



# TS836

## MICROPOWER VOLTAGE SUPERVISOR RESET ACTIVE HIGH

- **ULTRA LOW POWER CONSUMPTION:** 12µA 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:** 20µs 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 20µs 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.

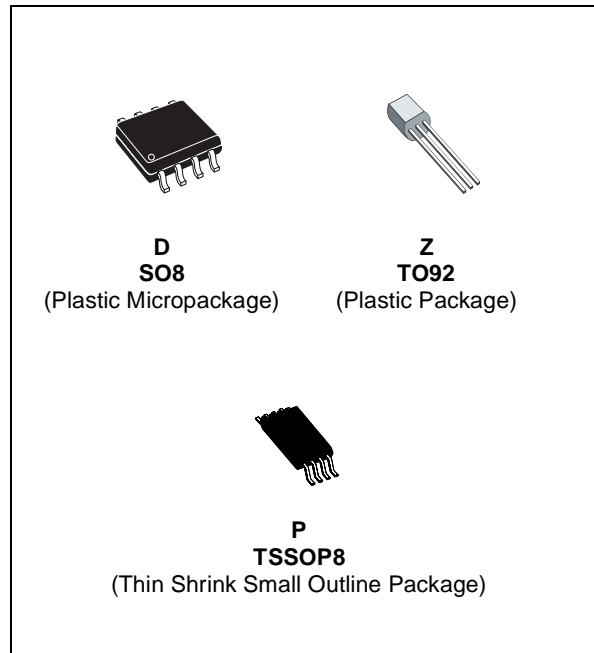
### APPLICATION

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

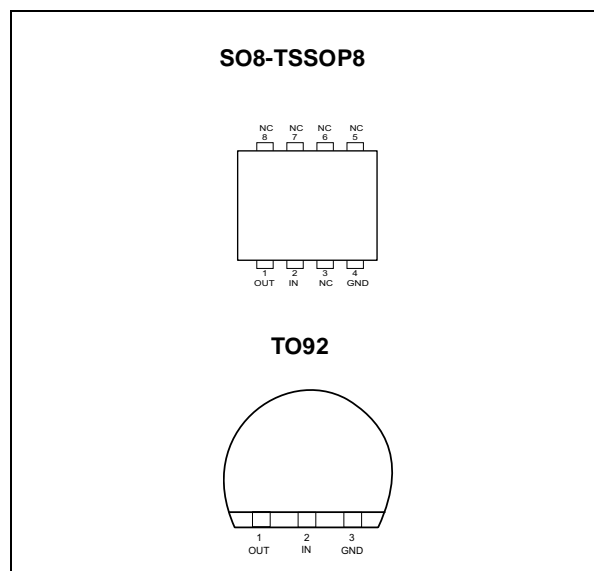
### ORDER CODE

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 <sub>CC</sub>	Supply Voltage <sup>1)</sup>	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 <sup>2)</sup>	SO8 TSSOP8 TO92	700 625 625	mW
T <sub>STG</sub>	Storage Temperature	-65 to +150	°C	

1. All voltages values, except differential voltage are with respect to network ground terminal.  
 2. P<sub>D</sub> is calculated with T<sub>AMB</sub>=+25°C, T<sub>J</sub>=+150°C and  
 R<sub>THJA</sub>= 175°C/W for SO8 package  
 R<sub>THJA</sub>= 200°C/W for TSSOP8 package  
 R<sub>THJA</sub>= 200°C/W for TO92 package

**OPERATING CONDITIONS**

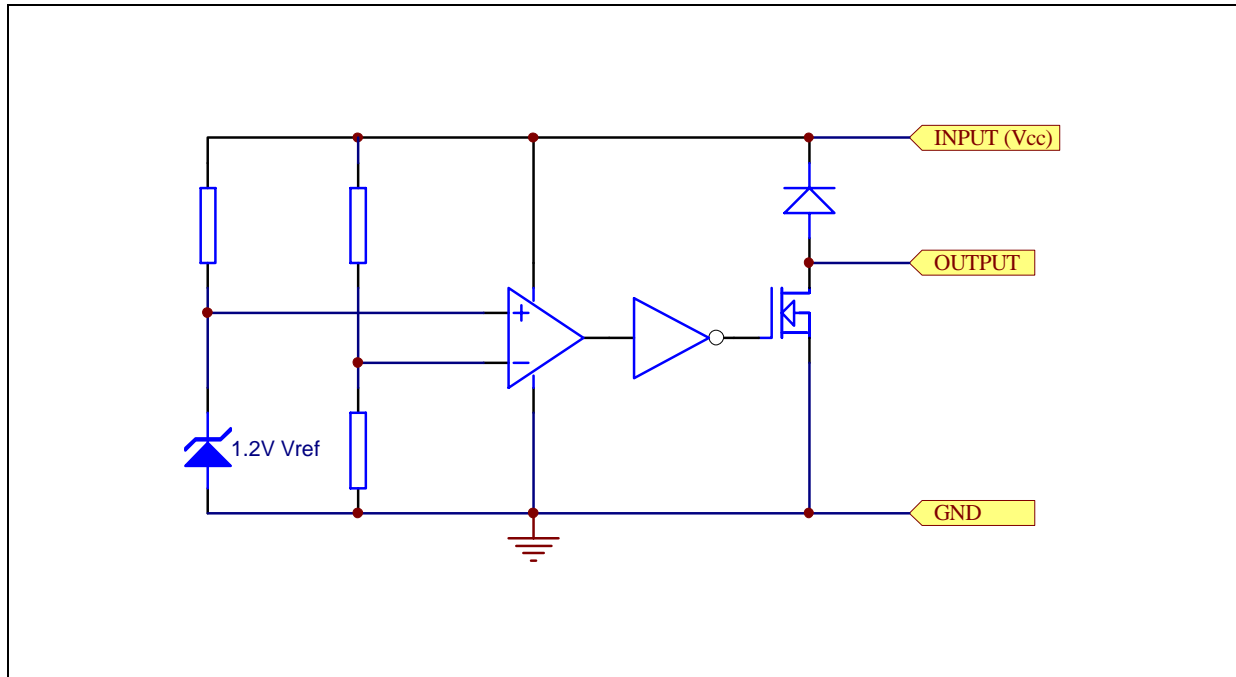
Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	1 to 5.5	V
T <sub>OPER</sub>	Operating Free Air Temperature Range	-40 to +85	°C

**TS836-4**

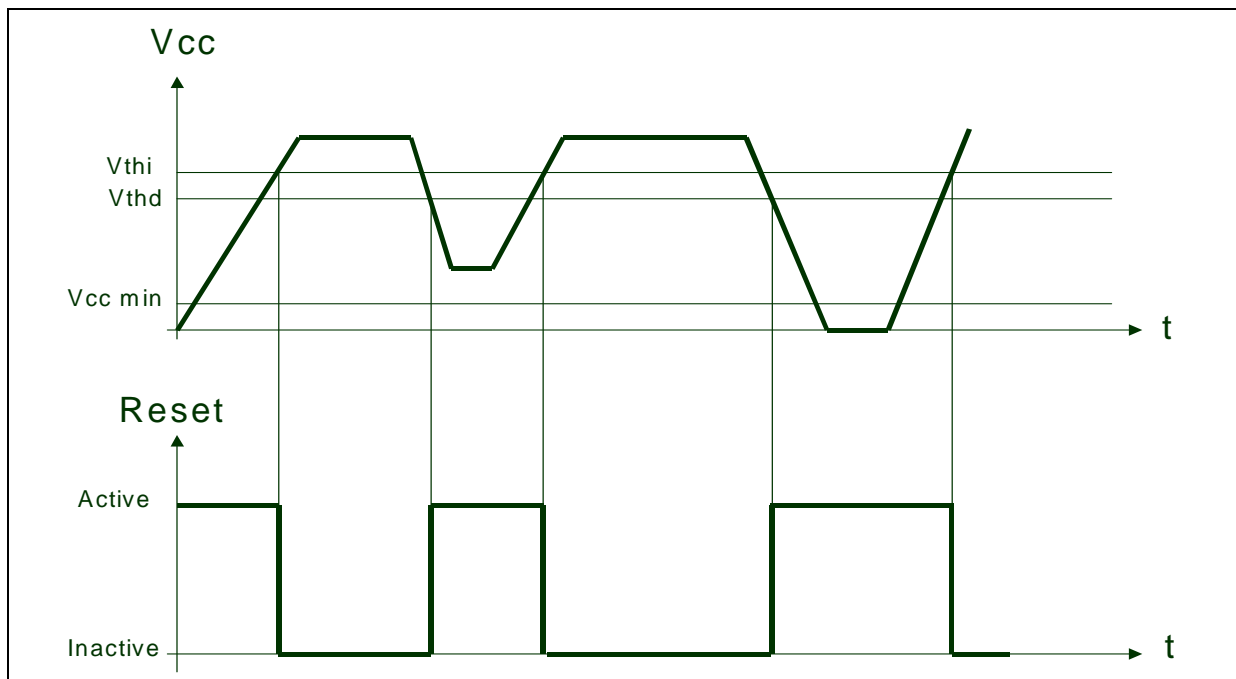
**ELECTRICAL CHARACTERISTICS** Tamb = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
V <sub>THi</sub>	Threshold Voltage - V <sub>CC</sub> Increasing 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 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 I <sub>OL</sub> = 8mA, T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub> V <sub>CC</sub> = 4V		450	800 1000	mV
I <sub>OH</sub>	Output Off-state Leakage T <sub>min.</sub> ≤ T <sub>amb</sub> ≤ T <sub>max.</sub> V <sub>CC</sub> = 5V		2	100 1000	nA
T <sub>PHL</sub>	Response Time High to Low R <sub>L</sub> = 10kΩ, C <sub>L</sub> = 15pF, V <sub>CC</sub> = V <sub>thd</sub> -10mV		20		μs

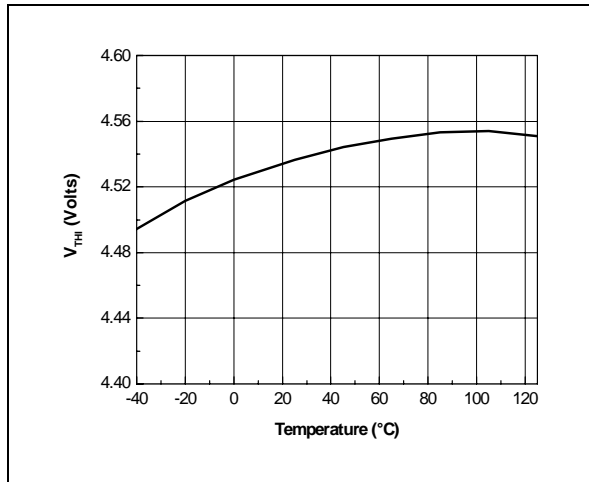
EQUIVALENT SCHEMATIC DIAGRAM



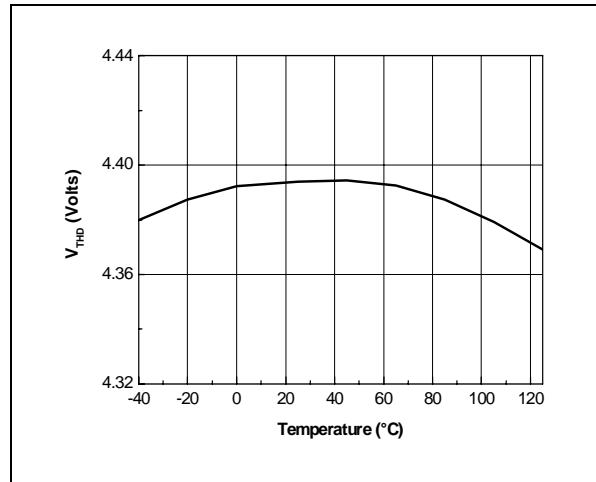
TIMING DIAGRAM



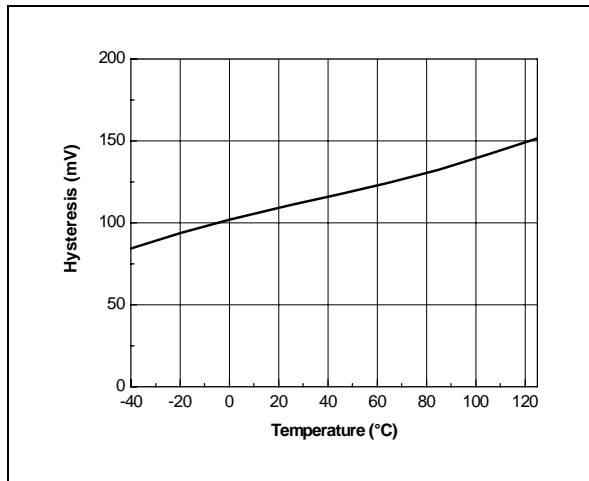
V<sub>th</sub> vs Temperature while V<sub>CC</sub> increasing



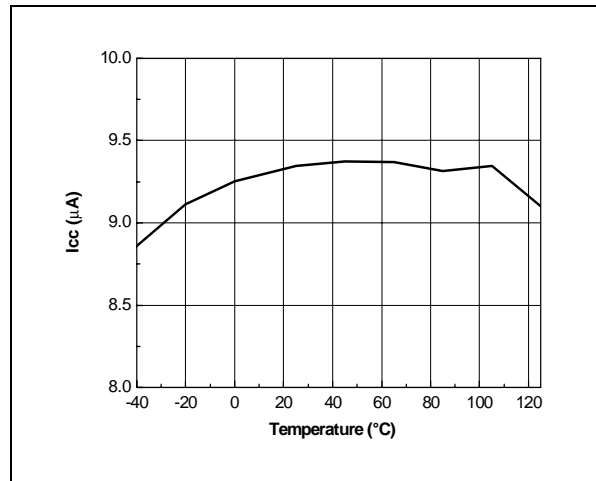
V<sub>thb</sub> vs Temperature while V<sub>CC</sub> decreasing



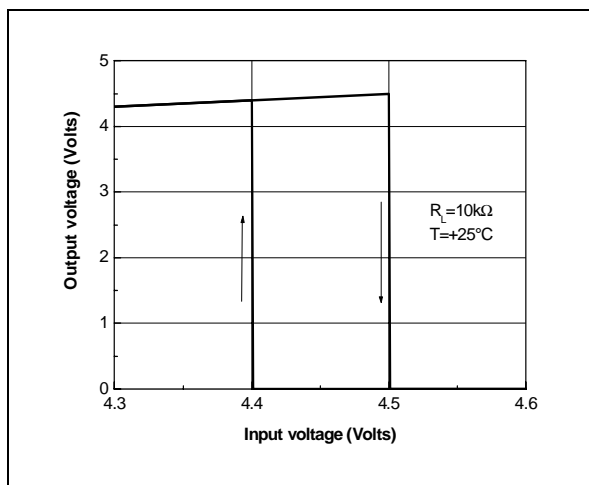
Hysteresis vs Temperature



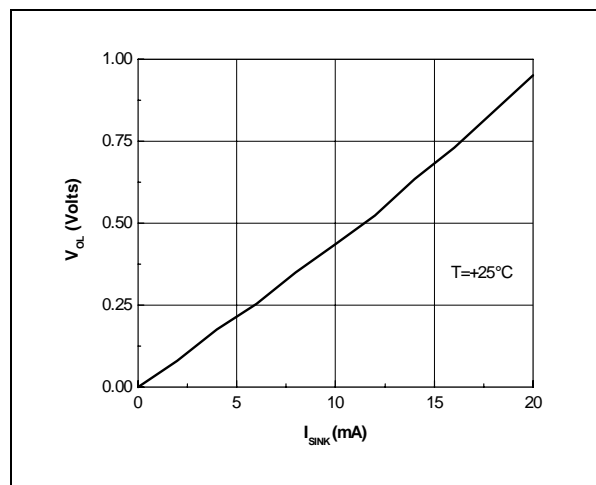
I<sub>CC</sub> vs Temperature



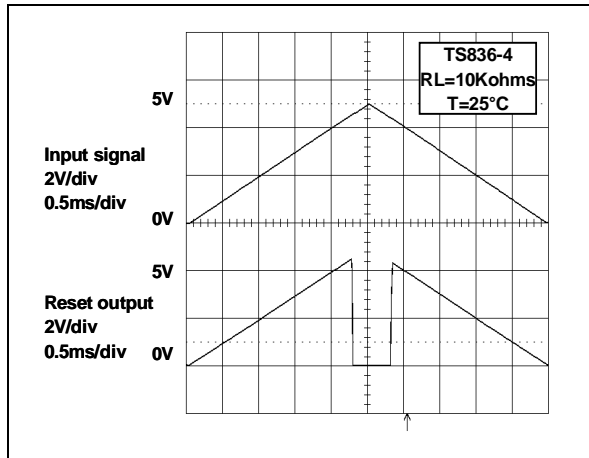
Reset Output Voltage vs Input Voltage



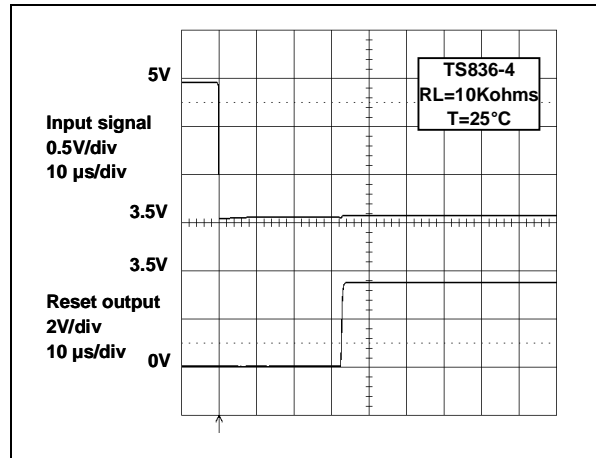
Voltage Output Low vs Sink Current



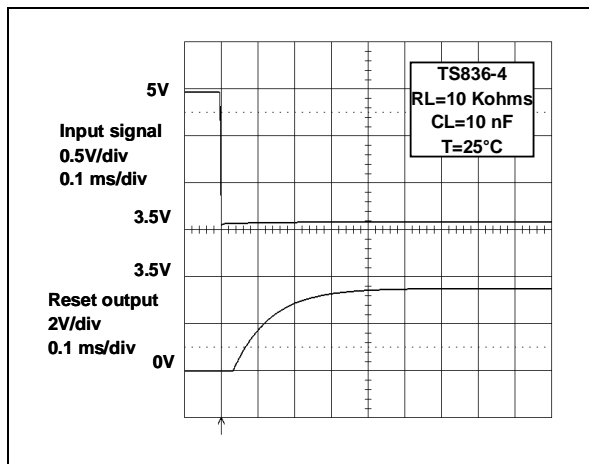
Reset Output Voltage vs Input Voltage



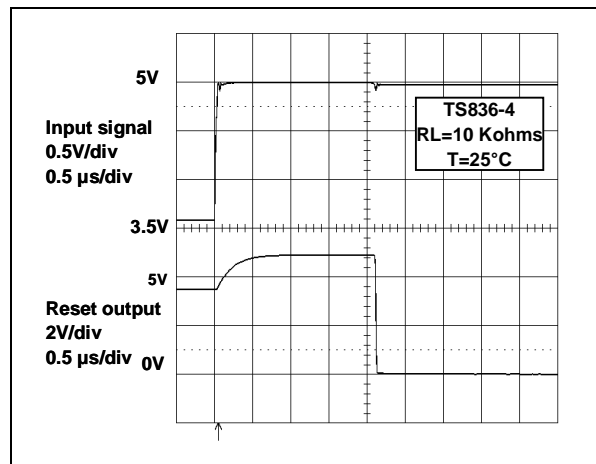
Supply Failing down: Reset Delay Time



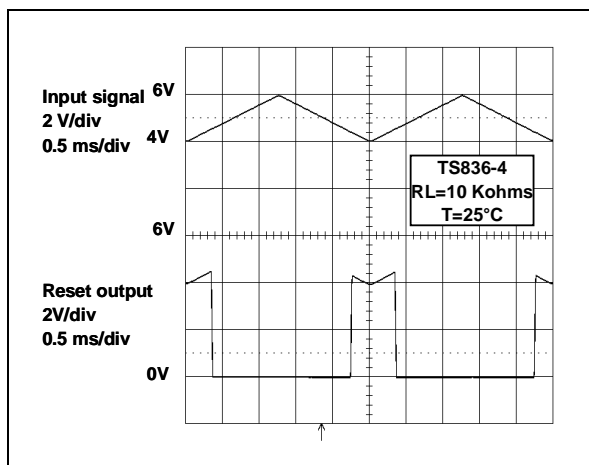
Supply Failing Down: Extended Reset Delay Time with an Additional Capacitor



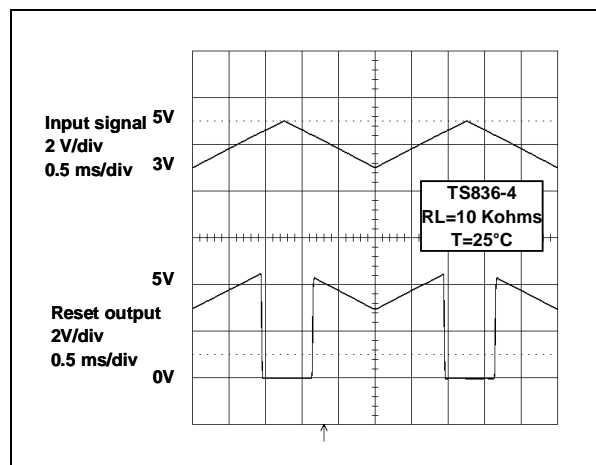
Supply Rising up: Output Delay Time



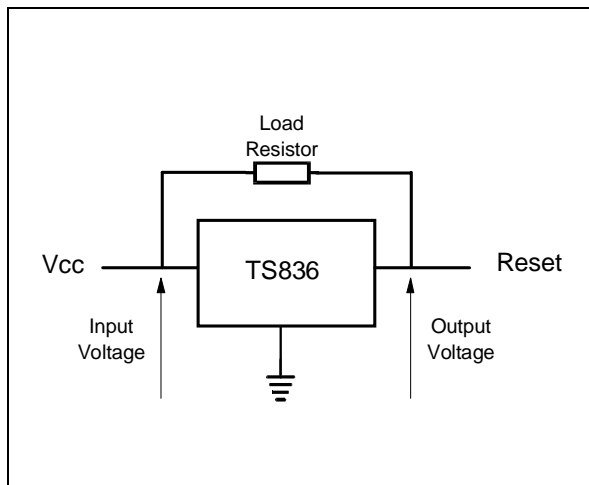
Reset Output Voltage vs Input Voltage (example)



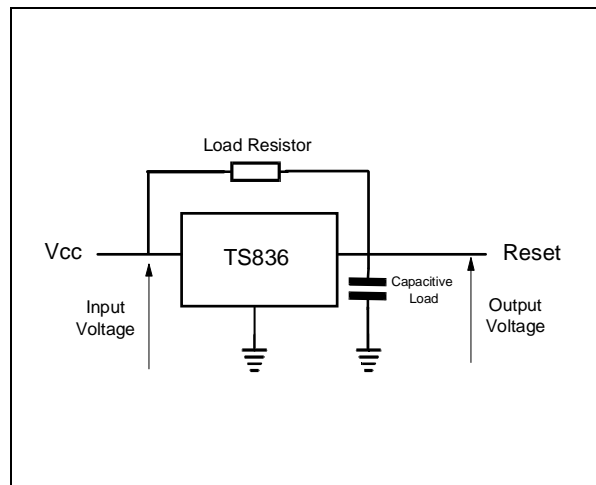
Reset Output Voltage vs Input Voltage (example)



Basic configuration



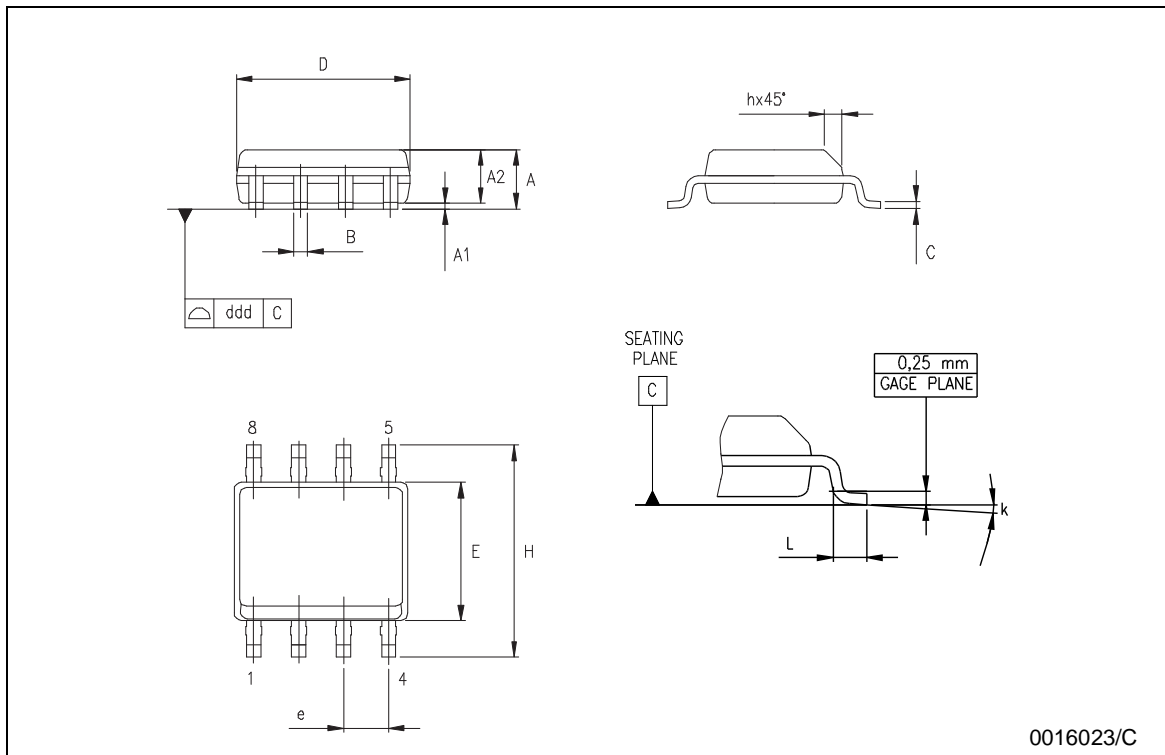
Configuration with an additional Capacitive Load



PACKAGE MECHANICAL DATA

**SO-8 MECHANICAL DATA**

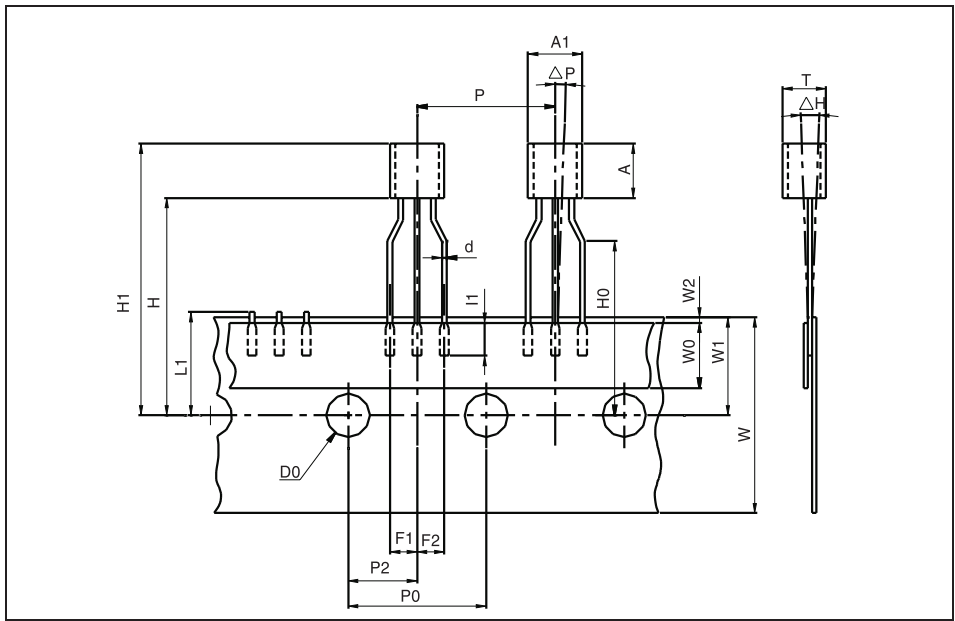
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020
L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

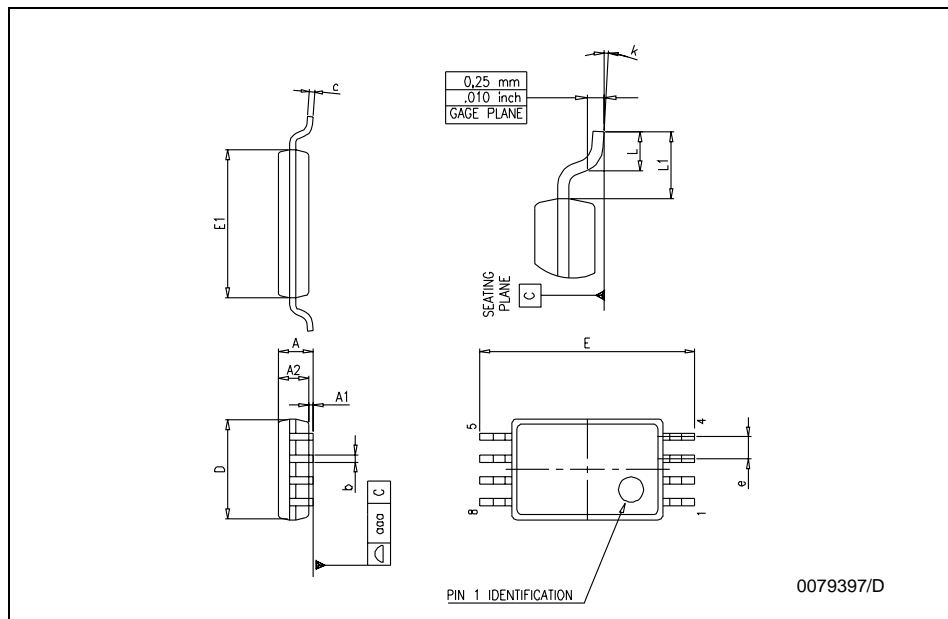
The drawing shows three views of the TO-92 package. The top view shows dimensions A (width of the body), D (total width), and R (radius of the top edge). The side view shows dimensions L (total height), W (width of the lead), e (lead height), and e1 (lead height at the base). The detail view shows dimensions S1 (lead thickness) and b (lead width). The drawing is labeled 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	



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