

# 3-Pin Microprocessor Power Supply Supervisors



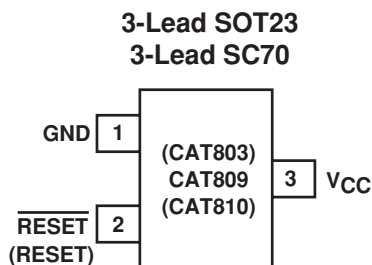
## FEATURES

- 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>(TM) 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

**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.

**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	$V_{CC}$ < 5.5V, J/L/M		8	20	$\mu$ A
			$V_{CC}$ < 3.6V, R/S/T/Z		6	15	
Reset Threshold Voltage	$V_{TH}$	L Threshold	$T_A$ = +25 $^{\circ}$ C	4.56	4.63	4.70	V
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.50		4.75	
		M Threshold	$T_A$ = +25 $^{\circ}$ C	4.31	4.38	4.45	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.25		4.50	
		J Threshold	$T_A$ = +25 $^{\circ}$ C	3.93	4.00	4.06	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	3.89		4.10	
		T Threshold	$T_A$ = +25 $^{\circ}$ C	3.04	3.08	3.11	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	3.00		3.15	
		S Threshold	$T_A$ = +25 $^{\circ}$ C	2.89	2.93	2.96	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.85		3.00	
		R Threshold	$T_A$ = +25 $^{\circ}$ C	2.59	2.63	2.66	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.55		2.70	
		Z Threshold	$T_A$ = +25 $^{\circ}$ C	2.28	2.32	2.35	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.25		2.38	

**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.

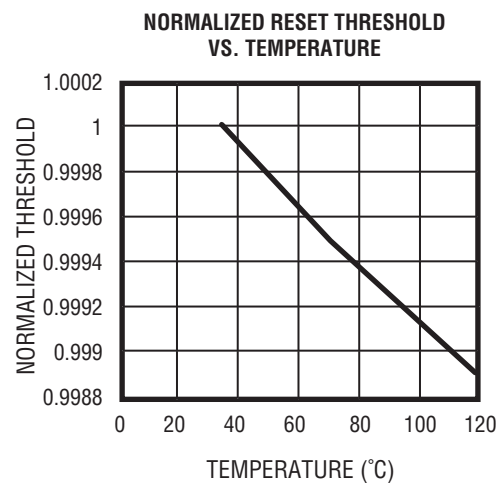
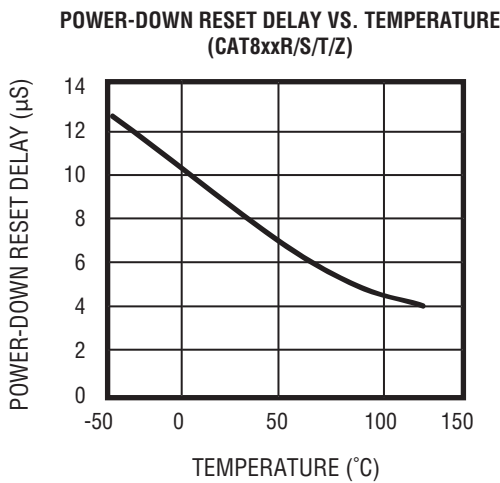
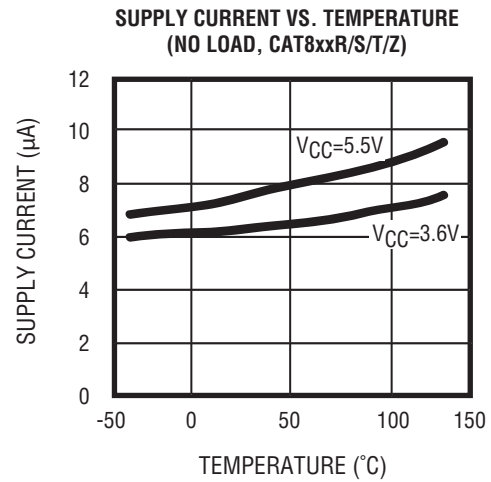
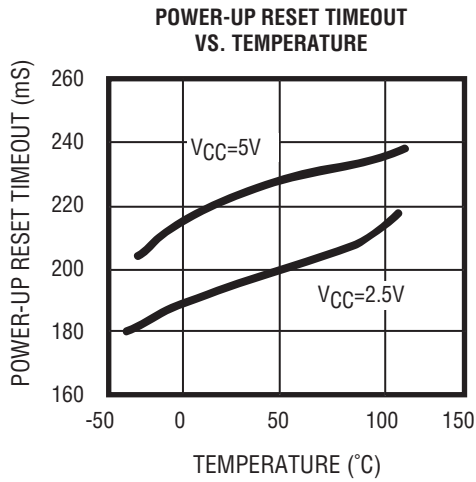
Parameter	Symbol	Conditions	Min	Typ <sup>(1)</sup>	Max	Units
Reset Threshold Tempco				30		ppm/°C
$V_{CC}$ to Reset Delay (Note 2)	$T_D$	$V_{CC} = V_{TH}$ to ( $V_{TH} - 100$ mV)		20		μs
Reset Active Timeout Period	$T_R$	$T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$	140	240	460	ms
$\overline{\text{RESET}}$ 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	
$\overline{\text{RESET}}$ 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)  $\overline{\text{RESET}}$  output for the CAT809; RESET output for the CAT810.

**TYPICAL OPERATING CHARACTERISTICS**

$V_{CC}$  = Full range,  $T_A$  =  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  unless otherwise noted. Typical values at  $T_A$  =  $+25^{\circ}\text{C}$  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.

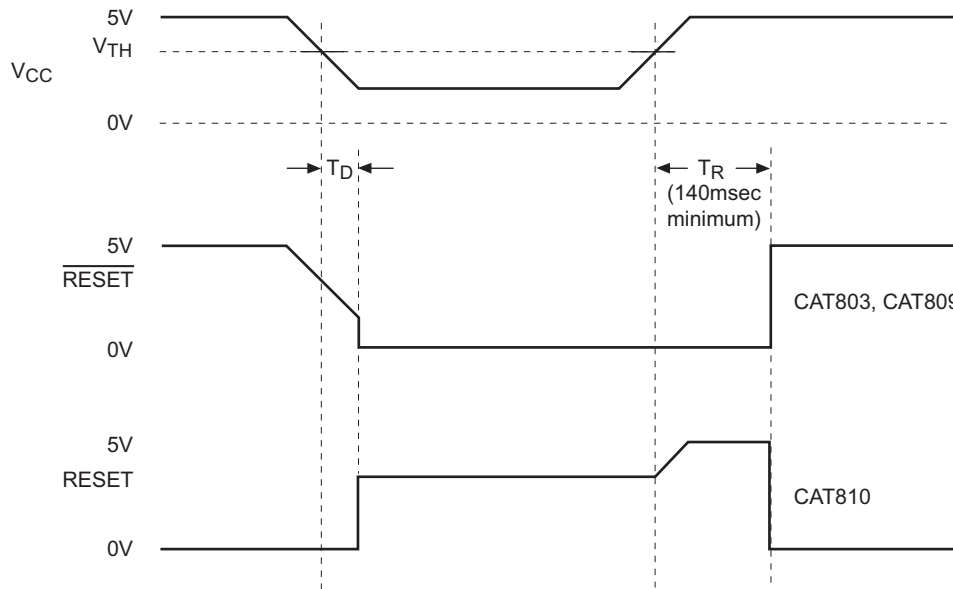


Figure 1. Reset Timing Diagram

#### 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 ( $V_{TH} - V_{CC}$ ).

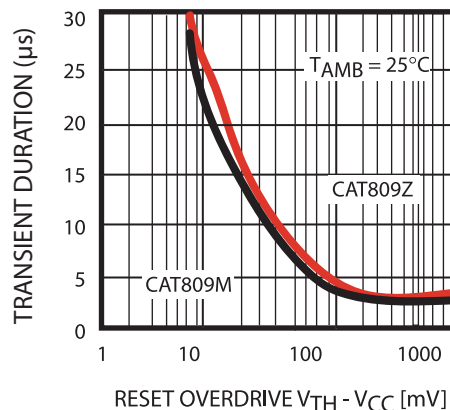
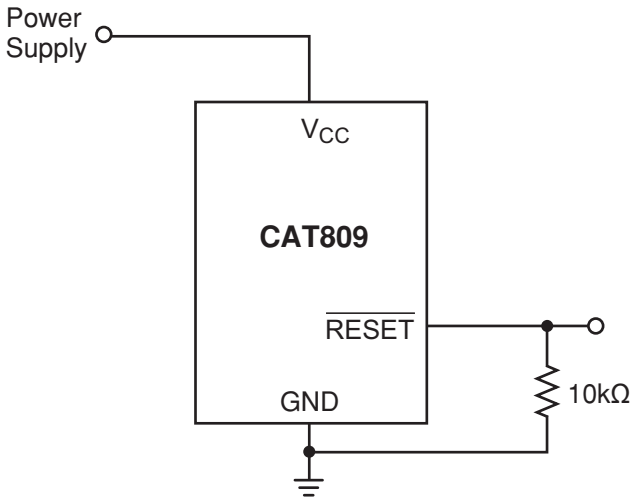


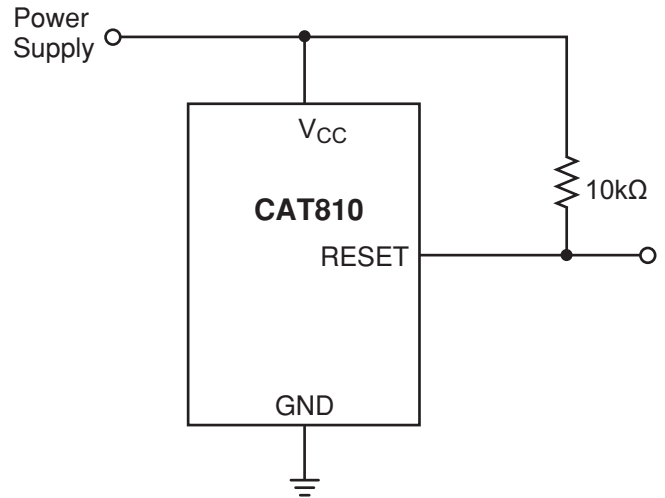
Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

**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  $>10k\Omega$  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.



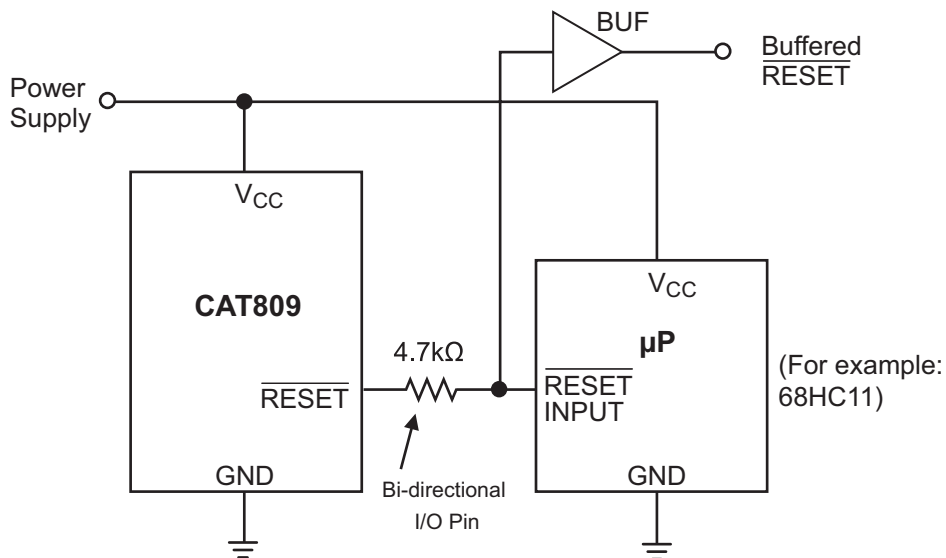
**Figure 3.  $\overline{\text{RESET}}$  Valid with  $V_{CC}$  Under 1.0V**



**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  $4.7k\Omega$  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 $\overline{\text{RESET}}$ APPLICATION

The CAT803 features an open-drain  $\overline{\text{RESET}}$  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 $\Omega$ .

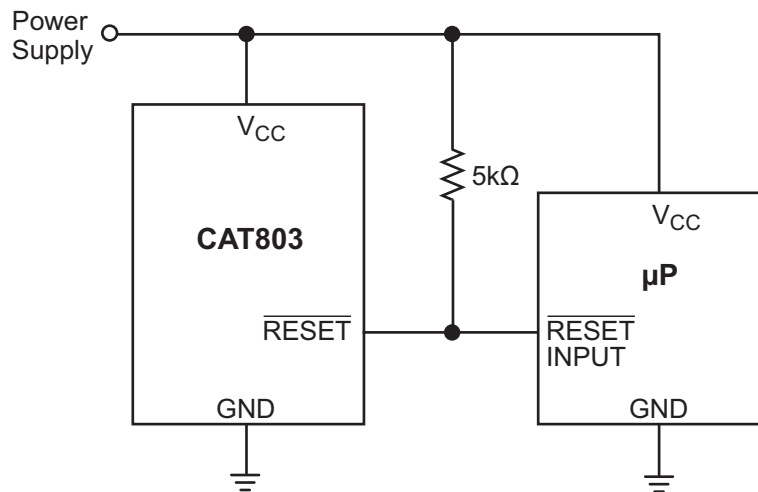
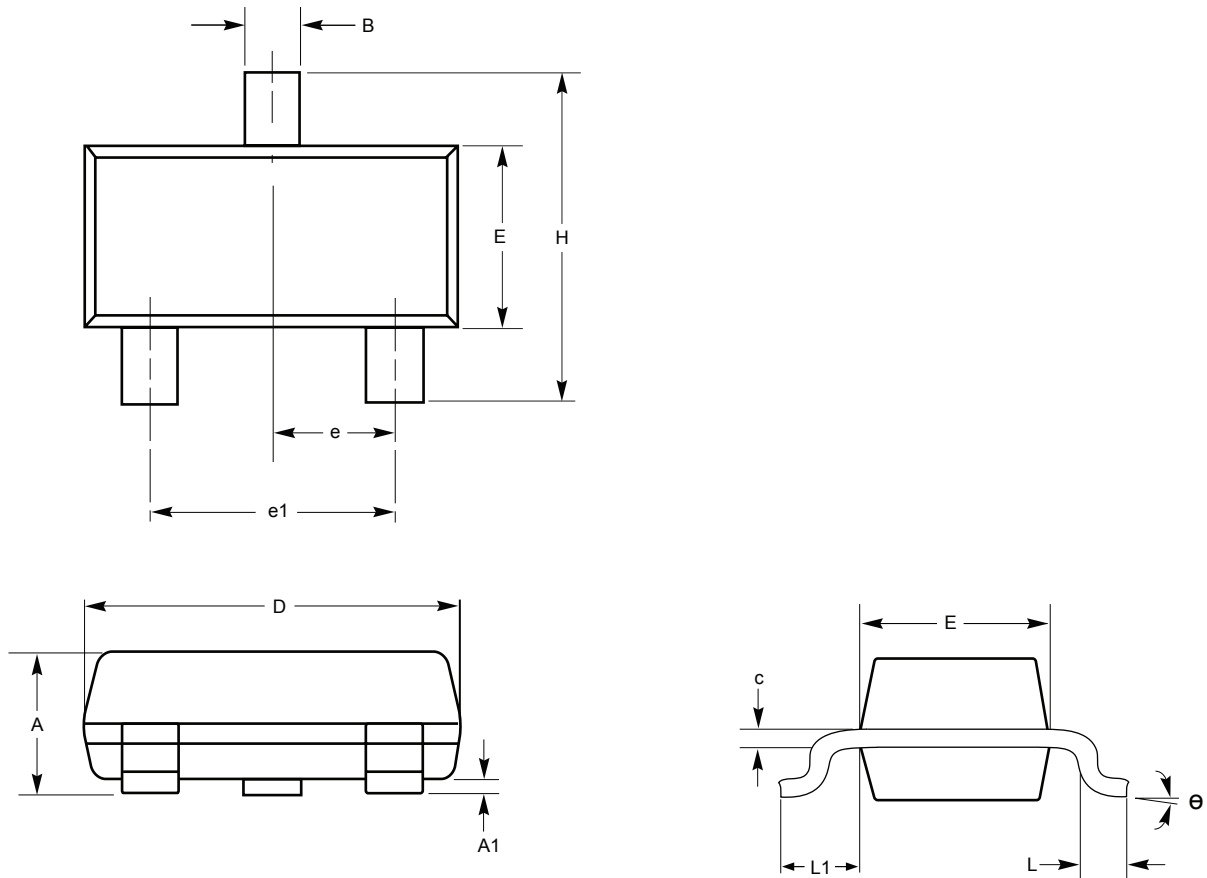


Figure 6. Typical CAT803 Open-Drain Circuit Configuration



**PACKAGE INFORMATION**

**Plastic SOT-23 (3-Pin)**

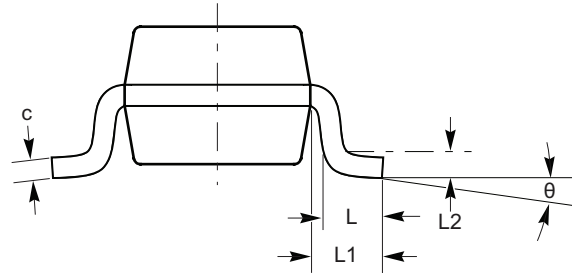
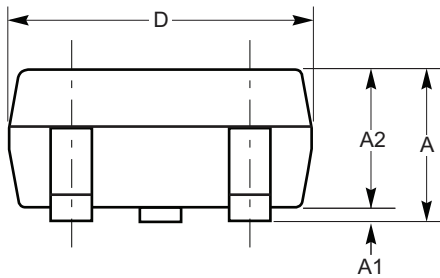
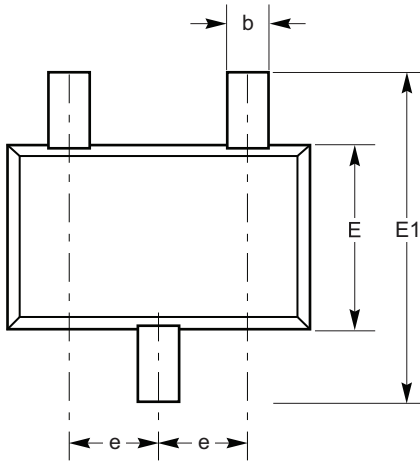


	Inches		Millimeters	
	Min	Max	Min	Max
<b>Plastic SOT-23 (3-Pin)</b>				
A	0.0350	0.0441	0.89	1.12
A1	0.0005	0.0039	0.013	0.10
B	0.0146	0.0197	0.37	0.50
c	0.0033	0.0071	0.085	0.18
D	0.1102	0.1197	2.80	3.04
E	0.0472	0.0551	1.20	1.40
e	0.0350	0.0406	0.89	1.03
e1	0.0701	0.0807	1.78	2.05
H	0.0827	0.1039	2.10	2.64
e	0°	8°	0°	8°
L	0.0083	0.0161	0.275	0.41
L1	0.0160	0.0270	0.275	0.685

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) This part is compliant with JEDEC specification TO-236
- (2) Die is face up for mold and trim/form
- (3) Dimensions are exclusive of mold flash and metal burr

**CAT803, CAT809, CAT810**
**PACKAGE INFORMATION**
**SC70 (3-Lead)**


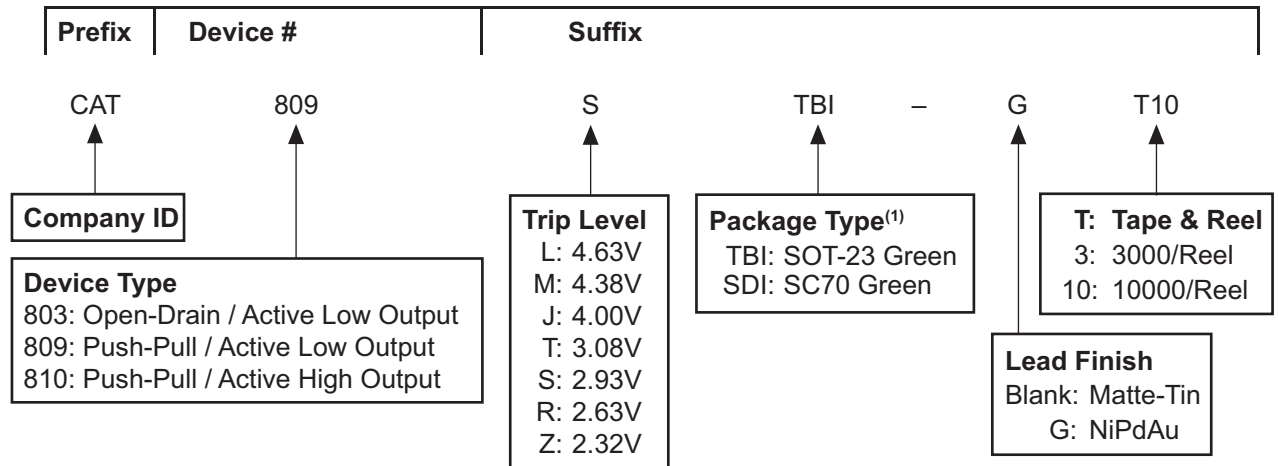
	Inches		Millimeters	
	Min	Max	Min	Max
<b>Plastic SC70 (3-Pin)</b>				
A	0.0315	0.0433	0.80	1.10
A1	0.0000	0.0039	0.00	0.10
A2	0.0315	0.0394	0.80	1.00
b	0.0059	0.00118	0.15	0.30
c	0.0035	0.0071	0.09	0.18
D	0.0709	0.0866	1.80	2.20
E	0.0453	0.0531	1.15	1.35
E1	0.0709	0.0945	1.80	2.40
e	0.0255 BSC		0.65BSC	
L	0.0102	0.0181	0.26	0.46
L1	0.0108	0.0226	0.275	0.575

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) This part is compliant with JEDEC specification MO-203.
- (2) Die is face up for mold. Die is facing down for trim/form.
- (3) Dimensions are exclusive of mold flash and metal burr.

**EXAMPLE OF ORDERING INFORMATION (2) (3) (4)**



**Notes:**

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard lead finish is Matte-Tin. 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 theshold trip level options have the same marking.
- (2) The "YM" in the SOT-23 package marking indicates the Year and Month of roduction 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	CAT803LSDI-G	CAT809LSDI	CAT809LSDI-G	CAT810LSDI	CAT810LSDI-G
CAT803MSDI	CAT803MSDI-G	CAT809MSDI	CAT809MSDI-G	CAT810MSDI	CAT810MSDI-G
CAT803JSDI	CAT803JSDI-G	CAT809JSDI	CAT809JSDI-G	CAT810JSDI	CAT810JSDI-G
CAT803TSDI	CAT803TSDI-G	CAT809TSDI	CAT809TSDI-G	CAT810TSDI	CAT810TSDI-G
CAT803SSDI	CAT803SSDI-G	CAT809SSDI	CAT809SSDI-G	CAT810SSDI	CAT810SSDI-G
CAT803RSDI	CAT803RSDI-G	CAT809RSDI	CAT809RSDI-G	CAT810RSDI	CAT810RSDI-G
CAT803ZSDI	CAT803ZSDI-G	CAT809ZSDI	CAT809ZSDI-G	CAT810ZSDI	CAT810ZSDI-G
CAT803LTBI	CAT803LTBI-G	CAT809LTBI	CAT809LTBI-G	CAT810LTBI	CAT810LTBI-G
CAT803MTBI	CAT803MTBI-G	CAT809MTBI	CAT809MTBI-G	CAT810MTBI	CAT810MTBI-G
CAT803JTBI	CAT803JTBI-G	CAT809JTBI	CAT809JTBI-G	CAT810JTBI	CAT810JTBI-G
CAT803TTBI	CAT803TTBI-G	CAT809TTBI	CAT809TTBI-G	CAT810TTBI	CAT810TTBI-G
CAT803STBI	CAT803STBI-G	CAT809STBI	CAT809STBI-G	CAT810STBI	CAT810STBI-G
CAT803RTBI	CAT803RTBI-G	CAT809RTBI	CAT809RTBI-G	CAT810RTBI	CAT810RTBI-G
CAT803ZTBI	CAT803ZTBI-G	CAT809ZTBI	CAT809ZTBI-G	CAT810ZTBI	CAT810ZTBI-G

**REVISION HISTORY**

<b>Date</b>	<b>Rev.</b>	<b>Reason</b>
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

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