

## Low power dual CMOS voltage comparator

### Features

- Wide single supply range or dual supplies 3 V to 16 V or  $\pm 1.5$  V to  $\pm 8$  V
- Very low supply current: 0.1 mA/comparator independent of supply voltage
- Extremely low input bias current: 1 pA typ
- Extremely low input offset currents: 1 pA typ
- Low input offset voltage
- Input common-mode voltage range includes GND
- Low output saturation voltage 150 mV typical
- Output compatible with TTL, MOS and CMOS
- High input impedance:  $10^{12} \Omega$  typical
- Fast response time: 200 ns typ for TTL level input step

### Applications

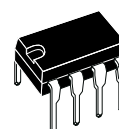
- Battery powered electronics
- General-purpose portable device
- General-purpose low voltage application

### Description

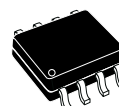
These devices consist of two independent precision voltage comparators, designed to operate with single or dual supplies.

These differential comparators use the STMicroelectronics silicon lin MOS process giving them an excellent consumption-speed ratio.

These devices are ideally suited for low consumption applications.

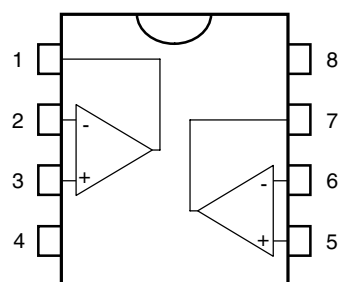


N  
DIP8  
(plastic package)



D  
SO8  
(plastic micropackage)

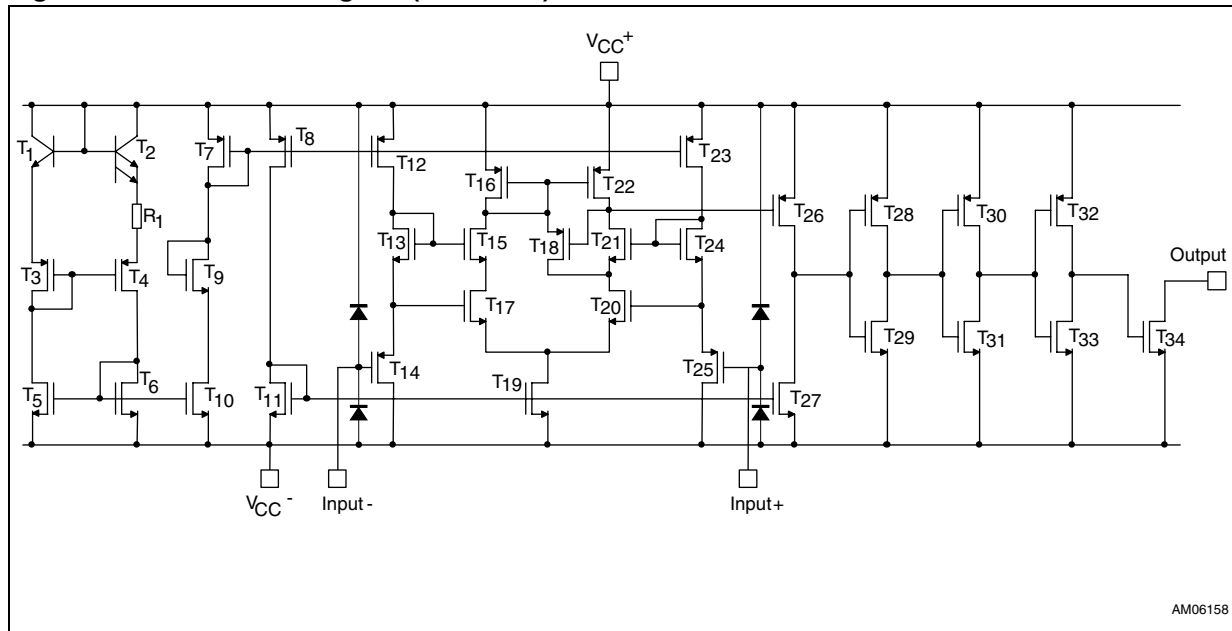
Pin connections (top view)



- 1 - Output 1
- 2 - Inverting Input 1
- 3 - Non-inverting Input 1
- 4 -  $V_{CC}^-$
- 5 - Non-inverting Input 2
- 6 - Inverting Input 2
- 7 - Output 2
- 8 -  $V_{CC}^+$

# 1 Application schematic

Figure 1. Schematic diagram (1/2 TS372)



## 2 Absolute maximum ratings and operating conditions

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CC+}$	Supply voltage <sup>(1) (2)</sup>	18	V
$V_{id}$	Differential input voltage <sup>(3)</sup>	$\pm 18$	V
$V_i$	Input voltage <sup>(4)</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>(5)</sup>	50	mA
	Duration of output circuit to GND <sup>(6)</sup>	Infinite	
$P_d$	Power dissipation <sup>(7)</sup> DIP8 SO8	1250 710	mW
$T_{stg}$	Storage temperature range	-65 to +150	°C
$T_j$	Junction temperature	+150	°C

1. Maximum power supply voltage when the comparator is not switching.
2. All voltage values, except differential voltage, are with respect to network ground terminal.
3. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
4. The magnitude of the input and the output voltages must never exceed the magnitude of the positive supply voltage.
5. Guaranteed by design.
6. Short-circuit from outputs to  $V_{CC+}$  can cause excessive heating and eventual destruction.
7.  $P_d$  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 SO-8 package.

**Table 2. Operating conditions**

Symbol	Parameter	Value	Unit
$V_{CC+}$	Supply voltage	3 to 16	V
$V_{icm}$	Input common-mode voltage range <sup>(1)</sup> $T_{amb} = 25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$ TS372C TS372I/TS372M	$V_{CC+} - 2$ $V_{CC+} - 2.25$ $V_{CC+} - 2.5$	V
$T_{oper}$	Operating free-air temperature range TS372C TS372I TS372M	0 to +70 -40 to +125 -55 to +125	°C

1. And input voltages  $\leq 12$  V.

### 3 Electrical characteristics

**Table 3. Electrical characteristics at  $V_{CC+} = 5\text{ V}$ ,  $V_{CC-} = 0\text{ V}$ ,  $T_{amb} = 25^\circ\text{C}$  (unless otherwise specified)**

Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input offset voltage ( $V_{ic} = V_{icm\ min}$ ) <sup>(1)</sup> $T_{amb} = 25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		2	10 12	mV
$I_{io}$	Input offset current <sup>(2)</sup> $T_{amb} = 25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$ TS372C TS372I/TS372M		1	100 200	pA
$I_{ib}$	Input offset current <sup>(2)</sup> $T_{amb} = 25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$ TS372C TS372I/TS372M		1	150 300	pA
$I_{OH}$	High level output current ( $V_{id} = 1\text{ V}$ ) $T_{amb} = 25^\circ\text{C}$ $V_{OH} = 5\text{ V}$ $T_{min} \leq T_{amb} \leq T_{max}$ $V_{OH} = 15\text{ V}$		0.1	1	nA $\mu\text{A}$
$V_{OL}$	Low level output voltage ( $V_{id} = -1$ , $I_{OL} = 4\text{ mA}$ ) $T_{amb} = 25^\circ\text{C}$ $T_{min} \leq T_{amb} \leq T_{max}$		100	400 700	mV
$I_{OL}$	Low level output current ( $V_{id} = -1$ , $V_{OL} = 1.5\text{ V}$ )	6	45		mA
$I_{CC}$	Supply current (each comparator) ( $V_{id} = 1\text{ V}$ , no load)		150	375	$\mu\text{A}$

1. The specified offset voltage is the maximum value required to drive the output down to 400 mV or up to 4 V with  $R_L = 100\text{ k}\Omega$  to  $V_{CC+}$ .
2. Maximum values including unavoidable inaccuracies of the industrial test.

**Table 4. Switching characteristics ( $V_{CC+} = 5\text{ V}$ ,  $T_{amb} = 25^\circ\text{C}$ )**

Symbol	Parameter	Min.	Typ.	Max.	Unit
$t_{re}$	Response time ( $R_L = 5.1\text{ k}\Omega$ connected to 5 V, $C_L = 15\text{ pF}$ ) <sup>(1)</sup> 100mV input step with 5mV overdrive TTL level input step		600 200		ns

1. The specified response time is the interval between the input signal and the instant when the output signal crosses 1.4 V.

**Note:** *If one of the two channels is not used, it must be configured with a differential input voltage greater than 100 mV to avoid switching.*

## 4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

## 4.1 DIP8 package information

Figure 2. DIP8 package mechanical drawing

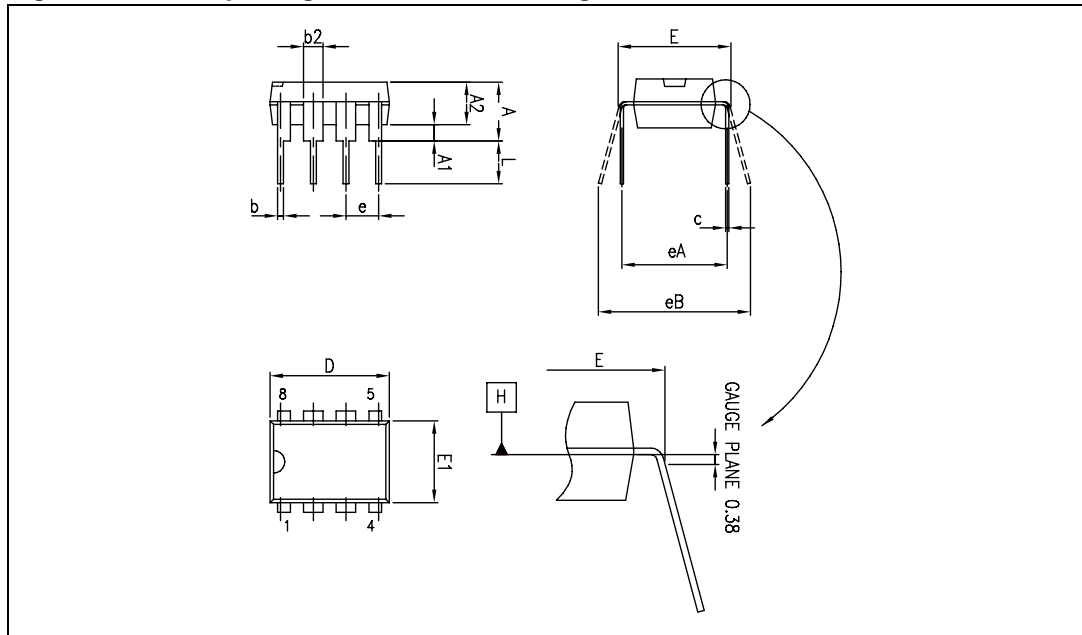


Table 5. DIP8 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			5.33			0.210
A1	0.38			0.015		
A2	2.92	3.30	4.95	0.115	0.130	0.195
b	0.36	0.46	0.56	0.014	0.018	0.022
b2	1.14	1.52	1.78	0.045	0.060	0.070
c	0.20	0.25	0.36	0.008	0.010	0.014
D	9.02	9.27	10.16	0.355	0.365	0.400
E	7.62	7.87	8.26	0.300	0.310	0.325
E1	6.10	6.35	7.11	0.240	0.250	0.280
e		2.54			0.100	
eA		7.62			0.300	
eB			10.92			0.430
L	2.92	3.30	3.81	0.115	0.130	0.150

## 4.2 SO-8 package information

Figure 3. SO-8 package mechanical drawing

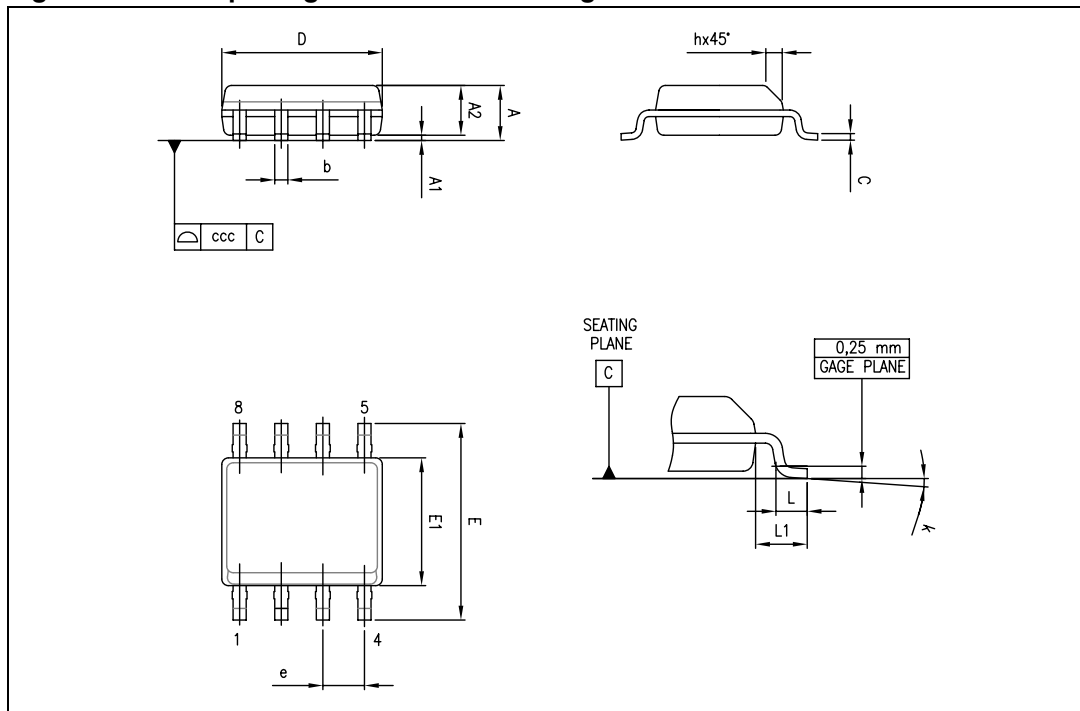


Table 6. SO-8 package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
A1	0.10		0.25	0.004		0.010
A2	1.25			0.049		
b	0.28		0.48	0.011		0.019
c	0.17		0.23	0.007		0.010
D	4.80	4.90	5.00	0.189	0.193	0.197
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e		1.27			0.050	
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
L1		1.04			0.040	
k	0		8°	1°		8°
ccc			0.10			0.004

## 5 Ordering information

**Table 7. Order codes**

Part number	Temperature range	Package	Packing	Marking
TS372CD	0°C, +70°C	SO-8	Tube	
TS372CDT	0°C, +70°C	SO-8	Tape & reel	
TS372CN	0°C, +70°C	DIP8		
TS372ID	-40°C, +125°C	SO-8	Tube	
TS372IDT	-40°C, +125°C	SO-8	Tape & reel	
TS372IN	-40°C, +125°C	DIP8		



## 6 Revision history

**Table 8. Document revision history**

Date	Revision	Changes
01-Feb-2002	1	Initial release.
28-Apr-2011	2	Document reformatted. Modified <a href="#">Table 2</a> , <a href="#">Table 3</a> and <a href="#">Table 7</a> .

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