

### Features

- Ultra low current consumption (6  $\mu$ A/comp. at  $V_{CC} = 2.7$  V)
- Rail-to-rail CMOS inputs
- Push-pull outputs
- Supply operation from 2.7 to 10 V
- Low propagation delay
- ESD protection (2 kV)
- Latch-up immunity (class A)
- Available in SOT23-5 micropackage, SO-8, SO-14, TSSOP8, and TSSOP14 package

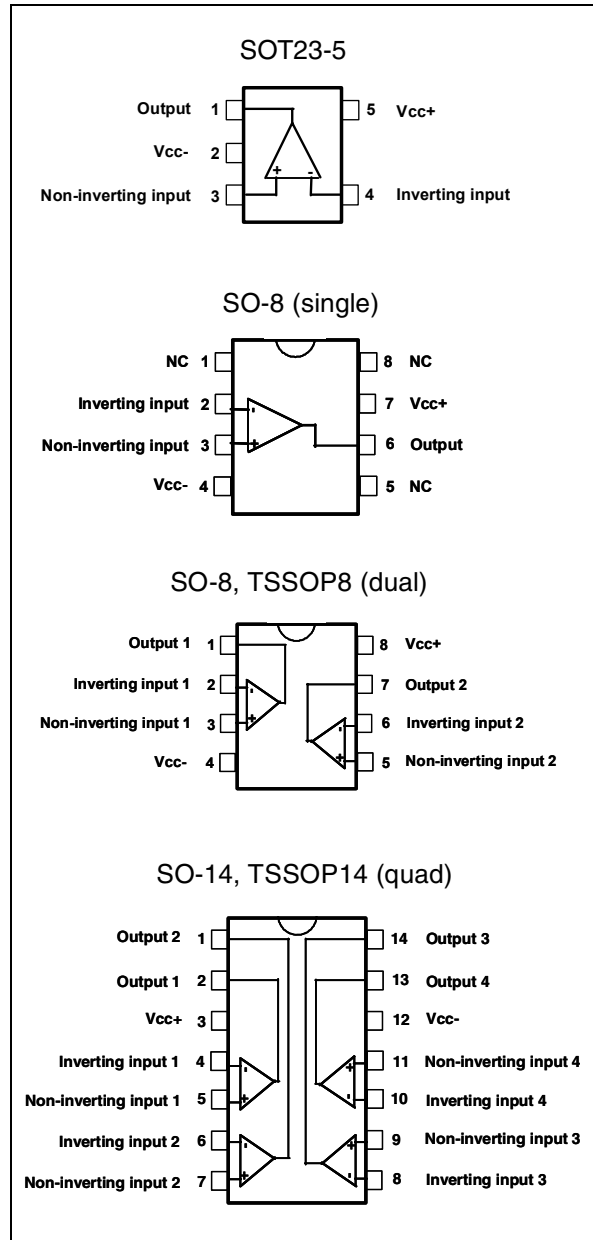
### Applications

- Battery powered systems such as alarms
- Portable communication systems
- Smoke/gas/fire detectors
- Portable computers

### Description

The TS86x device (single, dual and quad) is a rail-to-rail comparator characterized for 2.7 to 10 V operation over  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  temperature ranges. It exhibits an excellent speed-to-power ratio, featuring a current consumption of 6  $\mu$ A per comparator and a response time of 500 ns at 2.7 V for a 100 mV overdrive.

Due to its ultra low power consumption and its availability in a tiny package, the TS86x comparator family is perfectly suited to battery-powered systems. The output stage is designed with a push-pull structure allowing a direct connection to the microcontroller without additional pull-up resistors.



# 1 Absolute maximum ratings and operating conditions

**Table 1. Absolute maximum ratings**

| Symbol     | Parameter                                             | Value        | Unit |
|------------|-------------------------------------------------------|--------------|------|
| $V_{CC}$   | Supply voltage <sup>(1)</sup>                         | 12           | V    |
| $V_{ID}$   | Differential input voltage <sup>(2)</sup>             | $\pm 12$     | V    |
| $V_{IN}$   | Input voltage range <sup>(3)</sup>                    | -0.3 to 12.3 | V    |
| $R_{THJA}$ | Thermal resistance junction-to-ambient <sup>(4)</sup> |              | °C/W |
|            | SOT23-5                                               | 250          |      |
|            | SO-8                                                  | 125          |      |
|            | SO-14                                                 | 105          |      |
|            | TSSOP8                                                | 120          |      |
|            | TSSOP14                                               | 100          |      |
| $R_{THJC}$ | Thermal resistance junction-to-case <sup>(4)</sup>    |              | °C/W |
|            | SOT23-5                                               | 81           |      |
|            | SO-8                                                  | 40           |      |
|            | SO-14                                                 | 31           |      |
|            | TSSOP8                                                | 37           |      |
|            | TSSOP14                                               | 32           |      |
| $T_{STG}$  | Storage temperature range                             | -65 to +150  | °C   |
| $T_J$      | Maximum junction temperature                          | 150          | °C   |
| $T_{LEAD}$ | Lead temperature (soldering, 10 sec.)                 | 260          | °C   |
| ESD        | Human body model (HBM) <sup>(5)</sup>                 | 2            | kV   |
|            | Machine model (MM) <sup>(6)</sup>                     | 200          | V    |
|            | Latch-up immunity                                     | Class A      |      |

1. All voltages values, except differential voltage are with respect to network terminal.
2. Differential voltages are non-inverting input terminal with respect to the inverting input terminal.
3. The magnitude of input and output voltages must never exceed  $V_{CC} + 0.3$  V.
4. Short-circuits can cause excessive heating. These values are typical.
5. Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 k $\Omega$  resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
6. Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5  $\Omega$ ). This is done for all couples of connected pin combinations while the other pins are floating.

**Table 2. Operating conditions**

| Symbol     | Parameter                            | Value                                | Unit |
|------------|--------------------------------------|--------------------------------------|------|
| $V_{CC}$   | Supply voltage                       | 2.7 to 10                            | V    |
| $V_{ICM}$  | Common mode input voltage range      | $V_{CC}^- - 0.3$ to $V_{CC}^+ + 0.3$ | V    |
| $T_{Oper}$ | Operating free air temperature range | -40 to +85                           | °C   |

## 2 Electrical characteristics

**Table 3. Electrical characteristics at  $V_{CC} = 2.7\text{ V}$ ,  $T_{amb} = 25\text{ °C}$  (unless otherwise specified)**

| Symbol          | Parameter                                                              | Min. | Typ. | Max. | Unit                    |
|-----------------|------------------------------------------------------------------------|------|------|------|-------------------------|
| $V_{IO}$        | Input offset voltage                                                   |      |      |      |                         |
|                 | TS861/2/4                                                              |      | 3    | 15   | mV                      |
|                 | $T_{min} < T < T_{max}$                                                |      |      | 18   |                         |
|                 | TS861/2/4A                                                             |      | 3    | 7    |                         |
|                 | $T_{min} < T < T_{max}$                                                |      |      | 10   |                         |
| $\Delta V_{IO}$ | Input offset voltage drift                                             |      | 6    |      | $\mu\text{V}/\text{°C}$ |
| $I_{IO}$        | Input offset current <sup>(1)</sup>                                    |      | 1    | 150  | pA                      |
|                 | $T_{min} < T < T_{max}$                                                |      |      | 300  |                         |
| $I_{IB}$        | Input bias current <sup>(1)</sup>                                      |      | 1    | 300  | pA                      |
|                 | $T_{min} < T < T_{max}$                                                |      |      | 600  |                         |
| $V_{OH}$        | High level output voltage                                              |      |      |      | V                       |
|                 | $I_{SOURCE} = 2.5\text{ mA}$                                           | 2.35 | 2.45 |      |                         |
|                 | $T_{min} < T < T_{max}$                                                | 2.15 |      |      |                         |
| $V_{OL}$        | Low level output voltage                                               |      |      |      | V                       |
|                 | $I_{SINK} = 2.5\text{ mA}$                                             |      | 0.2  | 0.35 |                         |
|                 | $T_{min} < T < T_{max}$                                                |      |      | 0.45 |                         |
| $A_{VD}$        | Large signal voltage gain <sup>(2)</sup>                               |      | 240  |      | dB                      |
| CMR             | Common mode rejection ratio                                            |      |      |      | dB                      |
|                 | $0 < V_{ICM} < 2.7\text{ V}$                                           |      | 65   |      |                         |
| SVR             | Supply voltage rejection ratio                                         |      |      |      | dB                      |
|                 | $0 < V_{CC} < 10\text{ V}$                                             |      | 80   |      |                         |
| $I_{CC}$        | Supply current per comparator                                          |      |      |      | $\mu\text{A}$           |
|                 | No load, output low                                                    |      | 6    | 12   |                         |
|                 | No load, output high                                                   |      | 8    | 14   |                         |
| $T_{PLH}$       | Propagation delay from output low to output high                       |      |      |      | $\mu\text{s}$           |
|                 | $V_{ICM} = 1.35\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ |      |      |      |                         |
|                 | Overdrive = 10 mV                                                      |      | 1.5  |      |                         |
|                 | Overdrive = 100 mV                                                     |      | 0.6  |      |                         |
| $T_{PHL}$       | Propagation delay from output high to output low                       |      |      |      | $\mu\text{s}$           |
|                 | $V_{ICM} = 1.35\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ |      |      |      |                         |
|                 | Overdrive = 10 mV                                                      |      | 1.5  |      |                         |
|                 | Overdrive = 100 mV                                                     |      | 0.5  |      |                         |

**Table 3. Electrical characteristics at  $V_{CC} = 2.7\text{ V}$ ,  $T_{amb} = 25\text{ °C}$   
(unless otherwise specified) (continued)**

| Symbol | Parameter                                                                    | Min. | Typ. | Max. | Unit |
|--------|------------------------------------------------------------------------------|------|------|------|------|
| $T_F$  | Fall time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV |      | 20   |      | ns   |
| $T_R$  | Rise time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV |      | 20   |      | ns   |

1. Maximum values including unavoidable inaccuracies of the industrial tests.
2. Design evaluation.

**Note:** *Limits are 100% production tested at 25 °C. Limits over temperature are guaranteed through correlation and by design.*

**Table 4. Electrical characteristics at  $V_{CC} = 5\text{ V}$ ,  $T_{amb} = 25\text{ °C}$  (unless otherwise specified)**

| Symbol          | Parameter                                                                                                                                                            | Min.        | Typ.     | Max.                | Unit                         |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------|---------------------|------------------------------|
| $V_{IO}$        | Input offset voltage<br>TS861/2/4<br>$T_{min} < T < T_{max}$<br>TS861/2/4A<br>$T_{min} < T < T_{max}$                                                                |             | 3<br>3   | 15<br>18<br>7<br>10 | mV                           |
| $\Delta V_{IO}$ | Input offset voltage drift                                                                                                                                           |             | 6        |                     | $\mu\text{V}/^\circ\text{C}$ |
| $I_{IO}$        | Input offset current <sup>(1)</sup><br>$T_{min} < T < T_{max}$                                                                                                       |             | 1        | 150<br>300          | pA                           |
| $I_{IB}$        | Input bias current <sup>(1)</sup><br>$T_{min} < T < T_{max}$                                                                                                         |             | 1        | 300<br>600          | pA                           |
| $V_{OH}$        | High level output voltage<br>$I_{SOURCE} = 5\text{ mA}$<br>$T_{min} < T < T_{max}$                                                                                   | 4.6<br>4.45 | 4.8      |                     | V                            |
| $V_{OL}$        | Low level output voltage<br>$I_{SINK} = 5\text{ mA}$<br>$T_{min} < T < T_{max}$                                                                                      |             | 0.2      | 0.4<br>0.55         | V                            |
| $A_{VD}$        | Large signal voltage gain <sup>(2)</sup>                                                                                                                             |             | 240      |                     | dB                           |
| CMR             | Common mode rejection ratio<br>$0 < V_{ICM} < 5\text{ V}$                                                                                                            |             | 70       |                     | dB                           |
| SVR             | Supply voltage rejection ratio<br>$2.7 < V_{CC} < 10\text{ V}$                                                                                                       |             | 80       |                     | dB                           |
| $I_{CC}$        | Supply current per comparator<br>No load, output low<br>No load, output high                                                                                         |             | 6<br>8   | 12<br>14            | $\mu\text{A}$                |
| $T_{PLH}$       | Propagation delay from output low to output high<br>$V_{ICM} = 2.5\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$<br>Overdrive = 10 mV<br>Overdrive = 100 mV |             | 2<br>0.5 |                     | $\mu\text{s}$                |
| $T_{PHL}$       | Propagation delay from output high to output low<br>$V_{ICM} = 2.5\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$<br>Overdrive = 10 mV<br>Overdrive = 100 mV |             | 2<br>0.4 |                     | $\mu\text{s}$                |
| $T_F$           | Fall time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV                                                                                         |             | 20       |                     | ns                           |
| $T_R$           | Rise time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV                                                                                         |             | 20       |                     | ns                           |

1. Maximum values including unavoidable inaccuracies of the industrial test.

2. Design evaluation.

**Note:** Limits are 100% production tested at 25 °C. Limits over temperature are guaranteed through correlation and by design.

**Table 5. Electrical characteristics at  $V_{CC} = +10\text{ V}$ ,  $T_{amb} = 25\text{ °C}$  (unless otherwise specified)**

| Symbol          | Parameter                                                                                                                                                          | Min.        | Typ.       | Max.        | Unit                    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|------------|-------------|-------------------------|
| $V_{IO}$        | Input offset voltage ( $V_{ICM} = V_{CC} / 2$ )<br>TS861/2/4<br>$T_{min} < T < T_{max}$                                                                            |             | 3          | 15<br>18    | mV                      |
| $\Delta V_{IO}$ | Input offset voltage drift                                                                                                                                         |             | 6          |             | $\mu\text{V}/\text{°C}$ |
| $I_{IO}$        | Input offset current <sup>(1)</sup><br>$T_{min} < T < T_{max}$                                                                                                     |             | 1          | 150<br>300  | pA                      |
| $I_{IB}$        | Input bias current <sup>(1)</sup><br>$T_{min} < T < T_{max}$                                                                                                       |             | 1          | 300<br>600  | pA                      |
| $V_{OH}$        | High level output voltage<br>$I_{SOURCE} = 5\text{ mA}$<br>$T_{min} < T < T_{max}$                                                                                 | 9.6<br>9.45 | 9.8        |             | V                       |
| $V_{OL}$        | Low level output voltage<br>$I_{SINK} = 5\text{ mA}$<br>$T_{min} < T < T_{max}$                                                                                    |             | 0.2        | 0.4<br>0.55 | V                       |
| $A_{VD}$        | Large signal voltage gain <sup>(2)</sup>                                                                                                                           |             | 240        |             | dB                      |
| CMR             | Common mode rejection ratio<br>$0 < V_{ICM} < 10\text{ V}$                                                                                                         |             | 75         |             | dB                      |
| SVR             | Supply voltage rejection ratio<br>$2.7 < V_{CC} < 10\text{ V}$                                                                                                     |             | 80         |             | dB                      |
| $I_{CC}$        | Supply current per comparator<br>No load, output low<br>No load, output high                                                                                       |             | 7<br>10    | 14<br>16    | $\mu\text{A}$           |
| $T_{PLH}$       | Propagation delay from output low to output high<br>$V_{ICM} = 5\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$<br>Overdrive = 10 mV<br>Overdrive = 100 mV |             | 3<br>0.5   |             | $\mu\text{s}$           |
| $T_{PHL}$       | Propagation delay from output high to output low<br>$V_{ICM} = 5\text{ V}$ , $f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$<br>Overdrive = 10 mV<br>Overdrive = 100 mV |             | 2.6<br>0.4 |             | $\mu\text{s}$           |
| $T_F$           | Fall time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV                                                                                       |             | 20         |             | ns                      |
| $T_R$           | Rise time<br>$f = 10\text{ kHz}$ , $C_L = 50\text{ pF}$ , overdrive = 100 mV                                                                                       |             | 20         |             | ns                      |

1. Maximum values including unavoidable inaccuracies of the industrial test.

2. Design evaluation.

**Note:** Limits are 100% production tested at 25 °C. Limits over temperature are guaranteed through correlation and by design.

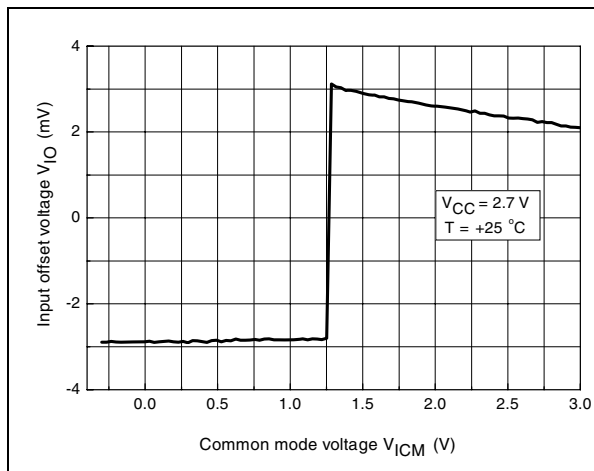
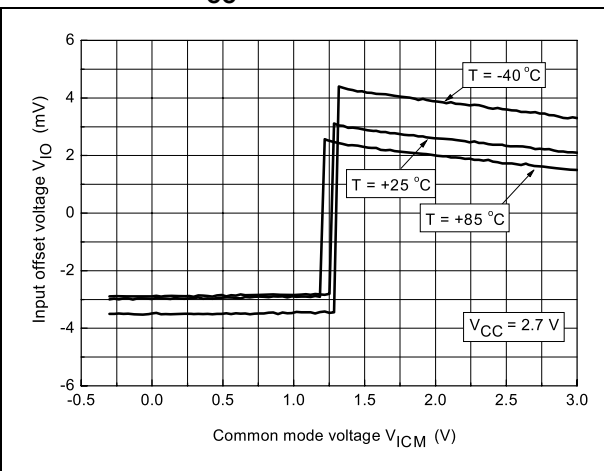
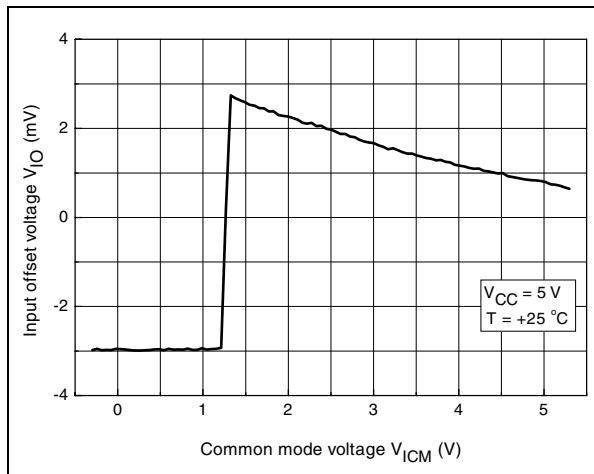
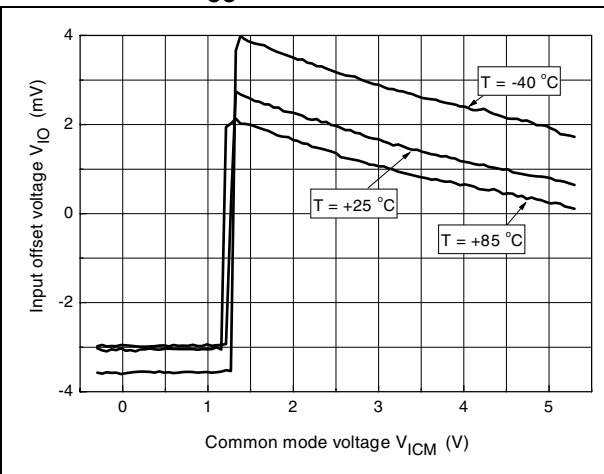
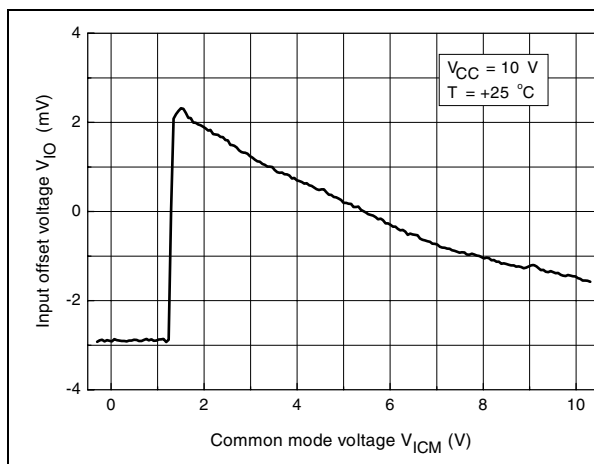
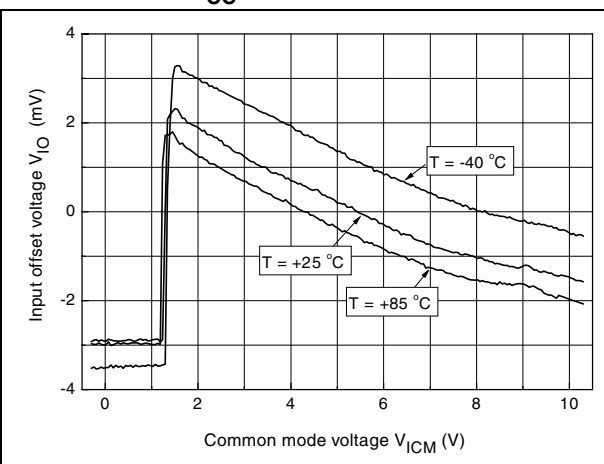
**Figure 1.**  $V_{IO}$  vs.  $V_{ICM}$  at  $V_{CC} = 2.7$  V**Figure 2.**  $V_{IO}$  vs.  $V_{ICM}$  and temperature at  $V_{CC} = 2.7$  V**Figure 3.**  $V_{IO}$  vs.  $V_{ICM}$  at  $V_{CC} = 5$  V**Figure 4.**  $V_{IO}$  vs.  $V_{ICM}$  and temperature at  $V_{CC} = 5$  V**Figure 5.**  $V_{IO}$  vs.  $V_{ICM}$  at  $V_{CC} = 10$  V**Figure 6.**  $V_{IO}$  vs.  $V_{ICM}$  and temperature at  $V_{CC} = 10$  V

Figure 7.  $V_{IO}$  vs.  $V_{CC}$  at  $V_{ICM} = V_{CC}/2$

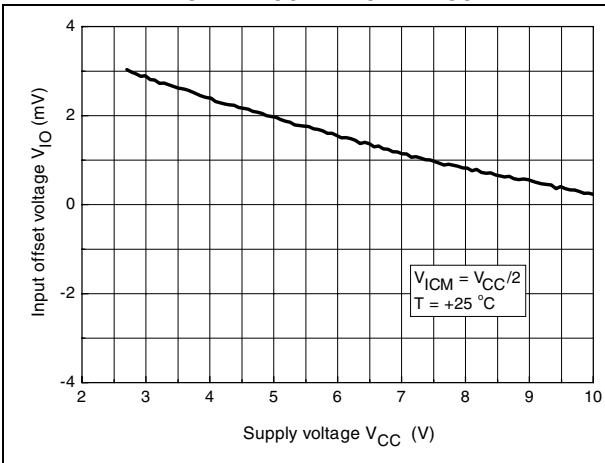


Figure 8.  $V_{IO}$  vs. temperature at  $V_{CC} = 5$  V

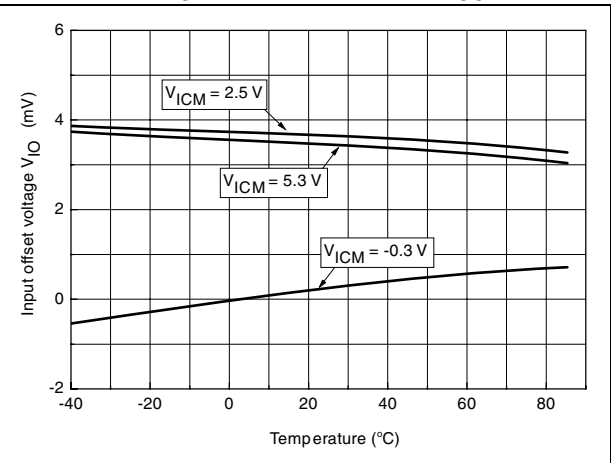


Figure 9. Supply current ( $I_{CC}$ ) vs. supply voltage ( $V_{CC}$ ) ( $V_{ID} = -1$  V)

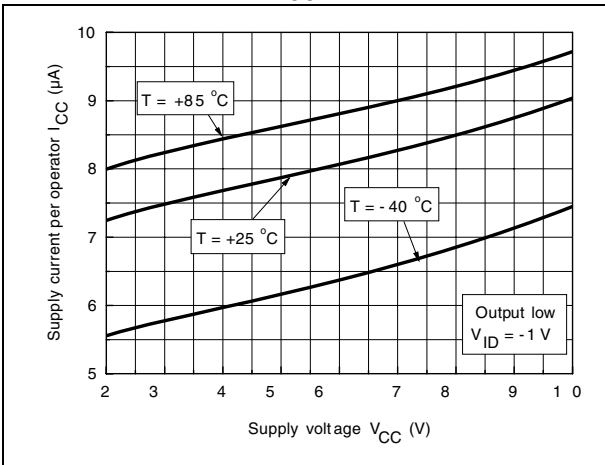


Figure 10. Supply current ( $I_{CC}$ ) vs. supply voltage ( $V_{CC}$ ) ( $V_{ID} = +1$  V)

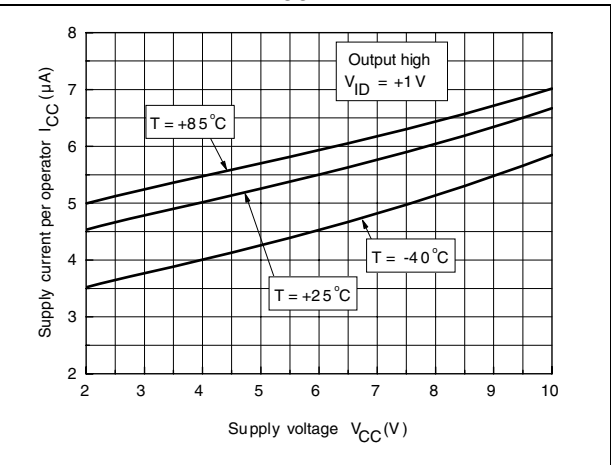


Figure 11. Supply current ( $I_{CC}$ ) vs. temperature ( $V_{ID} = -1$  V)

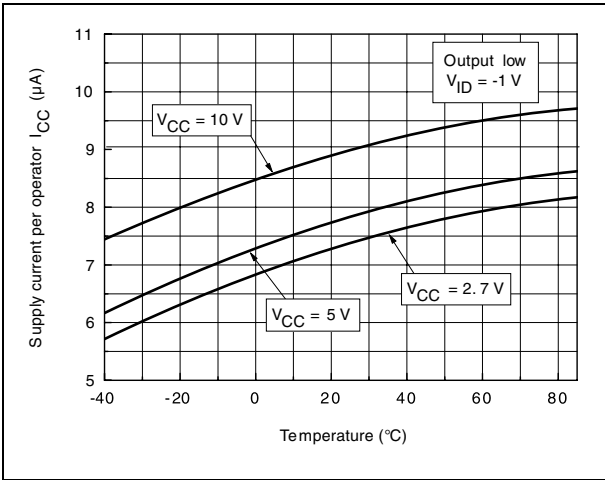
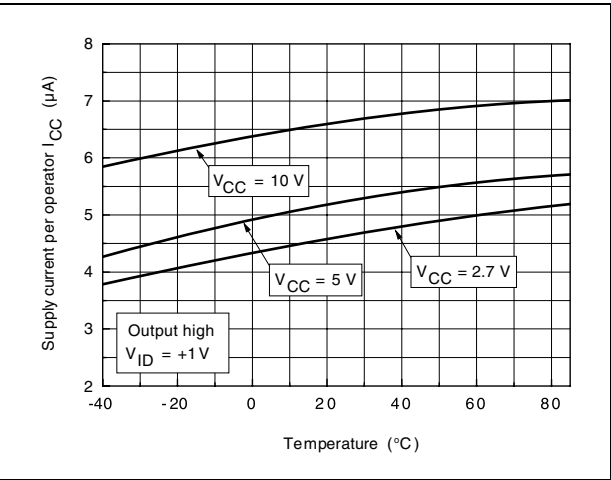
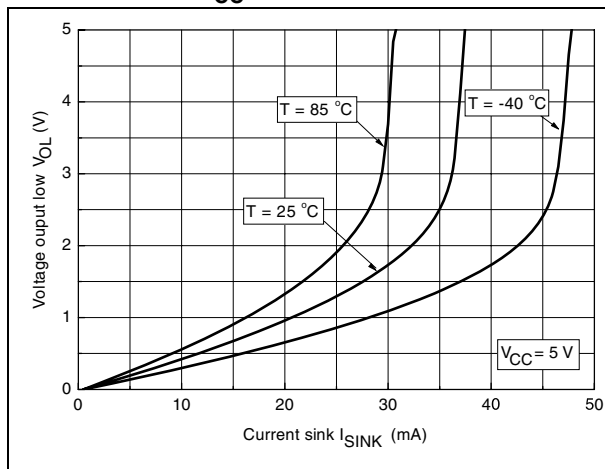


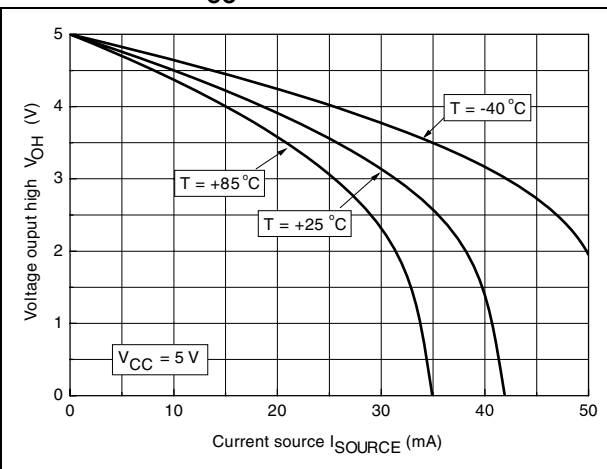
Figure 12. Supply current ( $I_{CC}$ ) vs. temperature ( $V_{ID} = +1$  V)



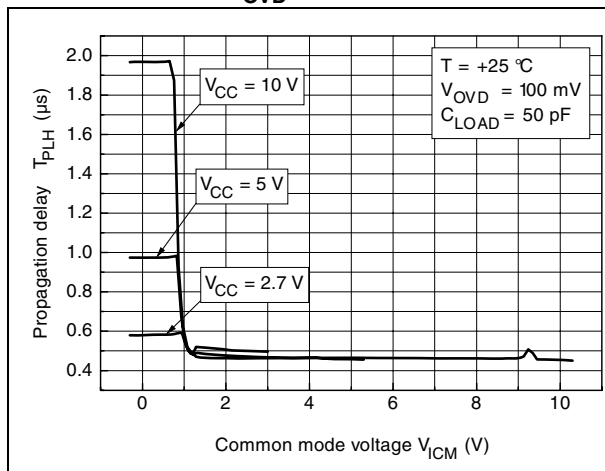
**Figure 13.**  $V_{OL}$  vs.  $I_{SINK}$  and temperature at  $V_{CC} = 5\text{ V}$



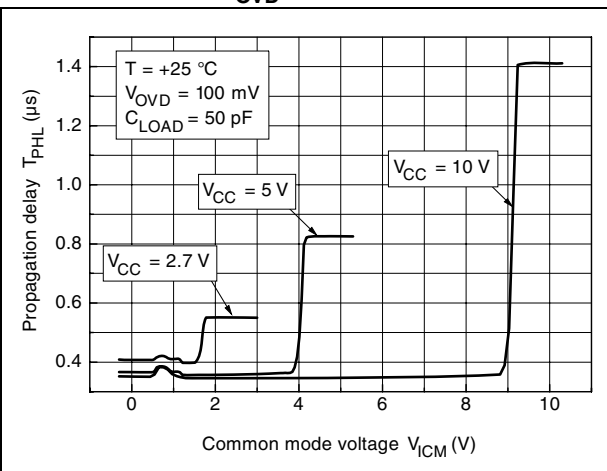
**Figure 14.**  $V_{OH}$  vs.  $I_{SOURCE}$  and temperature at  $V_{CC} = 5\text{ V}$



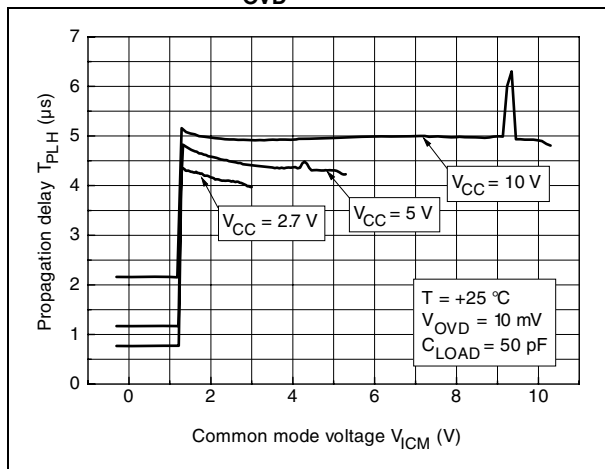
**Figure 15.** Propagation delay  $T_{PLH}$  vs.  $V_{ICM}$  with  $V_{OVD} = 100\text{ mV}$



**Figure 16.** Propagation delay  $T_{PHL}$  vs.  $V_{ICM}$  with  $V_{OVD} = 100\text{ mV}$



**Figure 17.** Propagation delay  $T_{PLH}$  vs.  $V_{ICM}$  with  $V_{OVD} = 10\text{ mV}$



**Figure 18.** Propagation delay  $T_{PHL}$  vs.  $V_{ICM}$  with  $V_{OVD} = 10\text{ mV}$

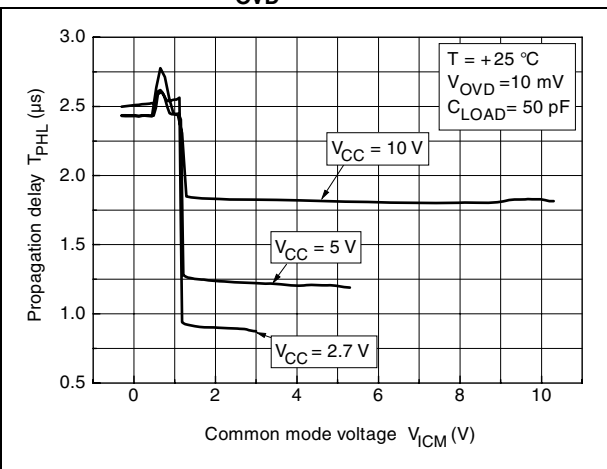


Figure 19. Propagation delay vs.  $V_{CC}$  with  $V_{OVD} = 10\text{ mV}$

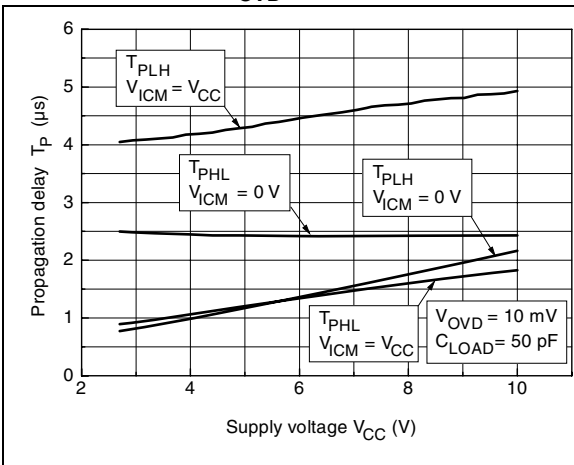


Figure 20. Propagation delay vs.  $V_{CC}$  with  $V_{OVD} = 100\text{ mV}$

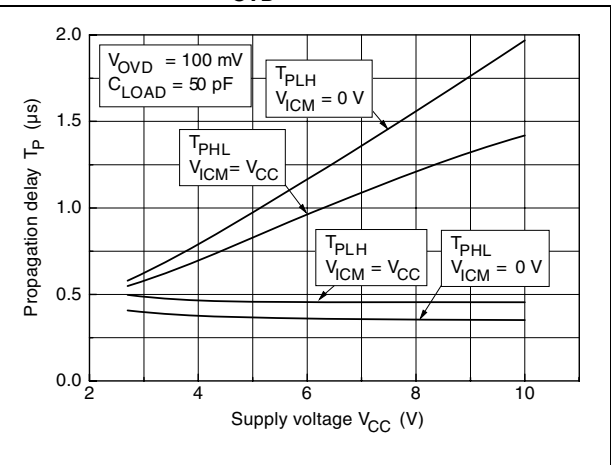


Figure 21. Propagation delay vs. overdrive voltage at  $V_{CC} = 2.7\text{ V}$

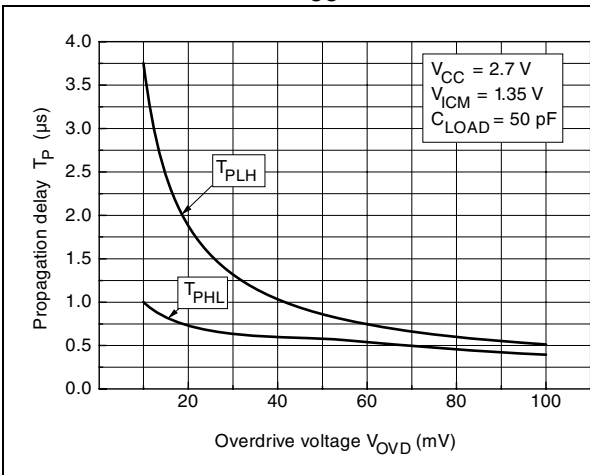


Figure 22. Propagation delay vs. overdrive voltage at  $V_{CC} = 5\text{ V}$

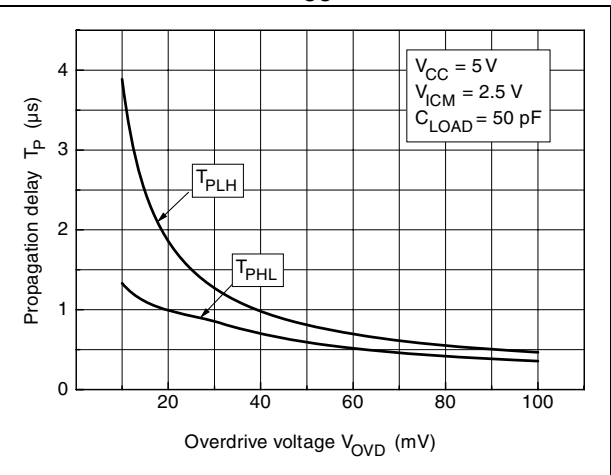
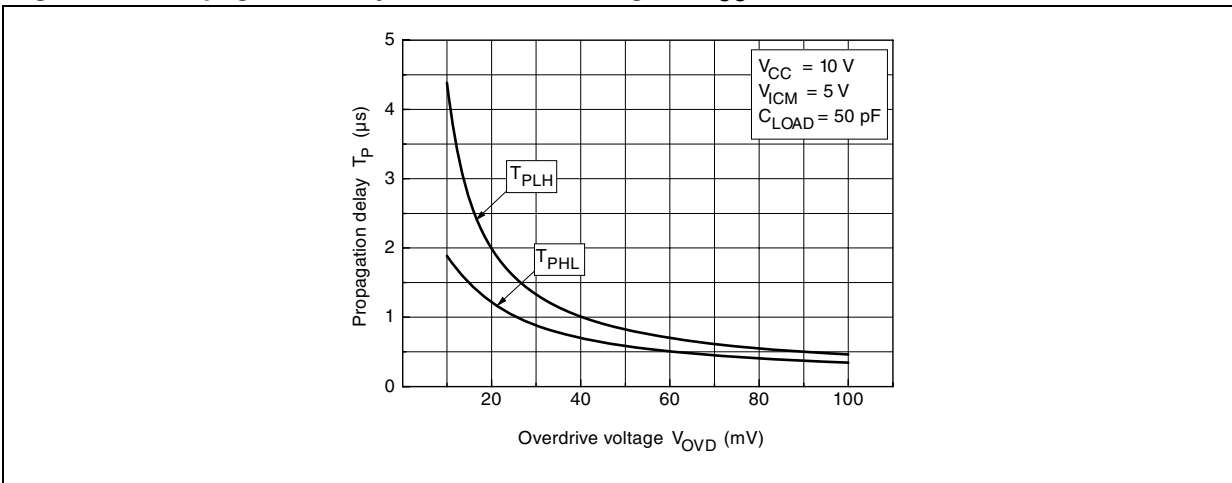


Figure 23. Propagation delay vs. overdrive voltage at  $V_{CC} = 10\text{ V}$



### 3 Package information

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

### 3.1 SOT23-5 package information

Figure 24. SOT23-5L package outline

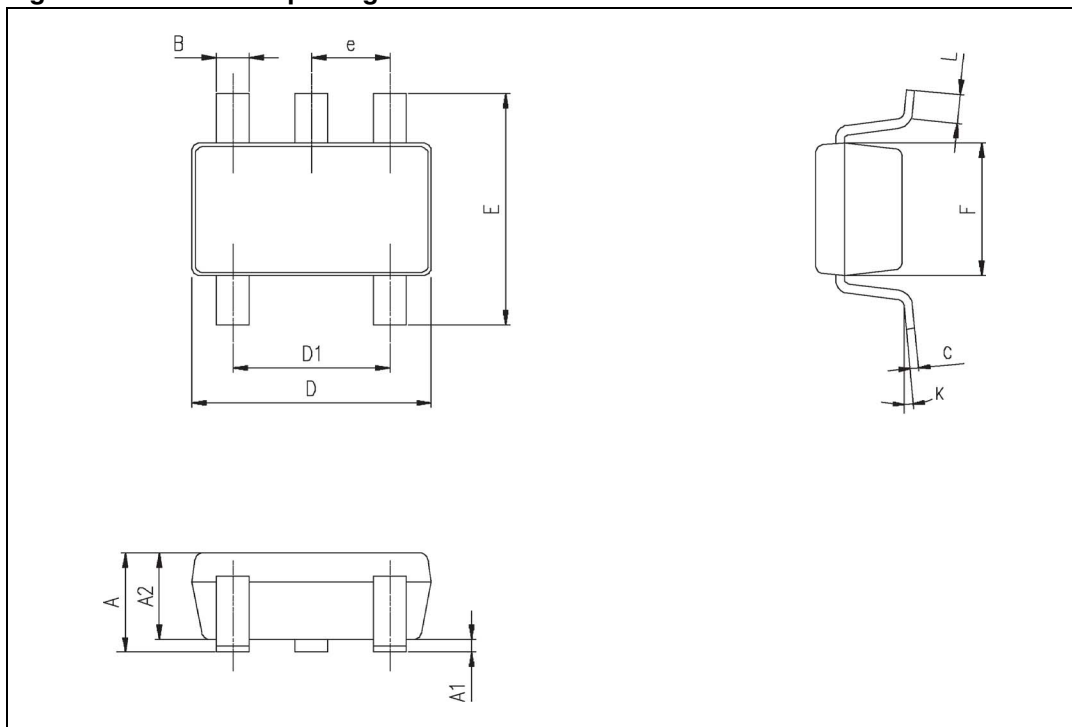


Table 6. SOT23-5L package mechanical data

| Symbol | Dimensions  |      |      |        |       |       |
|--------|-------------|------|------|--------|-------|-------|
|        | Millimeters |      |      | Inches |       |       |
|        | Min.        | Typ. | Max. | Min.   | Typ.  | Max.  |
| A      | 0.90        | 1.20 | 1.45 | 0.035  | 0.047 | 0.057 |
| A1     |             |      | 0.15 |        |       | 0.006 |
| A2     | 0.90        | 1.05 | 1.30 | 0.035  | 0.041 | 0.051 |
| B      | 0.35        | 0.40 | 0.50 | 0.013  | 0.015 | 0.019 |
| C      | 0.09        | 0.15 | 0.20 | 0.003  | 0.006 | 0.008 |
| D      | 2.80        | 2.90 | 3.00 | 0.110  | 0.114 | 0.118 |
| D1     |             | 1.90 |      |        | 0.075 |       |
| e      |             | 0.95 |      |        | 0.037 |       |
| E      | 2.60        | 2.80 | 3.00 | 0.102  | 0.110 | 0.118 |
| F      | 1.50        | 1.60 | 1.75 | 0.059  | 0.063 | 0.069 |
| L      | 0.10        | 0.35 | 0.60 | 0.004  | 0.013 | 0.023 |
| K      | 0°          |      | 10°  |        |       |       |

## 3.2 SO-8 package information

Figure 25. SO-8 package outline

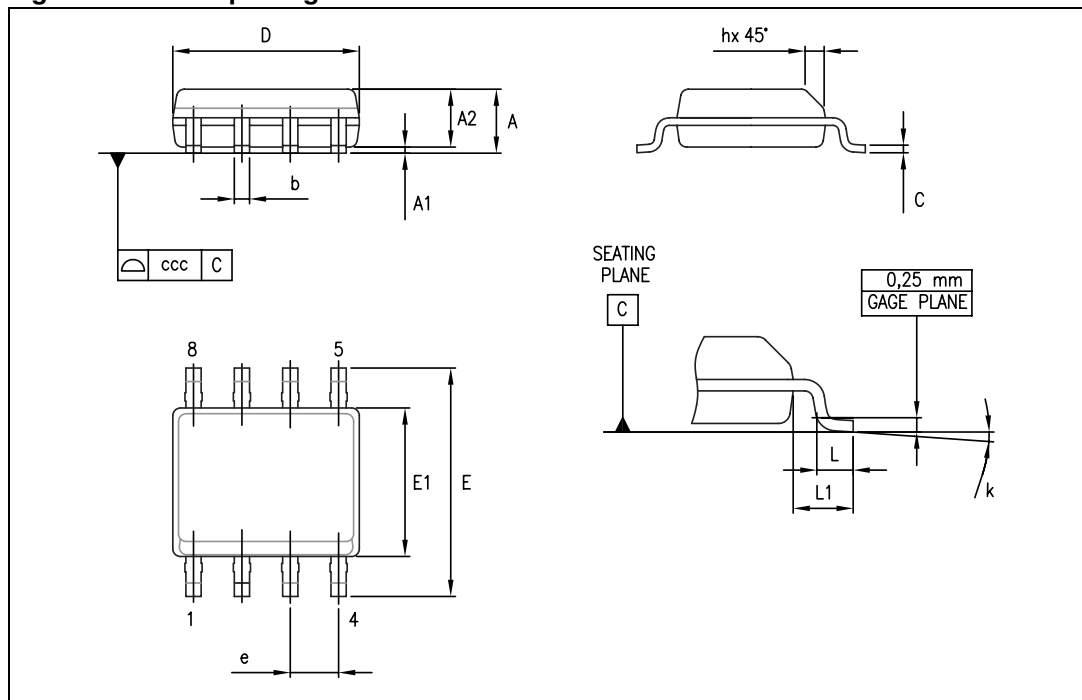


Table 7. SO-8 package mechanical data

| Symbol | 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 |

### 3.3 SO-14 package information

Figure 26. SO-14 package outline

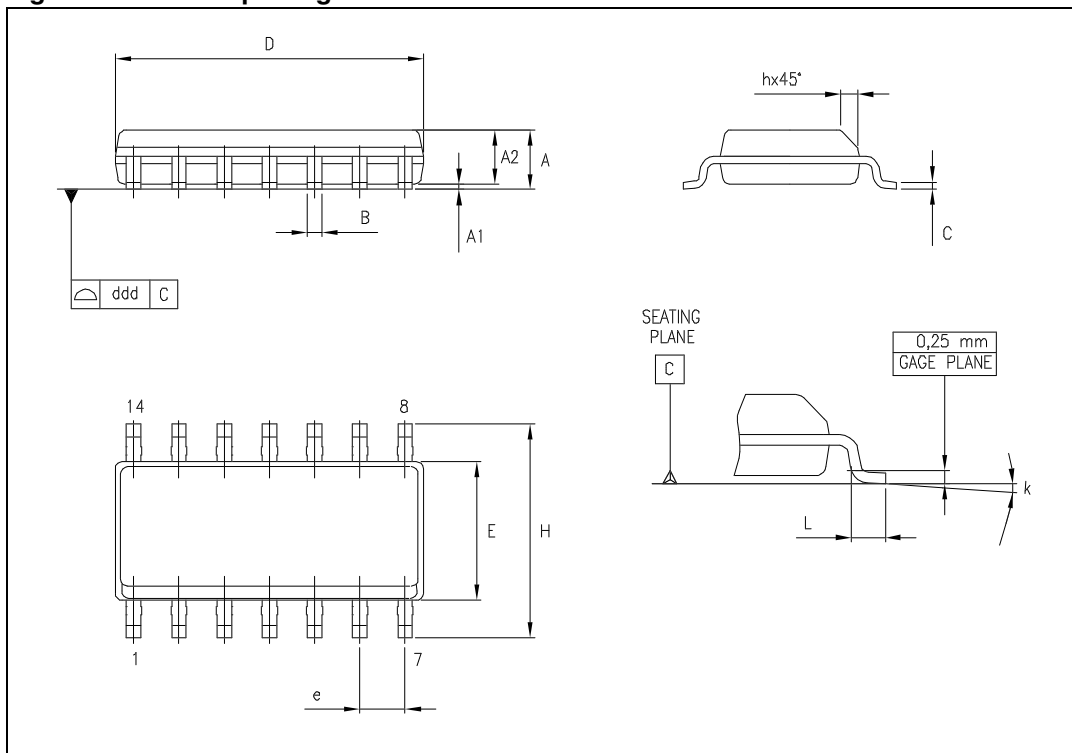


Table 8. SO-14 package mechanical data

| Symbol | Dimensions  |      |      |        |      |       |
|--------|-------------|------|------|--------|------|-------|
|        | Millimeters |      |      | Inches |      |       |
|        | Min.        | Typ. | Max. | Min.   | Typ. | Max.  |
| A      | 1.35        |      | 1.75 | 0.05   |      | 0.068 |
| A1     | 0.10        |      | 0.25 | 0.004  |      | 0.009 |
| A2     | 1.10        |      | 1.65 | 0.04   |      | 0.06  |
| B      | 0.33        |      | 0.51 | 0.01   |      | 0.02  |
| C      | 0.19        |      | 0.25 | 0.007  |      | 0.009 |
| D      | 8.55        |      | 8.75 | 0.33   |      | 0.34  |
| E      | 3.80        |      | 4.0  | 0.15   |      | 0.15  |
| e      |             | 1.27 |      |        | 0.05 |       |
| H      | 5.80        |      | 6.20 | 0.22   |      | 0.24  |
| h      | 0.25        |      | 0.50 | 0.009  |      | 0.02  |
| L      | 0.40        |      | 1.27 | 0.015  |      | 0.05  |
| k      | 8° (max.)   |      |      |        |      |       |
| ddd    |             |      | 0.10 |        |      | 0.004 |

### 3.4 TSSOP8 package information

Figure 27. TSSOP8 package outline

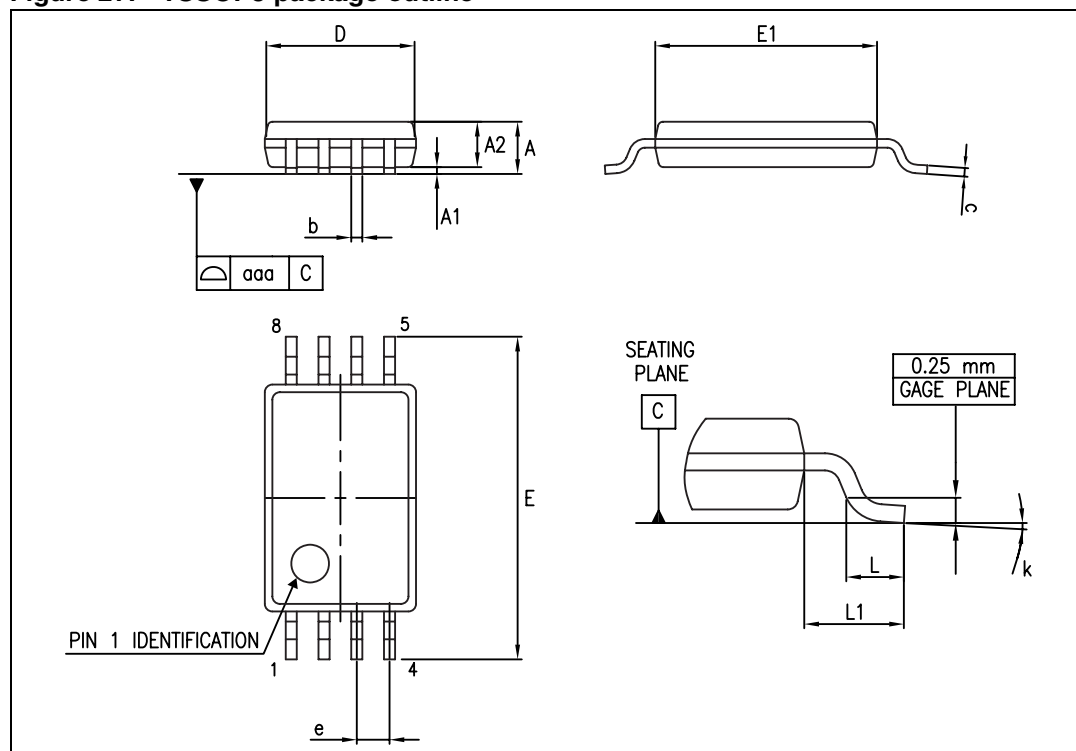


Table 9. TSSOP8 package mechanical data

| Symbol | Dimensions  |      |      |        |        |       |
|--------|-------------|------|------|--------|--------|-------|
|        | Millimeters |      |      | Inches |        |       |
|        | Min.        | Typ. | Max. | Min.   | Typ.   | Max.  |
| A      |             |      | 1.20 |        |        | 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  |       |
| aaa    |             |      | 0.10 |        |        | 0.004 |

### 3.5 TSSOP14 package information

Figure 28. TSSOP14 package outline

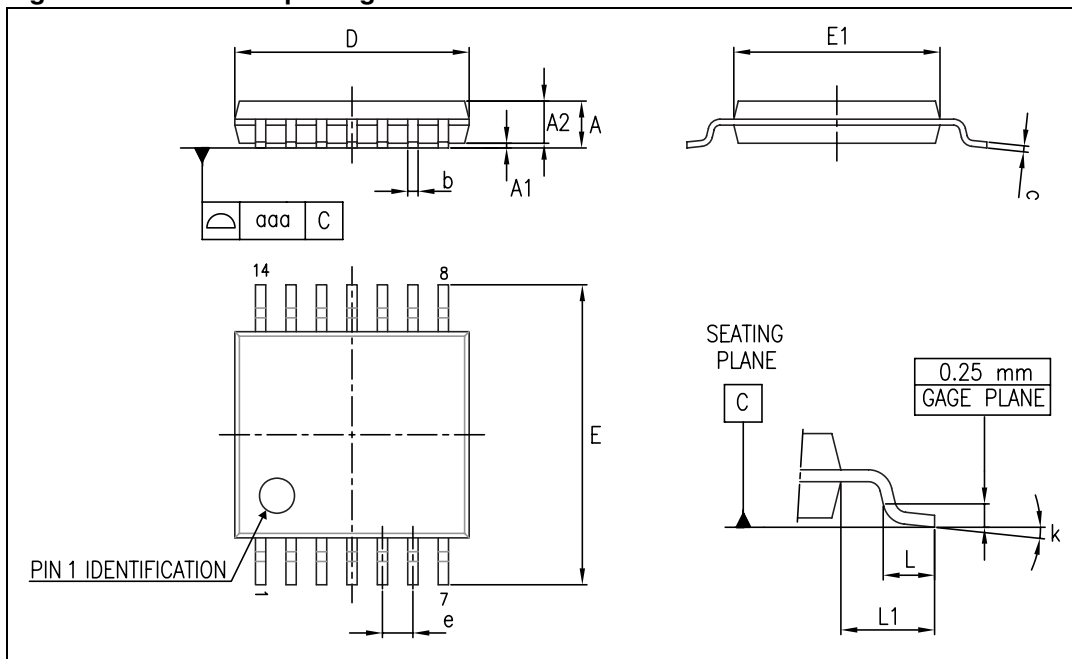


Table 10. TSSOP14 package mechanical data

| Symbol | Dimensions  |      |      |        |        |        |
|--------|-------------|------|------|--------|--------|--------|
|        | Millimeters |      |      | Inches |        |        |
|        | Min.        | Typ. | Max. | Min.   | Typ.   | Max.   |
| A      |             |      | 1.20 |        |        | 0.047  |
| A1     | 0.05        |      | 0.15 | 0.002  | 0.004  | 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  |        | 0.0089 |
| D      | 4.90        | 5.00 | 5.10 | 0.193  | 0.197  | 0.201  |
| E      | 6.20        | 6.40 | 6.60 | 0.244  | 0.252  | 0.260  |
| E1     | 4.30        | 4.40 | 4.50 | 0.169  | 0.173  | 0.176  |
| e      |             | 0.65 |      |        | 0.0256 |        |
| L      | 0.45        | 0.60 | 0.75 | 0.018  | 0.024  | 0.030  |
| L1     |             | 1.00 |      |        | 0.039  |        |
| k      | 0°          |      | 8°   | 0°     |        | 8°     |
| aaa    |             |      | 0.10 |        |        | 0.004  |

## 4 Ordering information

**Table 11. Order codes**

| Part number           | Temperature range | Package | Packaging             | Marking       |
|-----------------------|-------------------|---------|-----------------------|---------------|
| TS861ILT<br>TS861AILT | -40 °C, +85 °C    | SOT-23  | Tape and reel         | K501<br>K502  |
| TS861ID<br>TS861IDT   |                   | SO-8    | Tube<br>Tape and reel | 861I          |
| TS861AID<br>TS861AIDT |                   |         | Tube<br>Tape and reel | 861AI         |
| TS862ID<br>TS862IDT   | -40 °C, +85 °C    | SO-8    | Tube<br>Tape and reel | 862I          |
| TS862AID<br>TS862AIDT |                   |         | Tube<br>Tape and reel | 862AI         |
| TS862IPT<br>TS862AIPT |                   | TSSOP8  | Tape and reel         | 862I<br>862AI |
| TS864ID<br>TS864IDT   | -40 °C, +85 °C    | SO-14   | Tube<br>Tape and reel | 864I          |
| TS864AID<br>TS864AIDT |                   |         | Tube<br>Tape and reel | 864AI         |
| TS864IPT<br>TS864AIPT |                   | TSSOP14 | Tape and reel         | 864I<br>864AI |

## 5 Revision history

**Table 12. Document revision history**

| Date        | Revision | Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01-Feb-2002 | 1        | Initial release.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 28-Apr-2009 | 2        | Updated document format.<br>Removed power dissipation from <a href="#">Table 1: Absolute maximum ratings</a> .<br>Added Rthja and Rthjc values and ESD notes in <a href="#">Table 1</a> .<br>Updated curves in <a href="#">Figure 1</a> to <a href="#">Figure 14</a> .<br>Changed <a href="#">Figure 15</a> , <a href="#">Figure 16</a> , <a href="#">Figure 17</a> and <a href="#">Figure 18</a> .<br>Added <a href="#">Figure 19</a> , <a href="#">Figure 20</a> , <a href="#">Figure 21</a> , <a href="#">Figure 22</a> and <a href="#">Figure 23</a> .<br>Removed DIP package information in <a href="#">Chapter 3</a> and <a href="#">Chapter 4</a> .<br>Added ordering information in <a href="#">Table 11: Order codes</a> . |
| 06-Nov-2012 | 3        | Updated titles of <a href="#">Figure 9</a> to <a href="#">Figure 12</a> (added conditions).<br>Removed TS861IYLT, TS861AIYLT, TS862IYDT, TS862AIYDT, TS864IYDT, and TS864AIYDT order codes from <a href="#">Table 11</a> .<br>Minor corrections throughout document.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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