

## 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

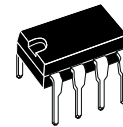
- Battery powered electronics
- General-purpose portable device
- General-purpose low voltage application

### Description

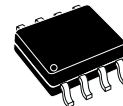
These devices consist of two independent precision voltage comparators, designed to operate with single or dual supplies.

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.

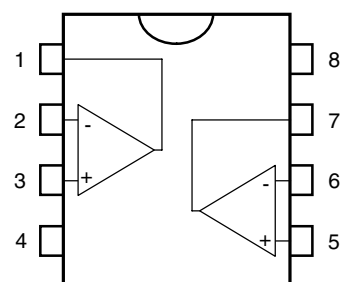


N  
DIP8  
(plastic package)



D  
SO8  
(plastic micropackage)

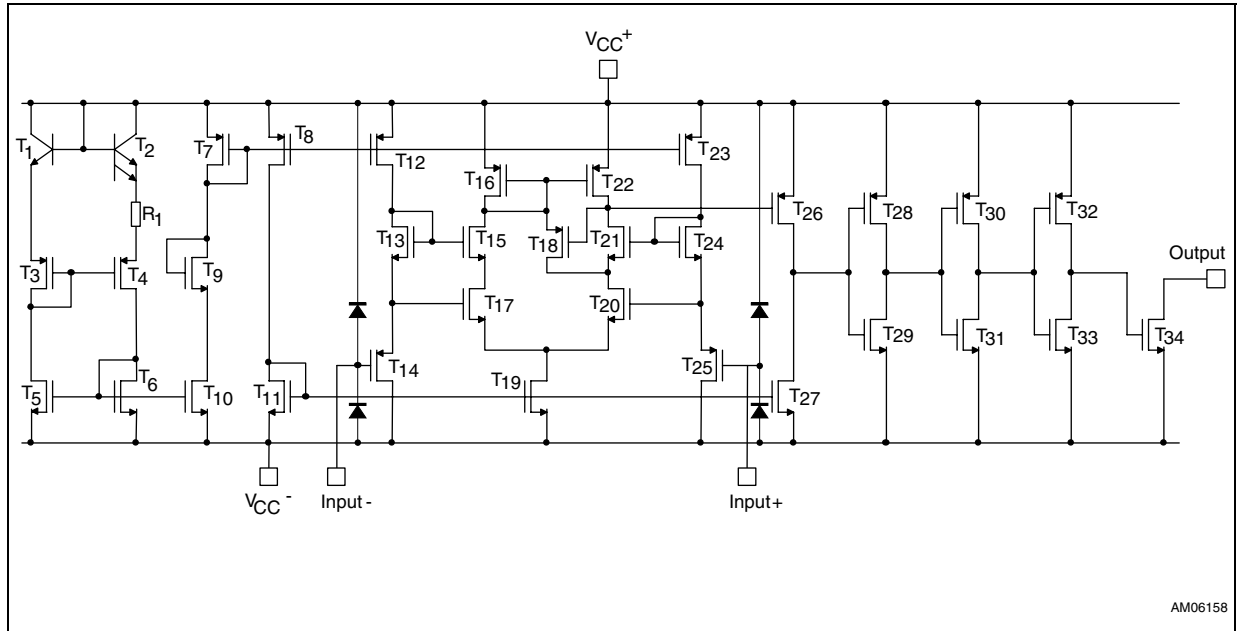
Pin connections (top view)



- 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><br>DIP8<br>SO8                  | 1250<br>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><br>$T_{amb} = 25^\circ\text{C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$ TS372C<br>TS372I/TS372M | $V_{CC+} - 2$<br>$V_{CC+} - 2.25$<br>$V_{CC+} - 2.5$ | V    |
| $T_{oper}$ | Operating free-air temperature range<br>TS372C<br>TS372I<br>TS372M  | 0 to +70<br>-40 to +125<br>-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><br>$T_{amb} = 25^\circ\text{C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$                                  |      | 2    | 10<br>12   | mV                  |
| $I_{io}$ | Input offset current <sup>(2)</sup><br>$T_{amb} = 25^\circ\text{C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$ TS372C<br>TS372I/TS372M                                      |      | 1    | 100<br>200 | pA                  |
| $I_{ib}$ | Input offset current <sup>(2)</sup><br>$T_{amb} = 25^\circ\text{C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$ TS372C<br>TS372I/TS372M                                      |      | 1    | 150<br>300 | pA                  |
| $I_{OH}$ | High level output current ( $V_{id} = 1\text{ V}$ )<br>$T_{amb} = 25^\circ\text{C}$ $V_{OH} = 5\text{ V}$<br>$T_{min} \leq T_{amb} \leq T_{max}$ $V_{OH} = 15\text{ V}$ |      | 0.1  | 1          | nA<br>$\mu\text{A}$ |
| $V_{OL}$ | Low level output voltage ( $V_{id} = -1$ , $I_{OL} = 4\text{ mA}$ )<br>$T_{amb} = 25^\circ\text{C}$<br>$T_{min} \leq T_{amb} \leq T_{max}$                              |      | 100  | 400<br>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)<br>( $V_{id} = 1\text{ V}$ , 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<br>( $R_L = 5.1\text{ k}\Omega$ connected to 5 V, $C_L = 15\text{ pF}$ ) <sup>(1)</sup><br>100mV input step with 5mV overdrive<br>TTL level input step |      | 600<br>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

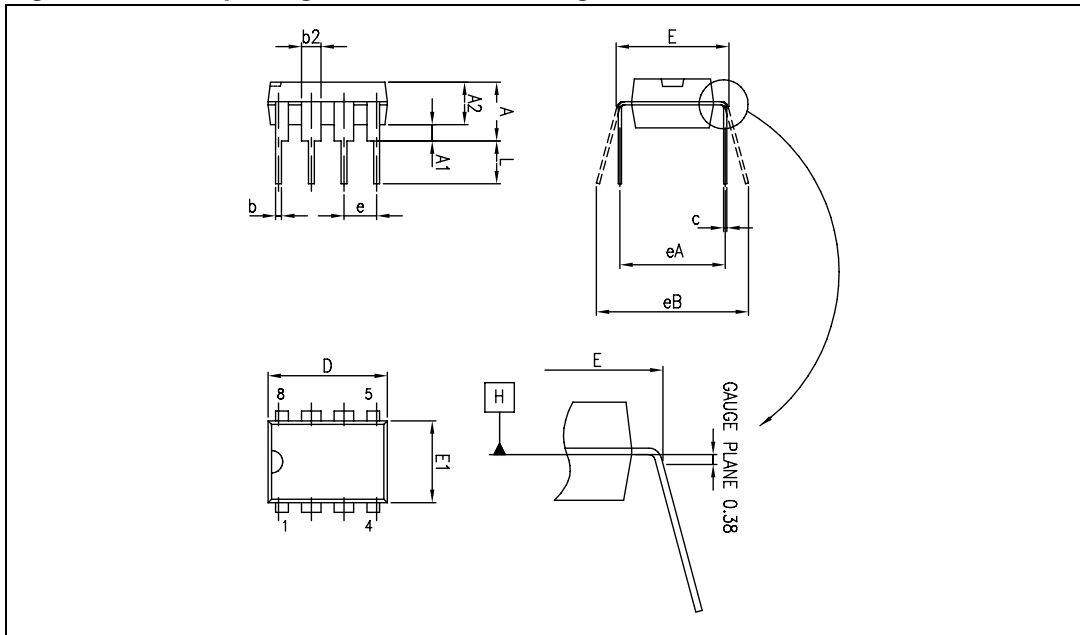


Table 5. DIP8 package mechanical data

| 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

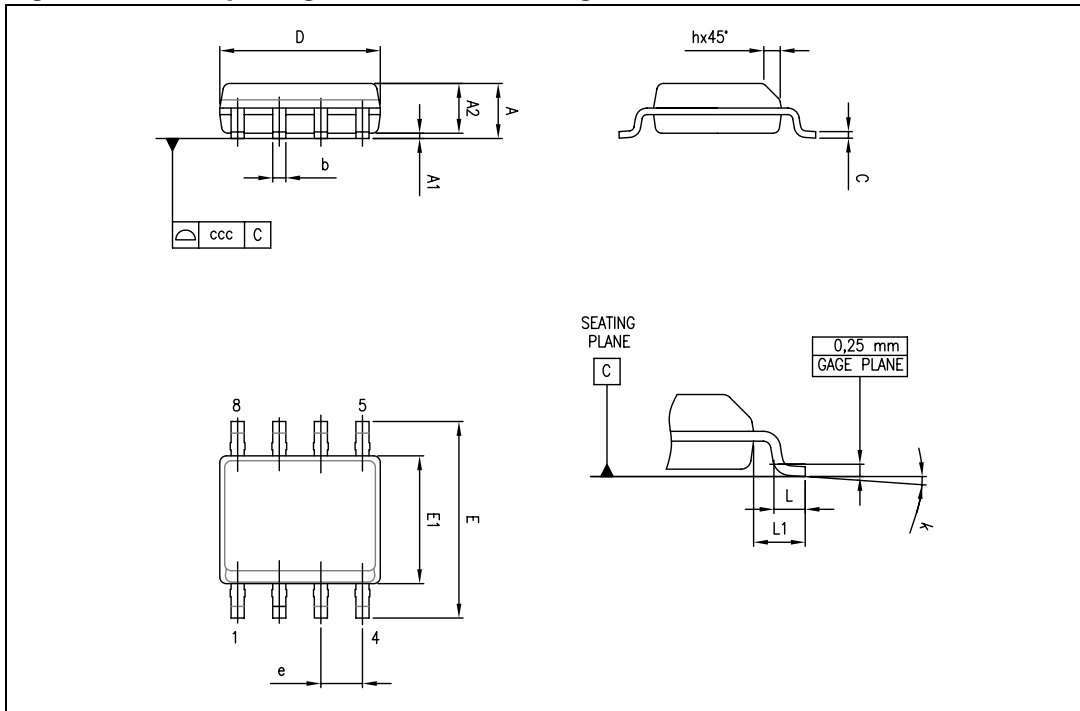


Table 6. SO-8 package mechanical data

| 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.<br>Modified <a href="#">Table 2</a> , <a href="#">Table 3</a> and <a href="#">Table 7</a> . |

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 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 - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

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