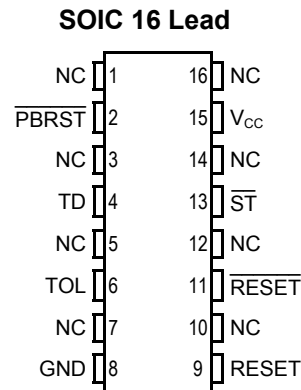
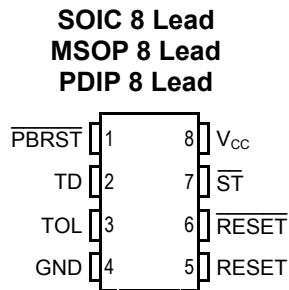


**PIN CONFIGURATION**



**PIN DESCRIPTION**

| Pin Number<br>8-Lead<br>Package | Pin Number<br>16-Lead<br>Package | Name                      | Function   |
|---------------------------------|----------------------------------|---------------------------|--|
| 1                               | 2                                | $\overline{\text{PBRST}}$ | Debounced manual pushbutton reset input  |
| 2                               | 4                                | TD                        | Watchdog typical time delay selection:<br>a) $t_{\text{TD}} = 150 \text{ ms}$ for TD = GND<br>b) $t_{\text{TD}} = 600 \text{ ms}$ for TD = Open<br>c) $t_{\text{TD}} = 1200 \text{ ms}$ for TD = $V_{\text{CC}}$   |
| 3                               | 6                                | TOL                       | CAT1232LP TOL selects 5% (TOL = GND) or 10% (TOL = $V_{\text{CC}}$ ) trip point tolerance. CAT1832 TOL selects 10% (TOL = GND) or 20% (TOL = $V_{\text{CC}}$ ) trip point tolerance.   |
| 4                               | 8                                | GND                       | Ground   |
| 5                               | 9                                | RESET                     | Active HIGH reset output. RESET is active<br>1. If $V_{\text{CC}}$ falls below the reset voltage trip point<br>2. If $\overline{\text{PBRST}}$ is low<br>3. If $\overline{\text{ST}}$ is not strobed low before the timeout period set by TD expires.<br>4. During power-up. |
| 6                               | 11                               | RESET                     | Active LOW reset output. (See RESET)   |
| 7                               | 13                               | $\overline{\text{ST}}$    | Strobe Input   |
| 8                               | 15                               | $V_{\text{CC}}$           | Power Supply   |
|                                 | 1, 3, 5, 7, 10,<br>12, 14, 16    | NC                        | No internal connection   |

**ABSOLUTE MAXIMUM RATINGS (\*)**

| Parameters  | Ratings                       | Units |
|---|-------------------------------|-------|
| Voltage on $V_{\text{CC}}$  | -0.5 to 7.0                   | V     |
| Voltage on $\overline{\text{ST}}$ and TD                                      | -0.5 to $V_{\text{CC}} + 0.5$ | V     |
| Voltage on $\overline{\text{PBRST}}$ ,<br>$\overline{\text{RESET}}$ and RESET | -0.5 to $V_{\text{CC}} + 0.5$ | V     |

| Parameters                       | Ratings     | Units              |
|----------------------------------|-------------|--------------------|
| Maximum Junction Temperature     | 125         | $^{\circ}\text{C}$ |
| Storage Temperature Range        | -65 to +150 | $^{\circ}\text{C}$ |
| Lead Soldering Temperature (10s) | 300         | $^{\circ}\text{C}$ |
| Operating Temperature Range      | -40 to +85  | $^{\circ}\text{C}$ |

**Note:**

\* 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.

## CAT1232LP, CAT1832

### ELECTRICAL CHARACTERISTICS

Unless otherwise stated, 1.0 V -  $V_{CC}$  - 5.5 V and over the operating temperature range of -40°C to +85°C.

All voltages are referenced to ground.

| Symbol     | Parameter   | Conditions                        | Min              | Typ              | Max              | Units      |
|------------|---|-----------------------------------|------------------|------------------|------------------|------------|
| $V_{CC}$   | Supply Voltage  |                                   | 1.0              |                  | 5.5              | V          |
| $I_{CC1}$  | Supply Current  | $V_{CC} = 5.5$ V, CAT1232LP       |                  | 35               | 50               | $\mu$ A    |
|            |   | $V_{CC} = 3.6$ V, CAT1832         |                  | 20               | 35               |            |
| $V_{IH}$   | ST and $\overline{PBRST}$ Input High Level              | (5)                               | 2                |                  | $V_{CC} + 0.3$ V | V          |
|            |   | (6)                               | $V_{CC} - 0.4$ V |                  |                  |            |
| $V_{IL}$   | ST and $\overline{PBRST}$ Input Low Level               | $V_{CC} = 5.5$ V, CAT1232LP       | -0.3             |                  | 0.8              | V          |
|            |   | $V_{CC} = 3.6$ V, CAT1832         |                  |                  | 0.5              |            |
| $V_{CCTP}$ | $V_{CC}$ Trip Point (TOL = GND)                         | CAT1232LP                         | 4.50             | 4.62             | 4.74             | V          |
| $V_{CCTP}$ | $V_{CC}$ Trip Point (TOL = $V_{CC}$ )                   | CAT1232LP                         | 4.25             | 4.37             | 4.49             | V          |
| $V_{CCTP}$ | $V_{CC}$ Trip Point (TOL = GND)                         | CAT1832                           | 2.80             | 2.88             | 2.97             | V          |
| $V_{CCTP}$ | $V_{CC}$ Trip Point (TOL = $V_{CC}$ )                   | CAT1832                           | 2.47             | 2.55             | 2.64             | V          |
| $t_{TD}$   | Watchdog Time-Out Period                                | TD = GND                          | 62.5             | 150              | 250              | ms         |
| $t_{TD}$   | Watchdog Time-Out Period                                | TD = $V_{CC}$                     | 500              | 1200             | 2000             | ms         |
| $t_{TD}$   | Watchdog Time-Out Period                                | TD floating                       | 250              | 600              | 1000             | ms         |
| $V_{OH}$   | Output Voltage  | $I = -500$ $\mu$ A <sup>(3)</sup> | $V_{CC} - 0.5$ V | $V_{CC} - 0.1$ V |                  | V          |
| $I_{OH}$   | Output Current  | Output = 2.4 V <sup>(2)</sup>     |                  | -350             |                  | $\mu$ A    |
| $I_{OL}$   | Output Current  | Output = 0.4 V                    | 10               |                  |                  | mA         |
| $I_{IL}$   | Input Leakage   | (1)                               | -1.0             |                  | 1.0              | $\mu$ A    |
| $R_{PU}$   | Internal Pull-Up Resistor                               | (1)                               | 32               | 40               | 55               | k $\Omega$ |
| $C_{IN}$   | Input Capacitance                                       |                                   |                  |                  | 5                | pF         |
| $C_{OUT}$  | Output Capacitance                                      |                                   |                  |                  | 7                | pF         |
| $t_{PB}$   | $\overline{PBRST}$ Manual Reset Minimum Low Time        | $\overline{PBRST} = V_{IL}$       | 20               |                  |                  | ms         |
| $t_{RST}$  | Reset Active Time                                       |                                   | 250              | 600              | 1000             | ms         |
| $t_{ST}$   | $\overline{ST}$ Pulse Width                             | (4)                               | 20               |                  |                  | ns         |
| $t_{RPD}$  | $V_{CC}$ Fail Detect to RESET or RESET                  |                                   |                  | 5                | 8                | $\mu$ s    |
| $t_F$      | $V_{CC}$ Slew Rate                                      |                                   | 20               |                  |                  | $\mu$ s    |
| $t_{PDLY}$ | $\overline{PBRST}$ Stable LOW to RESET and RESET Active |                                   |                  |                  | 20               | ms         |
| $t_{RPU}$  | $V_{CC}$ Detect to RESET or RESET Inactive              | $t_{RISE} = 5$ $\mu$ s            | 250              | 600              | 1000             | ms         |
| $t_R$      | $V_{CC}$ Slew Rate                                      | 4.25 V to 4.75 V                  | 0                |                  |                  | ns         |

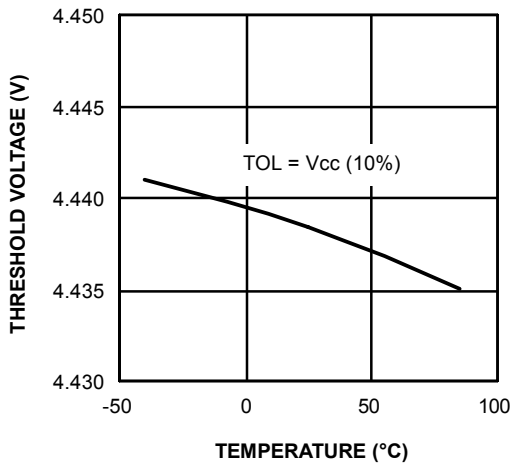
#### Notes:

- (1)  $\overline{PBRST}$  is internally pulled HIGH to  $V_{CC}$  through a nominal 40 k $\Omega$  resistor (RPU).
- (2) RESET is an open drain output on the CAT1232LP.
- (3) RESET remains within 0.5 V of  $V_{CC}$  on power-down until  $V_{CC}$  falls below 2 V. RESET remains within 0.5 V of ground on power-down until  $V_{CC}$  falls below 2.0 V.
- (4) Must not exceed the minimum watchdog time-out period ( $t_{TD}$ ). The watchdog circuit cannot be disabled. To avoid a reset,  $\overline{ST}$  must be strobed.
- (5) Measured with  $V_{CC} \geq 2.7$  V.
- (6) Measured with  $V_{CC} < 2.7$  V.

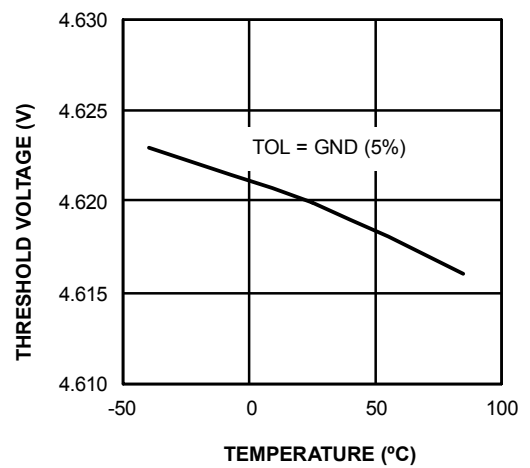
**TYPICAL CHARACTERISTICS**

For the CAT1232LP,  $V_{CC} = 5\text{ V}$  and  $T_{AMB} = 25^\circ\text{C}$  unless otherwise stated.

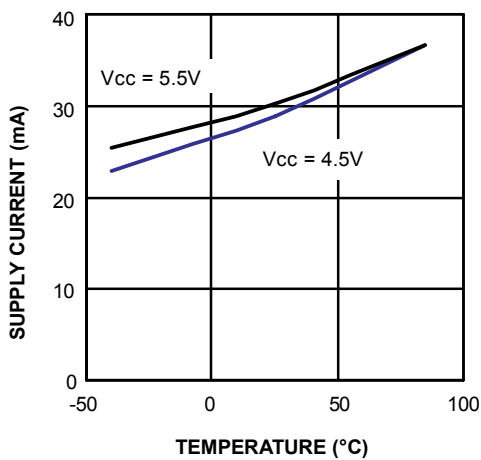
**Threshold Voltage vs. Temperature (10% TOL)**



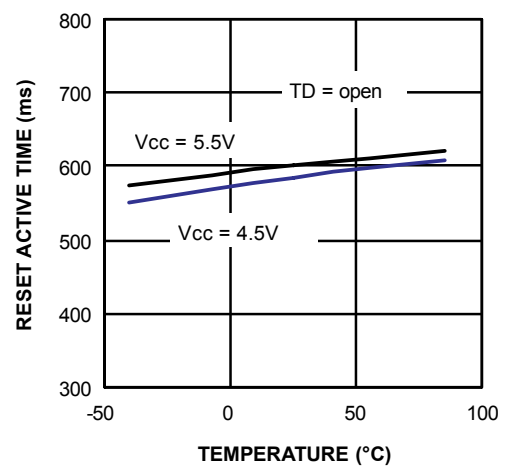
**Threshold Voltage vs. Temperature (5% TOL)**



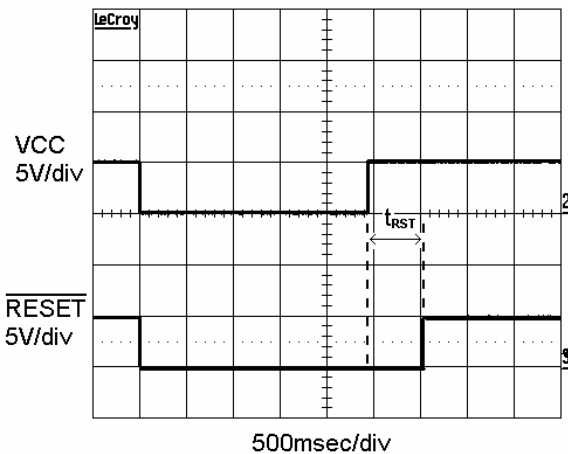
**Supply Current vs. Temperature**



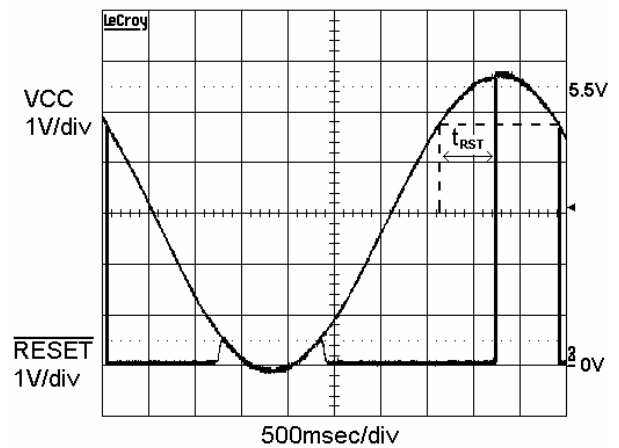
**Reset Active Time vs. Temperature**



**Reset Active Time Waveform**



**Transient Response**



**APPLICATION INFORMATION**

**SUPPLY VOLTAGE MONITOR**

**Reset Signal Polarity and Output Stage Structure**

$\overline{\text{RESET}}$  is an active LOW signal. It is developed with an open drain driver in the CAT1232LP. A pull-up resistor is required, typical values are 10 k $\Omega$  to 50 k $\Omega$ . The CAT1832 uses a CMOS push-pull output stage for the  $\overline{\text{RESET}}$ .

RESET is an active High signal developed by a CMOS push-pull output stage and is the logical opposite to  $\overline{\text{RESET}}$ .

**Trip Point Tolerance Selection**

The TOL input is used to select the  $V_{CC}$  trip point threshold. This selection is made connecting the TOL input to ground or  $V_{CC}$ . Connecting TOL to Ground makes the  $V_{CC}$  trip threshold 4.62 V for the CAT1232LP and 2.88 V for the CAT1832.

Connecting TOL to  $V_{CC}$  makes the  $V_{CC}$  trip threshold 4.37 V for the CAT1232LP and 2.55 V for the CAT1832.

After  $V_{CC}$  has risen above the trip point set by TOL,  $\overline{\text{RESET}}$  and  $\overline{\text{RESET}}$  remain active for a minimum time period of 250 ms.

On power-down, once  $V_{CC}$  falls below the reset threshold the  $\overline{\text{RESET}}$  outputs will remain active and are guaranteed valid down to a  $V_{CC}$  level of 1.0 V.

| Tolerance Select Voltage    | Trip Point Tolerance | Trip Point Voltage (V) |         |      |
|-----------------------------|----------------------|------------------------|---------|------|
|                             |                      | Min                    | Nominal | Max  |
| CAT1232LP<br>TOL = $V_{CC}$ | 10 %                 | 4.25                   | 4.37    | 4.49 |
| CAT1232LP<br>TOL = GND      | 5 %                  | 4.50                   | 4.62    | 4.74 |
| CAT1832<br>TOL = $V_{CC}$   | 20 %                 | 2.47                   | 2.55    | 2.64 |
| CAT1832<br>TOL = GND        | 10 %                 | 2.80                   | 2.88    | 2.97 |

**Manual Reset Operation**

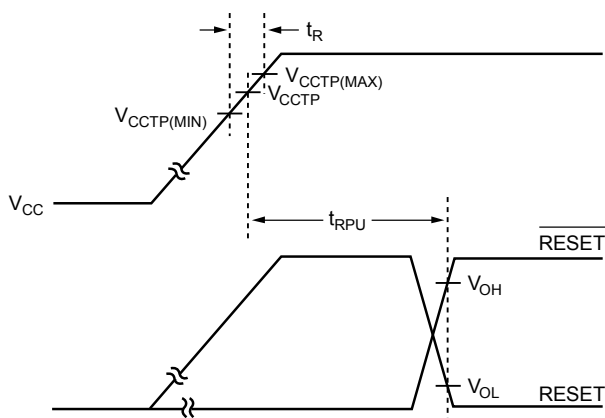
Push-button input,  $\overline{\text{PBRST}}$ , allows the user to issue reset signals. The pushbutton input is debounced and is pulled high through an internal 40 k $\Omega$  resistor.

When  $\overline{\text{PBRST}}$  is held low for the minimum time of 20 ms, both resets become active and remain active for a minimum time period of 250 ms after  $\overline{\text{PBRST}}$  returns high.

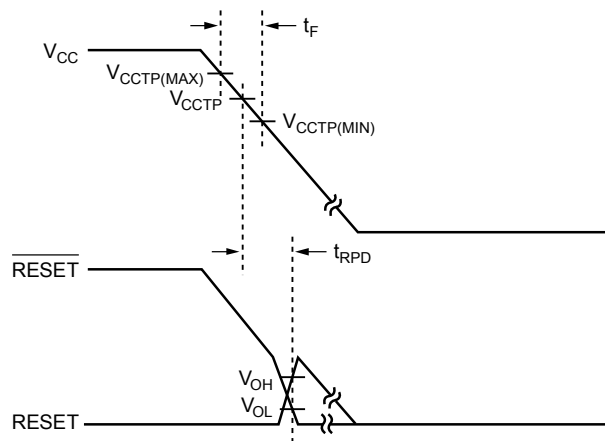
No external pull-up resistor is required, since  $\overline{\text{PBRST}}$  is pulled high by an internal 40 k $\Omega$  resistor.

$\overline{\text{PBRST}}$  can be driven from a TTL or CMOS logic line or short-ed to ground with a mechanical switch.

**Figure 1. Timing Diagram: Power Up**



**Figure 2. Timing Diagram: Power Down**



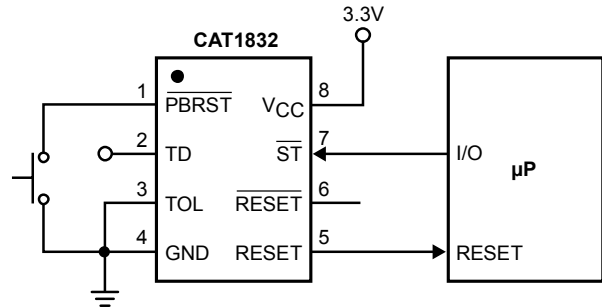
**WATCHDOG TIMER AND  $\overline{ST}$  INPUT**

A watchdog timer stops and restarts a microprocessor that has stopped proper operation or become “hung”. The watchdog performs this function by monitoring the  $\overline{ST}$  input. After the reset outputs go inactive the  $\overline{ST}$  input must be strobed with a high-to-low signal transition prior to the minimum watchdog timeout period. However if the  $\overline{ST}$  input is not strobed with a high-to-low signal transition prior to a watchdog timeout the reset outputs will become active for TRST resetting and restarting the microprocessor. Once the resets return to the inactive state the watchdog timer restarts the process.

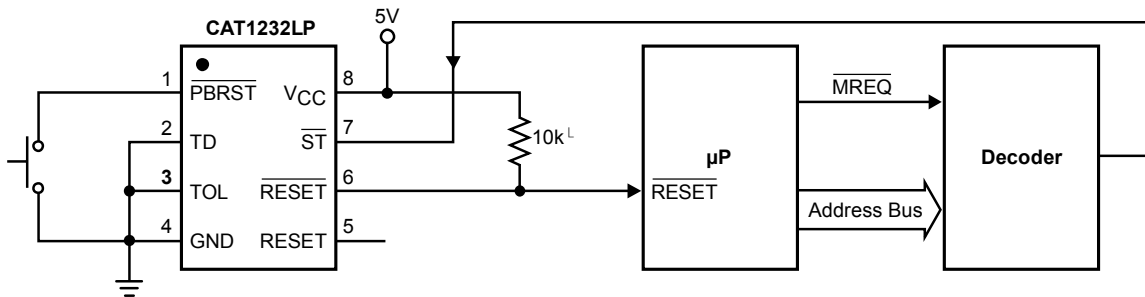
The TD input allows the user to select from three predetermined watchdog timeout periods. Always use the minimum timeout period to determine the required frequency of  $\overline{ST}$  high-to-low transitions and the maximum to determine the time prior to the reset outputs becoming active.  $\overline{ST}$  pulse widths must be 20 ns or greater.

The watchdog timer cannot be disabled. It must be strobed with a high-to-low signal transition to avoid a watchdog timeout and subsequent reset.

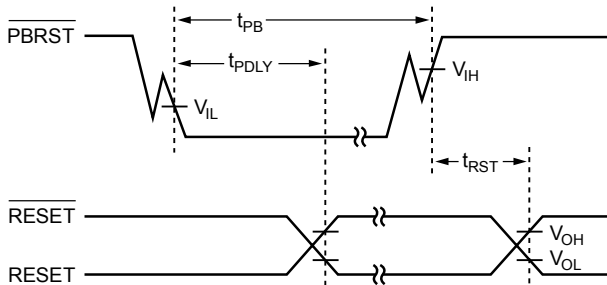
| TD Voltage Level | Watchdog Time-out Period (ms) |         |      |
|------------------|-------------------------------|---------|------|
|                  | Min                           | Nominal | Max  |
| GND              | 62.5                          | 150     | 250  |
| Floating         | 250                           | 600     | 1000 |
| V <sub>CC</sub>  | 500                           | 1200    | 2000 |



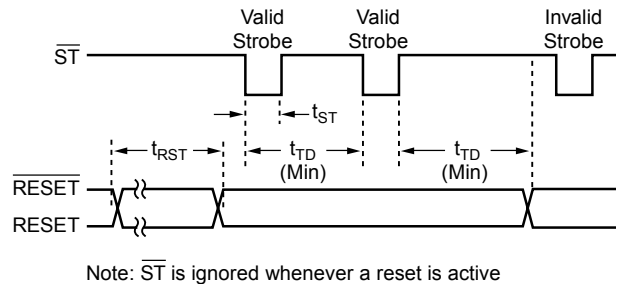
**Figure 4. CAT1832 Application Circuit: Pushbutton Reset**



**Figure 5. CAT1232LP Application Circuit: Watchdog Timer**



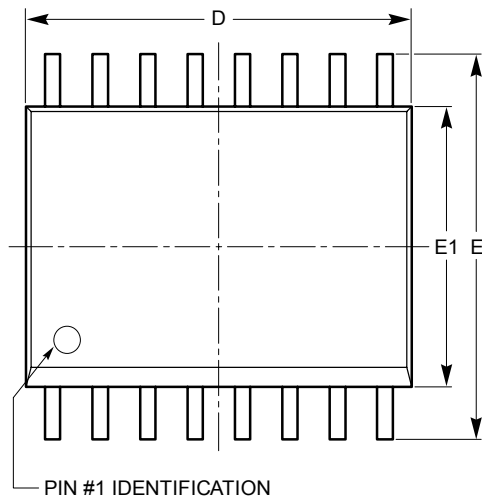
**Figure 6. Timing Diagram: Pushbutton Reset**



**Figure 7. Timing Diagram: Strobe Input**

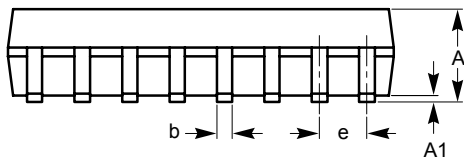
PACKAGE OUTLINE DRAWINGS

SOIC 16-Lead 300 mils (W)<sup>(1)(2)</sup>

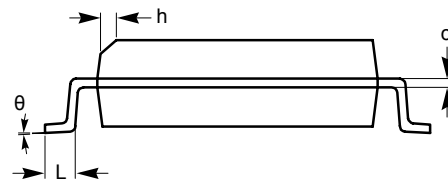


TOP VIEW

| SYMBOL   | MIN      | NOM   | MAX   |
|----------|----------|-------|-------|
| A        | 2.36     | 2.49  | 2.64  |
| A1       | 0.10     |       | 0.30  |
| b        | 0.33     | 0.41  | 0.51  |
| c        | 0.18     | 0.23  | 0.28  |
| D        | 10.08    | 10.31 | 10.49 |
| E        | 10.01    | 10.31 | 10.64 |
| E1       | 7.39     | 7.49  | 7.59  |
| e        | 1.27 BSC |       |       |
| h        | 0.25     |       | 0.75  |
| L        | 0.38     | 0.81  | 1.27  |
| $\theta$ | 0°       |       | 8°    |



SIDE VIEW



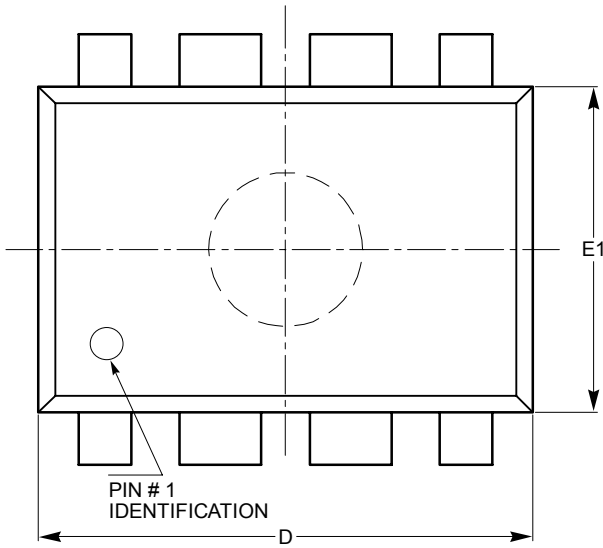
END VIEW

Notes:

- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MS-013.

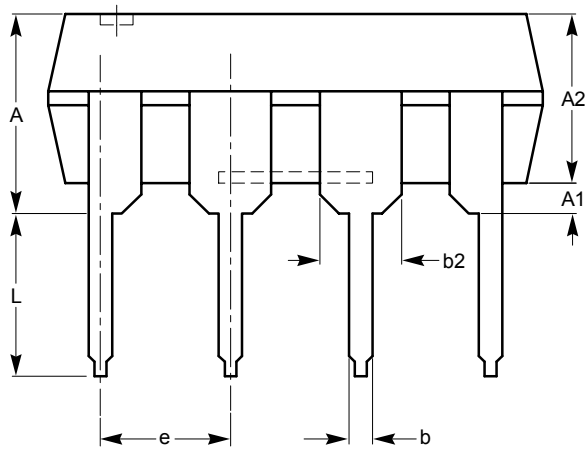
# CAT1232LP, CAT1832

## PDIP 8-Lead 300mils (L)<sup>(1)(2)</sup>

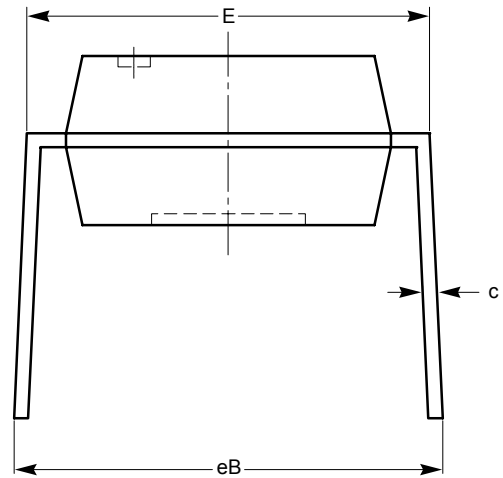


TOP VIEW

| SYMBOL | MIN      | NOM  | MAX   |
|--------|----------|------|-------|
| A      |          |      | 5.33  |
| A1     | 0.38     |      |       |
| A2     | 2.92     | 3.30 | 4.95  |
| b      | 0.36     | 0.46 | 0.56  |
| b2     | 1.14     | 1.52 | 1.78  |
| c      | 0.20     | 0.25 | 0.36  |
| D      | 9.02     | 9.27 | 10.16 |
| E      | 7.62     | 7.87 | 8.25  |
| e      | 2.54 BSC |      |       |
| E1     | 6.10     | 6.35 | 7.11  |
| eB     | 7.87     |      | 10.92 |
| L      | 2.92     | 3.30 | 3.80  |



SIDE VIEW



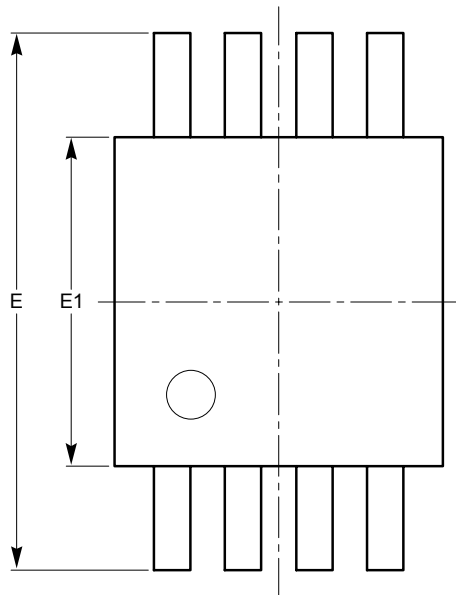
END VIEW

**Notes:**

- (1) All dimensions are in millimeters.
- (2) Complies with JEDEC MS-001.

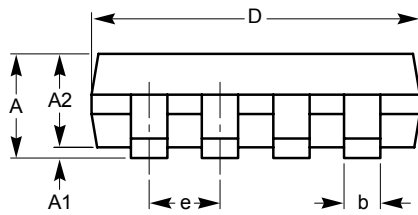
# CAT1232LP, CAT1832

## MSOP 8-Lead (Z) <sup>(1)(2)</sup>

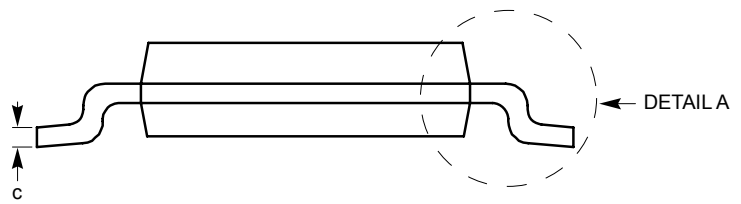


TOP VIEW

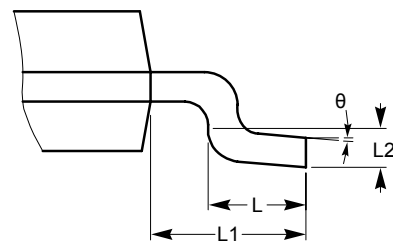
| SYMBOL   | MIN      | NOM  | MAX  |
|----------|----------|------|------|
| A        |          |      | 1.10 |
| A1       | 0.05     | 0.10 | 0.15 |
| A2       | 0.75     | 0.85 | 0.95 |
| b        | 0.22     |      | 0.38 |
| c        | 0.13     |      | 0.23 |
| D        | 2.90     | 3.00 | 3.10 |
| E        | 4.80     | 4.90 | 5.00 |
| E1       | 2.90     | 3.00 | 3.10 |
| e        | 0.65 BSC |      |      |
| L        | 0.40     | 0.60 | 0.80 |
| L1       | 0.95 REF |      |      |
| L2       | 0.25 BSC |      |      |
| $\theta$ | 0°       |      | 6°   |



SIDE VIEW



END VIEW



DETAIL A

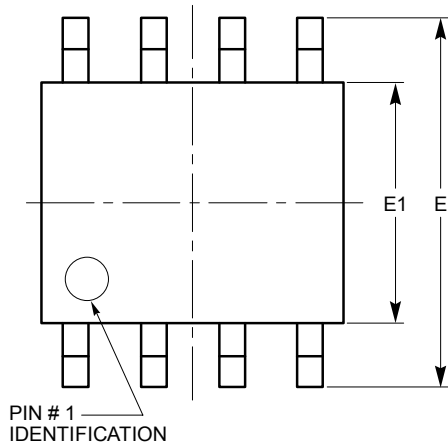
**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-187.



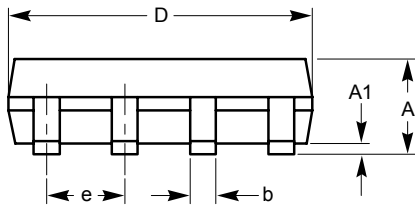
# CAT1232LP, CAT1832

## SOIC 8-Lead 150mils (V) <sup>(1)(2)</sup>

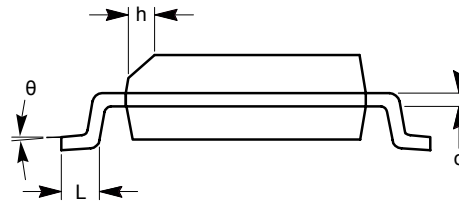


TOP VIEW

| SYMBOL   | MIN      | NOM | MAX  |
|----------|----------|-----|------|
| A        | 1.35     |     | 1.75 |
| A1       | 0.10     |     | 0.25 |
| b        | 0.33     |     | 0.51 |
| c        | 0.19     |     | 0.25 |
| D        | 4.80     |     | 5.00 |
| E        | 5.80     |     | 6.20 |
| E1       | 3.80     |     | 4.00 |
| e        | 1.27 BSC |     |      |
| h        | 0.25     |     | 0.50 |
| L        | 0.40     |     | 1.27 |
| $\theta$ | 0°       |     | 8°   |



SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MS-012.

# CAT1232LP, CAT1832

## ORDERING INFORMATION

| ORDERING PART NUMBER | Package      | Parts per Tube | Parts Per Reel | Reel Size (inch) |
|----------------------|--------------|----------------|----------------|------------------|
| CAT1232LPV-GT3*      | 8-lead, SOIC | —              | 3,000          | 13               |
| CAT1232LPZ-GT3*      | 8-lead, MSOP | —              | 3,000          | 13               |
| CAT1832L-G           | 8-lead, PDIP | 50             | —              | —                |
| CAT1832V-GT3         | 8-lead, SOIC | —              | 3,000          | 13               |
| CAT1832Z-GT3         | 8-lead, MSOP | —              | 3,000          | 13               |

\* Consult sales.

### Notes:

- (1) All packages are RoHS-compliant (Lead-free, Halogen-free).
- (2) The standard lead finish is NiPdAu.
- (3) The device used in the above example is a CAT1232LPV-GT3 (SOIC 8-Lead, NiPdAu, Tape & Reel).
- (4) For additional package and temperature options, please contact your nearest ON Semiconductor Sales office.
- (5) The SOIC 16-Lead package is only available in Matte-Tin finish.

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