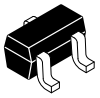
# CAX803, CAX809, CAX810

# 3-Pin Microprocessor Power Supply Supervisors

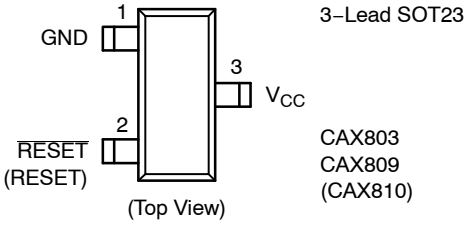
**ON Semiconductor®**

**http://onsemi.com**

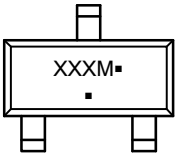


**SOT−23**
**TB SUFFIX**
**CASE 527AG**

**PIN CONFIGURATION**




**MARKING DIAGRAMS**




SOT−23

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 9 of this data sheet.

### Description

The CAX803, CAX809, and CAX810 are supervisory circuits that monitor power supplies in digital systems. The CAX803, CAX809, and CAX810 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 CAX803 has an open−drain $\overline{\text{RESET}}$ output (active LOW). The CAX803 requires a pull−up resistor on the reset output.

The CAX809 features a push−pull $\overline{\text{RESET}}$ output (active LOW) and the CAX810 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 CAX803, CAX809, and CAX810 are available in the compact 3−pin SOT−23 package.

### 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:
  − CAX803: Open−Drain Active LOW Reset
  − CAX809: Push−Pull Active LOW Reset
  − CAX810: 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
- 10 μA Power Supply Current
- Power Supply Transient Immunity
- Industrial Temperature Range: −40°C to +85°C
- Available in SOT−23 Package
- 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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**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 |

**Table 2. PIN DESCRIPTIONS**

| Pin Number | | | Name | Description |
|---|---|---|---|---|
| CAX803 | CAX809 | CAX810 | | |
| 1 | 1 | 1 | GND | Ground |
| 2 | 2 | – | $\overline{\text{RESET}}$ | Active LOW reset. $\overline{\text{RESET}}$ 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/μs |
| Continuous Power Dissipation<br>Derate 4 mW/°C above 70°C (SOT23) | 320 | mW |
| Operating Temperature Range | −40 to +85 | °C |
| Storage Temperature Range | −65 to +105 | °C |
| Lead Soldering Temperature (10 sec) | 300 | °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.

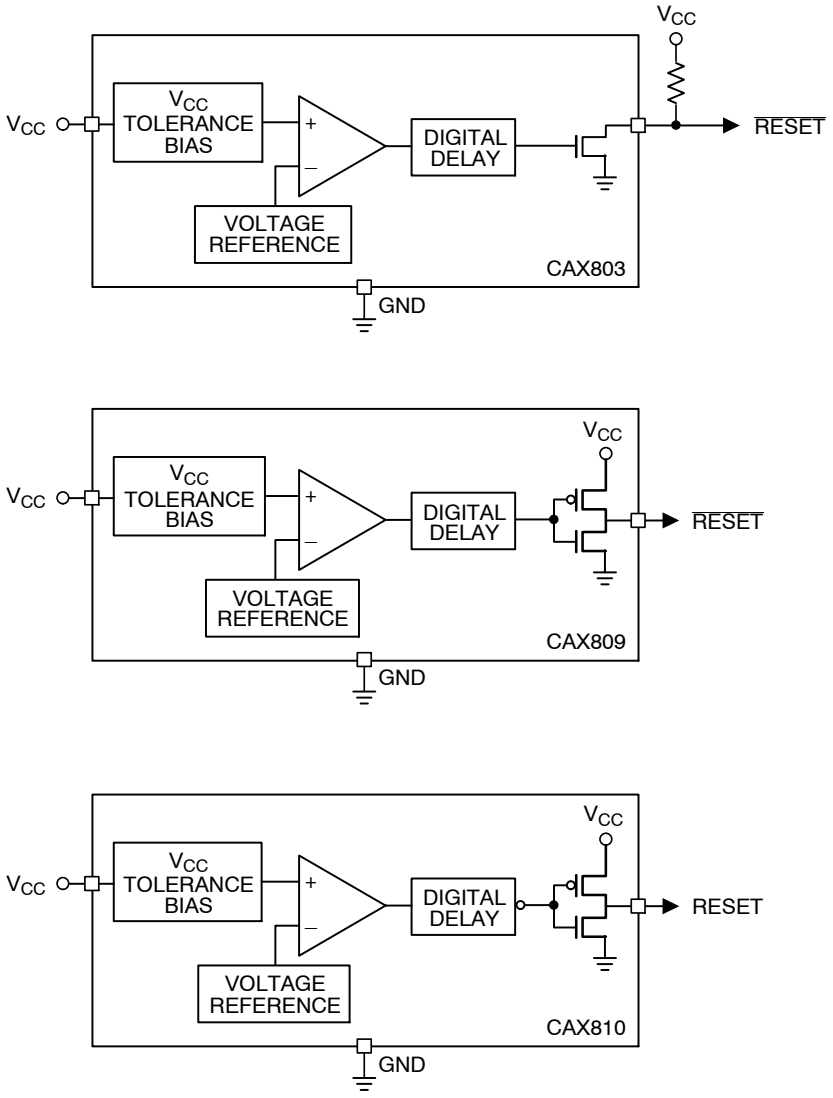



**Figure 1. Block Diagrams**

**Table 4. ELECTRICAL CHARACTERISTICS**
($V_{CC}$ = Full range, $T_A$ = −40°C to +85°C, unless otherwise specified. Typical values at $T_A$ = +25°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°C | | 1.0 | | 5.5 | V |
| | | $T_A$ = −40°C to +85°C | | 1.2 | | 5.5 | |
| $I_{CC}$ | Supply Current | $T_A$ = −40°C to +85°C | $V_{CC}$ < 5.5 V, J/L/M/H | | 15 | 25 | μA |
| | | | $V_{CC}$ < 3.6 V, R/S/T/Z/V | | 10 | 15 | |
| $V_{TH}$ | Reset Threshold Voltage | L Threshold | $T_A$ = +25°C | 4.56 | 4.63 | 4.70 | V |
| | | | $T_A$ = −40°C to +85°C | 4.50 | | 4.75 | |
| | | H Threshold | $T_A$ = +25°C | 4.48 | 4.55 | 4.62 | |
| | | | $T_A$ = −40°C to +85°C | 4.43 | | 4.67 | |
| | | M Threshold | $T_A$ = +25°C | 4.31 | 4.38 | 4.45 | |
| | | | $T_A$ = −40°C to +85°C | 4.25 | | 4.50 | |
| | | J Threshold | $T_A$ = +25°C | 3.93 | 4.00 | 4.06 | |
| | | | $T_A$ = −40°C to +85°C | 3.89 | | 4.10 | |
| | | T Threshold | $T_A$ = +25°C | 3.04 | 3.08 | 3.11 | |
| | | | $T_A$ = −40°C to +85°C | 3.00 | | 3.15 | |
| | | S Threshold | $T_A$ = +25°C | 2.89 | 2.93 | 2.96 | |
| | | | $T_A$ = −40°C to +85°C | 2.85 | | 3.00 | |
| | | R Threshold | $T_A$ = +25°C | 2.59 | 2.63 | 2.66 | |
| | | | $T_A$ = −40°C to +85°C | 2.55 | | 2.70 | |
| | | Z Threshold | $T_A$ = +25°C | 2.28 | 2.32 | 2.35 | |
| | | | $T_A$ = −40°C to +85°C | 2.25 | | 2.38 | |
| | Reset Threshold Tempco | | | | 30 | | ppm/°C |
| $T_D$ | $V_{CC}$ to Reset Delay (Note 2) | $V_{CC}$ = $V_{TH}$ to ($V_{TH}$ − 100 mV) | | | 20 | | μs |
| $T_R$ | Reset Active Timeout Period | $T_A$ = −40°C to +85°C | | 140 | 240 | 460 | ms |
| $V_{OL}$ | $\overline{\text{RESET}}$ Output Voltage Low (Open−drain active LOW, CAX803 and push−pull, active LOW, CAX809) | $V_{CC}$ = $V_{TH}$ min, $I_{SINK}$ = 1.2 mA CAX803R/S/T/Z, CAX809R/S/T/Z/V | | | | 0.3 | V |
| | | $V_{CC}$ = $V_{TH}$ min, $I_{SINK}$ = 3.2 mA CAX803J/L/M, CAX809J/L/M/H | | | | 0.4 | |
| | | $V_{CC}$ > 1.0 V, $I_{SINK}$ = 50 μA | | | | 0.3 | |
| $V_{OH}$ | $\overline{\text{RESET}}$ Output Voltage High (Push−pull, active LOW, CAX809) | $V_{CC}$ = $V_{TH}$ max, $I_{SOURCE}$ = 500 μA CAX809R/S/T/Z/V | | 0.8 $V_{CC}$ | | | V |
| | | $V_{CC}$ = $V_{TH}$ max, $I_{SOURCE}$ = 800 μA CAX809J/L/M/H | | $V_{CC}$ − 1.5 | | | |
| $V_{OL}$ | RESET Output Voltage Low (Push−pull, active HIGH, CAX810) | $V_{CC}$ > $V_{TH}$ max, $I_{SINK}$ = 1.2 mA CAX810R/S/T/Z | | | | 0.3 | V |
| | | $V_{CC}$ > $V_{TH}$ max, $I_{SINK}$ = 3.2 mA CAX810J/L/M | | | | 0.4 | |
| $V_{OH}$ | RESET Output Voltage High (Push−pull, active HIGH, CAX810) | 1.8 V < $V_{CC}$ $V_{TH}$ min, $I_{SOURCE}$ = 150 μA | | 0.8 $V_{CC}$ | | | V |

1. Production testing done at $T_A$ = +25°C; limits over temperature guaranteed by design only.
2. $\overline{\text{RESET}}$ output for the CAX809; RESET output for the CAX810.

## TYPICAL OPERATING CHARACTERISTICS

($V_{CC}$ = Full range, $T_A$ = −40°C to +85°C, unless otherwise specified. Typical values at $T_A$ = +25°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.)

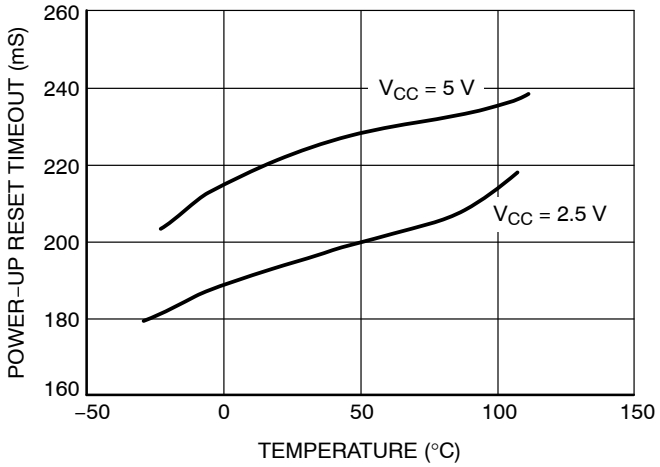



**Figure 2. Power−up Reset Timeout vs. Temperature**

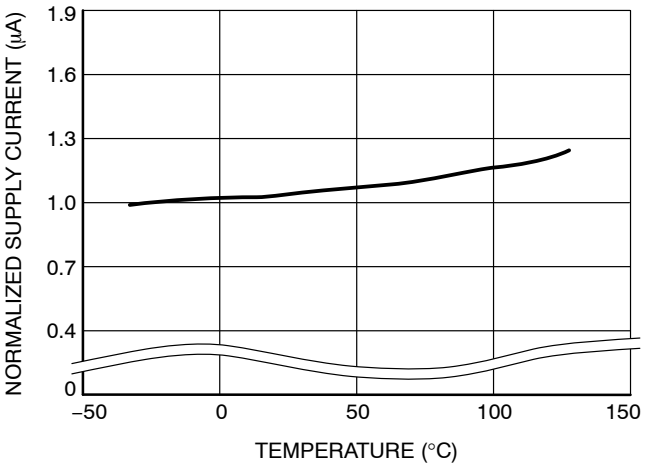



**Figure 3. Supply Current vs. Temperature (No Load, CAX8xxR/S/T/Z)**

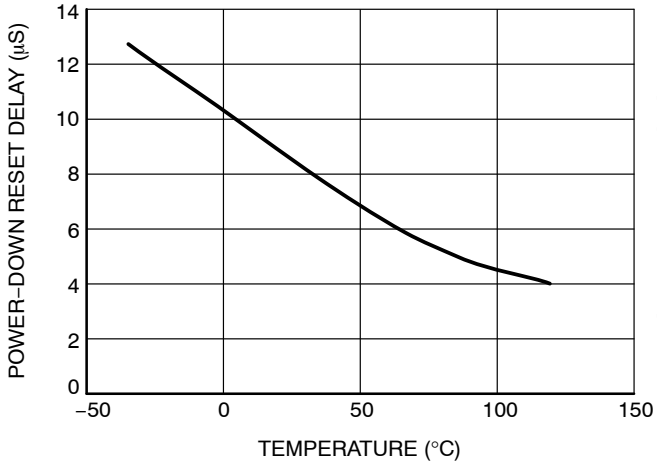



**Figure 4. Power−down Reset Delay vs. Temperature (CAX8xxR/S/T/Z)**

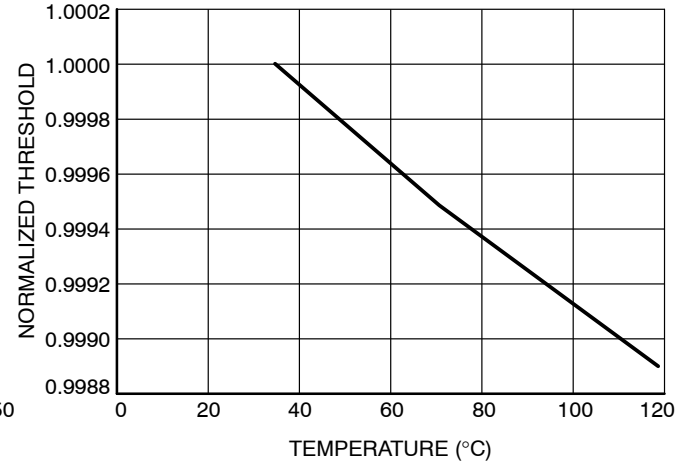



**Figure 5. Normalized Reset Threshold vs. Temperature**

## Detailed Descriptions

### Reset Timing

The reset signal is asserted LOW for the CAX803/CAX809 and HIGH for the CAX810 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.

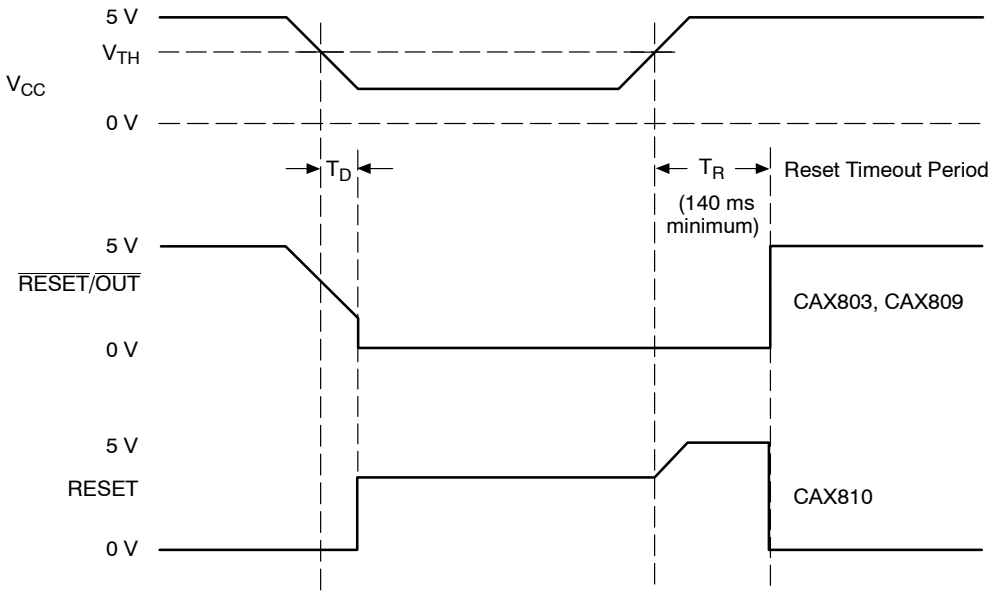



**Figure 6. Reset Timing Diagram**

### $V_{CC}$ Transient Response

The CAX803/CAX809/CAX810 protect μPs against brownout failure. Short duration transients of 4 μsec 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 ($V_{TH} - V_{CC}$).

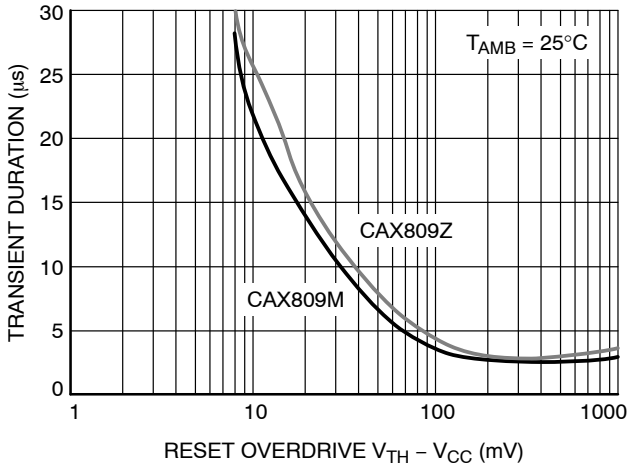



**Figure 7. Maximum Transient Duration without Causing a Reset Pulse vs. Reset Comparator Overdrive**

### Valid RESET with $V_{CC}$ Under 1.0 V

To ensure that the CAX809 $\overline{\text{RESET}}$ pin is in a known state when $V_{CC}$ is under 1.0 V, a >10 kΩ pull−down resistor between $\overline{\text{RESET}}$ pin and GND is recommended. For the CAX810, a pull−up resistor from RESET pin to $V_{CC}$ is needed.

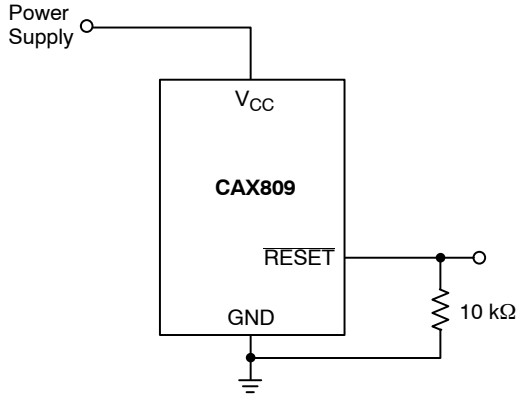



**Figure 8. $\overline{\text{RESET}}$ Valid with $V_{CC}$ Under 1.0 V**

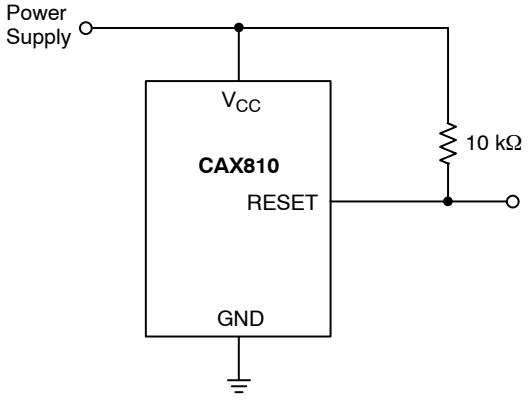



**Figure 9. RESET Valid with $V_{CC}$ Under 1.1 V**

### Bi−directional Reset Pin Interfacing

The CAX809/810 can interface with μP/μC bi−directional reset pins by connecting a 4.7 kΩ resistor in series with the CAX809/810 reset output and the μP/μC bi−directional reset pin.

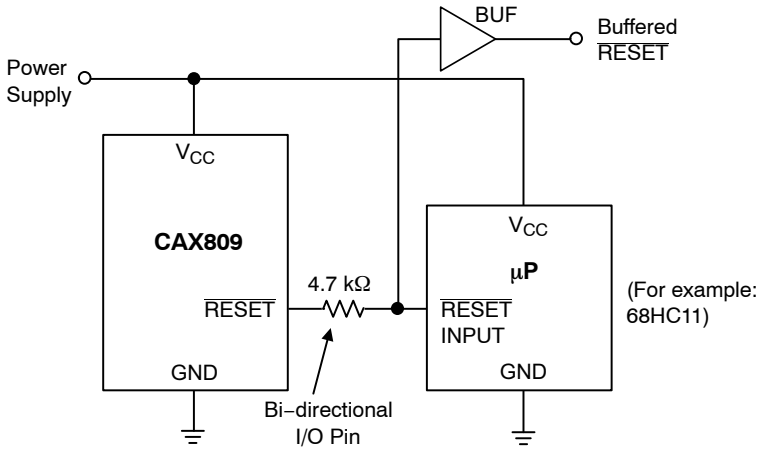



**Figure 10. Bi−directional Reset Pin Interfacing**

### CAX803 Open−Drain $\overline{\text{RESET}}$ Application

The CAX803 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 CAX803 $V_{CC}$ pin. The value of the pull−up resistor is not critical in most applications, typical values being between 5 kΩ and 10 kΩ.

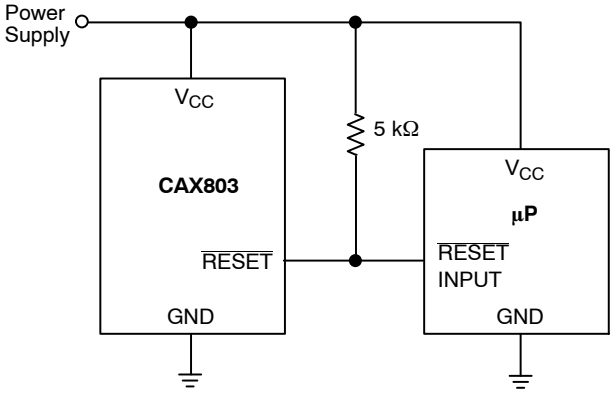
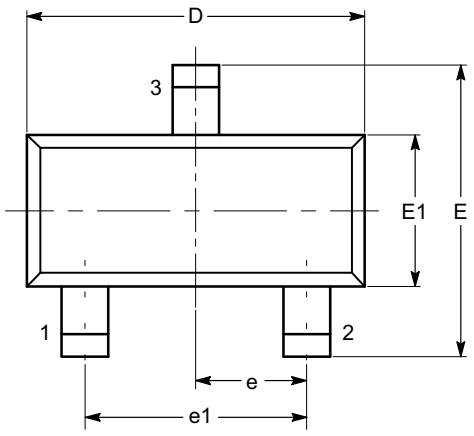



**Figure 11. Typical CAX803 Open−Drain Circuit Configuration**

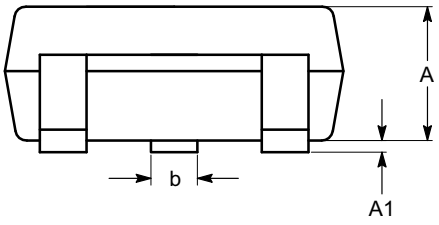
## PACKAGE DIMENSIONS

**SOT−23, 3 Lead**
CASE 527AG−01
ISSUE O

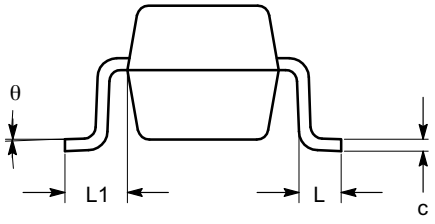



**TOP VIEW**

| 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.

**Table 5. ORDERING PART NUMBER**

| Order Number | Voltage | Top Mark (Note 3) | Output | Reset | Package | Quantity per Reel (Note 4) |
|---|---|---|---|---|---|---|
| CAX803LTBI−T3 | 4.63 V | VKL | Open Drain | LOW | SOT−23−3 | 3,000 |
| CAX803MTBI−T3 | 4.38 V | | | | | |
| CAX803JTBI−T3 | 4.00 V | | | | | |
| CAX803TTBI−T3 | 3.08 V | | | | | |
| CAX803STBI−T3 | 2.93 V | | | | | |
| CAX803RTBI−T3 | 2.63 V | | | | | |
| CAX803ZTBI−T3 | 2.32 V | | | | | |
| | | | | | | |
| CAX809LTBI−T3 | 4.63 V | VLD | CMOS / Push−Pull | LOW | SOT−23−3 | 3,000 |
| CAX809HTBI−T3 | 4.55 V | | | | | |
| CAX809MTBI−T3 | 4.38 V | | | | | |
| CAX809JTBI−T3 | 4.00 V | | | | | |
| CAX809TTBI−T3 | 3.08 V | | | | | |
| CAX809STBI−T3 | 2.93 V | | | | | |
| CAX809RTBI−T3 | 2.63 V | | | | | |
| CAX809ZTBI−T3 | 2.32 V | | | | | |
| | | | | | | |
| CAX810LTBI−T3 | 4.63 V | VHT | CMOS / Push−Pull | HIGH | SOT−23−3 | 3,000 |
| CAX810MTBI−T3 | 4.38 V | | | | | |
| CAX810JTBI−T3 | 4.00 V | | | | | |
| CAX810TTBI−T3 | 3.08 V | | | | | |
| CAX810STBI−T3 | 2.93 V | | | | | |
| CAX810RTBI−T3 | 2.63 V | | | | | |
| CAX810ZTBI−T3 | 2.32 V | | | | | |

3. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.
4. 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.
5. 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

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