



TS836

MICROPOWER VOLTAGE SUPERVISOR RESET ACTIVE HIGH

- **ULTRA LOW POWER CONSUMPTION:** 12 μ A max. at $V_{cc} = 5V$
- **PRECISION RESET THRESHOLD** (guaranteed over Temperature)
- **THRESHOLD VOLTAGE:**
4.50V typ. FOR TS836-4
- **GUARANTEED RESET OPERATION FOR V_{cc} DOWN TO 1V**
- **OPEN DRAIN OUTPUT COMPARATOR**
WITH $V_{ol} = 450mV$ typ. @ $I_{ol} = 8mA$ & $V_{cc} = 4V$
- **FAST RESPONSE TIME:** 20 μ s FOR A 10mV OVERDRIVE
- **100mV INTERNAL HYSTERESIS**

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 μ s response (with 10mV overdrive) and has an open drain output active when input voltage is lower than the threshold.

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

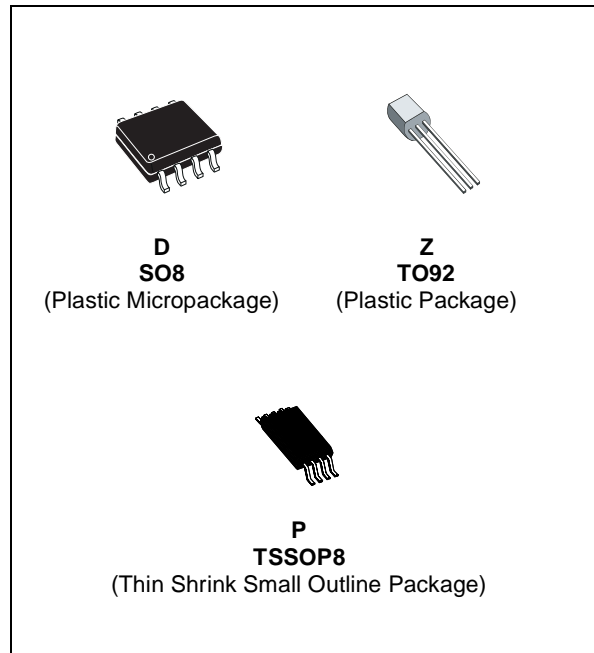
APPLICATION

- Power-on reset generator for micro controller
- Power failure detector

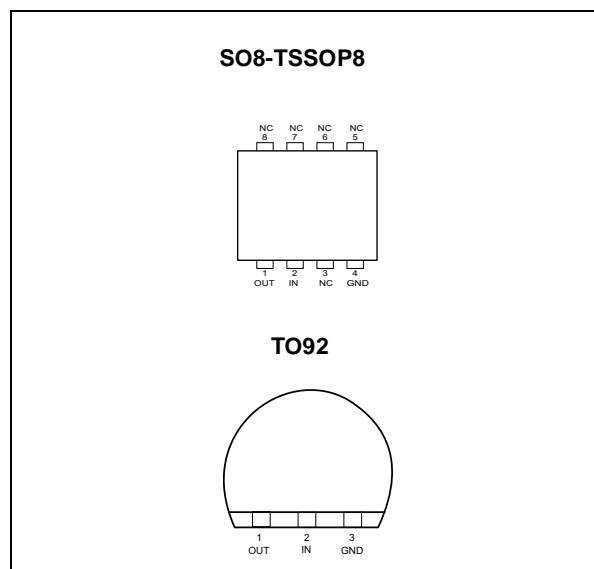
ORDER CODE

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

Z= T092 Plastic package - also available in Bulk (Z), Tape & Reel (ZT) and Ammo Pack (AP)
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 ¹⁾ | 7 | V | |
| V _{OUT} | Output Voltage | -0.3 to V _{CC} + 0.3 | V | |
| I _{OUT} | Output Current | 20 | mA | |
| P _D | Power Dissipation ²⁾ | SO8 TSSOP8 TO92 | 700 625 625 | mW |
| T _{STG} | Storage Temperature | -65 to +150 | °C | |

1. All voltages values, except differential voltage are with respect to network ground terminal.
 2. P_D is calculated with T_{AMB}=+25°C, T_J=+150°C and
 R_{THJA}= 175°C/W for SO8 package
 R_{THJA}= 200°C/W for TSSOP8 package
 R_{THJA}= 200°C/W for TO92 package

OPERATING CONDITIONS

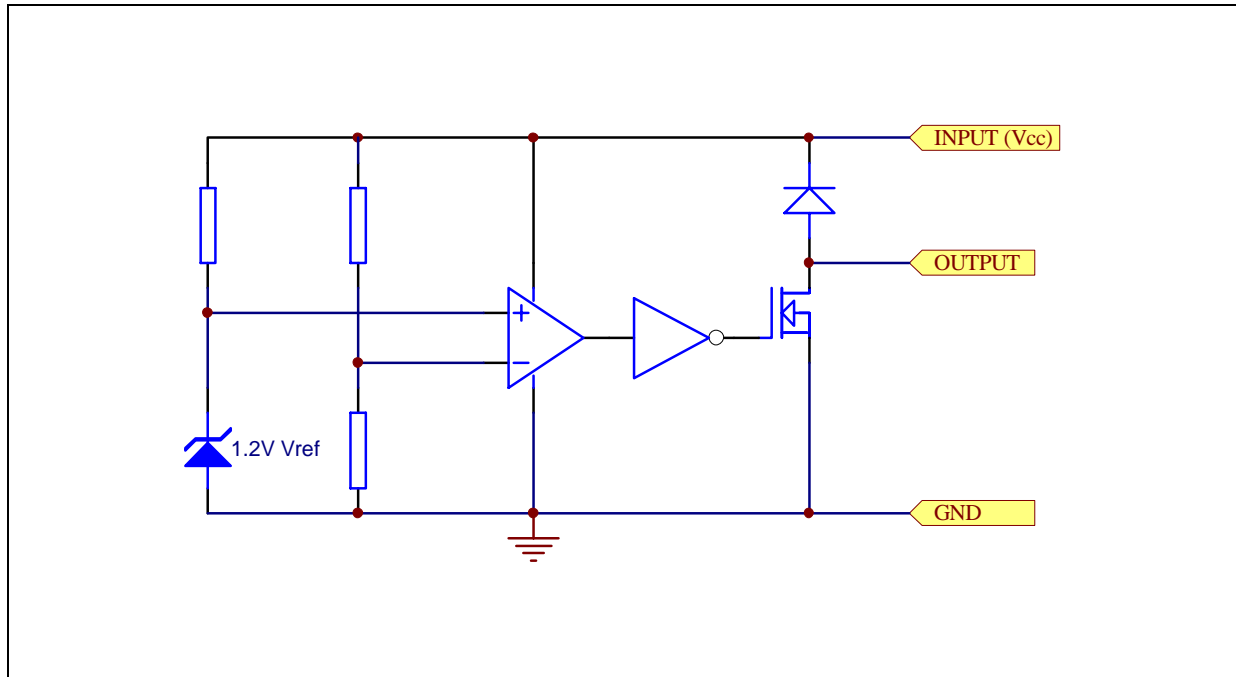
| Symbol | Parameter | Value | Unit |
|-------------------|--------------------------------------|------------|------|
| V _{CC} | Supply Voltage | 1 to 5.5 | V |
| T _{OPER} | Operating Free Air Temperature Range | -40 to +85 | °C |

TS836-4

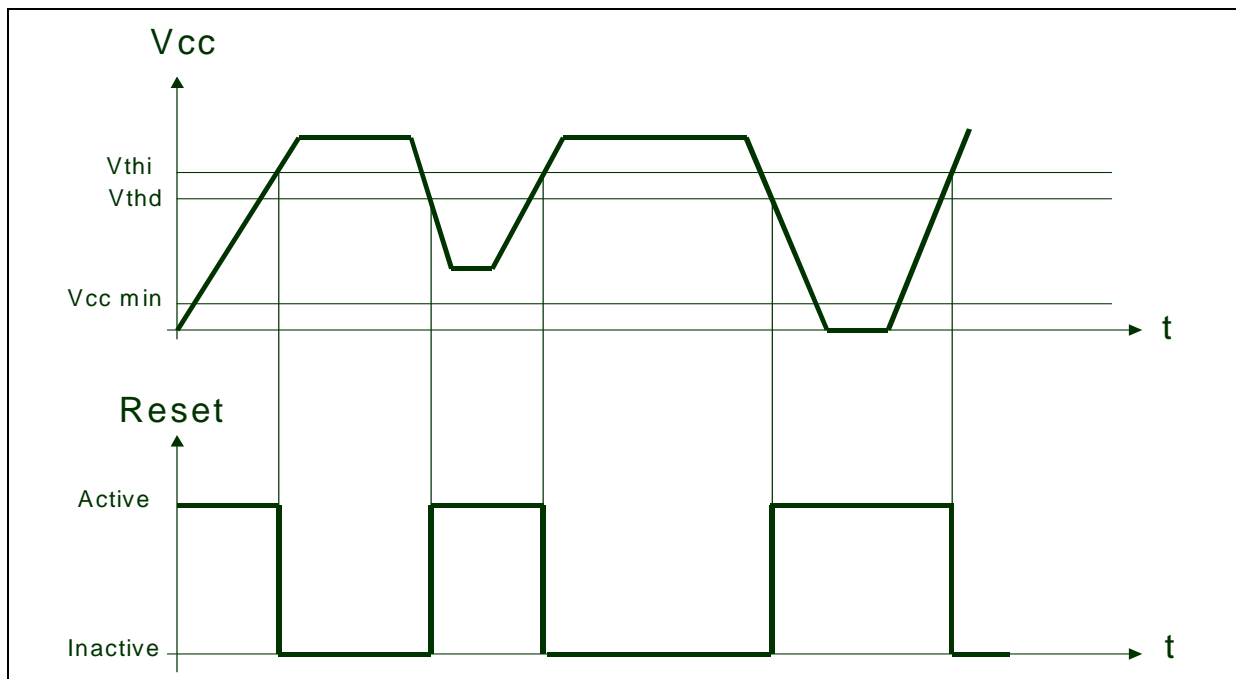
ELECTRICAL CHARACTERISTICS Tamb = 25°C (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|------------------|---|------|------|-------------|------|
| V _{THi} | Threshold Voltage - V _{CC} Increasing T _{min.} ≤ T _{amb} ≤ T _{max.} | 4.17 | 4.5 | 4.66 | V |
| V _{THD} | Threshold Voltage - V _{CC} Decreasing T _{min.} ≤ T _{amb} ≤ T _{max.} | 4.17 | 4.4 | 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 I _{OL} = 8mA, T _{min.} ≤ T _{amb} ≤ T _{max.} V _{CC} = 4V | | 450 | 800 1000 | mV |
| I _{OH} | Output Off-state Leakage T _{min.} ≤ T _{amb} ≤ T _{max.} V _{CC} = 5V | | 2 | 100 1000 | nA |
| T _{PHL} | Response Time High to Low R _L = 10kΩ, C _L = 15pF, V _{CC} = V _{thd} -10mV | | 20 | | μs |

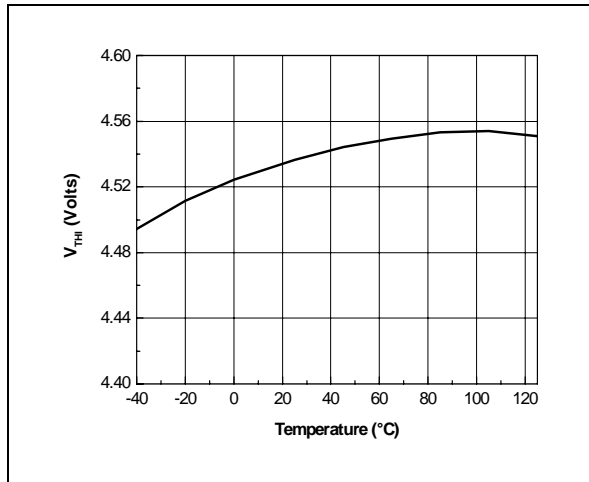
EQUIVALENT SCHEMATIC DIAGRAM



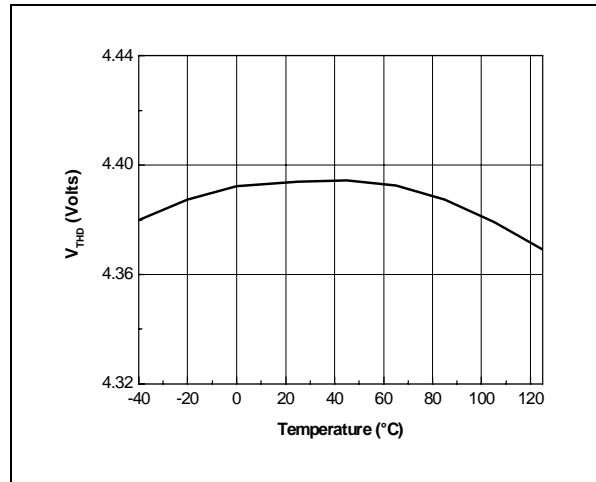
TIMING DIAGRAM



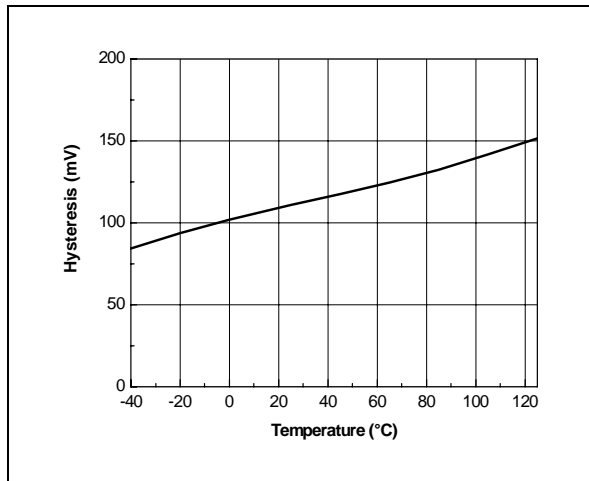
V_{th} vs Temperature while V_{CC} increasing



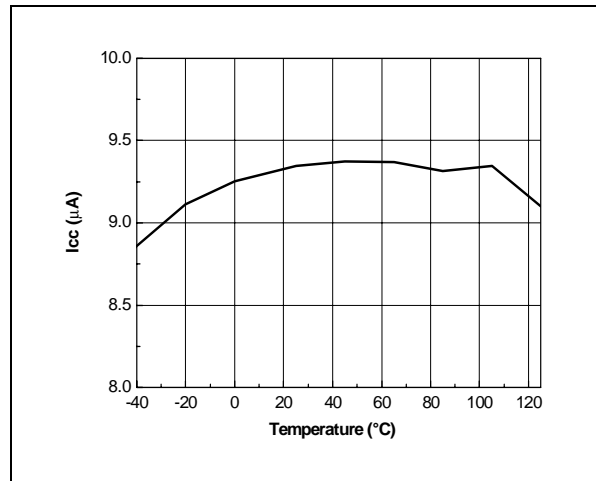
V_{thD} vs Temperature while V_{CC} decreasing



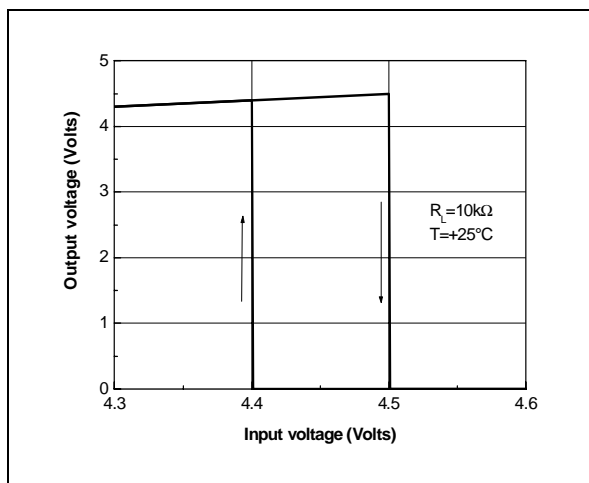
Hysteresis vs Temperature



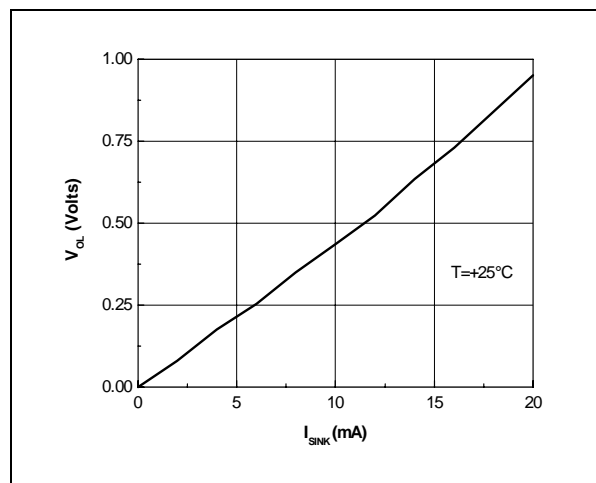
I_{CC} vs Temperature



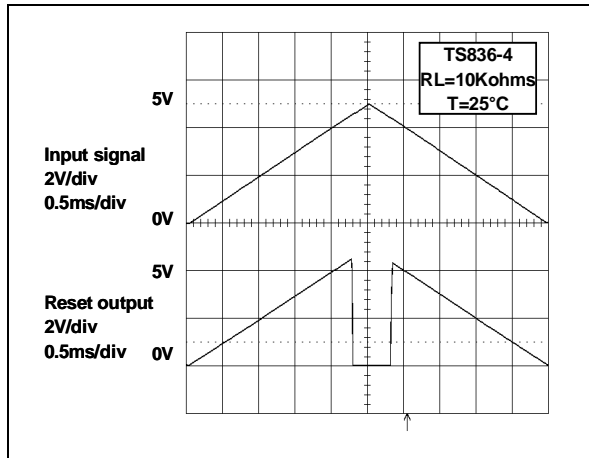
Reset Output Voltage vs Input Voltage



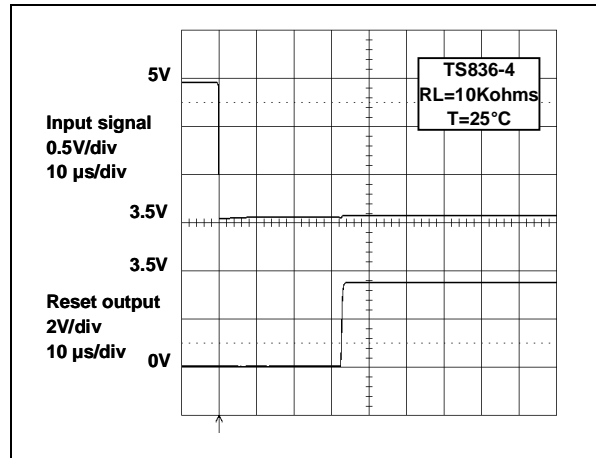
Voltage Output Low vs Sink Current



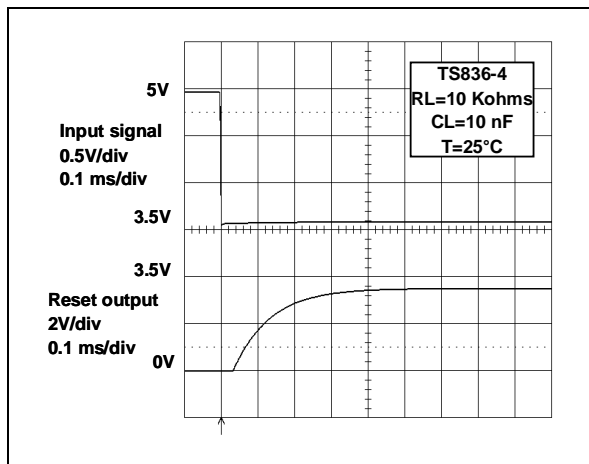
Reset Output Voltage vs Input Voltage



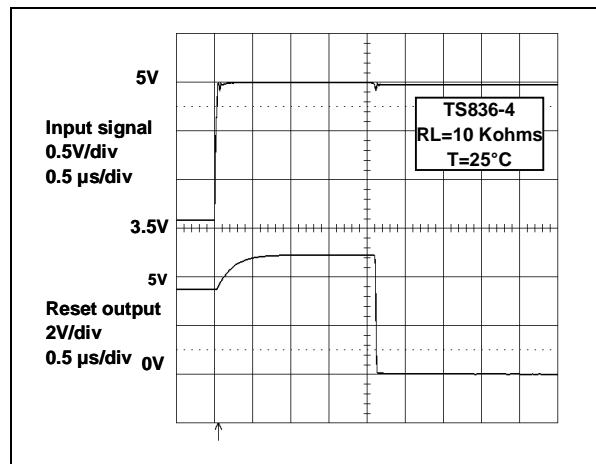
Supply Failing down: Reset Delay Time



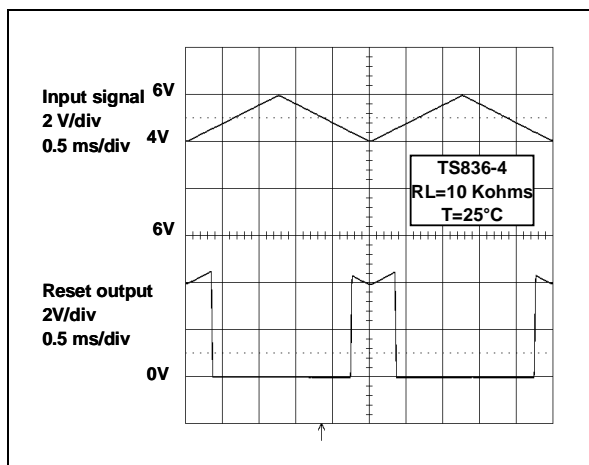
Supply Failing Down: Extended Reset Delay Time with an Additional Capacitor



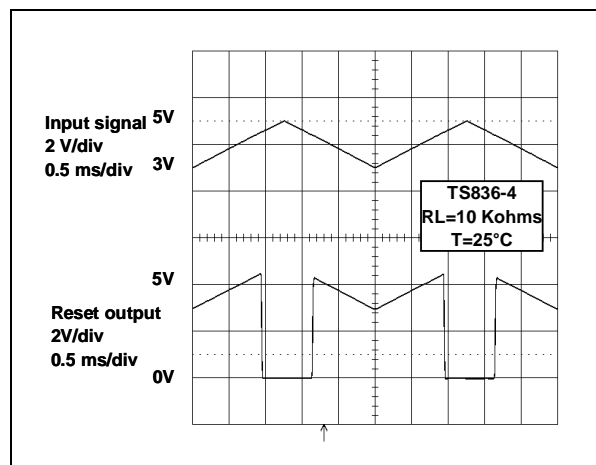
Supply Rising up: Output Delay Time



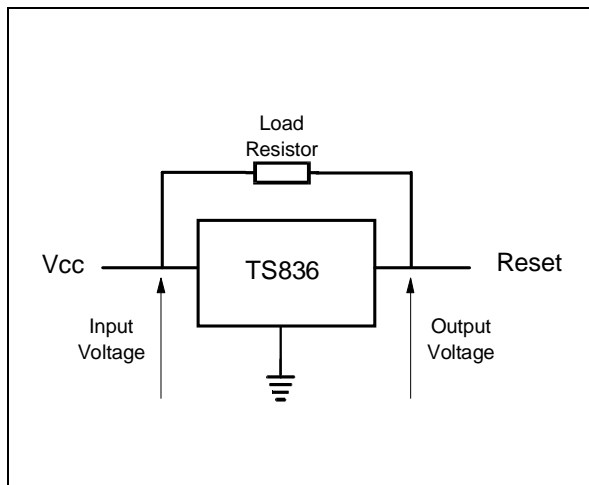
Reset Output Voltage vs Input Voltage (example)



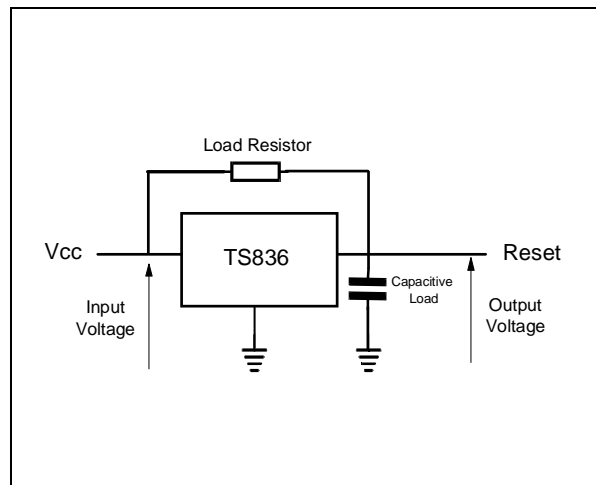
Reset Output Voltage vs Input Voltage (example)



Basic configuration



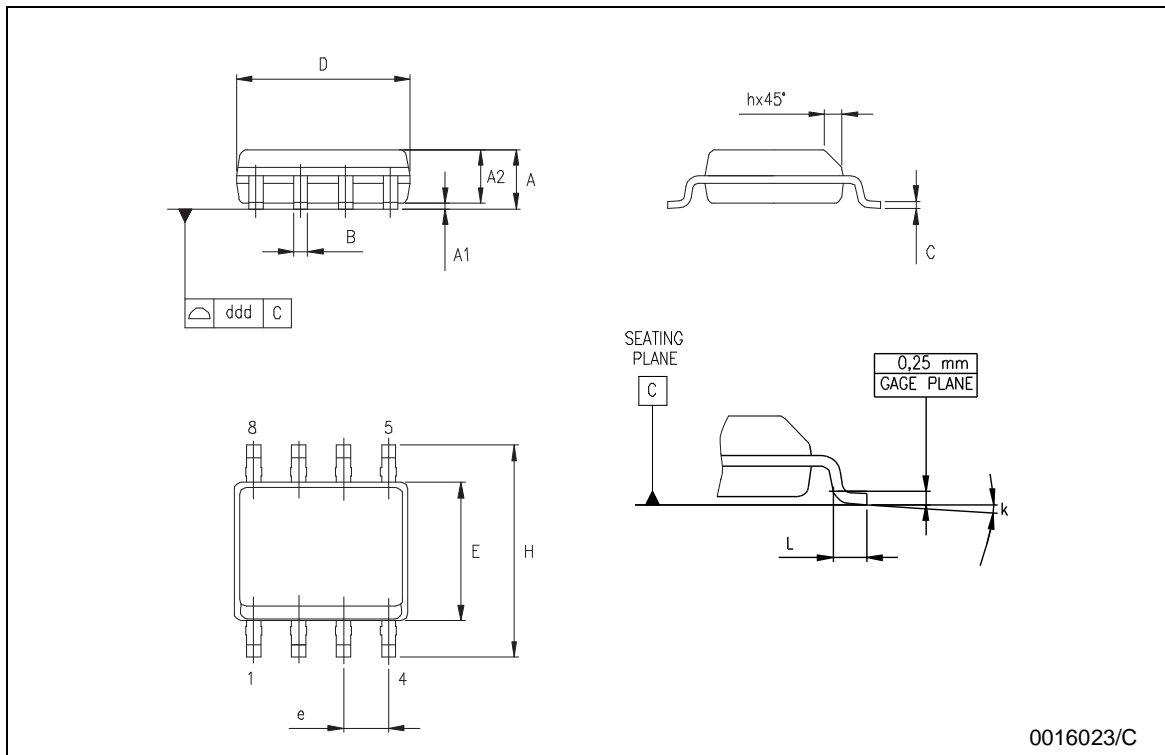
Configuration with an additional Capacitive Load



PACKAGE MECHANICAL DATA

SO-8 MECHANICAL DATA

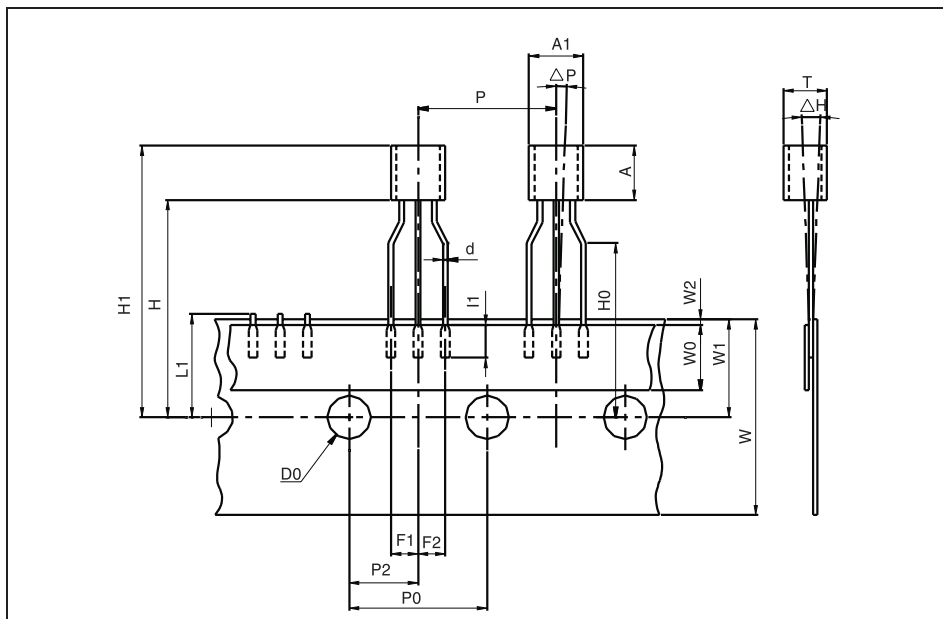
| DIM. | mm. | | | inch | | |
|------|------------------|------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 1.35 | | 1.75 | 0.053 | | 0.069 |
| A1 | 0.10 | | 0.25 | 0.04 | | 0.010 |
| A2 | 1.10 | | 1.65 | 0.043 | | 0.065 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.19 | | 0.25 | 0.007 | | 0.010 |
| D | 4.80 | | 5.00 | 0.189 | | 0.197 |
| E | 3.80 | | 4.00 | 0.150 | | 0.157 |
| e | | 1.27 | | | 0.050 | |
| H | 5.80 | | 6.20 | 0.228 | | 0.244 |
| h | 0.25 | | 0.50 | 0.010 | | 0.020 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| k | 8° (max.) | | | | | |
| ddd | | | 0.1 | | | 0.04 |



PACKAGE MECHANICAL DATA - TO92 TAPE AMMO PACK & TO92 TAPE & REEL

TO-92 MECHANICAL DATA

| DIM. | mm. | | | inches | | |
|-------|------|------|------|--------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| AL | | | 5.0 | | | 0.197 |
| A | | | 5.0 | | | 0.197 |
| T | | | 4.0 | | | 0.157 |
| d | | 0.45 | | | 0.018 | |
| l1 | 2.5 | | | 0.098 | | |
| P | 11.7 | 12.7 | 13.7 | 0.461 | 0.500 | 0.539 |
| PO | 12.4 | 12.7 | 13 | 0.488 | 0.500 | 0.512 |
| P2 | 5.95 | 6.35 | 6.75 | 0.234 | 0.250 | 0.266 |
| F1/F2 | 2.4 | 2.5 | 2.8 | 0.094 | 0.098 | 0.110 |
| h | -1 | 0 | 1 | -0.039 | 0 | 0.039 |
| P | -1 | 0 | 1 | -0.039 | 0 | 0.039 |
| W | 17.5 | 18.0 | 19.0 | 0.689 | 0.709 | 0.748 |
| W0 | 5.7 | 6 | 6.3 | 0.224 | 0.236 | 0.248 |
| W1 | 8.5 | 9 | 9.75 | 0.335 | 0.354 | 0.384 |
| W2 | | | 0.5 | | | 0.020 |
| H | | | 20 | | | 0.787 |
| H0 | 15.5 | 16 | 16.5 | 0.610 | 0.630 | 0.650 |
| H1 | | | 25 | | | 0.984 |
| DO | 3.8 | 4.0 | 4.2 | 0.150 | 0.157 | 0.165 |
| L1 | | | 11 | | | 0.433 |



Packing information are available at: <http://www.st.com/stonline/prodpres/packages/stdlin.htm>

PACKAGE MECHANICAL DATA - TO92 BULK

| TO-92 MECHANICA DATA | | | | | | |
|----------------------|------|------|-------|-------|------|-------|
| DIM. | mm. | | | mils | | |
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 4.32 | | 4.95 | 170.1 | | 194.9 |
| b | 0.36 | | 0.51 | 14.2 | | 20.1 |
| D | 4.45 | | 4.95 | 175.2 | | 194.9 |
| E | 3.30 | | 3.94 | 129.9 | | 155.1 |
| e | 2.41 | | 2.67 | 94.9 | | 105.1 |
| e1 | 1.14 | | 1.40 | 44.9 | | 55.1 |
| L | 12.7 | | 15.49 | 500.0 | | 609.8 |
| R | 2.16 | | 2.41 | 85.0 | | 94.9 |
| S1 | 0.92 | | 1.52 | 36.2 | | 59.8 |
| W | 0.41 | | 0.56 | 16.1 | | 22.0 |

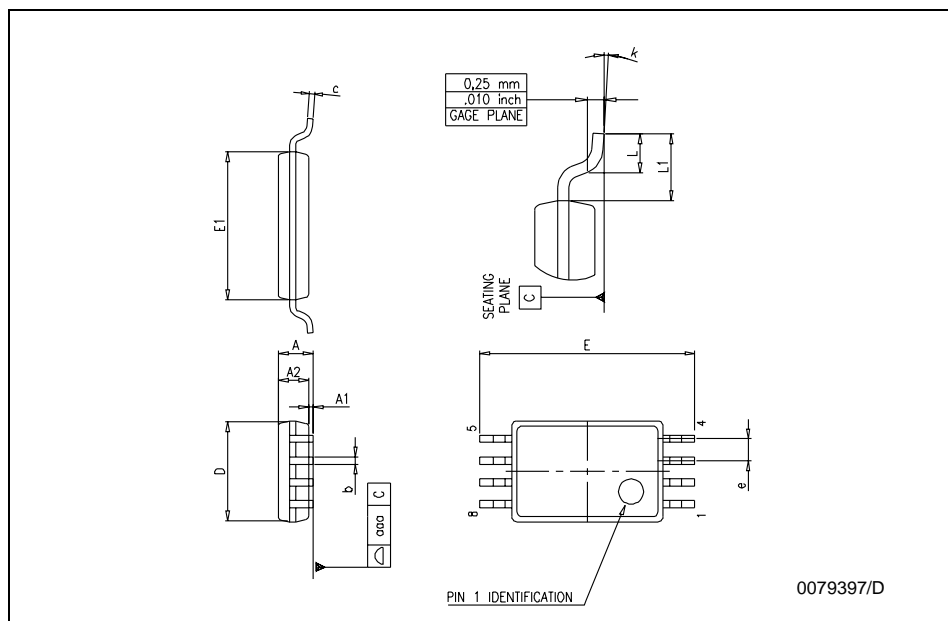
0102782/C

Packing information are available at: <http://www.st.com/stonline/prodpres/packages/stdlin.htm>

PACKAGE MECHANICAL DATA

TSSOP8 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|------|------|-------|--------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.006 |
| A2 | 0.80 | 1.00 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.008 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E | 6.20 | 6.40 | 6.60 | 0.244 | 0.252 | 0.260 |
| E1 | 4.30 | 4.40 | 4.50 | 0.169 | 0.173 | 0.177 |
| e | | 0.65 | | | 0.0256 | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |
| L1 | | 1 | | | 0.039 | |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2003 STMicroelectronics - Printed in Italy - All Rights Reserved
 STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco
 Singapore - Spain - Sweden - Switzerland - United Kingdom

© <http://www.st.com>

