

**VOLTAGE DETECTOR****AZ70XX****General Description**

The AZ70XX series ICs are under voltage detectors with a built in voltage threshold and low power consumption. The AZ70XX are specifically designed to accurately monitor power supplies.

The AZ70XX use a precision on-chip voltage reference and a comparator to measure the input operating voltage. These ICs can accurately reset the system after detecting voltage at the time of switching power on and instantaneous power off in various CPU systems and other logic systems. The detect voltage thresholds are 2.3V/2.5V/2.7V/2.9V/3.1V/3.3V/4.2V/4.5V for AZ7023/25/27/29/31/33/42/45 respectively. Built in hysteresis helps to prevent erratic operation in the presence of noise.

The AZ70XX series are available in 2 standard packages: TO-92 and SOT-89-3.

Features

- Low Current Consumption:
 $I_{CCL}=300\mu\text{A}$ Typical
 $I_{CCH}=30\mu\text{A}$ Typical
- Low Minimum Operating Voltage for Output Resetting: 0.8V Typical
- Built in Hysteresis Voltage: 50mV Typical
- Open Collector Output
- Extended Temperature Range: -40 to 85°C

Applications

- Low Battery Voltage Detector
- Power Fail Indicator
- Processor Reset Generator
- Battery Backup Control
- Home Electric Appliances

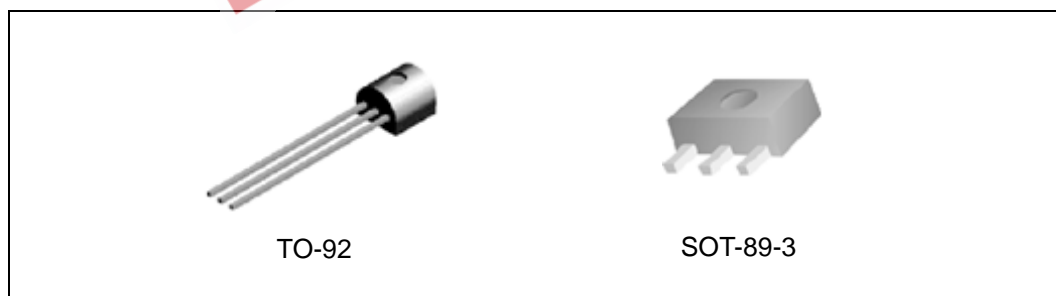


Figure 1. Package Types of AZ70XX



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Pin Configuration



Figure 2. Pin Configuration of AZ70XX (Top View)

Functional Block Diagram



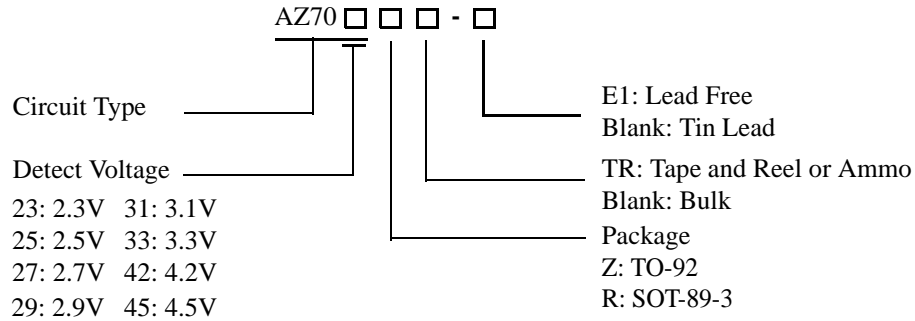
Figure 3. Functional Block Diagram of AZ70XX



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Ordering Information



| Package | Temperature Range | Detector Voltage | Part Number | | Marking ID | | Packing Type |
|----------|-------------------|------------------|-------------|--------------|------------|------------|--------------|
| | | | Tin Lead | Lead Free | Tin Lead | Lead Free | |
| TO-92 | -40 to 85°C | 2.3V | AZ7023Z | AZ7023Z-E1 | AZ7023Z | AZ7023Z-E1 | Bulk |
| | | | AZ7023ZTR | AZ7023ZTR-E1 | AZ7023Z | AZ7023Z-E1 | Ammo |
| | | 2.5V | AZ7025Z | AZ7025Z-E1 | AZ7025Z | AZ7025Z-E1 | Bulk |
| | | | AZ7025ZTR | AZ7025ZTR-E1 | AZ7025Z | AZ7025Z-E1 | Ammo |
| | | 2.7V | AZ7027Z | AZ7027Z-E1 | AZ7027Z | AZ7027Z-E1 | Bulk |
| | | | AZ7027ZTR | AZ7027ZTR-E1 | AZ7027Z | AZ7027Z-E1 | Ammo |
| | | 2.9V | AZ7029Z | AZ7029Z-E1 | AZ7029Z | AZ7029Z-E1 | Bulk |
| | | | AZ7029ZTR | AZ7029ZTR-E1 | AZ7029Z | AZ7029Z-E1 | Ammo |
| | | 3.1V | AZ7031Z | AZ7031Z-E1 | AZ7031Z | AZ7031Z-E1 | Bulk |
| | | | AZ7031ZTR | AZ7031ZTR-E1 | AZ7031Z | AZ7031Z-E1 | Ammo |
| | | 3.3V | AZ7033Z | AZ7033Z-E1 | AZ7033Z | AZ7033Z-E1 | Bulk |
| | | | AZ7033ZTR | AZ7033ZTR-E1 | AZ7033Z | AZ7033Z-E1 | Ammo |
| | | 4.2V | AZ7042Z | AZ7042Z-E1 | AZ7042Z | AZ7042Z-E1 | Bulk |
| | | | AZ7042ZTR | AZ7042ZTR-E1 | AZ7042Z | AZ7042Z-E1 | Ammo |
| | | 4.5V | AZ7045Z | AZ7045Z-E1 | AZ7045Z | AZ7045Z-E1 | Bulk |
| | | | AZ7045ZTR | AZ7045ZTR-E1 | AZ7045Z | AZ7045Z-E1 | Ammo |
| SOT-89-3 | -40 to 85°C | 2.3V | AZ7023RTR | AZ7023RTR-E1 | 7023R | E723 | Tape & Reel |
| | | 2.5V | AZ7025RTR | AZ7025RTR-E1 | 7025R | E725 | Tape & Reel |
| | | 2.7V | AZ7027RTR | AZ7027RTR-E1 | 7027R | E727 | Tape & Reel |
| | | 2.9V | AZ7029RTR | AZ7029RTR-E1 | 7029R | E729 | Tape & Reel |
| | | 3.1V | AZ7031RTR | AZ7031RTR-E1 | 7031R | E731 | Tape & Reel |
| | | 3.3V | AZ7033RTR | AZ7033RTR-E1 | 7033R | E733 | Tape & Reel |
| | | 4.2V | AZ7042RTR | AZ7042RTR-E1 | 7042R | E742 | Tape & Reel |
| | | 4.5V | AZ7045RTR | AZ7045RTR-E1 | 7045R | E745 | Tape & Reel |

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

**VOLTAGE DETECTOR****AZ70XX****Absolute Maximum Ratings (Note 1)**

| Parameter | Symbol | Min | Max | Unit |
|---|-----------|-----------------------|------|------|
| Supply Voltage | V_{CC} | -0.3 | 18 | V |
| Power Dissipation (Package Limitations) | P_D | TO-92 Package: 500 | | mW |
| | | SOT-89-3 Package: 400 | | |
| Storage Temperature Range | T_{STG} | -65 | 150 | °C |
| ESD (Machine Model) | ESD | | 500 | V |
| ESD (Human Body Mode) | ESD | | 5000 | V |

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 Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|-----------------------------|-----------|-----|-----|------|
| Supply Voltage | V_{CC} | | 15 | V |
| Operating Temperature Range | T_{OPR} | -40 | 85 | °C |



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Electrical Characteristics

Operating Conditions: $T_A=25^{\circ}\text{C}$ unless otherwise specified.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit | |
|--|------------------------------------|---|-----------|------------|-----|------------------------|---|
| Detecting Voltage | V_S | $R_L=200\Omega$ (Note 2) $V_{OL} \leq 0.4V$ | AZ7023R/Z | 2.15 | 2.3 | 2.45 | V |
| | | | AZ7025R/Z | 2.35 | 2.5 | 2.65 | |
| | | | AZ7027R/Z | 2.55 | 2.7 | 2.85 | |
| | | | AZ7029R/Z | 2.75 | 2.9 | 3.05 | |
| | | | AZ7031R/Z | 2.95 | 3.1 | 3.25 | |
| | | | AZ7033R/Z | 3.15 | 3.3 | 3.45 | |
| | | | AZ7042R/Z | 4.05 | 4.2 | 4.35 | |
| | | | AZ7045R/Z | 4.35 | 4.5 | 4.65 | |
| Low-Level Output Voltage | V_{OL} | $V_{CC}=V_S(\text{min})-0.05V$ $R_L=200\Omega$ (Note 2) | | | 0.4 | V | |
| Output Leakage Current | I_{OH} | $V_{CC}=15V$ | | | 0.1 | μA | |
| Hysteresis Voltage | V_{HYS} | $R_L=200\Omega$ (Note 2) | 30 | 50 | 100 | mV | |
| Detect Voltage Temperature Coefficient | $\Delta V_S/(V_S \times \Delta T)$ | $R_L=200\Omega$ (Note 2) | | ± 0.01 | | % / $^{\circ}\text{C}$ | |
| Circuit Current at On Time | I_{CCL} | $V_{CC}=V_S(\text{min})-0.05V$ | | 300 | 500 | μA | |
| Circuit Current at Off Time | I_{CCH} | $V_{CC}=5.25V$ | | 30 | 50 | μA | |
| Minimum Operating Voltage | V_{OPR} | $R_L=200\Omega$ (Note 2) $V_{OL} \leq 0.4V$ | | 0.8 | | V | |
| “L” Transmission Delay Time | tp_{HL} | V_{CC} changed from 5.25V to $V_S(\text{min})-0.05V$, $R_L=1.0K\Omega$, $C_L=100p$ (Note 3) | | 10 | | μs | |
| “H” Transmission Delay Time | tp_{LH} | V_{CC} changed from $V_S(\text{min})-0.05V$ to 5.25V, $R_L=1.0K\Omega$, $C_L=100p$ (Note 3) | | 15 | | μs | |
| Output Current at On Time | $I_{OL I}$ | $V_{CC}=V_S(\text{min})-0.05V$ $T_A=25^{\circ}\text{C}$ (Note 4) | 20 | | | mA | |
| | $I_{OL II}$ | $V_{CC}=V_S(\text{min})-0.05V$ $T_A=-40$ to 85°C (Note 4) | 16 | | | | |

Note 2: See test circuit 1 and Figure 12.

Note 3: See test circuit 2 and Figure 12.

Note 4: See test circuit 3. Adjusting the regulative power source until the reading value of voltage meter V is 0.4V, the reading value of current meter A is defined as "Output Current at On Time".



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Electrical Characteristics (Continued)



Figure 4. Test Circuit 1



Figure 5. Test Circuit 2

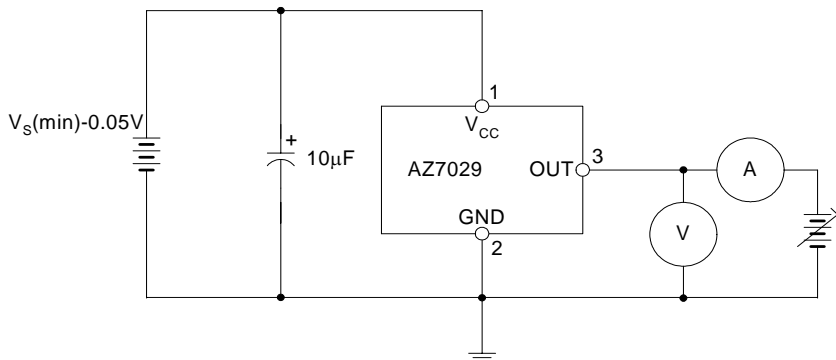


Figure 6. Test Circuit 3



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Typical Performance Characteristics



Figure 7. Detecting Voltage vs. Temperature

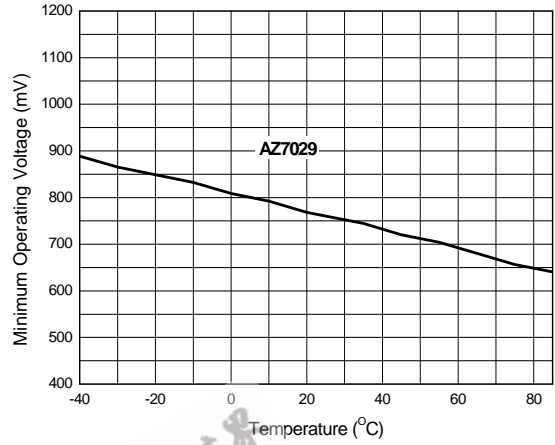


Figure 8. Minimum Operating Voltage vs. Temperature

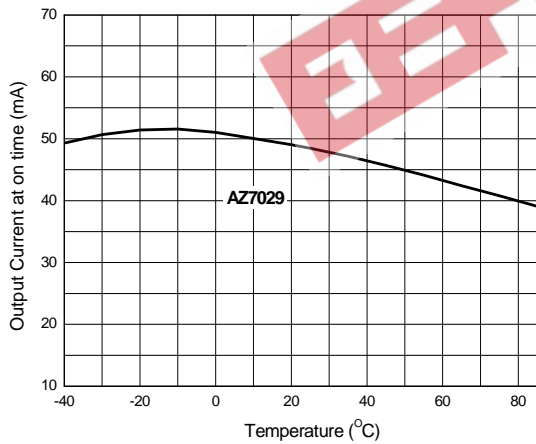


Figure 9. Output Current at on Time vs. Temperature

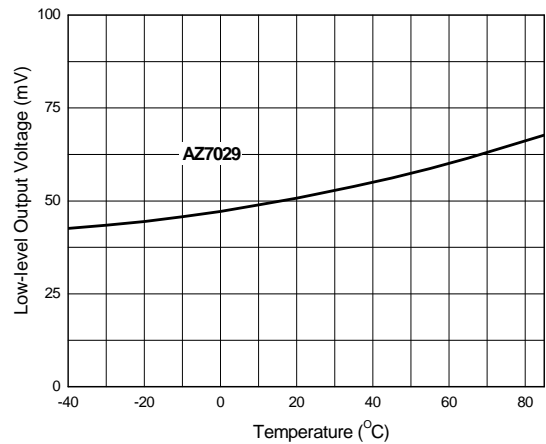


Figure 10. Low-level Output Voltage vs. Temperature



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Typical Performance Characteristics (Continued)

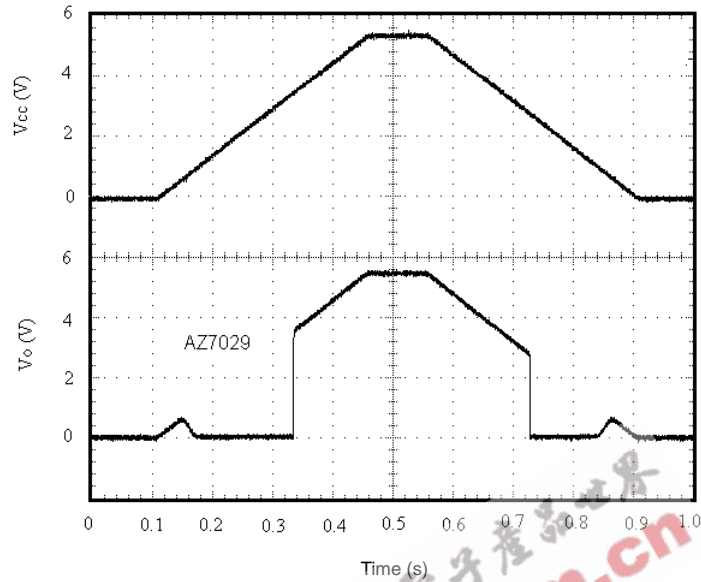


Figure 11. Output Voltage Dynamic Response when V_{CC} Increases and Decreases

Operating Diagram



Figure 12. AZ70XX Timing Waveform

**VOLTAGE DETECTOR****AZ70XX****Operating Diagram (Continued)**

Figure 12 is a typical timing waveform for AZ70XX during power-up and temporary power-down period. Here is some explanations for AZ70XX's operation.

1. During power-up period, V_{OUT} will remain undefined until V_{CC} rises above V_{OPR} (typically 0.8V). After that moment, the output will become valid and will be at its logic low state while $V_{OPR} < V_{CC} < V_S$ for power-up operating.

2. After a delay time of t_{pLH} from the moment $V_{CC} > V_S$, the V_{OUT} will be at its logic high state. In general, V_{OUT} is dependent upon the voltage that the pull up resistor connected to.

3. During power-down, after a delay time of t_{pHL} from the moment $V_{CC} < V_S - V_{HYS}$, V_{OUT} will be at its logic low state. In general, at rated output current and V_{CC} , V_{OUT} can be pulled down to a voltage as low as within 0.4V from GND. (See the Electrical Characteristics section).

4. V_{OUT} will be at its logic low state while $V_S - V_{HYS} > V_{CC} > V_{OPR}$ for power-down operating.

5. After V_{CC} falls below V_{OPR} , the output is undefined.

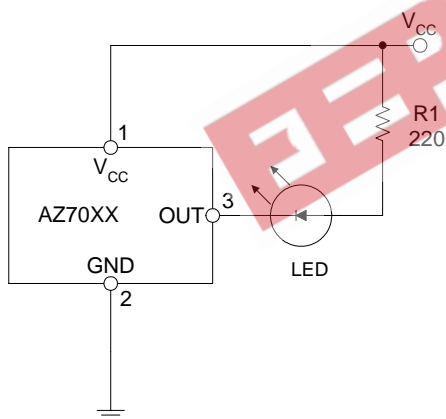
Typical Applications

Figure 13. Low Voltage Indicator



Figure 14. CPU Resetting Circuit



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