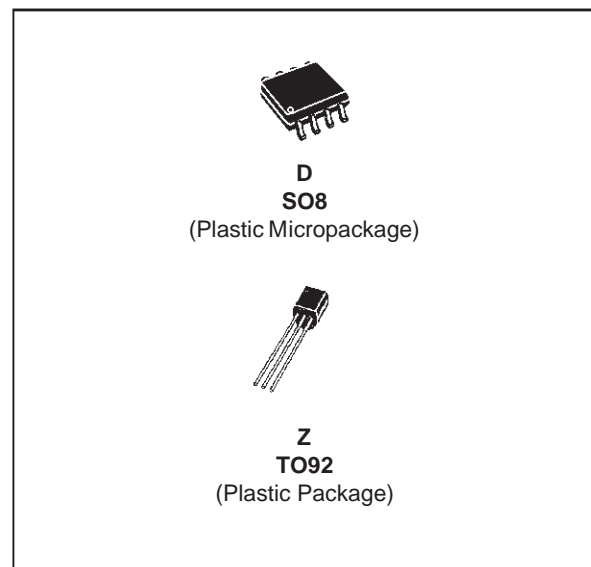




# TS836

## MICROPOWER VOLTAGE SUPERVISOR RESET ACTIVE HIGH

- ULTRA LOW POWER CONSUMPTION :  
12 $\mu$ A max. @ V<sub>CC</sub> = 5V
- PRECISION RESET THRESHOLD (guaranteed over Temperature)
- 4.50V<sub>typ.</sub> THRESHOLD VOLTAGE (TS836-4)
- GUARANTEED RESET OPERATION FOR V<sub>CC</sub> DOWN TO 1V
- OPEN DRAIN OUTPUT COMPARATOR WITH V<sub>OL</sub> = 450mV<sub>typ.</sub> @ I<sub>OL</sub> = 8mA & V<sub>CC</sub> = 4V
- FAST RESPONSE TIME : 20 $\mu$ s FOR A 10mV OVERDRIVE
- 100mV INTERNAL HYSTERESIS



### ORDER CODES

| Part Number | Temperature Range | Package |   |
|-------------|-------------------|---------|---|
|             |                   | D       | Z |
| TS836-4I    | -40, +85°C        | •       | ù |

### DESCRIPTION

The TS836 ultra low power integrated circuit incorporates a high stability band gap voltage reference and a comparator with open drain output.

The threshold voltage is set at 4.5V for TS836-4 by internal thermally matched resistances.

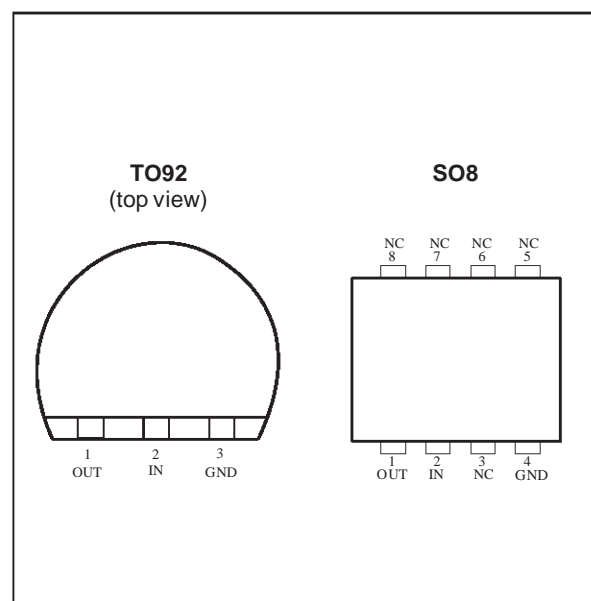
The comparator exhibits a 20 $\mu$ s response (with 10mV overdrive) and has an open drain output active when input voltage is higher than the threshold.

An internal hysteresis of 100mV increases the comparator's noise margin and prevents false reset operation.

### APPLICATIONS

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

### PIN CONNECTIONS



**ABSOLUTE MAXIMUM RATINGS**

| Symbol            | Parameter                            | Value                         | Unit |
|-------------------|--------------------------------------|-------------------------------|------|
| V <sub>CC</sub>   | Supply Voltage - note 1              | 7                             | V    |
| V <sub>out</sub>  | Output Voltage                       | -0.3 to V <sub>CC</sub> + 0.3 | V    |
| I <sub>out</sub>  | Output Current                       | 20                            | mA   |
| P <sub>d</sub>    | Power Dissipation                    | 200                           | mW   |
| T <sub>oper</sub> | Operating Free Air Temperature Range | -40 to +85                    | °C   |
| T <sub>stg</sub>  | Storage Temperature                  | -65 to +150                   | °C   |

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

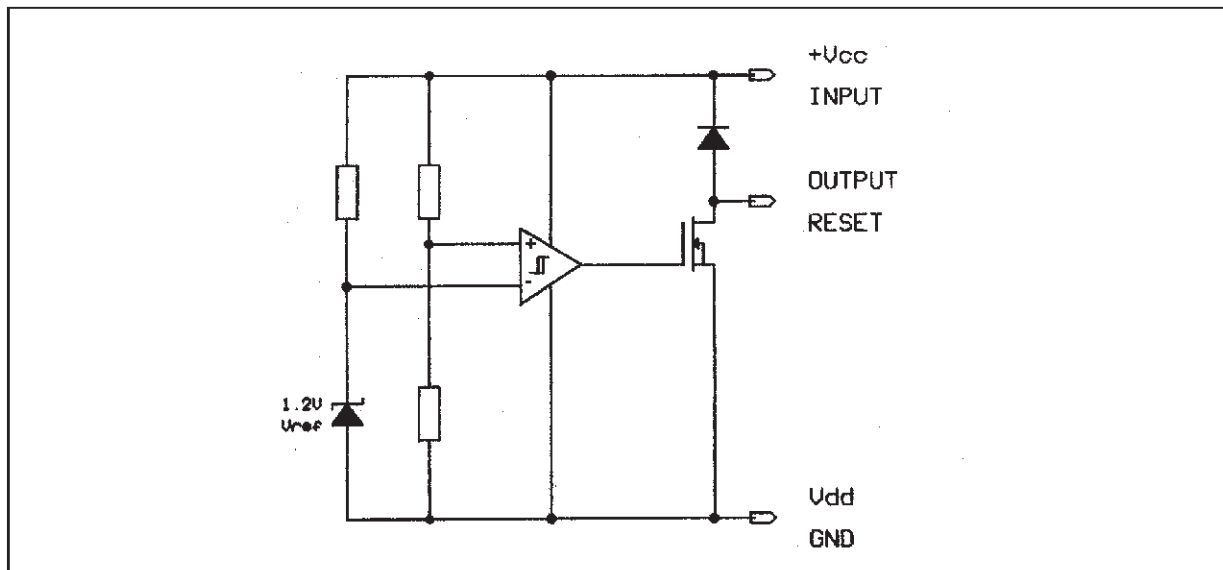
**OPERATING CONDITIONS**

| Symbol          | Parameter      | Value    | Unit |
|-----------------|----------------|----------|------|
| V <sub>CC</sub> | Supply Voltage | 1 to 5.5 | V    |

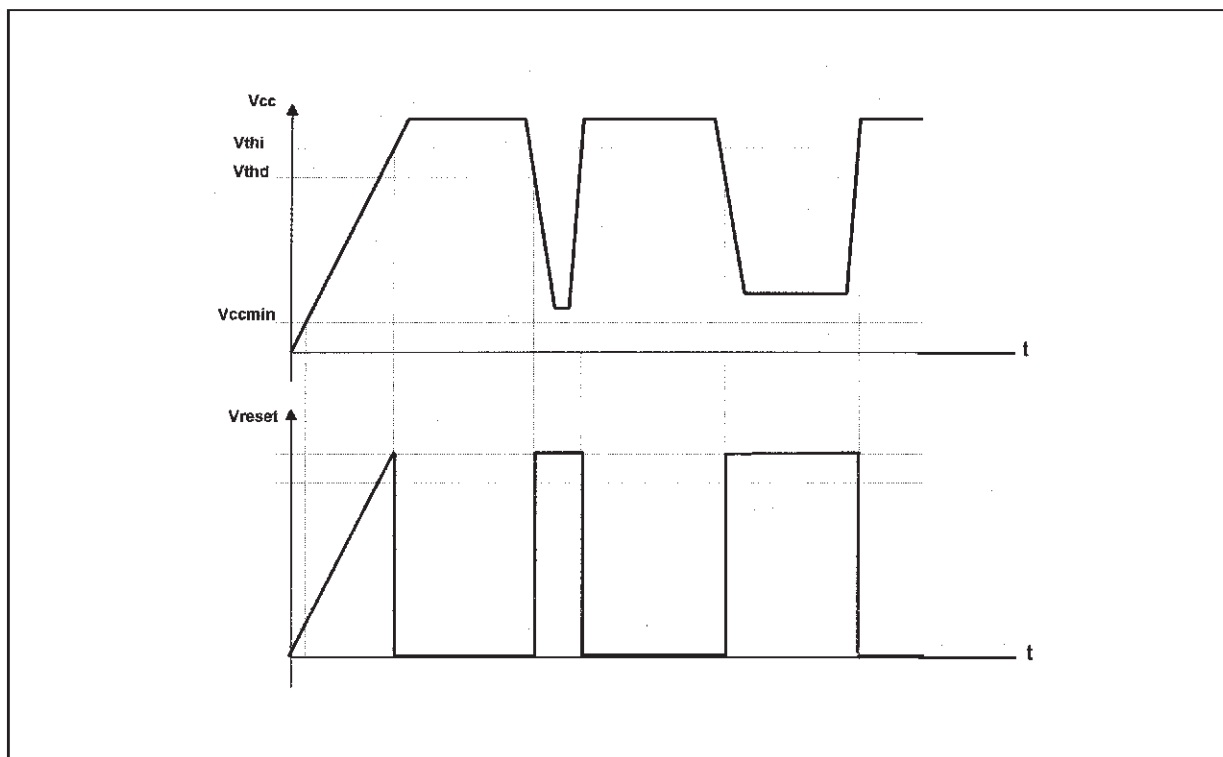
**TS836-4**
**ELECTRICAL CHARACTERISTICS** T<sub>amb</sub> = 25°C (unless otherwise specified)

| Symbol           | Parameter  | Min. | Typ. | Max.        | Unit |
|------------------|--|------|------|-------------|------|
| V <sub>thi</sub> | Threshold Voltage - V <sub>CC</sub> Increasing<br>T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>                       | 4.17 | 4.5  | 4.66        | V    |
| V <sub>thd</sub> | Threshold Voltage - V <sub>CC</sub> Decreasing<br>T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub>                       | 4.17 | 4.4  | 4.66        | V    |
| V <sub>hys</sub> | Hysteresis Voltage   | 50   | 100  | 200         | mV   |
| I <sub>CC</sub>  | Current Consumption V <sub>CC</sub> = 5V   |      |      | 12          | μA   |
| V <sub>OL</sub>  | Low Level Output Voltage<br>I <sub>OL</sub> = 8mA, T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub> V <sub>CC</sub> = 4V |      | 450  | 800<br>1000 | mV   |
| I <sub>OH</sub>  | Output Off-state Leakage<br>T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub> V <sub>CC</sub> = 5V                        |      | 2    | 100<br>1000 | nA   |
| t <sub>phl</sub> | Response Time High to Low<br>R <sub>L</sub> = 10kΩ, C <sub>L</sub> = 15pF, V <sub>CC</sub> = V <sub>thd</sub> -10mV              |      | 20   |             | μs   |

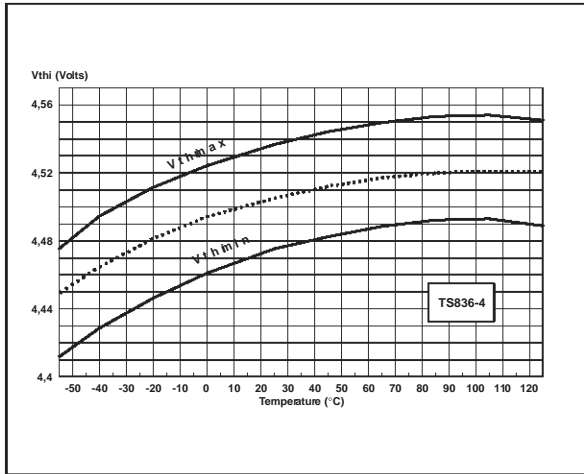
EQUIVALENT SCHEMATIC DIAGRAM



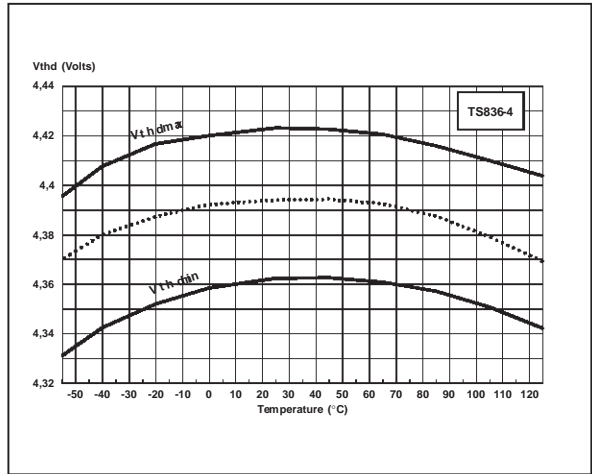
TIMING DIAGRAM



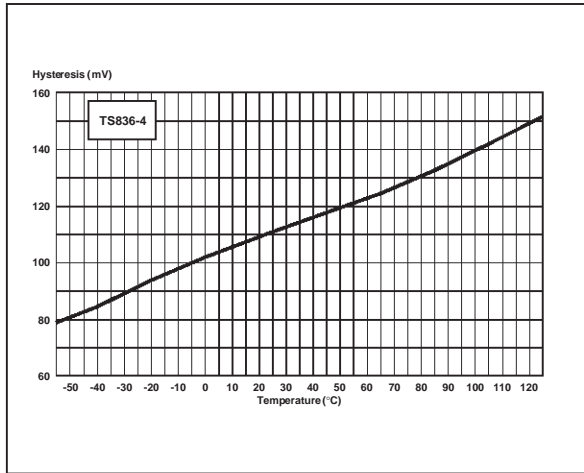
Vth vs Temperature while VCC increasing



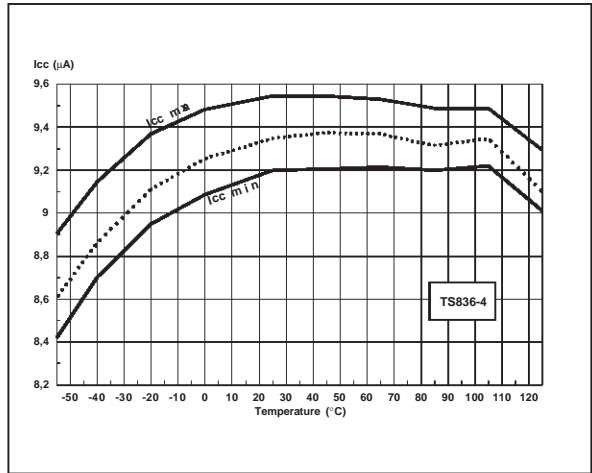
Vth vs Temperature while VCC decreasing



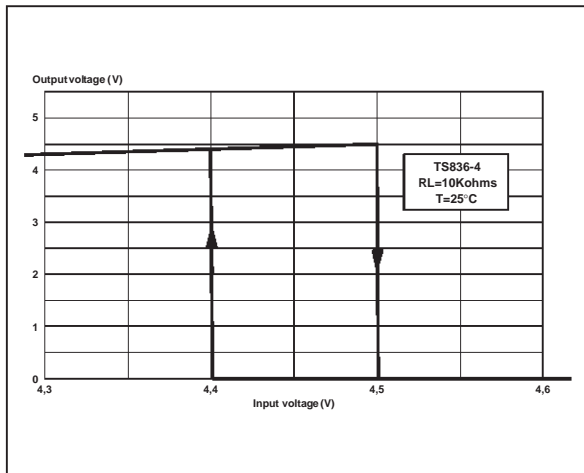
Hysteresis vs Temperature



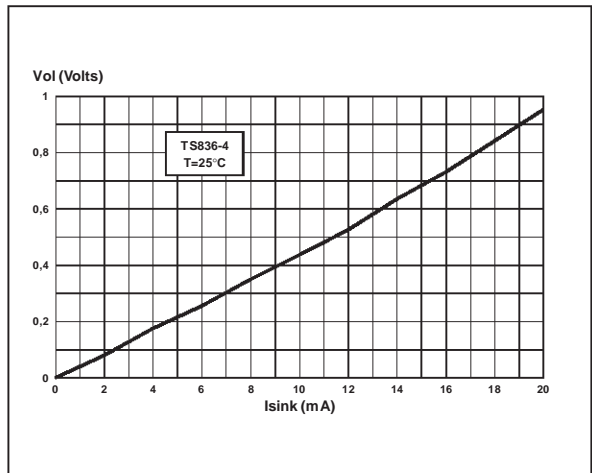
Icc vs Temperature



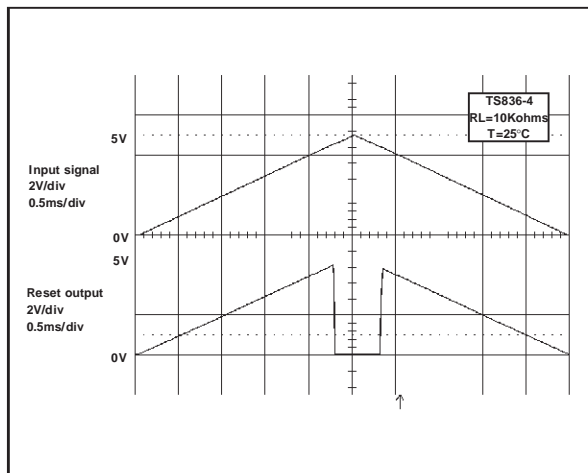
Reset Output Voltage vs Input Voltage



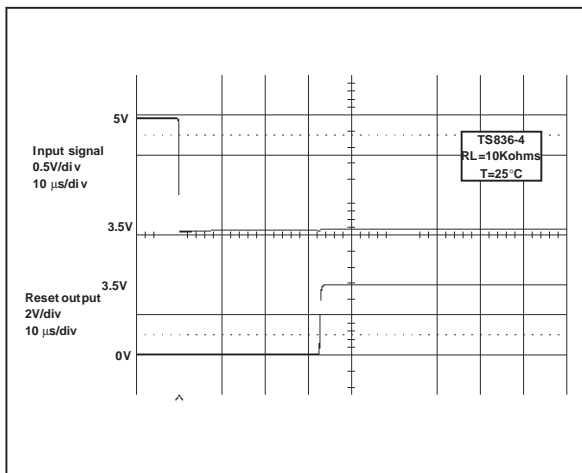
Voltage Output Low vs Sink Current



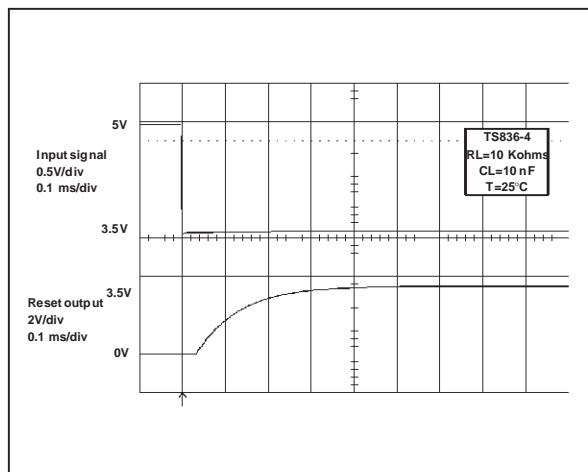
Reset Output Voltage vs Input Voltage



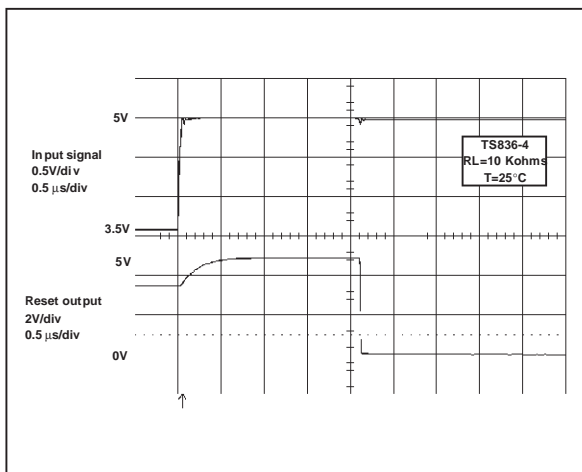
Supply Falling down : Reset Delay Time



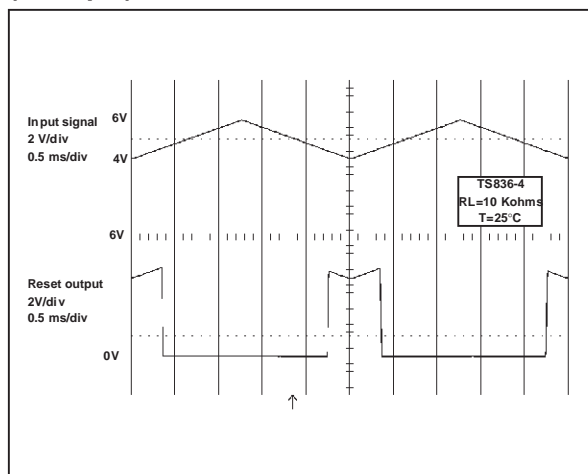
Supply Falling down : Extended Reset Delay Time with an Additional Capacitor



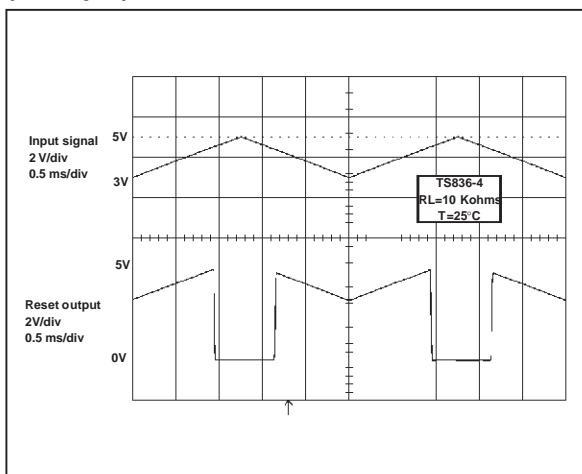
Supply Rising up : Output Delay Time



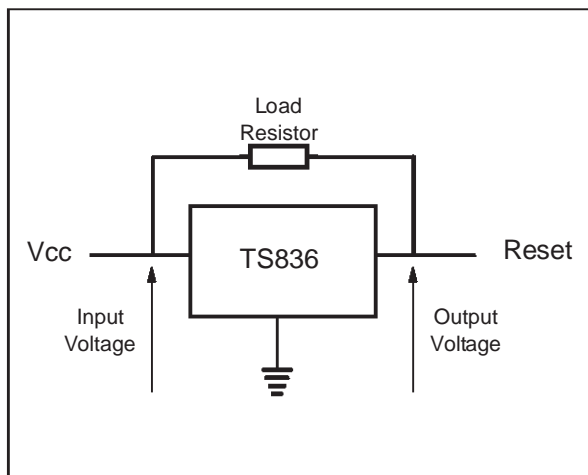
Reset Output Voltage vs Input Voltage (example)



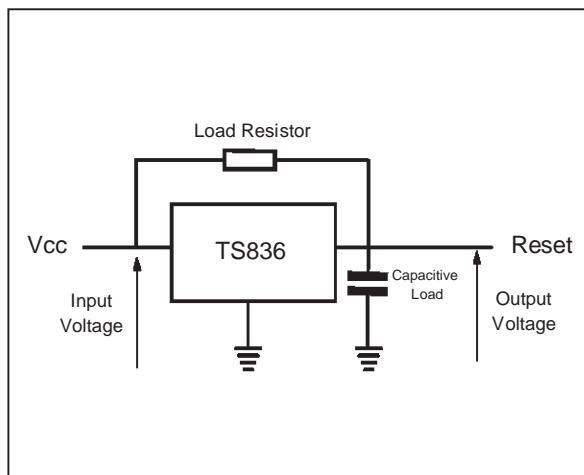
Reset Output Voltage vs Input Voltage (example)



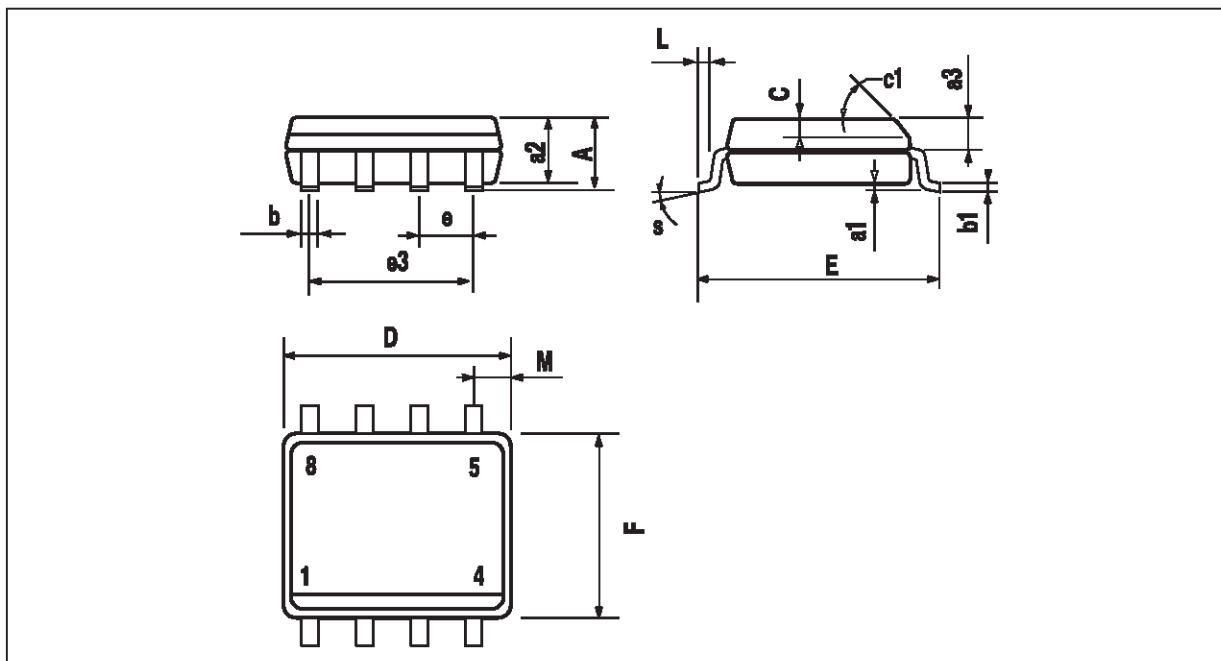
Basic Configuration



Configuration with an additional Capacitive Load

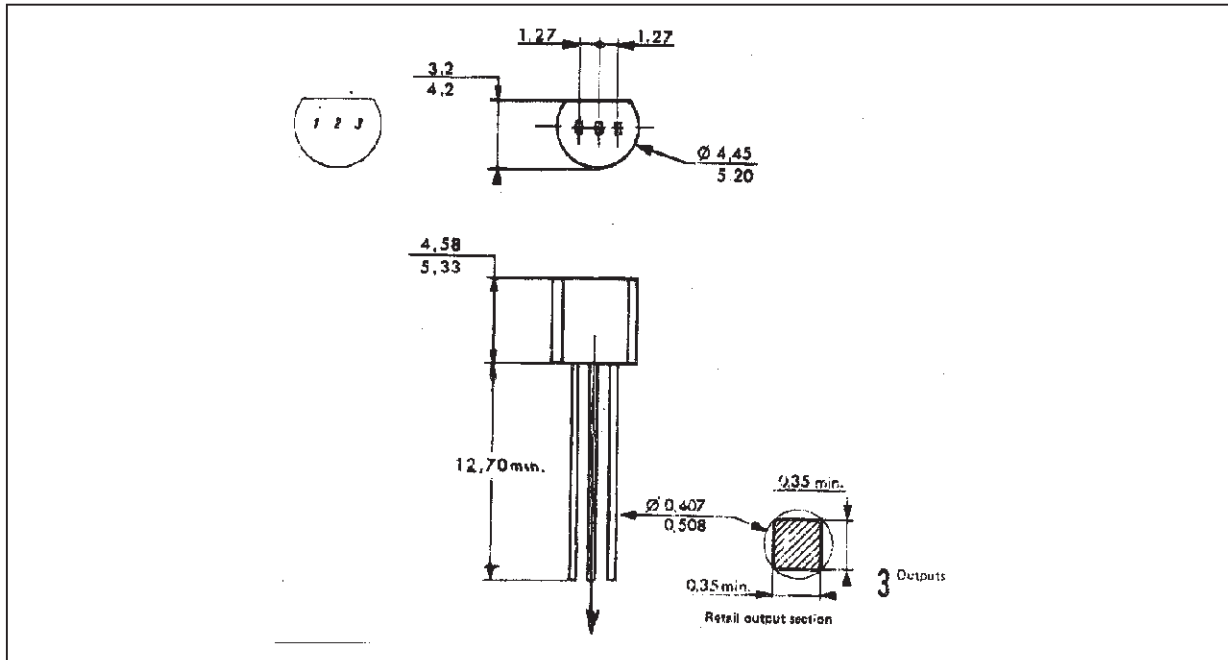


**PACKAGE MECHANICAL DATA**  
**8 PINS - PLASTIC MICROPACKAGE (SO)**



| 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 |        |        |

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