

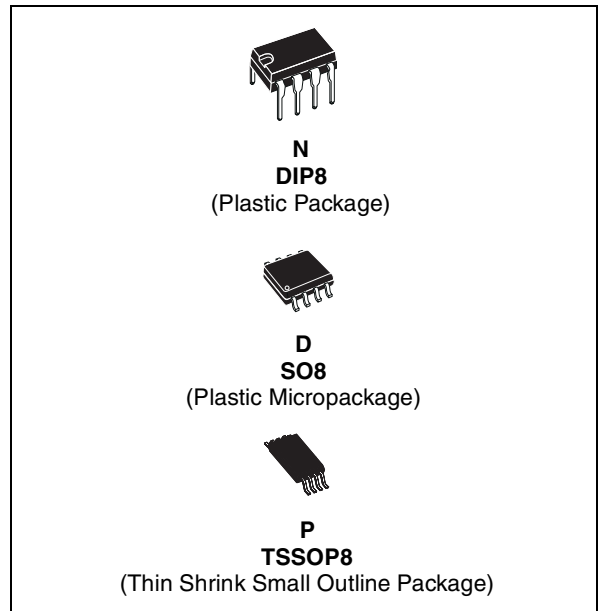
## Micropower Dual CMOS Voltage Comparators

- Push-pull CMOS output (no external pull-up resistor required)
- Extremely low supply current: 9 $\mu$ A typ / comparator
- Wide single supply range: 2.7V to 16V or dual supplies ( $\pm 1.35$ V to  $\pm 8$ V)
- Extremely low input bias current: 1pA typ
- Extremely low input offset currents: 1pA typ
- Input common-mode voltage range includes GND
- High input impedance: 10<sup>12</sup> $\Omega$  typ
- Fast response time: 2 $\mu$ s typ for 5mV overdrive
- Pin-to-pin and functionally compatible with bipolar LM393

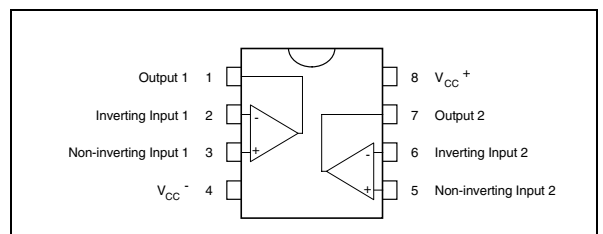
### Description

The TS3702 is a micropower CMOS dual voltage comparator with extremely low consumption of 9 $\mu$ A typ / comparator (20 times less than bipolar LM393). The push-pull CMOS output stage allows power and space saving by eliminating the external pull-up resistor required by usual open-collector output comparators.

Thus response times remain similar to the LM393.



### Pin Connections (top view)

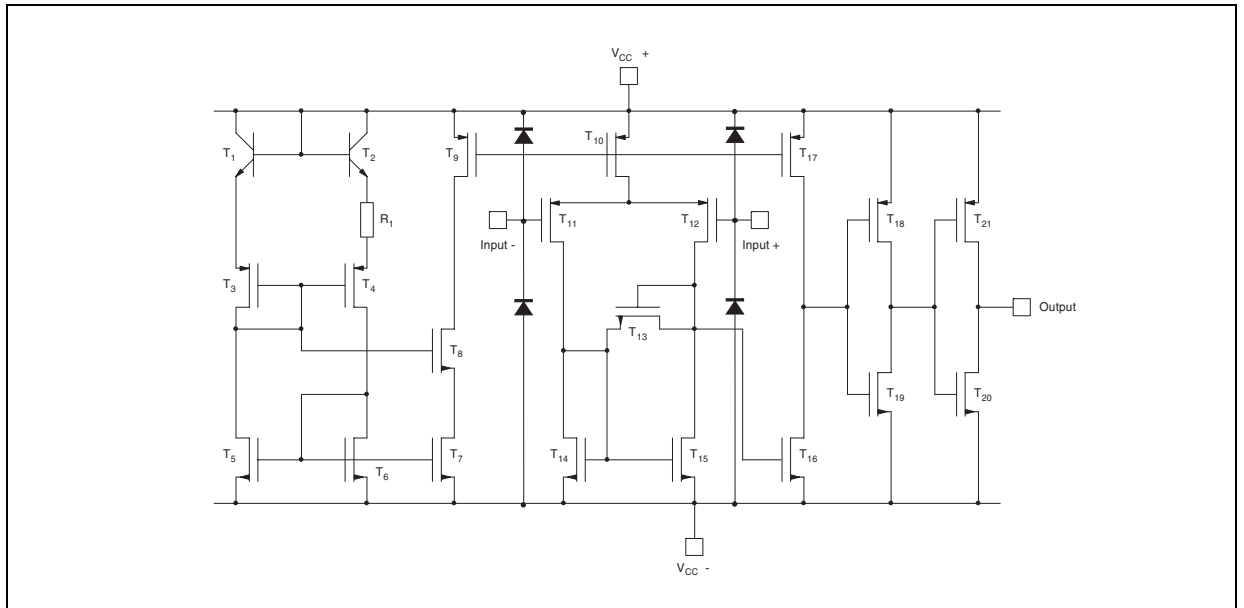


### Order Codes

Part Number	Temperature Range	Package	Packaging
TS3702CN	0°C, +70°C	DIP	Tube
TS3702CD/CDT		SO	Tube or Tape & Reel
TS3702IN	-40°C, +125°C	DIP	Tube
TS3702ID/IDT		SO	Tube or Tape & Reel
TS3702IPT		TSSOP (Thin Shrink Outline Package)	Tape & Reel
TS3702IYDT/IYD	-40°C, +125°C	SO (automotive grade level)	Tube or Tape & Reel

# 1 Schematic Diagram (for 1/2 TS3702)

Figure 1: Schematic diagram



## 2 Absolute Maximum Ratings

**Table 1: Key parameters and their absolute maximum ratings**

Symbol	Parameter	Value	Unit	
$V_{CC}^+$	Supply Voltage <sup>1</sup>	18	V	
$V_{id}$	Differential Input Voltage <sup>2</sup>	±18	V	
$V_i$	Input Voltage <sup>3</sup>	18	V	
$V_o$	Output Voltage	18	V	
$I_o$	Output Current	20	mA	
$I_F$	Forward Current in ESD Protection Diodes on Input <sup>4</sup>	50	mA	
$P_d$	Power Dissipation <sup>5</sup>	DIP8 SO8 TSSOP8	1250 710 625	mW
$T_{stg}$	Storage Temperature Range	-65 to +150	°C	

- 1) All voltage values, except differential voltage, are with respect to network ground terminal.
- 2) Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
- 3) The magnitude of the input and the output voltages must never exceed the magnitude of the positive and negative supply voltages.
- 4) Guaranteed by design.
- 5)  $P_d$  is calculated with  $T_{amb} = +25^\circ\text{C}$ ,  $T_j = +150^\circ\text{C}$  and  $R_{thja} = 100^\circ\text{C/W}$  for DIP8 package  
 $= 175^\circ\text{C/W}$  for SO8 package  
 $= 200^\circ\text{C/W}$  for TSSOP8 package

**Table 2: Operating conditions**

Symbol	Parameter	Value	Unit	
$V_{CC}^+$	Supply Voltage	TS3702C,I TS3702M	2.7 to 16 4 to 16	V
$V_{icm}$	Common Mode Input Voltage Range		0 to $V_{CC}^+ - 1.5$	V
$T_{oper}$	Operating Free-Air Temperature range	TS3702C TS3702I TS3702M	0 to +70 -40 to +125 -55 to +125	°C

### 3 Electrical Characteristics

Table 3:  $V_{CC}^+ = 3V$ ,  $V_{CC}^- = 0V$ ,  $T_{amb} = 25^\circ C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage <sup>1</sup> $V_{ic} = 1.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$			5 6.5	mV
$I_{io}$	Input Offset Current <sup>2</sup> $V_{ic} = 1.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	300	pA
$I_{ib}$	Input Bias Current <sup>2)</sup> $V_{ic} = 1.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	600	pA
$V_{icm}$	Input Common Mode Voltage Range $T_{min.} \leq T_{amb} \leq T_{max.}$	0 0		$V_{CC}^+ - 1.2$ $V_{CC}^+ - 1.5$	V
CMR	Common-mode Rejection Ratio $V_{ic} = V_{icm min.}$		80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = 3V$ to $5V$		75		dB
$V_{OH}$	High Level Output Voltage $V_{id} = 1V$ , $I_{OH} = -4mA$ $T_{min.} \leq T_{amb} \leq T_{max.}$	2 1.8	2.4		V
$V_{OL}$	Low Level Output Voltage $V_{id} = -1V$ , $I_{OL} = 4mA$ $T_{min.} \leq T_{amb} \leq T_{max.}$		300	400 575	mV
$I_{CC}$	Supply Current (each comparator) No load - Outputs low $T_{min.} \leq T_{amb} \leq T_{max.}$		7	20 25	$\mu A$
$t_{PLH}$	Response Time Low to High $V_{ic} = 0V$ , $f = 10kHz$ , $C_L = 50pF$ , Overdrive = 5mV TTL Input		1.5 0.7		$\mu s$
$t_{PHL}$	Response Time High to Low $V_{ic} = 0V$ , $f = 10kHz$ , $C_L = 50pF$ , Overdrive = 5mV TTL Input		2.2 0.15		$\mu s$

1) The specified offset voltage is the maximum value required to drive the output up to 2.5V or down to 0.3V.

2) Maximum values including unavoidable inaccuracies of the industrial test.

## 4 Electrical Characteristics

Table 4:  $V_{CC}^+ = 5V$ ,  $V_{CC}^- = 0V$ ,  $T_{amb} = 25^\circ C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage $V_{ic} = V_{icm\ min.}$ , $V_{CC}^+ = 5V$ to $10V$ <sup>1</sup> $T_{min.} \leq T_{amb} \leq T_{max.}$		1.2	5 6.5	mV
$I_{io}$	Input Offset Current <sup>2</sup> $V_{ic} = 2.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	300	pA
$I_{ib}$	Input Bias Current <sup>2)</sup> $V_{ic} = 2.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	600	pA
$V_{icm}$	Input Common Mode Voltage Range $T_{min.} \leq T_{amb} \leq T_{max}$	0 0		$V_{CC}^+ - 1.2$ $V_{CC}^+ - 1.5$	V
CMR	Common-mode Rejection Ratio $V_{ic} = V_{icm\ min.}$		82		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = +5V$ to $+10V$		90		dB
$V_{OH}$	High Level Output Voltage $V_{id} = 1V$ , $I_{OH} = -4mA$ $T_{min.} \leq T_{amb} \leq T_{max.}$	4.5 4.3	4.7		V
$V_{OL}$	Low Level Output Voltage $V_{id} = -1V$ , $I_{OL} = 4mA$ $T_{min.} \leq T_{amb} \leq T_{max.}$		200	300 375	mV
$I_{CC}$	Supply Current (each comparator) No load - Outputs low $T_{min.} \leq T_{amb} \leq T_{max.}$		9	20 25	$\mu A$
$t_{PLH}$	Response Time Low to High $V_{ic} = 0V$ , $f = 10kHz$ , $C_L = 50pF$ , Overdrive = 5mV Overdrive = 10mV Overdrive = 20mV Overdrive = 40mV TTL Input		1.5 1.1 0.9 0.7 0.6		$\mu s$
$t_{PHL}$	Response Time High to Low $V_{ic} = 0V$ , $f = 10kHz$ , $C_L = 50pF$ , Overdrive = 5mV Overdrive = 10mV Overdrive = 20mV Overdrive = 40mV TTL Input		2.2 1.6 1.1 0.75 0.17		$\mu s$
$t_f$	Fall time $f = 10kHz$ , $C_L = 50pF$ , Overdrive 50mV		30		ns

1) The specified offset voltage is the maximum value required to drive the output up to 4.5V or down to 0.3V.

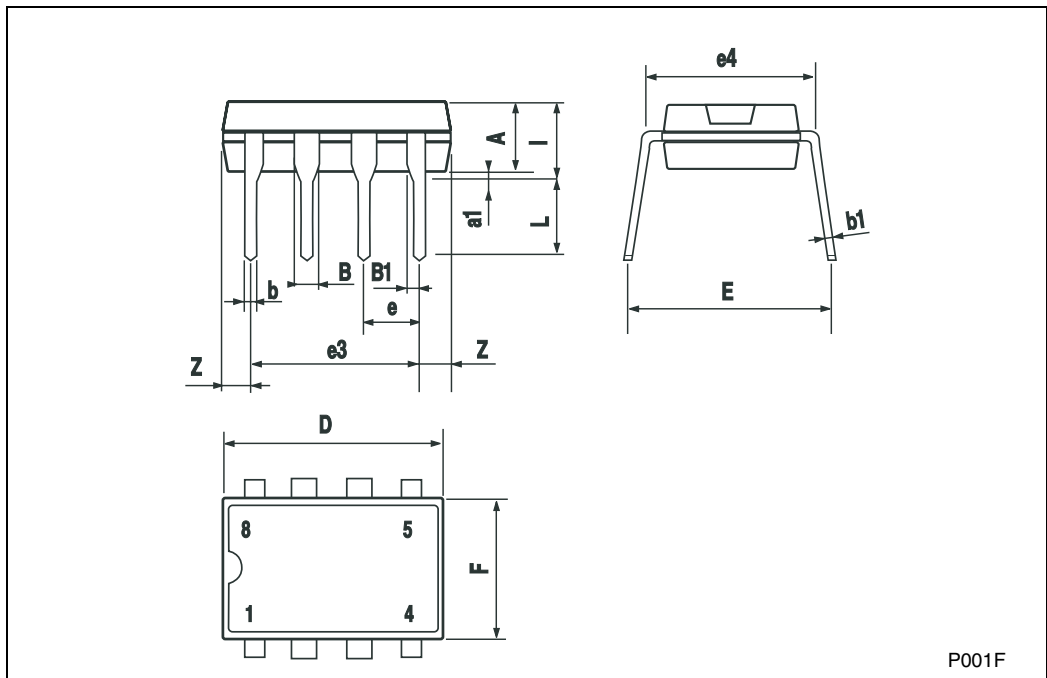
2) Maximum values including unavoidable inaccuracies of the industrial test.

## 5 Package Mechanical Data

### 5.1 DIP8 package

**Plastic DIP-8 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
l			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063

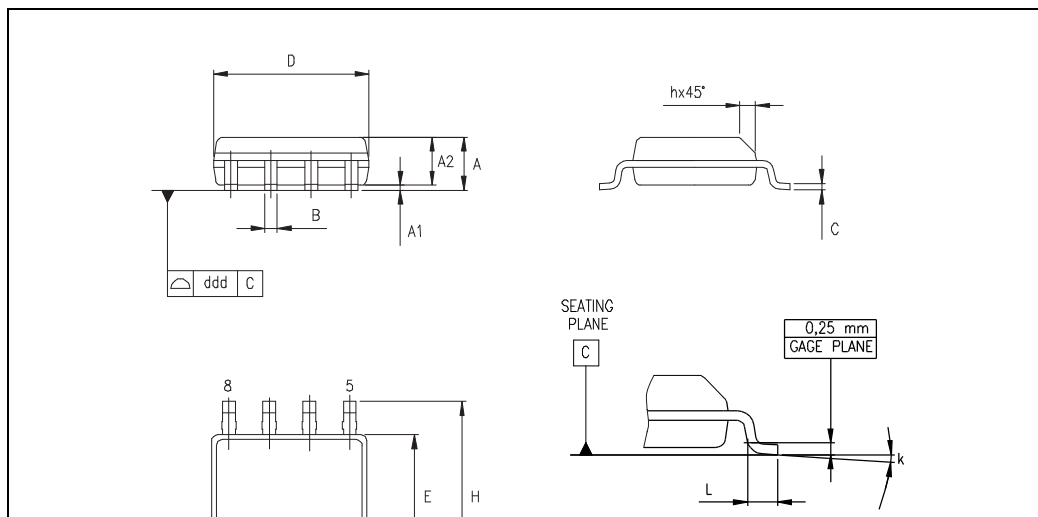


P001F

## 5.2 SO8 package

## SO-8 MECHANICAL DATA

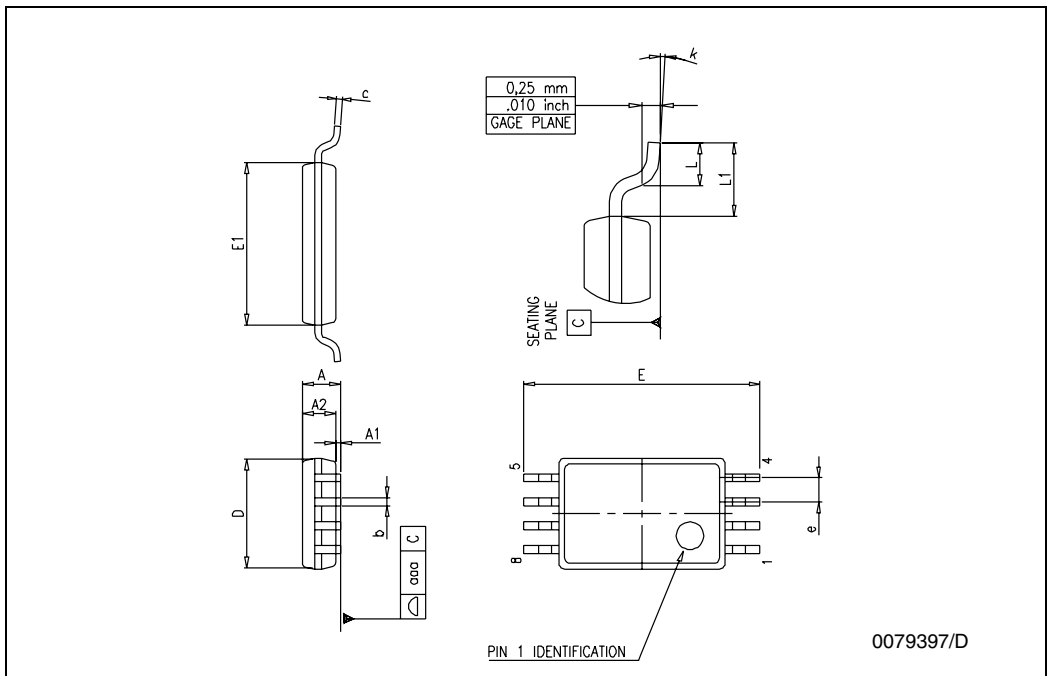
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.10		0.25	0.04		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	4.80		5.00	0.189		0.197
E	3.80		4.00	0.150		0.157
e		1.27			0.050	
H	5.80		6.20	0.228		0.244
h	0.25		0.50	0.010		0.020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



5.3 TSSOP8 package

**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	





## 6 Revision History

Date	Revision	Description of Changes
January 2003	1	First Release
May 2005	2	PIPAP references inserted in the datasheet see table order code p1

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  
All other names are the property of their respective owners

© 2005 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan -  
Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

[www.st.com](http://www.st.com)