

# 74LVC2G53

## 2-channel analog multiplexer/demultiplexer

Rev. 03 — 28 August 2007

Product data sheet

### 1. General description

The 74LVC2G53 is a low-power, low-voltage, high-speed, Si-gate CMOS device.

The 74LVC2G53 provides one analog multiplexer/demultiplexer with a digital select input (S), two independent inputs/outputs (Y0 and Y1), a common input/output (Z) and an active LOW enable input ( $\bar{E}$ ). When pin  $\bar{E}$  is HIGH, the switch is turned off.

Schmitt-trigger action at the select and enable inputs makes the circuit tolerant of slower input rise and fall times across the entire  $V_{CC}$  range from 1.65 V to 5.5 V.

### 2. Features

- Wide supply voltage range from 1.65 V to 5.5 V
- Very low ON resistance:
  - ◆ 7.5  $\Omega$  (typical) at  $V_{CC} = 2.7$  V
  - ◆ 6.5  $\Omega$  (typical) at  $V_{CC} = 3.3$  V
  - ◆ 6  $\Omega$  (typical) at  $V_{CC} = 5$  V
- Switch current capability of 32 mA
- High noise immunity
- CMOS low-power consumption
- TTL interface compatibility at 3.3 V
- Latch-up performance meets requirements of JESD 78 Class I
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101C exceeds 1000 V
- Control inputs accepts voltages up to 5 V
- Multiple package options
- Specified from  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C

3. Ordering information

Table 1. Ordering information

| Type number | Package           |        |                                                                                                |          |
|-------------|-------------------|--------|------------------------------------------------------------------------------------------------|----------|
|             | Temperature range | Name   | Description                                                                                    | Version  |
| 74LVC2G53DP | −40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads;<br>body width 3 mm; lead length 0.5 mm     | SOT505-2 |
| 74LVC2G53DC | −40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads;<br>body width 2.3 mm                  | SOT765-1 |
| 74LVC2G53GT | −40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads;<br>8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |
| 74LVC2G53GM | −40 °C to +125 °C | XQFN8  | plastic extremely thin quad flat package; no leads;<br>8 terminals; body 1.6 × 1.6 × 0.5 mm    | SOT902-1 |

4. Marking

Table 2. Marking

| Type number | Marking code |
|-------------|--------------|
| 74LVC2G53DC | V53          |
| 74LVC2G53DP | V53          |
| 74LVC2G53GT | V53          |
| 74LVC2G53GM | V53          |

5. Functional diagram

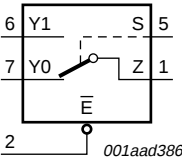


Fig 1. Logic symbol

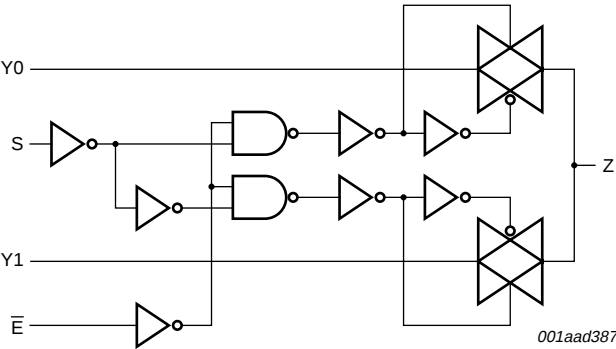
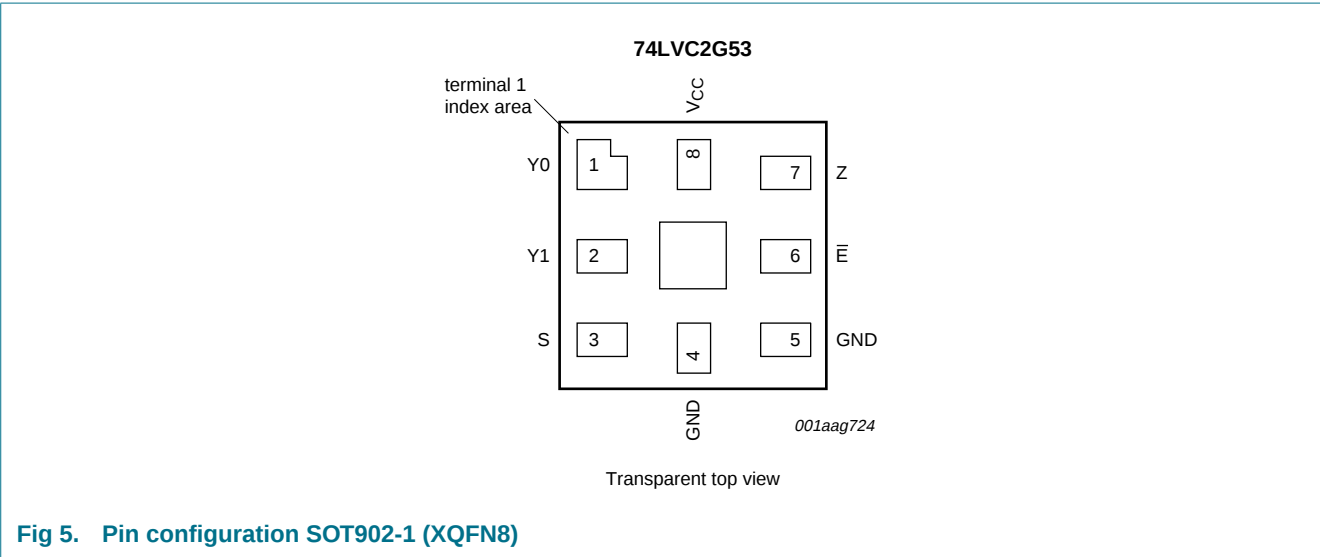
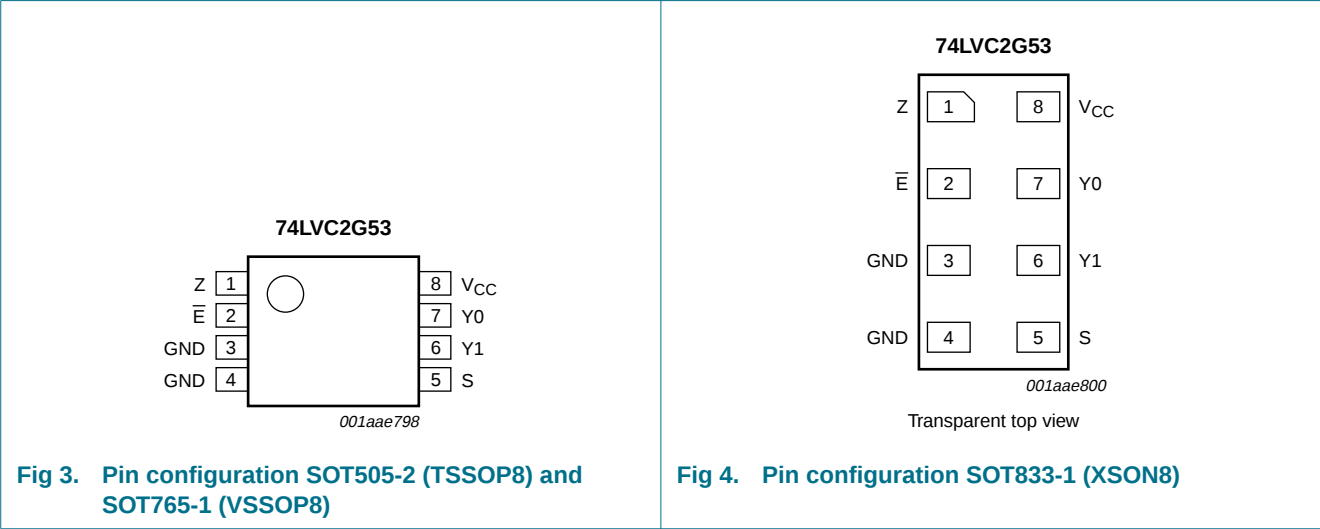


Fig 2. Logic diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol         | Pin                             |          | Description               |
|----------------|---------------------------------|----------|---------------------------|
|                | SOT505-2, SOT765-1 and SOT833-1 | SOT902-1 |                           |
| Z              | 1                               | 7        | common output or input    |
| $\overline{E}$ | 2                               | 6        | enable input (active LOW) |
| GND            | 3                               | 5        | ground (0 V)              |
| GND            | 4                               | 4        | ground (0 V)              |
| S              | 5                               | 3        | select input              |

Table 3. Pin description ...continued

| Symbol          | Pin                             |          | Description                 |
|-----------------|---------------------------------|----------|-----------------------------|
|                 | SOT505-2, SOT765-1 and SOT833-1 | SOT902-1 |                             |
| Y1              | 6                               | 2        | independent input or output |
| Y0              | 7                               | 1        | independent input or output |
| V <sub>CC</sub> | 8                               | 8        | supply voltage              |

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

| Input |                | Channel on         |
|-------|----------------|--------------------|
| S     | $\overline{E}$ |                    |
| L     | L              | Y0 to Z or Z to Y0 |
| H     | L              | Y1 to Z or Z to Y1 |
| X     | H              | Z (switch off)     |

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 X = don't care;  
 Z = high-impedance OFF-state.

## 8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter               | Conditions                                                            | Min                 | Max                   | Unit |
|------------------|-------------------------|-----------------------------------------------------------------------|---------------------|-----------------------|------|
| V <sub>CC</sub>  | supply voltage          |                                                                       | -0.5                | +6.5                  | V    |
| V <sub>I</sub>   | input voltage           |                                                                       | <sup>[1]</sup> -0.5 | +6.5                  | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V   | -50                 | -                     | mA   |
| I <sub>SK</sub>  | switch clamping current | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V   | -                   | ±50                   | mA   |
| V <sub>SW</sub>  | switch voltage          | enable and disable mode                                               | <sup>[2]</sup> -0.5 | V <sub>CC</sub> + 0.5 | V    |
| I <sub>SW</sub>  | switch current          | V <sub>SW</sub> > -0.5 V or V <sub>SW</sub> < V <sub>CC</sub> + 0.5 V | -                   | ±50                   | mA   |
| I <sub>CC</sub>  | supply current          |                                                                       | -                   | 100                   | mA   |
| I <sub>GND</sub> | ground current          |                                                                       | -100                | -                     | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                       | -65                 | +150                  | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C                                  | <sup>[3]</sup> -    | 250                   | mW   |

- [1] The minimum input voltage rating may be exceeded if the input current rating is observed.  
 [2] The minimum and maximum switch voltage ratings may be exceeded if the switch clamping current rating is observed.  
 [3] For the TSSOP8 and VSSOP8 packages: above 110 °C the value of P<sub>tot</sub> derates linearly with 8 mW/K.  
 For XSON8 and XQFN8 packages: above 45 °C the value of P<sub>tot</sub> derates linearly with 2.4 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions                               | Min   | Typ | Max      | Unit |
|---------------------|-------------------------------------|------------------------------------------|-------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                                          | 1.65  | -   | 5.5      | V    |
| $V_I$               | input voltage                       |                                          | 0     | -   | 5.5      | V    |
| $V_{SW}$            | switch voltage                      | enable and disable mode                  | [1] 0 | -   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                                          | -40   | -   | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.65\text{ V to }2.7\text{ V}$ | [2] - | -   | 20       | ns/V |
|                     |                                     | $V_{CC} = 2.7\text{ V to }5.5\text{ V}$  | [2] - | -   | 10       | ns/V |

[1] To avoid sinking GND current from terminal Z when switch current flows in terminal Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no GND current will flow from terminal Yn. In this case, there is no limit for the voltage drop across the switch.

[2] Applies to control signal levels.

## 10. Static characteristics

**Table 7. Static characteristics**

At recommended operating conditions; voltages are referenced to GND (ground 0 V).

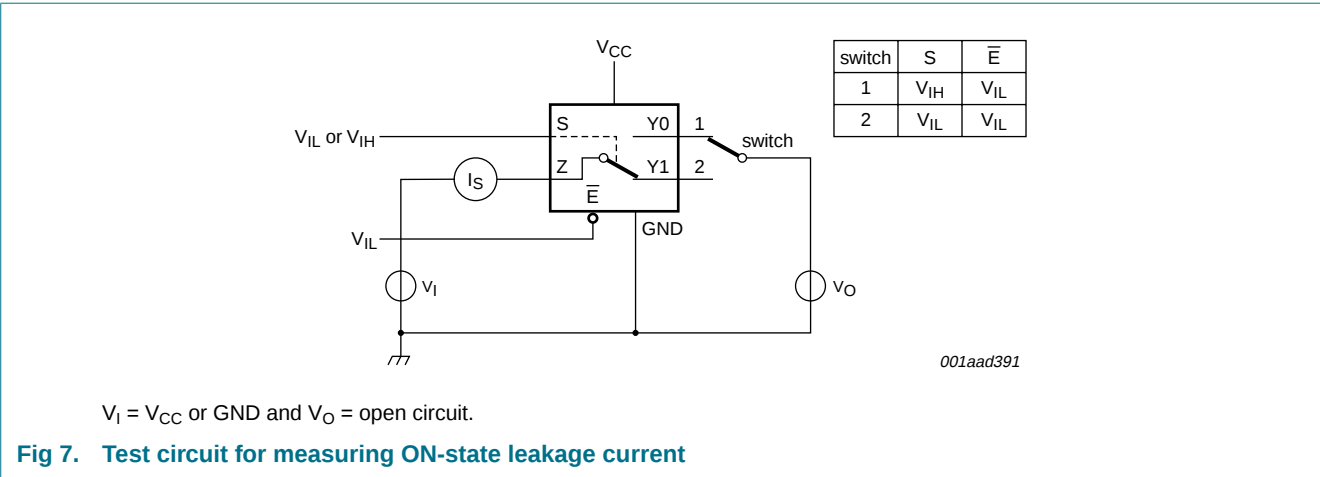
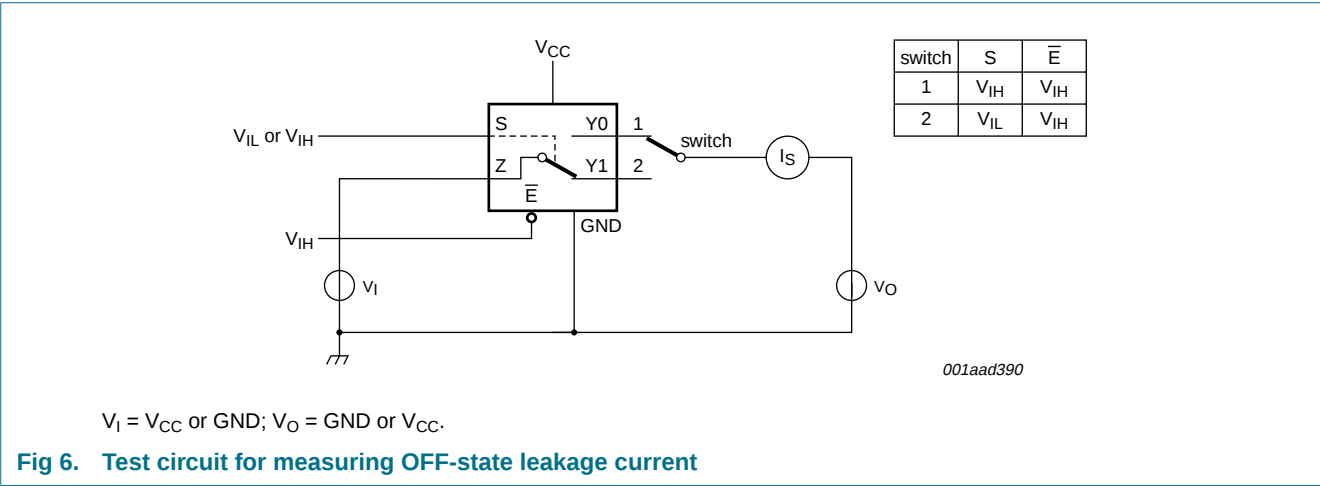
| Symbol          | Parameter                 | Conditions                                                                                                                                     | -40 °C to +85 °C |           |              | -40 °C to +125 °C |              | Unit          |
|-----------------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------|--------------|-------------------|--------------|---------------|
|                 |                           |                                                                                                                                                | Min              | Typ[1]    | Max          | Min               | Max          |               |
| $V_{IH}$        | HIGH-level input voltage  | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                                                                                                      | $0.65V_{CC}$     | -         | -            | $0.65V_{CC}$      | -            | V             |
|                 |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                                                                        | 1.7              | -         | -            | 1.7               | -            | V             |
|                 |                           | $V_{CC} = 3\text{ V to }3.6\text{ V}$                                                                                                          | 2.0              | -         | -            | 2.0               | -            | V             |
|                 |                           | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                                                                                                        | $0.7V_{CC}$      | -         | -            | $0.7V_{CC}$       | -            | V             |
| $V_{IL}$        | LOW-level input voltage   | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                                                                                                      | -                | -         | $0.35V_{CC}$ | -                 | $0.35V_{CC}$ | V             |
|                 |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                                                                        | -                | -         | 0.7          | -                 | 0.7          | V             |
|                 |                           | $V_{CC} = 3\text{ V to }3.6\text{ V}$                                                                                                          | -                | -         | 0.8          | -                 | 0.8          | V             |
|                 |                           | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                                                                                                        | -                | -         | $0.3V_{CC}$  | -                 | $0.3V_{CC}$  | V             |
| $I_I$           | input leakage current     | pin S and pin $\bar{E}$ ;<br>$V_I = 5.5\text{ V or GND}$ ;<br>$V_{CC} = 0\text{ V to }5.5\text{ V}$                                            | [2] -            | $\pm 0.1$ | $\pm 2$      | -                 | $\pm 10$     | $\mu\text{A}$ |
| $I_{S(OFF)}$    | OFF-state leakage current | $V_I = V_{IH}\text{ or }V_{IL}$ ; $V_{CC} = 5.5\text{ V}$ ;<br>see <a href="#">Figure 6</a>                                                    | [2] -            | $\pm 0.1$ | $\pm 5$      | -                 | $\pm 20$     | $\mu\text{A}$ |
| $I_{S(ON)}$     | ON-state leakage current  | $V_I = V_{IH}\text{ or }V_{IL}$ ; $V_{CC} = 5.5\text{ V}$ ;<br>see <a href="#">Figure 7</a>                                                    | [2] -            | $\pm 0.1$ | $\pm 5$      | -                 | $\pm 20$     | $\mu\text{A}$ |
| $I_{CC}$        | supply current            | $V_I = 5.5\text{ V or GND}$ ;<br>$V_{SW} = \text{GND or }V_{CC}$ ; $I_O = 0\text{ A}$ ;<br>$V_{CC} = 1.65\text{ V to }5.5\text{ V}$            | [2] -            | 0.1       | 10           | -                 | 40           | $\mu\text{A}$ |
| $\Delta I_{CC}$ | additional supply current | pin S and pin $\bar{E}$ ; $V_I = V_{CC} - 0.6\text{ V}$ ;<br>$I_O = 0\text{ A}$ ; $V_{SW} = \text{GND or }V_{CC}$ ;<br>$V_{CC} = 5.5\text{ V}$ | [2] -            | 5         | 500          | -                 | 5000         | $\mu\text{A}$ |

**Table 7. Static characteristics ...continued**  
 At recommended operating conditions; voltages are referenced to GND (ground 0 V).

| Symbol              | Parameter             | Conditions | −40 °C to +85 °C |                    |     | −40 °C to +125 °C |     | Unit |
|---------------------|-----------------------|------------|------------------|--------------------|-----|-------------------|-----|------|
|                     |                       |            | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| C <sub>I</sub>      | input capacitance     |            | -                | 2.5                | -   | -                 | -   | pF   |
| C <sub>S(OFF)</sub> | OFF-state capacitance |            | -                | 6.0                | -   | -                 | -   | pF   |
| C <sub>S(ON)</sub>  | ON-state capacitance  |            | -                | 18                 | -   | -                 | -   | pF   |

- [1] Typical values are measured at T<sub>amb</sub> = 25 °C.  
 [2] These typical values are measured at V<sub>CC</sub> = 3.3 V

10.1 Test circuits



## 10.2 ON resistance

**Table 8. ON resistance**

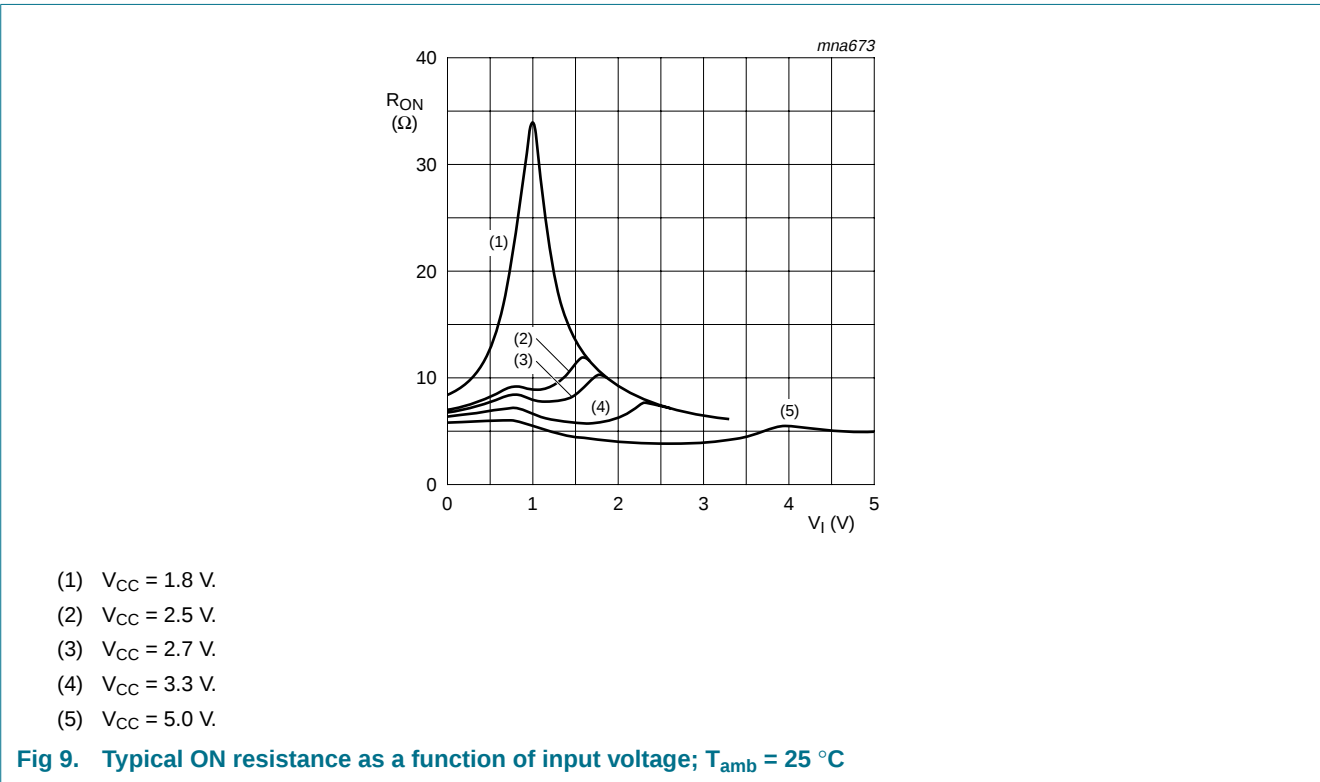
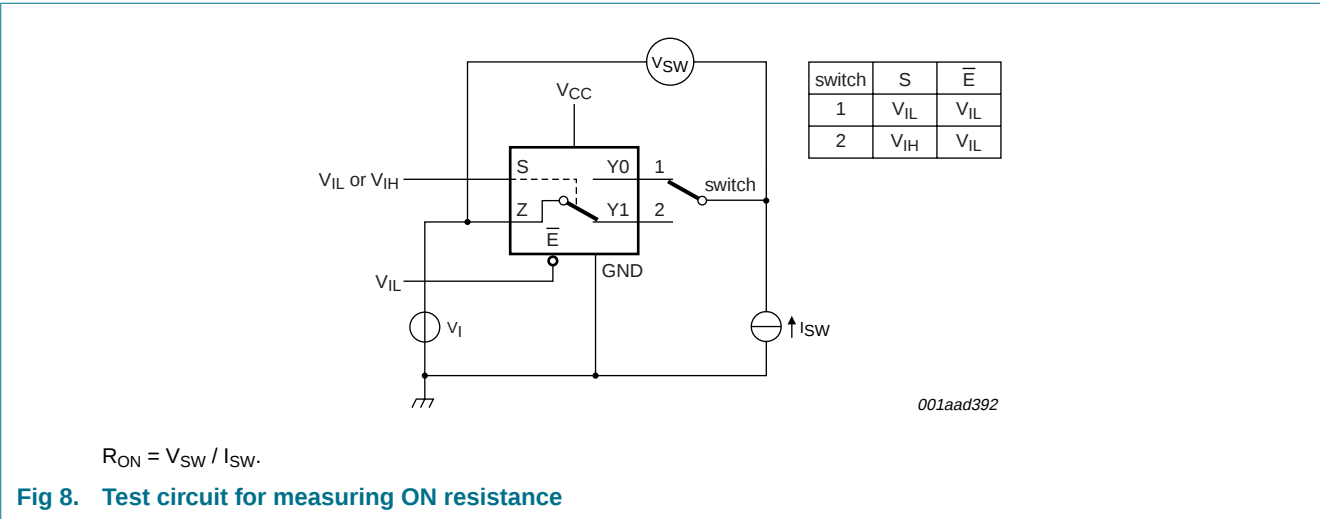
At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see [Figure 9](#) to [Figure 14](#).

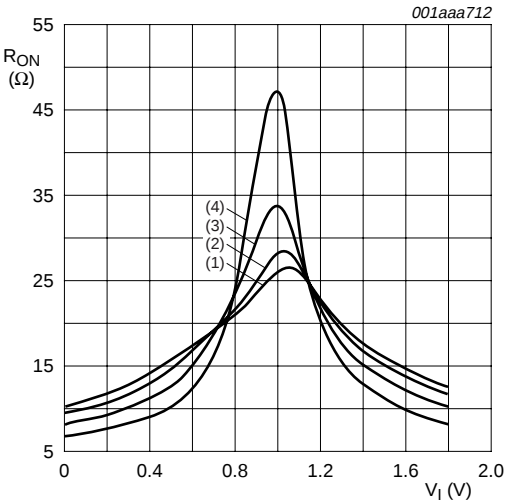
| Symbol                | Parameter                | Conditions                                                             | –40 °C to +85 °C |                    |     | –40 °C to +125 °C |     | Unit |
|-----------------------|--------------------------|------------------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|------|
|                       |                          |                                                                        | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| R <sub>ON(peak)</sub> | ON resistance (peak)     | V <sub>I</sub> = GND to V <sub>CC</sub> ; see <a href="#">Figure 8</a> |                  |                    |     |                   |     |      |
|                       |                          | I <sub>SW</sub> = 4 mA;<br>V <sub>CC</sub> = 1.65 V to 1.95 V          | -                | 34.0               | 130 | -                 | 195 | Ω    |
|                       |                          | I <sub>SW</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V               | -                | 12.0               | 30  | -                 | 45  | Ω    |
|                       |                          | I <sub>SW</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                       | -                | 10.4               | 25  | -                 | 38  | Ω    |
|                       |                          | I <sub>SW</sub> = 24 mA; V <sub>CC</sub> = 3 V to 3.6 V                | -                | 7.8                | 20  | -                 | 30  | Ω    |
|                       |                          | I <sub>SW</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V              | -                | 6.2                | 15  | -                 | 23  | Ω    |
| R <sub>ON(rail)</sub> | ON resistance (rail)     | V <sub>I</sub> = GND; see <a href="#">Figure 8</a>                     |                  |                    |     |                   |     |      |
|                       |                          | I <sub>SW</sub> = 4 mA;<br>V <sub>CC</sub> = 1.65 V to 1.95 V          | -                | 8.2                | 18  | -                 | 27  | Ω    |
|                       |                          | I <sub>SW</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V               | -                | 7.1                | 16  | -                 | 24  | Ω    |
|                       |                          | I <sub>SW</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                       | -                | 6.9                | 14  | -                 | 21  | Ω    |
|                       |                          | I <sub>SW</sub> = 24 mA; V <sub>CC</sub> = 3 V to 3.6 V                | -                | 6.5                | 12  | -                 | 18  | Ω    |
|                       |                          | I <sub>SW</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V              | -                | 5.8                | 10  | -                 | 15  | Ω    |
|                       |                          | V <sub>I</sub> = V <sub>CC</sub> ; see <a href="#">Figure 8</a>        |                  |                    |     |                   |     |      |
|                       |                          | I <sub>SW</sub> = 4 mA;<br>V <sub>CC</sub> = 1.65 V to 1.95 V          | -                | 10.4               | 30  | -                 | 45  | Ω    |
|                       |                          | I <sub>SW</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V               | -                | 7.6                | 20  | -                 | 30  | Ω    |
|                       |                          | I <sub>SW</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                       | -                | 7.0                | 18  | -                 | 27  | Ω    |
|                       |                          | I <sub>SW</sub> = 24 mA; V <sub>CC</sub> = 3 V to 3.6 V                | -                | 6.1                | 15  | -                 | 23  | Ω    |
|                       |                          | I <sub>SW</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V              | -                | 4.9                | 10  | -                 | 15  | Ω    |
| R <sub>ON(flat)</sub> | ON resistance (flatness) | V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[2]</sup>                 |                  |                    |     |                   |     |      |
|                       |                          | I <sub>SW</sub> = 4 mA;<br>V <sub>CC</sub> = 1.65 V to 1.95 V          | -                | 26.0               | -   | -                 | -   | Ω    |
|                       |                          | I <sub>SW</sub> = 8 mA; V <sub>CC</sub> = 2.3 V to 2.7 V               | -                | 5.0                | -   | -                 | -   | Ω    |
|                       |                          | I <sub>SW</sub> = 12 mA; V <sub>CC</sub> = 2.7 V                       | -                | 3.5                | -   | -                 | -   | Ω    |
|                       |                          | I <sub>SW</sub> = 24 mA; V <sub>CC</sub> = 3 V to 3.6 V                | -                | 2.0                | -   | -                 | -   | Ω    |
|                       |                          | I <sub>SW</sub> = 32 mA; V <sub>CC</sub> = 4.5 V to 5.5 V              | -                | 1.5                | -   | -                 | -   | Ω    |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and nominal V<sub>CC</sub>.

[2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V<sub>CC</sub> and temperature.

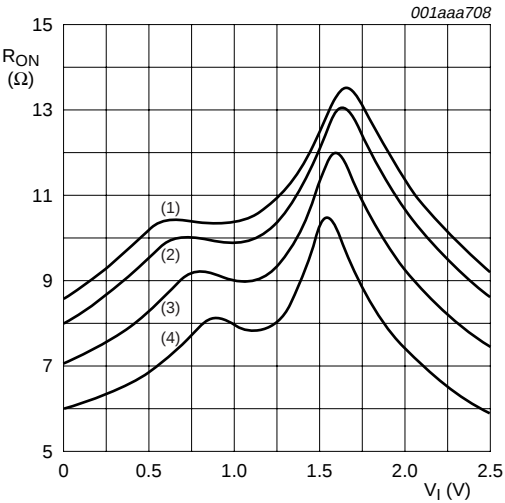
10.3 ON resistance test circuit and graphs





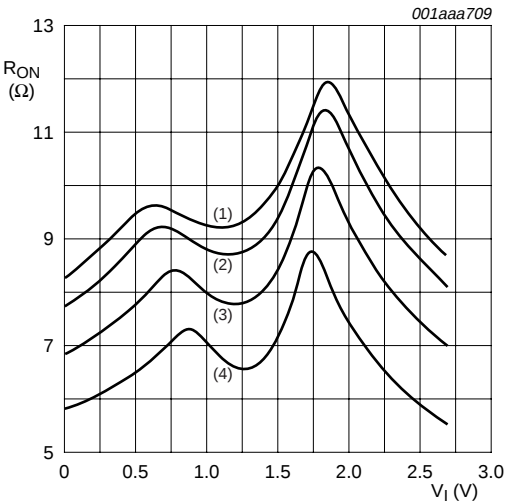
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

Fig 10. ON resistance as a function of input voltage;  
 $V_{CC} = 1.8\text{ V}$



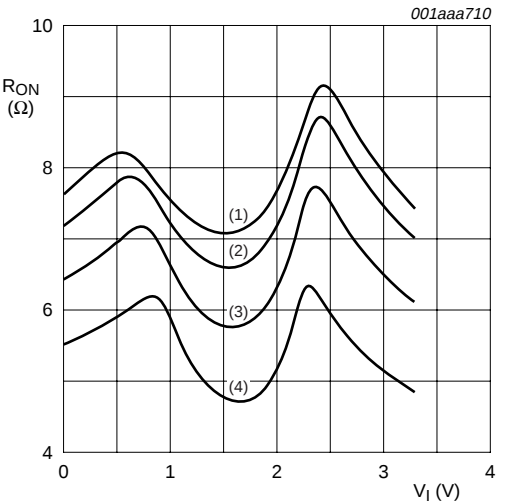
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

Fig 11. ON resistance as a function of input voltage;  
 $V_{CC} = 2.5\text{ V}$



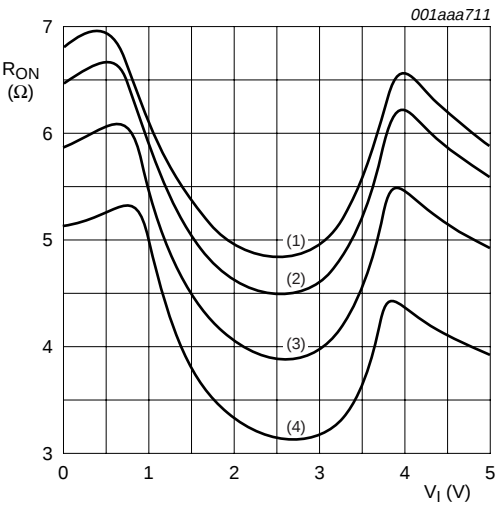
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

Fig 12. ON resistance as a function of input voltage;  
 $V_{CC} = 2.7\text{ V}$



- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

Fig 13. ON resistance as a function of input voltage;  
 $V_{CC} = 3.3\text{ V}$



- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}$ .
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}$ .
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}$ .

Fig 14. ON resistance as a function of input voltage;  $V_{CC} = 5.0\text{ V}$

11. Dynamic characteristics

Table 9. Dynamic characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see [Figure 17](#).

| Symbol   | Parameter         | Conditions                                                          | −40 °C to +85 °C |                    |     | −40 °C to +125 °C |      | Unit |
|----------|-------------------|---------------------------------------------------------------------|------------------|--------------------|-----|-------------------|------|------|
|          |                   |                                                                     | Min              | Typ <sup>[1]</sup> | Max | Min               | Max  |      |
| $t_{pd}$ | propagation delay | Z to Yn or Yn to Z; see <a href="#">Figure 15</a> <sup>[2][3]</sup> |                  |                    |     |                   |      |      |
|          |                   | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                           | -                | -                  | 2   | -                 | 2.5  | ns   |
|          |                   | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                             | -                | -                  | 1.2 | -                 | 1.5  | ns   |
|          |                   | $V_{CC} = 2.7\text{ V}$                                             | -                | -                  | 1.0 | -                 | 1.25 | ns   |
|          |                   | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                             | -                | -                  | 0.8 | -                 | 1.0  | ns   |
|          |                   | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                             | -                | -                  | 0.6 | -                 | 0.8  | ns   |

**Table 9. Dynamic characteristics ...continued**At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see [Figure 17](#).

| Symbol    | Parameter    | Conditions                                                         | –40 °C to +85 °C |                    |      | –40 °C to +125 °C |      | Unit |
|-----------|--------------|--------------------------------------------------------------------|------------------|--------------------|------|-------------------|------|------|
|           |              |                                                                    | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| $t_{en}$  | enable time  | S to Z or Yn; see <a href="#">Figure 16</a> <sup>[4]</sup>         |                  |                    |      |                   |      |      |
|           |              | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                          | 2.6              | 6.7                | 10.3 | 2.6               | 12.9 | ns   |
|           |              | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                            | 1.9              | 4.1                | 6.4  | 1.9               | 8.0  | ns   |
|           |              | $V_{CC} = 2.7\text{ V}$                                            | 1.9              | 4.0                | 5.5  | 1.8               | 7.0  | ns   |
|           |              | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                            | 1.8              | 3.4                | 5.0  | 1.8               | 6.3  | ns   |
|           |              | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                            | 1.3              | 2.6                | 3.8  | 1.3               | 4.8  | ns   |
|           |              | $\bar{E}$ to Z or Yn; see <a href="#">Figure 16</a> <sup>[4]</sup> |                  |                    |      |                   |      |      |
|           |              | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                          | 1.9              | 4.0                | 7.3  | 1.9               | 9.2  | ns   |
|           |              | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                            | 1.4              | 2.5                | 4.4  | 1.4               | 5.5  | ns   |
|           |              | $V_{CC} = 2.7\text{ V}$                                            | 1.1              | 2.6                | 3.9  | 1.1               | 4.9  | ns   |
|           |              | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                            | 1.2              | 2.2                | 3.8  | 1.2               | 4.8  | ns   |
|           |              | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                            | 1.0              | 1.7                | 2.6  | 1.0               | 3.3  | ns   |
| $t_{dis}$ | disable time | S to Z or Yn; see <a href="#">Figure 16</a> <sup>[5]</sup>         |                  |                    |      |                   |      |      |
|           |              | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                          | 2.1              | 6.8                | 10.0 | 2.1               | 12.5 | ns   |
|           |              | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                            | 1.4              | 3.7                | 6.1  | 1.4               | 7.7  | ns   |
|           |              | $V_{CC} = 2.7\text{ V}$                                            | 1.4              | 4.9                | 6.2  | 1.4               | 7.8  | ns   |
|           |              | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                            | 1.1              | 4.0                | 5.4  | 1.1               | 6.8  | ns   |
|           |              | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                            | 1.0              | 2.9                | 3.8  | 1.0               | 4.8  | ns   |
|           |              | $\bar{E}$ to Z or Yn; see <a href="#">Figure 16</a> <sup>[5]</sup> |                  |                    |      |                   |      |      |
|           |              | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                          | 2.3              | 5.6                | 8.6  | 2.3               | 11.0 | ns   |
|           |              | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                            | 1.2              | 3.2                | 4.8  | 1.2               | 6.0  | ns   |
|           |              | $V_{CC} = 2.7\text{ V}$                                            | 1.4              | 4.0                | 5.2  | 1.4               | 6.5  | ns   |
|           |              | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$                            | 2.0              | 3.7                | 5.0  | 2.0               | 6.3  | ns   |
|           |              | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                            | 1.3              | 2.9                | 3.8  | 1.3               | 4.8  | ns   |

[1] Typical values are measured at  $T_{amb} = 25\text{ °C}$  and nominal  $V_{CC}$ .[2]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[3] propagation delay is the calculated RC time constant of the typical ON resistance of the switch and the specified capacitance when driven by an ideal voltage source (zero output impedance).

[4]  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .[5]  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

11.1 Waveforms and test circuits

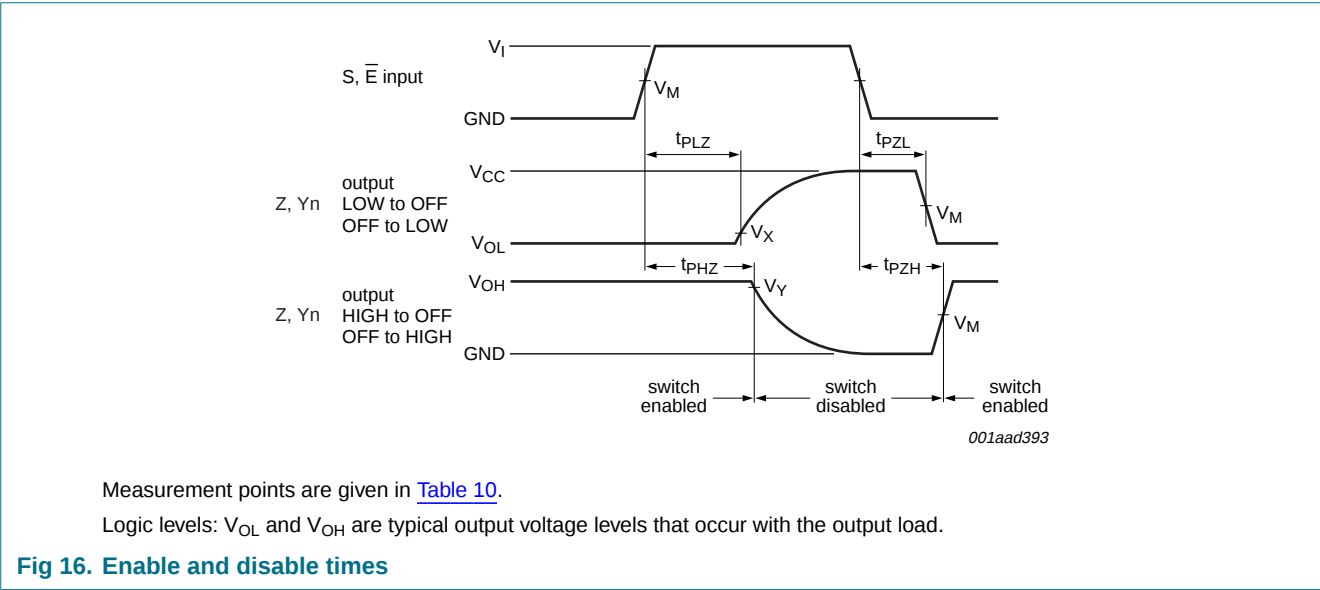
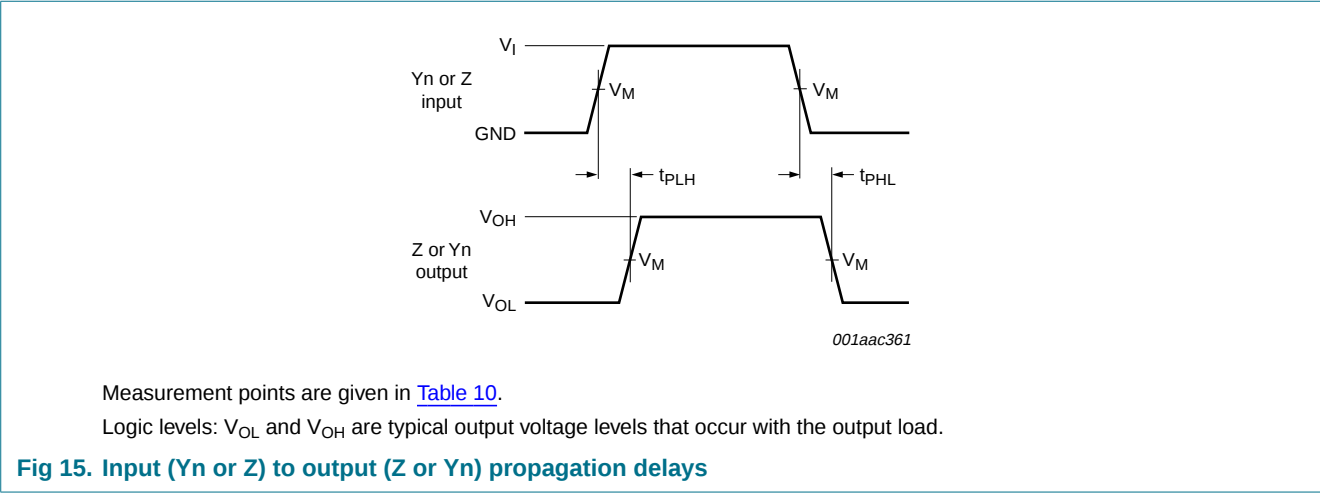
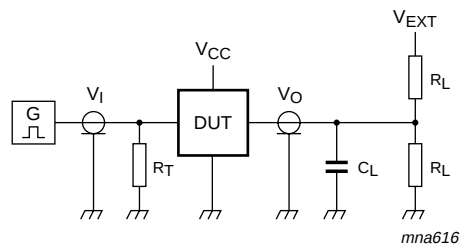


Table 10. Measurement points

| Supply voltage  | Input       | Output      |                          |                          |
|-----------------|-------------|-------------|--------------------------|--------------------------|
| $V_{CC}$        | $V_M$       | $V_M$       | $V_X$                    | $V_Y$                    |
| 1.65 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15\text{ V}$ | $V_{OH} - 0.15\text{ V}$ |
| 2.7 V to 5.5 V  | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3\text{ V}$  | $V_{OH} - 0.3\text{ V}$  |



Test data is given in [Table 11](#).

Definitions test circuit:

$R_T$  = Termination resistance (should be equal to output impedance  $Z_o$  of the pulse generator).

$C_L$  = Load capacitance (including jig and probe capacitance).

$R_L$  = Load resistance.

$V_{EXT}$  = External voltage for measuring switching times.

**Fig 17. Load circuit for switching times**

**Table 11. Test data**

| Supply voltage   | Input    |               | Load  |              | $V_{EXT}$          |                    |                    |
|------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$         | $V_I$    | $t_r, t_f$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | $\leq 2.0$ ns | 30 pF | 1 k $\Omega$ | open               | GND                | $2V_{CC}$          |
| 2.3 V to 2.7 V   | $V_{CC}$ | $\leq 2.0$ ns | 30 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |
| 2.7 V            | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |
| 3 V to 3.6 V     | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |
| 4.5 V to 5.5 V   | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2V_{CC}$          |

## 11.2 Additional dynamic characteristics

**Table 12. Additional dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = 25^\circ\text{C}$ .

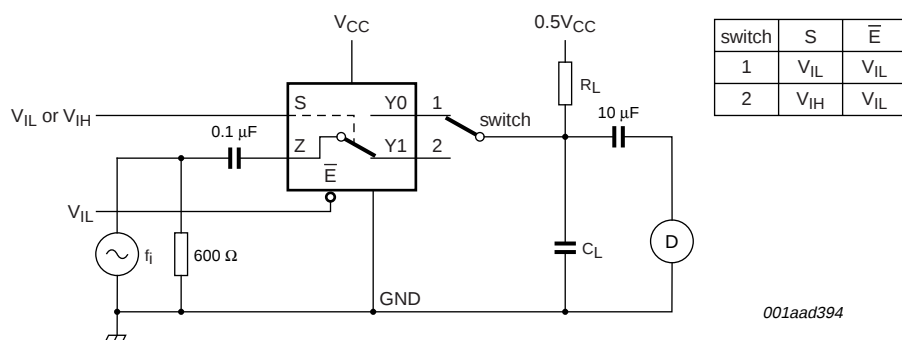
| Symbol       | Parameter                 | Conditions                                                                                                               | Min | Typ   | Max | Unit |
|--------------|---------------------------|--------------------------------------------------------------------------------------------------------------------------|-----|-------|-----|------|
| THD          | total harmonic distortion | $f_i = 600$ Hz to 20 kHz; $R_L = 600$ $\Omega$ ;<br>$C_L = 50$ pF; $V_I = 0.5$ V (p-p);<br>see <a href="#">Figure 18</a> |     |       |     |      |
|              |                           | $V_{CC} = 1.65$ V                                                                                                        | -   | 0.260 | -   | %    |
|              |                           | $V_{CC} = 2.3$ V                                                                                                         | -   | 0.078 | -   | %    |
|              |                           | $V_{CC} = 3.0$ V                                                                                                         | -   | 0.078 | -   | %    |
|              |                           | $V_{CC} = 4.5$ V                                                                                                         | -   | 0.078 | -   | %    |
| $f_{(-3dB)}$ | -3 dB frequency response  | $R_L = 50$ $\Omega$ ; $C_L = 5$ pF; see <a href="#">Figure 19</a>                                                        |     |       |     |      |
|              |                           | $V_{CC} = 1.65$ V                                                                                                        | -   | 200   | -   | MHz  |
|              |                           | $V_{CC} = 2.3$ V                                                                                                         | -   | 300   | -   | MHz  |
|              |                           | $V_{CC} = 3.0$ V                                                                                                         | -   | 300   | -   | MHz  |
|              |                           | $V_{CC} = 4.5$ V                                                                                                         | -   | 300   | -   | MHz  |

Table 12. Additional dynamic characteristics ...continued

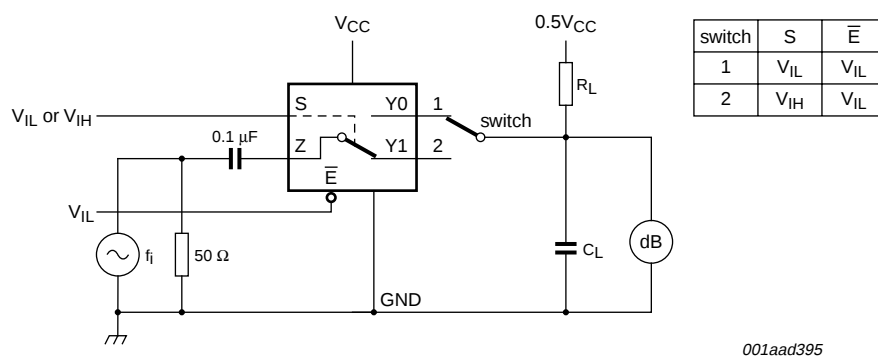
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = 25^{\circ}\text{C}$ .

| Symbol                | Parameter             | Conditions                                                                                                                                                                              | Min | Typ | Max | Unit |
|-----------------------|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $\alpha_{\text{iso}}$ | isolation (OFF-state) | $R_L = 50 \, \Omega$ ; $C_L = 5 \, \text{pF}$ ; $f_i = 10 \, \text{MHz}$ ;<br>see <a href="#">Figure 20</a>                                                                             |     |     |     |      |
|                       |                       | $V_{CC} = 1.65 \, \text{V}$                                                                                                                                                             | -   | -42 | -   | dB   |
|                       |                       | $V_{CC} = 2.3 \, \text{V}$                                                                                                                                                              | -   | -42 | -   | dB   |
|                       |                       | $V_{CC} = 3.0 \, \text{V}$                                                                                                                                                              | -   | -40 | -   | dB   |
|                       |                       | $V_{CC} = 4.5 \, \text{V}$                                                                                                                                                              | -   | -40 | -   | dB   |
| $Q_{\text{inj}}$      | charge injection      | $C_L = 0.1 \, \text{nF}$ ; $V_{\text{gen}} = 0 \, \text{V}$ ; $R_{\text{gen}} = 0 \, \Omega$ ;<br>$f_i = 1 \, \text{MHz}$ ; $R_L = 1 \, \text{M}\Omega$ ; see <a href="#">Figure 21</a> |     |     |     |      |
|                       |                       | $V_{CC} = 1.8 \, \text{V}$                                                                                                                                                              | -   | 3.3 | -   | pC   |
|                       |                       | $V_{CC} = 2.5 \, \text{V}$                                                                                                                                                              | -   | 4.1 | -   | pC   |
|                       |                       | $V_{CC} = 3.3 \, \text{V}$                                                                                                                                                              | -   | 5.0 | -   | pC   |
|                       |                       | $V_{CC} = 4.5 \, \text{V}$                                                                                                                                                              | -   | 6.4 | -   | pC   |
|                       |                       | $V_{CC} = 5.5 \, \text{V}$                                                                                                                                                              | -   | 7.5 | -   | pC   |

### 11.3 Test circuits

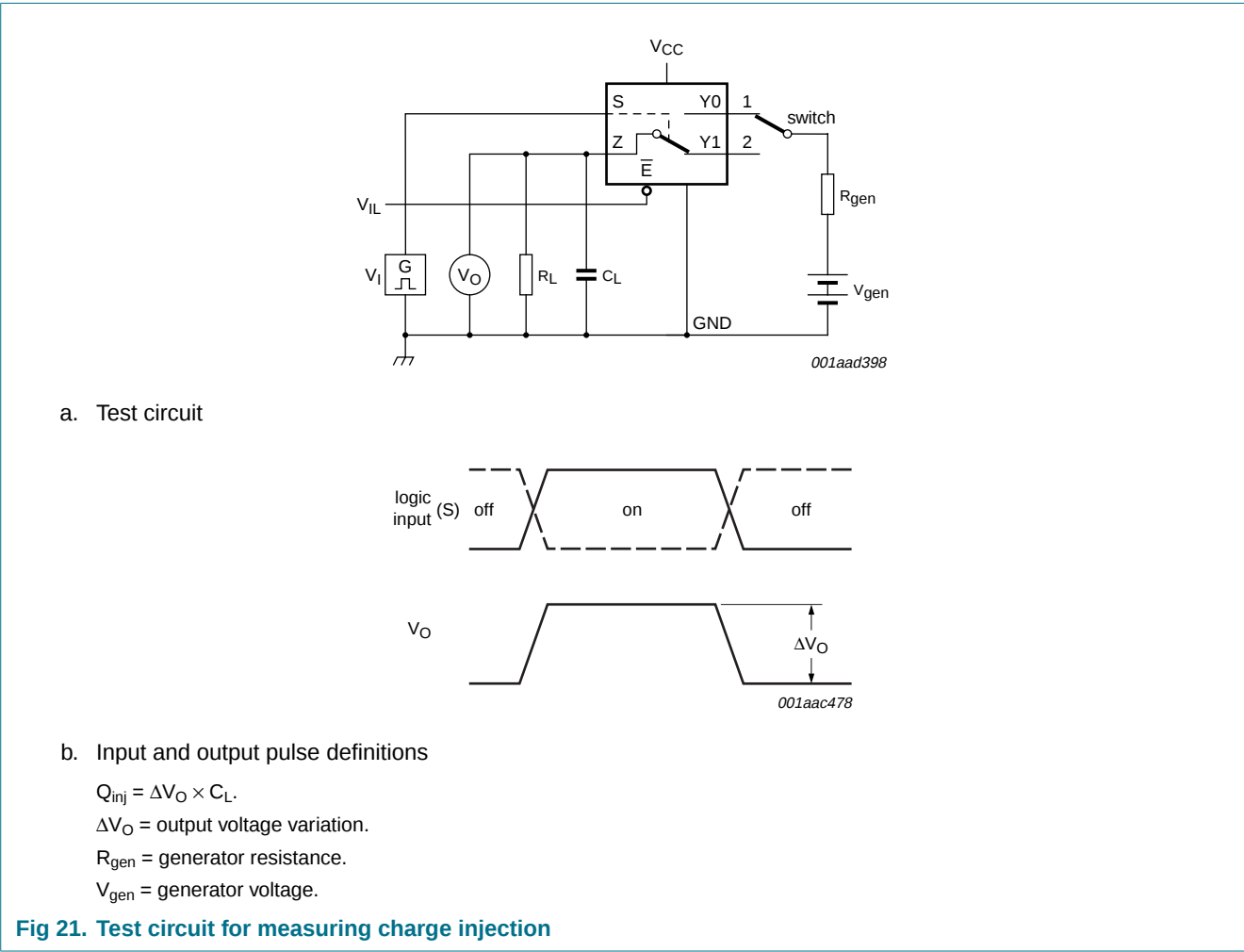
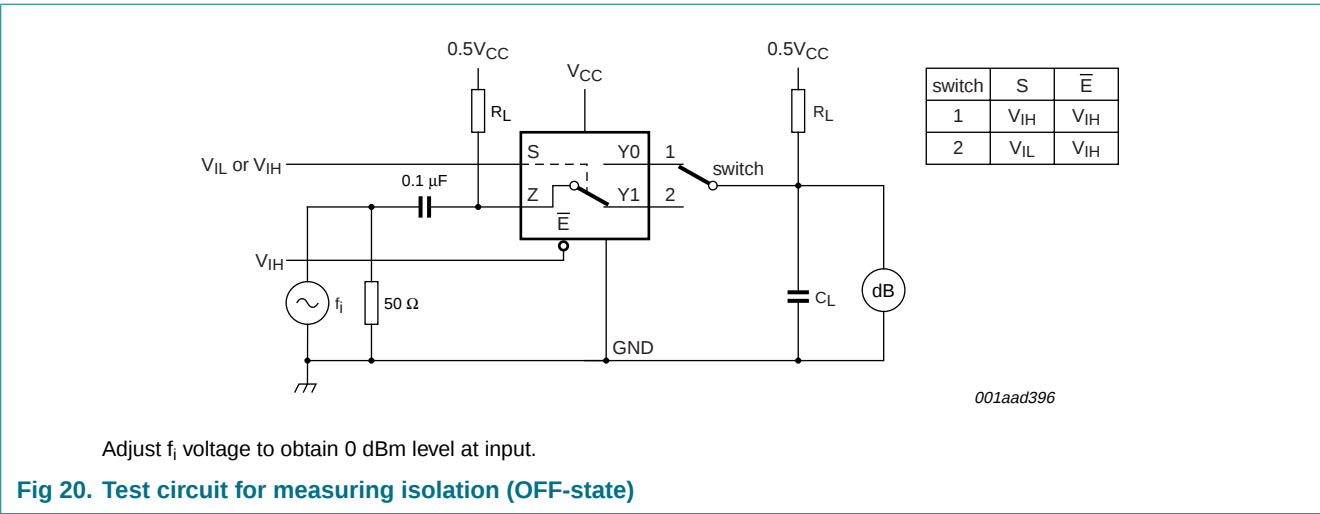


**Fig 18. Test circuit for measuring total harmonic distortion**



Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads  $-3$  dB.

**Fig 19. Test circuit for measuring the frequency response when switch is in ON-state**



12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm    SOT505-2

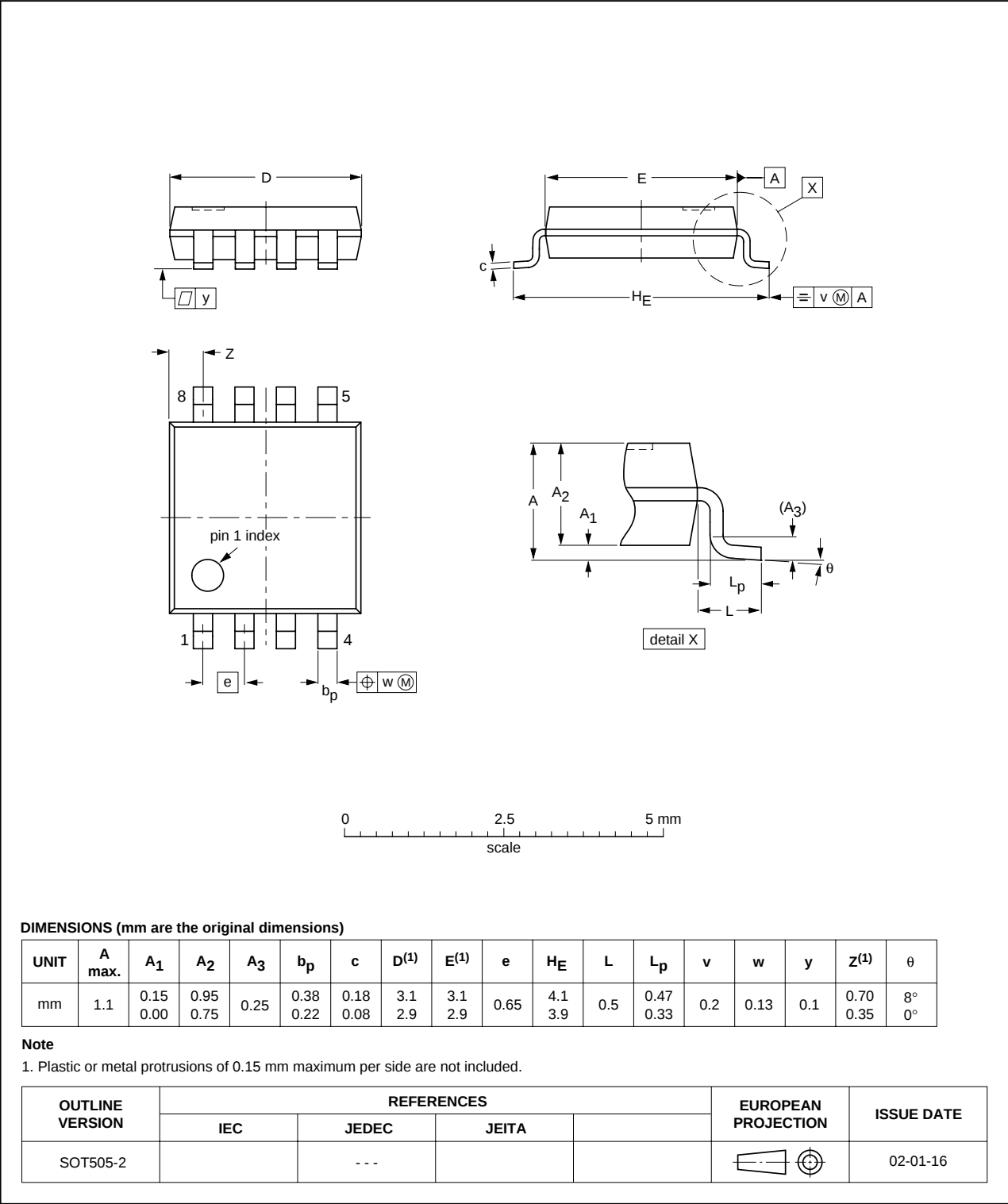


Fig 22. Package outline SOT505-2 (TSSOP8)

VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm

SOT765-1

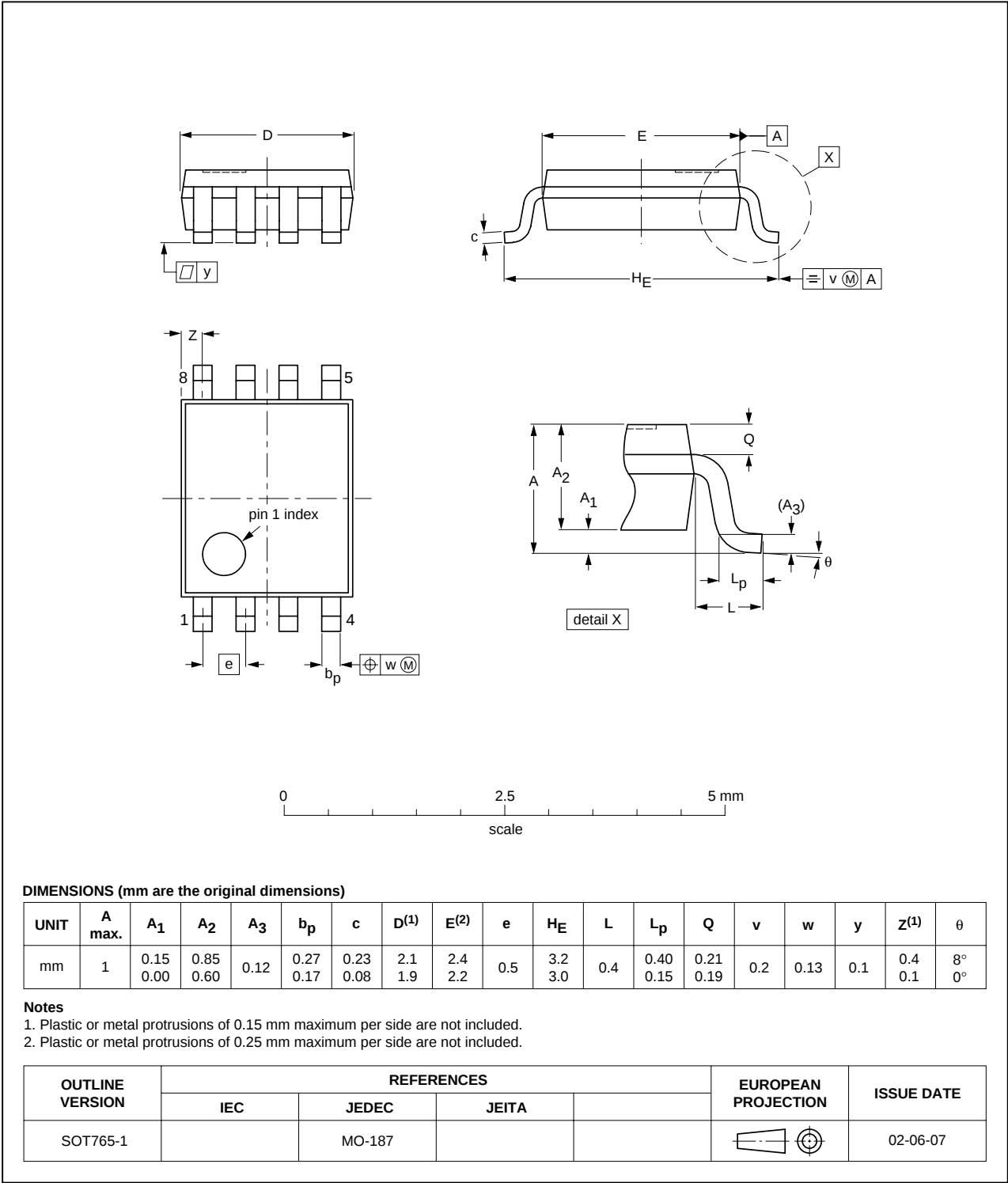


Fig 23. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

SOT833-1

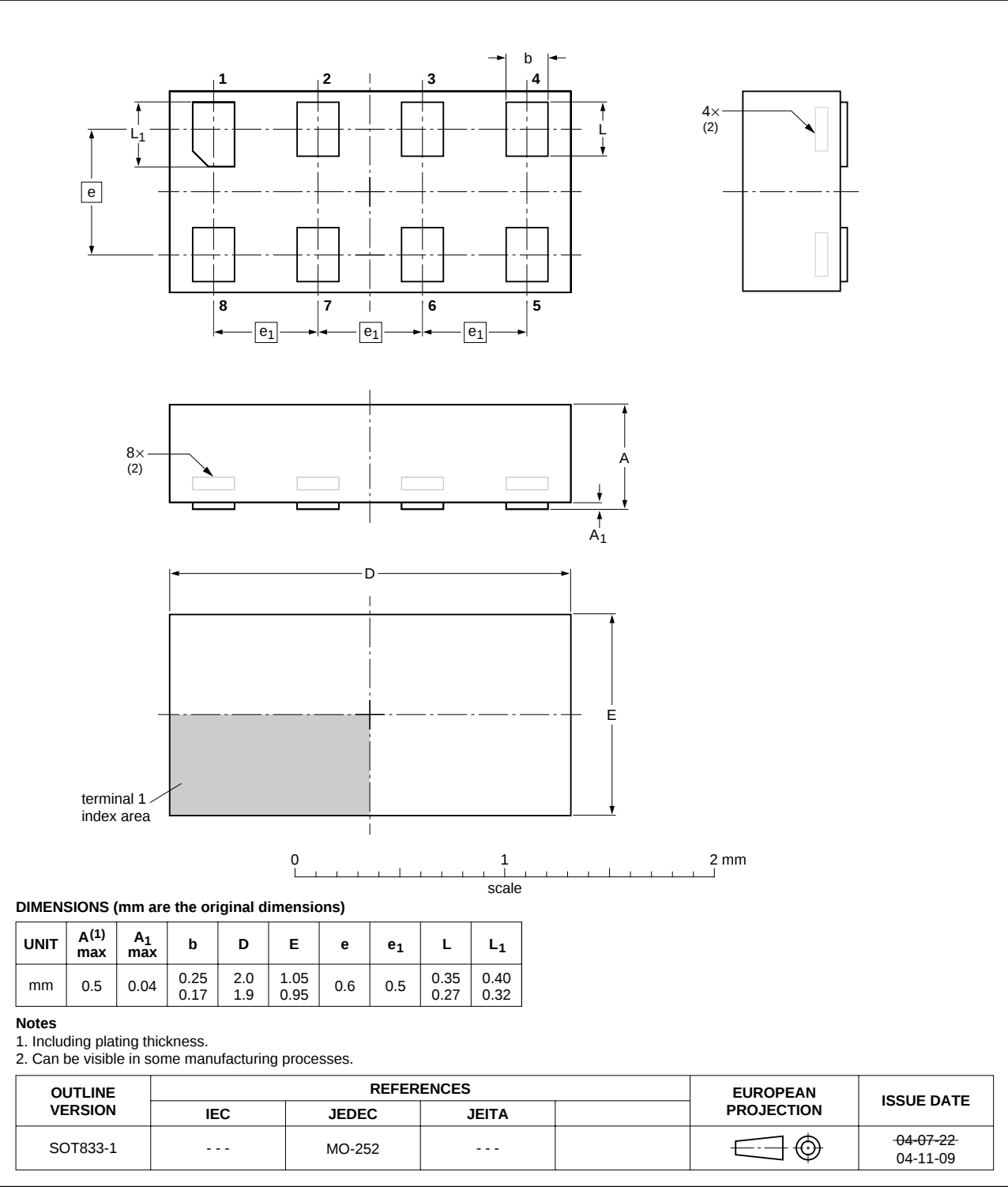


Fig 24. Package outline SOT833-1 (XSON8)

XQFN8: plastic extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.5 mm

SOT902-1

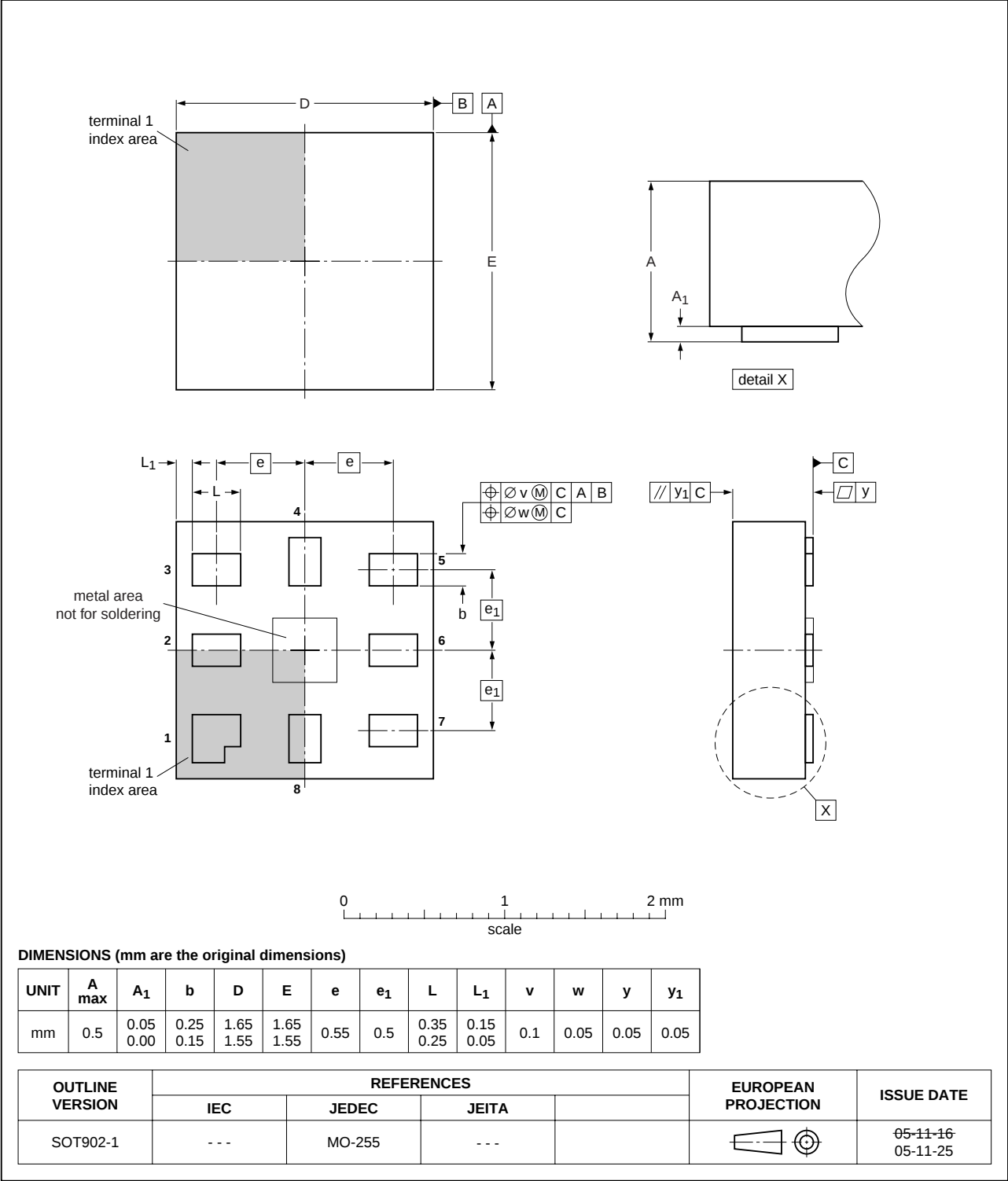


Fig 25. Package outline SOT902-1 (XQFN8)

## 13. Abbreviations

Table 13. Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | Complementary Metal Oxide Semiconductor |
| TTL     | Transistor-Transistor Logic             |
| HBM     | Human Body Model                        |
| ESD     | ElectroStatic Discharge                 |
| MM      | Machine Model                           |
| CDM     | Charged Device Model                    |
| DUT     | Device Under Test                       |

## 14. Revision history

Table 14. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Data sheet status  | Change notice | Supersedes  |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-------------|
| 74LVC2G53_3    | 20070828                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | 74LVC2G53_2 |
| Modifications: | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Added type number 74LVC2G53GM (XQFN8/SOT902-1 package).</li><li>• <a href="#">Section 2 “Features”</a>:<br/>Added: Switch handling capability of 32 mA.</li><li>• <a href="#">Section 10 “Static characteristics”</a>:<br/>Changed: Conditions for input leakage and supply current.</li><li>• <a href="#">Section 11.2 “Additional dynamic characteristics”</a>:<br/>Removed: Crosstalk between switches removed from additional characteristics table.<br/>Changed: Typical values of the charge injection.</li></ul> |                    |               |             |
| 74LVC2G53_2    | 20060331                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | 74LVC2G53_1 |
| 74LVC2G53_1    | 20060110                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Product data sheet | -             | -           |

## 15. Legal information

### 15.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition                                                                            |
|-----------------------------------|-------------------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## 17. Contents

|           |                                                   |           |
|-----------|---------------------------------------------------|-----------|
| <b>1</b>  | <b>General description</b> . . . . .              | <b>1</b>  |
| <b>2</b>  | <b>Features</b> . . . . .                         | <b>1</b>  |
| <b>3</b>  | <b>Ordering information</b> . . . . .             | <b>2</b>  |
| <b>4</b>  | <b>Marking</b> . . . . .                          | <b>2</b>  |
| <b>5</b>  | <b>Functional diagram</b> . . . . .               | <b>2</b>  |
| <b>6</b>  | <b>Pinning information</b> . . . . .              | <b>3</b>  |
| 6.1       | Pinning . . . . .                                 | 3         |
| 6.2       | Pin description . . . . .                         | 3         |
| <b>7</b>  | <b>Functional description</b> . . . . .           | <b>4</b>  |
| <b>8</b>  | <b>Limiting values</b> . . . . .                  | <b>4</b>  |
| <b>9</b>  | <b>Recommended operating conditions</b> . . . . . | <b>5</b>  |
| <b>10</b> | <b>Static characteristics</b> . . . . .           | <b>5</b>  |
| 10.1      | Test circuits . . . . .                           | 6         |
| 10.2      | ON resistance . . . . .                           | 7         |
| 10.3      | ON resistance test circuit and graphs . . . . .   | 8         |
| <b>11</b> | <b>Dynamic characteristics</b> . . . . .          | <b>10</b> |
| 11.1      | Waveforms and test circuits . . . . .             | 12        |
| 11.2      | Additional dynamic characteristics . . . . .      | 13        |
| 11.3      | Test circuits . . . . .                           | 14        |
| <b>12</b> | <b>Package outline</b> . . . . .                  | <b>16</b> |
| <b>13</b> | <b>Abbreviations</b> . . . . .                    | <b>20</b> |
| <b>14</b> | <b>Revision history</b> . . . . .                 | <b>20</b> |
| <b>15</b> | <b>Legal information</b> . . . . .                | <b>21</b> |
| 15.1      | Data sheet status . . . . .                       | 21        |
| 15.2      | Definitions . . . . .                             | 21        |
| 15.3      | Disclaimers . . . . .                             | 21        |
| 15.4      | Trademarks . . . . .                              | 21        |
| <b>16</b> | <b>Contact information</b> . . . . .              | <b>21</b> |
| <b>17</b> | <b>Contents</b> . . . . .                         | <b>22</b> |

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