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**

- **6µA power supply current**

- **Power supply transient immunity**

- **Industrial temperature range: -40ºC to +85ºC**

- **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

3-Lead SOT23
3-Lead SC70

GND — 1
(CAT803)
CAT809
(CAT810)
3 — V$_{CC}$
RESET — 2
(RESET)
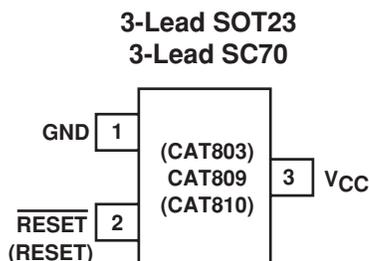
DESCRIPTION

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, $AE^{2(TM)}$ 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.

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	—	$\overline{\text{RESET}}$	Active LOW reset. $\overline{\text{RESET}}$ is asserted if V_{CC} falls below the reset threshold and remains low for at least 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

2
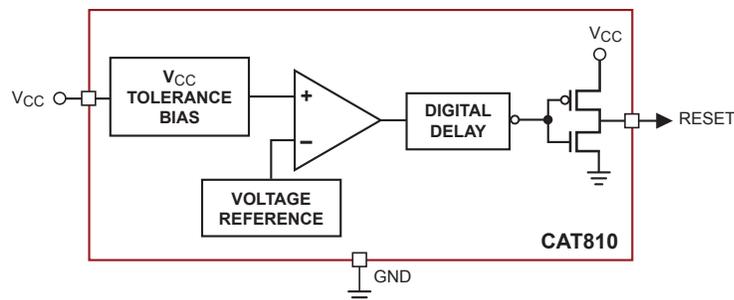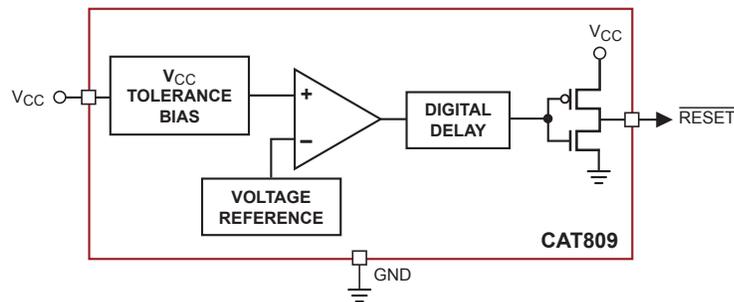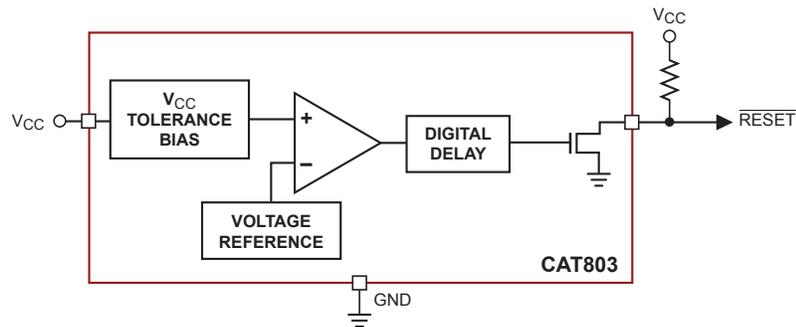
ABSOLUTE MAXIMUM RATINGS[1]

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

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 = -40ºC to +85ºC unless otherwise noted. Typical values at T_A = +25ºC 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 = 0ºC to +70ºC		1.0		5.5	V
		T_A = -40ºC to +85ºC		1.2		5.5	
Supply Current	I_{CC}	T_A = -40ºC to +85ºC	V_{CC} < 5.5V, J/L/M		8	20	µA
			V_{CC} < 3.6V, R/S/T/Z		6	15	
Reset Threshold Voltage	V_{TH}	L Threshold	T_A = +25ºC	4.56	4.63	4.70	V
			T_A = -40ºC to +85ºC	4.50		4.75	
		M Threshold	T_A = +25ºC	4.31	4.38	4.45	
			T_A = -40ºC to +85ºC	4.25		4.50	
		J Threshold	T_A = +25ºC	3.93	4.00	4.06	
			T_A = -40ºC to +85ºC	3.89		4.10	
		T Threshold	T_A = +25ºC	3.04	3.08	3.11	
			T_A = -40ºC to +85ºC	3.00		3.15	
		S Threshold	T_A = +25ºC	2.89	2.93	2.96	
			T_A = -40ºC to +85ºC	2.85		3.00	
		R Threshold	T_A = +25ºC	2.59	2.63	2.66	
			T_A = -40ºC to +85ºC	2.55		2.70	
		Z Threshold	T_A = +25ºC	2.28	2.32	2.35	
			T_A = -40ºC to +85ºC	2.25		2.38	

ELECTRICAL CHARACTERISTICS (continued)

V_{CC} = Full range, T_A = -40ºC to +85ºC unless otherwise noted. Typical values at T_A = +25ºC 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[1]	Max	Units
Reset Threshold Tempco				30		ppm/ºC
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 = -40ºC to +85ºC	140	240	460	ms
$\overline{RESET}$ Output Voltage Low (Open-drain active LOW, CAT803 and push-pull, active LOW, CAT809)	V_{OL}	V_{CC} = V_{TH} min, I_{SINK} = 1.2mA CAT803R/S/T/Z, CAT809R/S/T/Z				V
		V_{CC} = V_{TH} min, I_{SINK} = 3.2mA CAT803J/L/M, CAT809J/L/M			0.4	
		V_{CC} > 1.0V, I_{SINK} = 50µA			0.3	
$\overline{RESET}$ Output Voltage High (Push-pull, active LOW, CAT809)	V_{OH}	V_{CC} = V_{TH} max, I_{SOURCE} = 500µA CAT809R/S/T/Z	0.8 V_{CC}			V
		V_{CC} = V_{TH} max, I_{SOURCE} = 800µA 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} = 1.2mA CAT810R/S/T/Z			0.3	V
		V_{CC} > V_{TH} max, I_{SINK} = 3.2mA CAT810J/L/M			0.4	
RESET Output Voltage High (Push-pull active HIGH, CAT810)	V_{OH}	1.8V < V_{CC} V_{TH} min, I_{SOURCE} = 150µA	0.8 V_{CC}			V

Notes:

(1) Production testing done at T_A = +25ºC; limits over temperature guaranteed by design only.

(2) $\overline{RESET}$ 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.

POWER-UP RESET TIMEOUT VS. TEMPERATURE

SUPPLY CURRENT VS. TEMPERATURE (NO LOAD, CAT8xxR/S/T/Z)

POWER-DOWN RESET DELAY VS. TEMPERATURE (CAT8xxR/S/T/Z)

NORMALIZED RESET THRESHOLD VS. TEMPERATURE
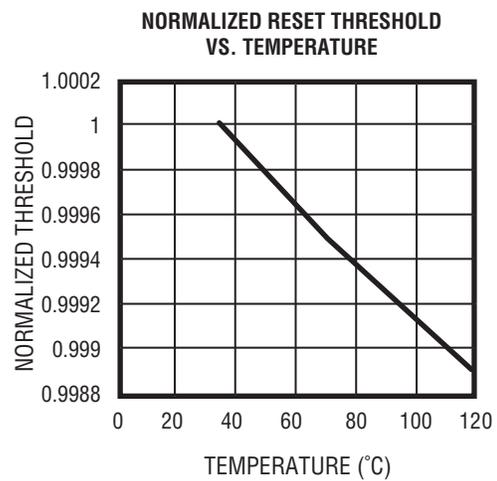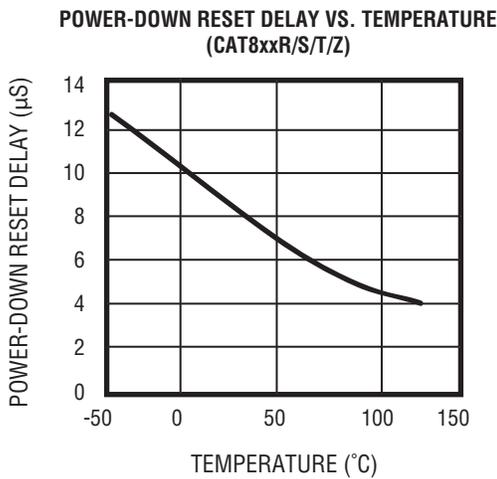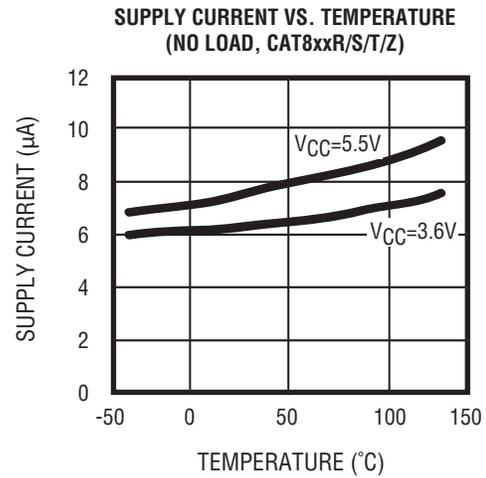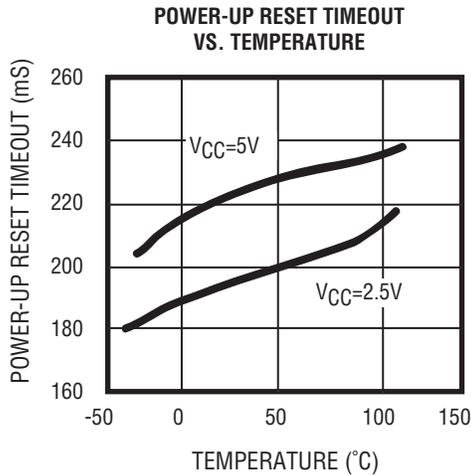
DETAILED DESCRIPTIONS

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.
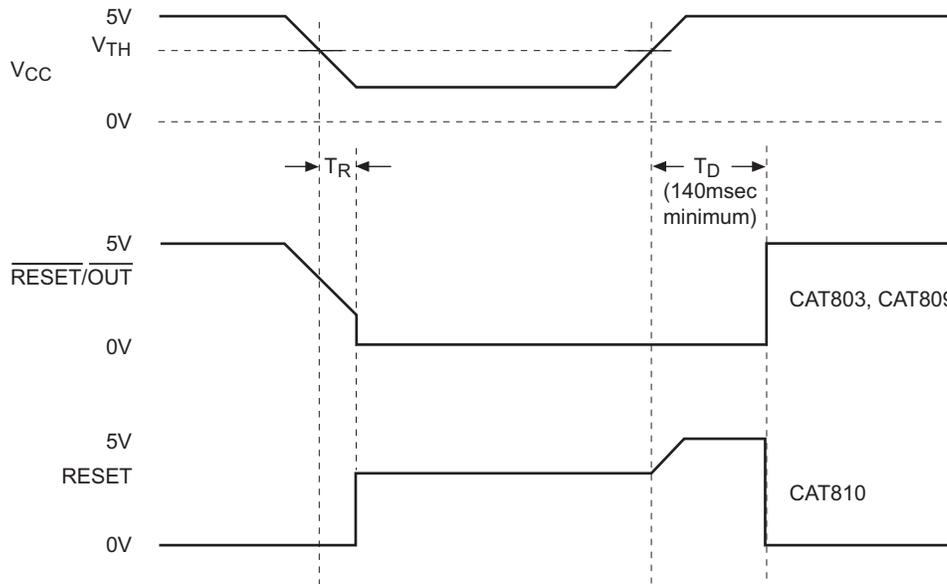
Figure 1. Reset Timing Diagram

V_{CC} TRANSIENT RESPONSE

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

Figure 2 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 0.5V above the threshold and drops below it by the amplitude of the overdrive voltage (V_{TH} - V_{CC}).
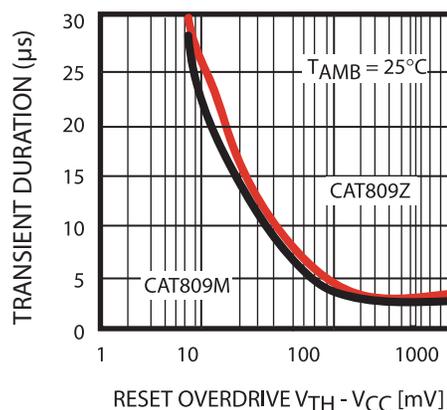

Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

VALID RESET WITH V_{CC} UNDER 1.0V

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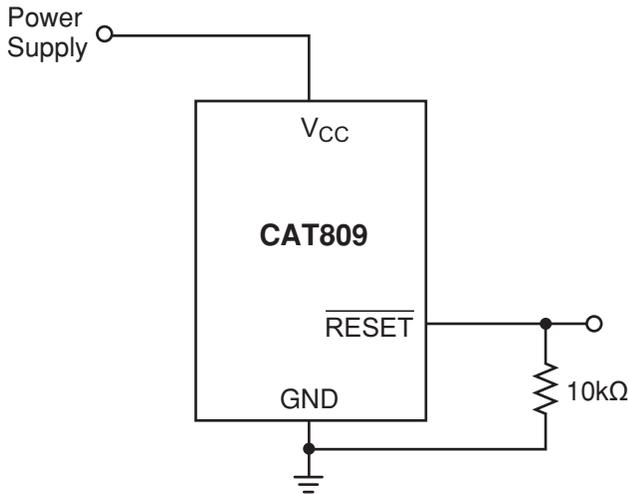

Figure 3. $\overline{RESET}$ Valid with V_{CC} Under 1.0V
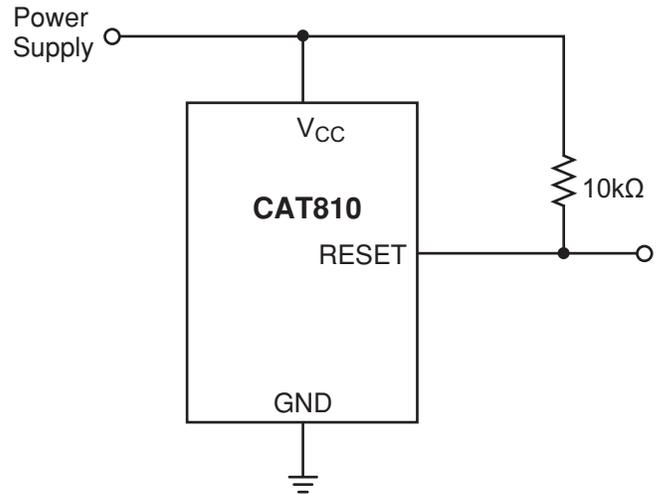
Figure 4. RESET Valid with V_{CC} Under 1.1V

BI-DIRECTIONAL RESET PIN INTERFACING

The CAT809/810 can interface with µP/µC bi-directional reset pins by connecting a 4.7kΩ resistor in series with the CAT809/810 reset output and the µP/µC bi-directional reset pin.
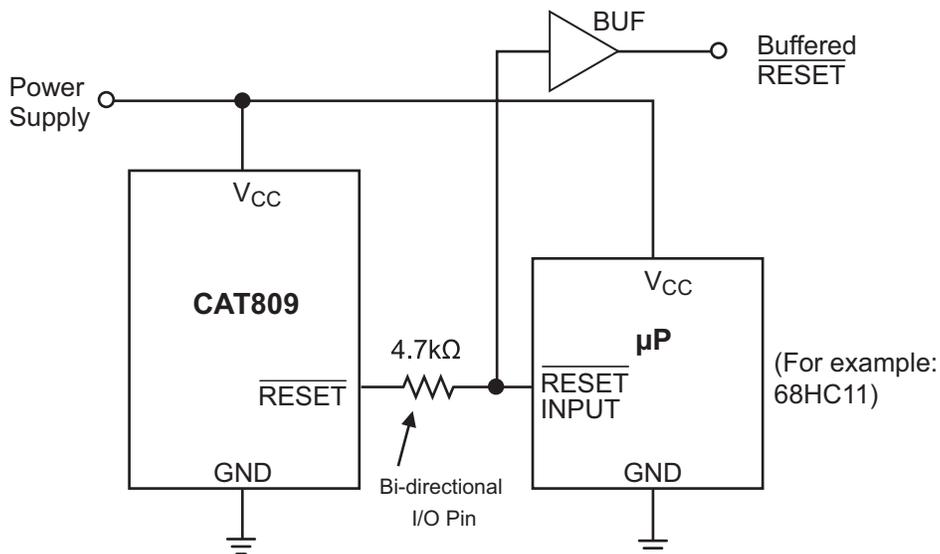
Figure 5. Bi-directional Reset Pin Interfacing

CAT803 OPEN-DRAIN $\overline{\text{RESET}}$ 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 5kΩ and 10kΩ.
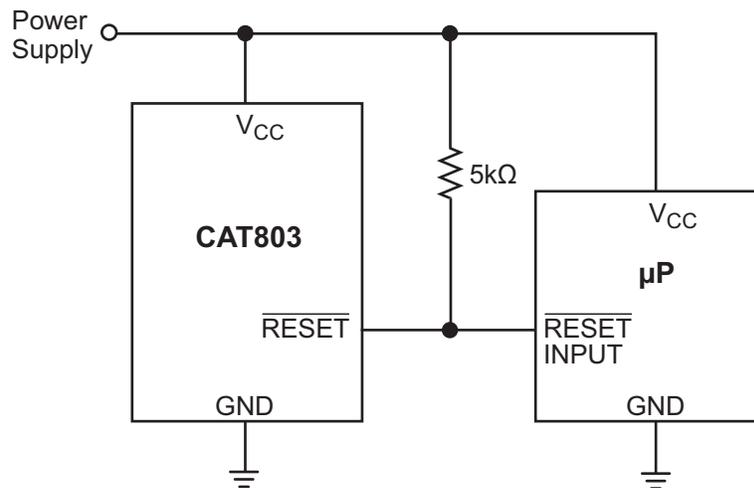

**Figure 6. Typical CAT803 Open-Drain Circuit Configuration**

PACKAGE OUTLINE DRAWINGS

SOT-23 3-Lead (TB)
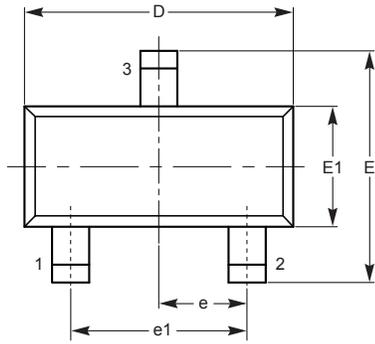
TOP VIEW

| 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	0º		8º
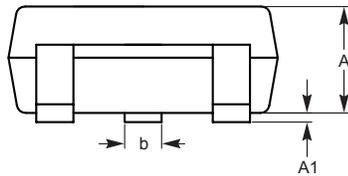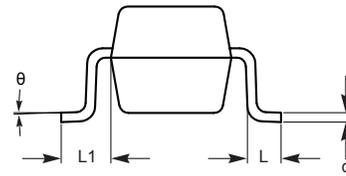
SIDE VIEW

END VIEW

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

Notes:

(1) All dimensions are in millimeters. Angles in degrees.

(2) Complies with JEDEC standard TO-236.

SC-70 3-Lead (SD)
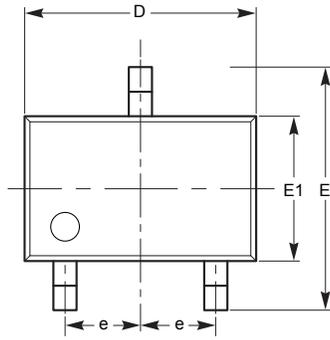
TOP VIEW

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°
$\theta 1$	4°		10°
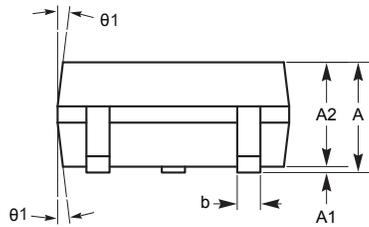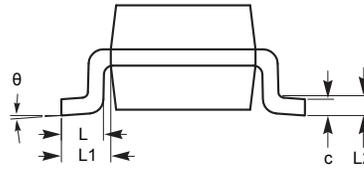
SIDE VIEW

END VIEW

**For current Tape and Reel information, download the PDF file from:**
www.catsemi.com/documents/tapeandreel.pdf

Notes:

(1) All dimensions are in millimeters. Angles in degrees.

(2) Complies with JEDEC standard MO-203.

EXAMPLE OF ORDERING INFORMATION [2] [3] [4]

Prefix	Device #	Suffix				
CAT	809	S	TBI	–	G	T10

Company ID

Device Type
803: Open-Drain / Active Low Output
809: Push-Pull / Active Low Output
810: Push-Pull / Active High Output

Trip Level
L: 4.63V
M: 4.38V
J: 4.00V
T: 3.08V
S: 2.93V
R: 2.63V
Z: 2.32V

Package Type[1]
TBI: SOT-23 Green
SDI: SC70 Green

Lead Finish
Blank: Matte-Tin
G: NiPdAu

T: Tape & Reel
3: 3000/Reel
10: 10000/Reel
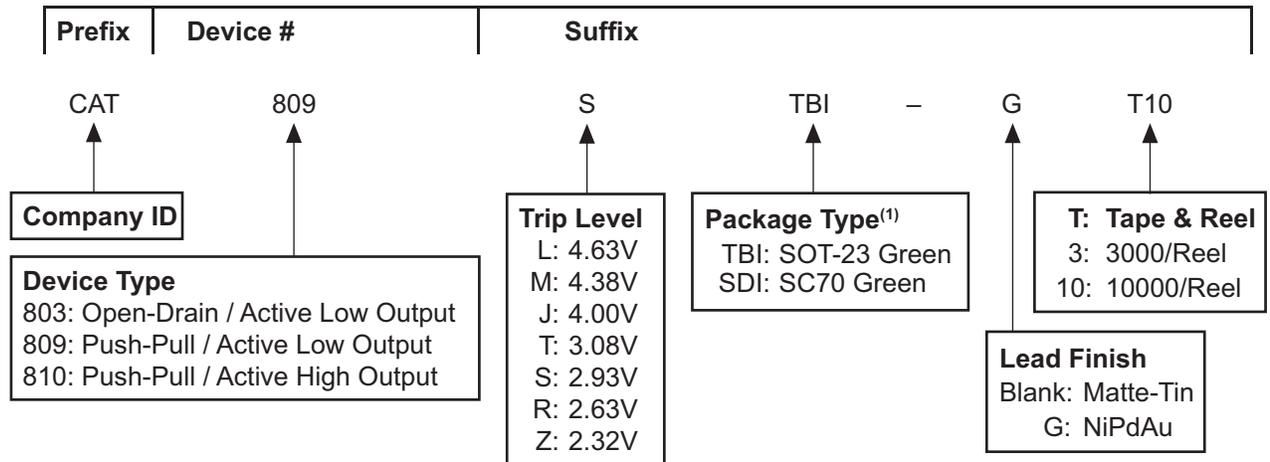
Notes:
(1) All packages are RoHS-compliant (Lead-free, Halogen-free).
(2) The standard lead finish is NiPdAu. Contact factory for other lead finishes.
(3) The device used in the example above is a CAT809STBI-GT10 (Push-Pull / Active Low Output, trip level of 2.85V to 3.00V NiPdAu, Tape and Reel).
(4) For additional package and temperature options, please contact your nearest Catalyst Semiconductor Sales office.

TOP MARKING

Device[1]	SOT-23 PbSn Finish[2]	SOT-23 RoHS Matte Finish[2]	SOT-23 RoHS NiPdAu Finish[2][3]	SC70 PbSn Finish[2]	SC70 RoHS Matte Finish[2]	SC70 RoHS NiPdAu Finish[2][3]
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.

ORDERING PART NUMBER

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