



# 3-Pin Microprocessor Power Supply Supervisors

## FEATURES

- Precision monitoring of +3.3 V (-5%, -10%), 5 V (-10% Power Supplies)
- Active low reset output
- Reset valid down to  $V_{CC} = 1.0$  V
- 6  $\mu$ A power supply current
- Power supply transient immunity
- Industrial temperature range: -40°C to +85°C
- RoHS-compliant SOT-23 package

## APPLICATIONS

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

## DESCRIPTION

The CAT853, CAT863, CAT859, and CAT869 are supervisory circuits that monitor power supplies in digital systems.

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. Industry standard threshold levels are offered to support +3.3 V or 5.0 V systems.

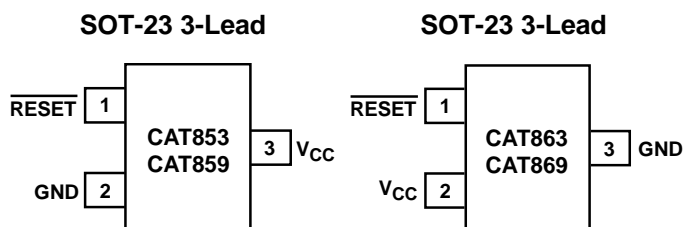
The CAT859 and CAT869 feature a  $\overline{\text{RESET}}$  push-pull output (active low) for the two pinout options.

The CAT853 and CAT863 feature an open drain  $\overline{\text{RESET}}$  output (active low). Both require a pull-up resistor on the  $\overline{\text{RESET}}$  output.

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.

For Ordering Information details, see page 9.

## PIN CONFIGURATION



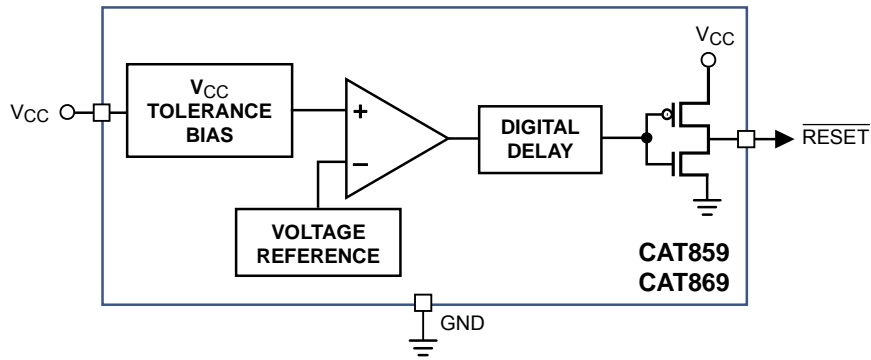
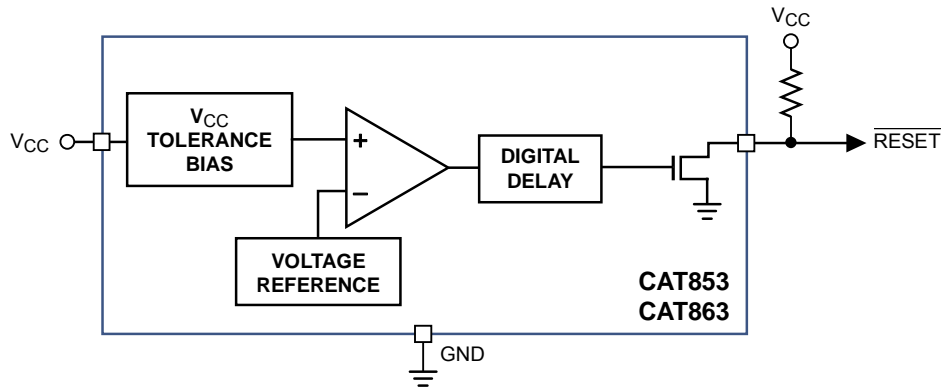
## THRESHOLD SUFFIX SELECTOR

Nominal Threshold Voltage	Threshold Suffix Designation
4.38 V	M
4.20 V	F
3.08 V	T
2.93 V	S
2.4 V	C

## PIN DESCRIPTION

Pin Name	Function
$\overline{\text{RESET}}$	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
GND	Ground
$V_{CC}$	Power supply voltage that is monitored

BLOCK DIAGRAMS



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

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

**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  $V_{CC}$  = 3.3 V for the C, S, T versions,  $V_{CC}$  = 5 V for the M version.

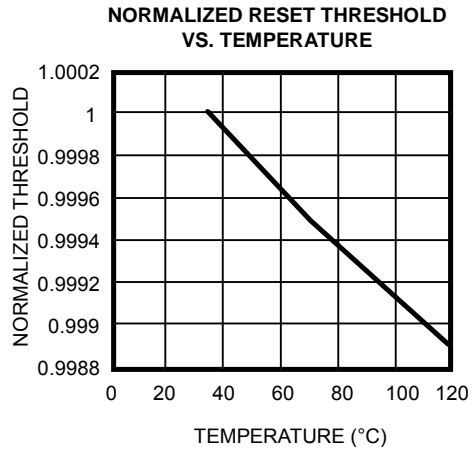
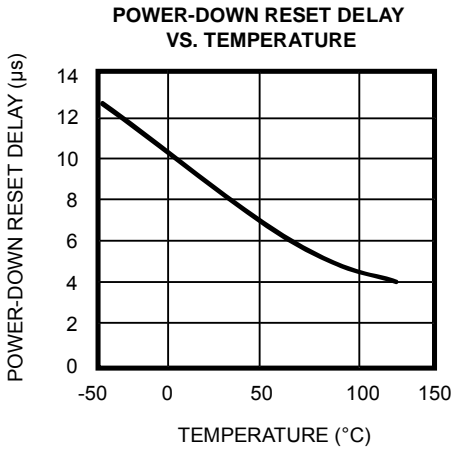
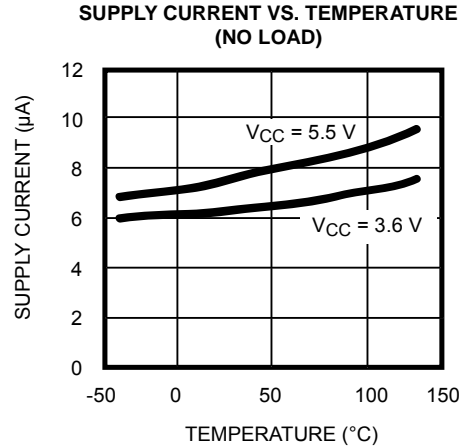
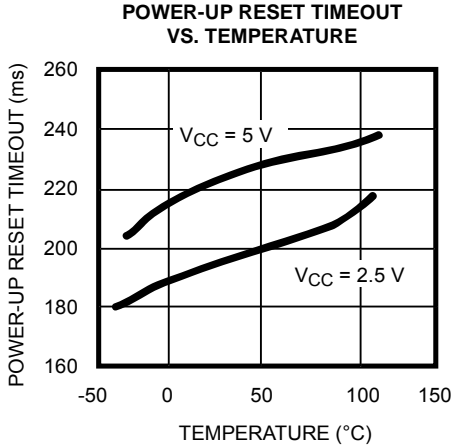
Symbol	Parameter	Conditions	Min	Typ <sup>(2)</sup>	Max	Units	
	$V_{CC}$ Range	$T_A$ = 0 $^{\circ}$ C to +70 $^{\circ}$ C	1.0		5.5	V	
		$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	1.2		5.5		
$I_{CC}$	Supply Current	$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C $V_{CC}$ < 3.6 V, C, S, T		6	15	$\mu$ A	
$V_{TH}$	Reset Threshold Voltage	M Threshold	$T_A$ = +25 $^{\circ}$ C	4.31	4.38	4.45	V
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.25		4.50	
		F Threshold	$T_A$ = +25 $^{\circ}$ C	4.14	4.20	4.26	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	4.08		4.31	
		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	
		C Threshold	$T_A$ = +25 $^{\circ}$ C	2.35	2.40	2.45	
			$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	2.30		2.50	
	Reset Threshold Tempco			30		ppm/ $^{\circ}$ C	
	$V_{CC}$ to Reset Delay	$V_{CC}$ = $V_{TH}$ to ( $V_{TH}$ - 100 mV)		20		$\mu$ s	
	Reset Active Timeout Period	$T_A$ = -40 $^{\circ}$ C to +85 $^{\circ}$ C	140	240	460	ms	
$V_{OL}$	$\overline{\text{RESET}}$ Output Voltage Low	$V_{CC}$ = $V_{TH}$ min, $I_{SINK}$ = 1.2 mA			0.4	V	
		$V_{CC}$ > 1.0 V, $I_{SINK}$ = 50 $\mu$ A			0.3		
$V_{OH}$	$\overline{\text{RESET}}$ Output Voltage High	$V_{CC}$ = $V_{TH}$ max, $I_{SOURCE}$ = -500 $\mu$ A (for CAT859/869 only)	0.8 $V_{CC}$			V	

**Notes:**

- 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.
- Production testing done at  $T_A$  = +25 $^{\circ}$ C; limits over temperature guaranteed by design only.

**TYPICAL ELECTRICAL 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  $V_{CC}$  = 3.3 V for the C, S, T versions,  $V_{CC}$  = 5 V for the M version.



## DETAILED DESCRIPTION

### RESET TIMING

The reset signal is asserted low for the CAT853, CAT863, CAT859, and CAT869 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.

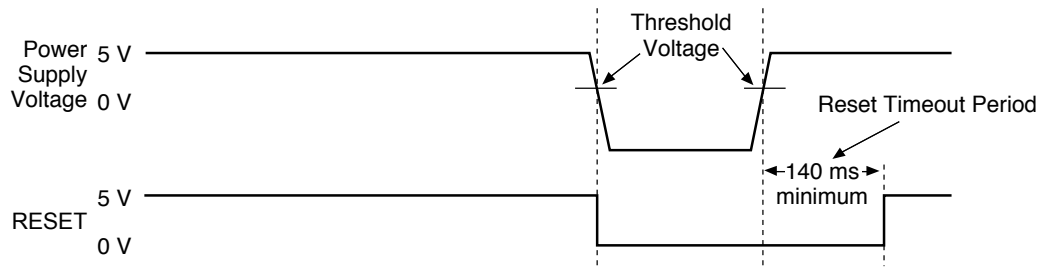


Figure 1. Reset Timing Diagram

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

The CAT853, CAT863, CAT859, and CAT869 protect  $\mu$ Ps against brownout failure. Short duration transients of 4  $\mu$ s or less and 100 mV 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 0.5 V above the threshold and drops below it by the amplitude of the overdrive voltage ( $V_{TH} - V_{CC}$ ).

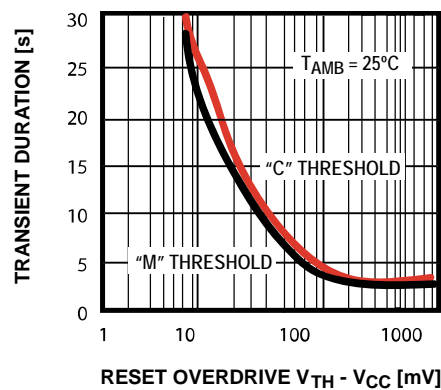
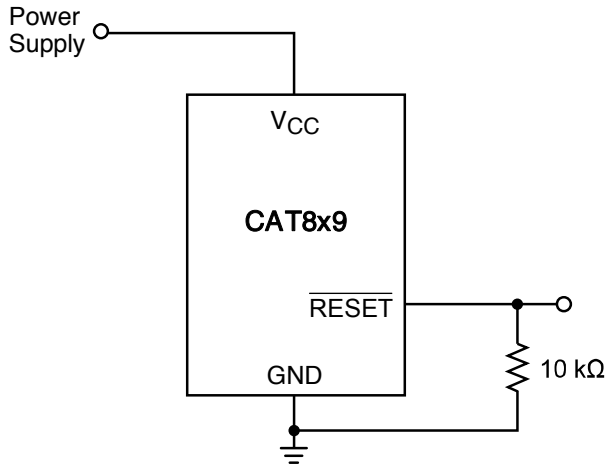


Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

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

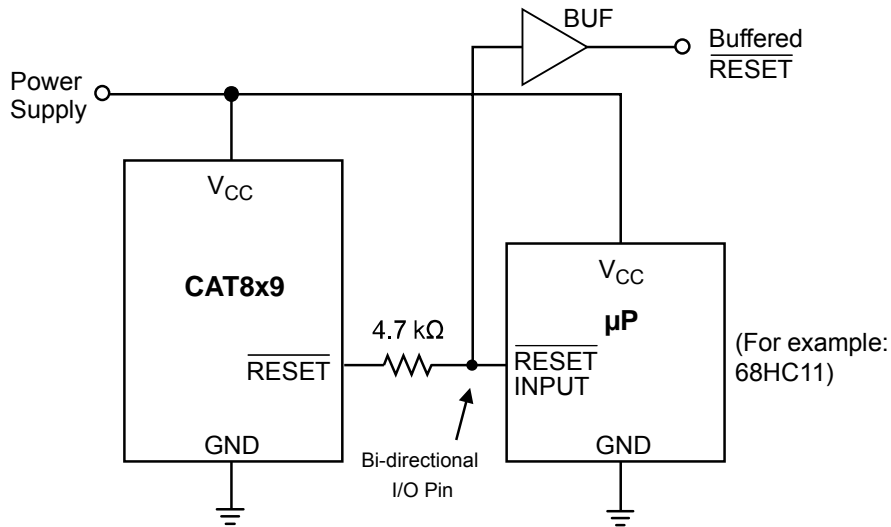
To ensure that the CAT859 and CAT869  $\overline{\text{RESET}}$  pin is in a known state when  $V_{CC}$  is under 1.0 V, a  $> 10 \text{ k}\Omega$  pull-down resistor between  $\overline{\text{RESET}}$  pin and GND is recommended.



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

**BI-DIRECTIONAL RESET PIN INTERFACING**

The CAT859 and CAT869 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 CAT859 and CAT869 reset output and the  $\mu\text{P}/\mu\text{C}$  bi-directional reset pin.



**Figure 4. Bi-directional Reset Pin Interfacing**

### CAT853 AND CAT863 OPEN-DRAIN RESET APPLICATION

The CAT853 and CAT863 features an open-drain RESET output and therefore need a pull-up resistor on the output for proper operation, as shown on Figure 5. 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 CAT8x3  $V_{CC}$  pin. The value of the pull-up resistor is not critical in most applications, typical values being between 5 k $\Omega$  and 10 k $\Omega$ .

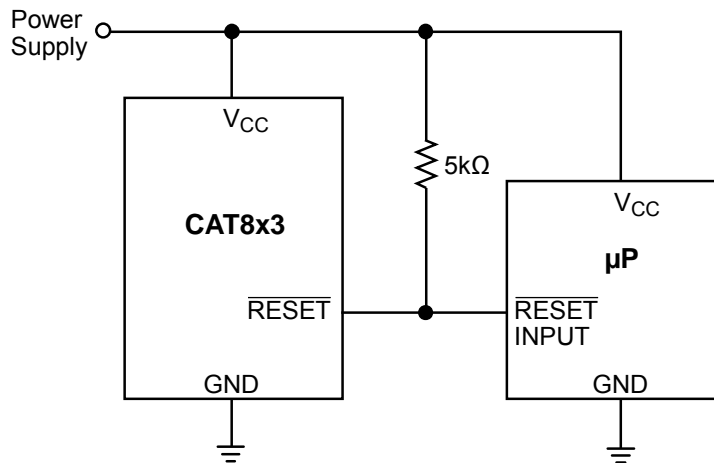
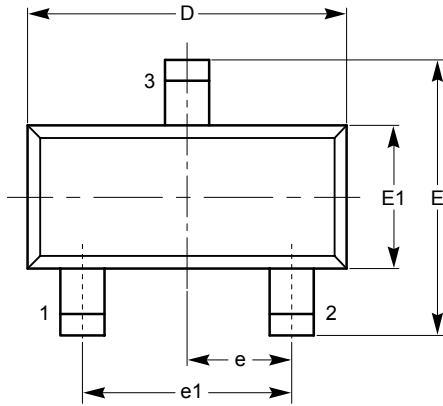


Figure 5. Typical CAT8x3 Open-Drain Circuit Configuration

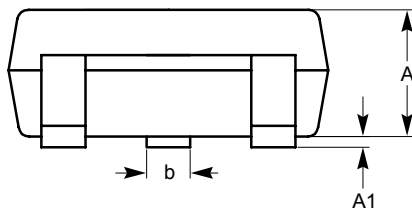
PACKAGE OUTLINE DRAWING

SOT-23 3-LEAD (TB) <sup>(1)(2)</sup>

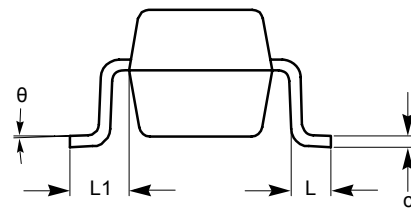


TOP VIEW

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		
$\theta$	0°		8°



SIDE VIEW



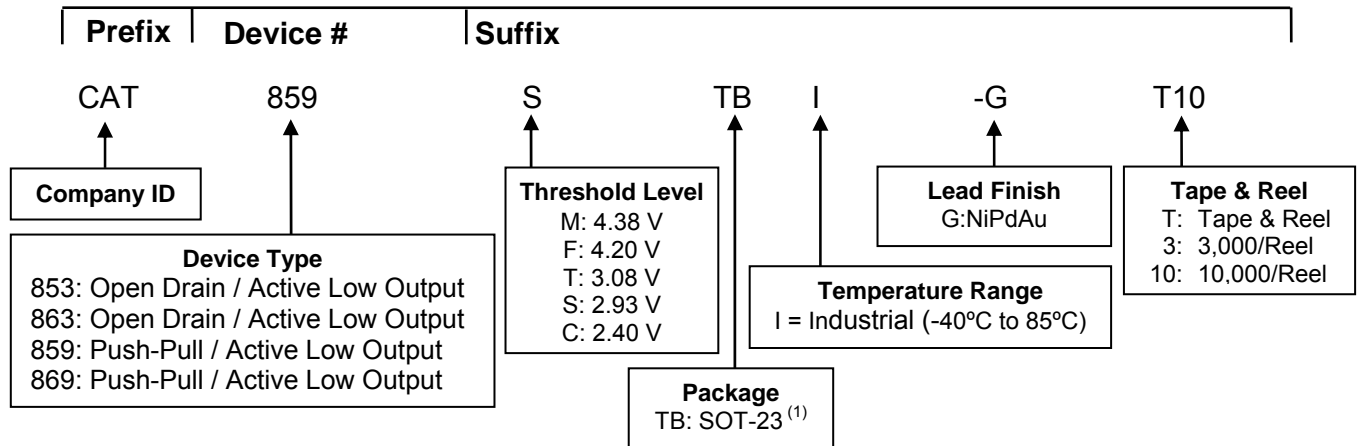
END VIEW

Notes:

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



**EXAMPLE OF ORDERING INFORMATION** <sup>(1)</sup> <sup>(2)</sup> <sup>(3)</sup>



**TOP MARKING**

Part and Threshold	SOT-23 RoHS NiPdAu Finish <sup>(4)</sup> <sup>(5)</sup>
CAT859C	RSYM
CAT859T	
CAT859S	
CAT859F	
CAT859M	
CAT869T	RTYM
CAT869S	
CAT869M	

Part and Threshold	SOT-23 RoHS NiPdAu Finish <sup>(4)</sup> <sup>(5)</sup>
CAT853C	RUYM
CAT853T	
CAT853S	
CAT853F	
CAT853M	
CAT863T	RVYM
CAT863S	
CAT863M	

**ORDERING PART NUMBER** <sup>(6)</sup>

CAT859CTBI-G
CAT859TTBI-G
CAT859STBI-G
CAT859FTBI-G
CAT859MTBI-G

CAT869TTBI-G
CAT869STBI-G
CAT869MTBI-G

CAT853CTBI-G
CAT853TTBI-G
CAT853STBI-G
CAT853FTBI-G
CAT853MTBI-G


CAT863TTBI-G
CAT863STBI-G
CAT863MTBI-G

**Notes:**

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The device used in the example above is a CAT859STBI-GT10 (Push-Pull / Active Low Output, trip level of 2.85 V to 3.00 V NiPdAu, Tape and Reel).
- (3) For additional package and temperature options, please contact your nearest ON Semiconductor Sales office.
- (4) The "YM" in the SOT-23 package marking indicates the Year and Month of production.
- (5) All NiPdAu devices will be marked to indicate product type. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.
- (6) For special threshold and package options, contact factory.

**REVISION HISTORY**

Date	Rev.	Description
11-Oct-06	A	Initial Issue CAT859, CAT869
04-May-07	B	Added CAT853, CAT863 Update Example of Ordering Information Update Top Marking Update Ordering Part Number
17-Jan-07	C	Add Threshold Level - C: 2.40 V Update Package Outline Drawing Add MD- to document number
30-Jan-08	D	Added Block Diagrams
05-Nov-08	E	Change logo and fine print to ON Semiconductor
04-Mar-09	F	Convert to MS Word format
08-Apr-09	G	Add Nominal Threshold Voltage 4.20 "F"

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