

**Description**

The Bay Linear B3431 is a three terminal adjustable shunt regulator with thermal stability over Temperature range. Using two external resistors allows the output voltage to be adjusted from 2.5V to 36V. With a sharp turn on characteristics the B3431 a superior replacement for zener diode applications.

The B3431 shunt regulator has a tolerance of 0.5% which has proven to be sufficient to overcome all of the other errors in the system to virtually eliminate the need for trimming in the power supply manufacturers assembly line and contribute a significant cost savings.

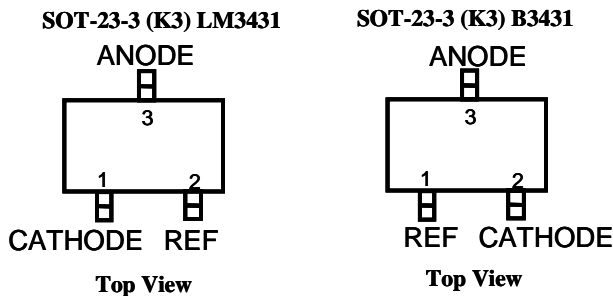
**Features**

- **Wide Operating Range ...1mA to100mA**
- **Tight Band Gap Tolerance .....0.5%**
- **Low Temp. Coefficient.....30 ppm/°C**
- **Wide temp range of -40 to +105°C**
- **Available in SOT-23 package**

**Applications**

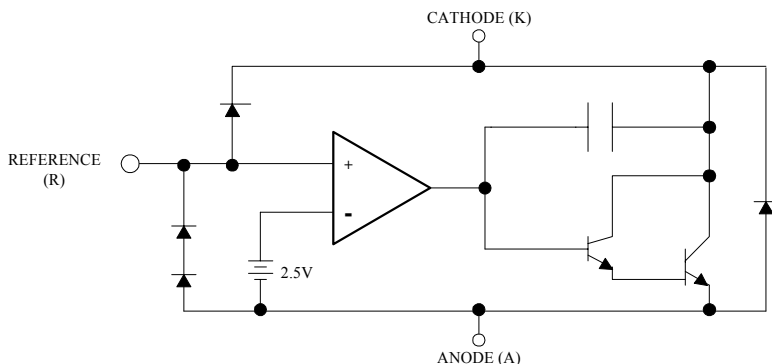
- **Switching Power Supplies**
- **Adjustable Power Supplies**
- **Linear Regulators**
- **Battery Powered Equipment**
- **Monitors, TV, VCR**
- **Instrumentation**

**Package Information**



**Ordering & Marking Information**

Package	Tolerance		
	0.5%	1%	2%
SOT-23	B3431AK3	B3431BK3	B3431CK3



## Absolute Max Ratings

Parameter	Symbol	Maximum	Units
Cathode Voltage	$V_Z$	37	V
Continuous Cathode Current	$I_Z$	150	mA
Reference Input Current	$I_{REF}$	10	mA
Power Dissipation at $T_A = 25^\circ\text{C}$			
S0-8	$P_D$	750	mW
TO-92		775	
SOT-23-3		200	
Thermal Resistance			
SOT-23-3	$\theta_{JA}$	575	$^\circ\text{C/W}$
S0-8		175	
TO-92		160	
Operating Junction Temperature Range	$T_J$	-40 to +150	$^\circ\text{C}$
Storage Temperature Range	$T_{STG}$	-65 to +150	$^\circ\text{C}$
Lead Temperature (Soldering) 10 seconds	$T_{LEAD}$	300	$^\circ\text{C}$
ESD Rating (Human Body Model)	$T_{ESD}$	2	kV

## Recommended Operating Conditions

	Min	Max	Symbol
Cathode Voltage, $V_Z$	$V_{REF}$	36	V
Cathode Current, $I_Z$	0.1	150	mA

## Electrical Characteristics

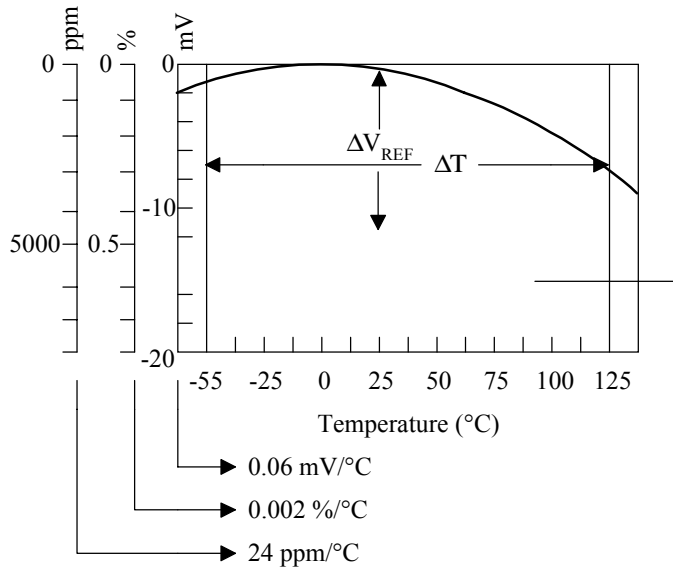
Unless specified:  $T_A = 25^\circ\text{C}$ . Values in bold apply over full operating ambient temperature.

			<b>B3431 0.5%</b>			
Parameter	Symbol	Condition	Min	Typ	Max	Units
Reference Voltage	$V_{REF}$	$V_Z = V_{REF1}$ $I_Z = 10\text{mA}^{(1)}$	2.490	2.50	2.515	V
$V_{REF}$ Temp Deviation	$V_{DEV}$	$V_Z = V_{REF1}$ $I_Z = 10\text{mA}^{(1)}$		<b>4</b>	<b>17</b>	mV
Ratio of Change in $V_{REF}$ To Change in $V_Z$	$\frac{\Delta V_{REF}}{\Delta V_Z}$	$I_Z = 10\text{mA}, \Delta V_Z = 10\text{V to } V_{Ref}$	-2.7	-1.0		mV/V
		$I_Z = 10\text{mA}, \Delta V_Z = 36\text{V to } 10\text{V}$	-2.0	-0.4	0.3	
Reference Input Current	$I_{REF}$	$R1 = 10\text{k}\Omega, R2 = \infty,$ $I_Z = 10\text{mA}^{(2)}$		0.7	<b>4</b>	$\mu\text{A}$
$I_{REF}$ Temperature Deviation	$I_{REF(DEV)}$	$R1 = 10\text{k}\Omega, R2 = \infty,$ $I_Z = 10\text{mA}^{(2)}$		<b>0.4</b>	<b>1.2</b>	$\mu\text{A}$
Off-State Cathode Current	$I_{Z(OFF)}$	$V_{REF} = 0\text{V}, V_Z = 36\text{V}^{(3)}$		<b>0.1</b>	<b>1</b>	$\mu\text{A}$
Dynamic Output Impedance	$r_Z$	$F < 1\text{kHz}, V_Z = V_{REF}$ $I_Z = 1\text{mA to } 100\text{mA}^{(1)}$		0.20	0.50	$\Omega$
Minimum Operating Current	$I_{Z(MIN)}$	$V_Z = V_{REF}^{(1)}$		0.4	1	mA

			B3431 1%			
Parameter	Symbol	Condition	Min	Typ	Max	Units
Reference Voltage	$V_{REF}$	$V_Z = V_{REF1} I_Z = 10mA^{(1)}$	2.474	2.50	2.526	V
$V_{REF}$ Temp Deviation	$V_{DEV}$	$V_Z = V_{REF1} I_Z = 10mA^{(1)}$		<b>4</b>	<b>17</b>	mV
Ratio of Change in $V_{REF}$ To Change in $V_Z$	$\frac{\Delta V_{REF}}{\Delta V_Z}$	$I_Z = 10mA, \Delta V_Z = 10V \text{ to } V_{Ref}$	-2.7	-1.0		mV/V
		$I_Z = 10mA, \Delta V_Z = 36V \text{ to } 10V$	-2.0	-0.4	0.3	
Reference Input Current	$I_{REF}$	$R1 = 10k\Omega, R2 = \infty, I_Z = 10mA^{(2)}$		0.7	<b>4</b>	$\mu A$
$I_{REF}$ Temperature Deviation	$I_{REF(DEV)}$	$R1 = 10k\Omega, R2 = \infty, I_Z = 10mA^{(2)}$		<b>0.4</b>	<b>1.2</b>	$\mu A$
Off-State Cathode Current	$I_{Z(OFF)}$	$V_{REF} = 0V, V_Z = 36V^{(3)}$		<b>0.1</b>	<b>1</b>	$\mu A$
Dynamic Output Impedance	$r_Z$	$F < 1kHz, V_Z = V_{REF}, I_Z = 1mA \text{ to } 100mA^{(1)}$		0.20	0.50	$\Omega$
Minimum Operating Current	$I_{Z(MIN)}$	$V_Z = V_{REF}^{(1)}$		0.4	1	mA

			B3431 2%			
Parameter	Symbol	Condition	Min	Typ	Max	Units
Reference Voltage	$V_{REF}$	$V_Z = V_{REF1} I_Z = 10mA^{(1)}$	2.445	2.495	2.545	V
$V_{REF}$ Temp Deviation	$V_{DEV}$	$V_Z = V_{REF1} I_Z = 10mA^{(1)}$		<b>4</b>	<b>17</b>	mV
Ratio of Change in $V_{REF}$ To Change in $V_Z$	$\frac{\Delta V_{REF}}{\Delta V_Z}$	$I_Z = 10mA, \Delta V_Z = 10V \text{ to } V_{Ref}$	-2.7	-1.0		mV/V
		$I_Z = 10mA, \Delta V_Z = 36V \text{ to } 10V$	-2.0	-0.4	0.3	
Reference Input Current	$I_{REF}$	$R1 = 10k\Omega, R2 = \infty, I_Z = 10mA^{(2)}$		0.7	<b>4</b>	$\mu A$
$I_{REF}$ Temperature Deviation	$I_{REF(DEV)}$	$R1 = 10k\Omega, R2 = \infty, I_Z = 10mA^{(2)}$		<b>0.4</b>	<b>1.2</b>	$\mu A$
Off-State Cathode Current	$I_{Z(OFF)}$	$V_{REF} = 0V, V_Z = 36V^{(3)}$		<b>0.1</b>	<b>1</b>	$\mu A$
Dynamic Output Impedance	$r_Z$	$F < 1kHz, V_Z = V_{REF}, I_Z = 1mA \text{ to } 100mA^{(1)}$		0.20	0.50	$\Omega$
Minimum Operating Current	$I_{Z(MIN)}$	$V_Z = V_{REF}^{(1)}$		0.4	1	mA

Calculating Average Temperature Coefficient (TC)



- $TC \text{ in mV}/^{\circ}C = \frac{\Delta V_{REF} \text{ (mV)}}{\Delta T_A}$
- $TC \text{ in } \%/^{\circ}C = \frac{\left( \frac{\Delta V_{REF}}{V_{REF \text{ at } 25^{\circ}C}} \right)}{\Delta T_A} \times 100$
- $TC \text{ in ppm}/^{\circ}C = \frac{\left( \frac{\Delta V_{REF}}{V_{REF \text{ at } 25^{\circ}C}} \right)}{\Delta T_A} \times 10^6$

Test Circuit

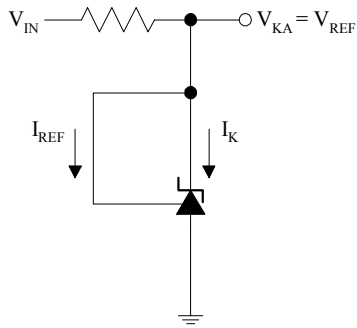


Figure 1a. Test Circuit 1

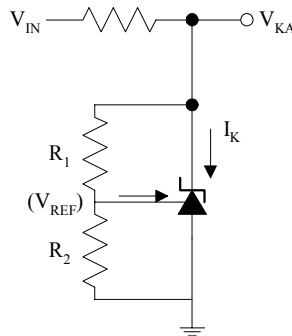


Figure 1b. Test Circuit 2

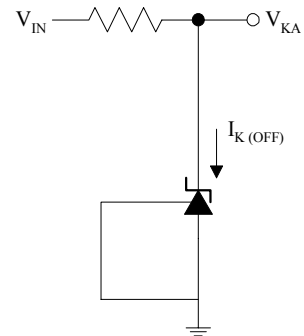


Figure 1c. Test Circuit 3

TYPICAL PERFORMANCE CURVES

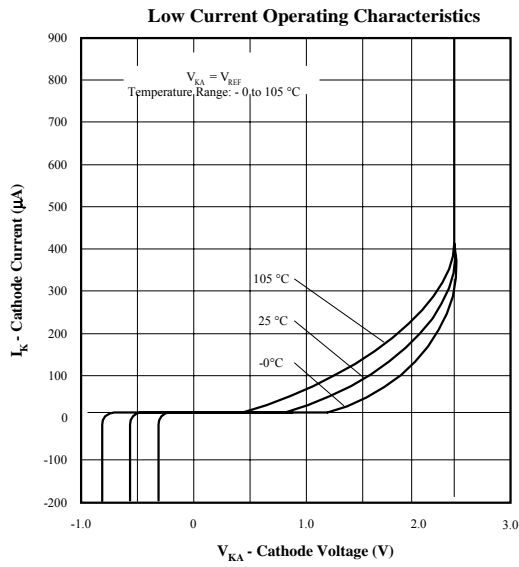


Figure 2

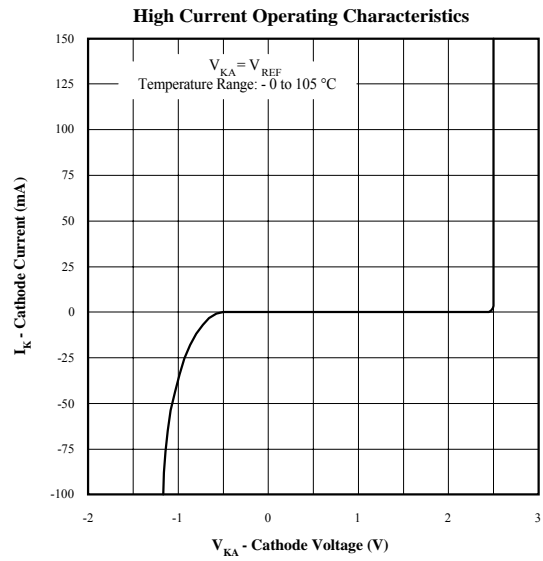


Figure 3

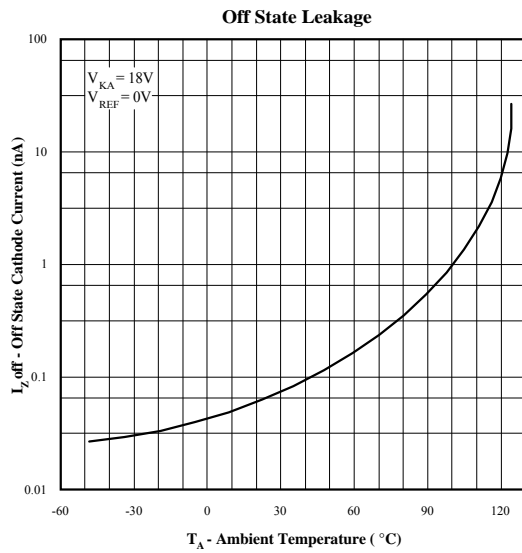


Figure 4

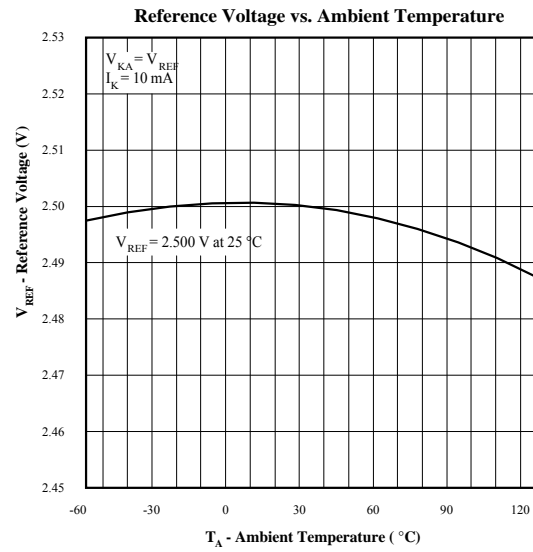


Figure 5

TYPICAL PERFORMANCE CURVES

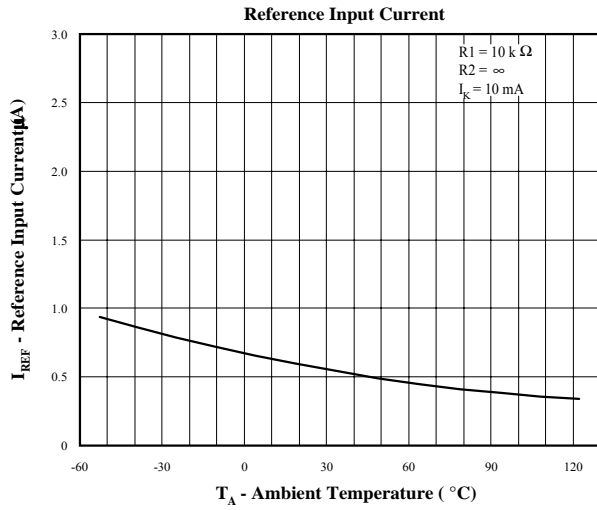


Figure 6

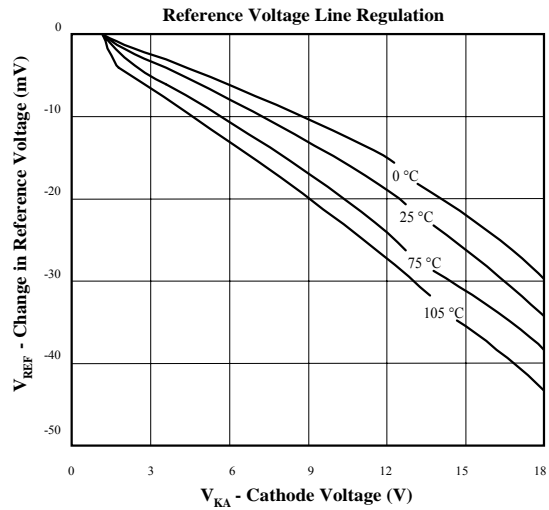


Figure 7

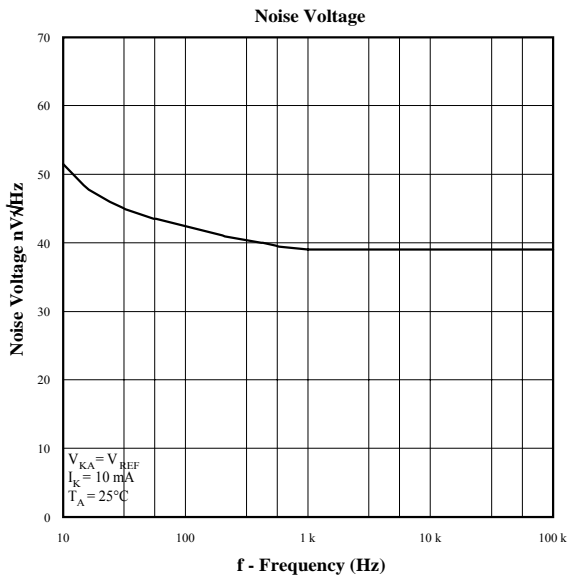


Figure 8

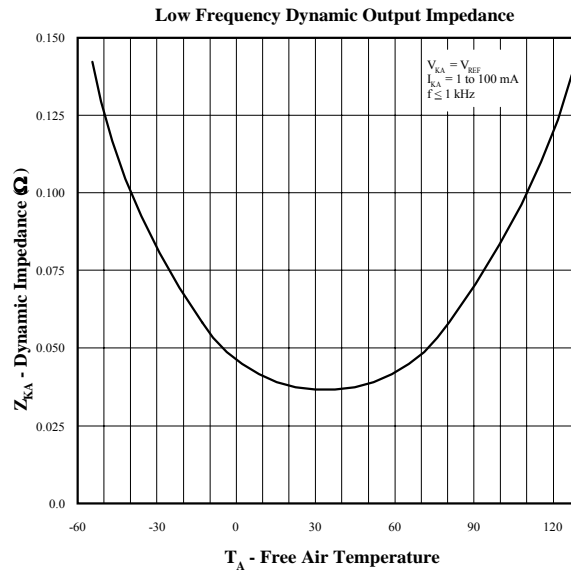


Figure 9

TYPICAL PERFORMANCE CURVES

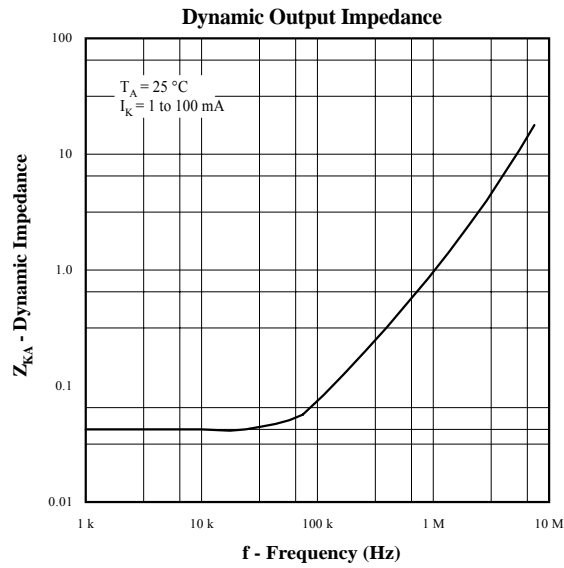


Figure 10

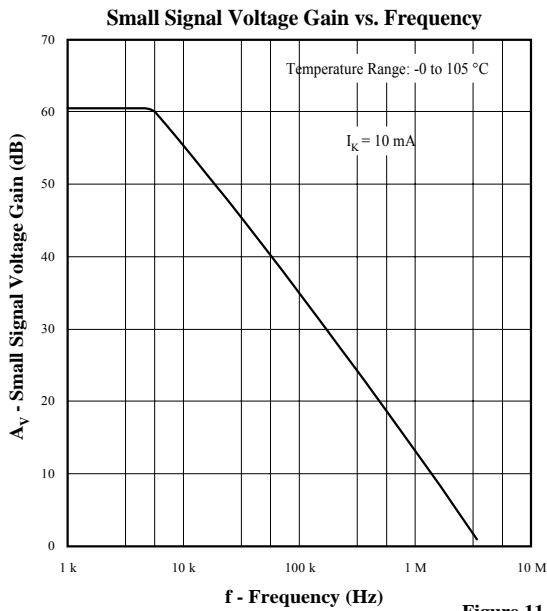
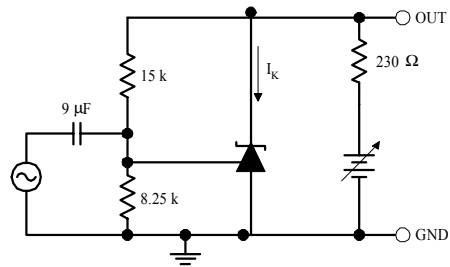


Figure 11



TYPICAL PERFORMANCE CURVES

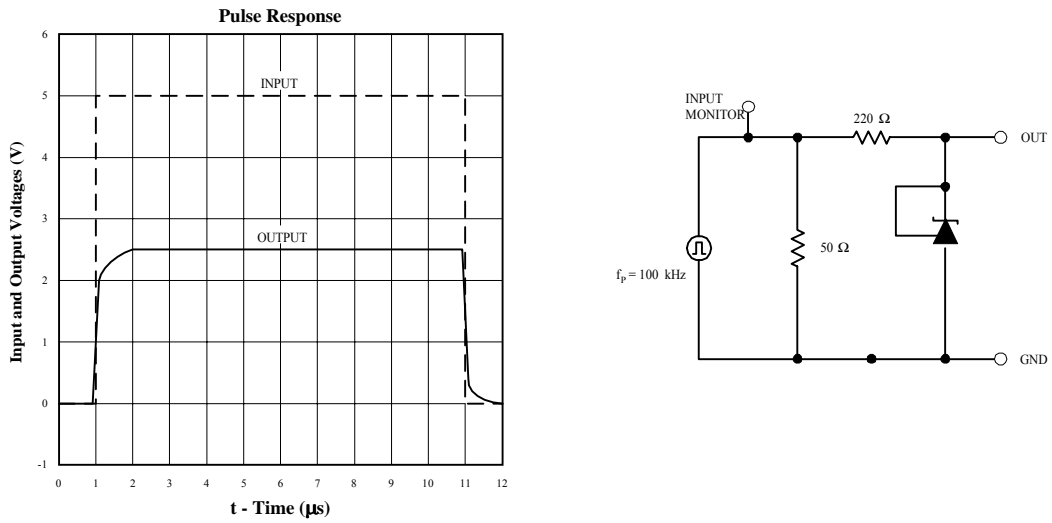


Figure 12

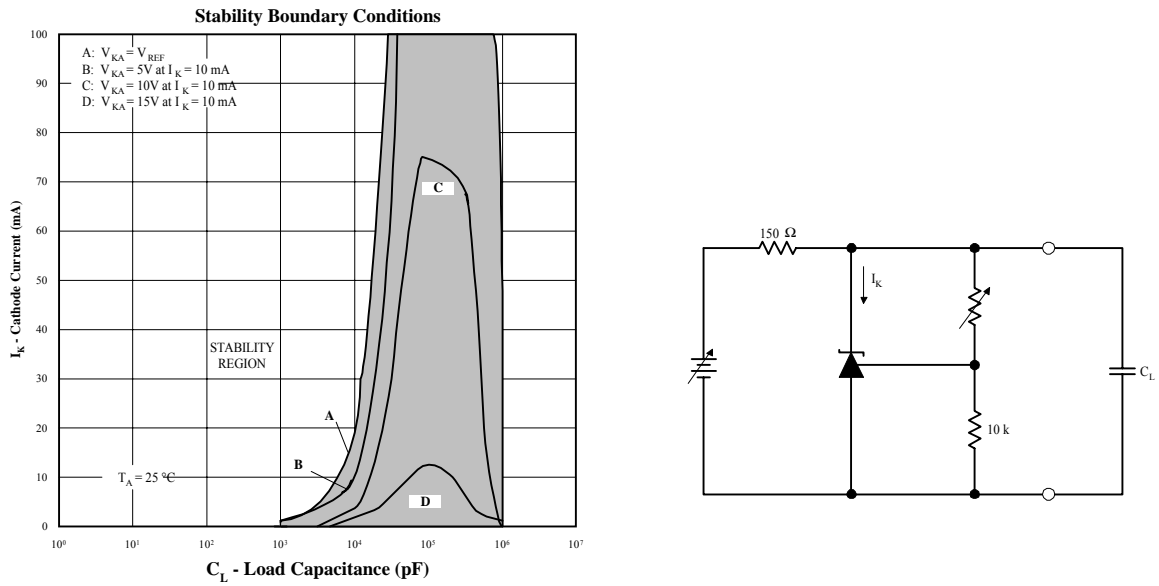
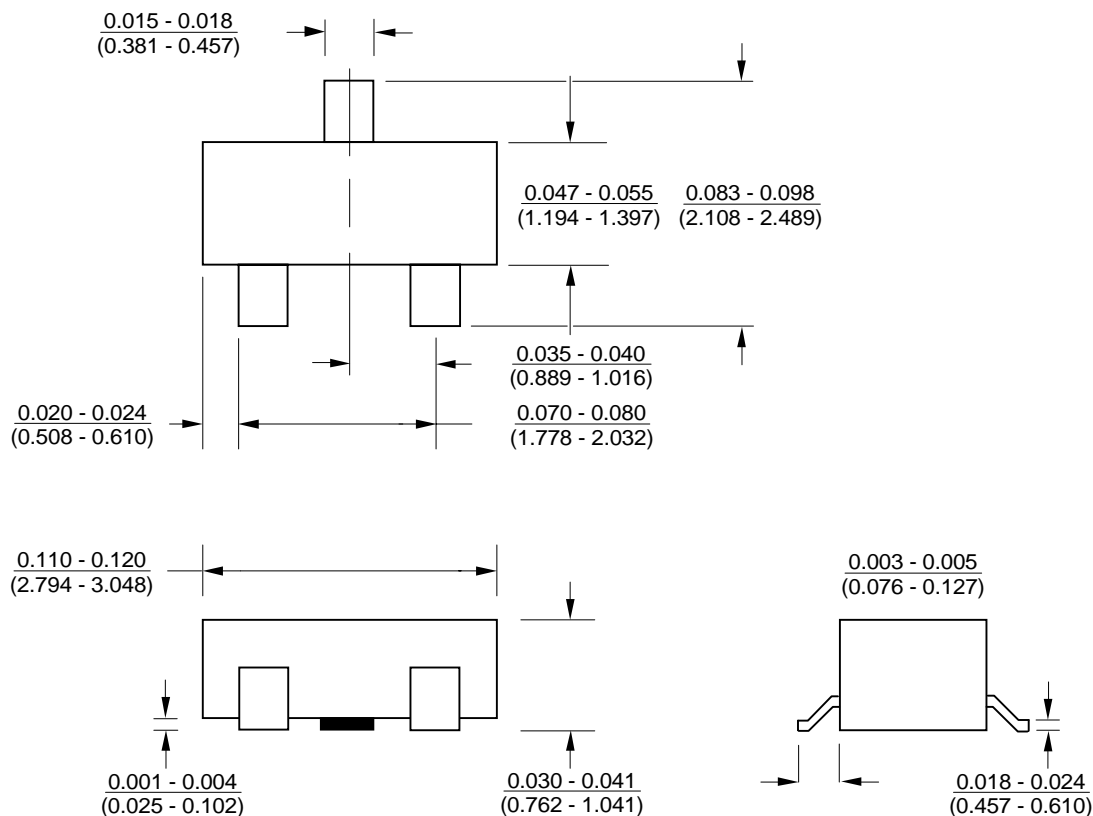


Figure 13



## Packaging Information

SOT-23



**Advance Information-** These data sheets contain descriptions of products that are in development. The specifications are based on the engineering calculations, computer simulations and/ or initial prototype evaluation.

**Preliminary Information-** These data sheets contain minimum and maximum specifications that are based on the initial device characterizations. These limits are subject to change upon the completion of the full characterization over the specified temperature and supply voltage ranges.

The application circuit examples are only to explain the representative applications of the devices and are not intended to guarantee any circuit design or permit any industrial property right to other rights to execute. Bay Linear takes no responsibility for any problems related to any industrial property right resulting from the use of the contents shown in the data book. Typical parameters can and do vary in different applications. Customer's technical experts must validate all operating parameters including "Typical" for each customer application.

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