

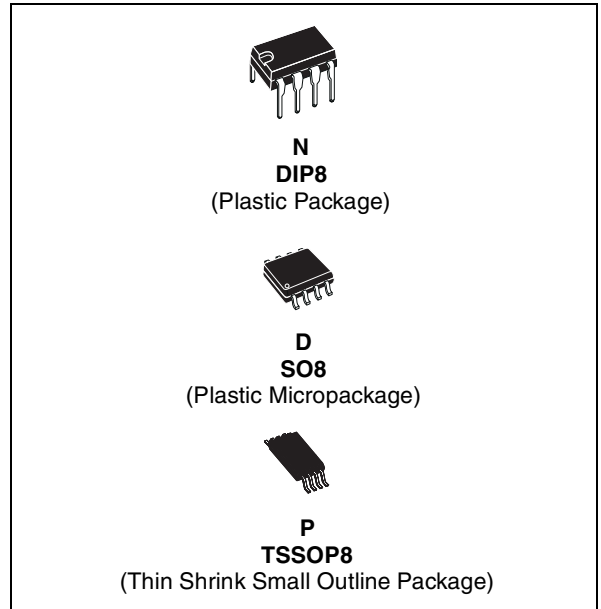
Micropower Dual CMOS Voltage Comparators

- Push-pull CMOS output (no external pull-up resistor required)
- Extremely low supply current: 9 μ A typ / comparator
- Wide single supply range: 2.7V to 16V or dual supplies (± 1.35 V to ± 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: 10¹² Ω typ
- Fast response time: 2 μ s typ for 5mV overdrive
- Pin-to-pin and functionally compatible with bipolar LM393

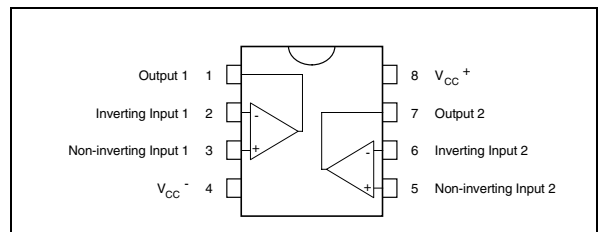
Description

The TS3702 is a micropower CMOS dual voltage comparator with extremely low consumption of 9 μ 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)

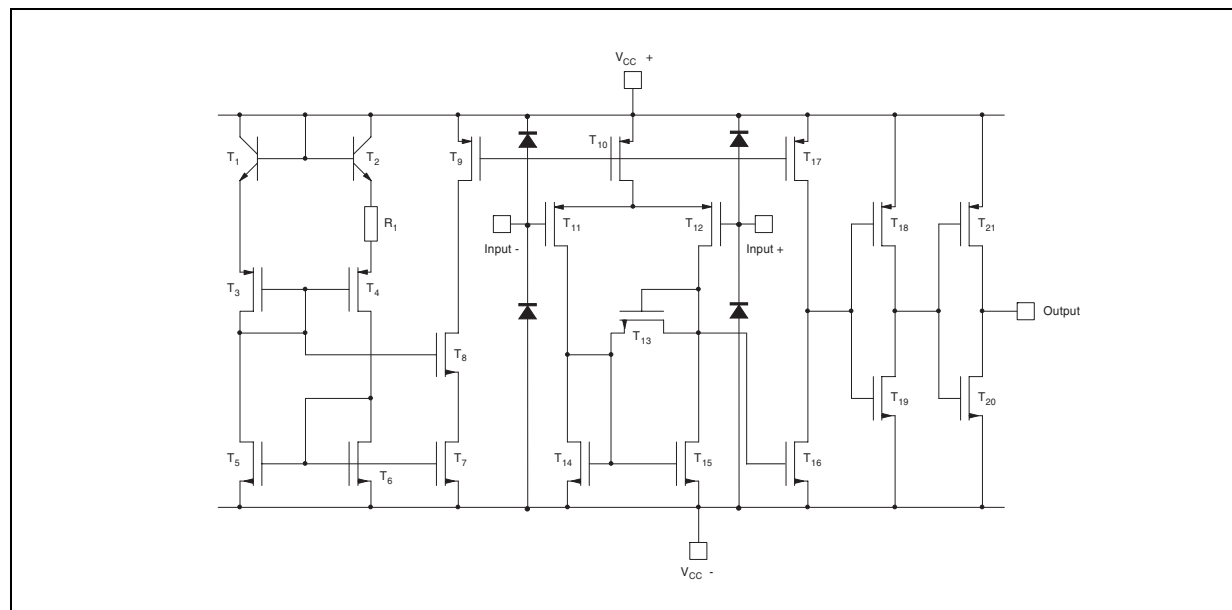


Order Codes

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 ¹	18	V
V_{id}	Differential Input Voltage ²	± 18	V
V_i	Input Voltage ³	18	V
V_o	Output Voltage	18	V
I_o	Output Current	20	mA
I_F	Forward Current in ESD Protection Diodes on Input ⁴	50	mA
P_d	Power Dissipation ⁵ 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 ¹ $V_{ic} = 1.5V$ $T_{min} \leq T_{amb} \leq T_{max}$			5 6.5	mV
I_{io}	Input Offset Current ² $V_{ic} = 1.5V$ $T_{min} \leq T_{amb} \leq T_{max}$		1	300	pA
I_{ib}	Input Bias Current ²⁾ $V_{ic} = 1.5V$ $T_{min} \leq T_{amb} \leq T_{max}$		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 $V_{ic} = V_{icm \text{ min.}}$		80		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = 3V \text{ to } 5V$		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	μA
t_{PLH}	Response Time Low to High $V_{ic} = 0V$, $f = 10kHz$, $C_L = 50pF$, Overdrive = 5mV TTL Input		1.5 0.7		μs
t_{PHL}	Response Time High to Low $V_{ic} = 0V$, $f = 10kHz$, $C_L = 50pF$, Overdrive = 5mV TTL Input		2.2 0.15		μs

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)

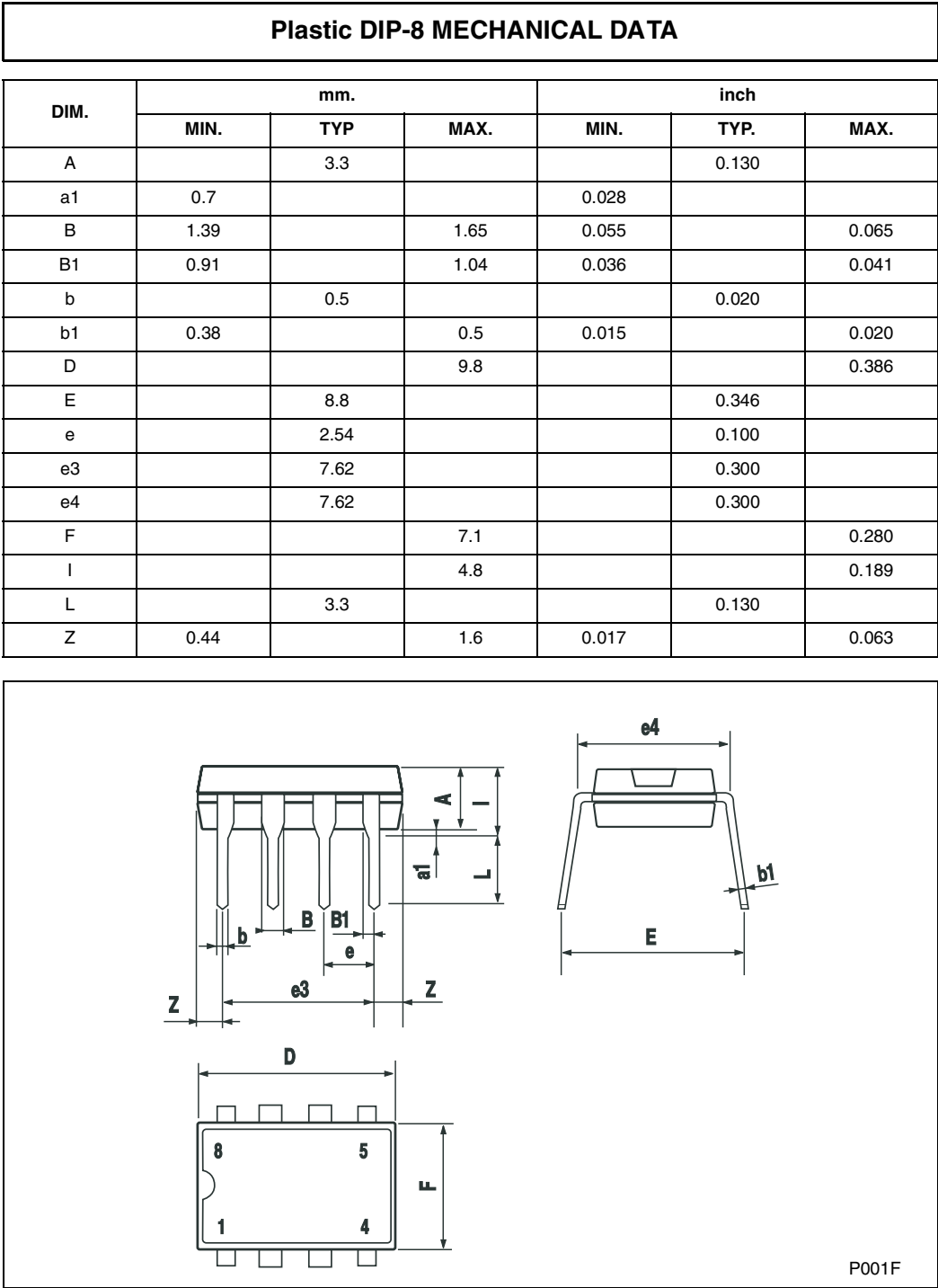
Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{io}	Input Offset Voltage $V_{ic} = V_{icm\ min.}$, $V_{CC}^+ = 5V$ to $10V$ ¹ $T_{min.} \leq T_{amb} \leq T_{max.}$		1.2	5 6.5	mV
I_{io}	Input Offset Current ² $V_{ic} = 2.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	300	pA
I_{ib}	Input Bias Current ²⁾ $V_{ic} = 2.5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		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	μA
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		μs
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		μs
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

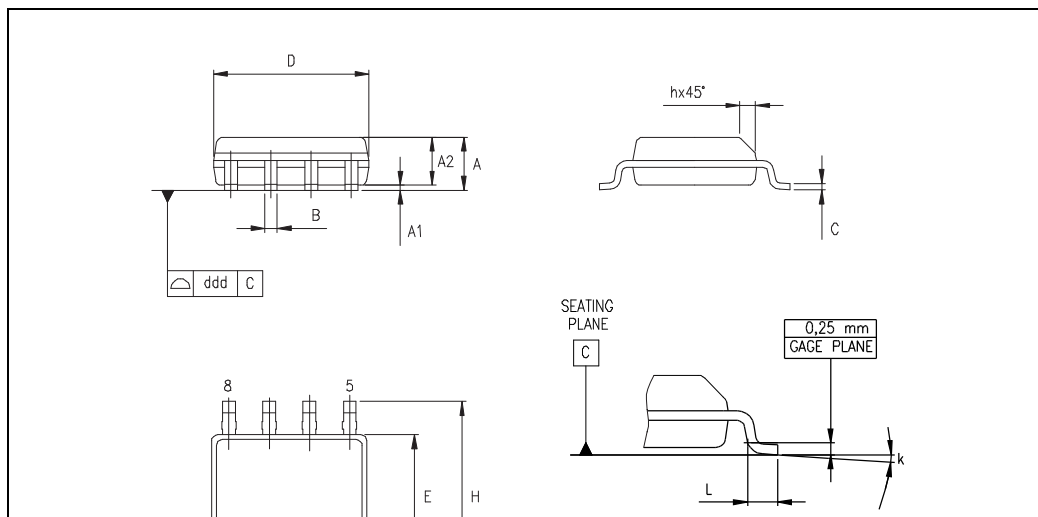
5.1 DIP8 package



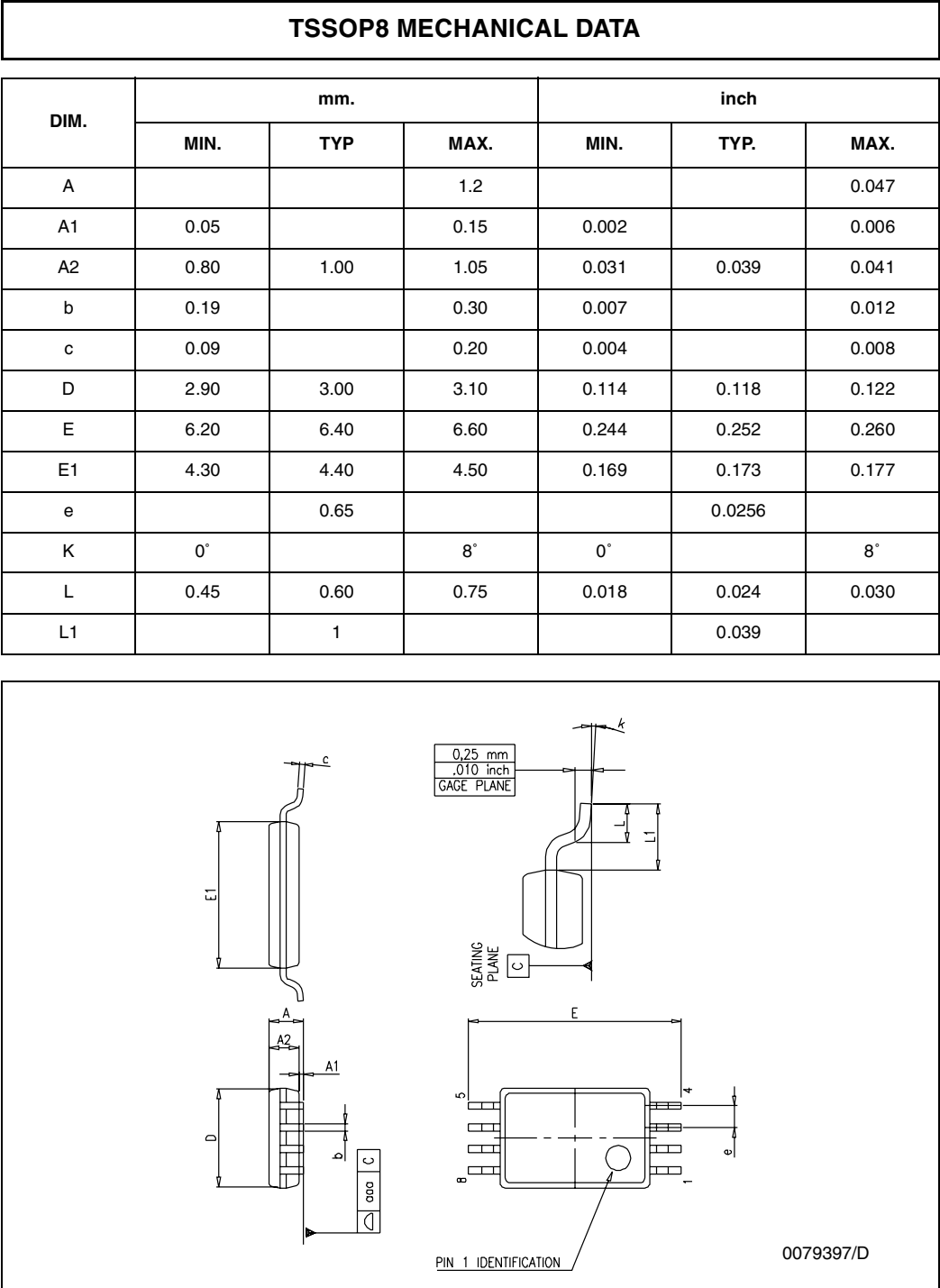
5.2 SO8 package

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° (max.)					
ddd			0.1			0.04



5.3 TSSOP8 package



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

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