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 **RESET** output (active LOW). The CAT803 requires a pull-up resistor on the reset output.

The CAT809 features a push–pull 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 $V_{CC} = 1.0 \text{ V}$
- 6 µA Power Supply Current
- Power Supply Transient Immunity
- Industrial Temperature Range: -40°C to +85°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



ON Semiconductor®

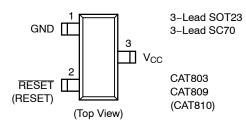
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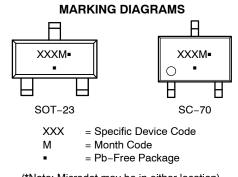




SC-70 SD SUFFIX CASE 419AB

PIN CONFIGURATION





(*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.

Table 1. THRESHOLD SUFFIX SELECTOR

Nominal Threshold Voltage	Threshold Suffix Designation
4.63 V	L
4.55 V	н
4.38 V	М
4.00 V	J
3.08 V	Т
2.93 V	S
2.63 V	R
2.32 V	Z
1.60 V	V

Table 2. PIN DESCRIPTIONS

	Pin Number			
CAT803	CAT809	CAT810	Name	Description
1	1	1	GND	Ground
2	2	-	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, RESET	20	mA	
Rate of Rise, V _{CC}	100	V/μs	
Continuous Power Dissipation Derate 2.2 mW/°C above 70°C (SC70) Derate 4 mW/°C above 70°C (SOT23)	175 320	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.

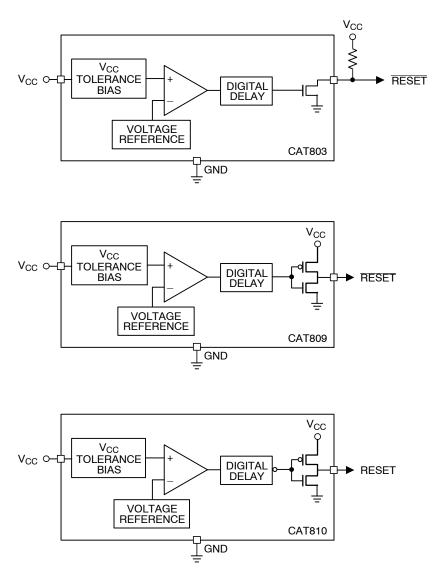


Figure 1. Block Diagrams

Table 4. ELECTRICAL CHARACTERISTICS

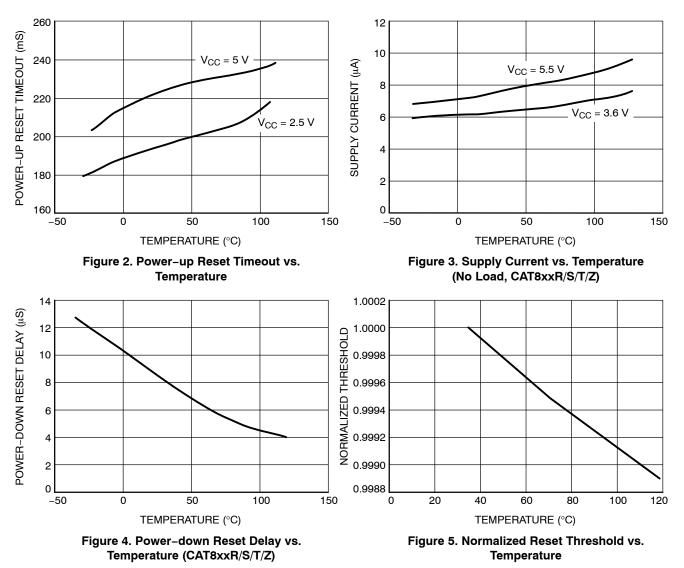
 $(V_{CC} = Full range, T_A = -40^{\circ}C \text{ to } +85^{\circ}C, \text{ unless otherwise specified. Typical values at } T_A = +25^{\circ}C \text{ and } V_{CC} = 5 \text{ V for the L/H/M/J versions, } V_{CC} = 3.3 \text{ V for the T/S versions, } V_{CC} = 3 \text{ V for the R version and } V_{CC} =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

Symbol	Parameter	Conditions		Min	Typ (Note 1)	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°C	1.2		5.5	1
I _{CC}	Supply Current	$T_A = -40^{\circ}C$ $V_{CC} < 5.5 \text{ V}, \text{ J/L/M/H}$			8	20	μΑ
		to +85°C	V _{CC} < 3.6 V, R/S/T/Z/V		6	15	
V_{TH}	Reset Threshold Voltage	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	
		H Threshold	$T_A = +25^{\circ}C$	4.48	4.55	4.62	
			$T_A = -40^{\circ}C$ to $+85^{\circ}C$	4.43		4.67	
		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	
			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	3.00		3.15	
		S Threshold	$T_A = +25^{\circ}C$	2.89	2.93	2.96	
			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	2.85		3.00	
		R Threshold	$T_A = +25^{\circ}C$	2.59	2.63	2.66	
			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	2.55		2.70	
		Z Threshold	$T_A = +25^{\circ}C$	2.28	2.32	2.35	
			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	2.25		2.38	
		V Threshold	$T_A = +25^{\circ}C$	1.58	1.60	1.62	
			$T_A = -40^{\circ}C \text{ to } +85^{\circ}C$	1.56		1.64	
	Reset Threshold Tempco				30		ppm/°0
TD	V _{CC} to Reset Delay (Note 2)	V _{CC} = V _{TH} to (V _{TH} – 100 mV)		20		μs
T _R	Reset Active Timeout Period	$T_A = -40^{\circ}C$ to	+85°C	140	240	460	ms
V _{OL}	RESET Output Voltage Low (Open-drain active LOW,	V _{CC} = V _{TH} min, I _{SINK} = 1.2 mA CAT803R/S/T/Z, CAT809R/S/T/Z/V				0.3	V
	CAT803 and push-pull, active LOW, CAT809)	V _{CC} = V _{TH} mir CAT803J/L/M,	n, I _{SINK} = 3.2 mA CAT809J/L/M/H			0.4	
		V _{CC} > 1.0 V, Ig	_{SINK} = 50 μA			0.3	
V _{OH}	RESET Output Voltage High (Push-pull, active LOW,	V _{CC} = V _{TH} max, I _{SOURCE} = 500 μA CAT809R/S/T/Z/V		0.8 V _{CC}			V
	CAT809)	V _{CC} = V _{TH} max, I _{SOURCE} = 800 μA CAT809J/L/M/H		V _{CC} – 1.5			1
V _{OL}	RESET Output Voltage Low (Push-pull, active HIGH,	V _{CC} > V _{TH} max, I _{SINK} = 1.2 mA CAT810R/S/T/Z				0.3	V
	CAT810)	V _{CC} > V _{TH} ma CAT810J/L/M	x, I _{SINK} = 3.2 mA			0.4	1
V _{OH}	RESET Output Voltage High (Push-pull, active HIGH, CAT810)	1.8 V < V _{CC} V I _{SOURCE} = 150	/ _{TH} min,) μA	0.8 V _{CC}			V

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

TYPICAL OPERATING CHARACTERISTICS

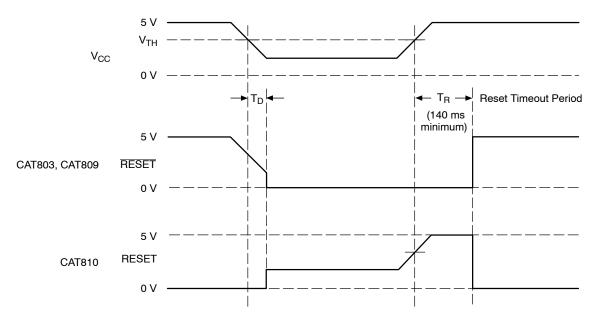
 $(V_{CC} = Full range, T_A = -40^{\circ}C \text{ to } +85^{\circ}C, \text{ unless otherwise specified. Typical values at } T_A = +25^{\circ}C \text{ and } V_{CC} = 5 \text{ V for the } L/M/J \text{ versions, } V_{CC} = 3.3 \text{ V for the T/S versions, } V_{CC} = 3 \text{ V for the R version and } V_{CC}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



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.



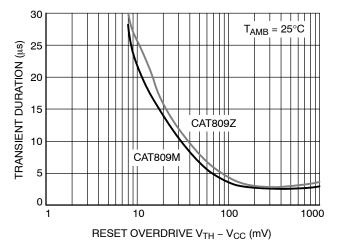


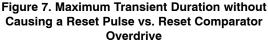
V_{CC} Transient Response

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





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 k Ω 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.

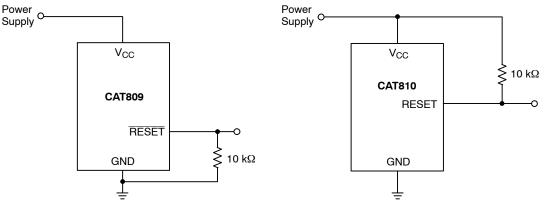


Figure 8. RESET Valid with V_{CC} Under 1.0 V

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

Bi-directional Reset Pin Interfacing

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

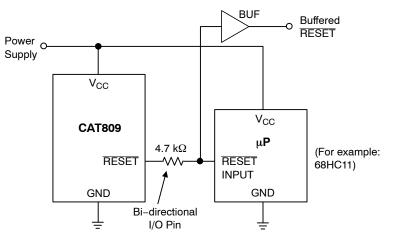


Figure 10. Bi-directional Reset Pin Interfacing

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 k Ω and 10 k Ω .

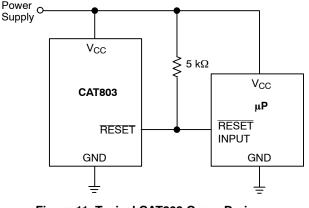


Figure 11. Typical CAT803 Open–Drain Circuit Configuration

Table 5. ORDERING PART NUMBER

Order Number		Top Mark (Note 4)					Quantity per Reel	
NiPdAu (Note 3)	Matte-Tin	Voltage	NiPdAu	Matte-Tin	Output	Reset	Package	(Note 5)
CAT803LSDI-GT3	CAT803LSDI-T3	4.63 V	VKA	VKL		1		1
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	Open Drain	LOW	SC70-3	
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				0.000
CAT803LTBI-GT3	CAT803LTBI-T3	4.63 V	VKA	VKL				3,000
CAT803MTBI-GT3	CAT803MTBI-T3	4.38 V	VKA	VKL				
CAT803JTBI-GT3	CAT803JTBI-T3	4.00 V	VKA	VKL			SOT-23-3	
CAT803TTBI-GT3	CAT803TTBI-T3	3.08 V	VKA	VKL	Open Drain	LOW		
CAT803STBI-GT3	CAT803STBI-T3	2.93 V	VKA	VKL	Diam			
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				
CAT809MSDI-GT3	CAT809MSDI-T3	4.38 V	VLA	VLD		LOW	SC70-3	
CAT809JSDI-GT3	CAT809JSDI-T3	4.00 V	VLA	VLD				
CAT809TSDI-GT3	CAT809TSDI-T3	3.08 V	VLA	VLD	CMOS /			
CAT809SSDI-GT3	CAT809SSDI-T3	2.93 V	VLA	VLD	Push-Pull			
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				
CAT809HTBI-GT3	CAT809HTBI-T3	4.55 V	VLA	VLD			OW SOT-23-3	3,000
CAT809MTBI-GT3	CAT809MTBI-T3	4.38 V	VLA	VLD				
CAT809JTBI-GT3	CAT809JTBI-T3	4.00 V	VLA	VLD	CMOS / Push-Pull			
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.

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

For detailed information and a breakdown of device nomenclature and numbering systems, please see the ON Semiconductor Device Nomenclature document, TND310/D, available at <u>www.onsemi.com</u>

Table 5. ORDERING PART NUMBER

Order N	Order Number		Top Mark (Note 4)													Quantity per Reel
NiPdAu (Note 3)	Matte-Tin	Voltage	NiPdAu	Matte-Tin	Output	Reset	Package	(Note 5)								
CAT810LSDI-GT3	CAT810LSDI-T3	4.63 V	VHA	VHT												
CAT810MSDI-GT3	CAT810MSDI-T3	4.38 V	VHA	VHT				0.000								
CAT810JSDI-GT3	CAT810JSDI-T3	4.00 V	VHA	VHT												
CAT810TSDI-GT3	CAT810TSDI-T3	3.08 V	VHA	VHT	CMOS / Push-Pull	HIGH	SC70-3									
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				3,000								
CAT810MTBI-GT3	CAT810MTBI-T3	4.38 V	VHA	VHT			HIGH SOT-23-3									
CAT810JTBI-GT3	CAT810JTBI-T3	4.00 V	VHA	VHT												
CAT810TTBI-GT3	CAT810TTBI-T3	3.08 V	VHA	VHT	CMOS / Push-Pull											
CAT810STBI-GT3	CAT810STBI-T3	2.93 V	VHA	VHT												
CAT810RTBI-GT3	CAT810RTBI-T3	2.63 V	VHA	VHT	1											
CAT810ZTBI-GT3	CAT810ZTBI-T3	2.32 V	VHA	VHT	1											

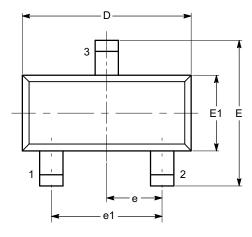
3. Not recommended for new designs.

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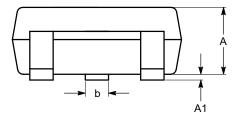
Nomenclature document, TND310/D, available at www.onsemi.com

PACKAGE DIMENSIONS

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

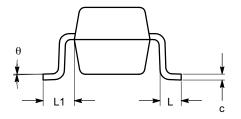


TOP VIEW



SIDE VIEW

SYMBOL	MIN	NOM	MAX			
А	0.89		1.12			
A1	0.013		0.10			
b	0.37		0.50			
С	0.085		0.18			
D	2.80		3.04			
Е	2.10		2.64			
E1	1.20		1.40			
е	0.95 BSC					
e1	1.90 BSC					
L	0.40 REF					
L1	0.54 REF					
θ	0°		8°			



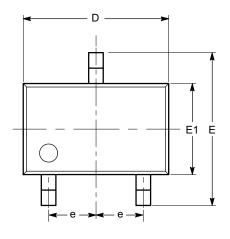
END VIEW

Notes:

- All dimensions are in millimeters. Angles in degrees.
 Complies with JEDEC TO-236.

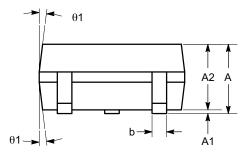
PACKAGE DIMENSIONS

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



TOP VIEW

SYMBOL	MIN	NOM	MAX			
А	0.80		1.10			
A1	0.00		0.10			
A2	0.80	0.90	1.00			
b	0.15		0.30			
с	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			
е		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

Notes:

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

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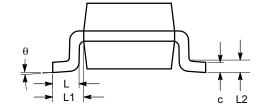
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