

CAT853, CAT859, CAT863, CAT869

3-Pin Microprocessor Power Supply Supervisors

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 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.

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 μA Power Supply Current
- Power Supply Transient Immunity
- Industrial Temperature Range: –40°C to +85°C
- SOT–23 Package
- These Devices are Pb–Free and are RoHS Compliant

Applications

- Computers, Servers, Laptops and Cable Modems
- Wireless Communications
- Embedded Control Systems
- White Goods
- Power Meters
- Intelligent Instruments
- PDAs and Handheld Equipment

Table 1. THRESHOLD SUFFIX SELECTOR

| Nominal Threshold Voltage | Threshold Suffix Designation |
|---------------------------|------------------------------|
| 4.63 V | L |
| 4.38 V | M |
| 4.20 V | F |
| 4.00 V | J |
| 3.08 V | T |
| 2.93 V | S |
| 2.63 V | R |
| 2.40 V | C |
| 2.32 V | Z |



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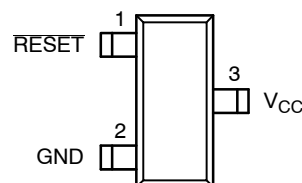
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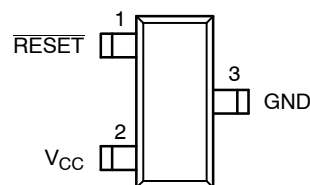
SOT–23
TB SUFFIX
CASE 527AG

PIN CONFIGURATION

CAT853, CAT859

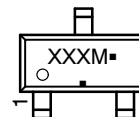


CAT863, CAT869



(Top Views)

MARKING DIAGRAM



XXX = Specific Device Code
M = Date Code
▪ = Pb–Free Package

(*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.

CAT853, CAT859, CAT863, CAT869

Table 2. 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 |

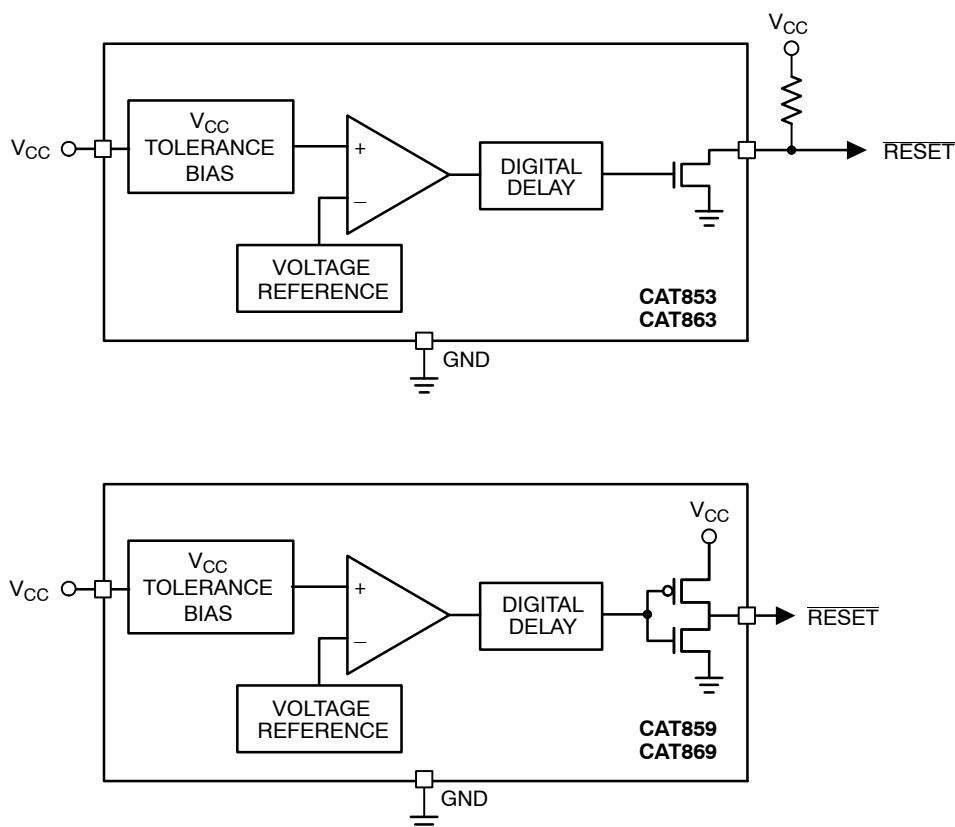


Figure 1. Block Diagrams

Table 3. ABSOLUTE MAXIMUM RATINGS

| 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 4 mW/ $^{\circ}$ 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 |

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.

CAT853, CAT859, CAT863, CAT869

Table 4. ELECTRICAL 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.)

| Symbol | Parameter | Conditions | | Min | Typ (Note 1) | Max | Units |
|----------|-----------------------------|--|--|--------------|-----------------|------|-------------------------|
| | V_{CC} Range | $T_A = 0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ | | 1.0 | | 5.5 | V |
| | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | | 1.2 | | 5.5 | |
| I_{CC} | Supply Current | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | $V_{CC} < 3.6\text{ V}$, C, S, T | | 6 | 15 | μA |
| V_{TH} | Reset Threshold Voltage | L Threshold | $T_A = +25^{\circ}\text{C}$ | 4.56 | 4.63 | 4.70 | V |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 4.50 | | 4.75 | |
| | | M Threshold | $T_A = +25^{\circ}\text{C}$ | 4.31 | 4.38 | 4.45 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 4.25 | | 4.50 | |
| | | F Threshold | $T_A = +25^{\circ}\text{C}$ | 4.14 | 4.20 | 4.26 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 4.08 | | 4.31 | |
| | | J Threshold | $T_A = +25^{\circ}\text{C}$ | 3.93 | 4.00 | 4.06 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 3.89 | | 4.10 | |
| | | T Threshold | $T_A = +25^{\circ}\text{C}$ | 3.04 | 3.08 | 3.11 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 3.00 | | 3.15 | |
| | | S Threshold | $T_A = +25^{\circ}\text{C}$ | 2.89 | 2.93 | 2.96 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 2.85 | | 3.00 | |
| | | R Threshold | $T_A = +25^{\circ}\text{C}$ | 2.59 | 2.63 | 2.66 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 2.55 | | 2.70 | |
| | | C Threshold | $T_A = +25^{\circ}\text{C}$ | 2.35 | 2.40 | 2.45 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 2.30 | | 2.50 | |
| | | Z Threshold | $T_A = +25^{\circ}\text{C}$ | 2.28 | 2.32 | 2.35 | |
| | | | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | 2.25 | | 2.38 | |
| | Reset Threshold Tempco | | | | 30 | | ppm/ $^{\circ}\text{C}$ |
| | V_{CC} to Reset Delay | $V_{CC} = V_{TH}$ to $(V_{TH} - 100\text{ mV})$ | | | 20 | | μs |
| | Reset Active Timeout Period | $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ | | 140 | 240 | 460 | ms |
| V_{OL} | RESET Output Voltage Low | $V_{CC} = V_{TH}\text{ min}$, $I_{SINK} = 1.2\text{ mA}$ | | | | 0.4 | V |
| | | $V_{CC} > 1.0\text{ V}$, $I_{SINK} = 50\text{ }\mu\text{A}$ | | | | 0.3 | |
| V_{OH} | RESET Output Voltage High | $V_{CC} = V_{TH}\text{ max}$, $I_{SOURCE} = -500\text{ }\mu\text{A}$ (for CAT859/869 only) | | $0.8 V_{CC}$ | | | V |

1. Production testing done at $T_A = +25^{\circ}\text{C}$; 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.)

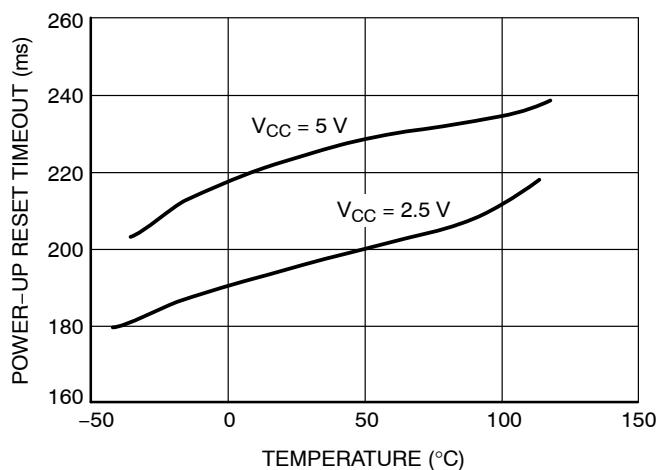


Figure 2. Power-Up Reset Timeout vs. Temperature

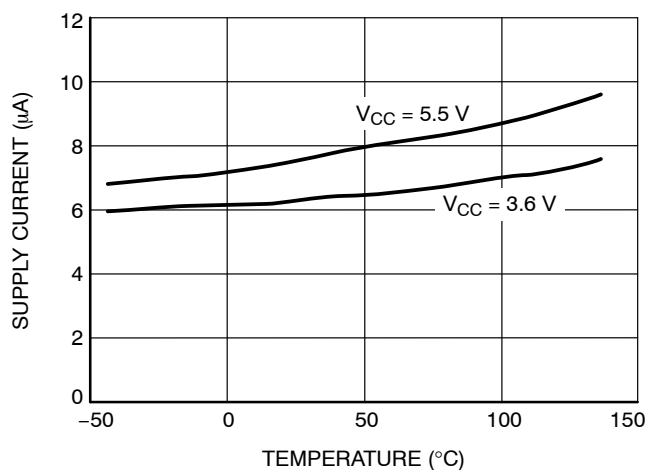


Figure 3. Supply Current vs. Temperature (No Load)

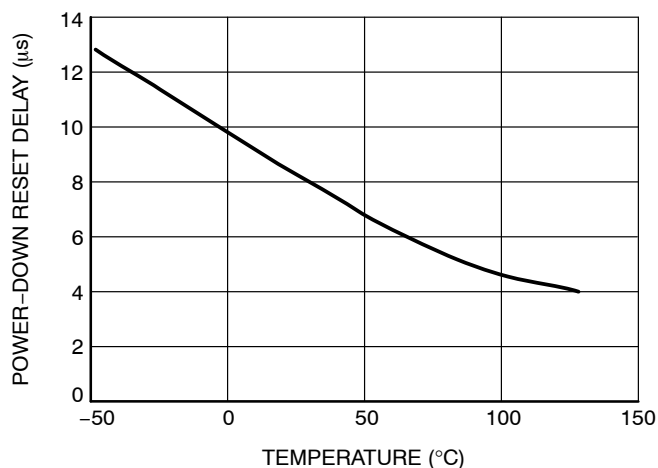


Figure 4. Power-Down Reset Delay vs. Temperature

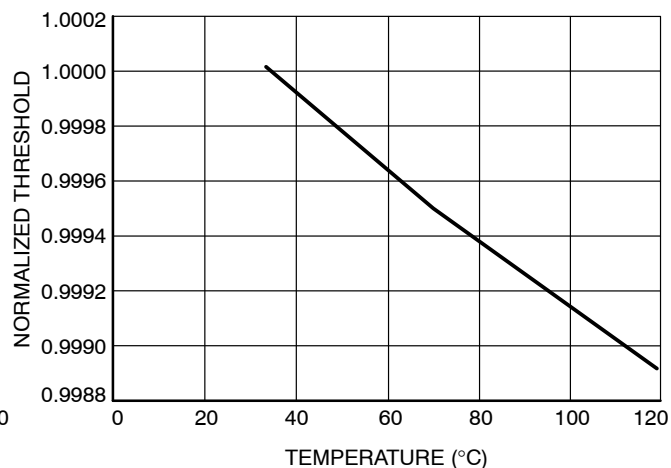


Figure 5. Normalized Reset Threshold vs. Temperature

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.

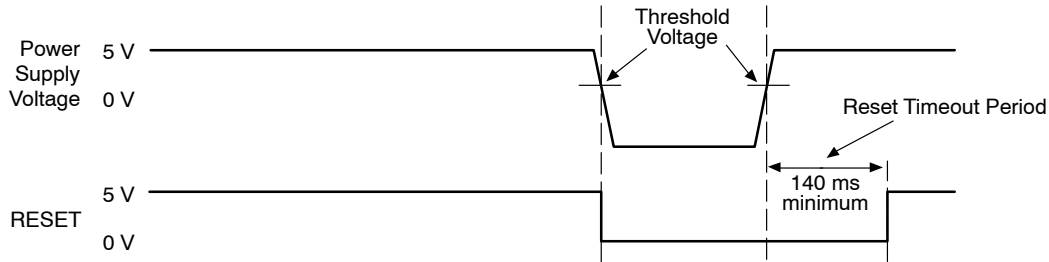


Figure 6. Reset Timing Diagram

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 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}).

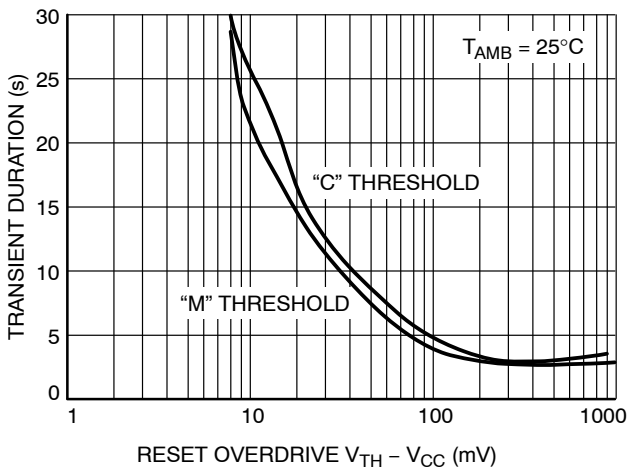


Figure 7. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive

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 k Ω pull-down resistor between $\overline{\text{RESET}}$ pin and GND is recommended.

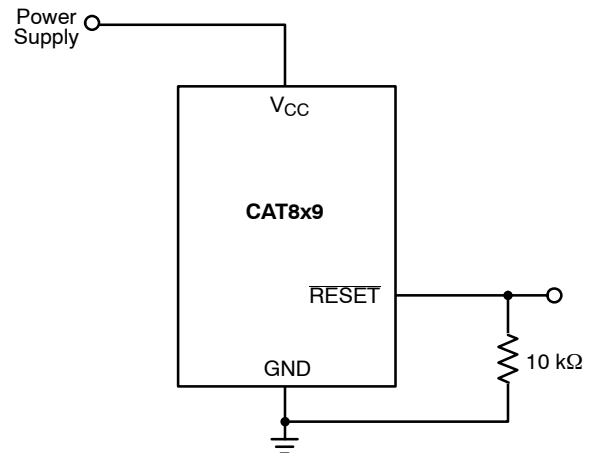


Figure 8. $\overline{\text{RESET}}$ Valid with V_{CC} Under 1.0 V

CAT853, CAT859, CAT863, CAT869

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.

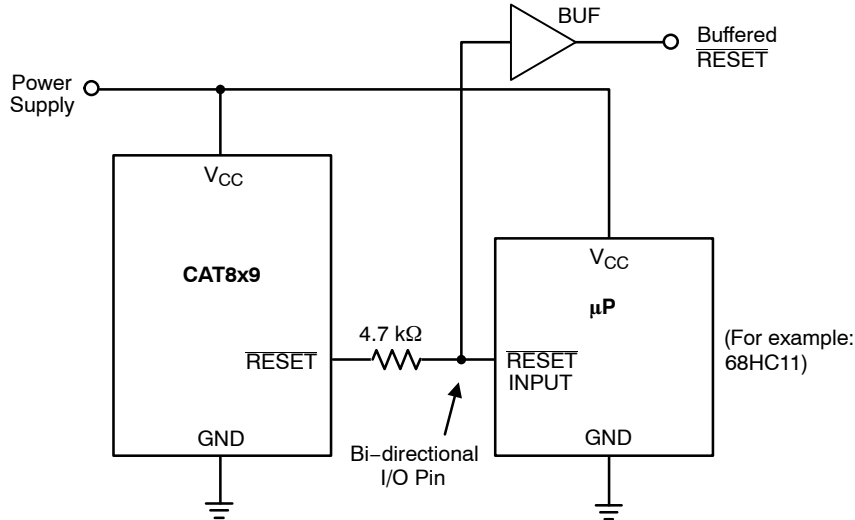


Figure 9. Bi-directional Reset Pin Interfacing

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 10. 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 VCC pin. The value of the pull-up resistor is not critical in most applications, typical values being between $5\text{ k}\Omega$ and $10\text{ k}\Omega$.

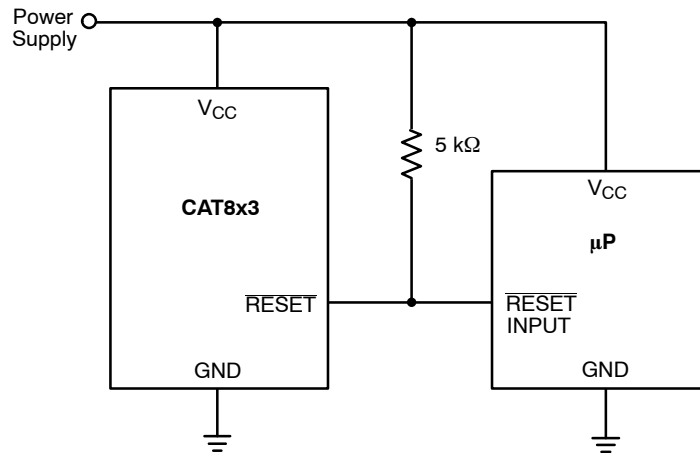
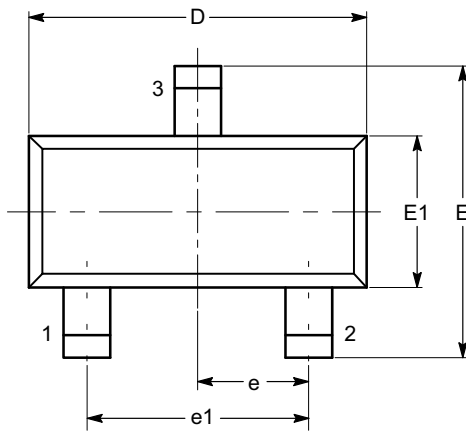


Figure 10. Typical CAT8x3 Open-Drain Circuit Configuration

CAT853, CAT859, CAT863, CAT869

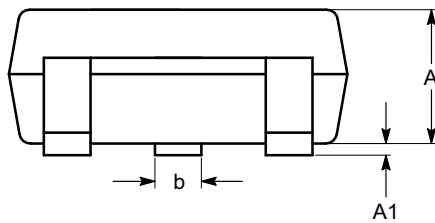
PACKAGE DIMENSIONS

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

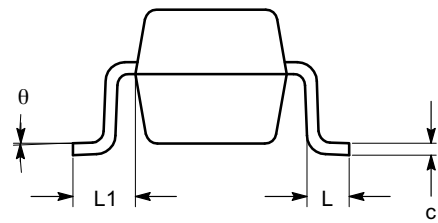


TOP VIEW

| 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 | 0.40 REF | | |
| L1 | 0.54 REF | | |
| θ | 0° | | 8° |



SIDE VIEW



END VIEW

Notes:

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


CAT853, CAT859, CAT863, CAT869

ORDERING INFORMATION

| Order Number | | Voltage | Top Mark (Note 2) | | Reset | Package | Quantity per Reel (Note 3) |
|----------------|---------------|---------|-------------------|-----------|-------|----------|----------------------------|
| NiPdAu | Matte-Tin | | NiPdAu | Matte-Tin | | | |
| CAT853LTBI-GT3 | CAT853LTBI-T3 | 4.63 V | VPA | VPR | LOW | SOT-23-3 | 3,000 |
| CAT853MTBI-GT3 | CAT853MTBI-T3 | 4.38 V | VPA | VPR | | | |
| CAT853FTBI-GT3 | CAT853FTBI-T3 | 4.20 V | VPA | VPR | | | |
| CAT853JTBI-GT3 | CAT853JTBI-T3 | 4.00 V | VPA | VPR | | | |
| CAT853TTBI-GT3 | CAT853TTBI-T3 | 3.08 V | VPA | VPR | | | |
| CAT853STBI-GT3 | CAT853STBI-T3 | 2.93 V | VPA | VPR | | | |
| CAT853RTBI-GT3 | CAT853RTBI-T3 | 2.63 V | VPA | VPR | | | |
| CAT853CTBI-GT3 | CAT853CTBI-T3 | 2.40 V | VPA | VPR | | | |
| CAT853ZTBI-GT3 | CAT853ZTBI-T3 | 2.32 V | VPA | VPR | | | |
| CAT859LTBI-GT3 | CAT859LTBI-T3 | 4.63 V | VNA | VNR | LOW | SOT-23-3 | 3,000 |
| CAT859MTBI-GT3 | CAT859MTBI-T3 | 4.38 V | VNA | VNR | | | |
| CAT859FTBI-GT3 | CAT859FTBI-T3 | 4.20 V | VNA | VNR | | | |
| CAT859JTBI-GT3 | CAT859JTBI-T3 | 4.00 V | VNA | VNR | | | |
| CAT859TTBI-GT3 | CAT859TTBI-T3 | 3.08 V | VNA | VNR | | | |
| CAT859STBI-GT3 | CAT859STBI-T3 | 2.93 V | VNA | VNR | | | |
| CAT859RTBI-GT3 | CAT859RTBI-T3 | 2.63 V | VNA | VNR | | | |
| CAT859CTBI-GT3 | CAT859CTBI-T3 | 2.40 V | VNA | VNR | | | |
| CAT859ZTBI-GT3 | CAT859ZTBI-T3 | 2.32 V | VNA | VNR | | | |
| CAT863LTBI-GT3 | CAT863LTBI-T3 | 4.63 V | VNB | VNK | LOW | SOT-23-3 | 3,000 |
| CAT863MTBI-GT3 | CAT863MTBI-T3 | 4.38 V | VNB | VNK | | | |
| CAT863FTBI-GT3 | CAT863FTBI-T3 | 4.20 V | VNB | VNK | | | |
| CAT863JTBI-GT3 | CAT863JTBI-T3 | 4.00 V | VNB | VNK | | | |
| CAT863TTBI-GT3 | CAT863TTBI-T3 | 3.08 V | VNB | VNK | | | |
| CAT863STBI-GT3 | CAT863STBI-T3 | 2.93 V | VNB | VNK | | | |
| CAT863RTBI-GT3 | CAT863RTBI-T3 | 2.63 V | VNB | VNK | | | |
| CAT863CTBI-GT3 | CAT863CTBI-T3 | 2.40 V | VNB | VNK | | | |
| CAT863ZTBI-GT3 | CAT863ZTBI-T3 | 2.32 V | VNB | VNK | | | |
| CAT869LTBI-GT3 | CAT869LTBI-T3 | 4.63 V | VNC | VNJ | LOW | SOT-23-3 | 3,000 |
| CAT869MTBI-GT3 | CAT869MTBI-T3 | 4.38 V | VNC | VNJ | | | |
| CAT869FTBI-GT3 | CAT869FTBI-T3 | 4.20 V | VNC | VNJ | | | |
| CAT869JTBI-GT3 | CAT869JTBI-T3 | 4.00 V | VNC | VNJ | | | |
| CAT869TTBI-GT3 | CAT869TTBI-T3 | 3.08 V | VNC | VNJ | | | |
| CAT869STBI-GT3 | CAT869STBI-T3 | 2.93 V | VNC | VNJ | | | |
| CAT869RTBI-GT3 | CAT869RTBI-T3 | 2.63 V | VNC | VNJ | | | |
| CAT869CTBI-GT3 | CAT869CTBI-T3 | 2.40 V | VNC | VNJ | | | |
| CAT869ZTBI-GT3 | CAT869ZTBI-T3 | 2.32 V | VNC | VNJ | | | |

- 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 www.onsemi.com

CAT853, CAT859, CAT863, CAT869

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