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/4.5Vfor 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}=300μA Typical
  I_{CCH}=30μA 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

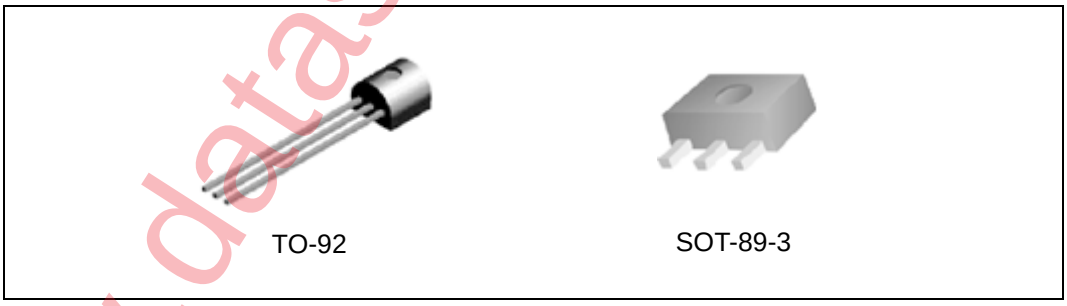

Figure 1. Package Types of AZ70XX

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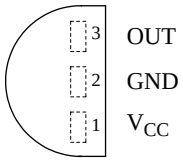
Pin Configuration

Z Package
(TO-92)



R Package
(SOT-89-3)

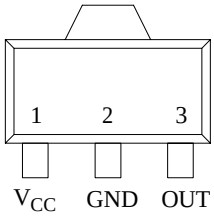


Figure 2. Pin Configuration of AZ70XX (Top View)

Functional Block Diagram

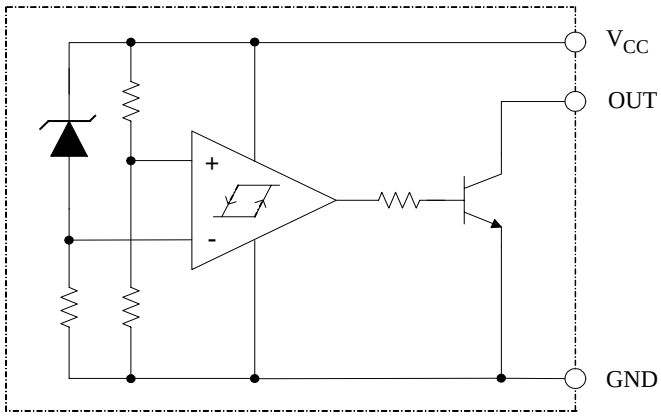
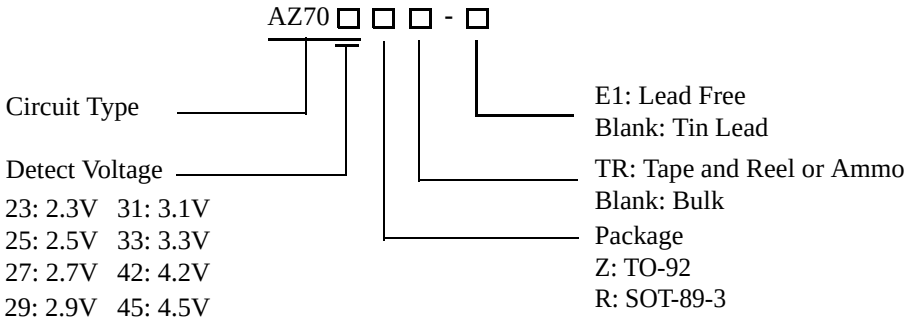


Figure 3. Functional Block Diagram of AZ70XX

VOLTAGE DETECTOR AZ70XX

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.

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

Electrical Characteristics

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

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Detecting Voltage	V_S	R_L=200Ω (Note 2) V_{OL} ≤ 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(min)-0.05V R_L=200Ω (Note 2)				0.4	V
Output Leakage Current	I_{OH}	V_{CC}=15V				0.1	μA
Hysteresis Voltage	V_{HYS}	R_L=200Ω (Note 2)		30	50	100	mV
Detect Voltage Temperature Coefficient	$\Delta V_S/(V_S \times \Delta T)$	R_L=200Ω (Note 2)			±0.01		% /°C
Circuit Current at On Time	I_{CCL}	V_{CC}=V_S(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=200Ω (Note 2) V_{OL} ≤ 0.4V			0.8		V
"L" Transmission Delay Time	tpHL	V_{CC} changed from 5.25V to V_S(min)-0.05V, R_L=1.0KΩ, C_L=100p (Note 3)			10		μs
"H" Transmission Delay Time	tpLH	V_{CC} changed from V_S(min)-0.05V to 5.25V, R_L=1.0KΩ, C_L=100p (Note 3)			15		μs
Output Current at On Time	I_{OL} Ⅰ	V_{CC}=V_S(min)-0.05V T_A=25°C (Note 4)		20			mA
	I_{OL} Ⅱ	V_{CC}=V_S(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".

Electrical Characteristics (Continued)

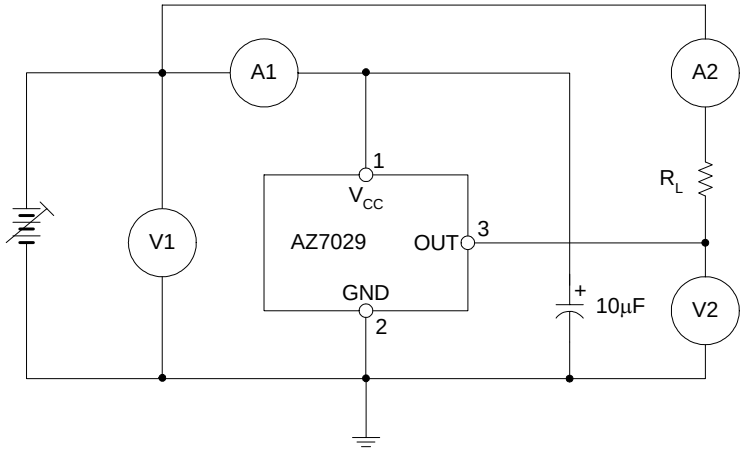


Figure 4. Test Circuit 1

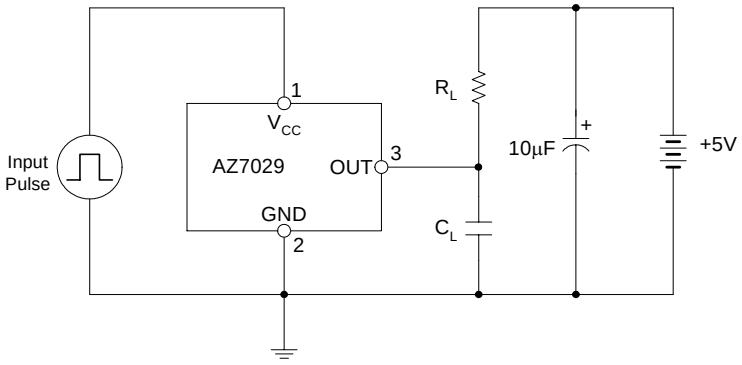


Figure 5. Test Circuit 2

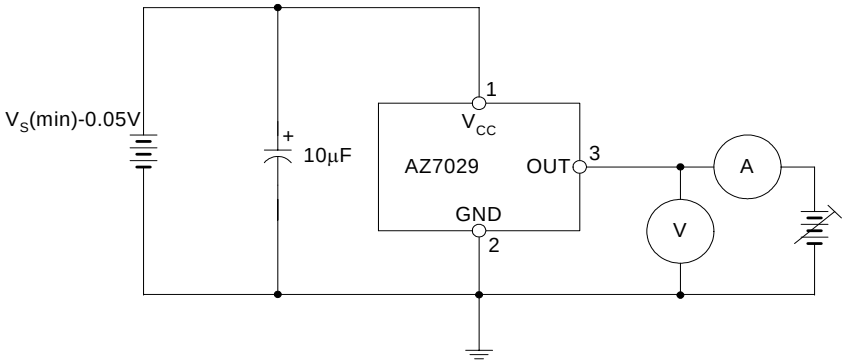


Figure 6. Test Circuit 3

Typical Performance Characteristics

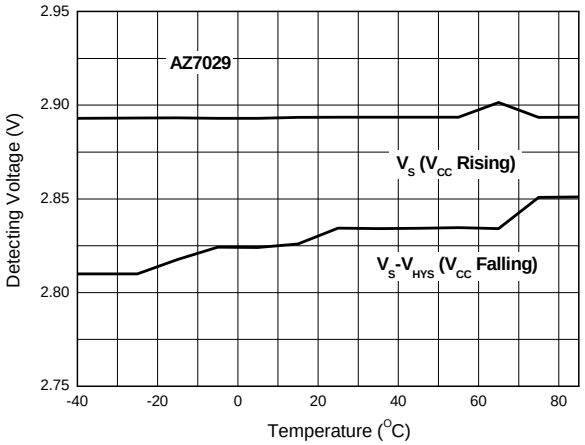


Figure 7. Detecting Voltage vs. Temperature

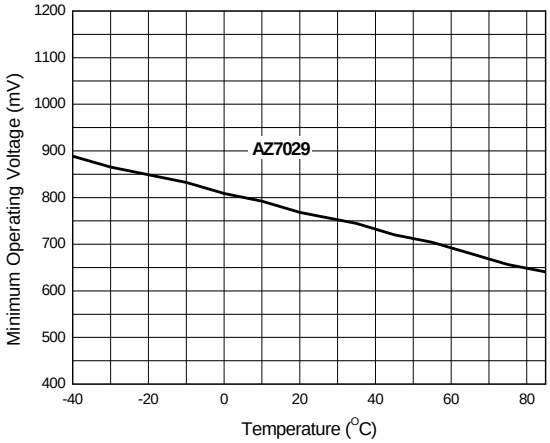


Figure 8. Minimum Operating Voltage vs. Temperature

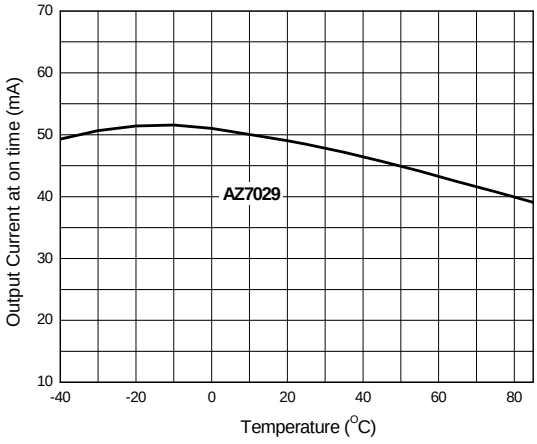


Figure 9. Output Current at on Time vs. Temperature

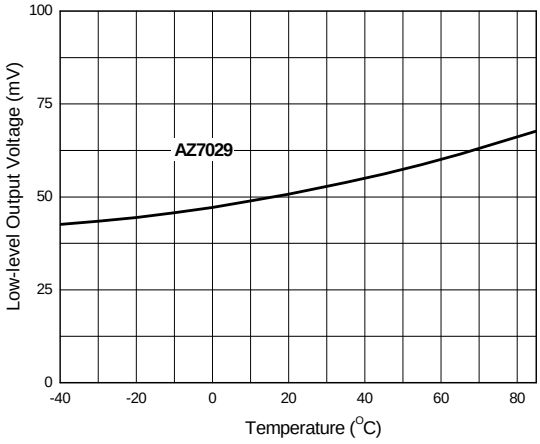


Figure 10. Low-level Output Voltage vs. Temperature

Typical Performance Characteristics (Continued)

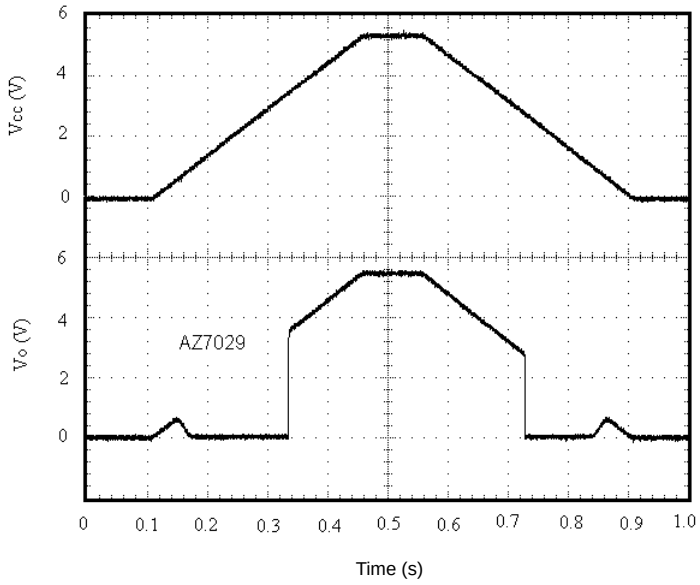


Figure 11. Output Voltage Dynamic Response when V_{CC} Increases and Decreases

Operating Diagram

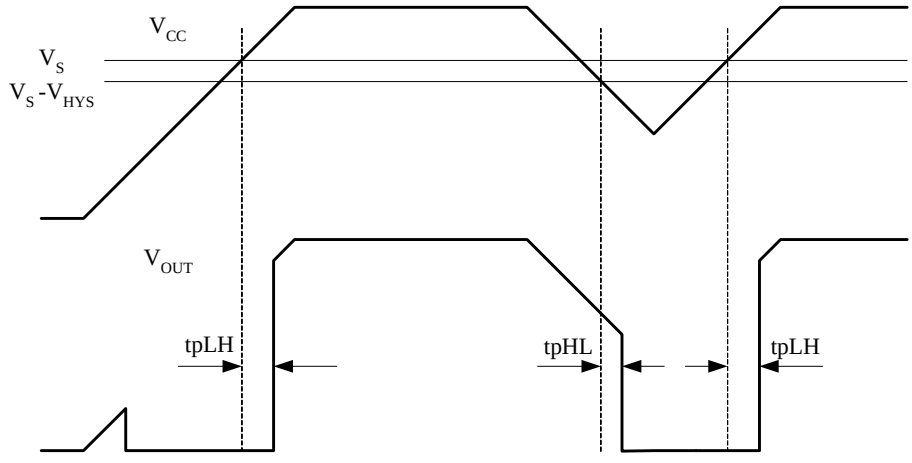


Figure 12. AZ70XX Timing Waveform

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 tpLH 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 tpHL 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

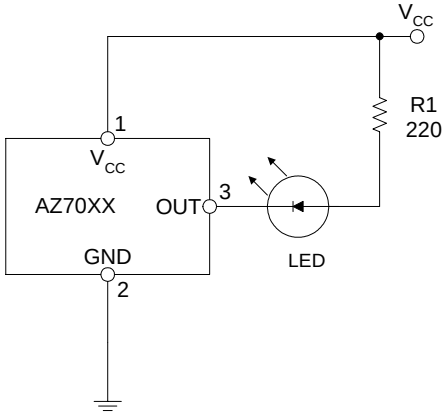


Figure 13. Low Voltage Indicator

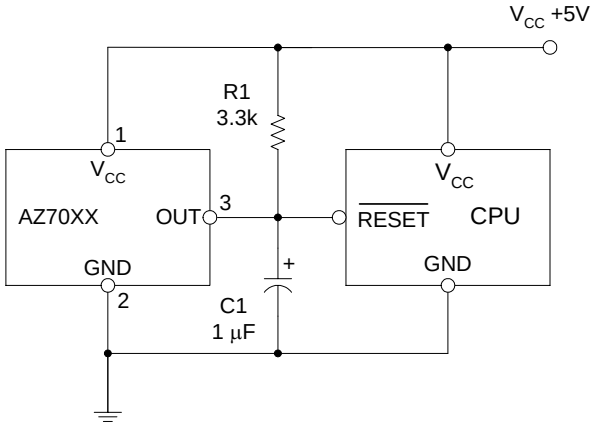
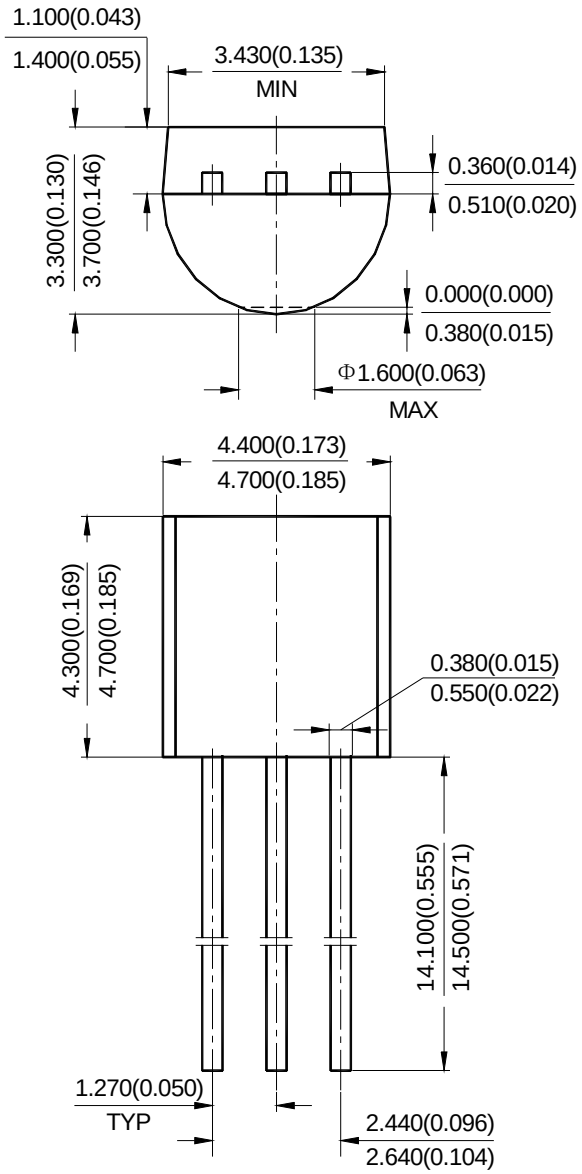


Figure 14. CPU Resetting Circuit

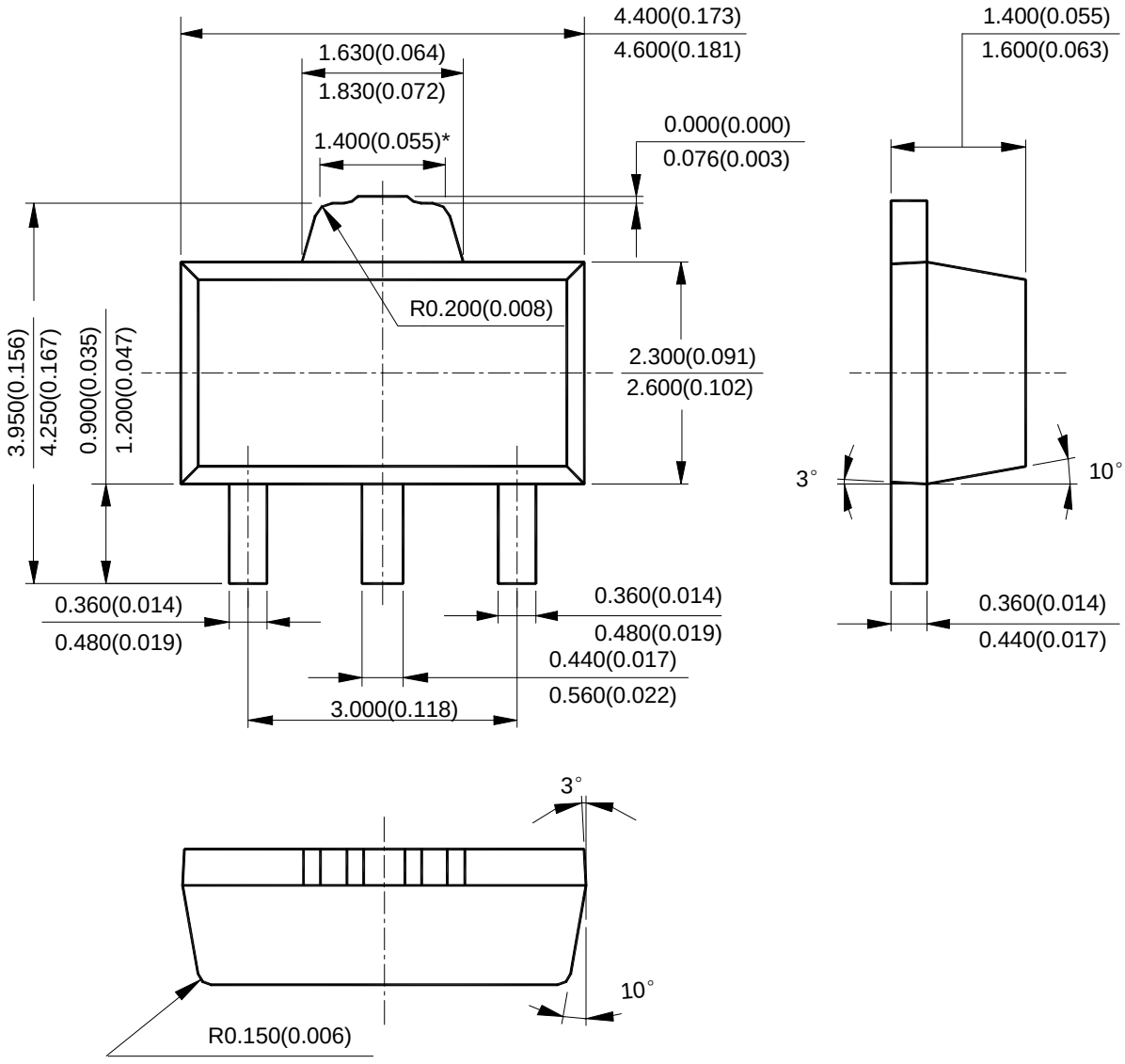
Mechanical Dimensions

TO-92 **Unit: mm（inch）**



Mechanical Dimensions (Continued)

SOT-89-3 **Unit: mm(inch)**



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