

CAT803, CAT809, CAT810

3-Pin Microprocessor Power Supply Supervisors

Description

The CAT803, CAT809, and CAT810 are supervisory circuits that monitor power supplies in digital systems. The CAT803, CAT809, and CAT810 are direct replacements for the MAX803, MAX809 and MAX810 in applications operating over the industrial temperature range.

These devices generate a reset signal, which is asserted while the power supply voltage is below a preset threshold level and for at least 140 ms after the power supply level has risen above that level. The underlying floating gate technology, Analog EEPROM used by ON Semiconductor, makes it possible to offer any custom reset threshold value. Seven industry standard threshold levels are offered to support +5.0 V, +3.3 V, +3.0 V and +2.5 V systems.

The CAT803 has an open-drain $\overline{\text{RESET}}$ output (active LOW). The CAT803 requires a pull-up resistor on the reset output.

The CAT809 features a push-pull $\overline{\text{RESET}}$ output (active LOW) and the CAT810 features a push-pull RESET output (active HIGH).

Fast transients on the power supply are ignored and the output is guaranteed to be in the correct state at V_{CC} levels as low as 1.0 V.

The CAT803, CAT809, and CAT810 are available in both the compact 3-pin SOT-23 and SC-70 packages.

Features

- Precision Monitoring of
 - +5.0 V (-5%, -10%, -20%),
 - +3.3 V (-5%, -10%),
 - +3.0 V (-10%) and
 - +2.5 V (-5%) Power Supplies
- Offered in Three Output Configurations:
 - CAT803: Open-Drain Active LOW Reset
 - CAT809: Push-Pull Active LOW Reset
 - CAT810: Push-Pull Active HIGH Reset
- Direct Replacements for the MAX803, MAX809 and MAX810 in Applications Operating over the Industrial Temperature Range
- Reset Valid down to $V_{CC} = 1.0$ V
- 6 μA Power Supply Current
- Power Supply Transient Immunity
- Industrial Temperature Range: -40°C to $+85^{\circ}\text{C}$
- Available in SOT-23 and SC-70 Packages
- These Devices are Pb-Free and are RoHS Compliant

Applications

- Computers, Servers, Laptops, Cable Modems
- Wireless Communications
- Embedded Control Systems
- White Goods, Power Meters
- Intelligent Instruments
- PDAs and Handheld Equipment



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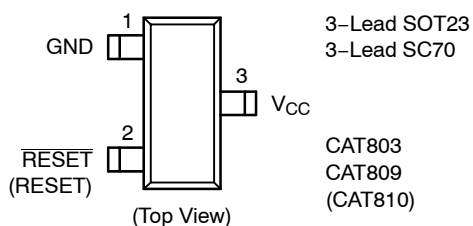


SOT-23
TB SUFFIX
CASE 527AG

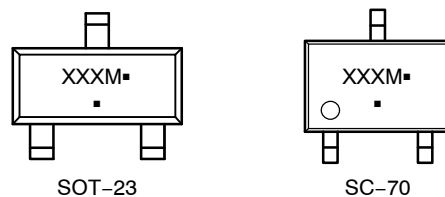


SC-70
SD SUFFIX
CASE 419AB

PIN CONFIGURATION



MARKING DIAGRAMS



XXX = Specific Device Code
M = Month Code
▪ = Pb-Free Package

(*Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

CAT803, CAT809, CAT810

Table 1. THRESHOLD SUFFIX SELECTOR

| Nominal Threshold Voltage | Threshold Suffix Designation |
|---------------------------|------------------------------|
| 4.63 V | L |
| 4.55 V | H |
| 4.38 V | M |
| 4.00 V | J |
| 3.08 V | T |
| 2.93 V | S |
| 2.63 V | R |
| 2.32 V | Z |
| 1.60 V | V |

Table 2. PIN DESCRIPTIONS

| Pin Number | | | Name | Description |
|------------|--------|--------|----------|---|
| CAT803 | CAT809 | CAT810 | | |
| 1 | 1 | 1 | GND | Ground |
| 2 | 2 | – | RESET | Active LOW reset. RESET is asserted if V_{CC} falls below the reset threshold and remains low for at least 140 ms after V_{CC} rises above the reset threshold. |
| – | – | 2 | RESET | Active HIGH reset. RESET is asserted if V_{CC} falls below the reset threshold and remains high for at least 140 ms after V_{CC} rises above the reset threshold. |
| 3 | 3 | 3 | V_{CC} | Power supply voltage that is monitored. |

Table 3. ABSOLUTE MAXIMUM RATINGS

| Parameter | Rating | Units |
|---|--------------|--------------|
| Any pin with respect to ground | –0.3 to +6.0 | V |
| Input Current, V_{CC} | 20 | mA |
| Output Current, RESET, $\overline{\text{RESET}}$ | 20 | mA |
| Rate of Rise, V_{CC} | 100 | V/ μ s |
| Continuous Power Dissipation Derate 2.2 mW/ $^{\circ}$ C above 70 $^{\circ}$ C (SC70) Derate 4 mW/ $^{\circ}$ C above 70 $^{\circ}$ C (SOT23) | 175 320 | mW |
| Operating Temperature Range | –40 to +85 | $^{\circ}$ C |
| Storage Temperature Range | –65 to +105 | $^{\circ}$ C |
| Lead Soldering Temperature (10 sec) | 300 | $^{\circ}$ C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

CAT803, CAT809, CAT810

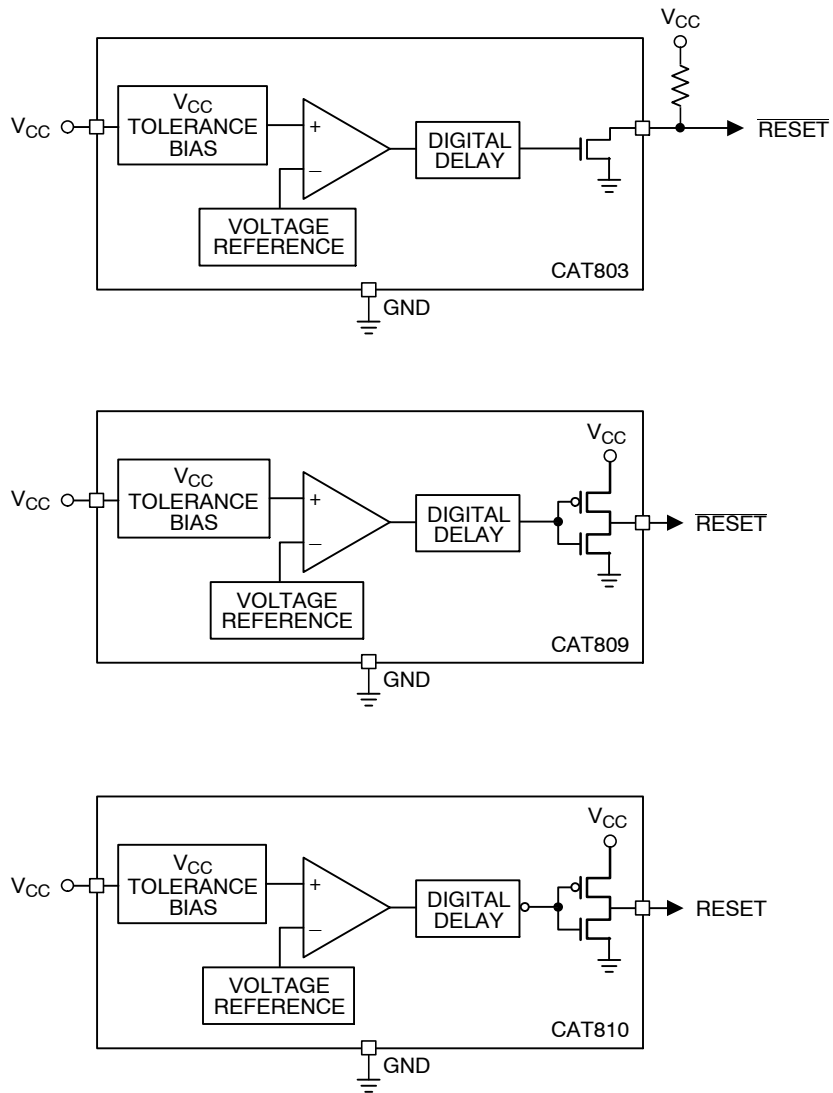


Figure 1. Block Diagrams

CAT803, CAT809, CAT810

Table 4. ELECTRICAL CHARACTERISTICS

(V_{CC} = Full range, T_A = -40°C to $+85^{\circ}\text{C}$, unless otherwise specified. Typical values at T_A = $+25^{\circ}\text{C}$ and V_{CC} = 5 V for the L/H/M/J versions, V_{CC} = 3.3 V for the T/S versions, V_{CC} = 3 V for the R version and V_{CC} = 2.5 V for the Z/V versions.)

| Symbol | Parameter | Conditions | Min | Typ (Note 1) | Max | Units | | | |
|----------|---|---|--|--|------|---------------|---|--|-------------------------|
| | V_{CC} Range | T_A = 0°C to $+70^{\circ}\text{C}$ | 1.0 | | 5.5 | V | | | |
| | | T_A = -40°C to $+85^{\circ}\text{C}$ | 1.2 | | 5.5 | | | | |
| I_{CC} | Supply Current | T_A = -40°C to $+85^{\circ}\text{C}$ | V_{CC} < 5.5 V, J/L/M/H | 8 | 20 | μA | | | |
| | | | V_{CC} < 3.6 V, R/S/T/Z/V | 6 | 15 | | | | |
| V_{TH} | Reset Threshold Voltage | L Threshold | T_A = $+25^{\circ}\text{C}$ | 4.56 | 4.63 | 4.70 | V | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 4.50 | | 4.75 | | | |
| | | H Threshold | T_A = $+25^{\circ}\text{C}$ | 4.48 | 4.55 | 4.62 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 4.43 | | 4.67 | | | |
| | | M Threshold | T_A = $+25^{\circ}\text{C}$ | 4.31 | 4.38 | 4.45 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 4.25 | | 4.50 | | | |
| | | J Threshold | T_A = $+25^{\circ}\text{C}$ | 3.93 | 4.00 | 4.06 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 3.89 | | 4.10 | | | |
| | | T Threshold | T_A = $+25^{\circ}\text{C}$ | 3.04 | 3.08 | 3.11 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 3.00 | | 3.15 | | | |
| | | S Threshold | T_A = $+25^{\circ}\text{C}$ | 2.89 | 2.93 | 2.96 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 2.85 | | 3.00 | | | |
| | | R Threshold | T_A = $+25^{\circ}\text{C}$ | 2.59 | 2.63 | 2.66 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 2.55 | | 2.70 | | | |
| | | Z Threshold | T_A = $+25^{\circ}\text{C}$ | 2.28 | 2.32 | 2.35 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 2.25 | | 2.38 | | | |
| | | V Threshold | T_A = $+25^{\circ}\text{C}$ | 1.58 | 1.60 | 1.62 | | | |
| | | | T_A = -40°C to $+85^{\circ}\text{C}$ | 1.56 | | 1.64 | | | |
| | | | Reset Threshold Tempco | | | 30 | | | ppm/ $^{\circ}\text{C}$ |
| | | T_D | V_{CC} to Reset Delay (Note 2) | $V_{CC} = V_{TH}$ to $(V_{TH} - 100 \text{ mV})$ | | 20 | | | μs |
| T_R | Reset Active Timeout Period | T_A = -40°C to $+85^{\circ}\text{C}$ | 140 | 240 | 460 | ms | | | |
| V_{OL} | RESET Output Voltage Low (Open-drain active LOW, CAT803 and push-pull, active LOW, CAT809) | $V_{CC} = V_{TH} \text{ min}$, $I_{SINK} = 1.2 \text{ mA}$ CAT803R/S/T/Z, CAT809R/S/T/Z/V | | | 0.3 | V | | | |
| | | $V_{CC} = V_{TH} \text{ min}$, $I_{SINK} = 3.2 \text{ mA}$ CAT803J/L/M, CAT809J/L/M/H | | | 0.4 | | | | |
| | | $V_{CC} > 1.0 \text{ V}$, $I_{SINK} = 50 \mu\text{A}$ | | | 0.3 | | | | |
| V_{OH} | RESET Output Voltage High (Push-pull, active LOW, CAT809) | $V_{CC} = V_{TH} \text{ max}$, $I_{SOURCE} = 500 \mu\text{A}$ CAT809R/S/T/Z/V | $0.8 V_{CC}$ | | | V | | | |
| | | $V_{CC} = V_{TH} \text{ max}$, $I_{SOURCE} = 800 \mu\text{A}$ CAT809J/L/M/H | $V_{CC} - 1.5$ | | | | | | |
| V_{OL} | RESET Output Voltage Low (Push-pull, active HIGH, CAT810) | $V_{CC} > V_{TH} \text{ max}$, $I_{SINK} = 1.2 \text{ mA}$ CAT810R/S/T/Z | | | 0.3 | V | | | |
| | | $V_{CC} > V_{TH} \text{ max}$, $I_{SINK} = 3.2 \text{ mA}$ CAT810J/L/M | | | 0.4 | | | | |
| V_{OH} | RESET Output Voltage High (Push-pull, active HIGH, CAT810) | $1.8 \text{ V} < V_{CC}$, $V_{TH} \text{ min}$, $I_{SOURCE} = 150 \mu\text{A}$ | $0.8 V_{CC}$ | | | V | | | |

1. Production testing done at T_A = $+25^{\circ}\text{C}$; limits over temperature guaranteed by design only.
2. RESET output for the CAT809; RESET output for the CAT810.

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TYPICAL OPERATING CHARACTERISTICS

(V_{CC} = Full range, T_A = -40°C to $+85^{\circ}\text{C}$, unless otherwise specified. Typical values at T_A = $+25^{\circ}\text{C}$ and V_{CC} = 5 V for the L/M/J versions, V_{CC} = 3.3 V for the T/S versions, V_{CC} = 3 V for the R version and V_{CC} = 2.5 V for the Z version.)

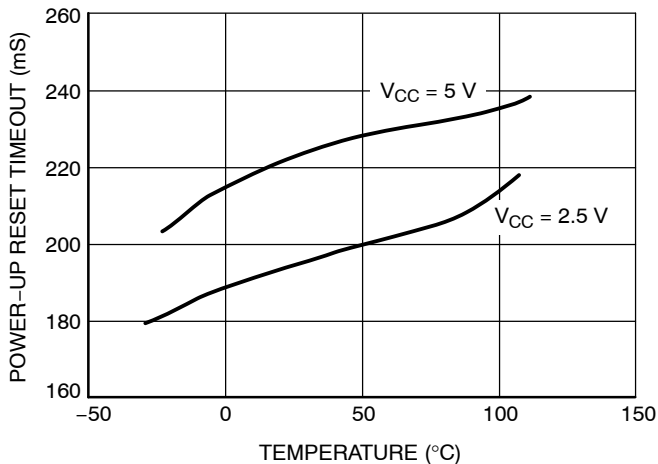


Figure 2. Power-up Reset Timeout vs. Temperature

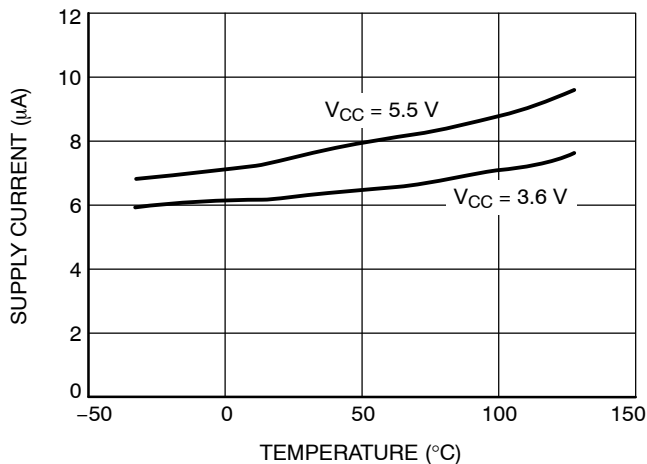


Figure 3. Supply Current vs. Temperature (No Load, CAT8xxR/S/T/Z)

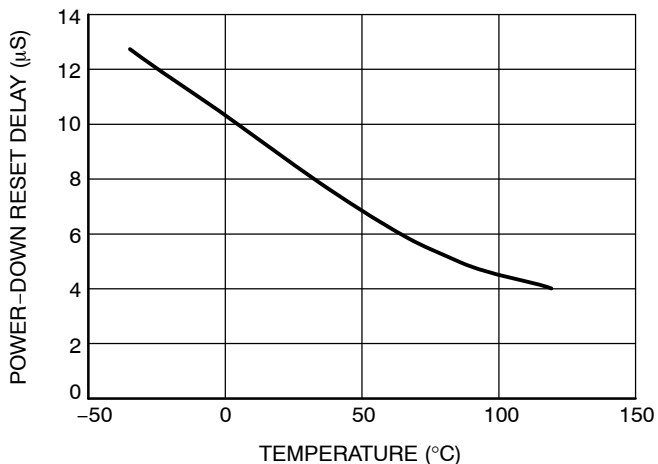


Figure 4. Power-down Reset Delay vs. Temperature (CAT8xxR/S/T/Z)

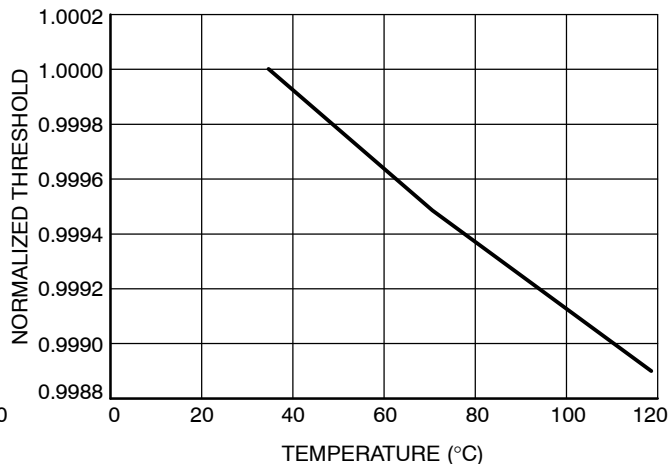


Figure 5. Normalized Reset Threshold vs. Temperature

CAT803, CAT809, CAT810

Detailed Descriptions

Reset Timing

The reset signal is asserted LOW for the CAT803/CAT809 and HIGH for the CAT810 when the power supply voltage falls below the threshold trip voltage and remains asserted for at least 140 ms after the power supply voltage has risen above the threshold.

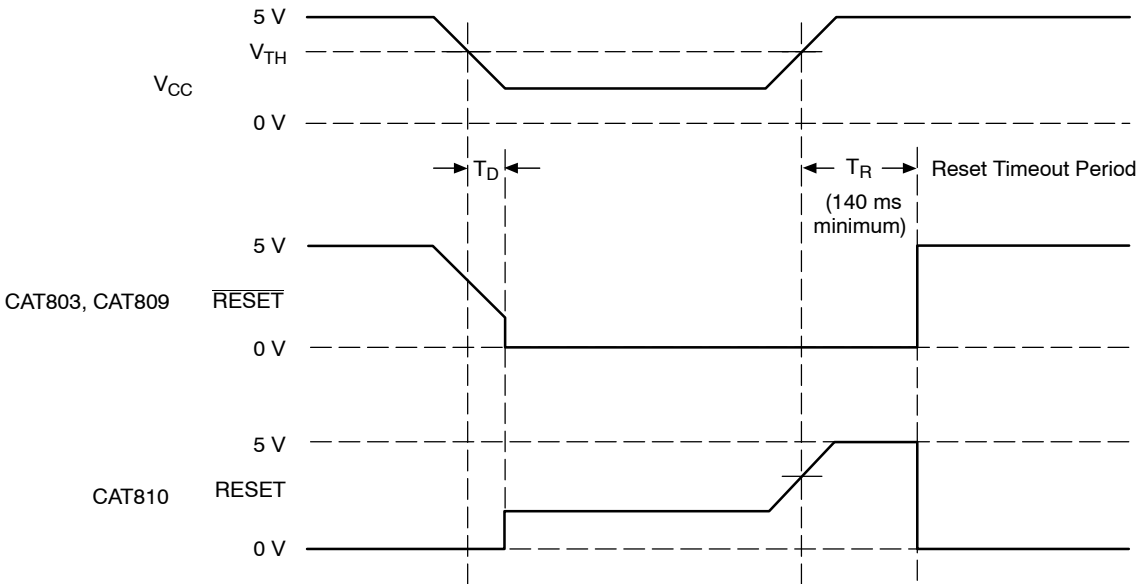


Figure 6. Reset Timing Diagram

V_{CC} Transient Response

The CAT803/CAT809/CAT810 protect μ Ps against brownout failure. Short duration transients of 4 μ sec or less and 100 mV amplitude typically do not cause a false RESET.

Figure 7 shows the maximum pulse duration of negative-going V_{CC} transients that do not cause a reset condition.

As the amplitude of the transient goes further below the threshold (increasing $V_{TH} - V_{CC}$), the maximum pulse duration decreases. In this test, the V_{CC} starts from an initial voltage of 0.5 V above the threshold and drops below it by the amplitude of the overdrive voltage ($V_{TH} - V_{CC}$).

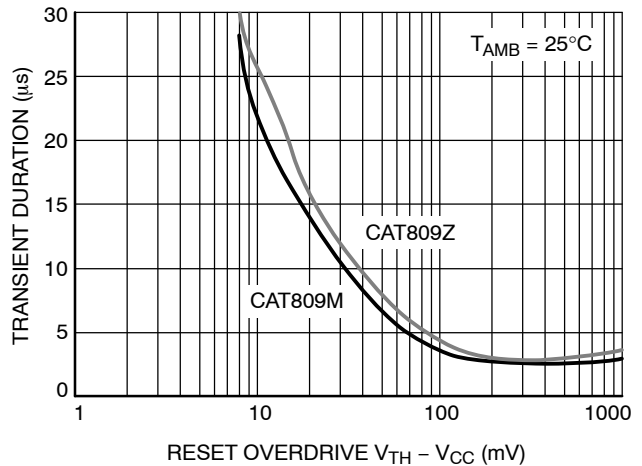


Figure 7. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive

CAT803, CAT809, CAT810

Valid RESET with V_{CC} Under 1.0 V

To ensure that the CAT809 RESET pin is in a known state when V_{CC} is under 1.0 V, a $>10\text{ k}\Omega$ pull-down resistor between RESET pin and GND is recommended. For the CAT810, a pull-up resistor from RESET pin to V_{CC} is needed.

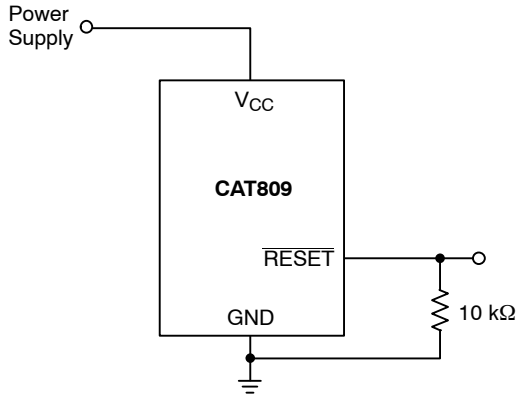


Figure 8. RESET Valid with V_{CC} Under 1.0 V

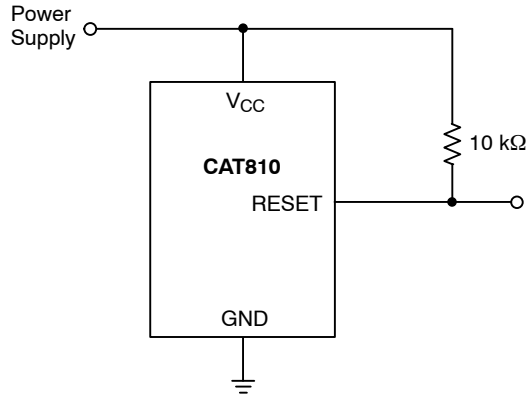


Figure 9. RESET Valid with V_{CC} Under 1.1 V

Bi-directional Reset Pin Interfacing

The CAT809/810 can interface with $\mu\text{P}/\mu\text{C}$ bi-directional reset pins by connecting a $4.7\text{ k}\Omega$ resistor in series with the CAT809/810 reset output and the $\mu\text{P}/\mu\text{C}$ bi-directional reset pin.

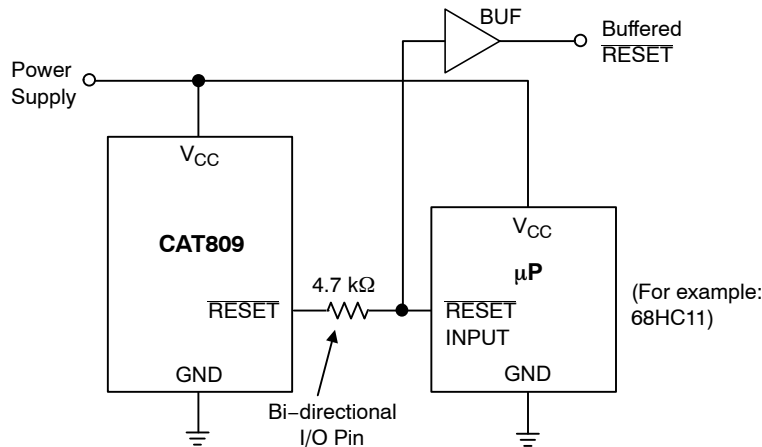


Figure 10. Bi-directional Reset Pin Interfacing

CAT803 Open-Drain RESET Application

The CAT803 features an open-drain RESET output and therefore needs a pull-up resistor on the output for proper operation, as shown on Figure 11. An advantage of the open-drain output includes the ability to “wire AND” several outputs together to form an inexpensive logic circuit. It is also possible to have the pull-up resistor connected to a different supply which can be higher than the CAT803 V_{CC} pin. The value of the pull-up resistor is not critical in most applications, typical values being between $5\text{ k}\Omega$ and $10\text{ k}\Omega$.

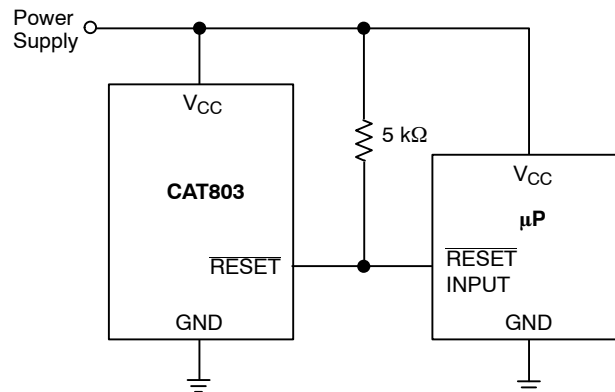


Figure 11. Typical CAT803 Open-Drain Circuit Configuration

CAT803, CAT809, CAT810

Table 5. ORDERING PART NUMBER

| Order Number | | Voltage | Top Mark (Note 4) | | Output | Reset | Package | Quantity per Reel (Note 5) |
|-----------------|---------------|---------|----------------------|-----------|---------------------|-------|----------|----------------------------------|
| NiPdAu (Note 3) | Matte-Tin | | NiPdAu | Matte-Tin | | | | |
| CAT803LSDI-GT3 | CAT803LSDI-T3 | 4.63 V | VKA | VKL | Open Drain | LOW | SC70-3 | 3,000 |
| CAT803MSDI-GT3 | CAT803MSDI-T3 | 4.38 V | VKA | VKL | | | | |
| CAT803JSDI-GT3 | CAT803JSDI-T3 | 4.00 V | VKA | VKL | | | | |
| CAT803TSDI-GT3 | CAT803TSDI-T3 | 3.08 V | VKA | VKL | | | | |
| CAT803SSDI-GT3 | CAT803SSDI-T3 | 2.93 V | VKA | VKL | | | | |
| CAT803RSDI-GT3 | CAT803RSDI-T3 | 2.63 V | VKA | VKL | | | | |
| CAT803ZSDI-GT3 | CAT803ZSDI-T3 | 2.32 V | VKA | VKL | | | | |
| CAT803LTBI-GT3 | CAT803LTBI-T3 | 4.63 V | VKA | VKL | Open Drain | LOW | SOT-23-3 | |
| CAT803MTBI-GT3 | CAT803MTBI-T3 | 4.38 V | VKA | VKL | | | | |
| CAT803JTBI-GT3 | CAT803JTBI-T3 | 4.00 V | VKA | VKL | | | | |
| CAT803TTBI-GT3 | CAT803TTBI-T3 | 3.08 V | VKA | VKL | | | | |
| CAT803STBI-GT3 | CAT803STBI-T3 | 2.93 V | VKA | VKL | | | | |
| CAT803RTBI-GT3 | CAT803RTBI-T3 | 2.63 V | VKA | VKL | | | | |
| CAT803ZTBI-GT3 | CAT803ZTBI-T3 | 2.32 V | VKA | VKL | | | | |
| CAT809LSDI-GT3 | CAT809LSDI-T3 | 4.63 V | VLA | VLD | CMOS / Push-Pull | LOW | SC70-3 | |
| CAT809MSDI-GT3 | CAT809MSDI-T3 | 4.38 V | VLA | VLD | | | | |
| CAT809JSDI-GT3 | CAT809JSDI-T3 | 4.00 V | VLA | VLD | | | | |
| CAT809TSDI-GT3 | CAT809TSDI-T3 | 3.08 V | VLA | VLD | | | | |
| CAT809SSDI-GT3 | CAT809SSDI-T3 | 2.93 V | VLA | VLD | | | | |
| CAT809RSDI-GT3 | CAT809RSDI-T3 | 2.63 V | VLA | VLD | | | | |
| CAT809ZSDI-GT3 | CAT809ZSDI-T3 | 2.32 V | VLA | VLD | | | | |
| CAT809LTBI-GT3 | CAT809LTBI-T3 | 4.63 V | VLA | VLD | CMOS / Push-Pull | LOW | SOT-23-3 | |
| CAT809HTBI-GT3 | CAT809HTBI-T3 | 4.55 V | VLA | VLD | | | | |
| CAT809MTBI-GT3 | CAT809MTBI-T3 | 4.38 V | VLA | VLD | | | | |
| CAT809JTBI-GT3 | CAT809JTBI-T3 | 4.00 V | VLA | VLD | | | | |
| CAT809TTBI-GT3 | CAT809TTBI-T3 | 3.08 V | VLA | VLD | | | | |
| CAT809STBI-GT3 | CAT809STBI-T3 | 2.93 V | VLA | VLD | | | | |
| CAT809RTBI-GT3 | CAT809RTBI-T3 | 2.63 V | VLA | VLD | | | | |
| CAT809ZTBI-GT3 | CAT809ZTBI-T3 | 2.32 V | VLA | VLD | | | | |
| CAT809VTBI-GT3 | CAT809VTBI-T3 | 1.60 V | VLA | VLD | | | | |

3. Not recommended for new designs.
4. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.
5. For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
6. For detailed information and a breakdown of device nomenclature and numbering systems, please see the ON Semiconductor Device Nomenclature document, TND310/D, available at www.onsemi.com

CAT803, CAT809, CAT810

Table 5. ORDERING PART NUMBER

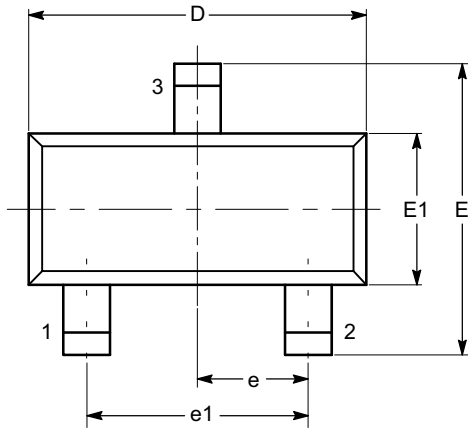
| Order Number | | Voltage | Top Mark (Note 4) | | Output | Reset | Package | Quantity per Reel (Note 5) |
|-----------------|---------------|---------|----------------------|-----------|---------------------|-------|----------|----------------------------------|
| NiPdAu (Note 3) | Matte-Tin | | NiPdAu | Matte-Tin | | | | |
| CAT810LSDI-GT3 | CAT810LSDI-T3 | 4.63 V | VHA | VHT | CMOS / Push-Pull | HIGH | SC70-3 | 3,000 |
| CAT810MSDI-GT3 | CAT810MSDI-T3 | 4.38 V | VHA | VHT | | | | |
| CAT810JSDI-GT3 | CAT810JSDI-T3 | 4.00 V | VHA | VHT | | | | |
| CAT810TSDI-GT3 | CAT810TSDI-T3 | 3.08 V | VHA | VHT | | | | |
| CAT810SSDI-GT3 | CAT810SSDI-T3 | 2.93 V | VHA | VHT | | | | |
| CAT810RSDI-GT3 | CAT810RSDI-T3 | 2.63 V | VHA | VHT | | | | |
| CAT810ZSDI-GT3 | CAT810ZSDI-T3 | 2.32 V | VHA | VHT | | | | |
| CAT810LTBI-GT3 | CAT810LTBI-T3 | 4.63 V | VHA | VHT | CMOS / Push-Pull | HIGH | SOT-23-3 | |
| CAT810MTBI-GT3 | CAT810MTBI-T3 | 4.38 V | VHA | VHT | | | | |
| CAT810JTBI-GT3 | CAT810JTBI-T3 | 4.00 V | VHA | VHT | | | | |
| CAT810TTBI-GT3 | CAT810TTBI-T3 | 3.08 V | VHA | VHT | | | | |
| CAT810STBI-GT3 | CAT810STBI-T3 | 2.93 V | VHA | VHT | | | | |
| CAT810RTBI-GT3 | CAT810RTBI-T3 | 2.63 V | VHA | VHT | | | | |
| CAT810ZTBI-GT3 | CAT810ZTBI-T3 | 2.32 V | VHA | VHT | | | | |

3. Not recommended for new designs.
4. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.
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CAT803, CAT809, CAT810

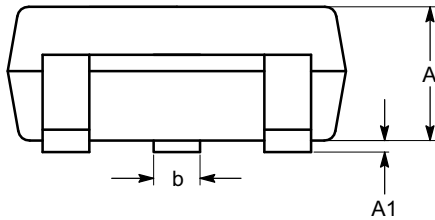
PACKAGE DIMENSIONS

SOT-23, 3 Lead
 CASE 527AG-01
 ISSUE O

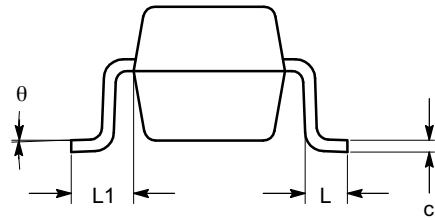


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|----------|----------|-----|------|
| A | 0.89 | | 1.12 |
| A1 | 0.013 | | 0.10 |
| b | 0.37 | | 0.50 |
| c | 0.085 | | 0.18 |
| D | 2.80 | | 3.04 |
| E | 2.10 | | 2.64 |
| E1 | 1.20 | | 1.40 |
| e | 0.95 BSC | | |
| e1 | 1.90 BSC | | |
| L | 0.40 REF | | |
| L1 | 0.54 REF | | |
| θ | 0° | | 8° |



SIDE VIEW



END VIEW

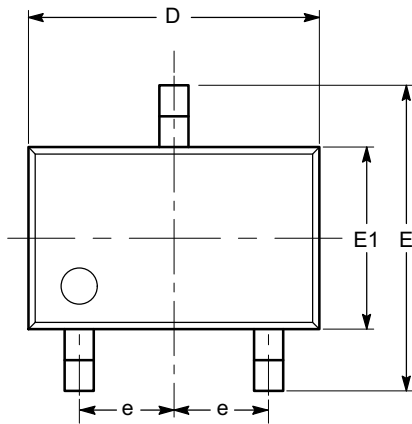
Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC TO-236.

CAT803, CAT809, CAT810

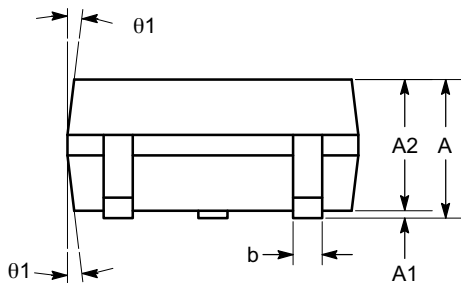
PACKAGE DIMENSIONS

SC-70, 3 Lead, 1.25x2
CASE 419AB-01
ISSUE O

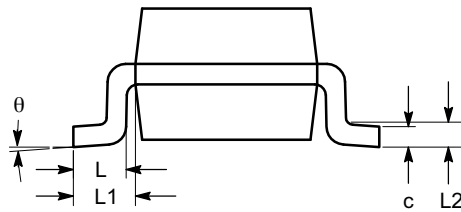


TOP VIEW

| SYMBOL | MIN | NOM | MAX |
|------------|----------|------|------|
| A | 0.80 | | 1.10 |
| A1 | 0.00 | | 0.10 |
| A2 | 0.80 | 0.90 | 1.00 |
| b | 0.15 | | 0.30 |
| c | 0.08 | | 0.22 |
| D | 1.80 | 2.00 | 2.20 |
| E | 1.80 | 2.10 | 2.40 |
| E1 | 1.15 | 1.25 | 1.35 |
| e | 0.65 BSC | | |
| L | 0.26 | 0.36 | 0.46 |
| L1 | 0.42 REF | | |
| L2 | 0.15 BSC | | |
| θ | 0° | | 8° |
| θ_1 | 4° | | 10° |




SIDE VIEW



END VIEW

Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

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

Факс: 8 (812) 320-02-42

Электронная почта: org@eplast1.ru

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