

**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR****AZ432****General Description**

The AZ432 series ICs are low voltage three-terminal adjustable regulators with guaranteed thermal stability over a full operation range. These ICs feature sharp turn-on characteristics, low temperature coefficient and low output impedance, which make them ideal substitutes for Zener diodes in applications such as switching power supply, charger, motherboard and other adjustable regulators.

The output voltage can be set to any value between 1.25V and 18V with two external resistors.

The AZ432 precision reference is offered in two band-gap tolerance: 0.5% and 1%.

These ICs are available in 4 packages: TO-92, SOT-23-3, SOT-23-5, SOT-89.

**Features**

- Wide Programmable Precise Output Voltage from 1.25V to 18V
- High Stability under Capacitive Load
- Low Temperature Deviation: 3mV Typical
- Low Equivalent Full-Range Temperature Coefficient: 20PPM/°C Typical
- Low Dynamic Output Resistance: 0.05Ω Typical
- High Sink Current Capacity from 55μA to 100 mA
- Low Output Noise
- Wide Operating Range of -40 to 125°C

**Applications**

- Graphic Card
- PC Motherboard
- Voltage Adapter
- Switching Power Supply
- Charger

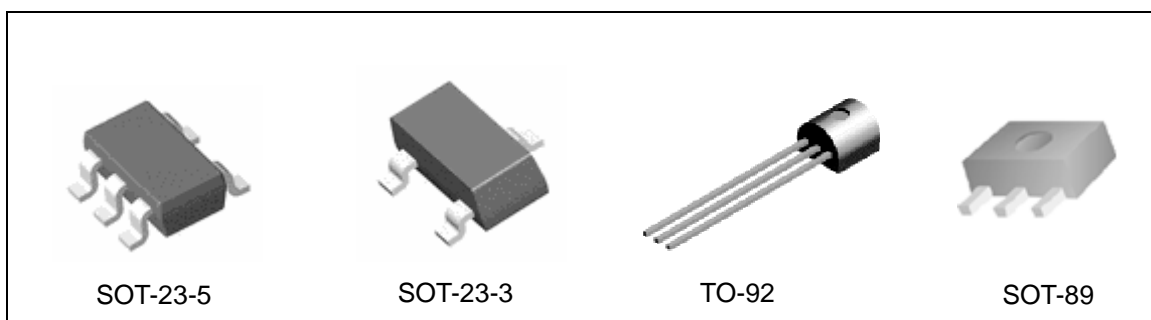


Figure 1. Package Types of AZ432



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Pin Configuration**

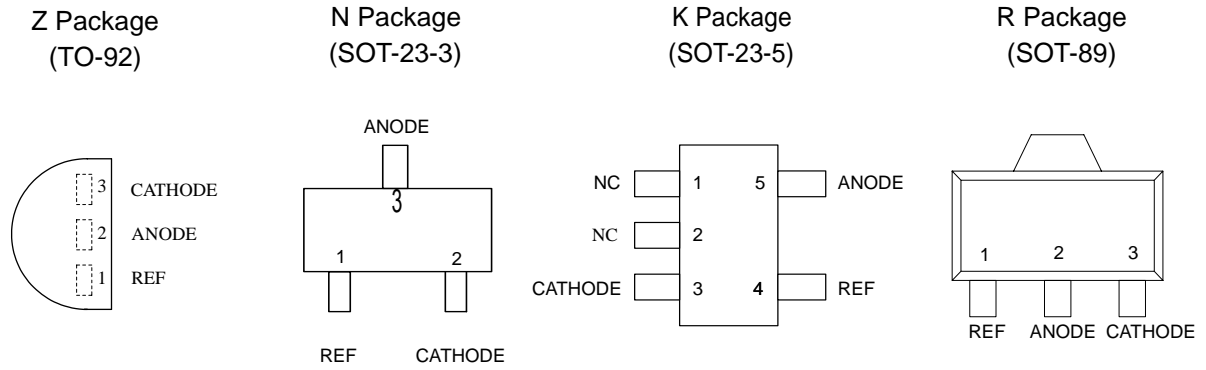


Figure 2. Pin Configuration of AZ432 (Top View)

**Functional Block Diagram**

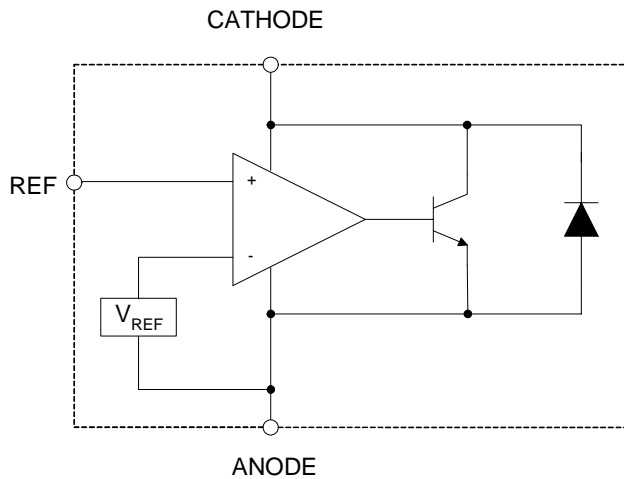
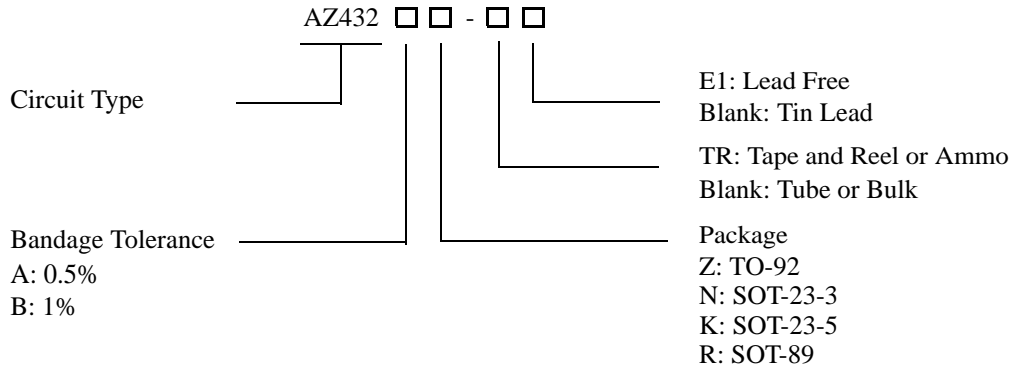


Figure 3. Functional Block Diagram of AZ432



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Ordering Information**



Package	Temperature Range	Voltage Tolerance	Part Number		Marking ID		Packing Type
			Tin Lead	Lead Free	Tin Lead	Lead Free	
TO-92	-40 to 125°C	0.50%	AZ432AZ	AZ432AZ-E1	AZ432AZ	AZ432AZ-E1	Bulk
		0.50%	AZ432AZTR	AZ432AZTR-E1	AZ432AZ	AZ432AZ-E1	Ammo
		1%	AZ432BZ	AZ432BZ-E1	AZ432BZ	AZ432BZ-E1	Bulk
		1%	AZ432BZTR	AZ432BZTR-E1	AZ432BZ	AZ432BZ-E1	Ammo
SOT-23-3	-40 to 125°C	0.50%	AZ432ANTR	AZ432ANTR-E1	N48	EA8	Tape & Reel
		1%	AZ432BNTR	AZ432BNTR-E1	N49	EA9	Tape & Reel
SOT-23-5	-40 to 125°C	0.50%	AZ432AKTR	AZ432AKTR-E1	K43	E7A	Tape & Reel
		1%	AZ432BKTR	AZ432BKTR-E1	K44	E8A	Tape & Reel
SOT-89	-40 to 125°C	0.50%	AZ432ARTR	AZ432ARTR-E1	R42A	E42A	Tape & Reel
		1%	AZ432BRTR	AZ432BRTR-E1	R42B	E42B	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant.

**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR****AZ432****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value		Unit
Cathode Voltage	$V_{KA}$	20		V
Cathode Current Range (Continuous)	$I_{KA}$	-100 to 100		mA
Reference Input Current Range	$I_{REF}$	10		mA
Power Dissipation	$P_D$	Z,R Package	770	mW
		N,K Package	370	
Storage Temperature Range	$T_{STG}$	-65 to 150		°C
Package Thermal Impedance	$Q_{JA}$	TO-92	130	°C/W
		SOT-23-3	330	
		SOT-23-5	250	
		SOT-89	100	

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

**Recommended Operation Ratings**

Parameter	Symbol	Min	Max	Unit
Cathode Voltage	$V_{KA}$	$V_{REF}$	18	V
Cathode Current	$I_{KA}$	0.1	100	mA
Operating Ambient Temperature Range		-40	125	°C



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Electrical Characteristics**

(Typical and limits apply for  $T_J=25^{\circ}\text{C}$  unless otherwise noted.)

Parameter	Test Circuit	Symbol	Conditions	Min	Typ	Max	Unit	
Reference Voltage	0.5%	4	$V_{REF}$	$V_{KA}=V_{REF}, I_{KA}=10\text{mA}$	1.244	1.250	1.256	V
	1%				1.238	1.250	1.262	
Deviation of Reference Voltage Over-Temperature	4	$\Delta V_{REF}$	$V_{KA}=V_{REF}$ $I_{KA}=10\text{mA}$	0 to $70^{\circ}\text{C}$	2	10	mV	
				-40 to $85^{\circ}\text{C}$	3	10		
Ratio of Change in $V_{REF}$ to the Change in Cathode Voltage	5	$\frac{\Delta V_{REF}}{\Delta V_{KA}}$	$I_{KA}=10\text{mA}$ , $\Delta V_{KA}: V_{REF}$ to 16V		-0.5	-1.5	mV/V	
Reference Input Current	5	$I_{REF}$	$I_{KA}=10\text{mA}, R1=10\text{K}\Omega, R2=\infty$		0.15	0.4	$\mu\text{A}$	
Deviation of Reference Current Over Full Temperature Range	5	$\Delta I_{REF}$	$I_{KA}=10\text{mA}, R1=10\text{K}\Omega, R2=\infty$ $T_A=-40$ to $85^{\circ}\text{C}$		0.1	0.4	$\mu\text{A}$	
Minimum Cathode Current for Regulation	4	$I_{KA}$ (MIN)	$V_{KA}=V_{REF}$		55	80	$\mu\text{A}$	
Off-State Cathode Current	6	$I_{KA}$ (OFF)	$V_{REF}=0, V_{KA}=18\text{V}$		0.04	0.10	$\mu\text{A}$	
			$V_{KA}=6\text{V}, V_{REF}=0$		0.01	0.05		
Dynamic Impedance	4	$Z_{KA}$	$V_{KA}=V_{REF}, I_{KA}=1$ to $100\text{mA}$ $f \leq 1.0\text{kHz}$		0.05	0.15	$\Omega$	



**Electrical Characteristics (Continued)**

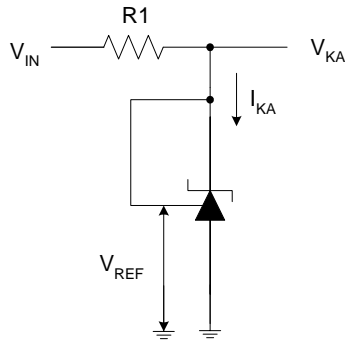


Figure 4. Test Circuit 4 for  $V_{KA} = V_{REF}$

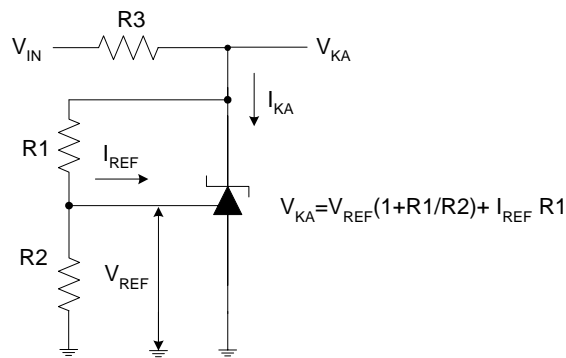


Figure 5. Test Circuit 5 for  $V_{KA} > V_{REF}$

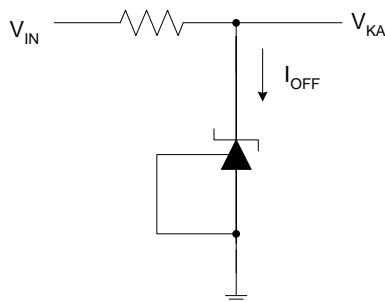


Figure 6. Test Circuit 6 for  $I_{OFF}$



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Performance Characteristics**

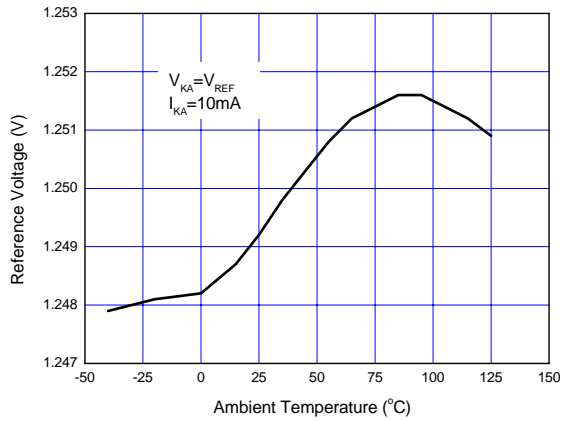


Figure 7. Reference Voltage vs. Ambient Temperature

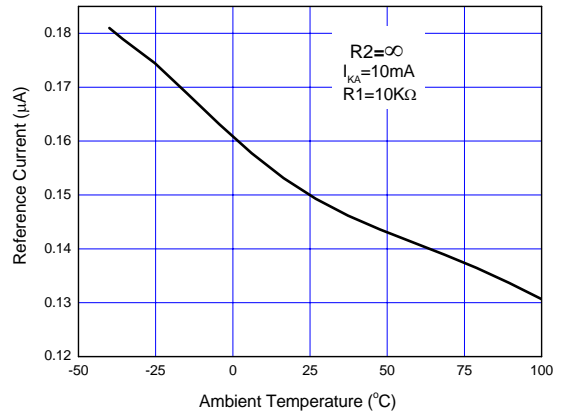


Figure 8. Reference Current vs. Ambient Temperature

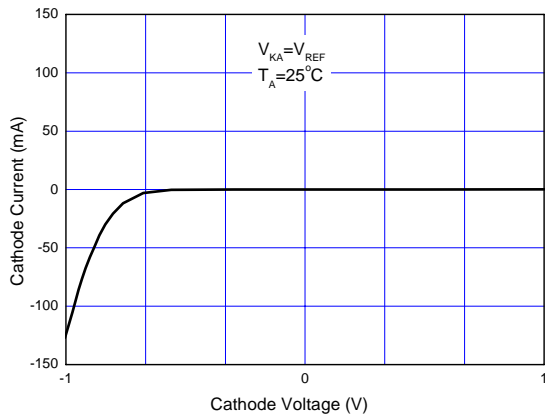


Figure 9. Cathode Current vs. Cathode Voltage

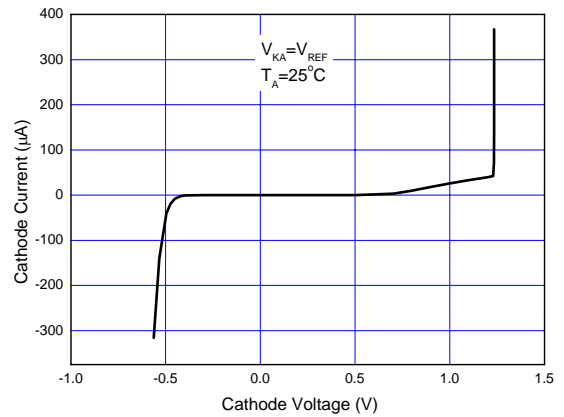


Figure 10. Current vs. cathode Voltage



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Performance Characteristics (Continued)**

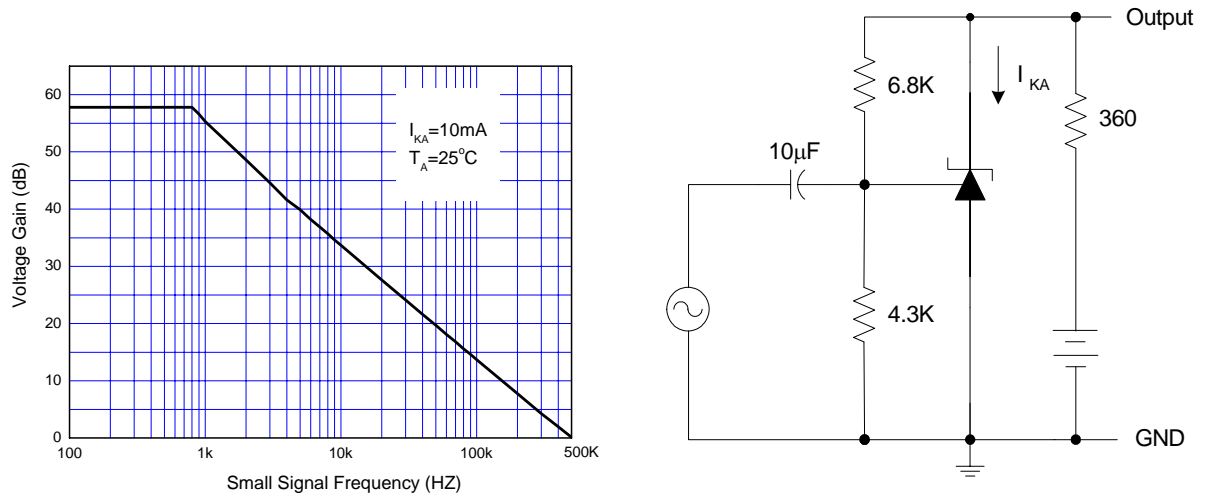


Figure 11. Small Signal Voltage Gain vs. Frequency

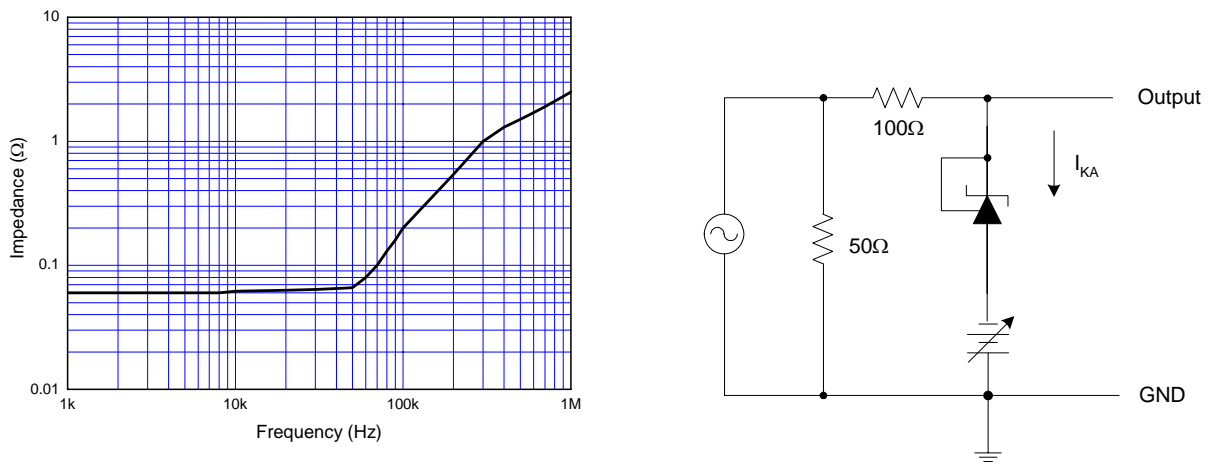


Figure 12. Dynamic Impedance vs. Frequency





**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Performance Characteristics (Continued)**

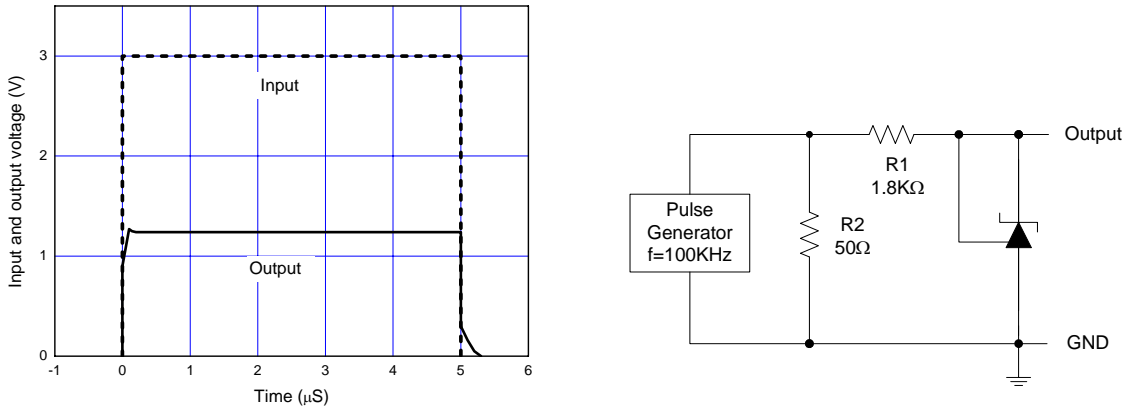


Figure 13. Pulse Response of Input and Output Voltage

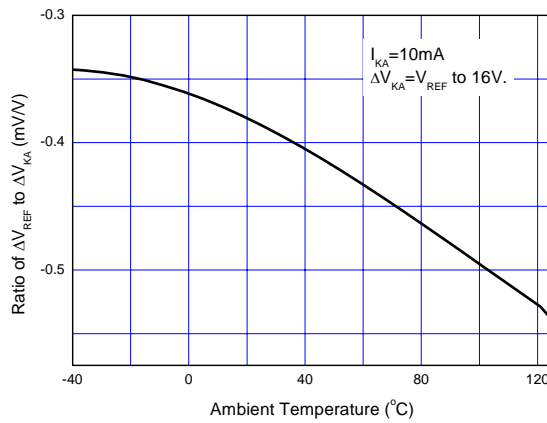
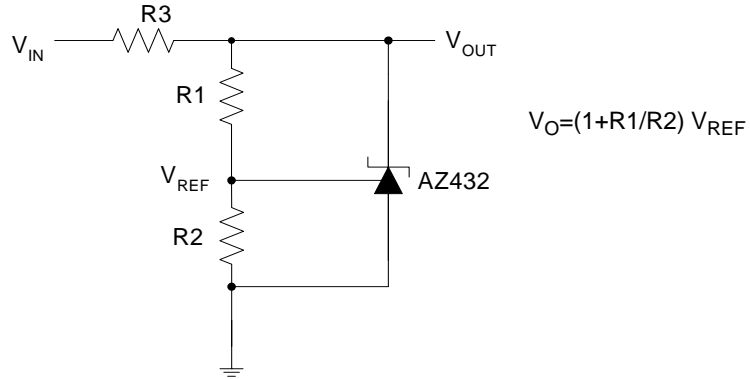


Figure 14. Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage vs. Ambient Temperature



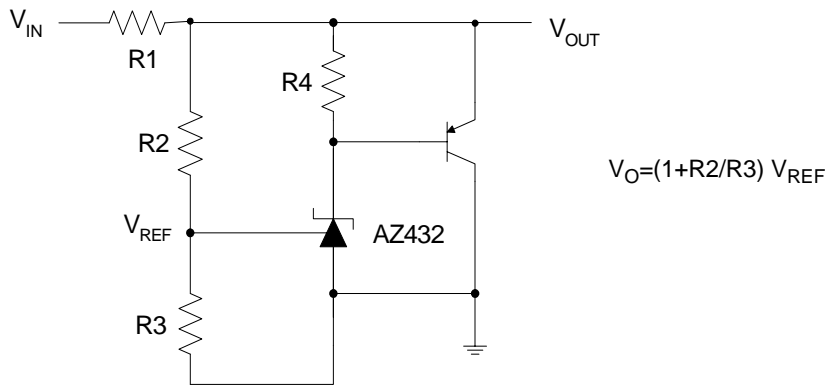
**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Applications**



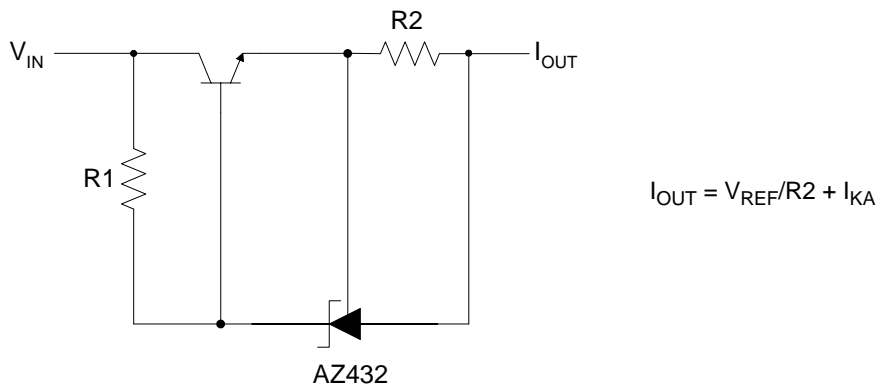
$$V_{O} = (1 + R1/R2) V_{REF}$$

Figure 15: Shunt Regulator



$$V_{O} = (1 + R2/R3) V_{REF}$$

Figure 16: High Current Shunt Regulator



$$I_{OUT} = V_{REF}/R2 + I_{KA}$$

Figure 17: Current Source or Current Limit



**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Application (Continued)**

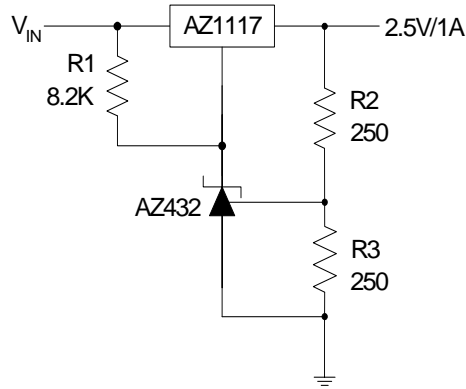


Figure18: Precision 2.5V/1A Regulator

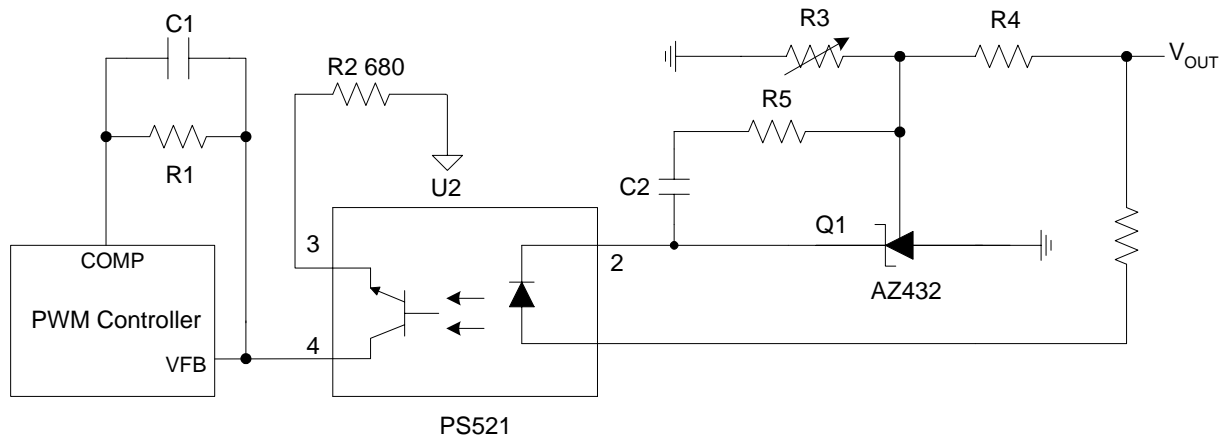


Figure 19: PWM Converter with Reference

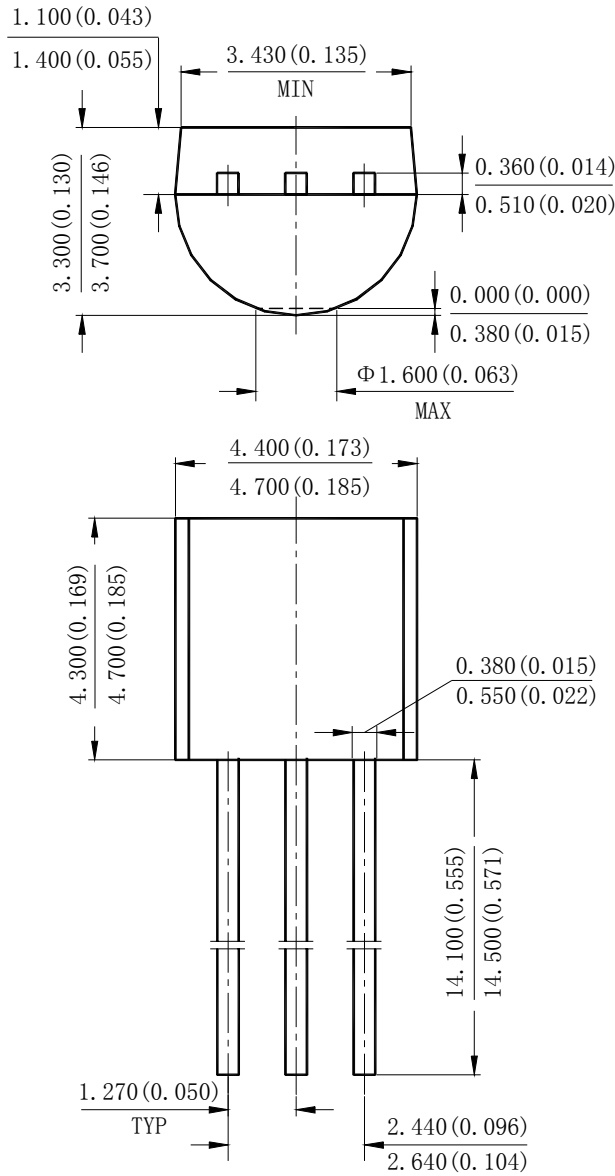


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions**

**TO-92**

**Unit: mm (inch)**



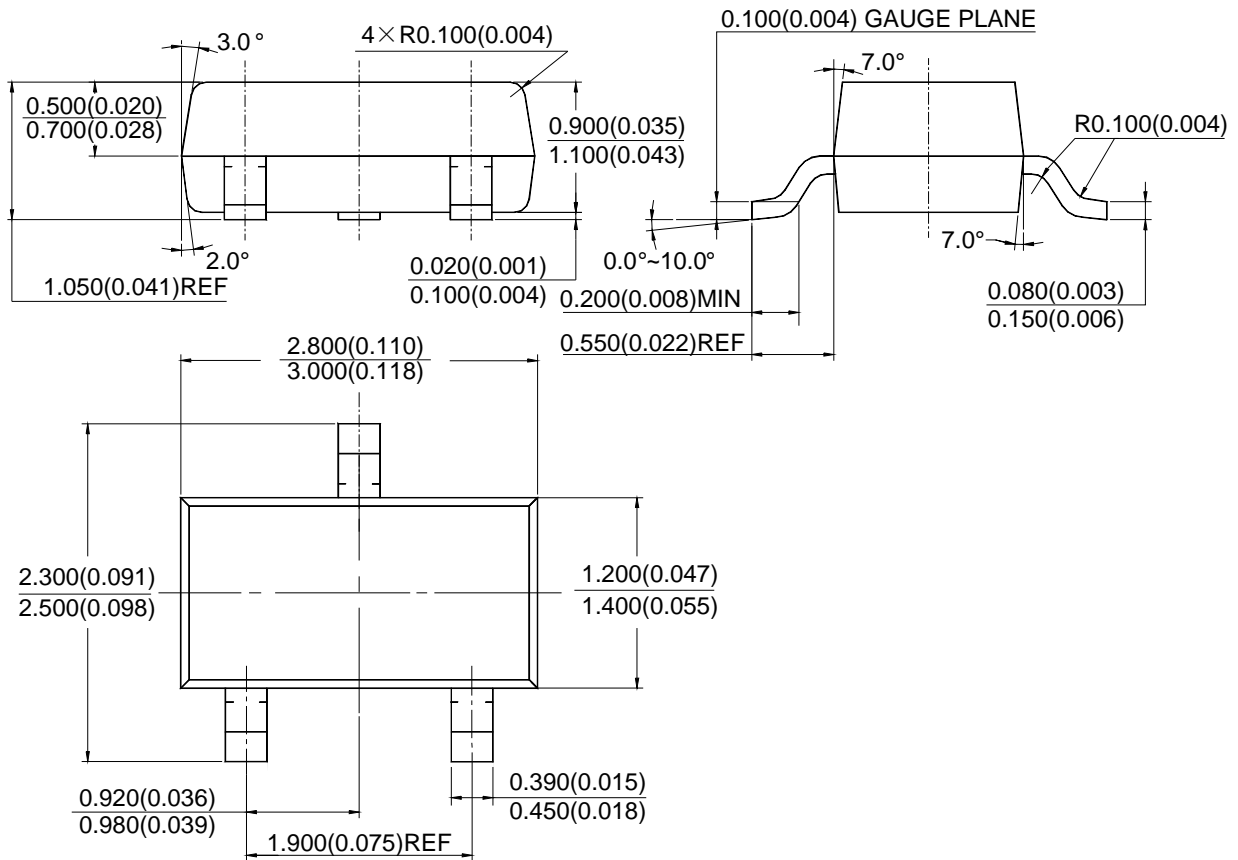


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-23-3**

**Unit: mm(inch)**



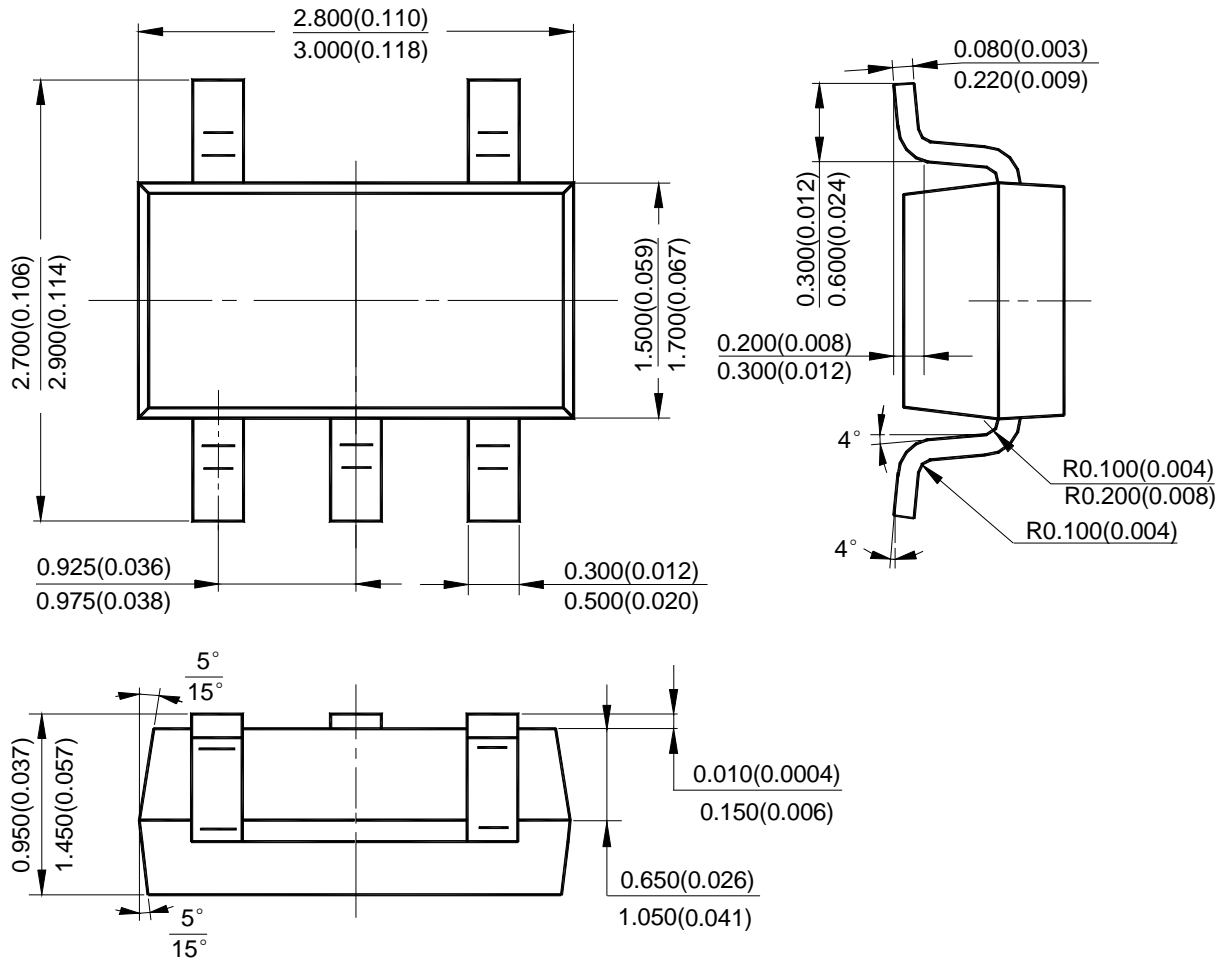


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-23-5**

**Unit: mm(inch)**



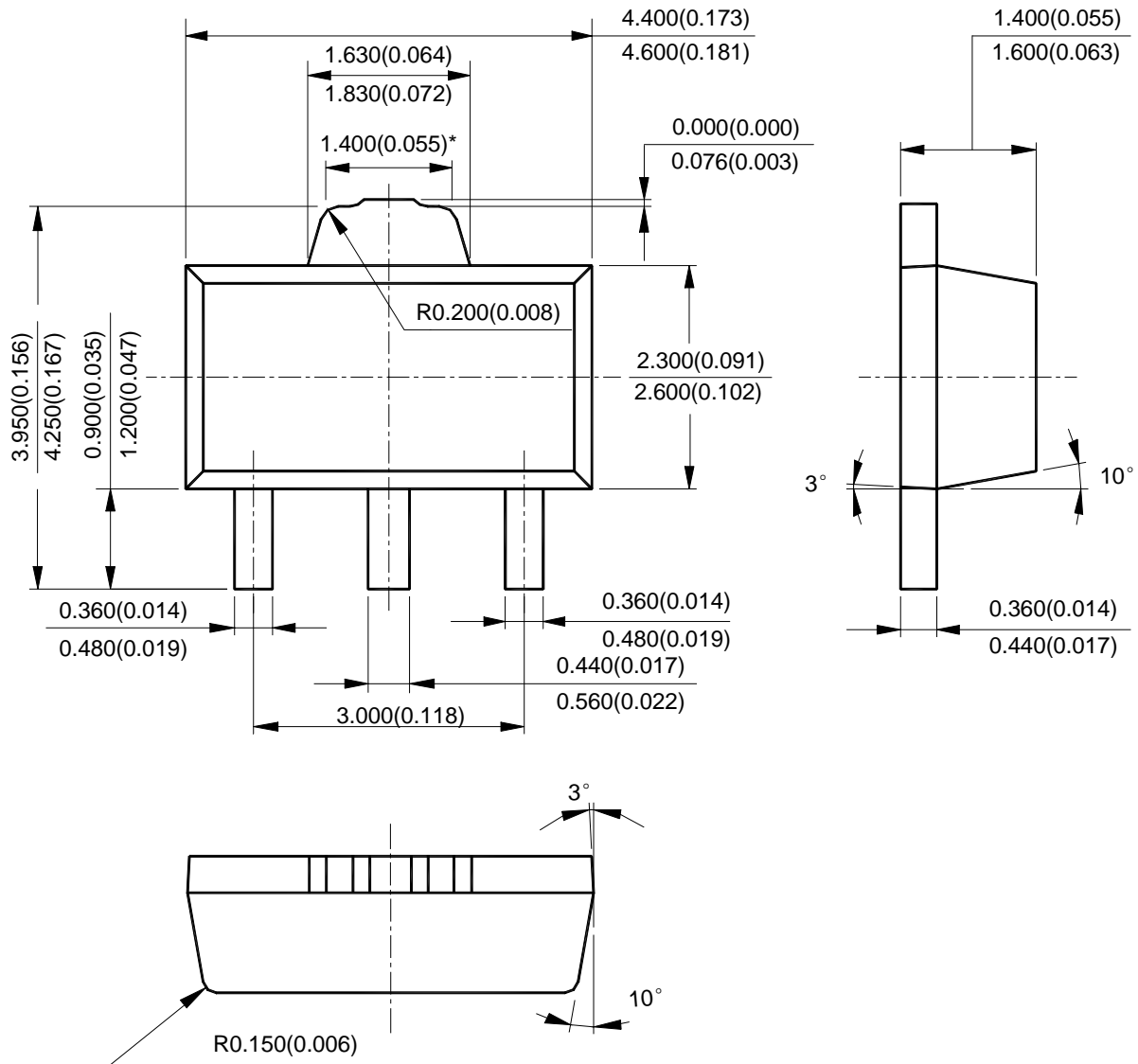


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-89**

**Unit: mm(inch)**





BCD Semiconductor Manufacturing Limited

<http://www.bcdsemi.com>

---

**BCD Semiconductor Corporation**

3170 De La Cruz Blvd, Suite # 105 Santa Clara, CA 95054-2411, U.S.A

Tel: +1-408-988 6388, Fax: +1-408-988 6386

**Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.**

800 Yi Shan Road, Shanghai 200233, PRC

Tel: +86-21-6485-1491, Fax: +86-21-5450-0008

**Advanced Analog Circuits (Shanghai) Corporation**

8F, B Zone, 900 Yi Shan Road, Shanghai 200233, PRC

Tel: +86-21-6495 9539, Fax: +86-21-6485 9673

**BCD Semiconductor (Taiwan) Company Limited**

Room 2210, 22nd Fl, 333, Keelung Road, Sec. 1, TaiPei (110), Taiwan

Tel: +886-2-2758 6828, Fax: +886-2-2758 6892

**IMPORTANT NOTICE**

BCD Semiconductor Manufacturing Limited reserves the right to make changes without further notice to any products or specifications herein. BCD Semiconductor Manufacturing Limited does not assume any responsibility for use of any its products for any particular purpose, nor does BCD Semiconductor Manufacturing Limited assume any liability arising out of the application or use of any its products or circuits. BCD Semiconductor Manufacturing Limited does not convey any license under its patent rights or other rights nor the rights of others.