# Low-Power Precision Voltage Detector

## FEATURES

- **Ultra Low Current Consumption 2.4μA**
- **Accurate Voltage Detection Threshold**
- **Fine Voltage Detection Threshold Resolution**
- **Open Drain Output (Active Low)**
- **Industrial temperature range -40°C to +85°C**
- **5-pin TSOT-23 and 3-pin SOT-89 RoHS compliant packages**

## APPLICATIONS

- **Battery-Powered Systems**
- **Power Supply Monitoring**
- **Handheld and Portable Equipment**
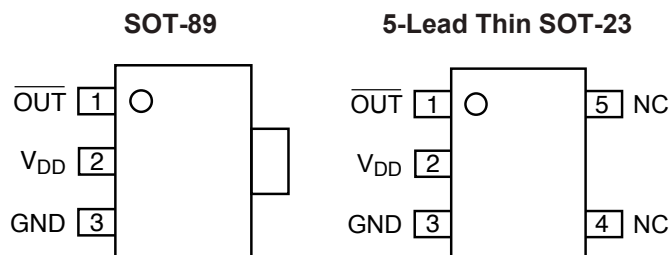- **Processor Supervisor Reset**

## DESCRIPTION

The CAT808 is a high-precision voltage detector designed for monitoring single cell and multi-cell batteries. Voltage detection thresholds between 2.0V and 3.5V are provided with 0.1V resolution and ±3.0% accuracy.

The CAT808 open-drain output is active low until the $V_{DD}$ voltage exceeds the detection threshold. A low hysteresis is built into the device to minimize output "chatter", while $V_{DD}$ passes through the detection threshold, and the output transitions high.
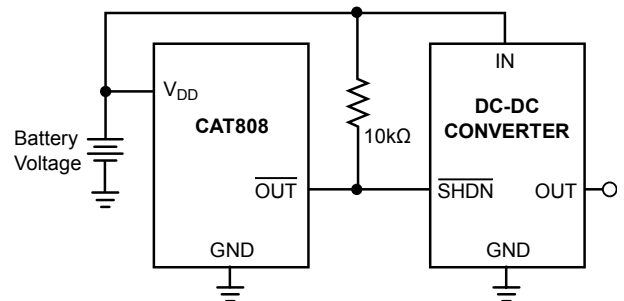
After the CAT808 asserts the output high condition, it continues to monitor $V_{DD}$ until it drops below the detection threshold, when the output goes low until $V_{DD}$ once again exceeds the detection threshold.

For Ordering Information details, see page 7.

## PIN CONFIGURATION



**SOT-89**

$\overline{OUT}$ 1
$V_{DD}$ 2
GND 3

**5-Lead Thin SOT-23**

$\overline{OUT}$ 1    5 NC
$V_{DD}$ 2
GND 3    4 NC

## TYPICAL APPLICATION



Battery Voltage

$V_{DD}$ **CAT808** $\overline{OUT}$ GND

10kΩ

**DC-DC CONVERTER** IN $\overline{SHDN}$ OUT GND

**Note:** The value of the pull-up resistor is not critical

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## ABSOLUTE MAXIMUM RATINGS[1]

| Parameters | | Ratings | Units |
|---|---|---|---|
| Temperature under Bias | | -55 to +125 | ºC |
| Storage Temperature | | -65 to +150 | ºC |
| Voltage on any Pin with Respect to GND[2][3] | | -2.0 to $V_{DD}$ + 2.0 | V |
| $V_{DD}$ with Respect to GND | | -2.0 to 7.0 | V |
| Lead Soldering temperature (10 seconds) | | +300 | ºC |
| Power Dissipation | TSOT-23-5 | 250 | mW |
| | SOT-89 | 500 | mW |

## RECOMMENDED OPERATING CONDITIONS

| Parameters | Ratings | Units |
|---|---|---|
| $V_{DD}$ | +1.2 to +6.0 | V |
| Operating Temperature Range | -40 to +85 | ºC |

## DC ELECTRICAL CHARACTERISTICS

$T_A$ = -40ºC to +85ºC, $V_{DD}$ = 1.2V to 6.0V

| Symbol | Parameter | Conditions | | Min | Typ. | Max | Units |
|---|---|---|---|---|---|---|---|
| $V_{DET}$ | Detection Voltage | CAT808Nxxx-27 | | 2.62 | 2.7 | 2.78 | V |
| | | CAT808Nxxx-32 | | 3.12 | 3.2 | 3.28 | |
| | | CAT808Nxxx-35 | | 3.42 | 3.5 | 3.58 | |
| $I_{DD}$ | Current Consumption | $V_{DD}$ = 4.0V | | - | 2.4 | 5 | µA |
| | | $V_{DD}$ = 5.0V | | - | 3.5 | 7 | |
| | | $V_{DD}$ = 6.0V | | - | 5 | 10 | |
| $I_{OUT}$ | Output SinkCurrent | $V_{DS}$ = 0.5V | $V_{DD}$=1.2V | 0.6 | 1.4 | - | mA |
| | | | $V_{DD}$=2.4V | 2.9 | 5 | - | |
| $I_{LEAK}$ | Output Leakage Current | $V_{DS}$ = 5.0V, $V_{DD}$ = 5.0V | | - | - | 1 | µA |
| $T_{PHL/LH}$ | Response Time | – | | - | - | 60 | µs |
| $\frac{\Delta - V_{DET}}{\Delta T_A \bullet -V_{DET}}$ | Detection Voltage Temperature Coefficient[4] | | | - | ±10 | ±100 | ppm/ºC |

**Notes:**

(1) 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 devices 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.

(2) The Minimum DC input voltage is -0.5V. During transitions, inputs may undershoot to -2.0V for periods of less than 20ns. Maximum DC voltage on output pins is $V_{CC}$ +0.5V, which may overshoot to $V_{CC}$ +2.0V for periods of less than 20ns.

(3) Latch-up protection is provided for stresses up to 100mA on all pins from -1V to $V_{CC}$ +1V.

(4) The temperature change ratio in the detection voltage [ppm/°C] is calculated by using the following equation:

$$\frac{\Delta - V_{DET}}{\Delta T_A \bullet -V_{DET}} \times 1,000,000 [ppm/°C]$$

## OPERATION – VOLTAGE DETECTOR

The CAT808 has an active low output that asserts (pulls low) when the supply voltage drops below the detection threshold voltage ($V_{DET}$). The open-drain output requires an external pull-up resistor between the output pin and the supply voltage (as shown in the typical application diagram). On power-up, $\overline{OUT}$ is held active low until the supply voltage ($V_{DD}$) rises above $V_{DET}$. While $V_{DD}$ is above $V_{DET}$, $\overline{OUT}$ stays high until $V_{DD}$ drops below $V_{DET}$, then $\overline{OUT}$ once again goes low.

## BLOCK DIAGRAM
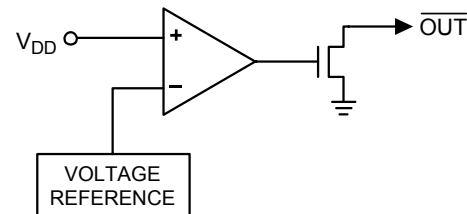


## TIMING DIAGRAM
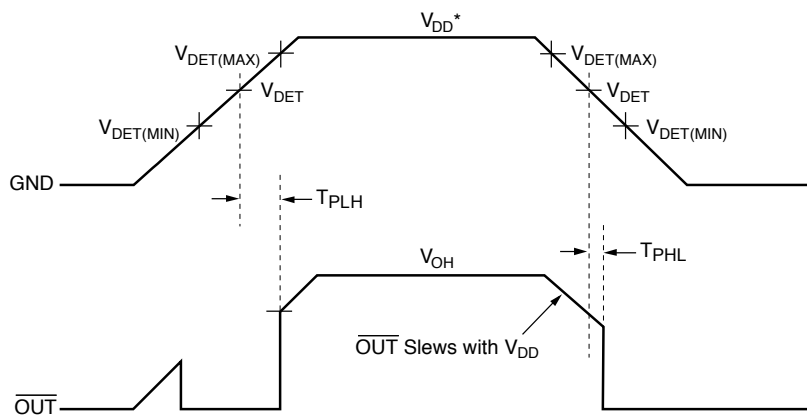


* Voltage of $V_{DD}$ below 1 volt will not be able to maintain low output.

## PIN FUNCTIONS

| Pin | Function |
| --- | --- |
| $V_{DD}$ | Voltage Input and Power Supply |
| GND | Ground Pin |
| $\overline{OUT}$ | Active Low Open Drain output |
| NC | No Connect, the pin is electrically open |

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## TYPICAL ELECTRICAL OPERATING CHARACTERISTICS
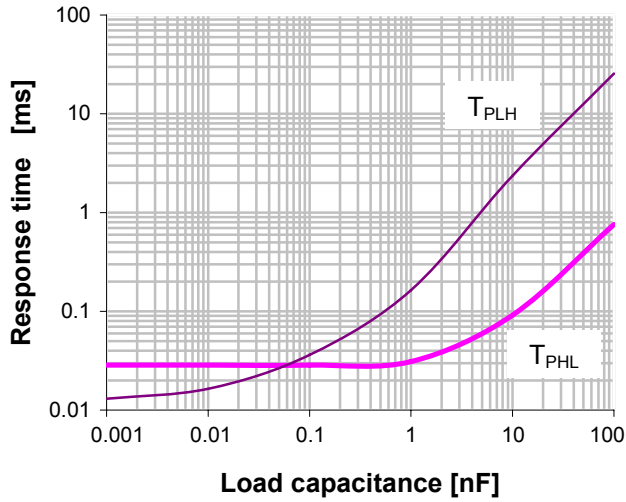
Typical values at $T_A$ = 25°C.

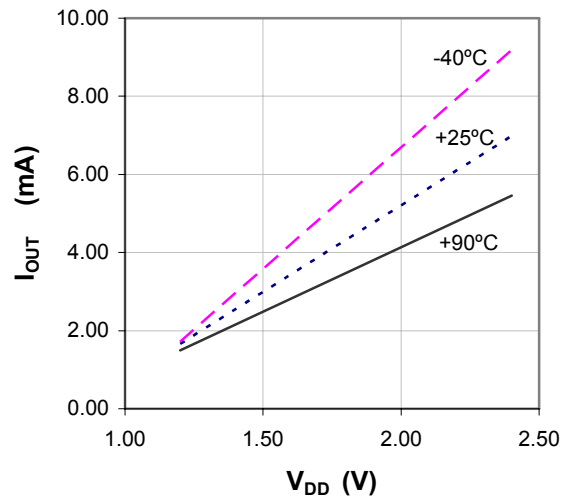**$V_{DD}$ Supply Current vs. $V_{DD}$ Supply Voltage**
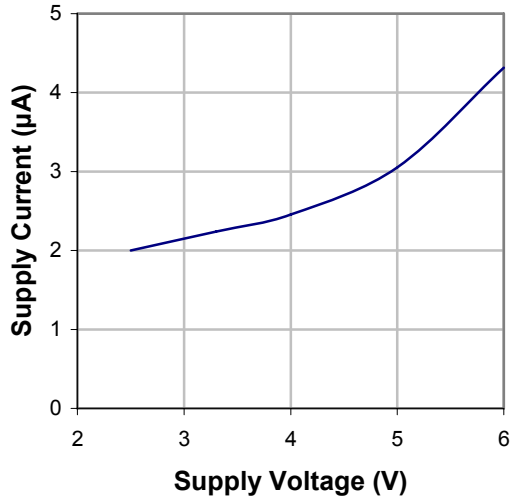


**$V_{DET}$ Detection Voltage vs. Temperature**
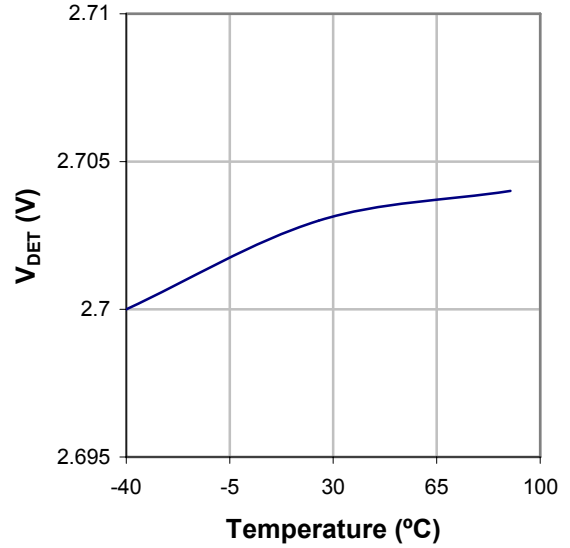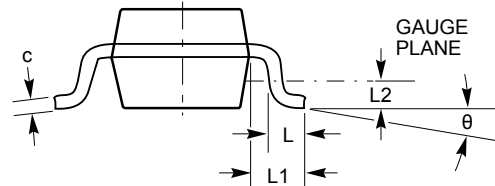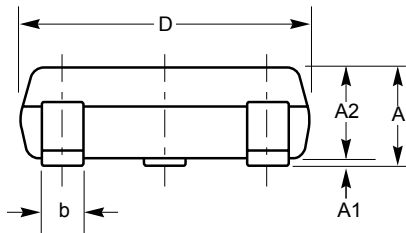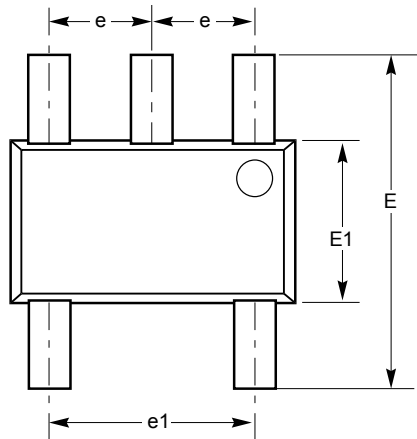


**Response time vs. Load Capacitance**



**$I_{OUT}$ Transistor Output Current vs. $V_{DD}$ Supply Voltage**

## PACKAGE INFORMATION

### 5-LEAD TSOT-23 PACKAGE



| SYMBOL | MIN | NOM | MAX |
|--------|-----|-----|-----|
| A | — | — | 1.00 |
| A1 | 0.01 | 0.05 | 0.10 |
| A2 | 0.80 | 0.87 | 0.90 |
| b | 0.30 | — | 0.45 |
| c | 0.12 | 0.15 | 0.20 |
| D | 2.90BSC | | |
| E | 2.80BSC | | |
| E1 | 1.60BSC | | |
| e | 0.95BSC | | |
| e1 | 1.90BSC | | |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.60REF | | |
| L2 | 0.25BSC | | |
| q | 0° | | 8° |

**Notes:**

(1)   All dimensions are in millimeters.

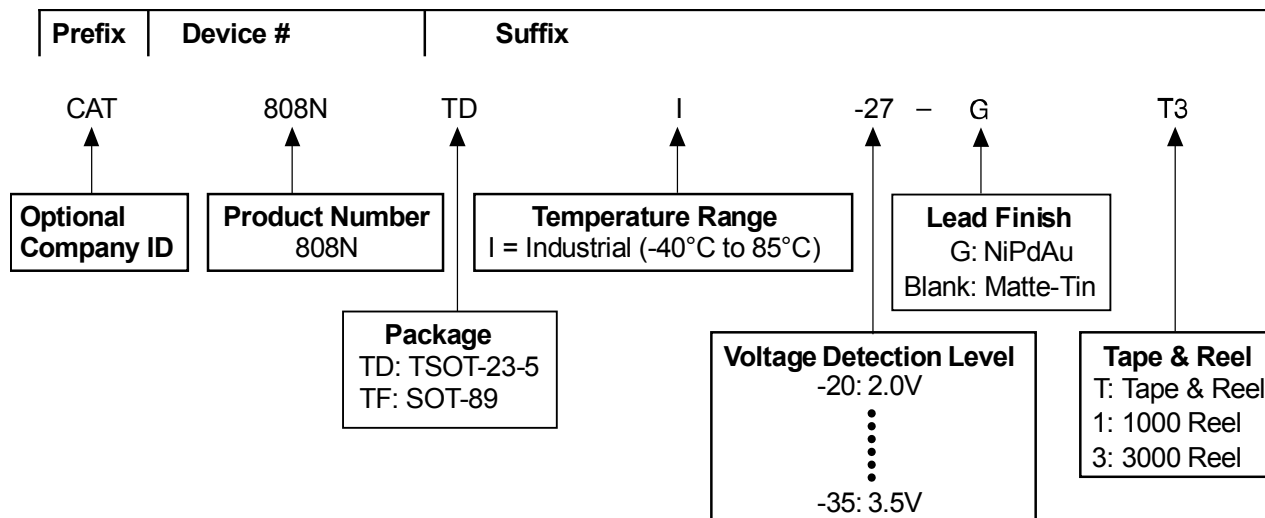(2)   Complies with JEDEC specification MO-193.

## 3-LEAD SOT-89 PACKAGE
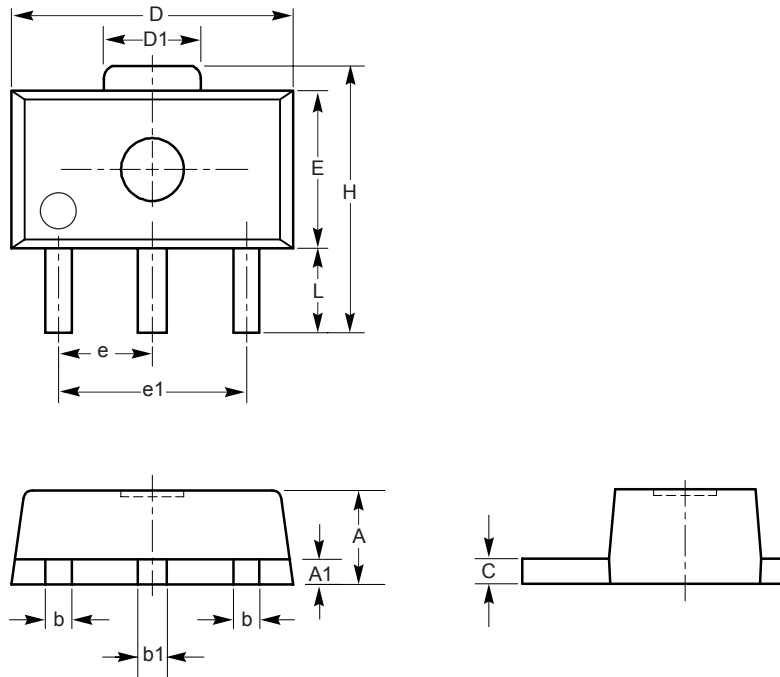


| SYMBOL | MIN | NOM | MAX |
|--------|-----|-----|-----|
| A | 1.40 | 1.50 | 1.60 |
| A1 | 0.30 | 0.40 | 0.50 |
| L | 0.80 | – | 1.20 |
| b | 0.36 | 0.42 | 0.48 |
| b1 | 0.41 | 0.47 | 0.53 |
| C | 0.38 | 0.40 | 0.43 |
| D | 4.40 | 4.50 | 4.60 |
| D1 | 1.40 | 1.60 | 1.75 |
| H | 3.94 | – | 4.25 |
| E | 2.40 | 2.50 | 2.60 |
| e1 | 2.90 | 3.00 | 3.10 |
| e | 1.45 | 1.50 | 1.55 |

**Notes:**

(1)  All dimensions are in millimeters.

(2)  Lead frame material: copper.

## EXAMPLE OF ORDERING INFORMATION

| Prefix | Device # | | Suffix |
|---|---|---|---|

CAT      808N      TD      I      -27  −   G      T3

**Optional Company ID**

**Product Number**
808N

**Package**
TD: TSOT-23-5
TF: SOT-89

**Temperature Range**
I = Industrial (-40°C to 85°C)

**Voltage Detection Level**
-20: 2.0V
•
•
•
•
•
-35: 3.5V

**Lead Finish**
G: NiPdAu
Blank: Matte-Tin

**Tape & Reel**
T: Tape & Reel
1: 1000 Reel
3: 3000 Reel

**Notes:**

(1) All packages are RoHS-compliant (Lead-free, Halogen-free).

(2) The standard finish is NiPdAu.

(3) The device used in the above example is a CAT808NTDI-27-GT3 (TSOT-23-5, Industrial Temperature, 2.7V Detection Level, NiPdAu, Tape & Reel).

(4) For additional detection voltage, package and temperature options, please contact your nearest Catalyst Semiconductor Sales office.

## TOP MARKING

| Part Number | Package | Detection Voltage | Top Marking |
|---|---|---|---|
| CAT808NTDI-27-G | TSOT-23-5 | 2.70 | MVym |
| CAT808NTDI-32-G | TSOT-23-5 | 3.20 | MVym |
| CAT808NTDI-35-G | TSOT-23-5 | 3.50 | MVym |
| | | | |
| CAT808NTFI-27 | SOT-89 | 2.70 | AAxxx |
| CAT808NTFI-32 | SOT-89 | 3.20 | AAxxx |
| CAT808NTFI-35 | SOT-89 | 3.50 | AAxxx |

**Notes:**

(1) ym – Year and Month Code.

(2) xxx – Assembly location code and last 2 digits of assembly lot code.

(3) SOT-89 is offered in Matte-Tin only.

# REVISION HISTORY

| Date | Rev. | Reason |
|------|------|--------|
| 11/07/06 | A | Initial Issue |
| 05/10/07 | B | Update Features<br>Update Description<br>Update DC Electrical Characteristics<br>Update Example of Ordering Information<br>Update Top Marking |

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