# 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**

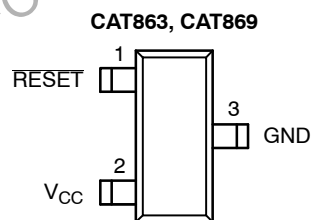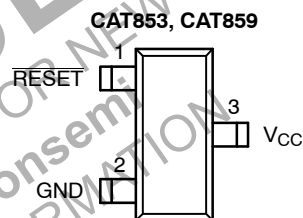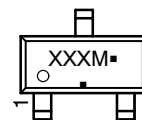| Nominal Threshold Voltage | Threshold Suffix Designation |
|---|---|
| 4.63 V | L |
| 4.38 V | M |
| 4.20 V | F |
| 4.00 V | J |
| 3.08 V | T |
| 2.93 V | S |
| 2.63 V | R |
| 2.40 V | C |
| 2.32 V | Z |

## ON Semiconductor®

**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 7 of this data sheet.

**Table 2. PIN DESCRIPTION**

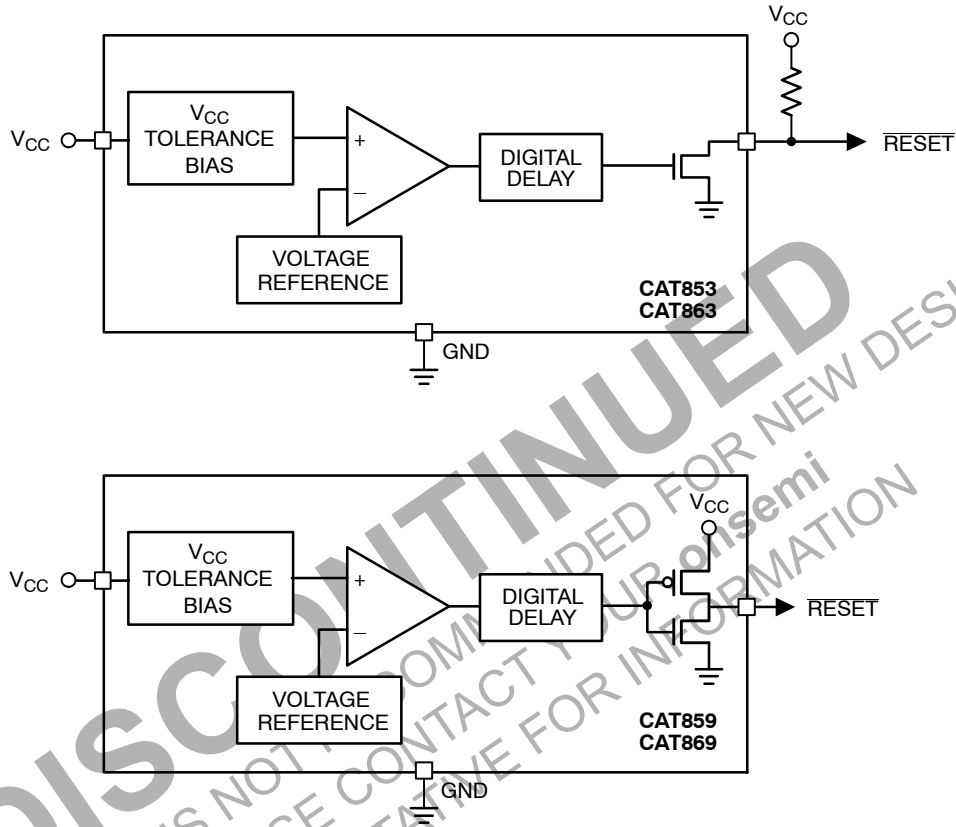| Pin Name | Function |
|---|---|
| $\overline{\text{RESET}}$ | Active low reset. $\overline{\text{RESET}}$ is asserted if $V_{CC}$ falls below the reset threshold and remains low for at least 140 ms after $V_{CC}$ rises above the reset threshold |
| GND | Ground |
| $V_{CC}$ | Power supply voltage that 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/µs |
| Continuous Power Dissipation<br>　　Derate 4 mW/°C above 70°C (SOT23) | 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.

**Table 4. ELECTRICAL CHARACTERISTICS** ($V_{CC}$ = Full range, $T_A$ = −40°C to +85°C unless otherwise noted.
Typical values at $T_A$ = +25°C and $V_{CC}$ = 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°C to +70°C | | 1.0 | | 5.5 | V |
| | | $T_A$ = −40°C to +85°C | | 1.2 | | 5.5 | |
| $I_{CC}$ | Supply Current | $T_A$ = −40°C to +85°C | $V_{CC}$ < 3.6 V, C, S, T | | 6 | 15 | μA |
| $V_{TH}$ | Reset Threshold Voltage | L Threshold | $T_A$ = +25°C | 4.56 | 4.63 | 4.70 | V |
| | | | $T_A$ = −40°C to +85°C | 4.50 | | 4.75 | |
| | | M Threshold | $T_A$ = +25°C | 4.31 | 4.38 | 4.45 | |
| | | | $T_A$ = −40°C to +85°C | 4.25 | | 4.50 | |
| | | F Threshold | $T_A$ = +25°C | 4.14 | 4.20 | 4.26 | |
| | | | $T_A$ = −40°C to +85°C | 4.08 | | 4.31 | |
| | | J Threshold | $T_A$ = +25°C | 3.93 | 4.00 | 4.06 | |
| | | | $T_A$ = −40°C to +85°C | 3.89 | | 4.10 | |
| | | T Threshold | $T_A$ = +25°C | 3.04 | 3.08 | 3.11 | |
| | | | $T_A$ = −40°C to +85°C | 3.00 | | 3.15 | |
| | | S Threshold | $T_A$ = +25°C | 2.89 | 2.93 | 2.96 | |
| | | | $T_A$ = −40°C to +85°C | 2.85 | | 3.00 | |
| | | R Threshold | $T_A$ = +25°C | 2.59 | 2.63 | 2.66 | |
| | | | $T_A$ = −40°C to +85°C | 2.55 | | 2.70 | |
| | | C Threshold | $T_A$ = +25°C | 2.35 | 2.40 | 2.45 | |
| | | | $T_A$ = −40°C to +85°C | 2.30 | | 2.50 | |
| | | Z Threshold | $T_A$ = +25°C | 2.28 | 2.32 | 2.35 | |
| | | | $T_A$ = −40°C to +85°C | 2.25 | | 2.38 | |
| | Reset Threshold Tempco | | | | 30 | | ppm/°C |
| | $V_{CC}$ to Reset Delay | $V_{CC}$ = $V_{TH}$ to ($V_{TH}$ − 100 mV) | | | 20 | | μs |
| | Reset Active Timeout Period | $T_A$ = −40°C to +85°C | | 140 | 240 | 460 | ms |
| $V_{OL}$ | 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 μA | | | | 0.3 | |
| $V_{OH}$ | RESET Output Voltage High | $V_{CC}$ = $V_{TH}$ max, $I_{SOURCE}$ = −500 μA (for CAT859/869 only) | | 0.8 $V_{CC}$ | | | V |

1. Production testing done at $T_A$ = +25°C; limits over temperature guaranteed by design only.

## TYPICAL ELECTRICAL OPERATING CHARACTERISTICS

($V_{CC}$ = Full range, $T_A$ = −40°C to +85°C unless otherwise noted. Typical values at $T_A$ = +25°C and $V_{CC}$ = 3.3 V
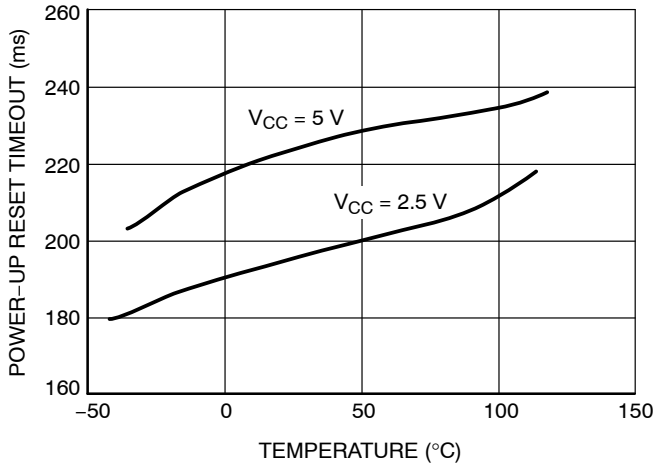for the C, S, T versions, $V_{CC}$ = 5 V for the M version.)
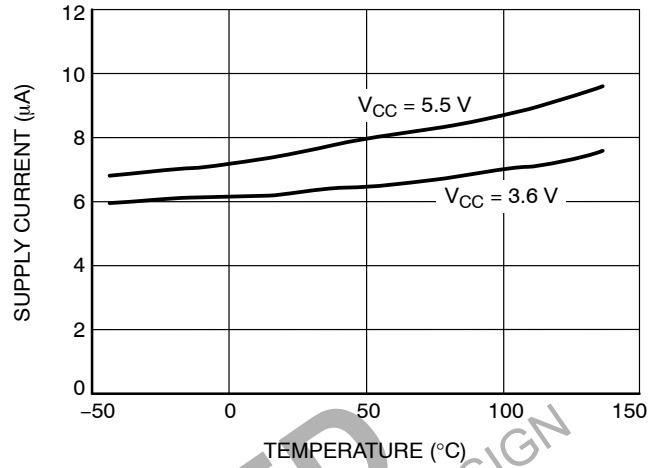
**Figure 2. Power−Up Reset Timeout vs. Temperature**
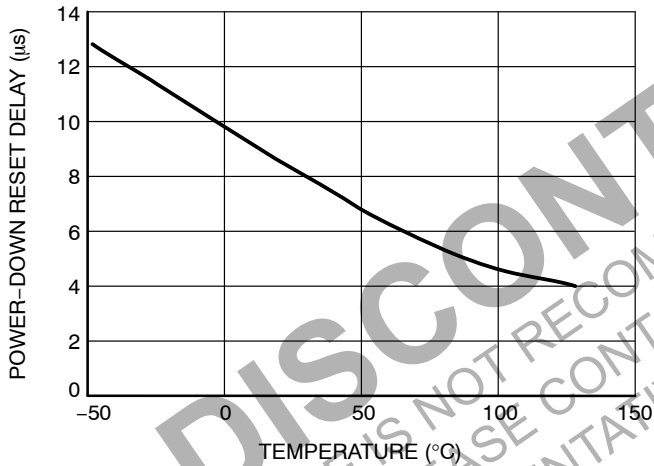
**Figure 3. Supply Current vs. Temperature (No Load)**

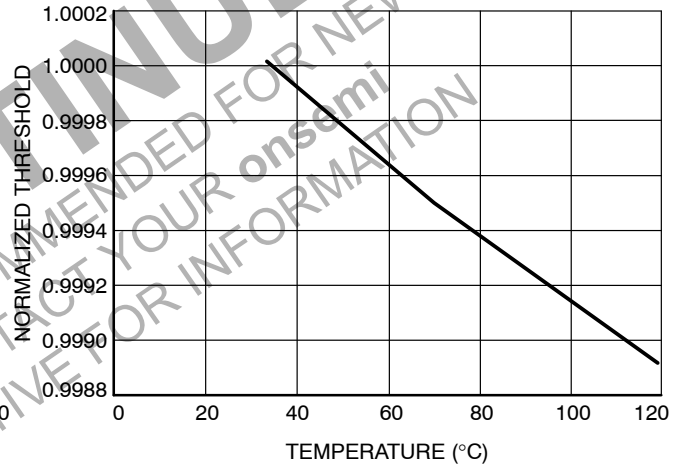**Figure 4. Power−Down Reset Delay vs. Temperature**

**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.
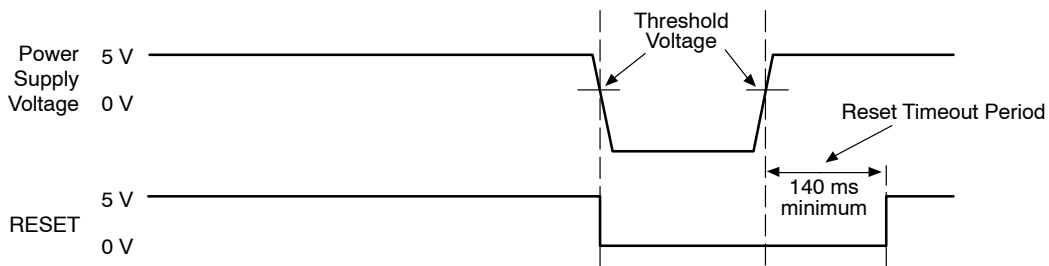


**Figure 6. Reset Timing Diagram**

**$V_{CC}$ Transient Response**

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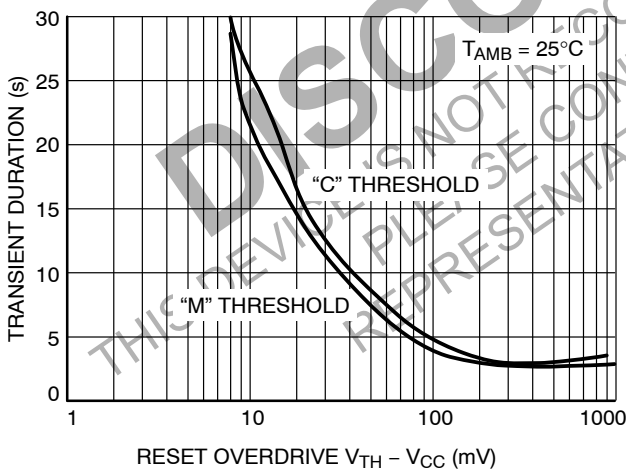


**Figure 7. Maximum Transient Duration Without Causing a Reset Pulse vs. Reset Comparator Overdrive**

**Valid Reset with $V_{CC}$ under 1.0 V**

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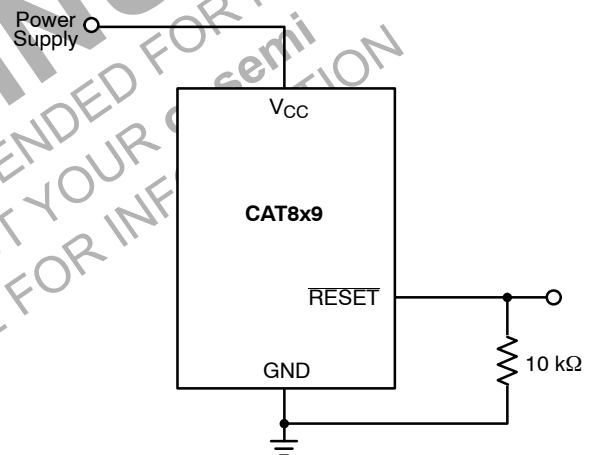


**Figure 8. $\overline{RESET}$ Valid with $V_{CC}$ Under 1.0 V**

**Bi−directional Reset Pin Interfacing**

The CAT859 and CAT869 can interface with μP/μC bi−directional reset pins by connecting a 4.7 kΩ resistor in series with the CAT859 and CAT869 reset output and the μP/μC bi−directional reset pin.
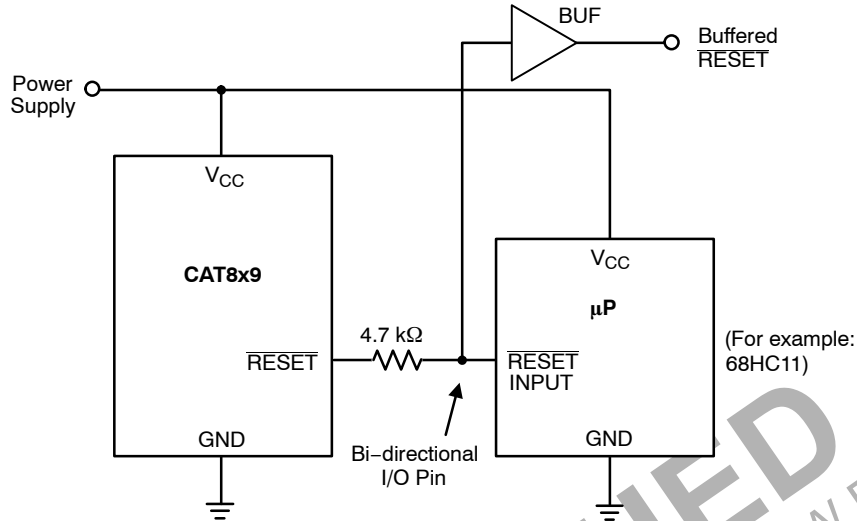


**Figure 9. Bi−directional Reset Pin Interfacing**

**CAT853 and CAT863 Open−Drain $\overline{\text{RESET}}$ 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 $V_{CC}$ pin. The value of the pull−up resistor is not critical in most applications, typical values being between 5 kΩ and 10 kΩ.
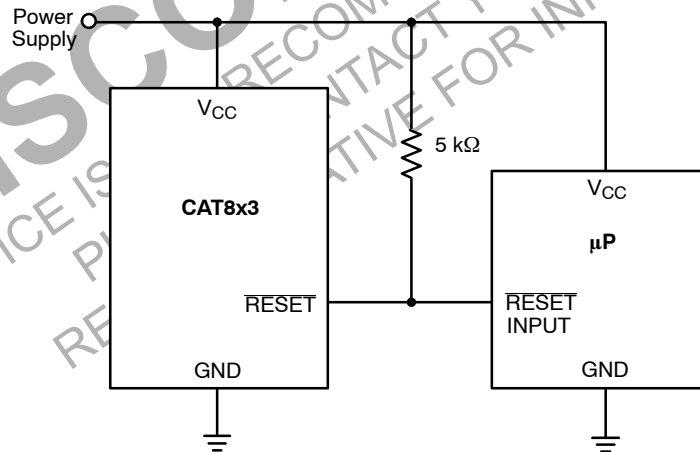


**Figure 10. Typical CAT8x3 Open−Drain Circuit Configuration**

## 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 | | | |

2. Threshold and full part numbers will be provided on box and reel labels as well as all Shipping documents.
3. 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.
4. 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
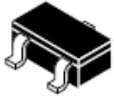
**SOT−23/SUPERSOT™−23, 3 LEAD, 1.4x2.9**
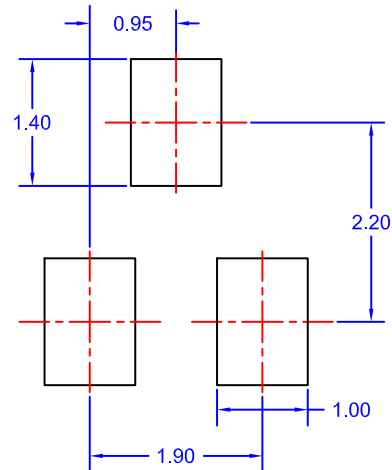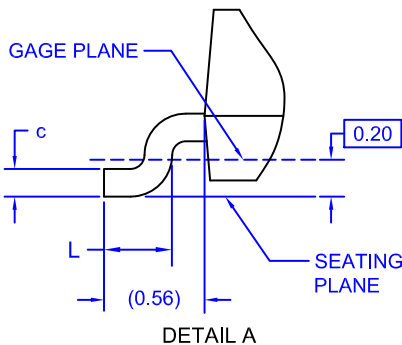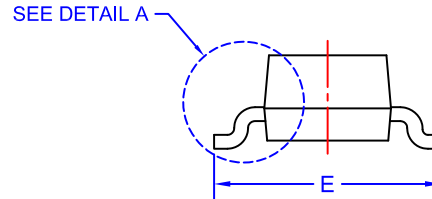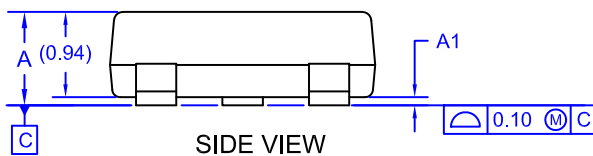CASE 527AG
ISSUE A

DATE 09 DEC 2019



TOP VIEW

SIDE VIEW

DETAIL A

GAGE PLANE

SEATING PLANE

SEE DETAIL A

LAND PATTERN RECOMMENDATION*

*FOR ADDITIONAL INFORMATION ON OUR Pb−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

NOTES: UNLESS OTHERWISE SPECIFIED
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR EXTRUSIONS.

| DIM | MIN. | NOM. | MAX. |
|-----|------|------|------|
| A | 0.85 | 0.95 | 1.12 |
| A1 | 0.00 | 0.05 | 0.10 |
| b | 0.370 | 0.435 | 0.508 |
| c | 0.085 | 0.150 | 0.180 |
| D | 2.80 | 2.92 | 3.04 |
| E | 2.31 | 2.51 | 2.71 |
| E1 | 1.20 | 1.40 | 1.52 |
| e | | 0.95 BSC | |
| e1 | | 1.90 BSC | |
| L | 0.33 | 0.38 | 0.43 |

**GENERIC MARKING DIAGRAM\***

XXXM▪
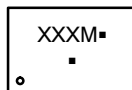
XXX = Specific Device Code
M = Month Code
▪ = Pb−Free Package
(Note: Microdot may be in either location)

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

| DOCUMENT NUMBER: | 98AON34319E | | |
|---|---|---|---|
| DESCRIPTION: | SOT−23/SUPERSOT−23, 3 LEAD, 1.4X2.9 | | PAGE 1 OF 1 |

## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at**
www.onsemi.com/support/sales

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