

# MB431B

## Adjustable Precision Shunt Regulator

### Description

The MB431B is a 3-terminal adjustable shunt regulator with guaranteed temperature stability over the entire temperature range of operation. The output voltage may be set at any level greater than 2.5V ( $V_{REF}$ ) up to 36V merely by selecting two external resistors that act as a voltage divided network. Due to the sharp turn-on characteristics this device is an excellent replacement for many zener diode applications.

### Features

- Average temperature coefficient 20 ppm/°C
- Temperature compensated for operation over the full temperature range
- Programmable output voltage
- Fast turn-on response low output noise
- Wide Operating Range of -40 to 125 °C
- Wide Programmable Precise Output Voltage from 2.5V to 36V



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### Pin Configuration

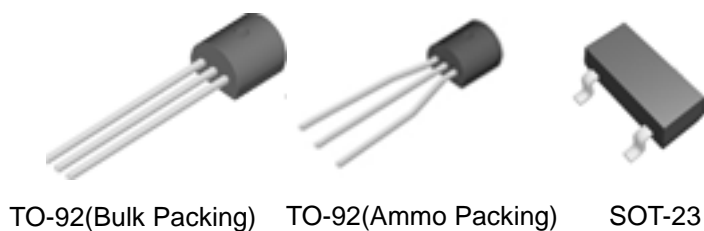
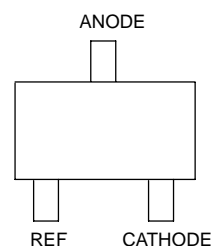
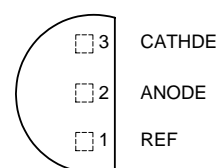
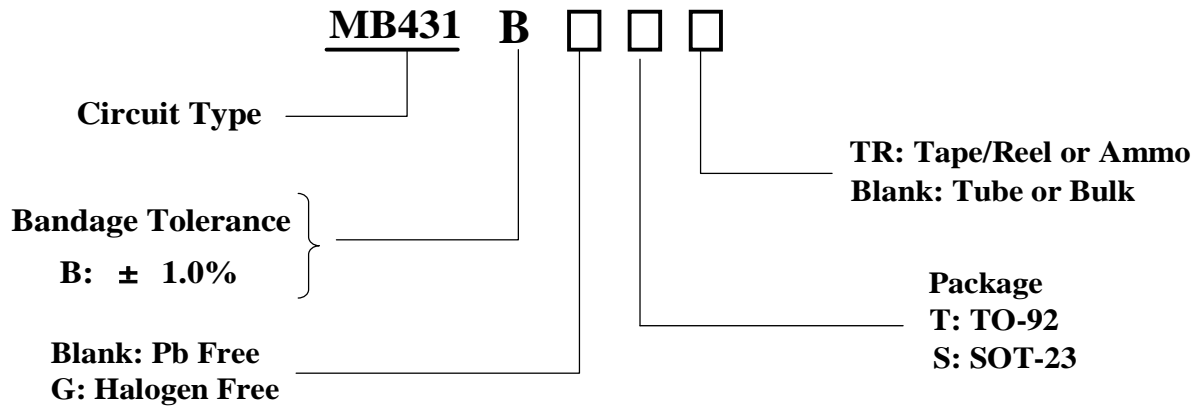


Figure 1. Package Types of MB431B

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## Order Information



Package	Part Number		Marking ID		Packing Type
	Pb-free	Halogen-Free	Pb-free	Halogen-Free	
TO-92	MB431BT	MB431BGT	MB431B	MB431BG	Bulk
TO-92	MB431BTTR	MB431BGTR	MB431B	MB431BG	Ammo
SOT-23	MB431BSTR	MB431BGSTR	31B	31BG	Tape & Reel

## Functional Block Diagram

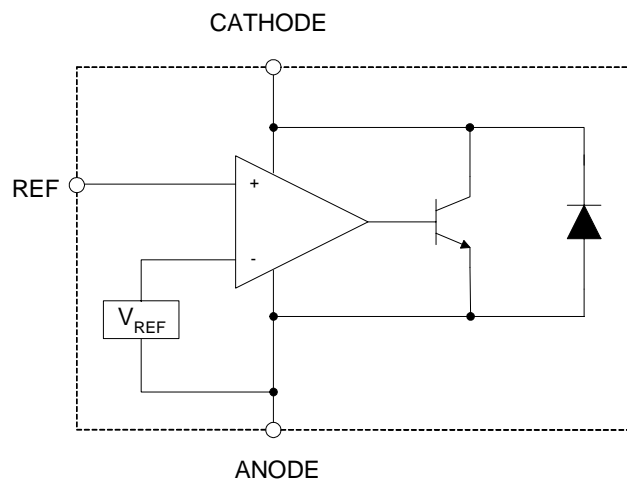


Figure 2. Functional Block Diagram of MB431B

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## Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Cathode Voltage	$V_{KA}$	40	V
Cathode Current Range (Continuous)	$I_{KA}$	-100 to 100	mA
Reference Input Current Range	$I_{REF}$	10	mA
Power Dissipation	$P_D$	T,Z Package: 750	mW
		S Package: 350	
Junction Temperature	$T_J$	150	°C
Storage Temperature Range	$T_{STG}$	-65 to +150	°C
Package Thermal Impedance	$\theta_{JA}$	TO-92: 150	°C/W
		SOT-23-3: 90	
		SOT-89: 100	

## Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Cathode Voltage	$V_{KA}$	$V_{REF}$	36	V
Cathode Current	$I_{KA}$	1.0	100	mA
Operating Ambient Temperature Range	$T_A$	-40	+125	°C

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## Electrical Characteristics

Operating Conditions: TA= 25 °C unless otherwise specified.

Parameter	Test Circuit	Symbol	Conditions	MB431			Unit	
				Min	Typ	Max		
Reference Voltage	3	$V_{REF}$	$V_{KA}=V_{REF}$ $I_{KA}=10mA$	B	2.475	2.500	2.525	V
Deviation of Reference Voltage Over-Temperature	3	$\Delta V_{REF}$	0 to 70°C			5	12	mV
			-20 to +85°C			5	15	
Ratio of Change in Reference Voltage to the Change in Cathode Voltage	4	$\Delta V_{REF} / \Delta V_{KA}$	$I_{KA}=10mA$ $\Delta V_{KA}=10V$ to $V_{REF}$			-1.2	-2.7	mV/V
			$I_{KA}=10mA$ $\Delta V_{KA}=36V$ to $10V$			-0.8	-2.2	
Reference Current	4	$I_{REF}$	$I_{KA}=10mA$ $R1=10k \Omega, R2=\infty$			0.8	4	$\mu A$
Deviation of Reference Current Over Full Temperature Range	4	$\Delta I_{REF}$	$I_{KA}=10mA$ $R1=10k \Omega, R2=\infty$ $T_A=-20$ to $+85^\circ C$			0.03	0.3	$\mu A$
Minimum Cathode Current for Regulation	3	$I_{KA(min)}$	$V_{KA}=V_{REF}$			0.4	1.0	mA
Off-State Cathode Current	5	$I_{KA(off)}$	$V_{KA}=36V, V_{REF}=0$			0.1	1.0	$\mu A$
Dynamic Impedance	3	$Z_{KA}$	$V_{KA}=V_{REF}$ $I_{KA}=1$ to $100mA$ $f \leq 1.0KHz$			0.2	0.5	ohm

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## Test Circuits

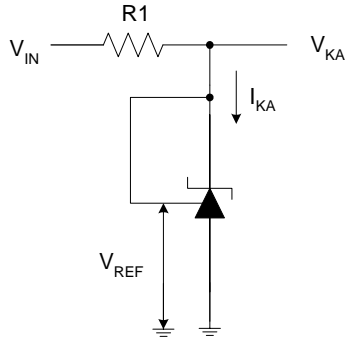


Figure 3 .Test Circuit 3 for  $V_{KA} > V_{REF}$

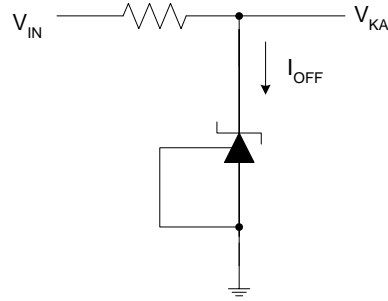


Figure 4 .Test Circuit 4 for  $I_{off}$

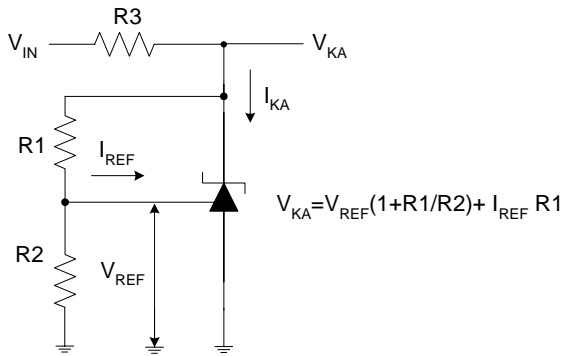


Figure 5 .Test Circuit 5 for  $V_{KA} > V_{REF}$

## Typical Performance Characteristics

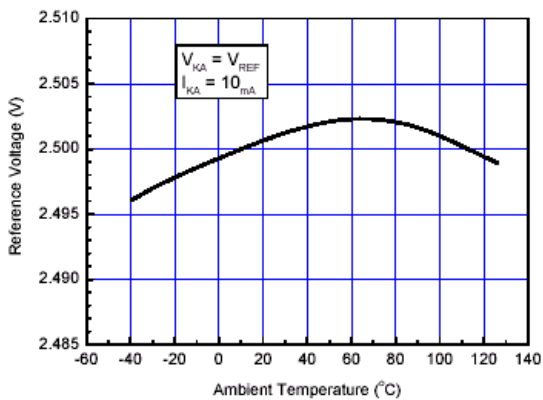


Figure 6.  $V_{REF}$  vs. Ambient Temperature

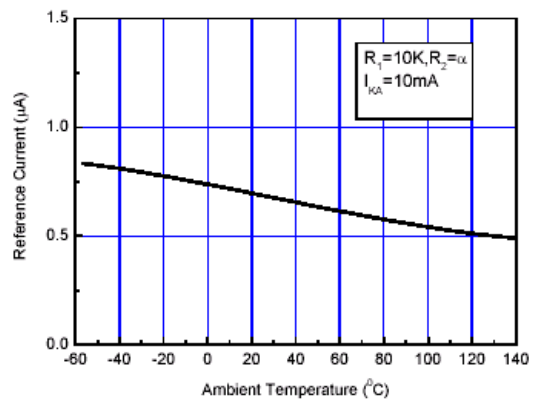


Figure 7.  $I_{REF}$  vs. Ambient Temperature

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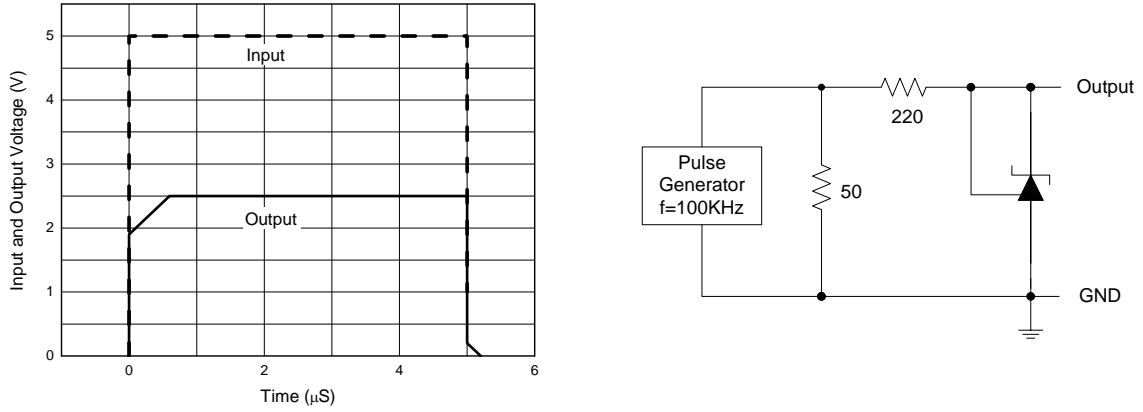


Figure 8. Pulse Response of Input and Output Voltage

## Typical Applications

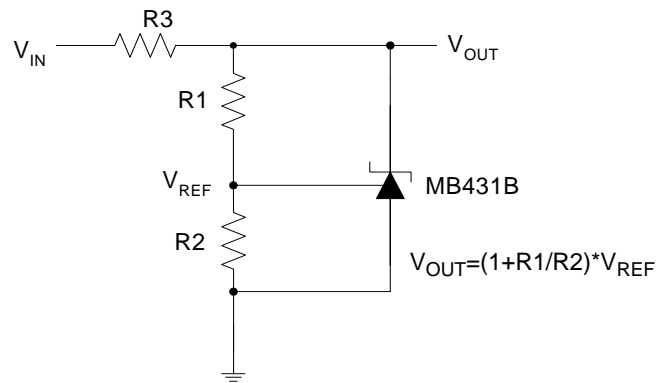


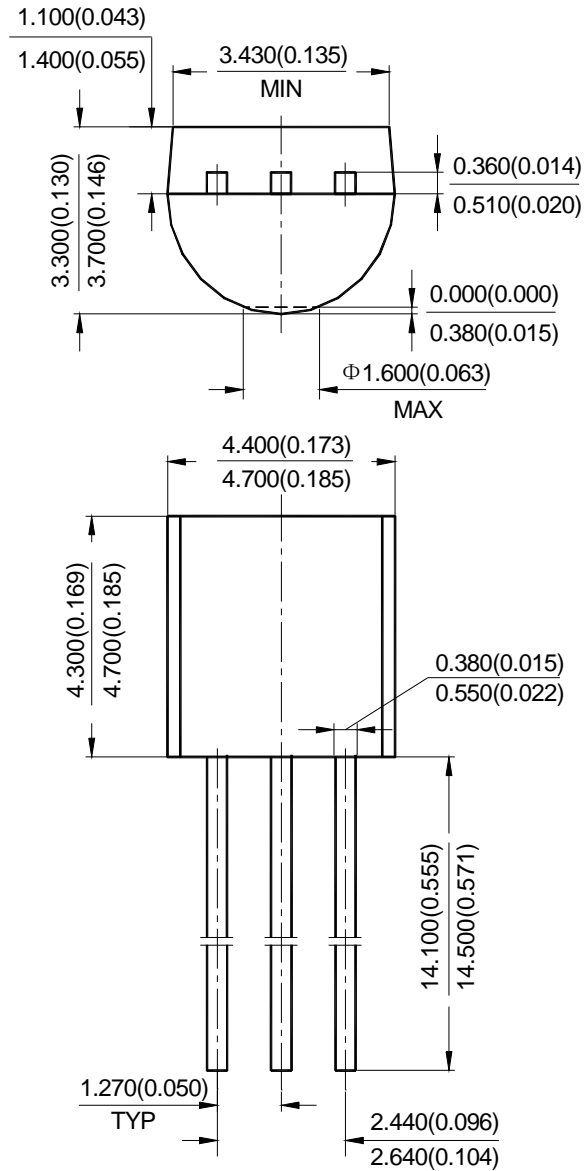
Figure 9. Shunt Regulator

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## Mechanical Dimensions

TO-92(Bulk Packing)

Unit: mm(inch)

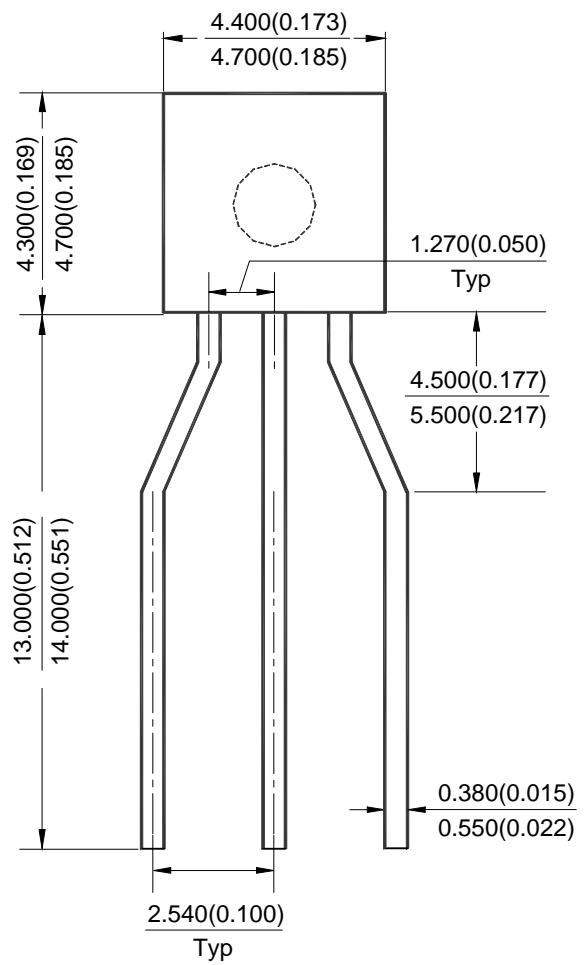
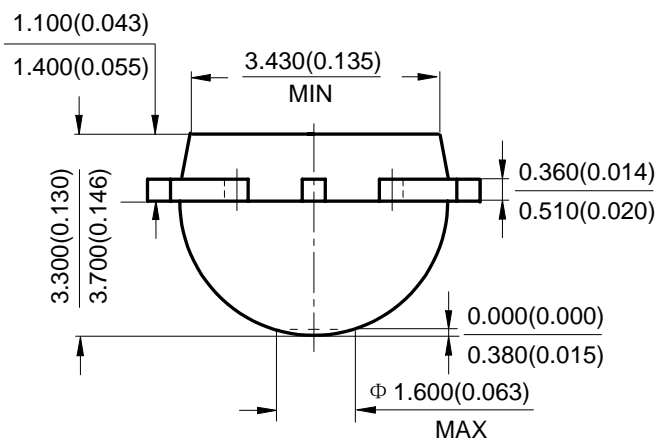


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## Mechanical Dimensions (Cont'd)

TO-92(Ammo Packing)

Unit: mm(inch)

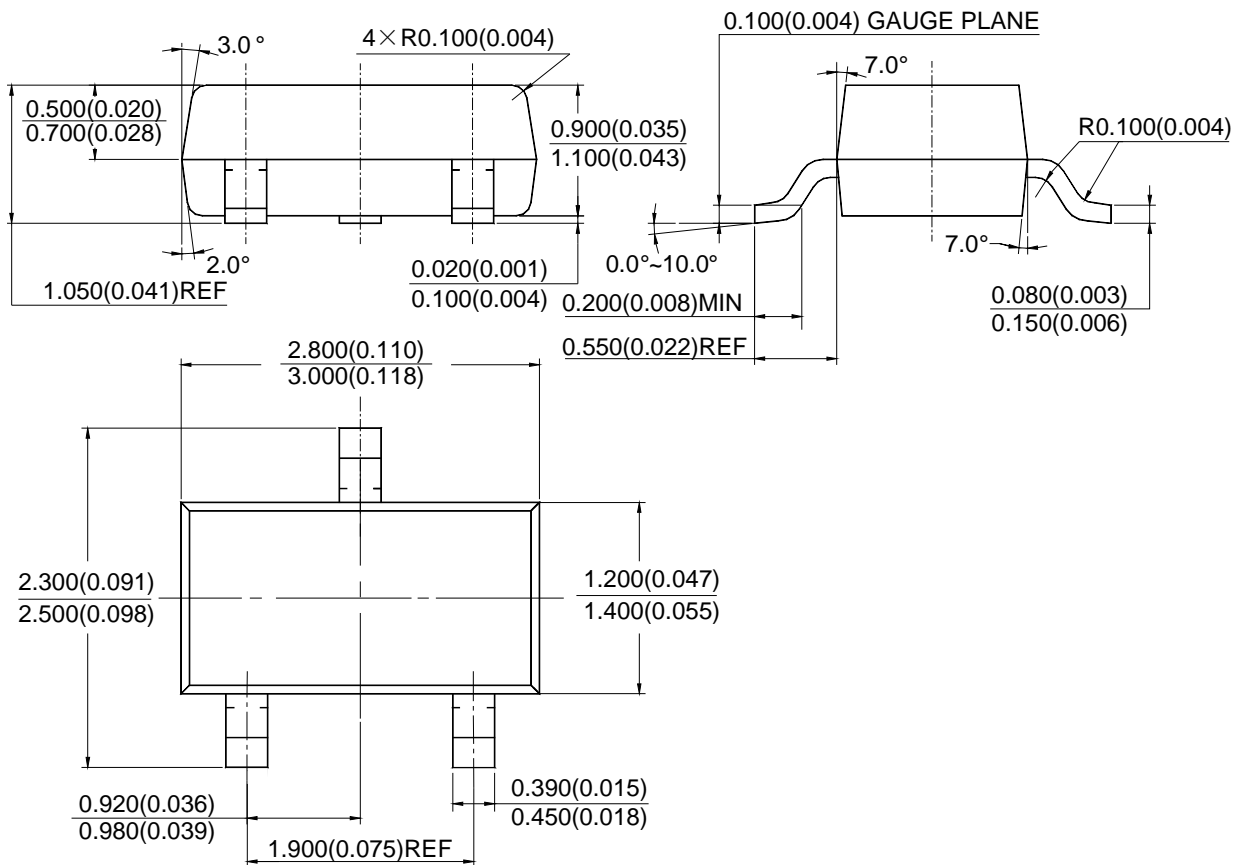


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## Mechanical Dimensions (Cont'd)

SOT-23

Unit: mm(inch)



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