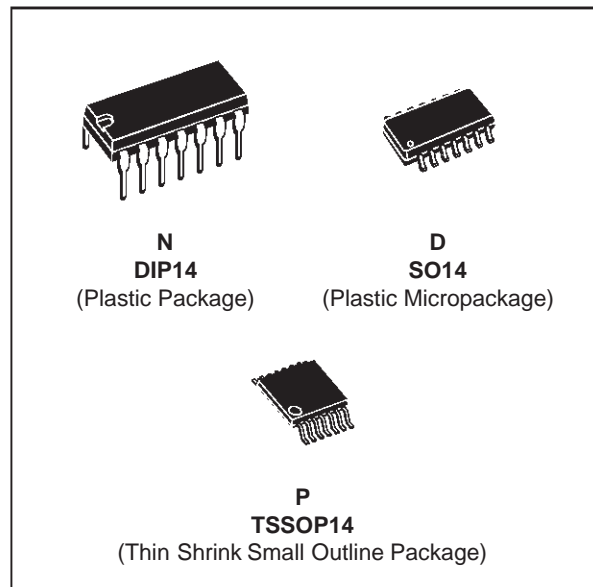




# TS339C,I,M

## MICROPOWER QUAD CMOS VOLTAGE COMPARATORS

- EXTREMELY LOW SUPPLY CURRENT :  
9 $\mu$ A TYP / COMPARATOR
- WIDE SINGLE SUPPLY RANGE (3V TO 16V)  
OR DUAL SUPPLIES ( $\pm$ 1.5V TO  $\pm$ 8V)
- EXTREMELY LOW INPUT BIAS CURRENT :  
1pA TYP
- EXTREMELY LOW INPUT OFFSET  
CURRENT : 1pA TYP
- INPUT COMMON-MODE VOLTAGE RANGE  
INCLUDES GND
- HIGH INPUT IMPEDANCE : 10<sup>12</sup> $\Omega$  TYP
- FAST RESPONSE TIME : 1.5 $\mu$ s TYP FOR  
5mV OVERDRIVE
- PIN-TO-PIN AND FUNCTIONALLY  
COMPATIBLE WITH BIPOLAR LM339



### DESCRIPTION

The TS339 is a micropower CMOS quad voltage comparator with extremely low consumption of 9 $\mu$ A typ / comparator (20 times less than bipolar LM339). Similar performances are offered by the quad micropower comparator TS3704 with a push-pull CMOS output.

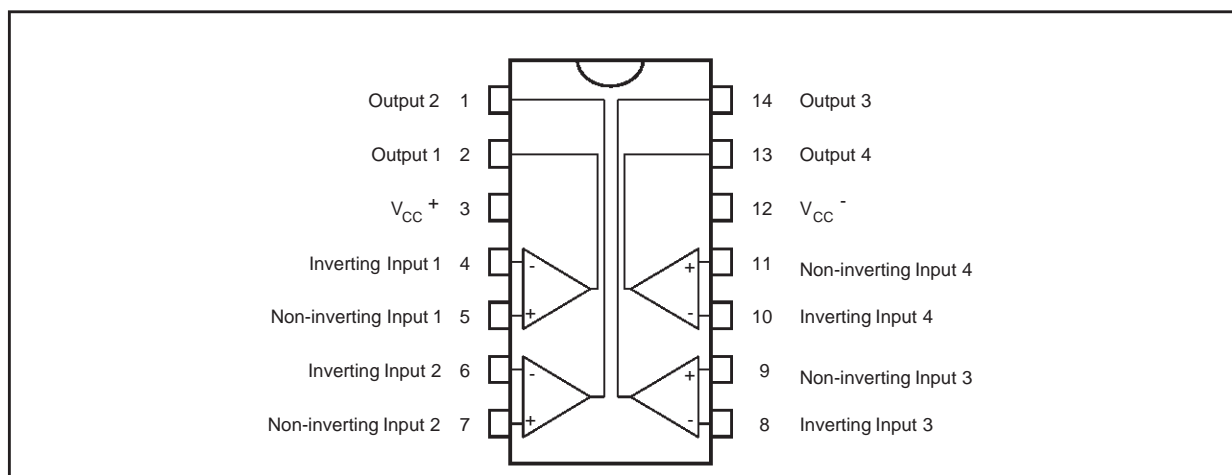
Thus response times remain similar to the LM339.

### ORDER CODES

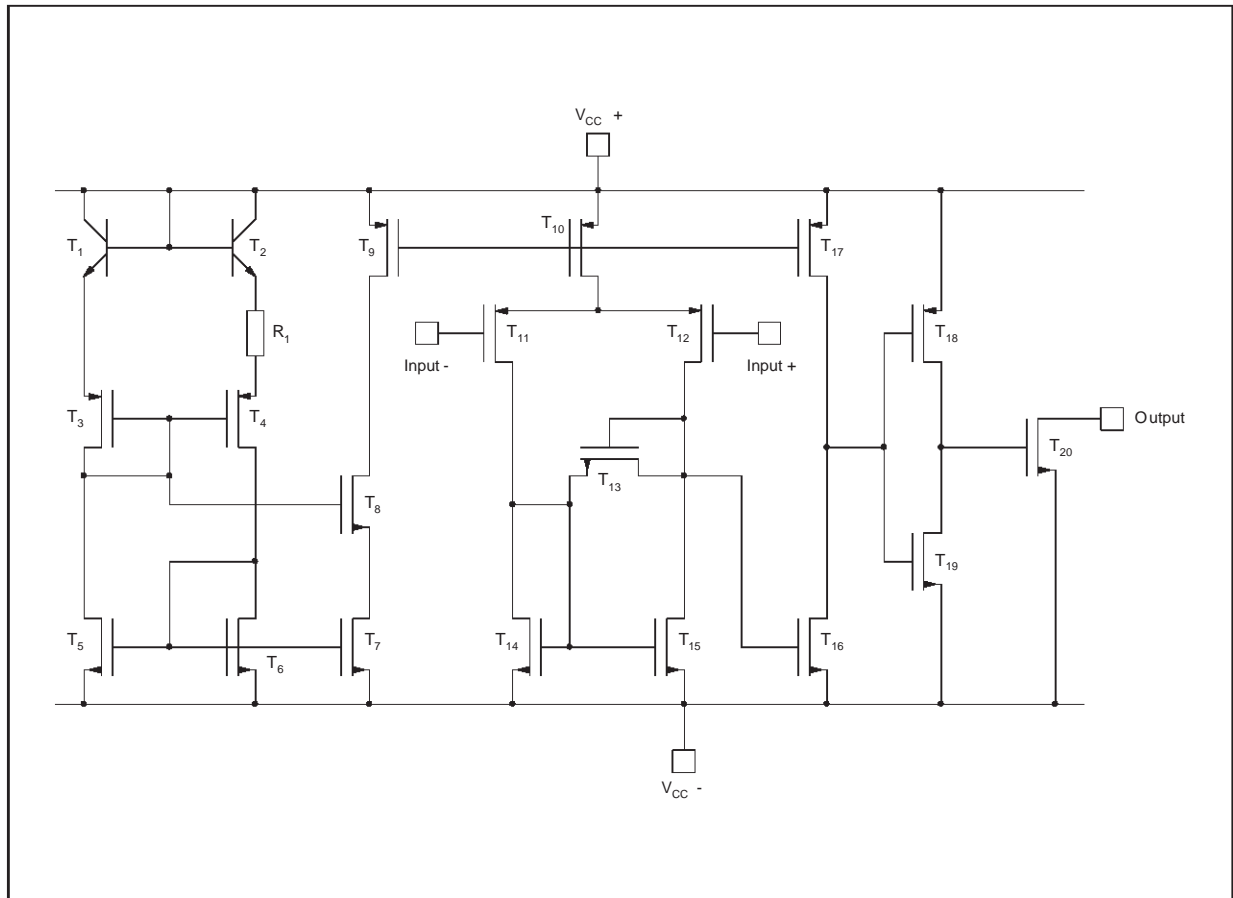
Part Number	Temperature Range	Package		
		N	D	P
TS339C	0°C, +70°C	●	●	●
TS339I	-40°C, +125°C	●	●	●
TS339M	-55°C, +125°C	●	●	●

**Example :** TS339CN

### PIN CONNECTIONS (top view)



**SCHEMATIC DIAGRAM** (for 1/4 TS339)



**MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}^+$	Supply Voltage - (note 1)	18	V
$V_{id}$	Differential Input Voltage - (note 2)	$\pm 18$	V
$V_i$	Input Voltage - (note 3)	18	V
$V_o$	Output Voltage	18	V
$I_o$	Output Current	20	mA
$T_{oper}$	Operating Free-Air Temperature Range	0 to +70 -40 to +125 -55 to +125	$^{\circ}C$
$T_{stg}$	Storage Temperature Range	-65 to +150	$^{\circ}C$

- Notes :**
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 supply voltage.
  4. Short circuit from outputs to  $V_{CC}^+$  can cause excessive heating and eventual destruction.

**OPERATING CONDITIONS**

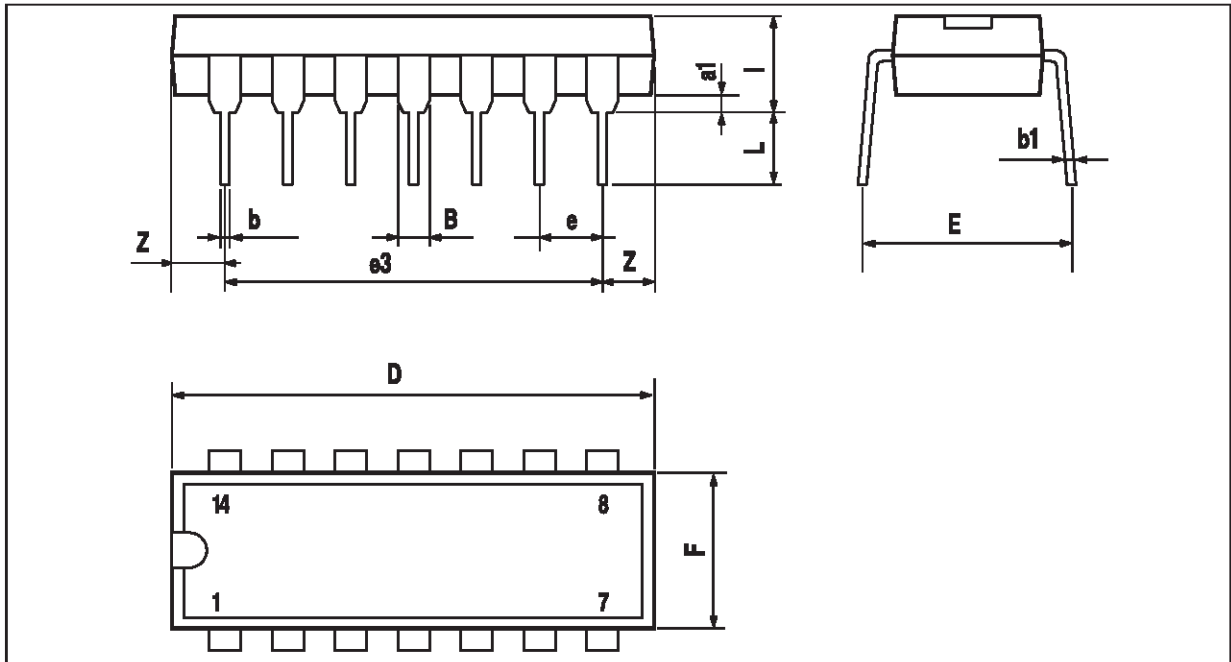
Symbol	Parameter	Value	Unit
$V_{CC}^+$	Supply Voltage	3 to 16 4 to 16	V
$V_{icm}$	Common Mode Input Voltage Range	0 to $V_{CC}^+ - 1.5$	V

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

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage - (note 1) $V_{ic} = V_{icm\ min.}, V_{CC}^+ = 5V\ to\ 10V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1.4	5 6.5	mV
$I_{io}$	Input Offset Current - (note 2) $V_{ic} = 2.5\ V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	300	pA
$I_{ib}$	Input Bias Current - (note 2) $V_{ic} = 2.5\ V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		1	600	pA
$V_{icm}$	Input Common Mode Voltage Range $T_{min.} \leq T_{amb} \leq T_{max.}$	0 to $V_{CC}^+ - 1.2$ 0 to $V_{CC}^+ - 1.5$			V
CMR	Common-mode Rejection Ratio $V_{ic} = V_{icm\ min.}$		75		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ = +5V\ to\ +10V$		85		dB
$I_{OH}$	High Level Output Current $V_{id} = 1V, V_{OH} = +5V$ $T_{min.} \leq T_{amb} \leq T_{max.}$		2	40 1000	nA
$V_{OL}$	Low Level Output Voltage $V_{id} = -1V, I_{OL} = 6mA$ $T_{min.} \leq T_{amb} \leq T_{max.}$		350	400 650	mV
$I_{CC}$	Supply Current (4 comparators) No load - Outputs low $T_{min.} \leq T_{amb} \leq T_{max.}$		36	80 100	$\mu A$
$t_{PLH}$	Response Time Low to High $V_{ic} = 0V, f = 10kHz, R_L = 5.1k\Omega, C_L = 15pF,$ Overdrive = 5mV Overdrive = 10mV Overdrive = 20mV Overdrive = 40mV TTL Input		1.5 1.2 1.1 0.9 0.8		$\mu s$
$t_{PHL}$	Response Time High to Low $V_{ic} = 0V, f = 10kHz, R_L = 5.1k\Omega, C_L = 15pF,$ Overdrive = 5mV Overdrive = 10mV Overdrive = 20mV Overdrive = 40mV TTL Input		2.5 1.9 1.2 0.8 0.08		$\mu s$
$t_f$	Fall Time $f = 10kHz, C_L = 15pF, R_L = 5.1k\Omega, Overdrive\ 50mV$		25		ns

**Note :** 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.

**PACKAGE MECHANICAL DATA**  
14 PINS - PLASTIC DIP

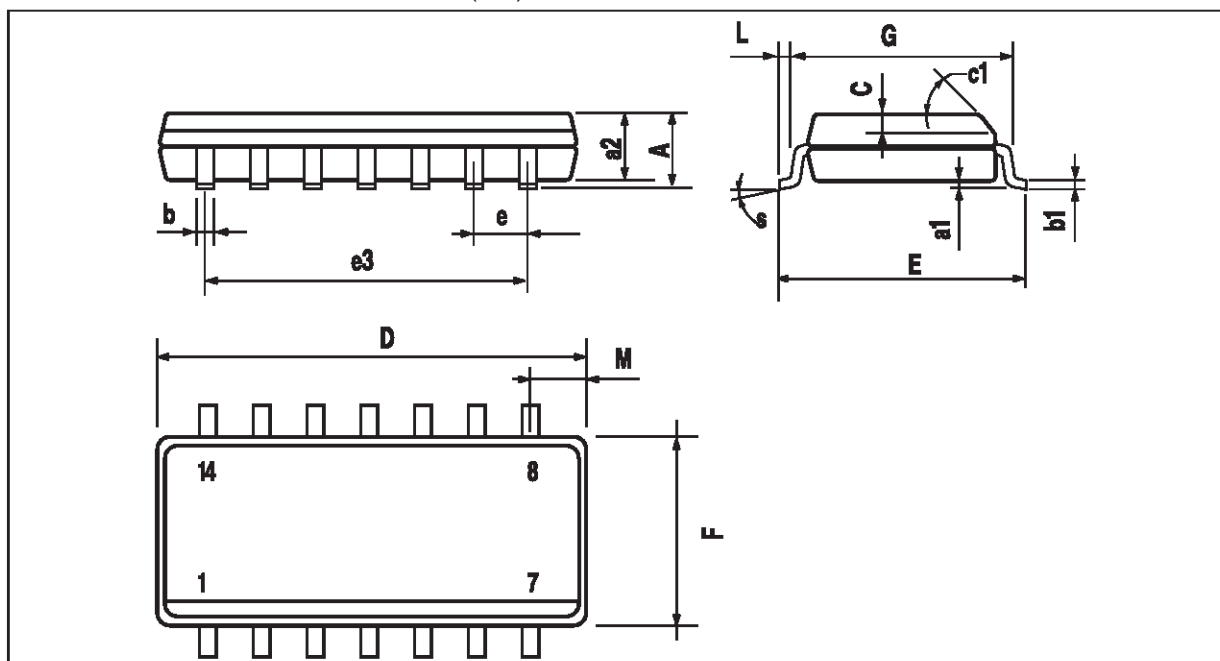


PM-DIP14,EP5

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

DIP14,TEL

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

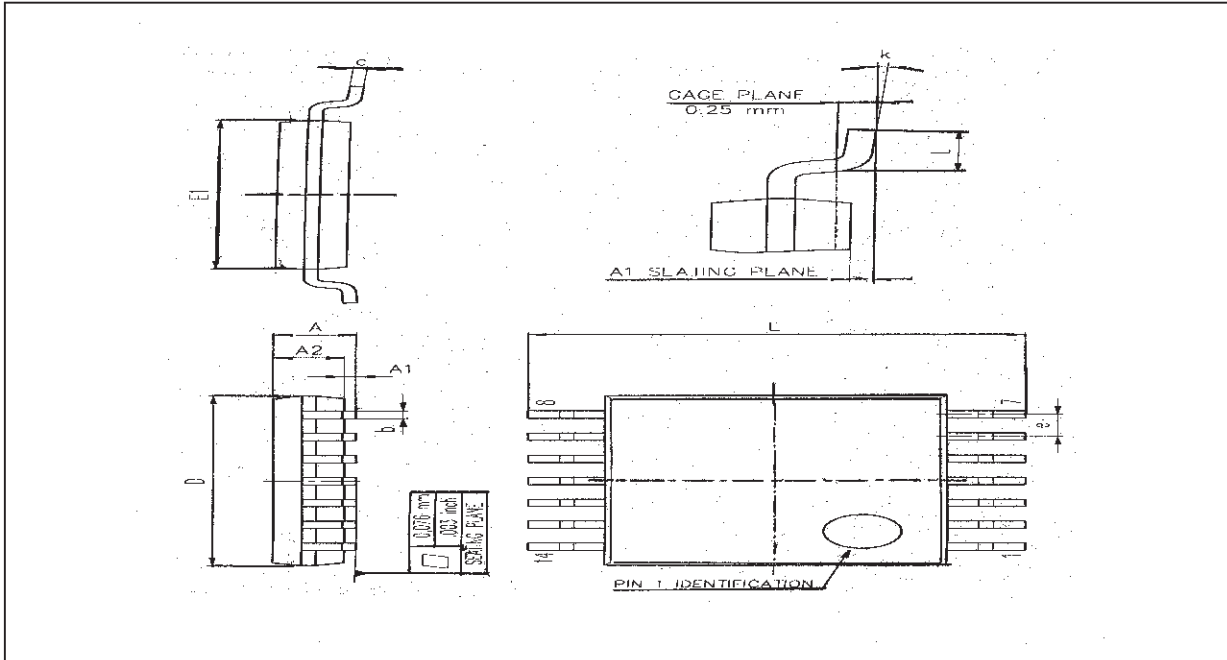


PM-S014.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.334
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
M			0.68			0.027
S	8° (max.)					

S014.TBL

**PACKAGE MECHANICAL DATA**  
 14 PINS - THIN SHRINK SMALL OUTLINE PACKAGE



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.20			0.05
A1	0.05		0.15	0.01		0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.15
c	0.09		0.20	0.003		0.012
D	4.90	5.00	5.10	0.192	0.196	0.20
E		6.40			0.252	
E1	4.30	4.40	4.50	0.169	0.173	0.177
e		0.65			0.025	
k	0°		8°	0°		8°
l	0.50	0.60	0.75	0.09	0.0236	0.030

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