Bay Linear

Inspire the Linear Power

Adjustable Shunt Regulator B3431

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

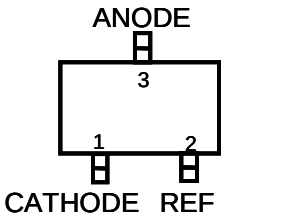
- **Wide Operating Range …1mA to100mA**
- **Tight Band Gap Tolerance ……..…0.5%**
- **Low Temp. Coefficient…...…...30 ppm/^{o}C**
- **Wide temp range of –40 to +105^{o}C**
- **Available in SOT-23 package**

Applications

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

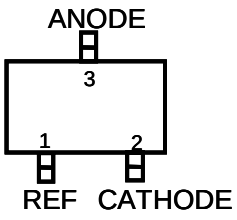
Package Information

SOT-23-3 (K3) LM3431



Top View

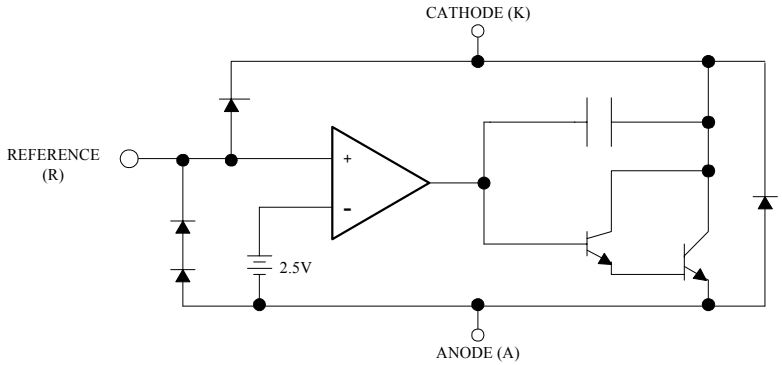
SOT-23-3 (K3) B3431



Top View

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°C S0-8 TO-92 SOT-23-3	P_D	 750 775 200	mW
Thermal Resistance SOT-23-3 S0-8 TO-92	O_{JA}	 575 175 160	°C/W
Operating Junction Temperature Range	T_J	-40 to +150	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C
Lead Temperature (Soldering) 10 seconds	T_{LEAD}	300	°C
ESD Rating (Human Body Model)	T_{ESD}	2	kV

Recommended Operating Conditions

	Min	Max	Symbol
Cathode Voltage, Vz	V_{REF}	36	V
Cathode Current, Iz	0.1	150	mA

Electrical Characteristics

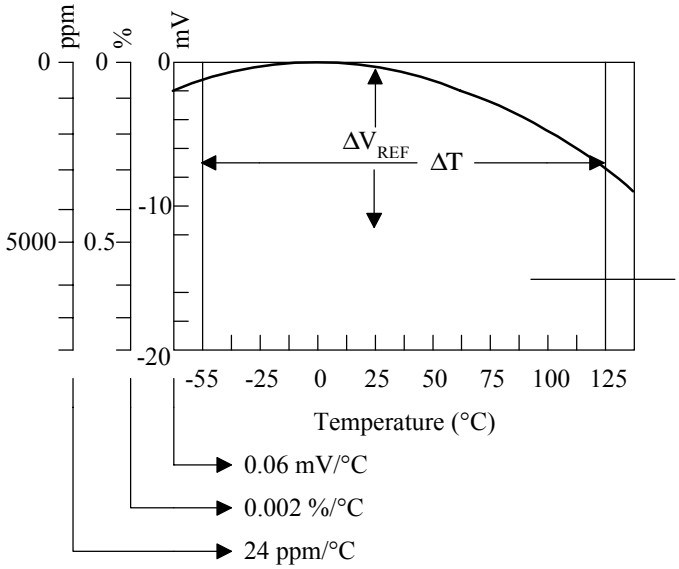
Unless specified: $T_{A = 25°C}$. Values in bold apply over full operating ambient temperature.

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

Calculating Average Temperature Coefficient (TC)



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

Test Circuit

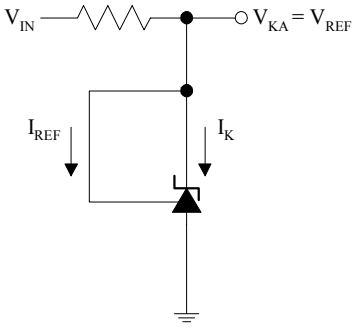


Figure 1a. Test Circuit 1

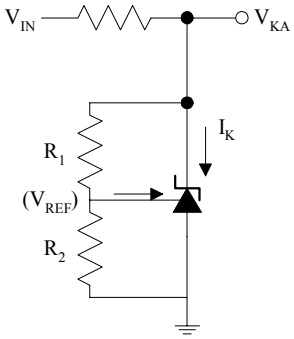


Figure 1b. Test Circuit 2

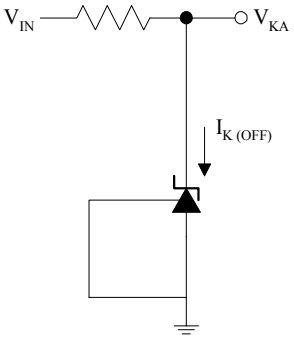


Figure 1c. Test Circuit 3

TYPICAL PERFORMANCE CURVES

Low Current Operating Characteristics

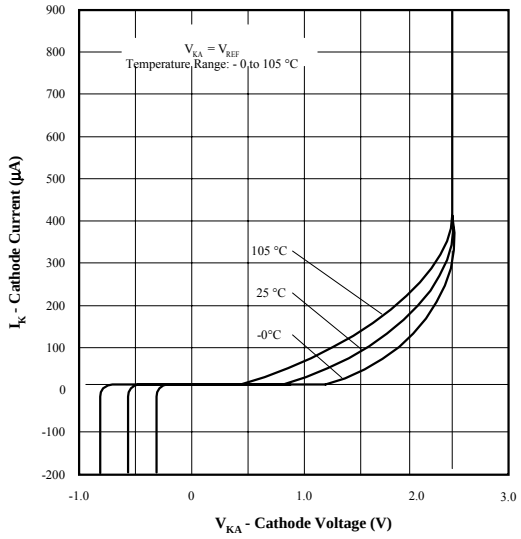


Figure 2

High Current Operating Characteristics

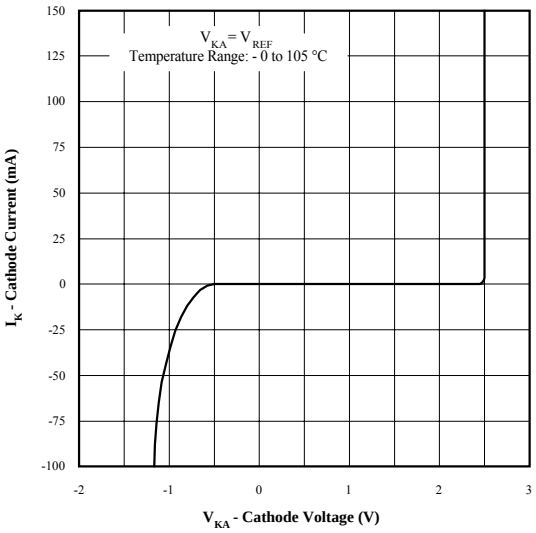


Figure 3

Off State Leakage

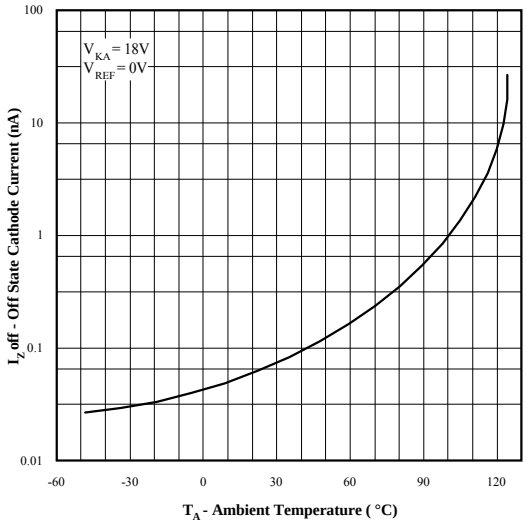


Figure 4

Reference Voltage vs. Ambient Temperature

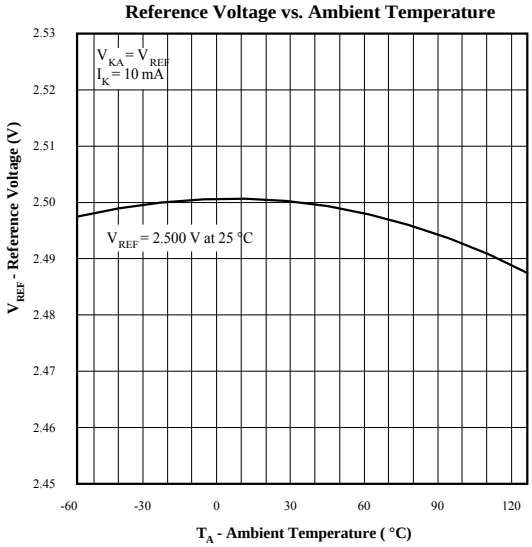


Figure 5

TYPICAL PERFORMANCE CURVES

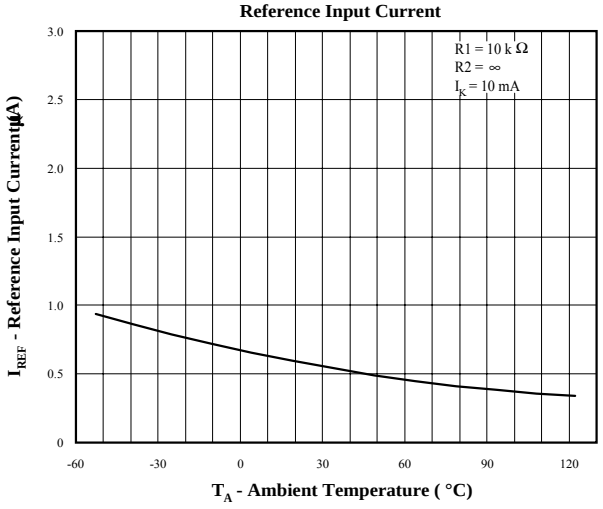


Figure 6

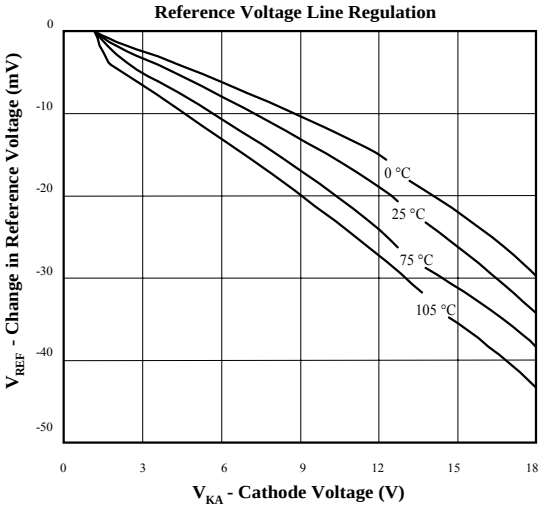


Figure 7

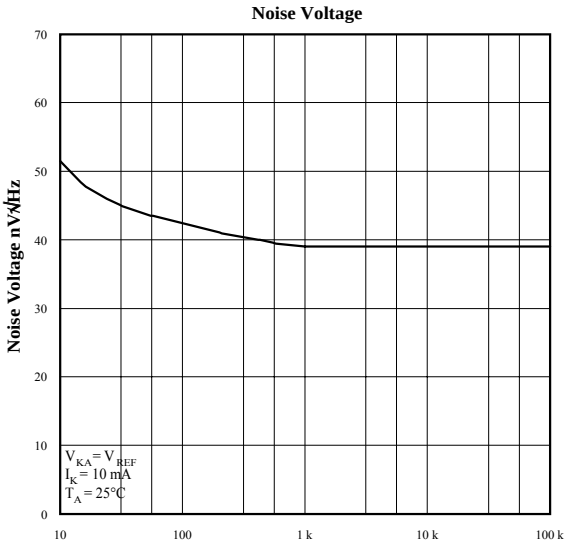


Figure 8

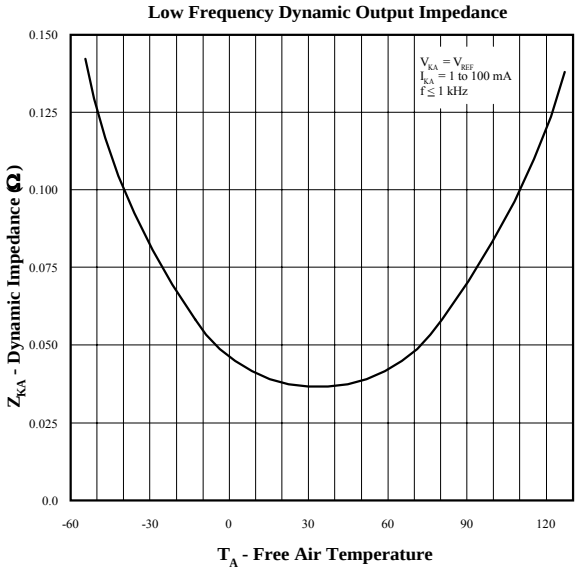


Figure 9

TYPICAL PERFORMANCE CURVES

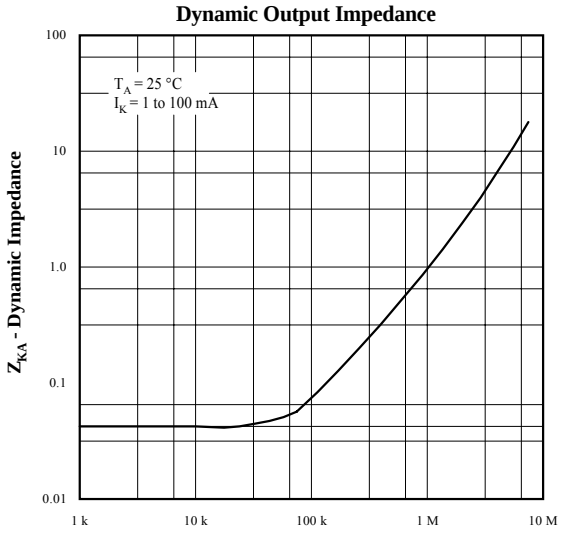


Figure 10

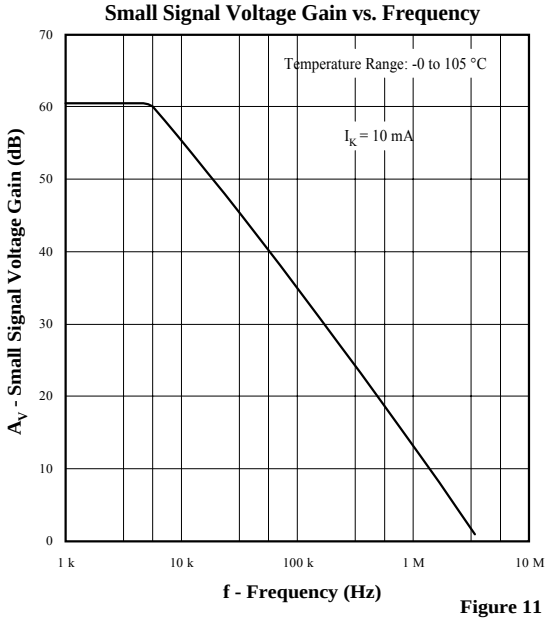
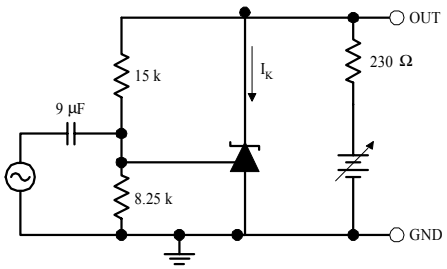
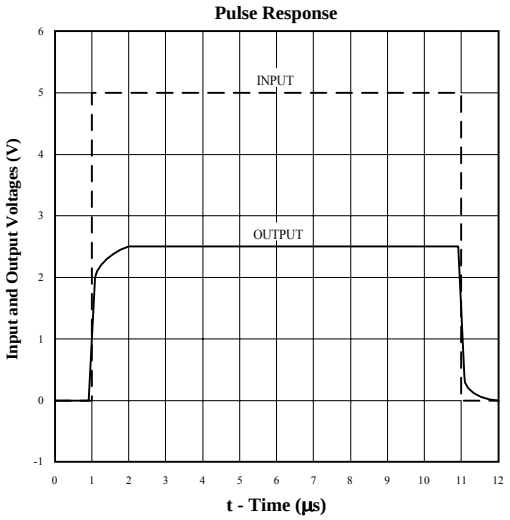


Figure 11



TYPICAL PERFORMANCE CURVES



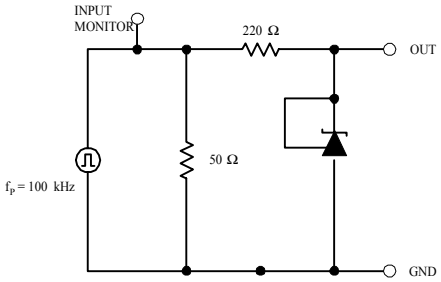
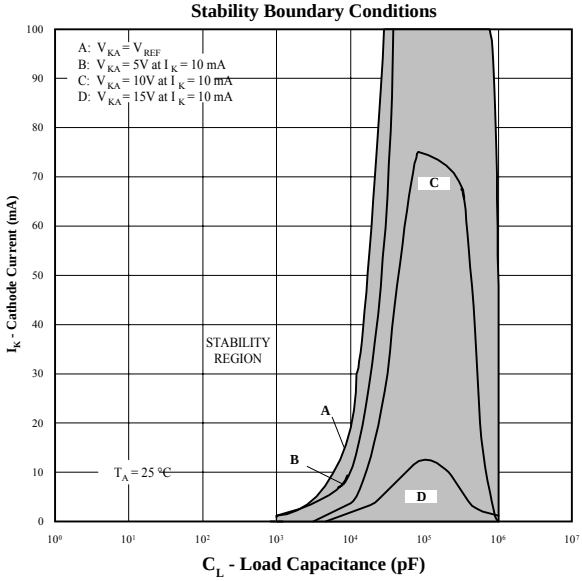


Figure 12



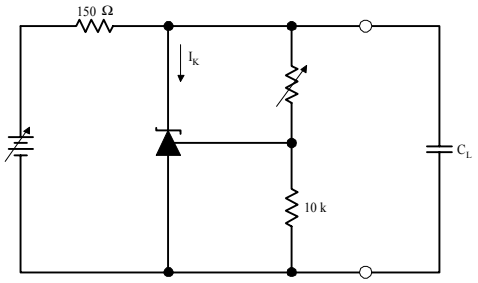
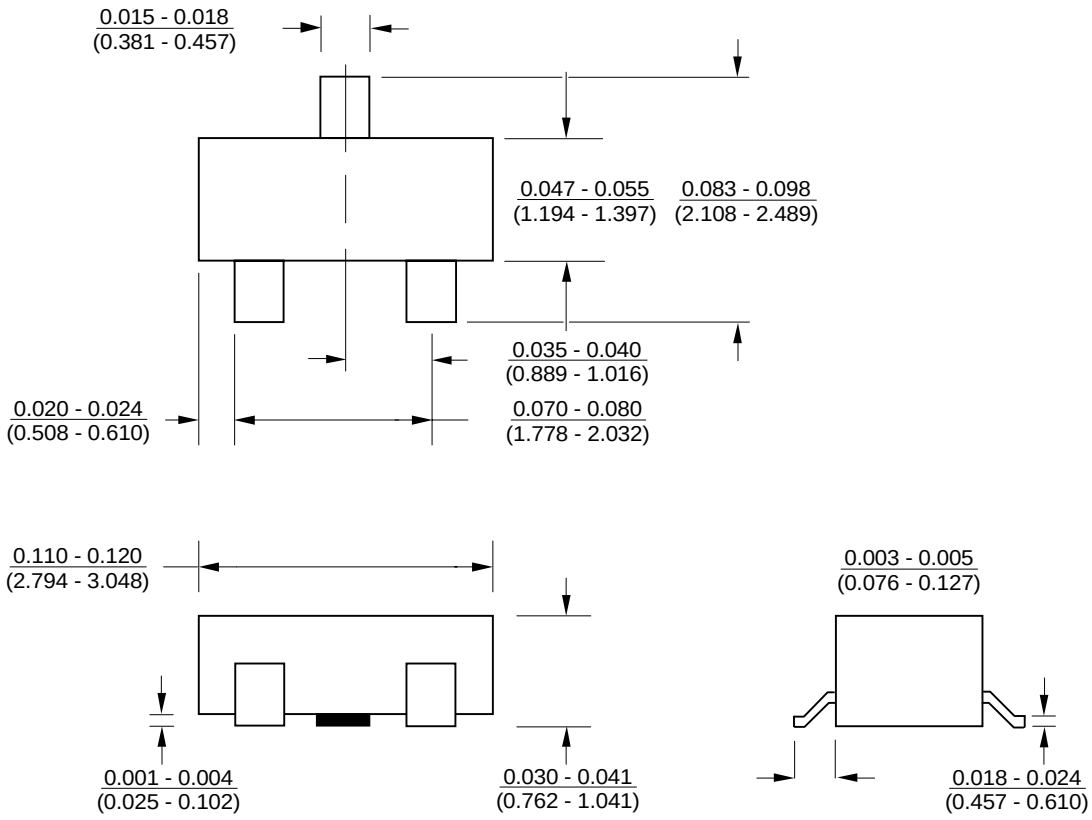


Figure 13

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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