

## 3-Pin Microprocessor Power Supply Supervisors



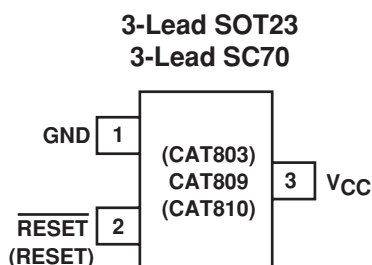
### FEATURES

- Precision monitoring of  
+5.0V (-5%, -10%, -20%),  
+3.3V (-5%, -10%),  
+3.0V (-10%) and  
+2.5V (-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  $V_{CC} = 1.0V$
- 6 $\mu A$  power supply current
- Power supply transient immunity
- Industrial temperature range: -40°C to +85°C
- Available in RoHS-compliant SOT-23 and SC70 packages

### APPLICATIONS

- Computers
- Servers
- Laptops
- Cable modems
- Wireless communications
- Embedded control systems
- White goods
- Power meters
- Intelligent instruments
- PDAs and handheld equipment

### PIN CONFIGURATION



### 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, AE<sup>2</sup>(™) used by Catalyst Semiconductor, makes it possible to offer any custom reset threshold value. Seven industry standard threshold levels are offered to support +5.0V, +3.3V, +3.0V and +2.5V systems.

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

The CAT809 features a push-pull  $\overline{RESET}$  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 1.0V.

The CAT803, CAT809, and CAT810 are available in both the compact 3-pin SOT-23 and SC70 packages.

For Ordering Information details, see page 11.

### THRESHOLD SUFFIX SELECTOR

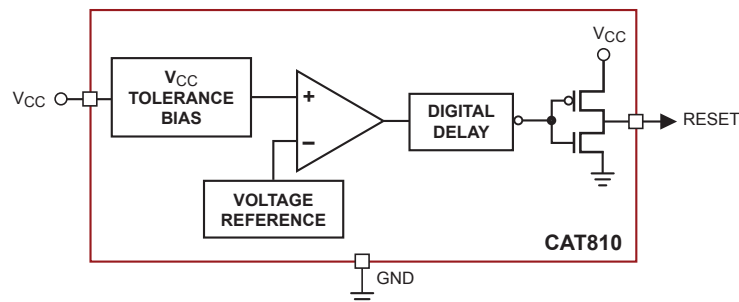
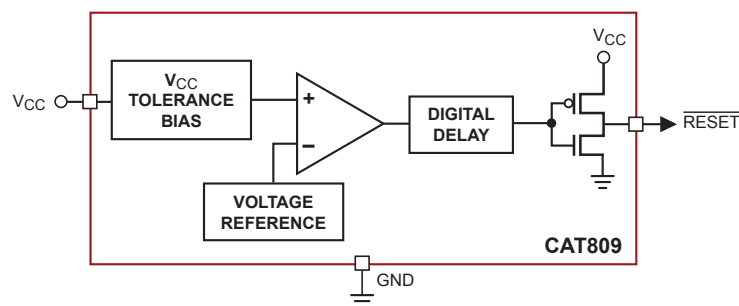
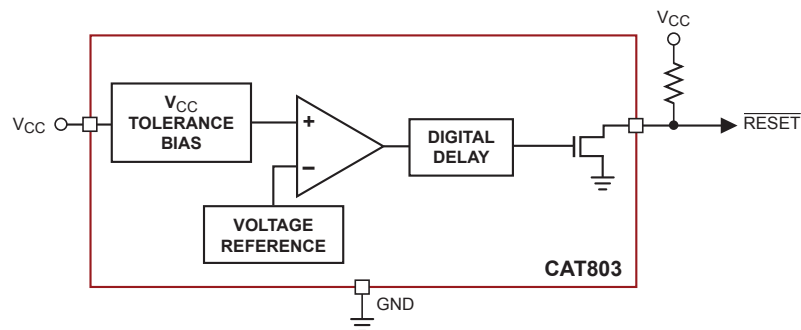
Nominal Threshold Voltage	Threshold Suffix Designation
4.63V	L
4.38V	M
4.00V	J
3.08V	T
2.93V	S
2.63V	R
2.32V	Z

# CAT803, CAT809, CAT810

## 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 140ms 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 140ms after $V_{CC}$ rises above the reset threshold.
3	3	3	$V_{CC}$	Power supply voltage that is monitored.

## BLOCK DIAGRAMS



**ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>**

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

**Note:**

- (1) Stresses above 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 outside of those listed in the operational sections of this specification is not implied. Exposure to any absolute maximum rating for extended periods may affect device performance and reliability.

**ELECTRICAL CHARACTERISTICS**

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

Parameter	Symbol	Conditions	Min	Typ	Max	Units
$V_{CC}$ Range		$T_A$ = 0 $^{\circ}$ C to +70 $^{\circ}$ C	1.0		5.5	V
		$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	1.2		5.5	
Supply Current	$I_{CC}$	$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	$V_{CC} < 5.5\text{V, J/L/M}$	8	20	$\mu$ A
			$V_{CC} < 3.6\text{V, R/S/T/Z}$	6	15	
Reset Threshold Voltage	$V_{TH}$	L Threshold	$T_A$ = +25 $^{\circ}$ C	4.56	4.63	V
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.50		
		M Threshold	$T_A$ = +25 $^{\circ}$ C	4.31	4.38	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.25		
		J Threshold	$T_A$ = +25 $^{\circ}$ C	3.93	4.00	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	3.89		
		T Threshold	$T_A$ = +25 $^{\circ}$ C	3.04	3.08	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	3.00		
		S Threshold	$T_A$ = +25 $^{\circ}$ C	2.89	2.93	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.85		
		R Threshold	$T_A$ = +25 $^{\circ}$ C	2.59	2.63	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.55		
		Z Threshold	$T_A$ = +25 $^{\circ}$ C	2.28	2.32	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.25		

## CAT803, CAT809, CAT810

### ELECTRICAL CHARACTERISTICS (continued)

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

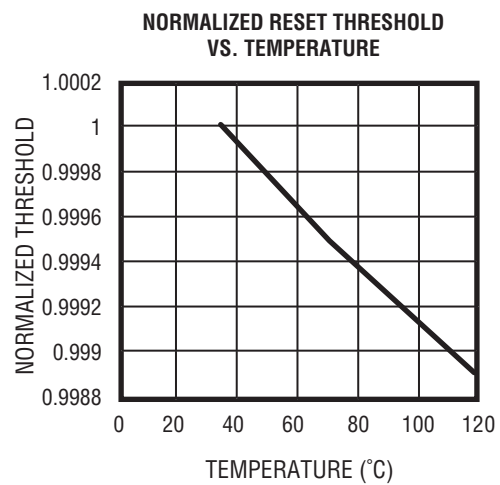
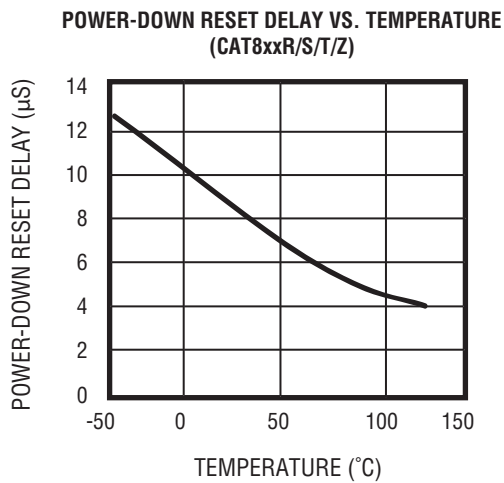
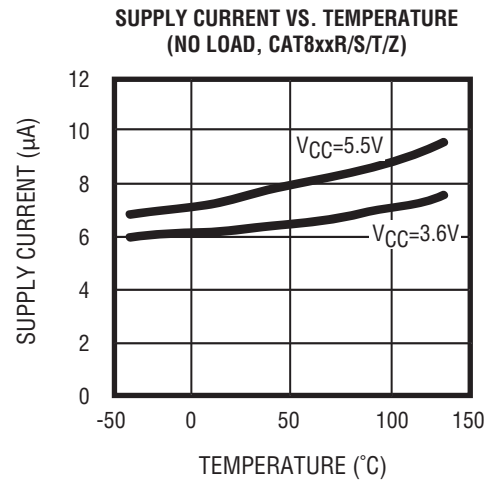
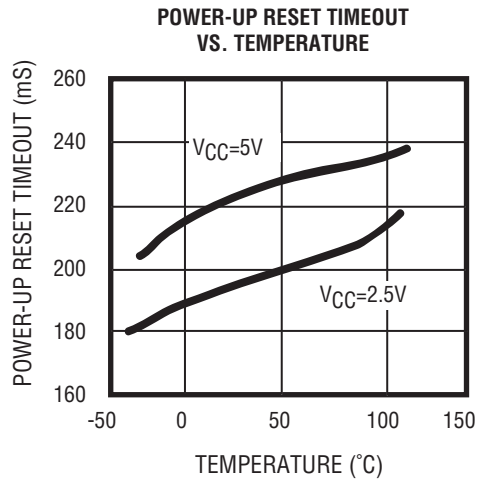
Parameter	Symbol	Conditions	Min	Typ <sup>(1)</sup>	Max	Units
Reset Threshold Tempco				30		ppm/°C
$V_{CC}$ to Reset Delay (Note 2)	$T_D$	$V_{CC} = V_{TH}$ to ( $V_{TH} - 100$ mV)		20		μs
Reset Active Timeout Period	$T_R$	$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	140	240	460	ms
RESET Output Voltage Low (Open-drain active LOW, CAT803 and push-pull, ac- tive LOW, CAT809)	$V_{OL}$	$V_{CC} = V_{TH}$ min, $I_{SINK} = 1.2\text{mA}$ CAT803R/S/T/Z, CAT809R/S/T/Z				V
		$V_{CC} = V_{TH}$ min, $I_{SINK} = 3.2\text{mA}$ CAT803J/L/M, CAT809J/L/M			0.4	
		$V_{CC} > 1.0\text{V}$ , $I_{SINK} = 50\mu\text{A}$			0.3	
RESET Output Voltage High (Push-pull, active LOW, CAT809)	$V_{OH}$	$V_{CC} = V_{TH}$ max, $I_{SOURCE} = 500\mu\text{A}$ CAT809R/S/T/Z	$0.8 V_{CC}$			V
		$V_{CC} = V_{TH}$ max, $I_{SOURCE} = 800\mu\text{A}$ CAT809J/L/M	$V_{CC} - 1.5$			
RESET Output Voltage Low (Push-pull, active HIGH, CAT810)	$V_{OL}$	$V_{CC} > V_{TH}$ max, $I_{SINK} = 1.2\text{mA}$ CAT810R/S/T/Z			0.3	V
		$V_{CC} > V_{TH}$ max, $I_{SINK} = 3.2\text{mA}$ CAT810J/L/M			0.4	
RESET Output Voltage High (Push-pull active HIGH, CAT810)	$V_{OH}$	$1.8\text{V} < V_{CC}$ $V_{TH}$ min, $I_{SOURCE} = 150\mu\text{A}$	$0.8 V_{CC}$			V

#### Notes:

- (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.

## TYPICAL OPERATING CHARACTERISTICS

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



## 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 140ms after the power supply voltage has risen above the threshold.

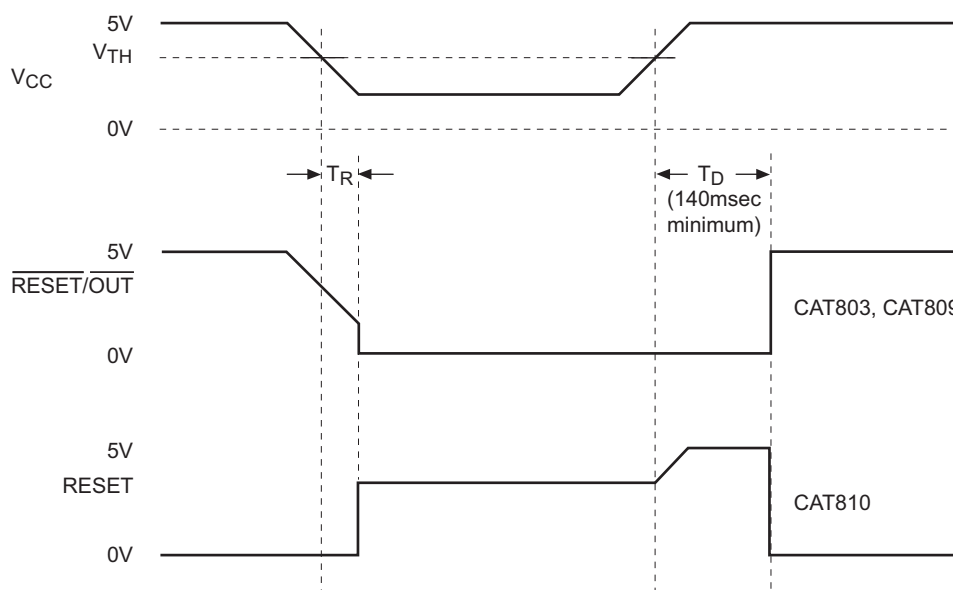


Figure 1. Reset Timing Diagram

#### V<sub>CC</sub> TRANSIENT RESPONSE

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

Figure 2 shows the maximum pulse duration of negative-going V<sub>CC</sub> 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<sub>CC</sub> starts from an initial voltage of 0.5V above the threshold and drops below it by the amplitude of the overdrive voltage ( $V_{TH} - V_{CC}$ ).

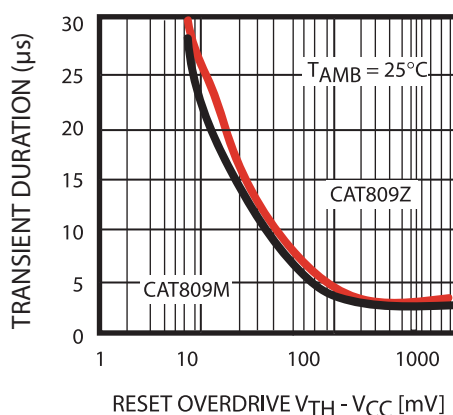
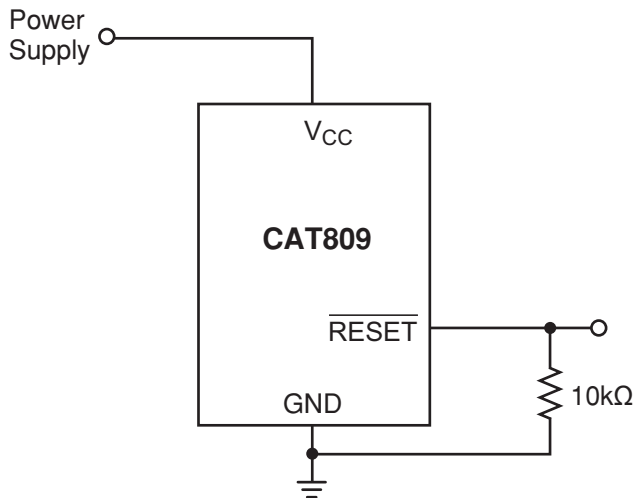


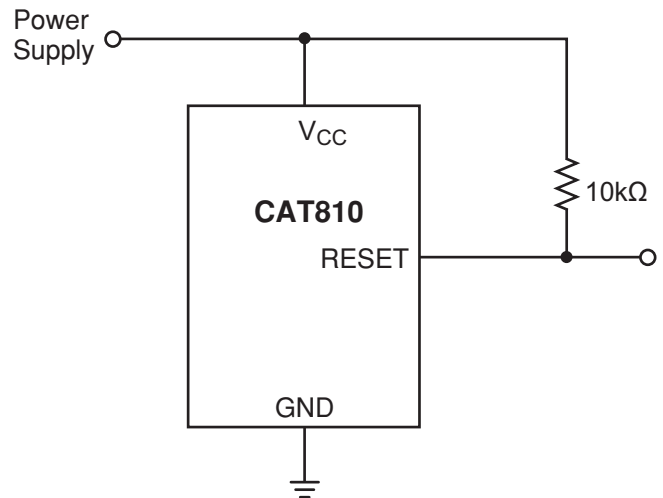
Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

### VALID RESET WITH $V_{CC}$ UNDER 1.0V

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



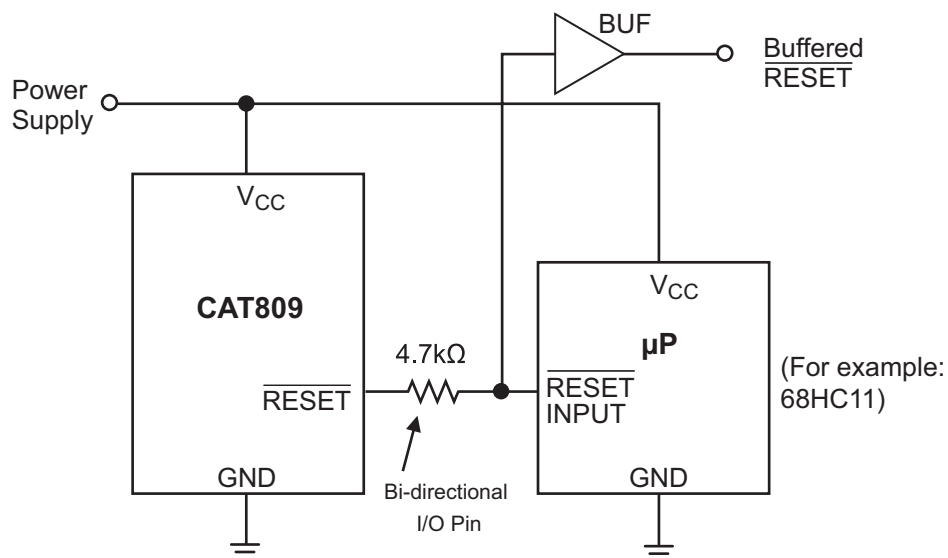
**Figure 3.  $\overline{\text{RESET}}$  Valid with  $V_{CC}$  Under 1.0V**



**Figure 4. RESET Valid with  $V_{CC}$  Under 1.1V**

### 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 5. Bi-directional Reset Pin Interfacing**

## CAT803, CAT809, CAT810

### 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 6. 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 5k $\Omega$  and 10k $\Omega$ .

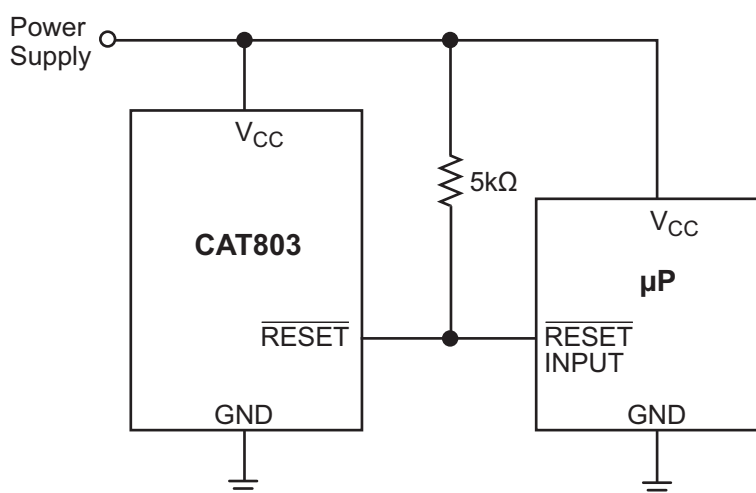
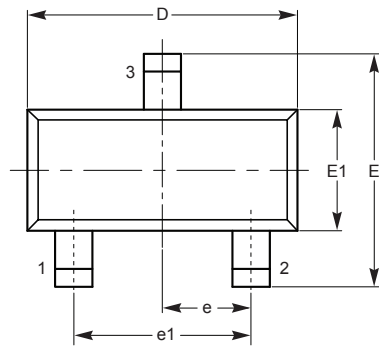


Figure 6. Typical CAT803 Open-Drain Circuit Configuration



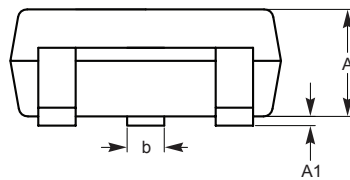
## PACKAGE OUTLINE DRAWINGS

### SOT-23 3-Lead (TB)

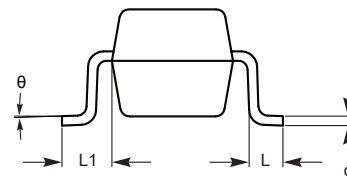


TOP VIEW

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	0.400 REF		
L1	0.540 REF		
θ	0°		8°



SIDE VIEW



END VIEW

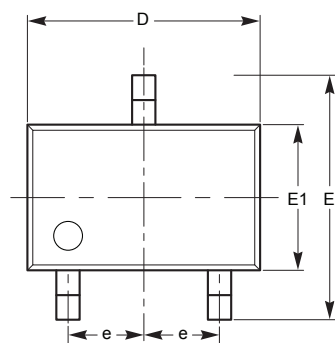
For current Tape and Reel information, download the PDF file from:  
[www.catsemi.com/documents/tapeandreel.pdf](http://www.catsemi.com/documents/tapeandreel.pdf)

#### Notes:

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

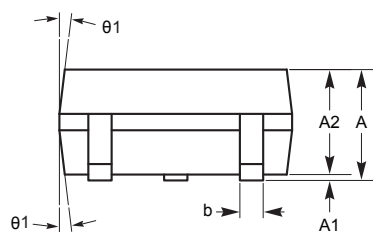
# CAT803, CAT809, CAT810

## SC-70 3-Lead (SD)

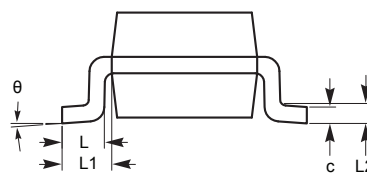


TOP VIEW

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°
θ1	4°		10°



SIDE VIEW

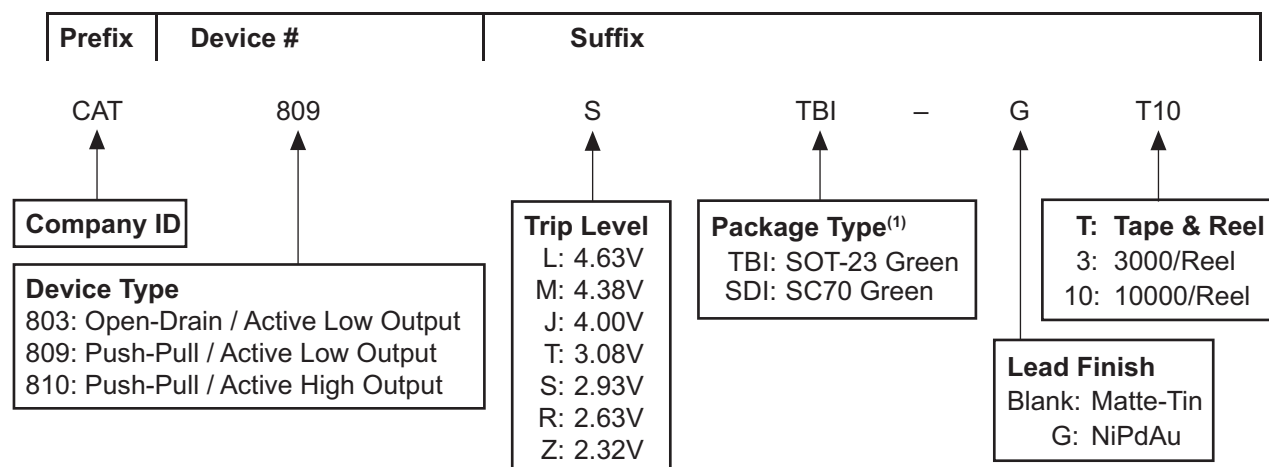


END VIEW

For current Tape and Reel information, download the PDF file from:  
[www.catsemi.com/documents/tapeandreeel.pdf](http://www.catsemi.com/documents/tapeandreeel.pdf)

### Notes:

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

**EXAMPLE OF ORDERING INFORMATION** <sup>(2) (3) (4)</sup>

**Notes:**

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard lead finish is NiPdAu. Contact factory for other lead finishes.
- (3) The device used in the example above is a CAT809STBI-GT10 (Push-Pull / Active Low Output, trip level of 2.85V to 3.00V NiPdAu, Tape and Reel).
- (4) For additional package and temperature options, please contact your nearest Catalyst Semiconductor Sales office.

**TOP MARKING**

Device <sup>(1)</sup>	SOT-23 PbSn Finish <sup>(2)</sup>	SOT-23 RoHS Matte Finish <sup>(2)</sup>	SOT-23 RoHS NiPdAu Finish <sup>(2)(3)</sup>	SC70 PbSn Finish <sup>(2)</sup>	SC70 RoHS Matte Finish <sup>(2)</sup>	SC70 RoHS NiPdAu Finish <sup>(2)(3)</sup>
CAT803x	N/A	RPYM	RNYM	N/A	RP__	RN__
CAT809x	PAYM	PBYM	NRYM	PA__	PB__	NR__
CAT810x	PCYM	PDYM	NSYM	PC__	PD__	NS__

**Notes:**

- (1) All threshold trip level options have the same marking.
- (2) The “YM” in the SOT-23 package marking indicates the Year and Month of reduction and the “\_” in the SC70 package marking indicates the assembly location.
- (3) All NiPdAu devices will be marked to indicate product type and package. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.

## CAT803, CAT809, CAT810

### ORDERING PART NUMBER

CAT803LSDI <sup>(1)</sup>	CAT803LSDI-G	CAT809LSDI <sup>(1)</sup>	CAT809LSDI-G	CAT810LSDI <sup>(1)</sup>	CAT810LSDI-G
CAT803MSDI <sup>(1)</sup>	CAT803MSDI-G	CAT809MSDI <sup>(1)</sup>	CAT809MSDI-G	CAT810MSDI <sup>(1)</sup>	CAT810MSDI-G
CAT803JSDI <sup>(1)</sup>	CAT803JSDI-G	CAT809JSDI <sup>(1)</sup>	CAT809JSDI-G	CAT810JSDI <sup>(1)</sup>	CAT810JSDI-G
CAT803TSDI <sup>(1)</sup>	CAT803TSDI-G	CAT809TSDI <sup>(1)</sup>	CAT809TSDI-G	CAT810TSDI <sup>(1)</sup>	CAT810TSDI-G
CAT803SSDI <sup>(1)</sup>	CAT803SSDI-G	CAT809SSDI <sup>(1)</sup>	CAT809SSDI-G	CAT810SSDI <sup>(1)</sup>	CAT810SSDI-G
CAT803RSDI <sup>(1)</sup>	CAT803RSDI-G	CAT809RSDI <sup>(1)</sup>	CAT809RSDI-G	CAT810RSDI <sup>(1)</sup>	CAT810RSDI-G
CAT803ZSDI <sup>(1)</sup>	CAT803ZSDI-G	CAT809ZSDI <sup>(1)</sup>	CAT809ZSDI-G	CAT810ZSDI <sup>(1)</sup>	CAT810ZSDI-G
CAT803LTBI <sup>(1)</sup>	CAT803LTBI-G	CAT809LTBI <sup>(1)</sup>	CAT809LTBI-G	CAT810LTBI <sup>(1)</sup>	CAT810LTBI-G
CAT803MTBI <sup>(1)</sup>	CAT803MTBI-G	CAT809MTBI <sup>(1)</sup>	CAT809MTBI-G	CAT810MTBI <sup>(1)</sup>	CAT810MTBI-G
CAT803JTBI <sup>(1)</sup>	CAT803JTBI-G	CAT809JTBI <sup>(1)</sup>	CAT809JTBI-G	CAT810JTBI <sup>(1)</sup>	CAT810JTBI-G
CAT803TTBI <sup>(1)</sup>	CAT803TTBI-G	CAT809TTBI <sup>(1)</sup>	CAT809TTBI-G	CAT810TTBI <sup>(1)</sup>	CAT810TTBI-G
CAT803STBI <sup>(1)</sup>	CAT803STBI-G	CAT809STBI <sup>(1)</sup>	CAT809STBI-G	CAT810STBI <sup>(1)</sup>	CAT810STBI-G
CAT803RTBI <sup>(1)</sup>	CAT803RTBI-G	CAT809RTBI <sup>(1)</sup>	CAT809RTBI-G	CAT810RTBI <sup>(1)</sup>	CAT810RTBI-G
CAT803ZTBI <sup>(1)</sup>	CAT803ZTBI-G	CAT809ZTBI <sup>(1)</sup>	CAT809ZTBI-G	CAT810ZTBI <sup>(1)</sup>	CAT810ZTBI-G

**Note:**

(1) Contact Factory for availability.

## REVISION HISTORY

Date	Rev.	Reason
10/29/2003	N	Updated VCC Transient Response text and Figure 2
10/30/2003	O	Updated Power Up Reset Timeout vs. Temperature curve
3/10/2004	P	Corrected temperature range Updated Description Updated Ordering Information Updated Absolute Maximum Ratings Updated Electrical Characteristics
03/23/2004	Q	Updated Description Updated Ordering Information Updated Absolute Maximum Ratings Updated Electrical Characteristics Updated Typical Operating Characteristics Updated Package Information
3/25/2004	R	Changed Preliminary designation to Final Updated Max Reset Active Timeout Period in Electrical Characteristics Updated package drawings
5/10/2004	S	Updated top marking table
12/28/2005	T	Updated Features Updated Ordering Information Updated Top Marking
02/17/2006	Q	Updated Typical Operating Characteristics
08/10/2006	U	Updated Features Updated Description Updated Max Reset Active Timeout Period in Electrical Characteristics Updated Figure 1 Updated Package Information Correct Revision Number
10/17/2006	V	Updated Top Marking Updated Detailed Description Adding CAT803
02/12/2007	W	Updated Electrical Characteristics Updated Figure 1 Updated Ordering Information
03/20/2007	X	Updated Detailed Descriptions
01/31/2008	Y	Added MD- to Document Number Added Block Diagrams Updated Package Outline Drawings Updated Example of Ordering Information Updated Ordering Part Number

---

#### ***Copyrights, Trademarks and Patents***

© Catalyst Semiconductor, Inc.

Trademarks and registered trademarks of Catalyst Semiconductor include each of the following:

Adaptive Analog™, Beyond Memory™, DPP™, EZDim™, LDD™, MiniPot™, Quad-Mode™ and Quantum Charge Programmable™

Catalyst Semiconductor has been issued U.S. and foreign patents and has patent applications pending that protect its products.

*CATALYST SEMICONDUCTOR MAKES NO WARRANTY, REPRESENTATION OR GUARANTEE, EXPRESS OR IMPLIED, REGARDING THE SUITABILITY OF ITS PRODUCTS FOR ANY PARTICULAR PURPOSE, NOR THAT THE USE OF ITS PRODUCTS WILL NOT INFRINGE ITS INTELLECTUAL PROPERTY RIGHTS OR THE RIGHTS OF THIRD PARTIES WITH RESPECT TO ANY PARTICULAR USE OR APPLICATION AND SPECIFICALLY DISCLAIMS ANY AND ALL LIABILITY ARISING OUT OF ANY SUCH USE OR APPLICATION, INCLUDING BUT NOT LIMITED TO, CONSEQUENTIAL OR INCIDENTAL DAMAGES.*

Catalyst Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Catalyst Semiconductor product could create a situation where personal injury or death may occur.

Catalyst Semiconductor reserves the right to make changes to or discontinue any product or service described herein without notice. Products with data sheets labeled "Advance Information" or "Preliminary" and other products described herein may not be in production or offered for sale.

Catalyst Semiconductor advises customers to obtain the current version of the relevant product information before placing orders. Circuit diagrams illustrate typical semiconductor applications and may not be complete.

---



Catalyst Semiconductor, Inc.  
Corporate Headquarters  
2975 Stender Way  
Santa Clara, CA 95054  
Phone: 408.542.1000  
Fax: 408.542.1200  
www.catsemi.com

Document No: MD-3004  
Revision: Y  
Issue date: 01/31/08