ\text{C}$ to $+105^\circ\text{C}$ $R1 = 10\text{k}\Omega$, $R2 = \infty$, $I_Z = 10\text{mA}$ (test circuit 2)		0.1	0.4		0.1	0.4		0.1	0.4	μA	
$I_{Z(OFF)}$	Off State Cathode Current	$V_{REF} = 0\text{V}$ (test circuit 3)	$V_Z = 6\text{V}$	0.04	0.1		0.04	0.1		0.04	0.1	μA	
			$V_Z = 16\text{V}$	0.04	0.5		0.04	0.5		0.04	0.5		
R_Z	Dynamic Output Impedance	$f < 1\text{kHz}$, $V_Z = V_{REF}$, $I_Z = 100\mu\text{A}$ to 100mA (test circuit 1)		0.05	0.2		0.05	0.2		0.05	0.2	Ω	
$I_{Z(MIN)}$	Minimum Operating Current	$V_Z = V_{REF}$ (test circuit 1)		60	80		60	80		60	80	μA	

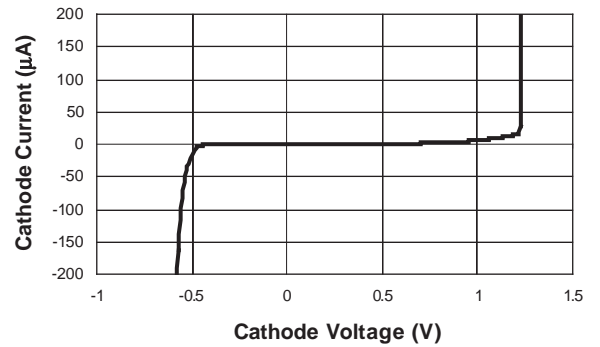
Typical Characteristics

Unless otherwise noted, $T_A = 25^\circ\text{C}$, $I_Z = 10\text{mA}$.

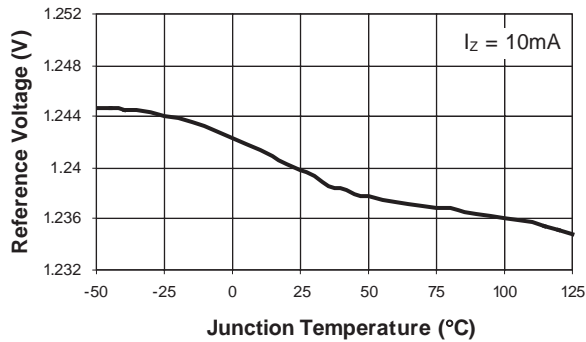
Cathode Current vs. Cathode Voltage



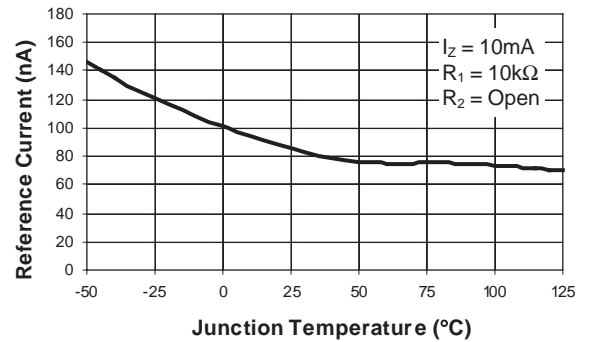
Cathode Current vs. Cathode Voltage



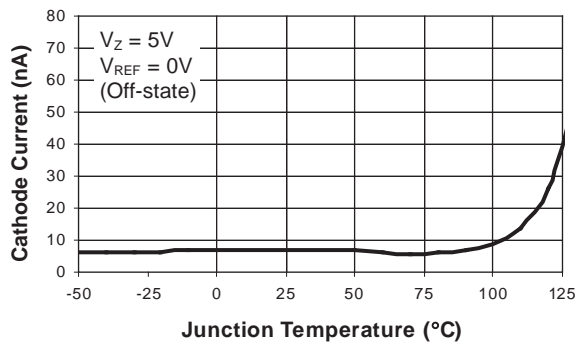
Reference Voltage vs. Temperature



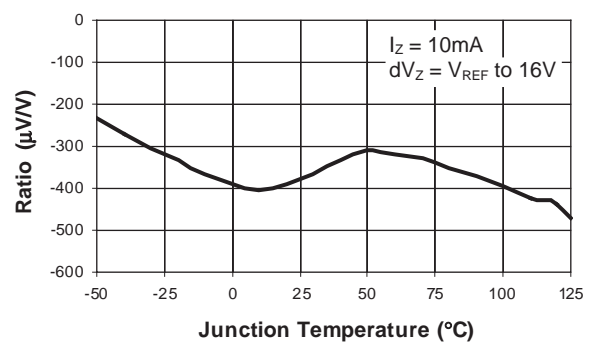
Reference Current vs. Temperature



Cathode Current vs. Temperature



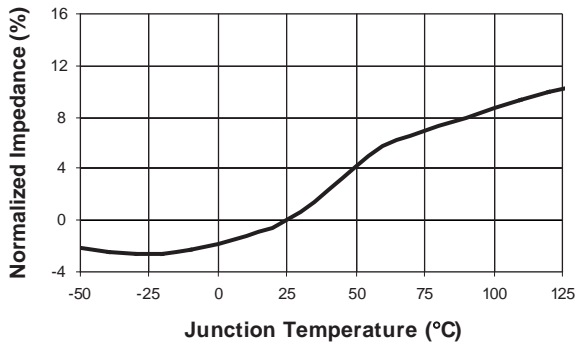
Ratio of $\Delta V_{REF} / \Delta V_Z$ vs. Temperature



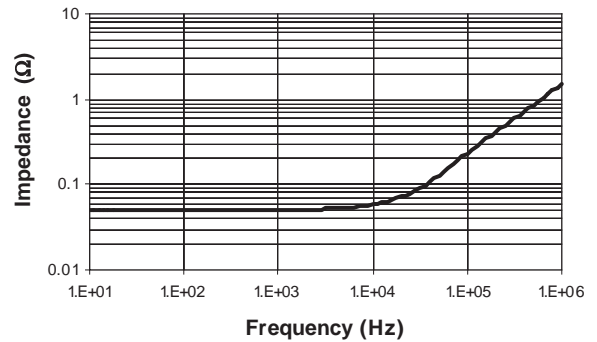
Typical Characteristics

Unless otherwise noted, $T_A = 25^\circ\text{C}$, $I_Z = 10\text{mA}$.

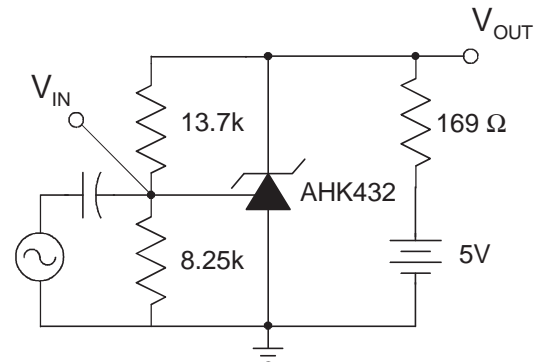
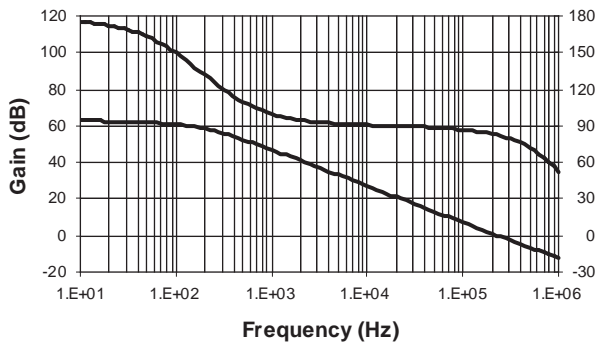
Cathode Impedance vs. Temperature



Impedance vs. Frequency

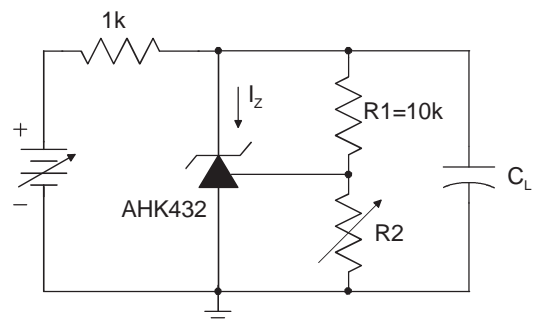
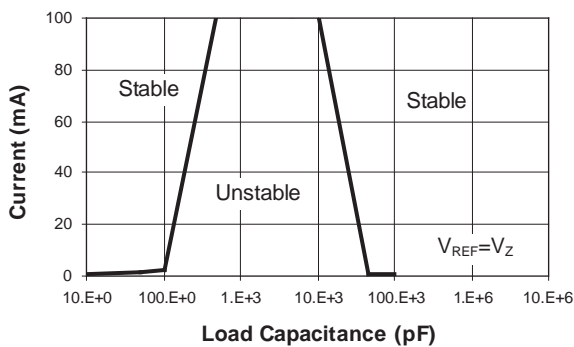


Gain and Phase vs. Frequency



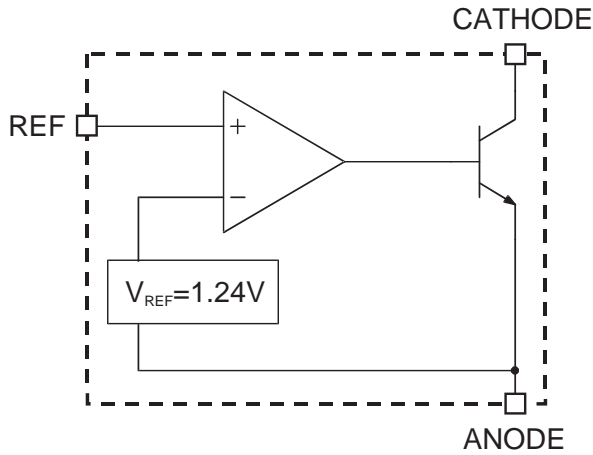
Test Circuit for Voltage Gain and Phase

Stability Boundary

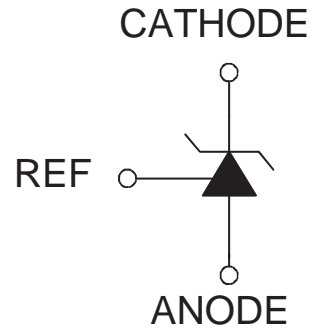


Test Circuit for Stability

Functional Block Diagram

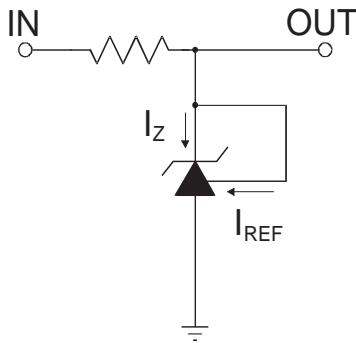


Symbol Diagram

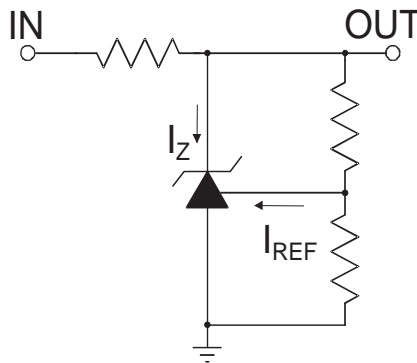


Test Circuits

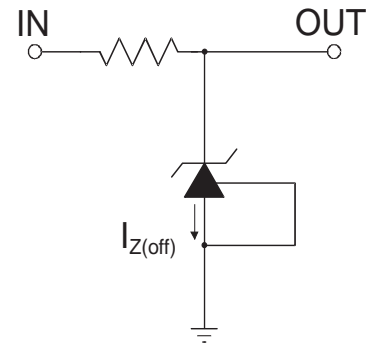
Test Circuit 1



Test Circuit 2



Test Circuit 3



Ordering Information¹

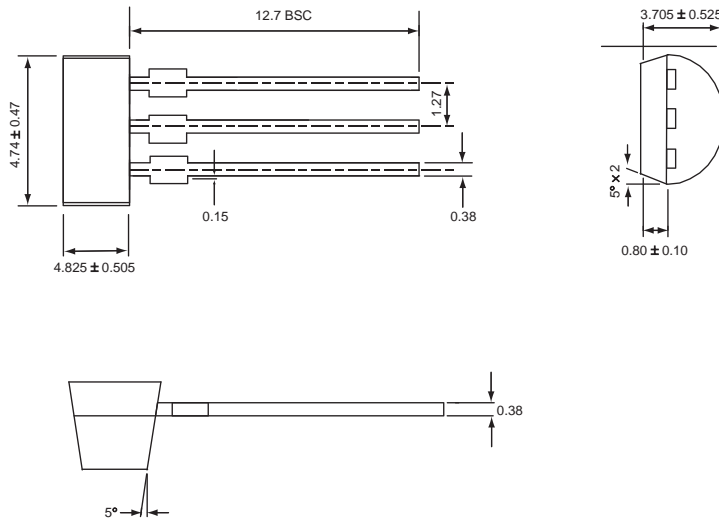
Package	Bulk or Tape and Reel	Tolerance		
		0.5%	1.0%	2.0%
SOT23-3	Bulk	N/A	N/A	N/A
SOT23-5		N/A	N/A	N/A
TO92		AHK432ILY-.5-B1	AHK432ILY-1-B1	AHK432ILY-2-B1
SOT23-3	Tape and Reel	AHK432IGY-.5-T1	AHK432IGY-1-T1	N/A
SOT23-5		AHK432IGV-.5-T1	AHK432IGV-1-T1	N/A
TO-92	Ammo	AHK432ILY-.5-A1	AHK432ILY-1-A1	AHK432ILY-2-A1



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Package Information

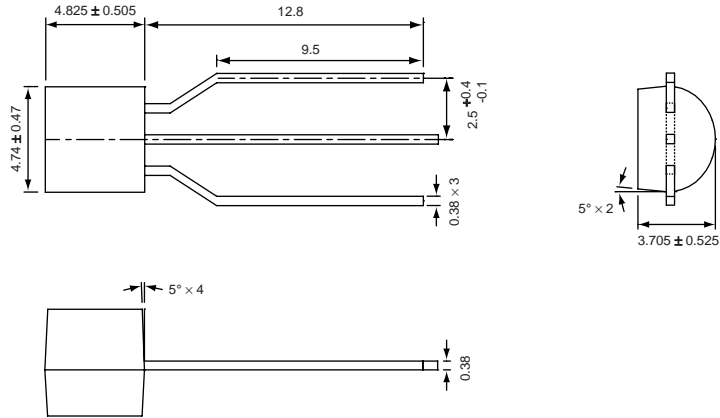
TO-92 (Bulk packing option)



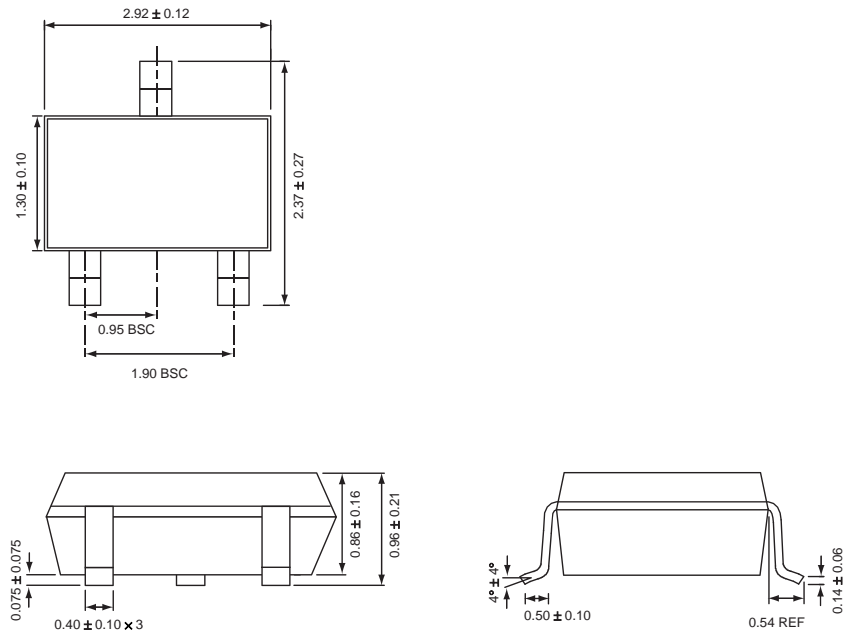
All dimensions in millimeters.

1. Sample stock is generally held on part numbers listed in **BOLD**.

TO-92 (Ammo packing option)

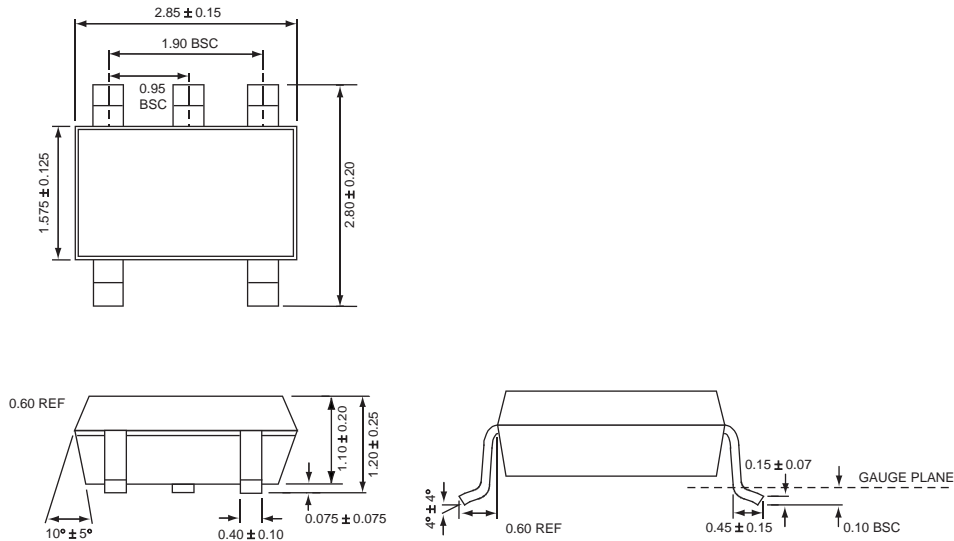


SOT23-3



All dimensions in millimeters.

SOT23-5



All dimensions in millimeters.

Endnote:

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