

### General Description

The AHK432 is a low voltage adjustable shunt reference with thermal stability guaranteed over the full industrial temperature range. This 3-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 $\mu$ 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 $\Omega$  making it an excellent replacement for zener diodes in low tempco designs.

The AHK432 is available in the surface-mount 3 or 5 pin SOT-23, as well as the through hole TO-92. Three voltage tolerance options are offered in each package:  $\pm 0.5\%$ ,  $\pm 1\%$ , and  $\pm 2\%$ .

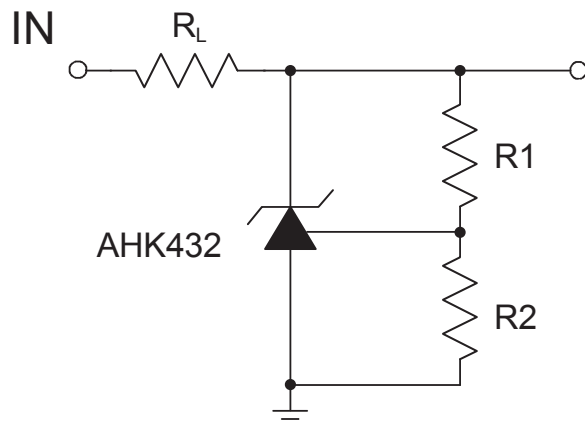
### Features

- Wide output voltage range (1.24 to 20V)
- Operating current from 60 $\mu$ A to 100mA
- Low dynamic output resistance of 50m $\Omega$
- $\pm 0.5\%$  trimmed voltage reference
- 10mV typ.  $V_{REF}$  deviation, from -40 to +105 $^{\circ}$ C
- Surface mount 3 or 5 pin SOT-23 or through-hole 3 pin TO-92 packages

### Applications

- Notebook computers
- Isolated feedback in switching power supplies
- Adjustable and programmable supplies
- Linear regulators (External Reference)
- Instrumentation
- Medical Electronics\*
- Global voltage reference for multiple power supplies

### Typical Application



Adjustable regulator:

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

### Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

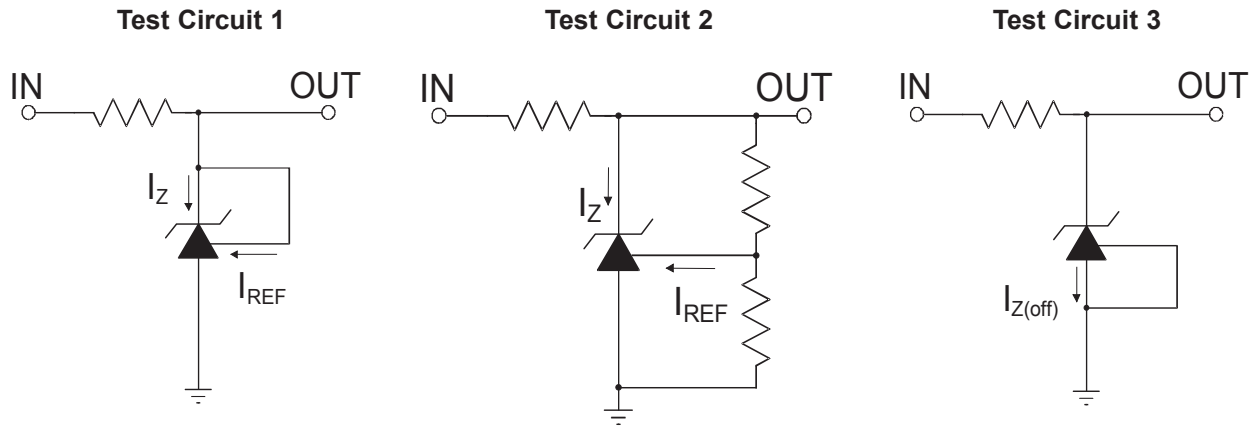
Symbol	Description		Value	Units
$V_Z$	Cathode Voltage		20	V
$I_Z$	Continuous Cathode Current		100	mA
$I_{REF}$	Reference Current		3	mA
$T_J$	Operating Junction Temperature Range		-40 to 150	$^\circ\text{C}$
$\Theta_{JA}$	Maximum Thermal Resistance	TO-92	160	$^\circ\text{C/W}$
		SOT-23-3, SOT-23-5	410	
$P_D$	Maximum Power Dissipation	TO-92	780	mW
		SOT-23-3, SOT-23-5	300	
$T_{LEAD}$	Maximum Soldering Temperature (at Leads)		260	$^\circ\text{C}$

Note: 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 ( $T_J=25^\circ\text{C}$ 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	$T_A=-40$ to $+105^\circ\text{C}$ , $V_Z=V_{REF}$ , $I_Z=10\text{mA}$ (test circuit 1)		10	25		10	25		10	25	mV	
$\Delta V_{REF}/\Delta V_Z$	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	$\mu\text{A}$	
$I_{REF(DEV)}$	$I_{REF}$ Temp Deviation	$T_A=-40$ 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	$\mu\text{A}$	
$I_{Z(OFF)}$	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	$\mu\text{A}$	
			$V_Z=16\text{V}$	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 $100\text{mA}$ (test circuit 1)		0.05	0.2		0.05	0.2		0.05	0.2	$\Omega$	
$I_{Z(MIN)}$	Minimum Operating Current	$V_Z=V_{REF}$ (test circuit 1)		60	80		60	80		60	80	$\mu\text{A}$	

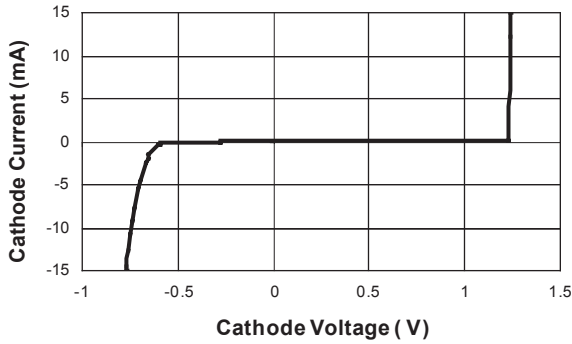
### Test Circuits



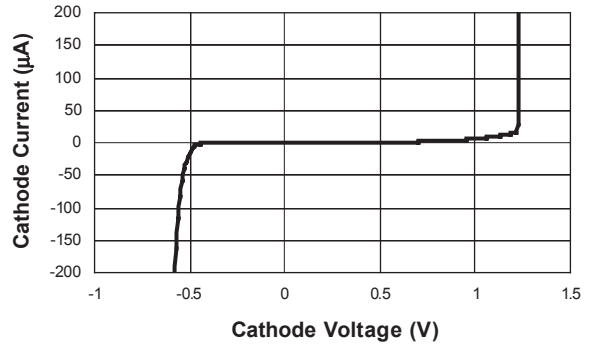
### Typical Characteristics

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

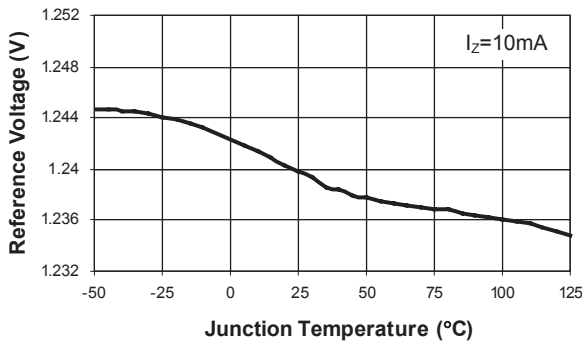
**Cathode Current vs. Cathode Voltage**



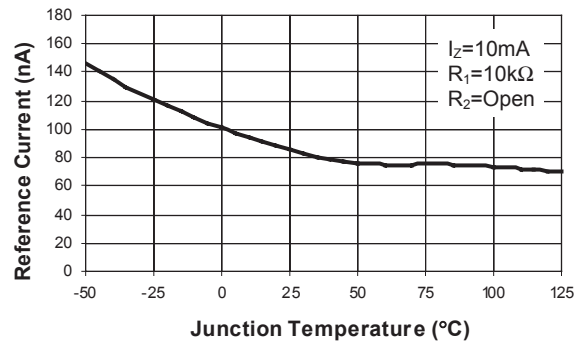
**Cathode Current vs. Cathode Voltage**



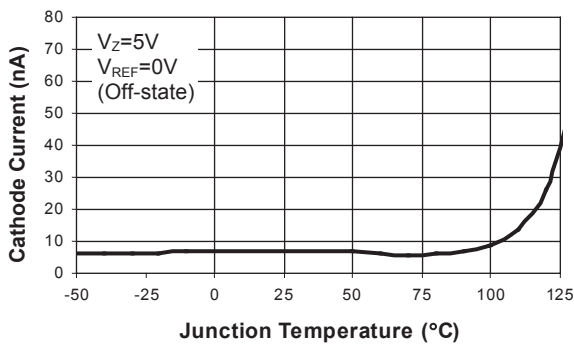
**Reference Voltage vs. Temperature**



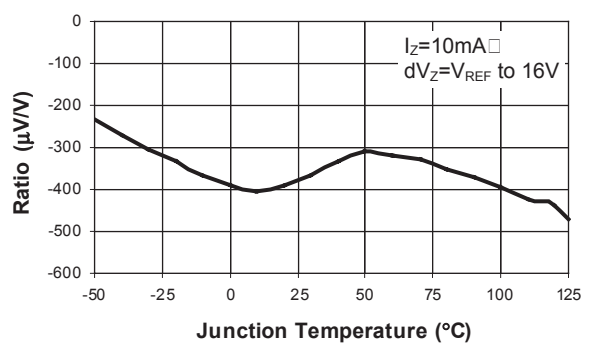
**Reference Current vs. Temperature**



**Cathode Current vs. Temperature**

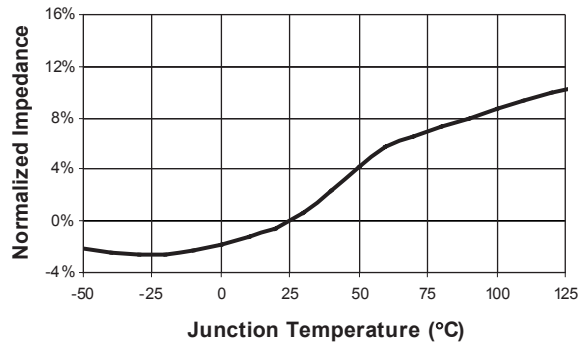


**Ratio of  $\Delta V_{REF} / \Delta V_Z$  vs. Temperature**

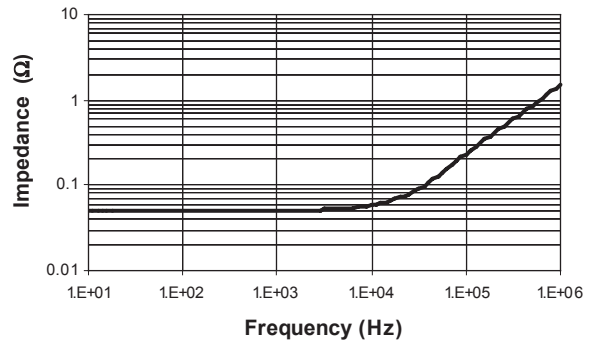


(Unless otherwise noted,  $T_A = 25^\circ\text{C}$ ,  $I_Z = 10\text{mA}$ )

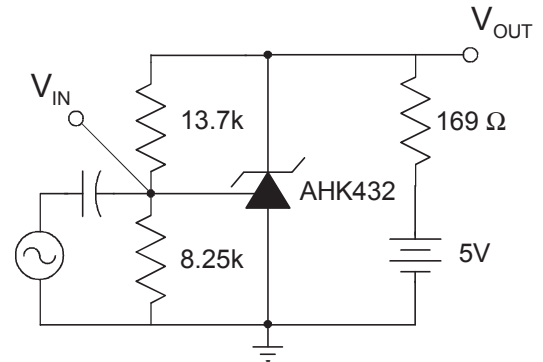
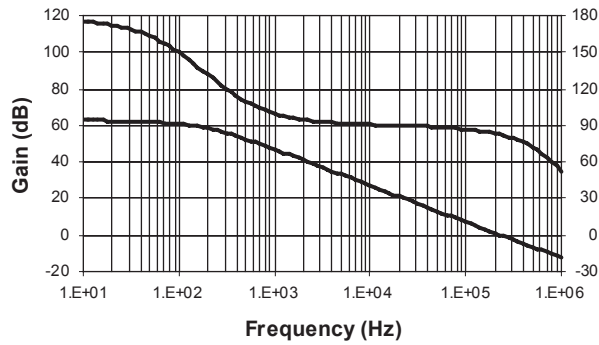
**Cathode Impedance vs. Temperature**



**Impedance vs. Frequency**

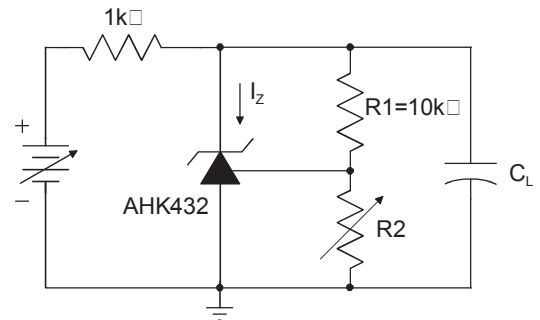
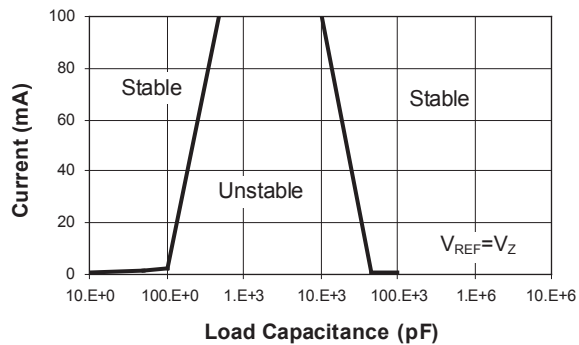


**Gain and Phase vs. Frequency**



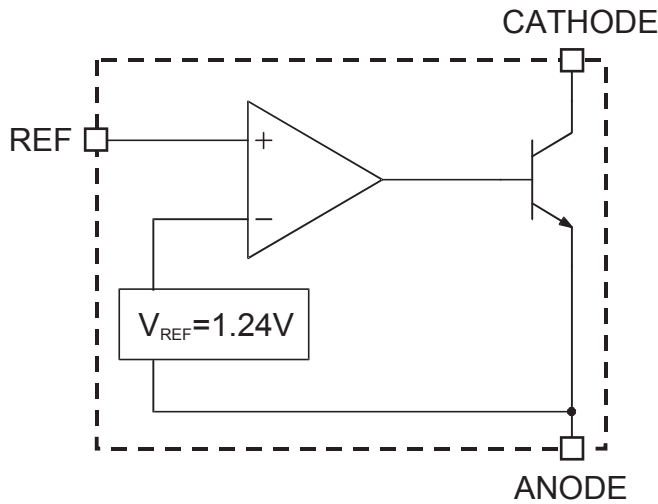
**Test Circuit for Voltage Gain and Phase**

**Stability Boundary**

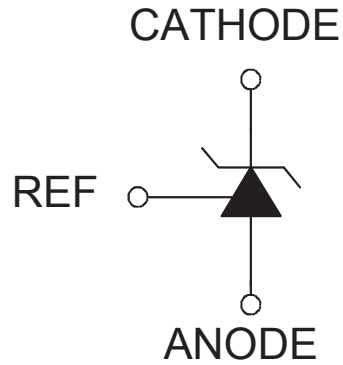


**Test Circuit for Stability**

### Functional Block Diagram



### Symbol Diagram



### Ordering Information

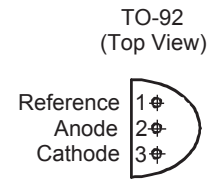
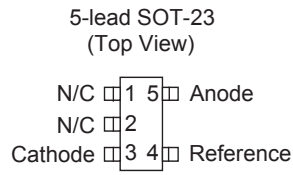
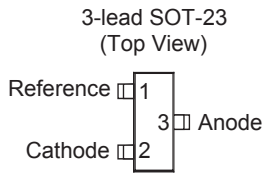
Package	Bulk or Tape and Reel	Tolerance		
		0.5%	1.0%	2.0%
SOT-23-3	Bulk	N/A	N/A	N/A
SOT-23-5		N/A	N/A	N/A
TO-92		AHK432ILY-.5-B1	AHK432ILY-1-B1	AHK432ILY-2-B1
SOT-23-3	Tape and Reel	AHK432IGY-.5-T1	AHK432IGY-1-T1	N/A
SOT-23-5		AHK432IGV-.5-T1	AHK432IGV-1-T1	N/A
TO-92	Ammo	AHK432ILY-.5-A1	AHK432ILY-1-A1	AHK432ILY-2-A1

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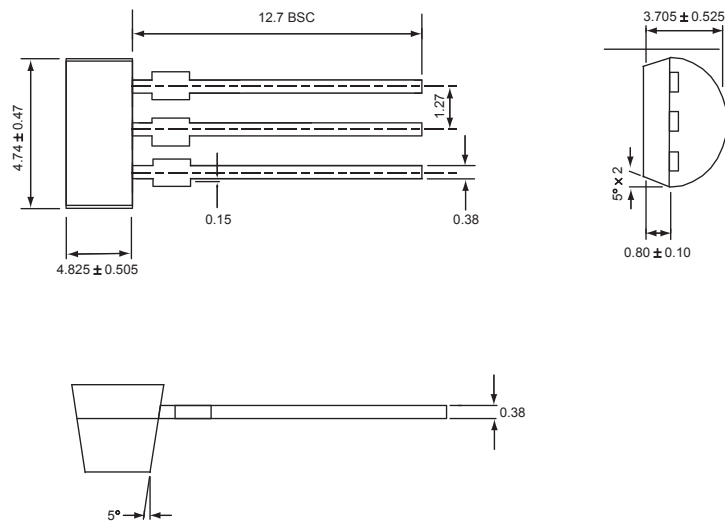
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### Pin Configuration



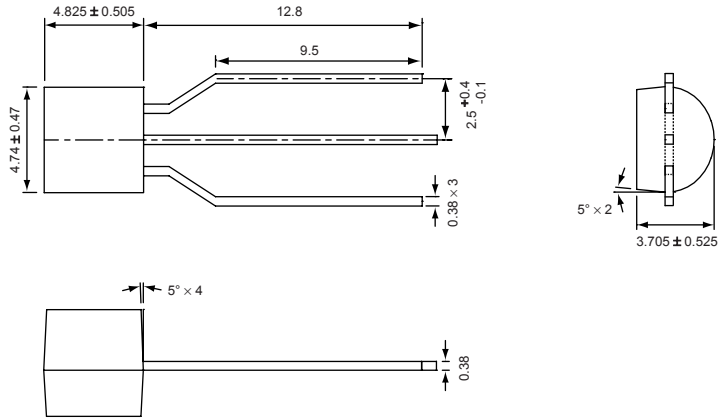
### Package Information

#### TO-92 (Bulk packing option)

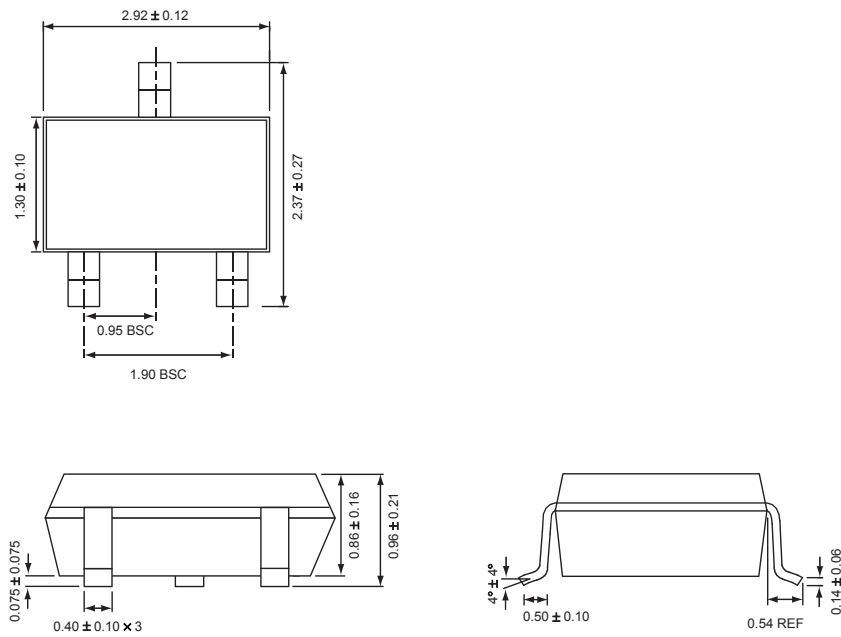


All dimensions in millimeters.

**TO-92 (Ammo packing option)**



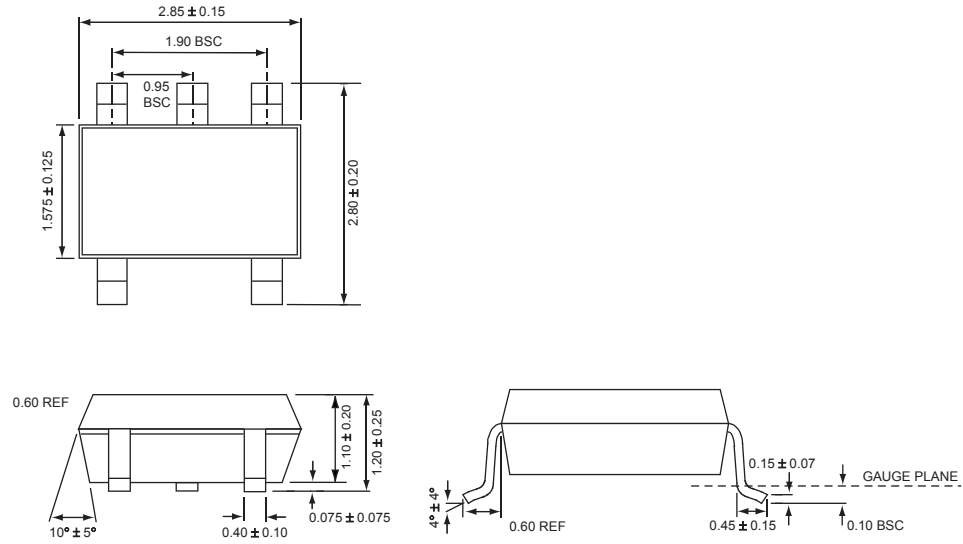
**SOT-23-3**



All dimensions in millimeters.



### SOT-23-5



All dimensions in millimeters.

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