



3-Pin Microprocessor Power Supply Supervisors

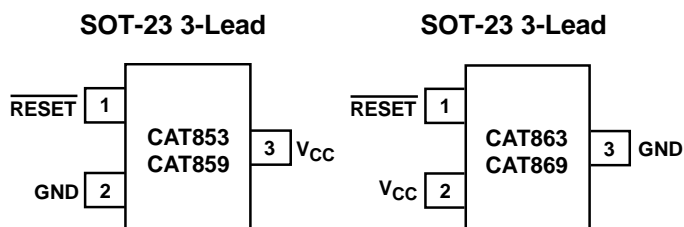
FEATURES

- 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 μ 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

PIN CONFIGURATION



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.

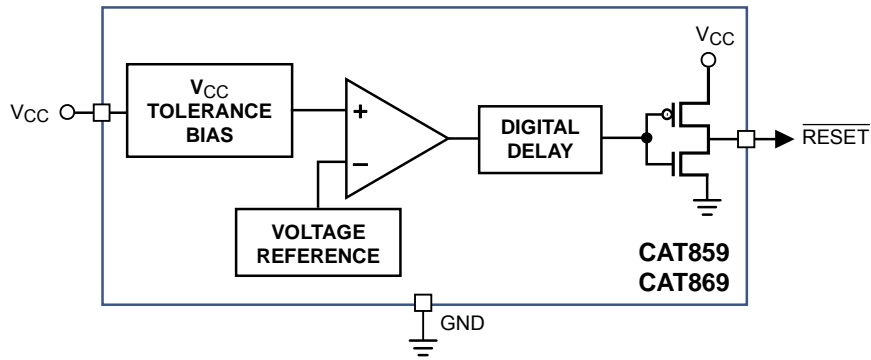
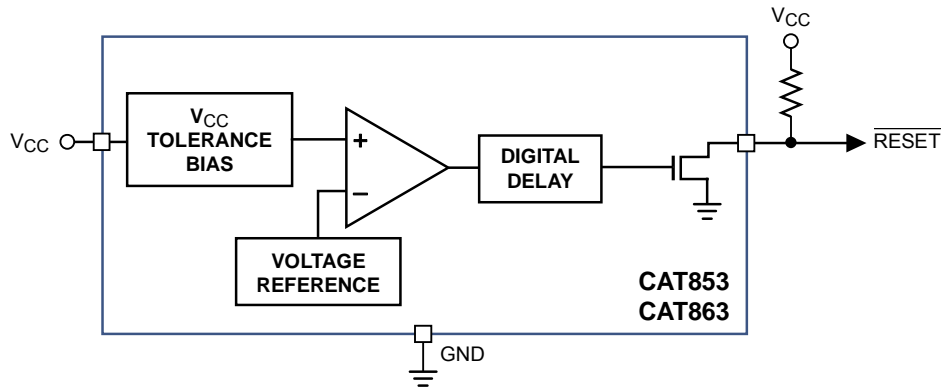
THRESHOLD SUFFIX SELECTOR

| 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⁽¹⁾

| 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/ μ 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.

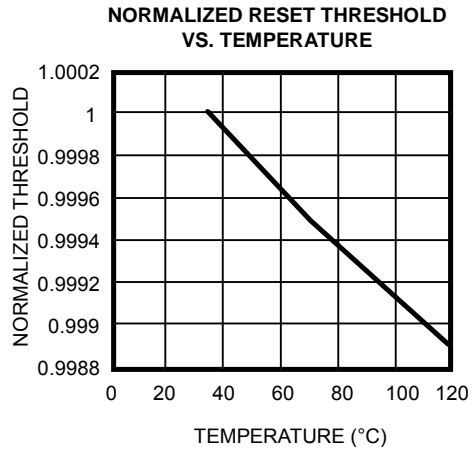
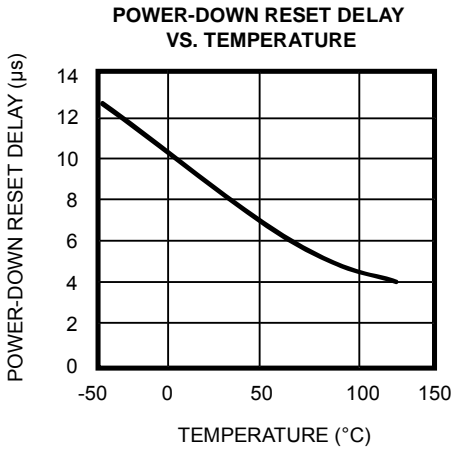
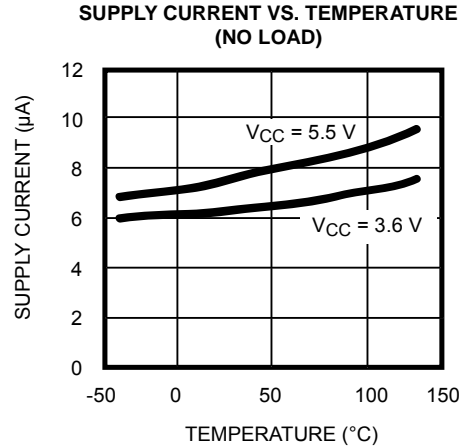
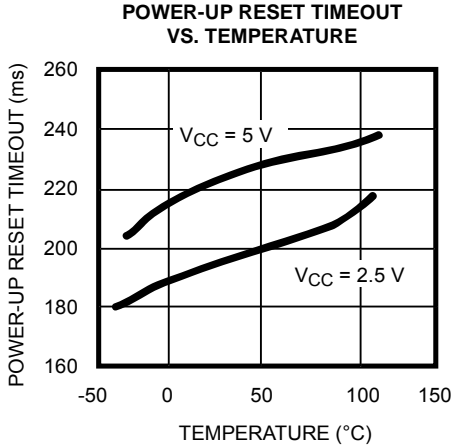
| Symbol | Parameter | Conditions | Min | Typ ⁽²⁾ | Max | Units | |
|----------|---|---|--|--------------------|------|-------------------|---|
| | V_{CC} Range | T_A = 0 $^{\circ}$ C to +70 $^{\circ}$ C | 1.0 | | 5.5 | V | |
| | | T_A = -40 $^{\circ}$ C to +85 $^{\circ}$ C | 1.2 | | 5.5 | | |
| I_{CC} | Supply Current | T_A = -40 $^{\circ}$ C to +85 $^{\circ}$ C V_{CC} < 3.6 V, C, S, T | | 6 | 15 | μ 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 | | μ 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, $I_{SINK} = 50$ μ A | | | 0.3 | | |
| V_{OH} | $\overline{\text{RESET}}$ Output Voltage High | $V_{CC} = V_{TH}$ max, $I_{SOURCE} = -500$ μ 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°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.

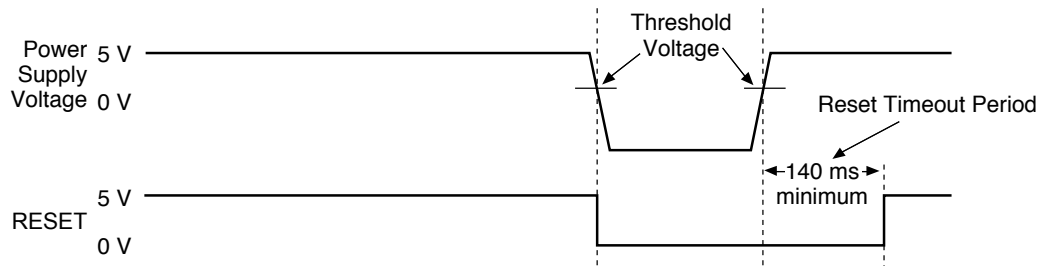


Figure 1. Reset Timing Diagram

V_{CC} TRANSIENT RESPONSE

The CAT853, CAT863, CAT859, and CAT869 protect μ Ps against brownout failure. Short duration transients of 4 μ 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_{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 ($V_{TH} - V_{CC}$).

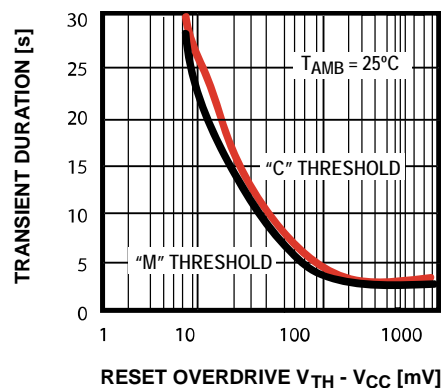


Figure 2. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

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.

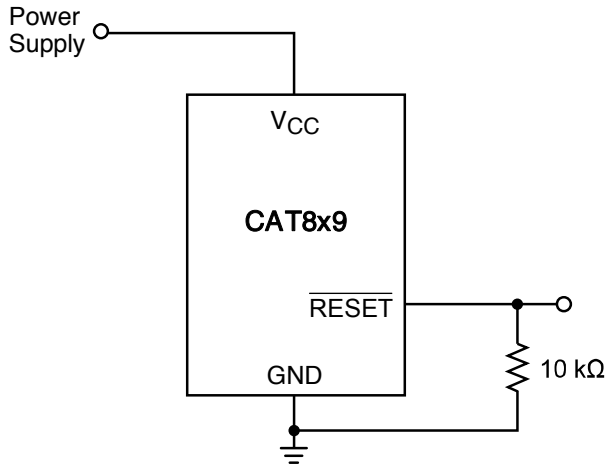


Figure 3. $\overline{\text{RESET}}$ Valid with V_{CC} Under 1.0 V

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.

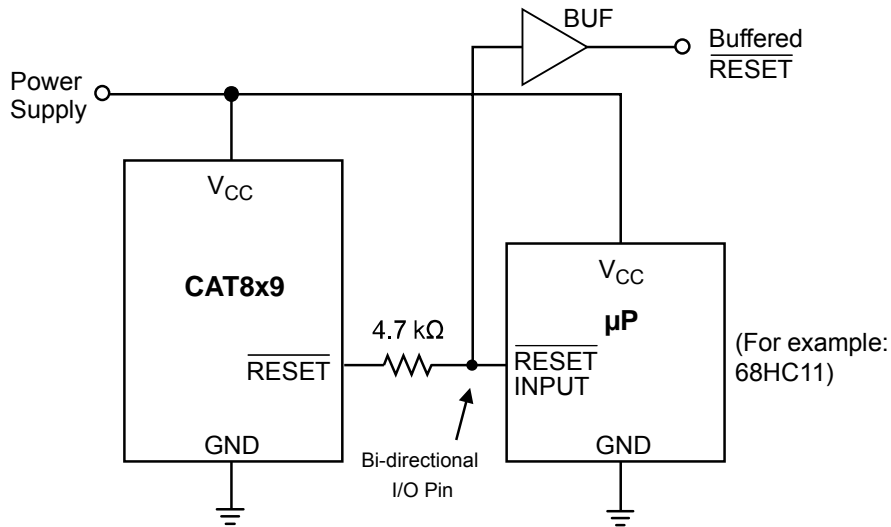


Figure 4. Bi-directional Reset Pin Interfacing

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 Ω and 10 k Ω .

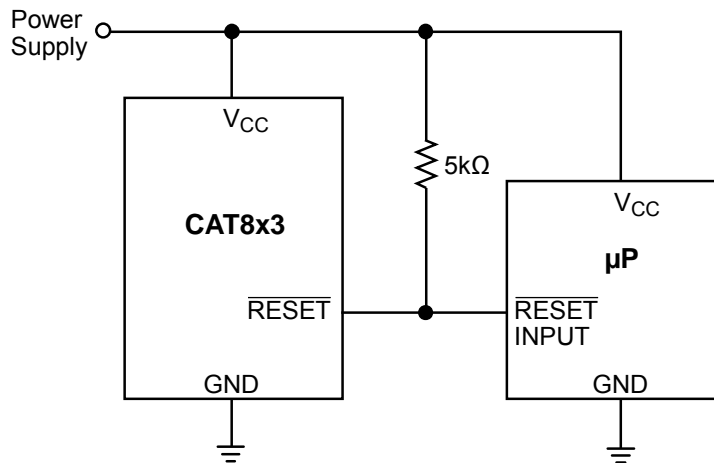
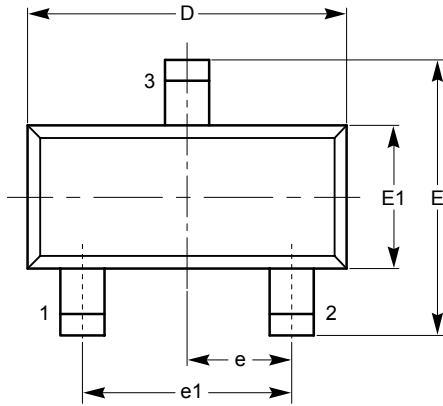


Figure 5. Typical CAT8x3 Open-Drain Circuit Configuration

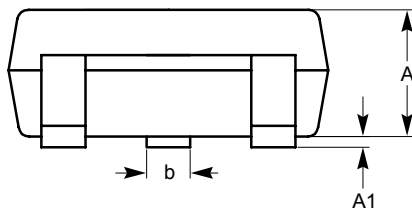
PACKAGE OUTLINE DRAWING

SOT-23 3-LEAD (TB) ⁽¹⁾⁽²⁾

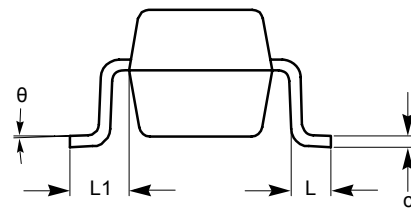


TOP VIEW

| 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

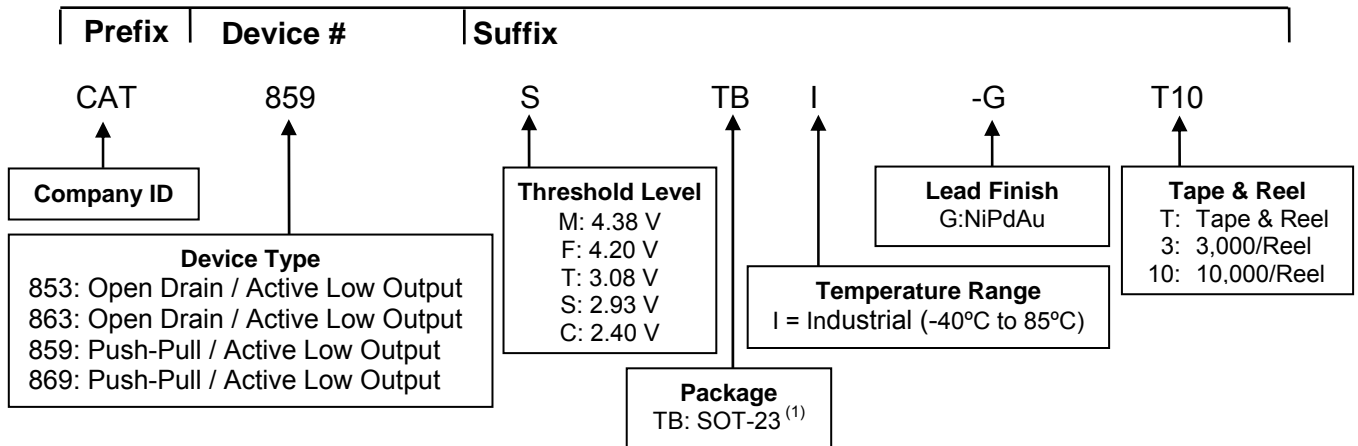


END VIEW

Notes:

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

EXAMPLE OF ORDERING INFORMATION ⁽¹⁾ ⁽²⁾ ⁽³⁾



TOP MARKING

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

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

ORDERING PART NUMBER ⁽⁶⁾

| |
|--------------|
| 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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