



# TS831

## MICROPOWER VOLTAGE SUPERVISOR RESET ACTIVE LOW

- ULTRA LOW POWER CONSUMPTION :  
12 $\mu$ A maximum
- PRECISION RESET THRESHOLD
- THRESHOLD VOLTAGE:  
4.33V typ. FOR TS831-5  
4.50V typ. FOR TS831-4  
2.71V typ. FOR TS831-3
- GUARANTEED RESET OPERATION FOR  
V<sub>CC</sub> DOWN TO 1V
- OPEN DRAIN OUTPUT COMPARATOR
- FAST RESPONSE TIME : 20 $\mu$ s FOR A 10mV  
OVERDRIVE
- INTERNAL BUILT-IN HYSTERESIS
- PIN TO PIN COMPATIBLE WITH MC33064  
AND MC33164

### DESCRIPTION

The TS831 is an ultra low power integrated circuit incorporating a high stability band-gap voltage reference and a comparator with an open drain output.

The threshold voltage is set at 4.33V for TS831-5, 4.5V for TS831-4 and 2.71V for TS831-3 by internal thermally matched resistors.

The comparator exhibits a 20 $\mu$ s response (with 10mV overdrive) and has an open drain output active when input voltage is lower than the threshold. An internal hysteresis, 100mV for TS831-4 / TS831-5 and 60mV for TS831-3, increases the comparator's noise margin and prevents false reset operation.

### APPLICATION

- Power-on reset generator for microcontroller
- Power failure detector

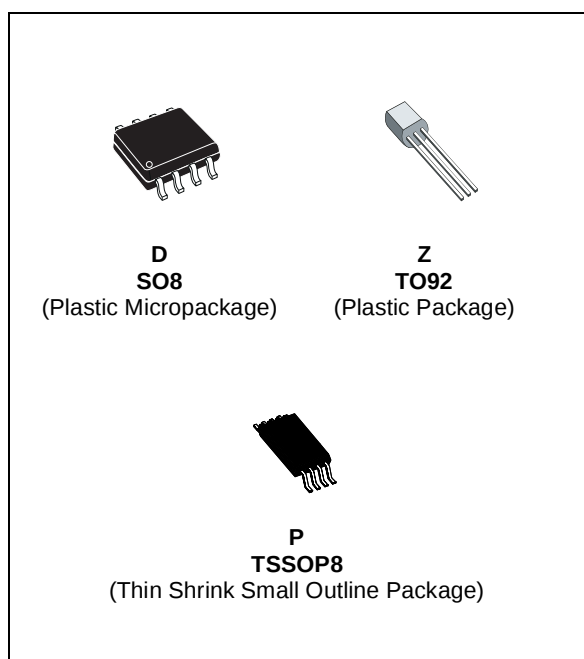
### ORDER CODE

| Part Number | Temperature Range | Package |   |   |
|-------------|-------------------|---------|---|---|
|             |                   | D       | Z | P |
| TS831-5I    | -40, +125°C       | •       | • | • |
| TS831-4I    |                   | •       | • | • |
| TS831-3I    |                   | •       | • | • |

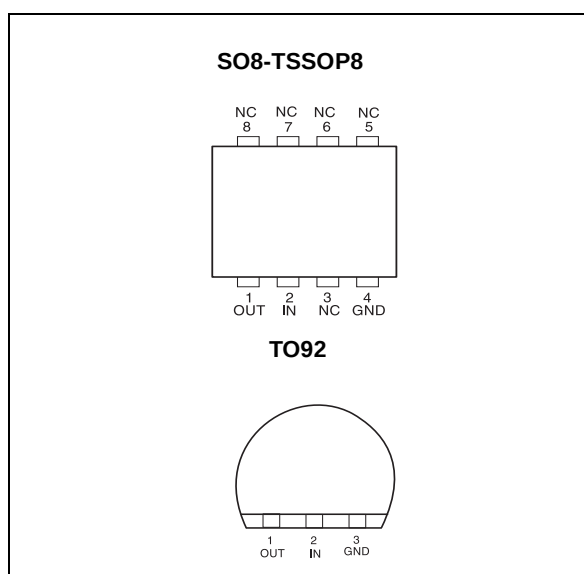
Z= TO92 Plastic package

D = Small Outline Package (SO) - also available in Tape & Reel (DT)

P = Thin Shrink Small Outline Package (TSSOP) - only available in Tape & Reel (PT)



### PIN CONNECTIONS (top view)



**ABSOLUTE MAXIMUM RATINGS**

| Symbol    | Parameter                                                 | Value                  | Unit |
|-----------|-----------------------------------------------------------|------------------------|------|
| $V_{CC}$  | Supply Voltage <sup>1)</sup>                              | 7                      | V    |
| $V_{OUT}$ | Output Voltage                                            | -0.3 to $V_{CC} + 0.3$ | V    |
| $I_{OUT}$ | Output Sink Current<br>TS831-5 and TS831-4<br>TS831-3     | 20<br>5                | mA   |
| $P_D$     | Power Dissipation <sup>2)</sup><br>TO92<br>SO8<br>TSSOP8  | 625<br>700<br>625      | mW   |
| $I_F$     | Clamp Diode Forward Current, pin 1 to pin 2 <sup>3)</sup> | 100                    | mA   |
| $T_{STG}$ | Storage Temperature                                       | -65 to +150            | °C   |

1. All voltages values, except differential voltage are with respect to network ground terminal.

2.  $T_j = 150^\circ\text{C}$ ,  $T_{amb} = 25^\circ\text{C}$  with  $R_{thja} = 200^\circ\text{C/W}$  for TO-92 package  
 $R_{thja} = 175^\circ\text{C/W}$  for SO8 package  
 $R_{thja} = 200^\circ\text{C/W}$  for TSSOP8 package

3. Maximum package power dissipation limits must be observed.

**OPERATING CONDITIONS**

| Symbol     | Parameter                            | Value       | Unit |
|------------|--------------------------------------|-------------|------|
| $V_{CC}$   | Supply Voltage                       | 1 to 5.5    | V    |
| $T_{OPER}$ | Operating Free Air Temperature Range | -40 to +125 | °C   |

**TS831-5**
**ELECTRICAL CHARACTERISTICS**  $T_{amb} = 25^\circ\text{C}$  (unless otherwise specified)

| Symbol    | Parameter                                                                                                             | Min.         | Typ. | Max.                | Unit |
|-----------|-----------------------------------------------------------------------------------------------------------------------|--------------|------|---------------------|------|
| $V_{THI}$ | Threshold Voltage with $V_{CC}$ Increasing<br>-40°C ≤ $T_{amb}$ ≤ +85°C<br>-40°C ≤ $T_{amb}$ ≤ +125°C                 | 4.11<br>4.11 | 4.33 | 4.46<br>4.50        | V    |
| $V_{THD}$ | Threshold Voltage with $V_{CC}$ Decreasing<br>-40°C ≤ $T_{amb}$ ≤ +85°C<br>-40°C ≤ $T_{amb}$ ≤ +125°C                 | 4.10<br>4.06 | 4.21 | 4.46<br>4.46        | V    |
| $V_{HYS}$ | Hysteresis Voltage                                                                                                    | 50           | 100  | 200                 | mV   |
| $I_{CC}$  | Current Consumption $V_{CC} = 5V$                                                                                     |              |      | 12                  | μA   |
| $V_{OL}$  | Low Level Output Voltage<br>-40°C ≤ $T_{amb}$ ≤ +85°C<br>-40°C ≤ $T_{amb}$ ≤ +125°C<br>$V_{CC} = 4V$ , $I_{OL} = 8mA$ |              | 450  | 800<br>1000<br>1300 | mV   |
| $I_{OH}$  | High Level Output Current<br>-40°C ≤ $T_{amb}$ ≤ +125°C<br>$V_{CC} = 5V$                                              |              | 2    | 100<br>1000         | nA   |
| $T_{PHL}$ | Response Time High to Low<br>$R_L = 10k\Omega$ , $C_L = 15pF$ , $V_{CC} = V_{THD} - 10mV$                             |              | 20   |                     | μs   |

**Note :** Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

**TS831-4****ELECTRICAL CHARACTERISTICS** Tamb = 25°C (unless otherwise specified)

| Symbol    | Parameter                                                                                             | Min.         | Typ. | Max.                | Unit |
|-----------|-------------------------------------------------------------------------------------------------------|--------------|------|---------------------|------|
| $V_{THI}$ | Threshold Voltage with $V_{CC}$ Increasing<br>-40°C ≤ Tamb ≤ +85°C<br>-40°C ≤ Tamb ≤ +125°C           | 4.18<br>4.18 | 4.50 | 4.66<br>4.70        | V    |
| $V_{THD}$ | Threshold Voltage with $V_{CC}$ Decreasing<br>-40°C ≤ Tamb ≤ +85°C<br>-40°C ≤ Tamb ≤ +125°C           | 4.17<br>4.13 | 4.40 | 4.66<br>4.66        | V    |
| $V_{HYS}$ | Hysteresis Voltage                                                                                    | 50           | 100  | 200                 | mV   |
| $I_{CC}$  | Current Consumption $V_{CC} = 5V$                                                                     |              |      | 12                  | μA   |
| $V_{OL}$  | Low Level Output Voltage $V_{CC} = 4V, I_{OL} = 8mA$<br>-40°C ≤ Tamb ≤ +85°C<br>-40°C ≤ Tamb ≤ +125°C |              | 450  | 800<br>1000<br>1300 | mV   |
| $I_{OH}$  | High Level Output Current $V_{CC} = 5V$<br>-40°C ≤ Tamb ≤ +125°C                                      |              | 2    | 100<br>1000         | nA   |
| $T_{PHL}$ | Response Time High to Low<br>$R_L = 10k\Omega, C_L = 15pF, V_{CC} = V_{THD} - 10mV$                   |              | 20   |                     | μs   |

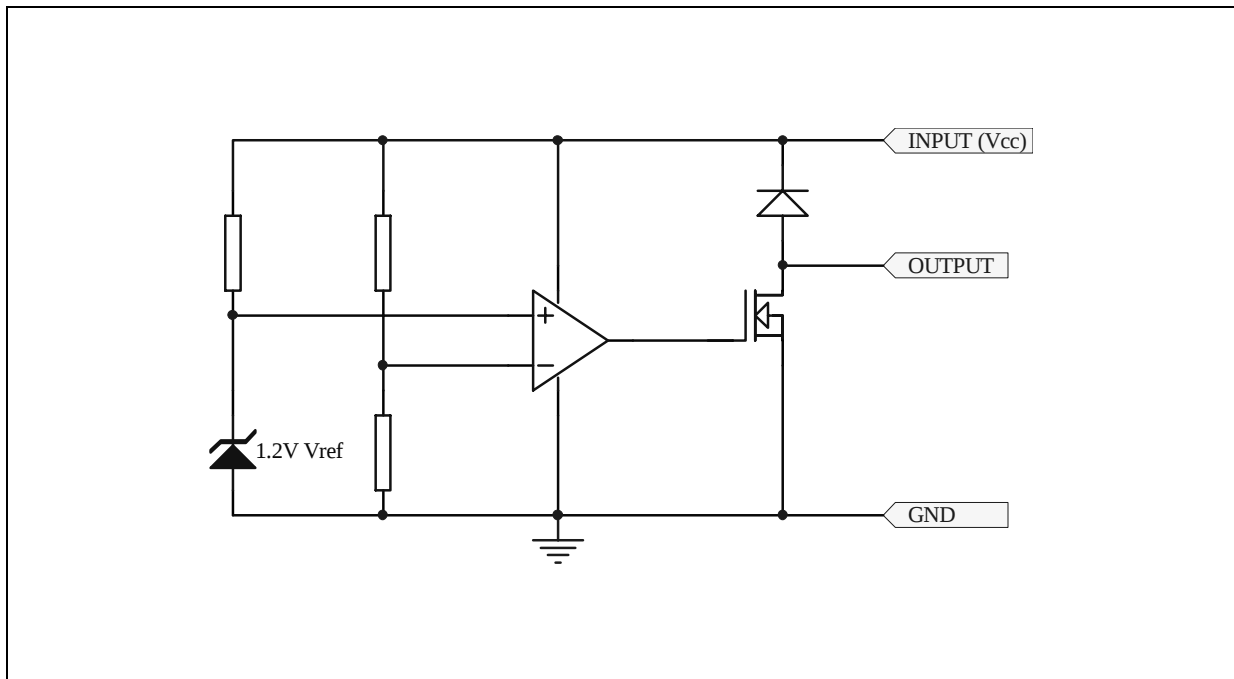
**Note :** Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

**TS831-3****ELECTRICAL CHARACTERISTICS** Tamb = 25°C (unless otherwise specified)

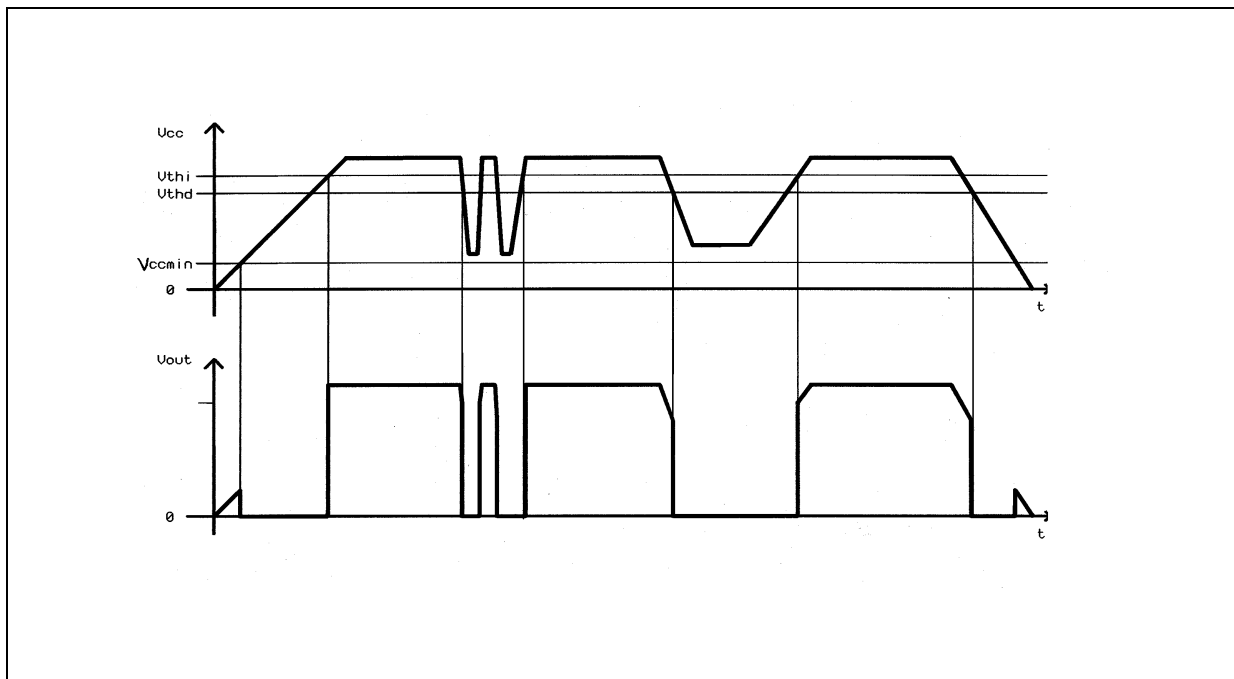
| Symbol    | Parameter                                                                           | Min. | Typ. | Max.        | Unit |
|-----------|-------------------------------------------------------------------------------------|------|------|-------------|------|
| $V_{THI}$ | Threshold Voltage with $V_{CC}$ Increasing<br>-40°C ≤ Tamb ≤ +125°C                 | 2.55 | 2.71 | 2.8         | V    |
| $V_{THD}$ | Threshold Voltage with $V_{CC}$ Decreasing<br>-40°C ≤ Tamb ≤ +125°C                 | 2.55 | 2.65 | 2.8         | V    |
| $V_{HYS}$ | Hysteresis Voltage                                                                  | 30   | 60   | 100         | mV   |
| $I_{CC}$  | Current Consumption $V_{CC} = 3V$                                                   |      |      | 12          | μA   |
| $V_{OL}$  | Low Level Output Voltage $V_{CC} = 2.4V, I_{OL} = 1mA$<br>-40°C ≤ Tamb ≤ +125°C     |      | 140  | 400<br>500  | mV   |
| $I_{OH}$  | High Level Output Current $V_{CC} = 3V$<br>-40°C ≤ Tamb ≤ +125°C                    |      | 2    | 100<br>1000 | nA   |
| $T_{PHL}$ | Response Time High to Low<br>$R_L = 10k\Omega, C_L = 15pF, V_{CC} = V_{THD} - 10mV$ |      | 20   |             | μs   |

**Note :** Limits are 100% production tested at 25°C. Limits over temperature are guaranteed through correlation and by design.

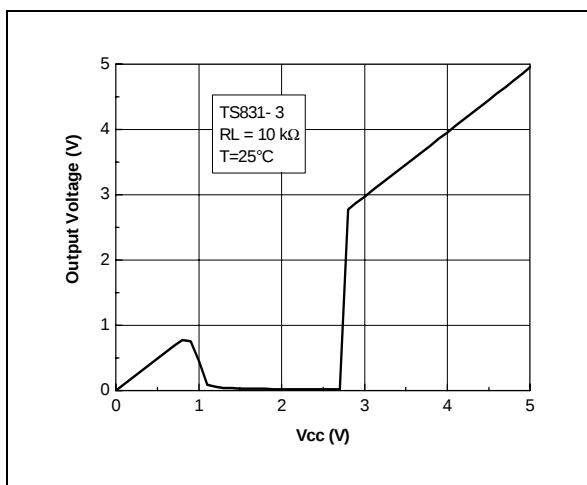
## EQUIVALENT SCHEMATIC DIAGRAM



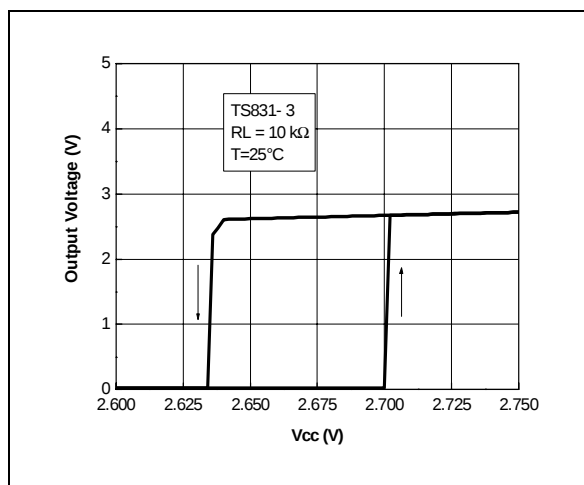
## TIMING DIAGRAM



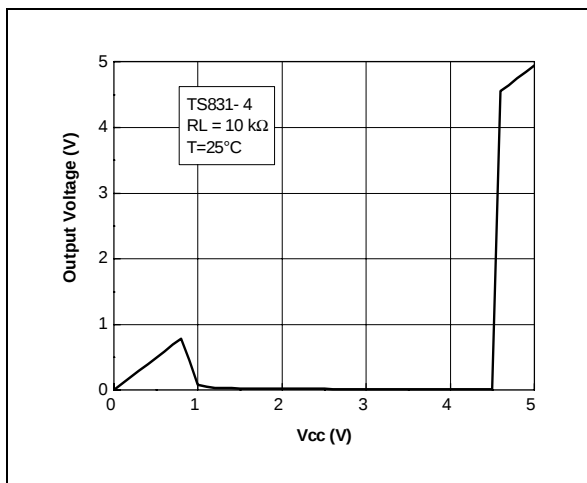
Output voltage versus Vcc



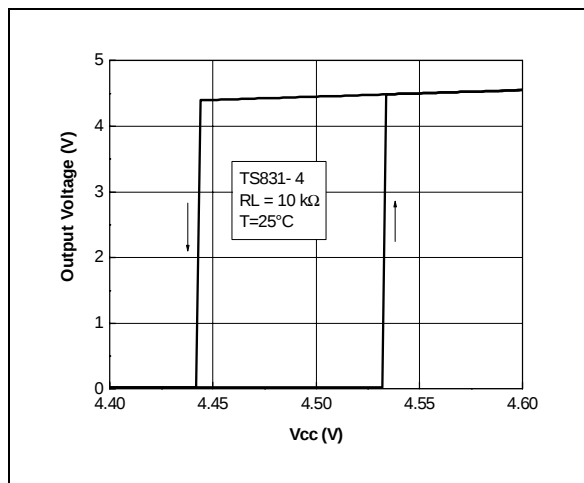
Reset output voltage versus Vcc



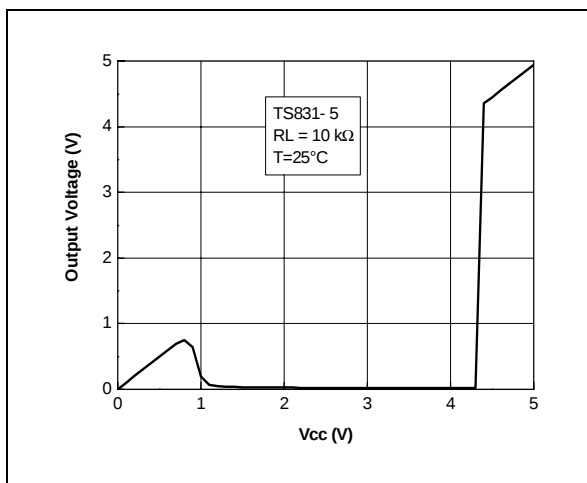
Output voltage versus Vcc



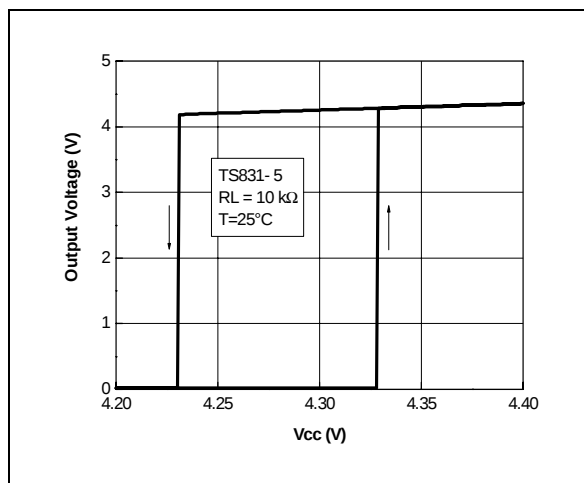
Reset output voltage versus Vcc



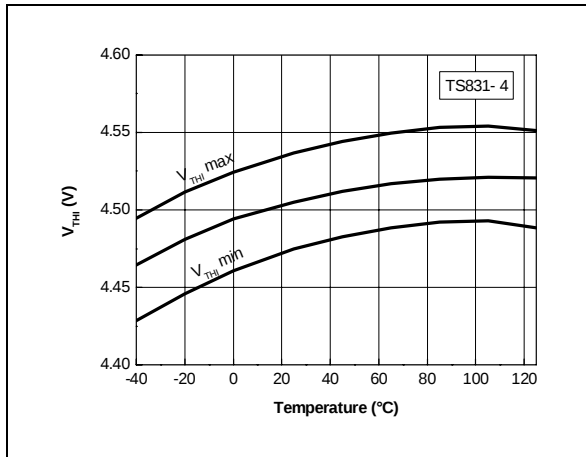
Output voltage versus Vcc



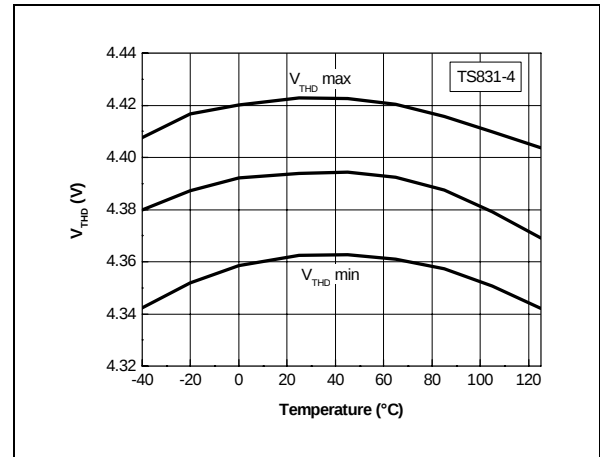
Reset output voltage versus Vcc



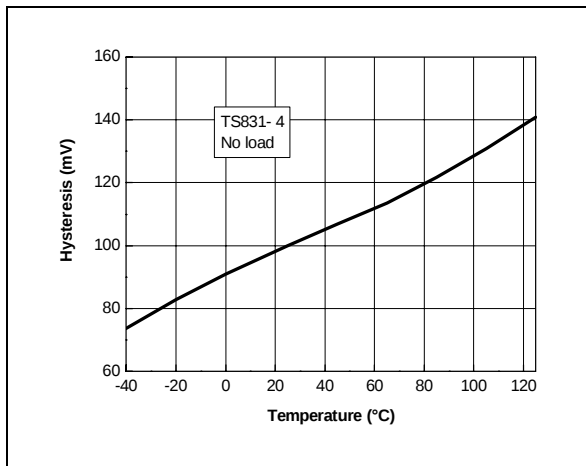
$V_{THI}$  versus temperature



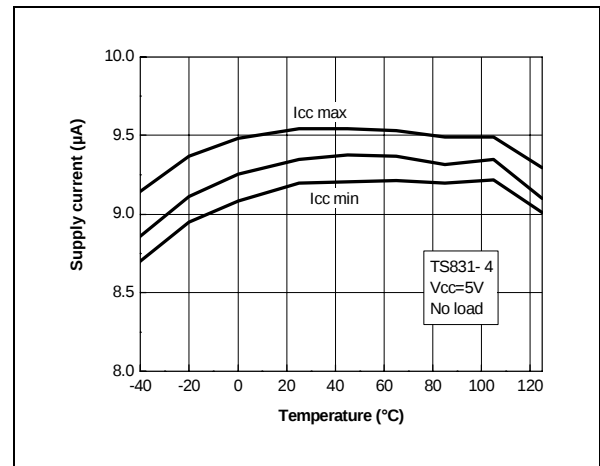
$V_{THD}$  versus temperature



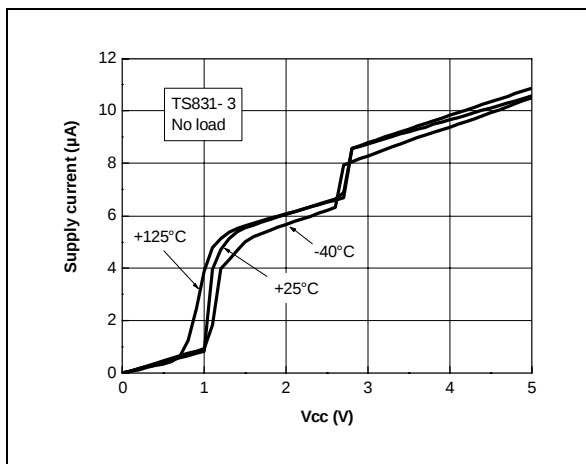
Hysteresis voltage versus temperature



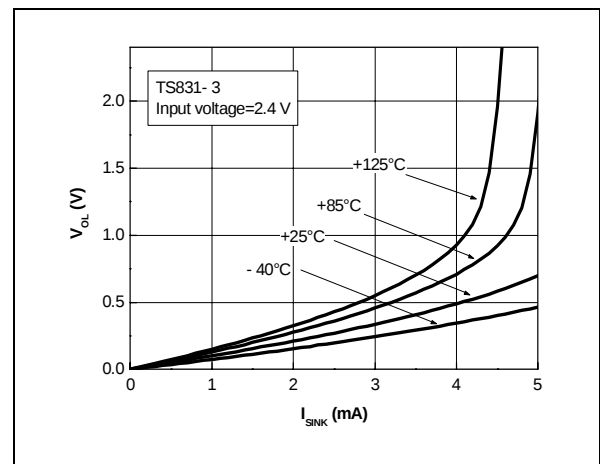
Supply current versus temperature

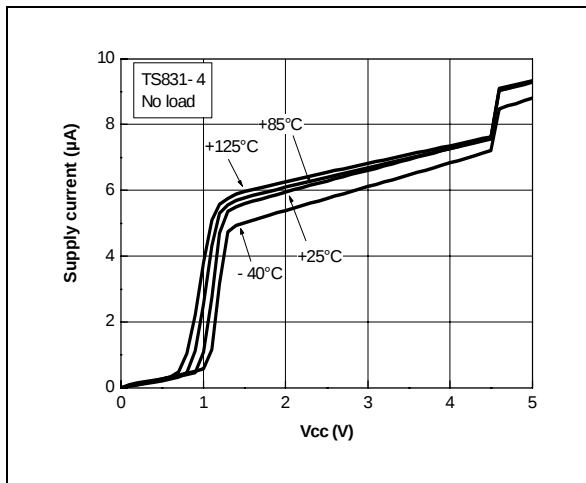
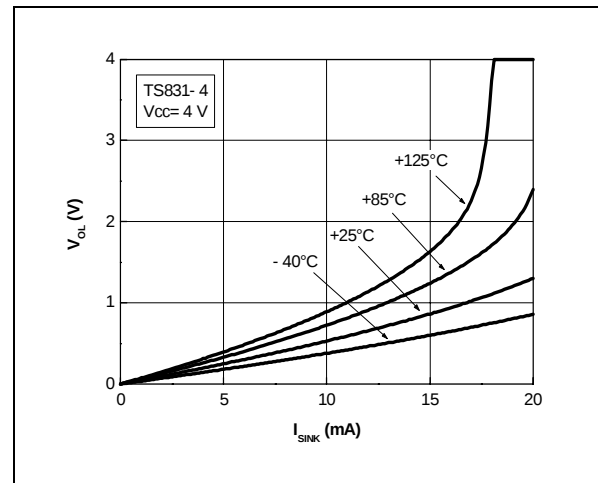
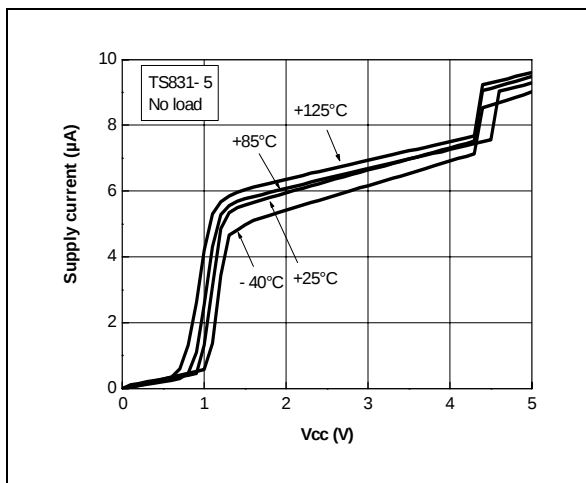
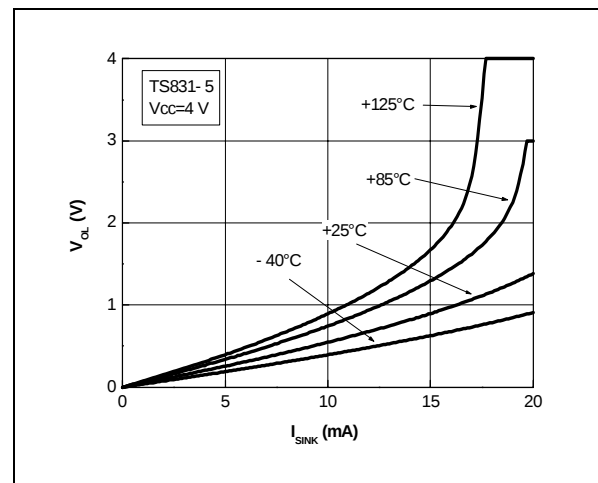


Supply current vs V<sub>CC</sub> & temperature

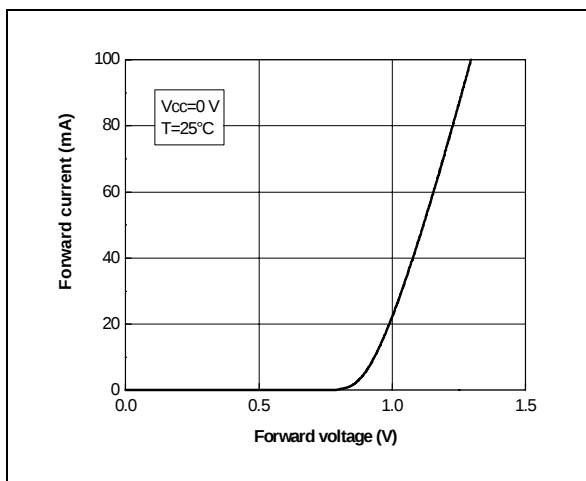


Voltage output low vs I<sub>sink</sub> & temperature

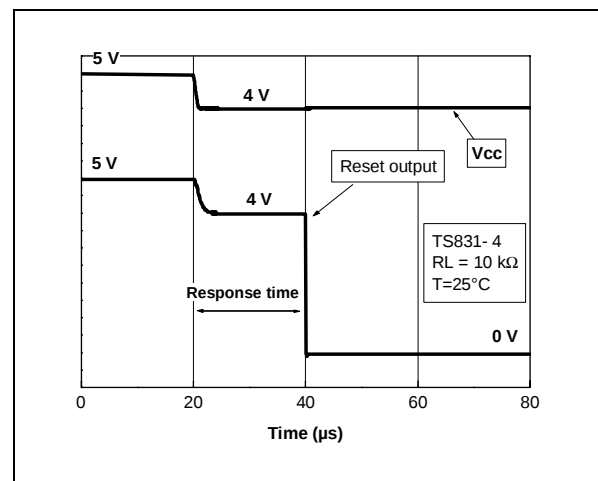


Supply current vs  $V_{CC}$  & temperatureVoltage output low vs  $I_{SINK}$  & temperatureSupply current vs  $V_{CC}$  & temperatureVoltage output low vs  $I_{SINK}$  & temperature

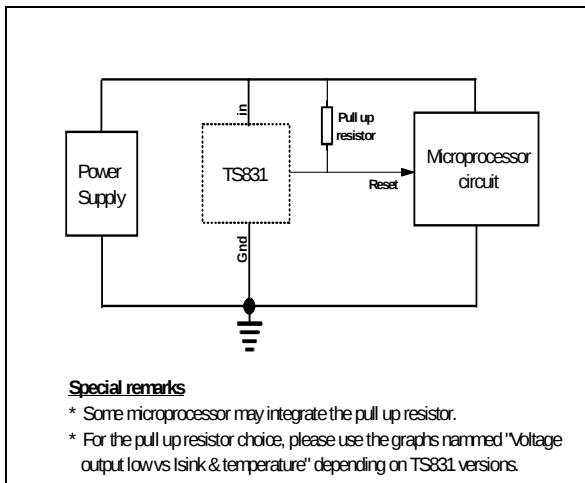
Clamp diode forward current versus voltage



Response time

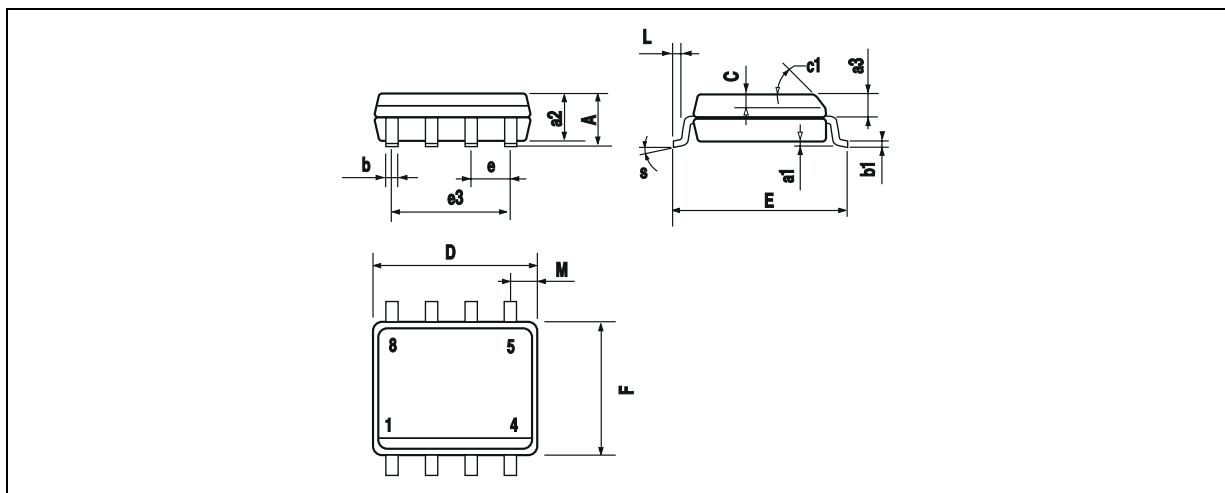


## Basic configuration



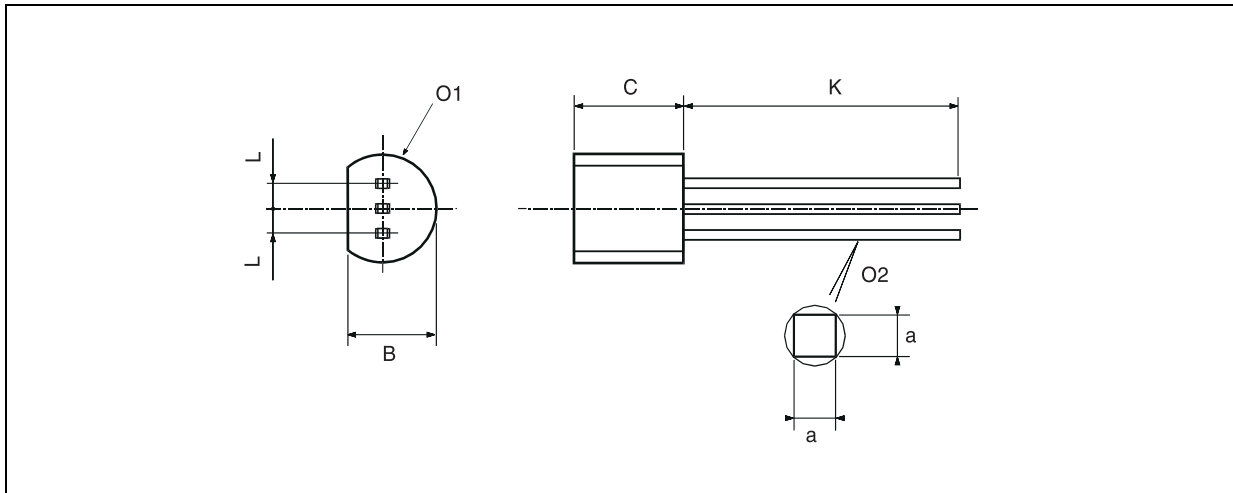
**PACKAGE MECHANICAL DATA**

8 PINS - PLASTIC MICROPACKAGE (SO)

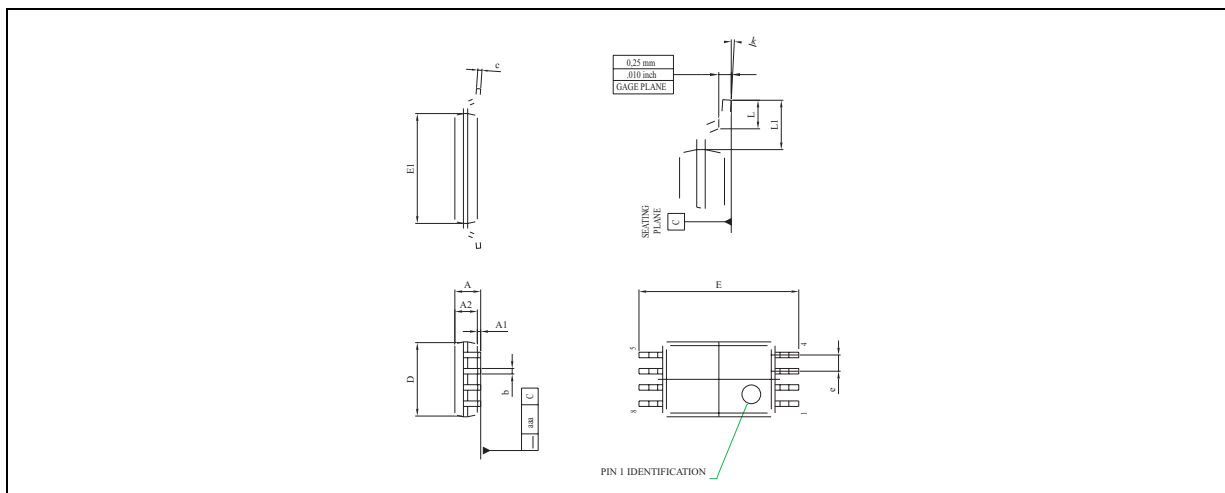


| Dim. | Millimeters |      |      | Inches |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A    |             |      | 1.75 |        |       | 0.069 |
| a1   | 0.1         |      | 0.25 | 0.004  |       | 0.010 |
| a2   |             |      | 1.65 |        |       | 0.065 |
| a3   | 0.65        |      | 0.85 | 0.026  |       | 0.033 |
| b    | 0.35        |      | 0.48 | 0.014  |       | 0.019 |
| b1   | 0.19        |      | 0.25 | 0.007  |       | 0.010 |
| C    | 0.25        |      | 0.5  | 0.010  |       | 0.020 |
| c1   | 45° (typ.)  |      |      |        |       |       |
| D    | 4.8         |      | 5.0  | 0.189  |       | 0.197 |
| E    | 5.8         |      | 6.2  | 0.228  |       | 0.244 |
| e    |             | 1.27 |      |        | 0.050 |       |
| e3   |             | 3.81 |      |        | 0.150 |       |
| F    | 3.8         |      | 4.0  | 0.150  |       | 0.157 |
| L    | 0.4         |      | 1.27 | 0.016  |       | 0.050 |
| M    |             |      | 0.6  |        |       | 0.024 |
| S    | 8° (max.)   |      |      |        |       |       |

**PACKAGE MECHANICAL DATA**  
3 PINS - PLASTIC PACKAGE TO92



| Dim. | Millimeters |      |       | Inches |        |        |
|------|-------------|------|-------|--------|--------|--------|
|      | Min         | Typ. | Max.  | Min.   | Typ.   | Max.   |
| L    |             | 1.27 |       |        | 0.05   |        |
| B    | 3.2         | 3.7  | 4.2   | 0.126  | 0.1457 | 0.1654 |
| O1   | 4.45        | 5.00 | 5.2   | 0.1752 | 0.1969 | 0.2047 |
| C    | 4.58        | 5.03 | 5.33  | 0.1803 | 0.198  | 0.2098 |
| K    | 12.7        |      |       | 0.5    |        |        |
| O2   | 0.407       | 0.5  | 0.508 | 0.016  | 0.0197 | 0.02   |
| a    | 0.35        |      |       | 0.0138 |        |        |

**PACKAGE MECHANICAL DATA****8 PINS - THIN SHRINK SMALL OUTLINE PACKAGE**

| Dim. | Millimeters |      |      | Inches |        |       |
|------|-------------|------|------|--------|--------|-------|
|      | Min.        | Typ. | Max. | Min.   | Typ.   | Max.  |
| A    |             |      | 1.20 |        |        | 0.05  |
| A1   | 0.05        |      | 0.15 | 0.01   |        | 0.006 |
| A2   | 0.80        | 1.00 | 1.05 | 0.031  | 0.039  | 0.041 |
| b    | 0.19        |      | 0.30 | 0.007  |        | 0.15  |
| c    | 0.09        |      | 0.20 | 0.003  |        | 0.012 |
| D    | 2.90        | 3.00 | 3.10 | 0.114  | 0.118  | 0.122 |
| E    |             | 6.40 |      |        | 0.252  |       |
| E1   | 4.30        | 4.40 | 4.50 | 0.169  | 0.173  | 0.177 |
| e    |             | 0.65 |      |        | 0.025  |       |
| k    | 0°          |      | 8°   | 0°     |        | 8°    |
| l    | 0.50        | 0.60 | 0.75 | 0.09   | 0.0236 | 0.030 |

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