

**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 voltage tolerance: 0.5% and 1.0%.

These ICs are available in 4 packages: TO-92 (bulk or ammo packing), SOT-23, SOT-23-5 and 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 0.1mA 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

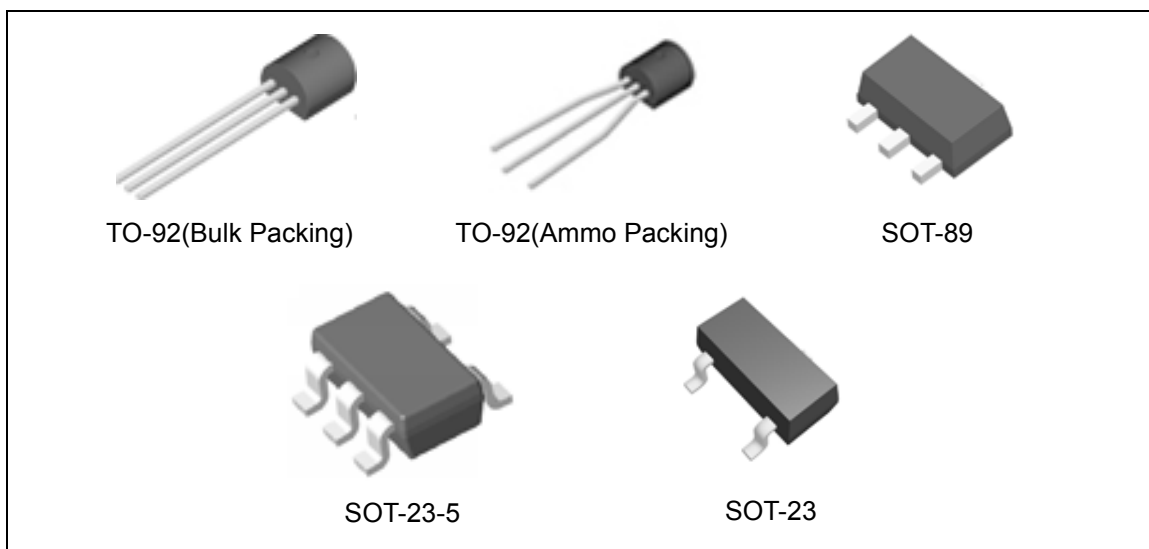
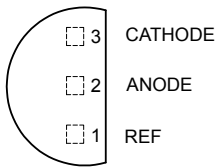


Figure 1. Package Types of AZ432

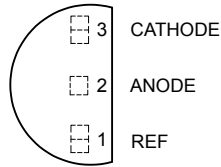
**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Pin Configuration**

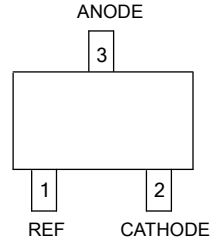
Z Package  
(TO-92(Bulk Packing))



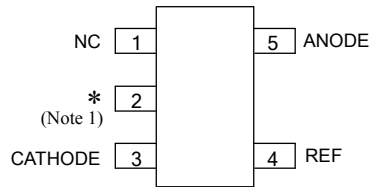
Z Package  
(TO-92(Ammo Packing))



N Package  
(SOT-23)



K Package  
(SOT-23-5)



Note 1: \* Pin 2 is attached to substrate and must be connected to ANODE or open

R Package  
(SOT-89)

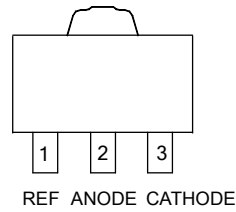


Figure 2. Pin Configuration of AZ432 (Top View)

**Functional Block Diagram**

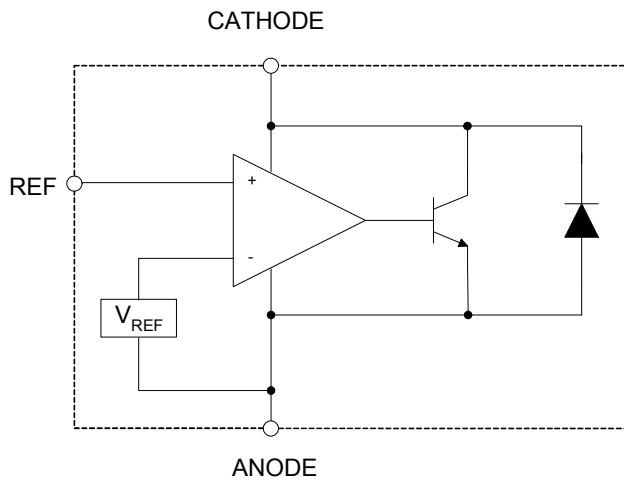
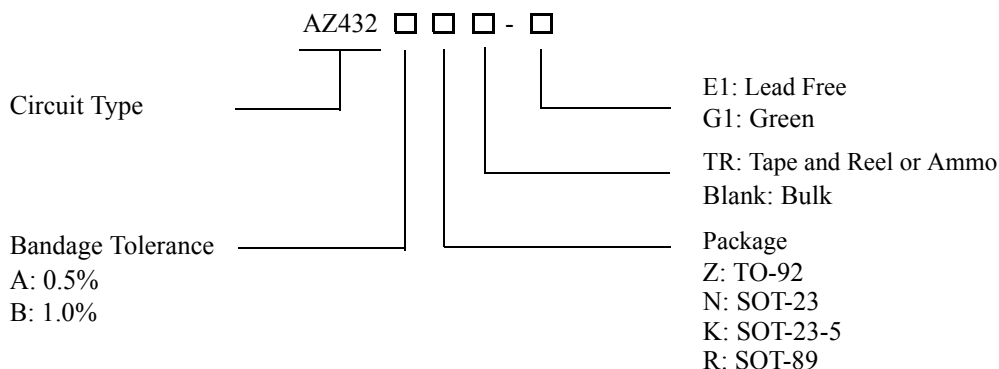


Figure 3. Functional Block Diagram of AZ432



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

**Ordering Information**



| Package  | Temperature Range | Voltage Tolerance | Part Number  |              | Marking ID |            | Packing Type |
|----------|-------------------|-------------------|--------------|--------------|------------|------------|--------------|
|          |                   |                   | Lead Free    | Green        | Lead Free  | Green      |              |
| TO-92    | -40 to 125°C      | 0.5%              | AZ432AZ-E1   | AZ432AZ-G1   | AZ432AZ-E1 | AZ432AZ-G1 | Bulk         |
|          |                   | 0.5%              | AZ432AZTR-E1 | AZ432AZTR-G1 | AZ432AZ-E1 | AZ432AZ-G1 | Ammo         |
|          |                   | 1.0%              | AZ432BZ-E1   | AZ432BZ-G1   | AZ432BZ-E1 | AZ432BZ-G1 | Bulk         |
|          |                   | 1.0%              | AZ432BZTR-E1 | AZ432BZTR-G1 | AZ432BZ-E1 | AZ432BZ-G1 | Ammo         |
| SOT-23   | -40 to 125°C      | 0.5%              | AZ432ANTR-E1 | AZ432ANTR-G1 | EA8        | GA8        | Tape & Reel  |
|          |                   | 1.0%              | AZ432BNTR-E1 | AZ432BNTR-G1 | EA9        | GA9        | Tape & Reel  |
| SOT-23-5 | -40 to 125°C      | 0.5%              | AZ432AKTR-E1 | AZ432AKTR-G1 | E7A        | G7A        | Tape & Reel  |
|          |                   | 1.0%              | AZ432BKTR-E1 | AZ432BKTR-G1 | E8A        | G8A        | Tape & Reel  |
| SOT-89   | -40 to 125°C      | 0.5%              | AZ432ARTR-E1 | AZ432ARTR-G1 | E42A       | G42A       | Tape & Reel  |
|          |                   | 1.0%              | AZ432BRTR-E1 | AZ432BRTR-G1 | E42B       | G42B       | Tape & Reel  |

BCD Semiconductor's Pb-free products, as designated with "E1" suffix in the part number, are RoHS compliant. Products with "G1" suffix are available in green packages.

**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR****AZ432****Absolute Maximum Ratings (Note 2)**

| 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 |      |
| Junction Temperature               | $T_J$     | 150          |     | °C   |
| Storage Temperature Range          | $T_{STG}$ | -65 to 150   |     | °C   |

Note 2: 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  $T_A=25^\circ\text{C}$ , unless otherwise noted.)

| Parameter   | Test Circuit | Symbol                                 | Conditions  | Min                        | Typ    | Max   | Unit               |
|---|--------------|--|---|----------------------------|--------|-------|--------------------|
| Reference Voltage   | 0.5%         | 4                                      | $V_{KA}=V_{REF}, I_{KA}=10\text{mA}$  | 1.244                      | 1.250  | 1.256 | V                  |
|   | 1.0%         |  |   | 1.238                      | 1.250  | 1.262 |                    |
| Deviation of Reference Voltage Over Full Temperature Range    | 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    |                    |
|   |              |  |   | -40 to $125^\circ\text{C}$ | 4      | 15    |                    |
| Ratio of Change in $V_{REF}$ to the Change in Cathode Voltage | 5            | $\frac{\Delta V_{REF}}{\Delta V_{KA}}$ | $I_{KA}=10\text{mA}, \Delta V_{KA}: V_{REF} \text{ to } 16\text{V}$                         |                            | -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            | $\Delta I_{REF}$                       | $I_{KA}=10\text{mA}, R1=10\text{K}\Omega, R2=\infty, T_A=-40 \text{ to } 125^\circ\text{C}$ |                            | 0.1    | 0.4   | $\mu\text{A}$      |
| Minimum Cathode Current for Regulation                        | 4            | $I_{KA}(\text{MIN})$                   | $V_{KA}=V_{REF}$  |                            | 55     | 80    | $\mu\text{A}$      |
| Off-state Cathode Current                                     | 6            | $I_{KA}(\text{OFF})$                   | $V_{REF}=0, V_{KA}=18\text{V}$  |                            | 0.04   | 0.10  | $\mu\text{A}$      |
|   |              |  | $V_{KA}=6\text{V}, V_{REF}=0$   |                            | 0.01   | 0.05  |                    |
| Dynamic Impedance   | 4            | $Z_{KA}$                               | $V_{KA}=V_{REF}, I_{KA}=1 \text{ to } 100\text{mA}, f \leq 1.0\text{kHz}$                   |                            | 0.05   | 0.15  | $\Omega$           |
| Thermal Resistance (Junction to Case)                         |              | $\theta_{JC}$                          | SOT-23  |                            | 84.84  |       | $^\circ\text{C/W}$ |
|   |              |  | SOT-23-5  |                            | 84.84  |       |                    |
|   |              |  | TO-92   |                            | 140.80 |       |                    |
|   |              |  | SOT-89  |                            | 29.80  |       |                    |

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

**Electrical Characteristics (Continued)**

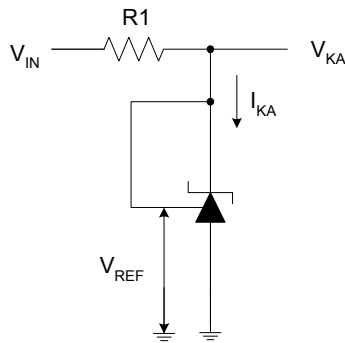


Figure 4. Test Circuit 4 for  $V_{KA} = V_{REF}$

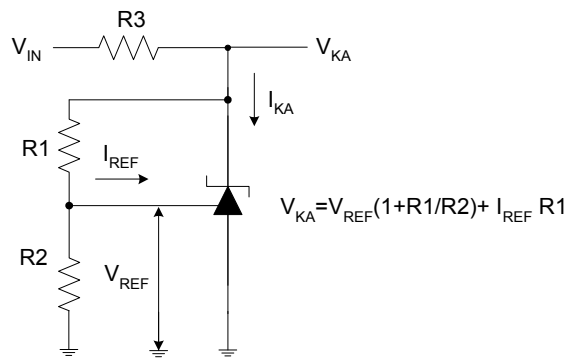


Figure 5. Test Circuit 5 for  $V_{KA} > V_{REF}$

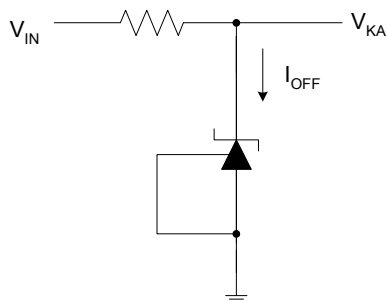


Figure 6. Test Circuit 6 for  $I_{OFF}$



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

**Typical Performance Characteristics**

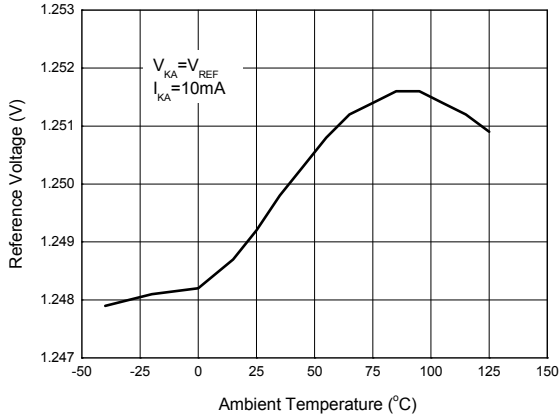


Figure 7. Reference Voltage vs. Ambient Temperature

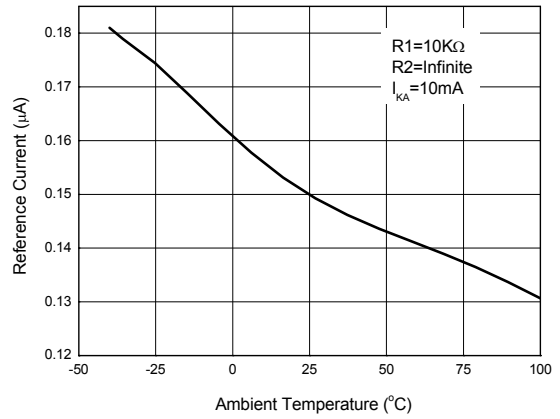


Figure 8. Reference Current vs. Ambient Temperature

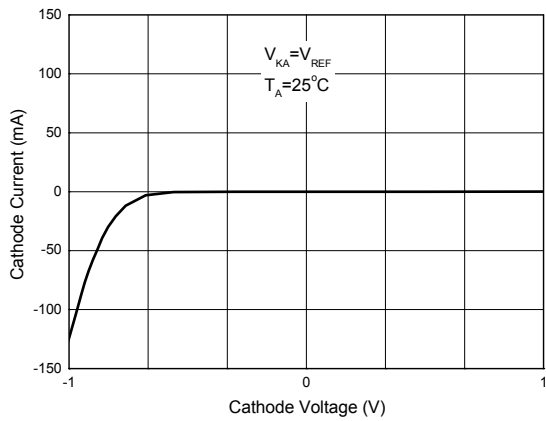


Figure 9. Cathode Current vs. Cathode Voltage

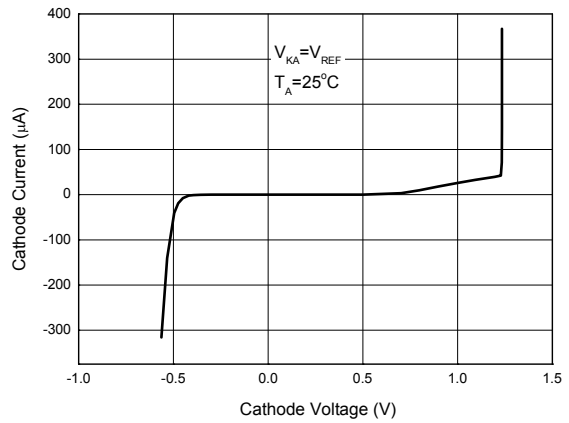


Figure 10. Cathode Current vs. Cathode Voltage

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

**Typical Performance Characteristics (Continued)**

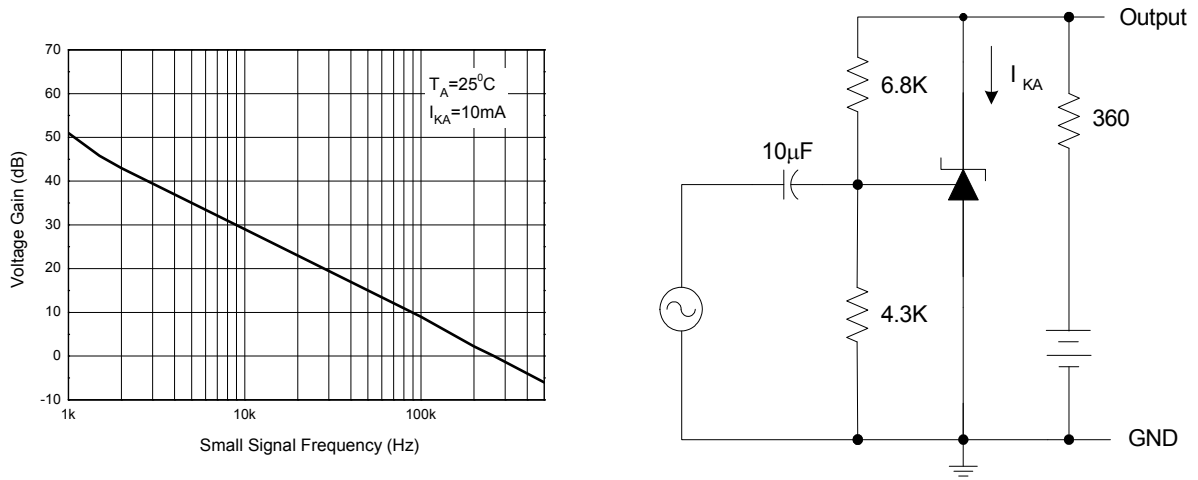


Figure 11. Small Signal Voltage Gain vs. Frequency

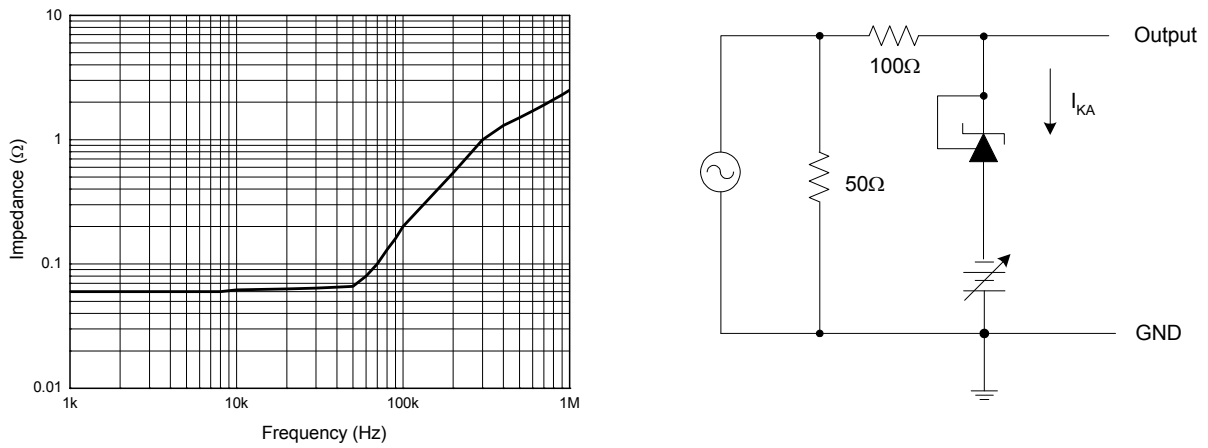


Figure 12. Dynamic Impedance vs. Frequency



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

**Typical Performance Characteristics (Continued)**

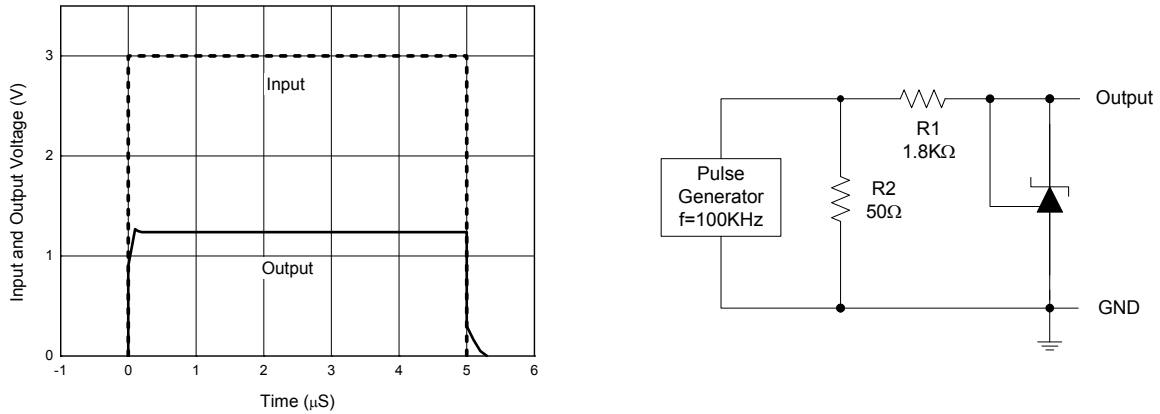


Figure 13. Pulse Response of Input and Output Voltage

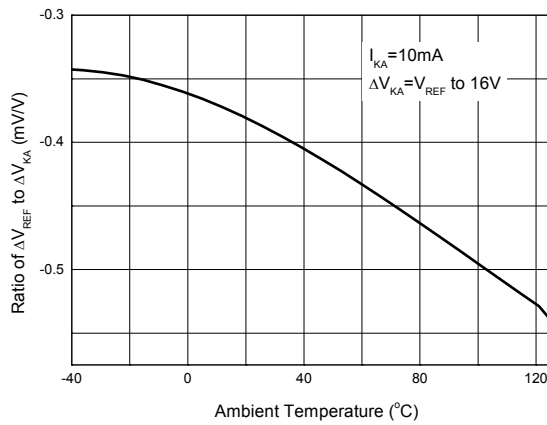
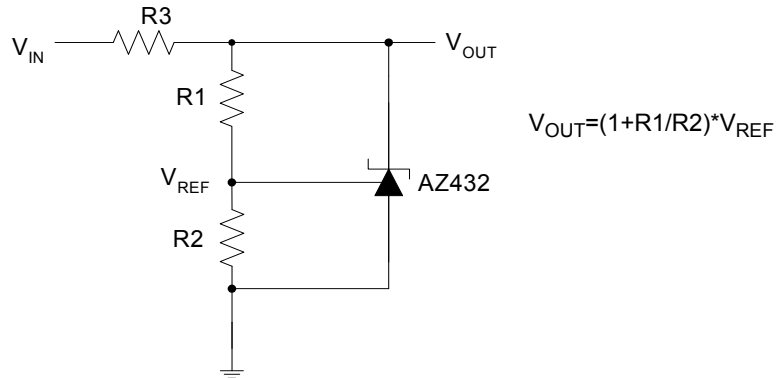


Figure 14. Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage vs. Ambient Temperature

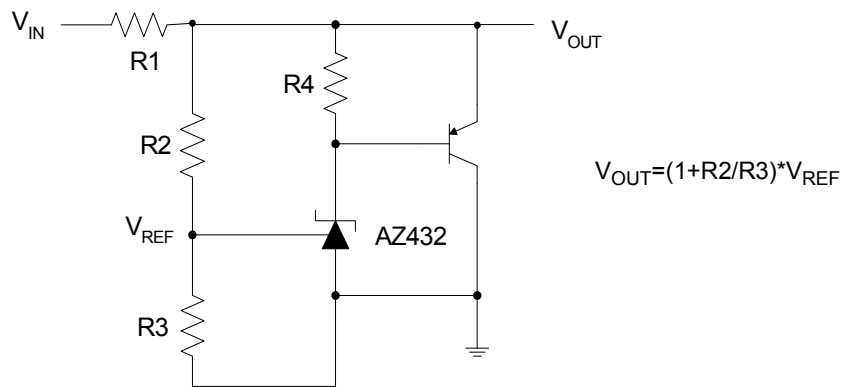
**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Typical Applications**



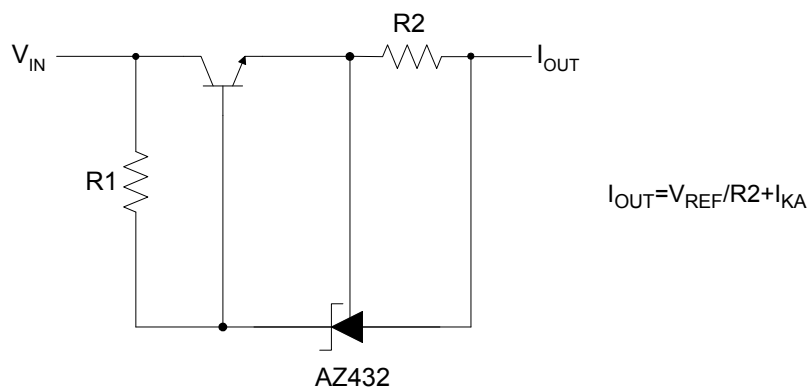
$$V_{OUT} = (1 + R1/R2) * V_{REF}$$

Figure 15. Shunt Regulator



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

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)**

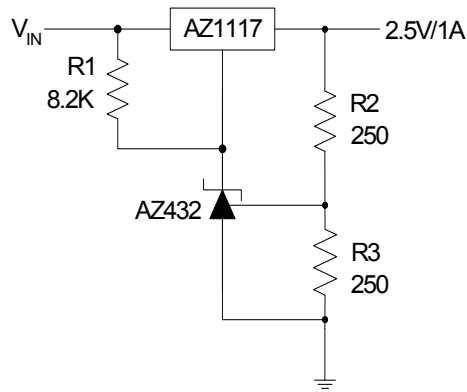


Figure18. Precision 2.5V/1A Regulator

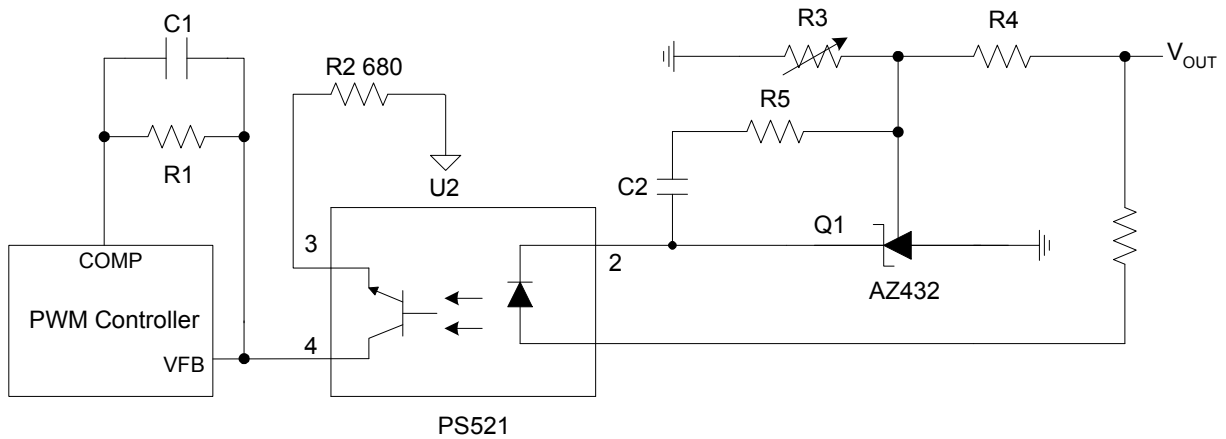


Figure 19. PWM Converter with Reference

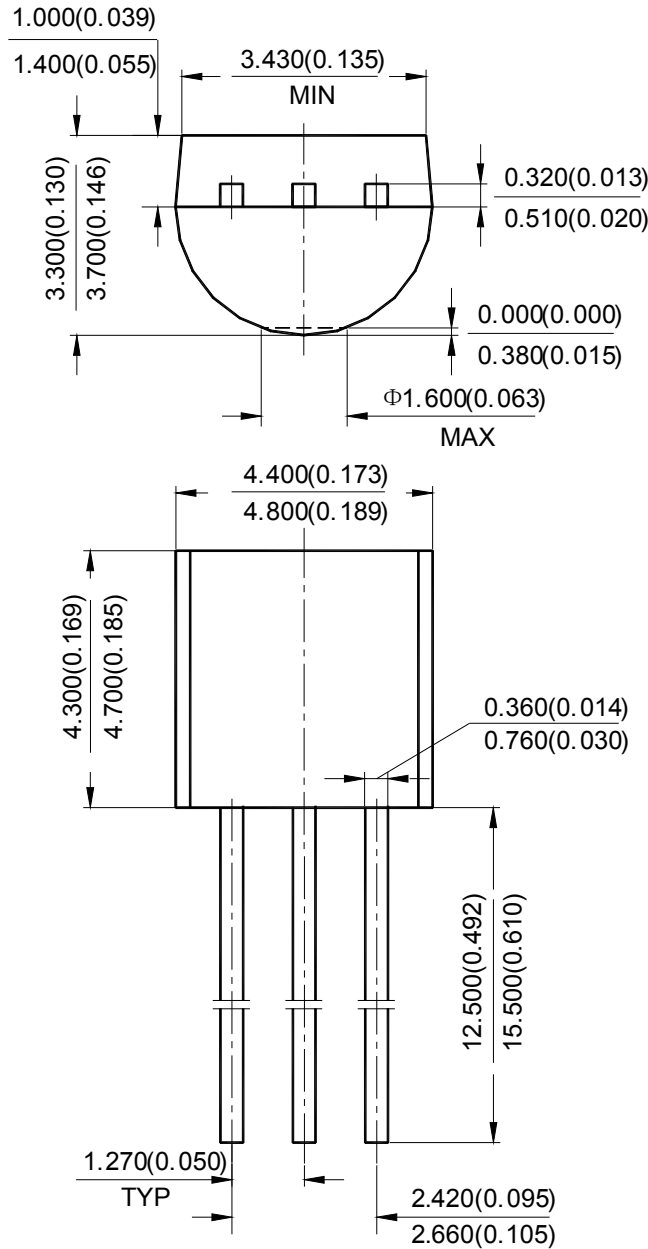


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions**

**TO-92(Bulk Packing)**

**Unit: mm(inch)**



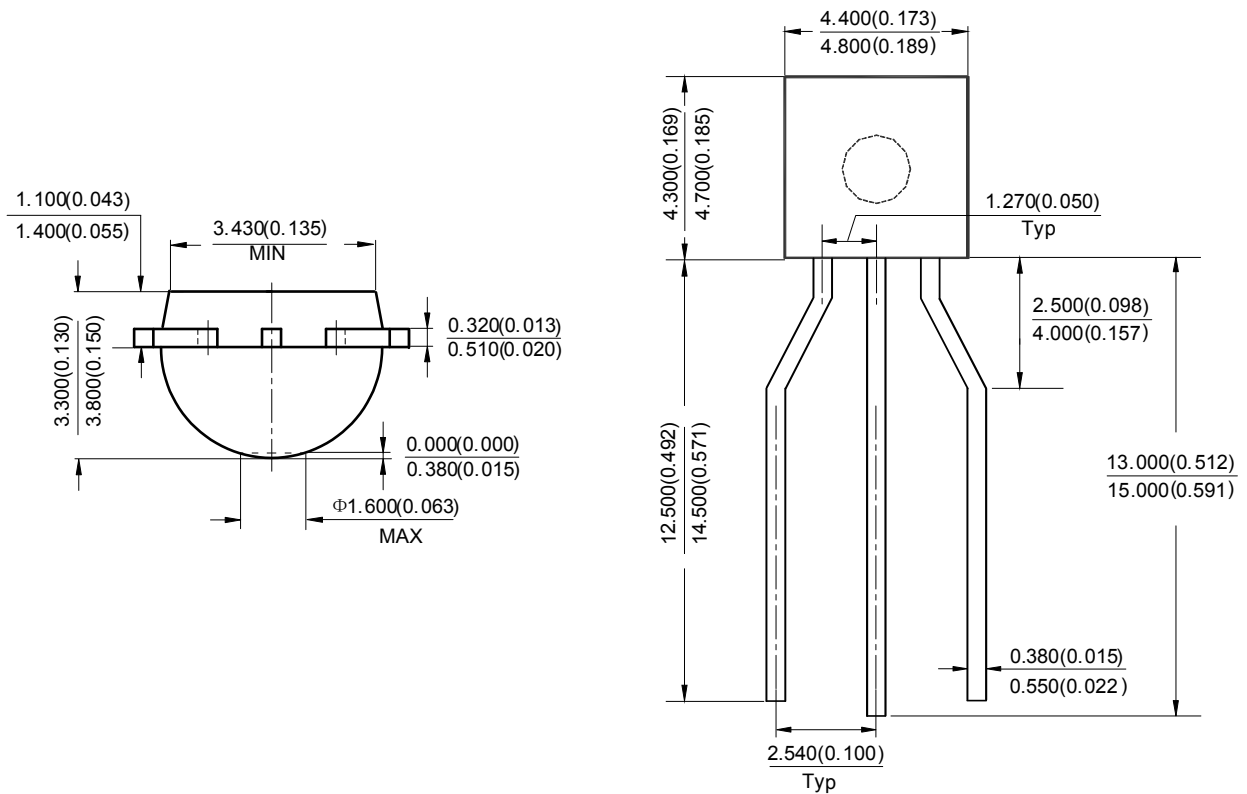


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**TO-92(Ammo Packing)**

**Unit: mm(inch)**



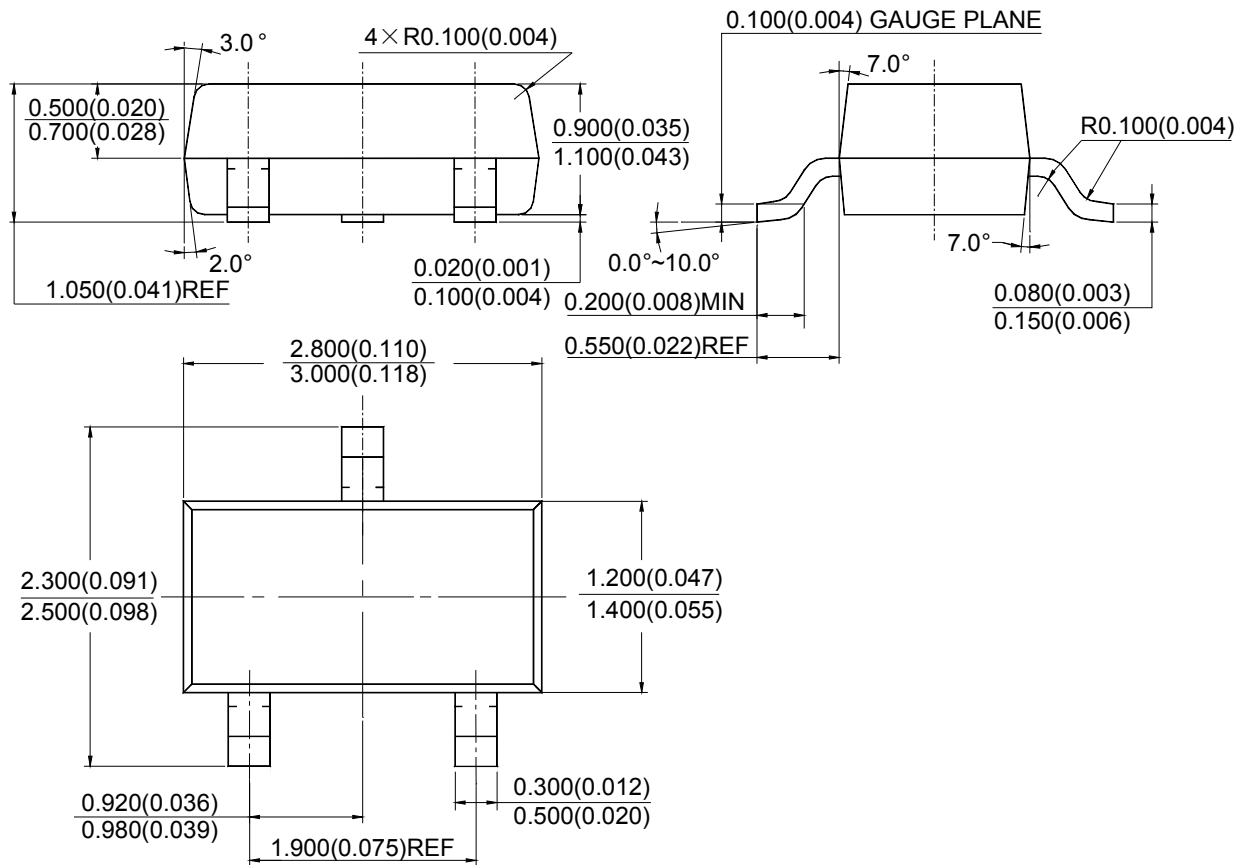


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-23**

**Unit: mm(inch)**



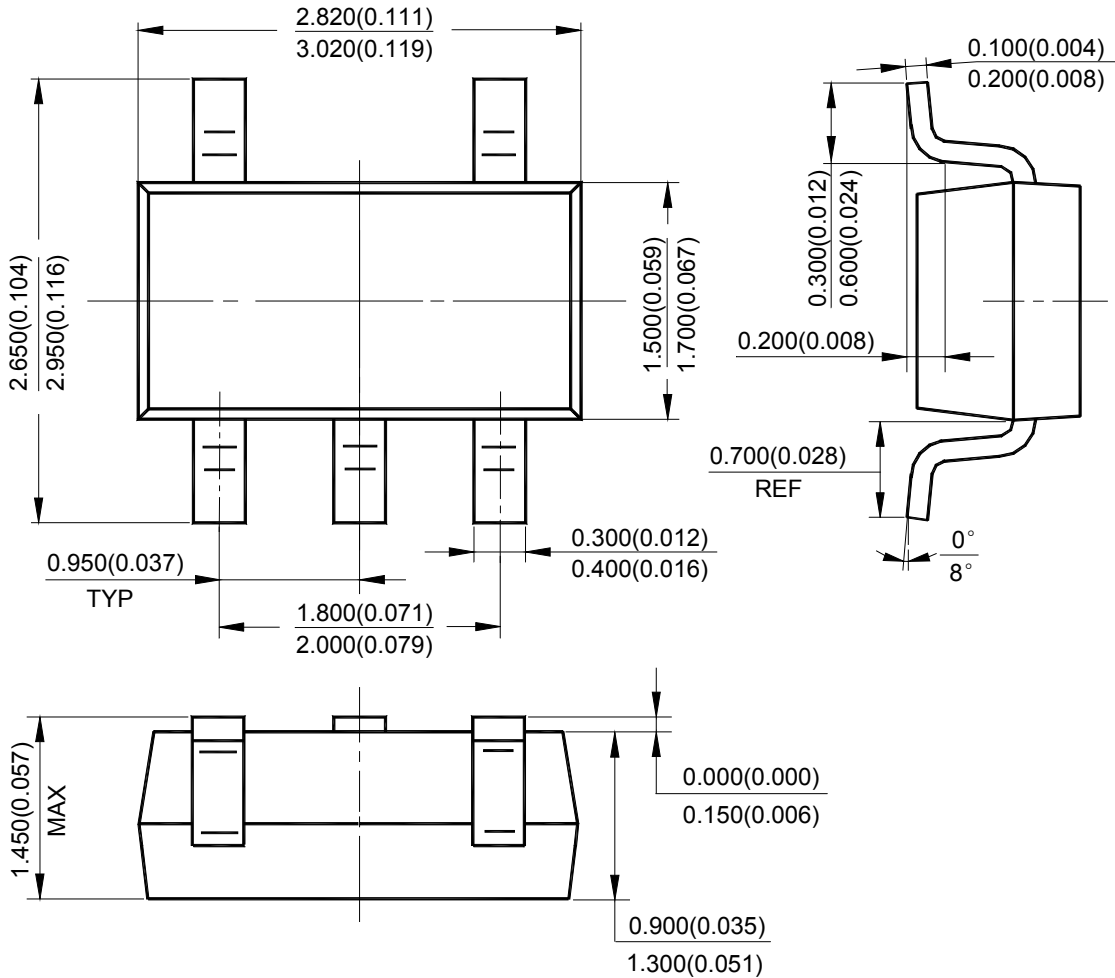


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-23-5**

**Unit: mm(inch)**



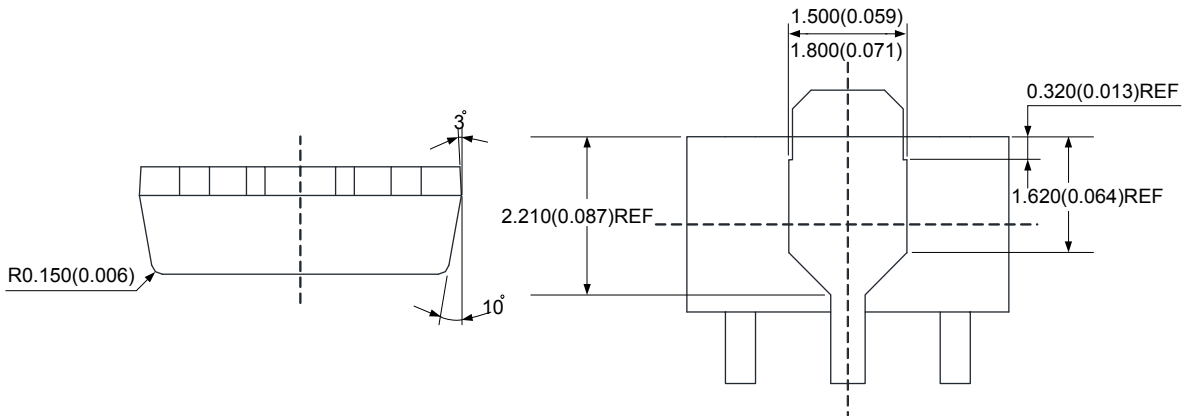
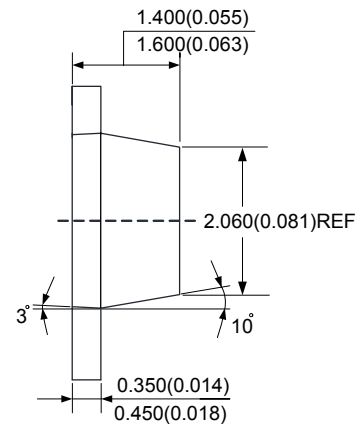
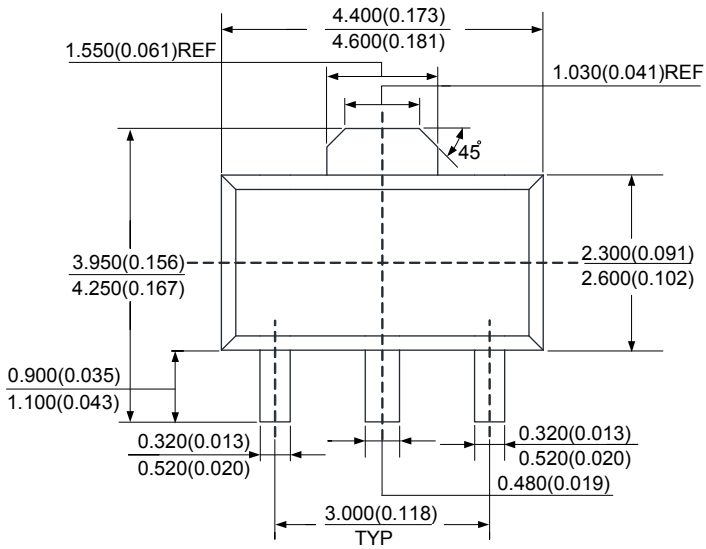


**LOW VOLTAGE (1.25V) ADJUSTABLE PRECISION SHUNT REGULATOR** **AZ432**

**Mechanical Dimensions (Continued)**

**SOT-89**

**Unit: mm(inch)**







## **BCD Semiconductor Manufacturing Limited**

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#### **MAIN SITE**

##### **- Headquarters**

##### **BCD Semiconductor Manufacturing Limited**

No. 1600, Zi Xing Road, Shanghai Zizhu Science-based Industrial Park, 200241, China  
Tel: +86-21-24162266, Fax: +86-21-24162277

##### **- Wafer Fab**

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

800 Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

#### **REGIONAL SALES OFFICE**

##### **Shenzhen Office**

##### **Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office**

Unit A Room 1203, Skyworth Bldg., Gaoxin Ave. 1.S., Nanshan District, Shenzhen, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

##### **Taiwan Office**

##### **BCD Semiconductor (Taiwan) Company Limited**

4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

##### **USA Office**

##### **BCD Semiconductor Corp.**

30920 Huntwood Ave. Hayward, CA 94544, USA  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788



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- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.