

# 74LVC1G53

## 2-channel analog multiplexer/demultiplexer

Rev. 9 — 5 April 2013

Product data sheet

### 1. General description

---

The 74LVC1G53 is a low-power, low-voltage, high-speed, Si-gate CMOS device.

The 74LVC1G53 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 ( $\overline{E}$ ). When pin  $\overline{E}$  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 and benefits

---

- 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-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 1000 V
- Control inputs accept 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  |
| 74LVC1G53DP | −40 °C to +125 °C | TSSOP8 | plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm     | SOT505-2 |
| 74LVC1G53DC | −40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                  | SOT765-1 |
| 74LVC1G53GT | −40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |
| 74LVC1G53GF | −40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm         | SOT1089  |
| 74LVC1G53GD | −40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 3 × 2 × 0.5 mm    | SOT996-2 |
| 74LVC1G53GM | −40 °C to +125 °C | XQFN8  | plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 × 1.6 × 0.5 mm   | SOT902-2 |
| 74LVC1G53GN | −40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm       | SOT1116  |
| 74LVC1G53GS | −40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm      | SOT1203  |

### 4. Marking

Table 2. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74LVC1G53DC | V53                         |
| 74LVC1G53DP | V53                         |
| 74LVC1G53GT | V53                         |
| 74LVC1G53GF | V3                          |
| 74LVC1G53GD | V53                         |
| 74LVC1G53GM | V53                         |
| 74LVC1G53GN | V3                          |
| 74LVC1G53GS | V3                          |

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram

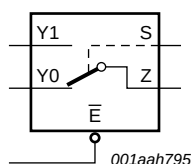


Fig 1. Logic symbol

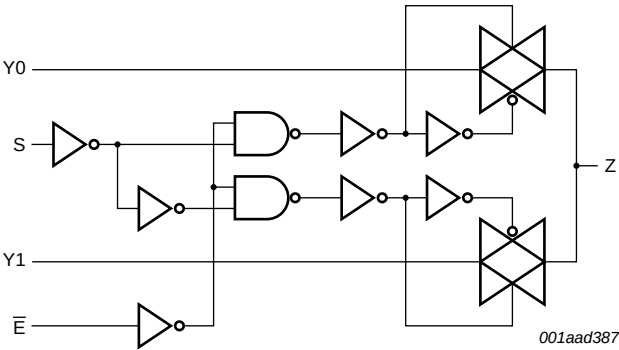


Fig 2. Logic diagram

6. Pinning information

6.1 Pinning

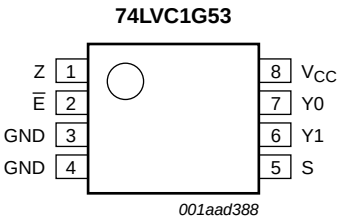


Fig 3. Pin configuration SOT505-2 and SOT765-1

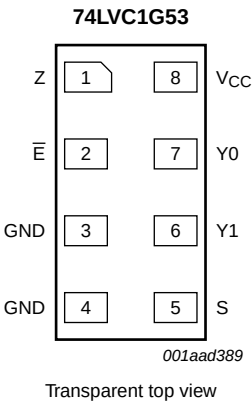
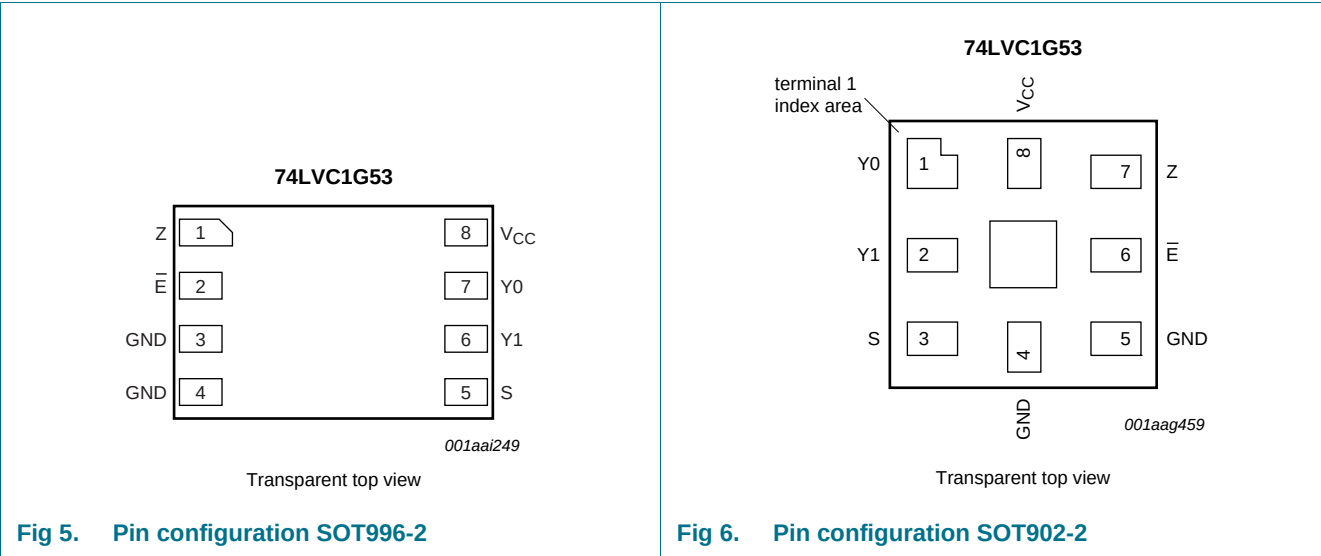


Fig 4. Pin configuration SOT833-1, SOT1089, SOT1116 and SOT1203



6.2 Pin description

Table 3. Pin description

| Symbol          | Pin                                                                  |          | Description                 |
|-----------------|----------------------------------------------------------------------|----------|-----------------------------|
|                 | SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203 | SOT902-2 |                             |
| 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                |
| 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 |
|-----------|-------------------------|--------------------------------------------------------------|----------|----------------|------|
| $V_{CC}$  | supply voltage          |                                                              | -0.5     | +6.5           | V    |
| $V_I$     | input voltage           |                                                              | [1] -0.5 | +6.5           | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$       | -50      | -              | mA   |
| $I_{SK}$  | switch clamping current | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$       | -        | $\pm 50$       | mA   |
| $V_{SW}$  | switch voltage          | enable and disable mode                                      | [2] -0.5 | $V_{CC} + 0.5$ | V    |
| $I_{SW}$  | switch current          | $V_{SW} > -0.5\text{ V}$ or $V_{SW} < V_{CC} + 0.5\text{ V}$ | -        | $\pm 50$       | mA   |
| $I_{CC}$  | supply current          |                                                              | -        | 100            | mA   |
| $I_{GND}$ | ground current          |                                                              | -100     | -              | mA   |
| $T_{stg}$ | storage temperature     |                                                              | -65      | +150           | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$                | [3] -    | 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 TSSOP8 packages: above 55 °C the value of  $P_{tot}$  derates linearly with 2.5 mW/K.

For VSSOP8 packages: above 110 °C the value of  $P_{tot}$  derates linearly with 8.0 mW/K.

For XSON8 and XQFN8 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6. Operating conditions**

| Symbol              | Parameter                           | Conditions                                 | Min   | 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**

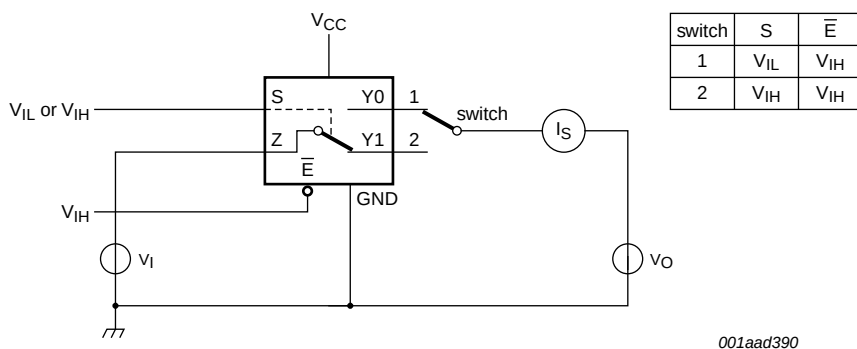
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

| Symbol              | Parameter                 | Conditions                                                                                                                                      | T <sub>amb</sub> = −40 °C to +85 °C |                    |                        | T <sub>amb</sub> = −40 °C to +125 °C |                        | Unit |    |
|---------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|--------------------|------------------------|--------------------------------------|------------------------|------|----|
|                     |                           |                                                                                                                                                 | Min                                 | Typ <sup>[1]</sup> | Max                    | Min                                  | Max                    |      |    |
| V <sub>IH</sub>     | HIGH-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                              | 0.65 × V <sub>CC</sub>              | -                  | -                      | 0.65 × V <sub>CC</sub>               | -                      | V    |    |
|                     |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                | 1.7                                 | -                  | -                      | 1.7                                  | -                      | V    |    |
|                     |                           | V <sub>CC</sub> = 3 V to 3.6 V                                                                                                                  | 2.0                                 | -                  | -                      | 2.0                                  | -                      | V    |    |
|                     |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                | 0.7 × V <sub>CC</sub>               | -                  | -                      | 0.7 × V <sub>CC</sub>                | -                      | V    |    |
| V <sub>IL</sub>     | LOW-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                                                                              | -                                   | -                  | 0.35 × V <sub>CC</sub> | -                                    | 0.35 × V <sub>CC</sub> | V    |    |
|                     |                           | V <sub>CC</sub> = 2.3 V to 2.7 V                                                                                                                | -                                   | -                  | 0.7                    | -                                    | 0.7                    | V    |    |
|                     |                           | V <sub>CC</sub> = 3 V to 3.6 V                                                                                                                  | -                                   | -                  | 0.8                    | -                                    | 0.8                    | V    |    |
|                     |                           | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                                                                | -                                   | -                  | 0.3 × V <sub>CC</sub>  | -                                    | 0.3 × V <sub>CC</sub>  | V    |    |
| I <sub>I</sub>      | input leakage current     | pin S and pin $\bar{E}$ ;<br>V <sub>I</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 0 V to 5.5 V                                                   | <sup>[2]</sup>                      | -                  | ±0.1                   | ±2                                   | -                      | ±10  | μA |
| I <sub>S(OFF)</sub> | OFF-state leakage current | V <sub>CC</sub> = 5.5 V;<br>see <a href="#">Figure 7</a>                                                                                        | <sup>[2]</sup>                      | -                  | ±0.1                   | ±5                                   | -                      | ±20  | μA |
| I <sub>S(ON)</sub>  | ON-state leakage current  | V <sub>CC</sub> = 5.5 V;<br>see <a href="#">Figure 8</a>                                                                                        | <sup>[2]</sup>                      | -                  | ±0.1                   | ±5                                   | -                      | ±20  | μA |
| I <sub>CC</sub>     | supply current            | V <sub>I</sub> = 5.5 V or GND;<br>V <sub>SW</sub> = GND or V <sub>CC</sub> ;<br>V <sub>CC</sub> = 1.65 V to 5.5 V                               | <sup>[2]</sup>                      | -                  | 0.1                    | 10                                   | -                      | 40   | μA |
| ΔI <sub>CC</sub>    | additional supply current | pin S and pin $\bar{E}$ ;<br>V <sub>I</sub> = V <sub>CC</sub> − 0.6 V;<br>V <sub>SW</sub> = GND or V <sub>CC</sub> ;<br>V <sub>CC</sub> = 5.5 V | <sup>[2]</sup>                      | -                  | 5                      | 500                                  | -                      | 5000 | μA |
| 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 |

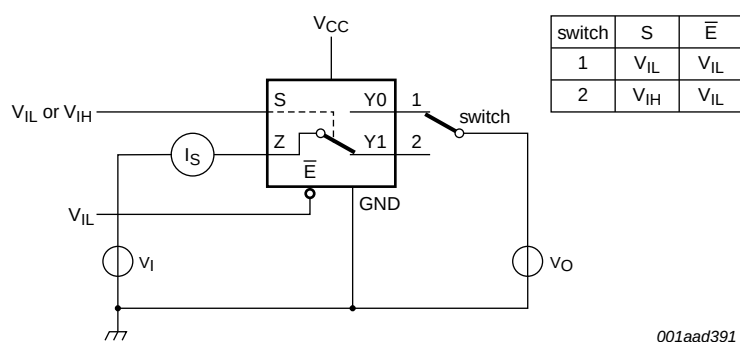
[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

[2] These typical values are measured at V<sub>CC</sub> = 3.3 V.

## 10.1 Test circuits


$$V_I = V_{CC} \text{ or GND; } V_O = \text{GND or } V_{CC}.$$

**Fig 7. Test circuit for measuring OFF-state leakage current**



$V_I = V_{CC}$  or GND and  $V_O =$  open circuit.

**Fig 8. Test circuit for measuring ON-state leakage current**

## 10.2 ON resistance

### Table 8. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see [Figure 10](#) to [Figure 15](#).

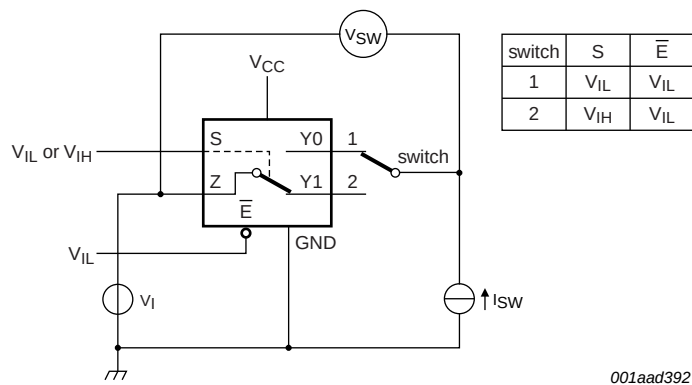
| Symbol                | Parameter            | Conditions                                                             | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|-----------------------|----------------------|------------------------------------------------------------------------|------------------|--------------------|-----|-------------------|-----|------|
|                       |                      |                                                                        | 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 9</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    |

**Table 8.** ON resistance ...continuedAt recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see [Figure 10](#) to [Figure 15](#).

| 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(rail)</sub> | ON resistance (rail)     | V <sub>I</sub> = GND; see <a href="#">Figure 9</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 9</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.

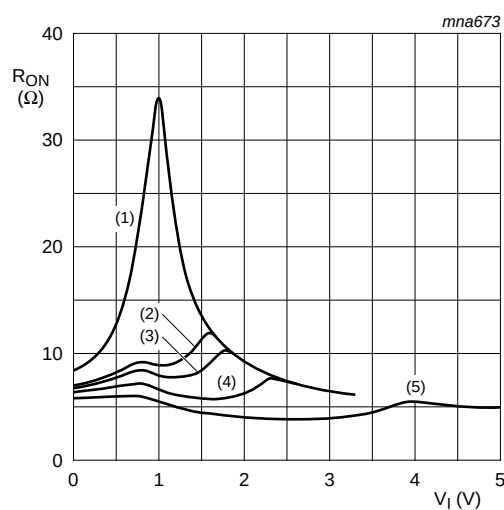
### 10.3 ON resistance test circuit and graphs



$$R_{ON} = V_{SW} / I_{SW}$$

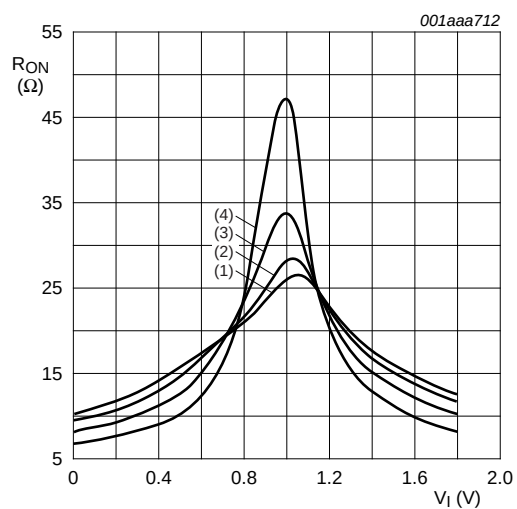
**Fig 9.** Test circuit for measuring ON resistance





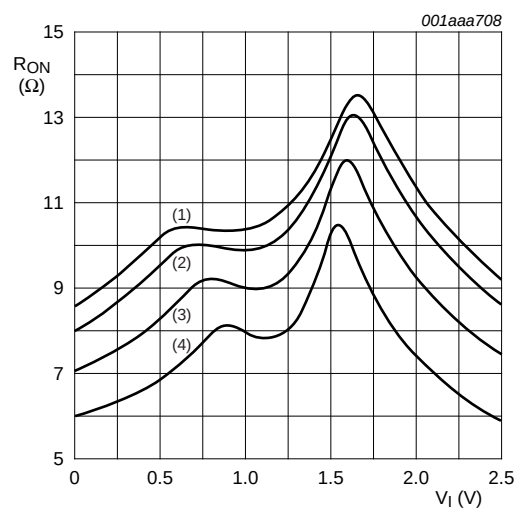
- (1)  $V_{CC} = 1.8 \text{ V}$ .
- (2)  $V_{CC} = 2.5 \text{ V}$ .
- (3)  $V_{CC} = 2.7 \text{ V}$ .
- (4)  $V_{CC} = 3.3 \text{ V}$ .
- (5)  $V_{CC} = 5.0 \text{ V}$ .

Fig 10. Typical ON resistance as a function of input voltage;  $T_{amb} = 25 \text{ }^{\circ}\text{C}$



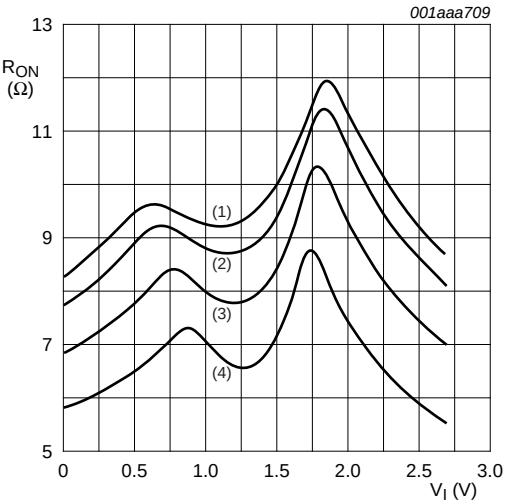
- (1)  $T_{amb} = 125 \text{ }^{\circ}\text{C}$ .
- (2)  $T_{amb} = 85 \text{ }^{\circ}\text{C}$ .
- (3)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$ .
- (4)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$ .

Fig 11. ON resistance as a function of input voltage;  
 $V_{CC} = 1.8 \text{ V}$



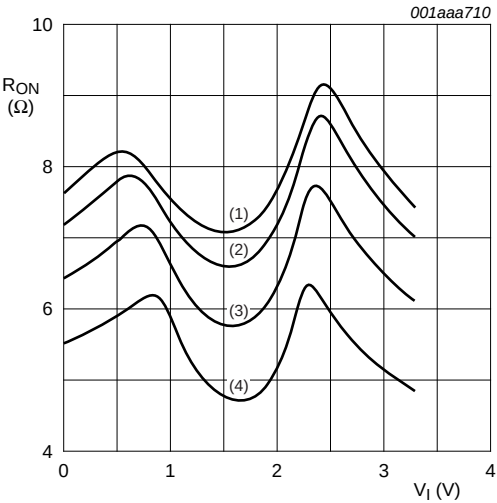
- (1)  $T_{amb} = 125 \text{ }^{\circ}\text{C}$ .
- (2)  $T_{amb} = 85 \text{ }^{\circ}\text{C}$ .
- (3)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$ .
- (4)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$ .

Fig 12. ON resistance as a function of input voltage;  
 $V_{CC} = 2.5 \text{ V}$



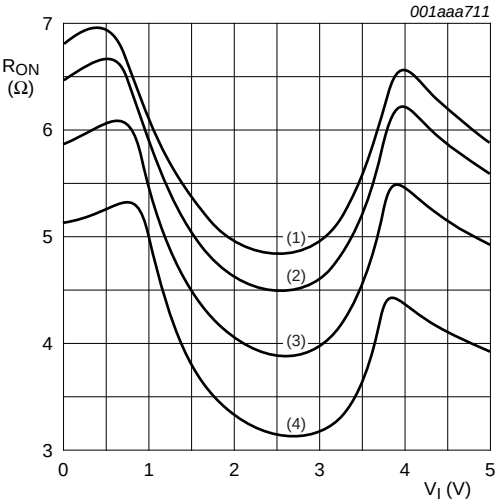
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

Fig 13. 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 14. 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 15. 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 18](#).

| 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 Y <sub>n</sub> or Y <sub>n</sub> to Z; see <a href="#">Figure 16</a> <sup>[2][3]</sup> |                  |                    |      |                   |      |      |
|           |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                          | -                | -                  | 2    | -                 | 2.5  | ns   |
|           |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                                            | -                | -                  | 1.2  | -                 | 1.5  | ns   |
|           |                   | V <sub>CC</sub> = 2.7 V                                                                     | -                | -                  | 1.0  | -                 | 1.25 | ns   |
|           |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                                            | -                | -                  | 0.8  | -                 | 1.0  | ns   |
|           |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                            | -                | -                  | 0.6  | -                 | 0.8  | ns   |
| $t_{en}$  | enable time       | S to Z or Y <sub>n</sub> ; see <a href="#">Figure 17</a> <sup>[4]</sup>                     |                  |                    |      |                   |      |      |
|           |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                          | 2.6              | 6.7                | 10.3 | 2.6               | 12.9 | ns   |
|           |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                                            | 1.9              | 4.1                | 6.4  | 1.9               | 8.0  | ns   |
|           |                   | V <sub>CC</sub> = 2.7 V                                                                     | 1.9              | 4.0                | 5.5  | 1.8               | 7.0  | ns   |
|           |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                                            | 1.8              | 3.4                | 5.0  | 1.8               | 6.3  | ns   |
|           |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                            | 1.3              | 2.6                | 3.8  | 1.3               | 4.8  | ns   |
|           |                   | $\bar{E}$ to Z or Y <sub>n</sub> ; see <a href="#">Figure 17</a> <sup>[4]</sup>             |                  |                    |      |                   |      |      |
|           |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                          | 1.9              | 4.0                | 7.3  | 1.9               | 9.2  | ns   |
|           |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                                            | 1.4              | 2.5                | 4.4  | 1.4               | 5.5  | ns   |
|           |                   | V <sub>CC</sub> = 2.7 V                                                                     | 1.1              | 2.6                | 3.9  | 1.1               | 4.9  | ns   |
|           |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                                            | 1.2              | 2.2                | 3.8  | 1.2               | 4.8  | ns   |
|           |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                            | 1.0              | 1.7                | 2.6  | 1.0               | 3.3  | ns   |
| $t_{dis}$ | disable time      | S to Z or Y <sub>n</sub> ; see <a href="#">Figure 17</a> <sup>[5]</sup>                     |                  |                    |      |                   |      |      |
|           |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                          | 2.1              | 6.8                | 10.0 | 2.1               | 12.5 | ns   |
|           |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                                            | 1.4              | 3.7                | 6.1  | 1.4               | 7.7  | ns   |
|           |                   | V <sub>CC</sub> = 2.7 V                                                                     | 1.4              | 4.9                | 6.2  | 1.4               | 7.8  | ns   |
|           |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                                            | 1.1              | 4.0                | 5.4  | 1.1               | 6.8  | ns   |
|           |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                            | 1.0              | 2.9                | 3.8  | 1.0               | 4.8  | ns   |
|           |                   | $\bar{E}$ to Z or Y <sub>n</sub> ; see <a href="#">Figure 17</a> <sup>[5]</sup>             |                  |                    |      |                   |      |      |
|           |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                                                          | 2.3              | 5.6                | 8.6  | 2.3               | 11.0 | ns   |
|           |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                                                            | 1.2              | 3.2                | 4.8  | 1.2               | 6.0  | ns   |
|           |                   | V <sub>CC</sub> = 2.7 V                                                                     | 1.4              | 4.0                | 5.2  | 1.4               | 6.5  | ns   |
|           |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                                                            | 2.0              | 3.7                | 5.0  | 2.0               | 6.3  | ns   |
|           |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                                                            | 1.3              | 2.9                | 3.8  | 1.3               | 4.8  | ns   |

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

[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

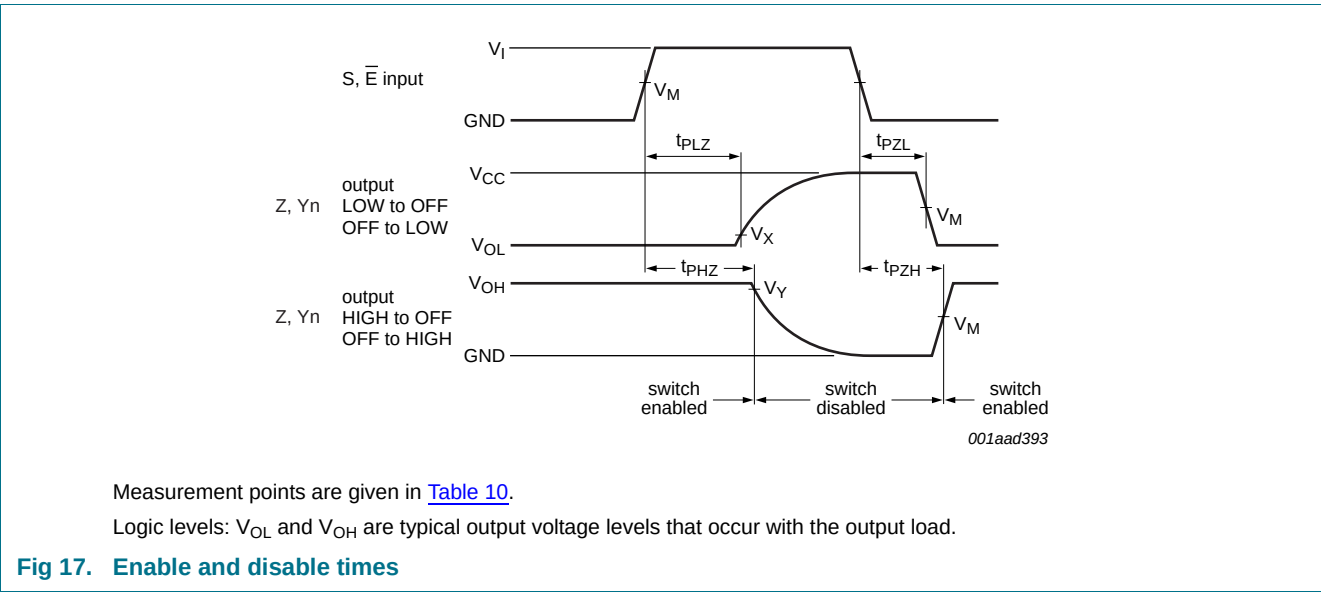
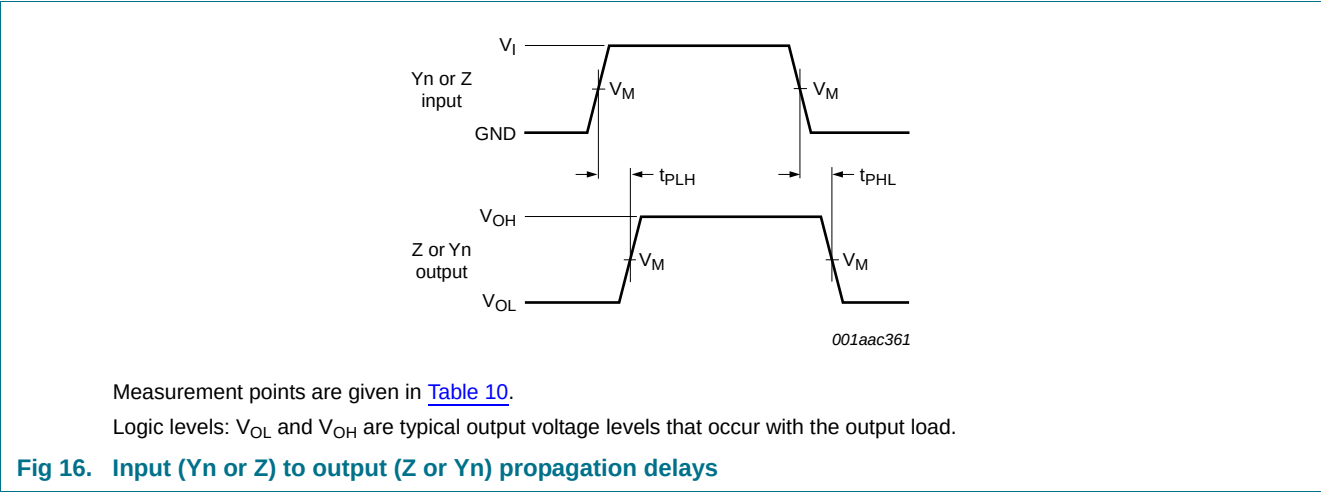
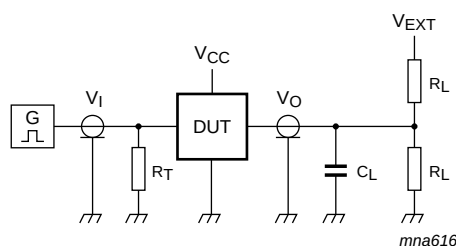


Table 10. Measurement points

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



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 18. Test circuit for measuring 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                | $2 \times V_{CC}$  |
| 2.3 V to 2.7 V   | $V_{CC}$ | $\leq 2.0$ ns | 30 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |
| 2.7 V            | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |
| 3 V to 3.6 V     | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |
| 4.5 V to 5.5 V   | $V_{CC}$ | $\leq 2.5$ ns | 50 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |

## 11.2 Additional dynamic characteristics

**Table 12. Additional dynamic characteristics**

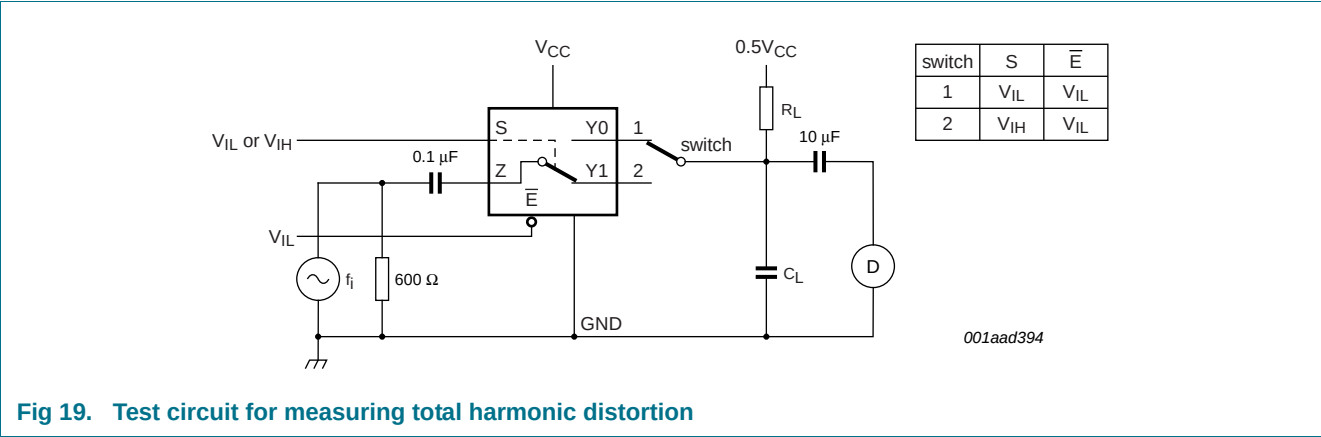
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = 25$  °C.

| 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); see <a href="#">Figure 19</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 20</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  |

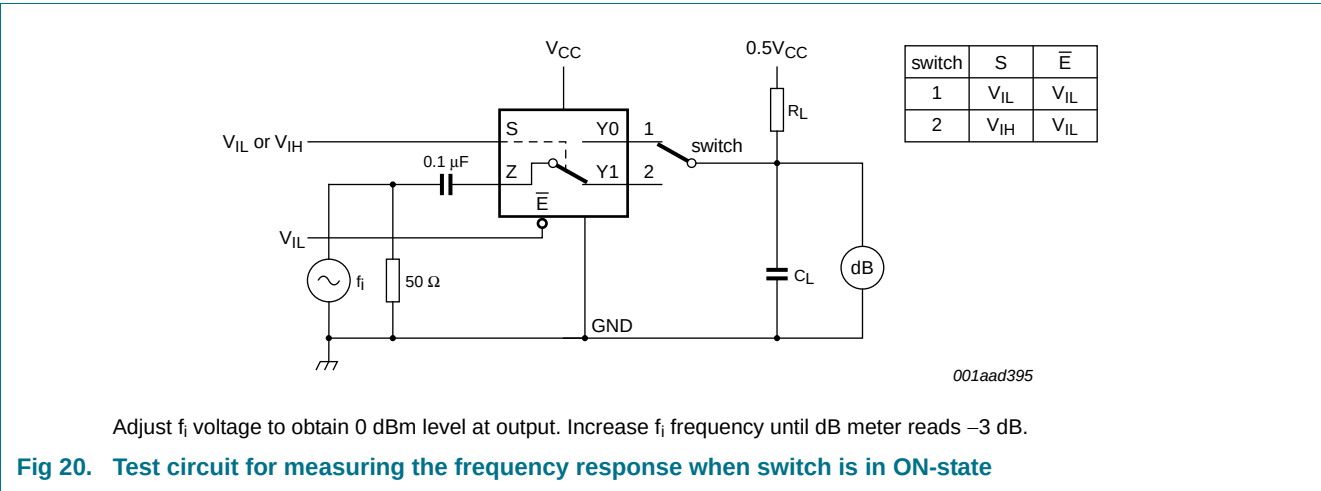
**Table 12. Additional dynamic characteristics ...continued**  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

| Symbol         | Parameter             | Conditions                                                                                                                                                        | Min | Typ | Max | Unit |
|----------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $\alpha_{iso}$ | isolation (OFF-state) | $R_L = 50\text{ }\Omega$ ; $C_L = 5\text{ pF}$ ; $f_i = 10\text{ MHz}$ ;<br>see <a href="#">Figure 21</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   |
| $Q_{inj}$      | charge injection      | $C_L = 0.1\text{ nF}$ ; $V_{gen} = 0\text{ V}$ ; $R_{gen} = 0\text{ }\Omega$ ;<br>$f_i = 1\text{ MHz}$ ; $R_L = 1\text{ M}\Omega$ ; see <a href="#">Figure 22</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   |

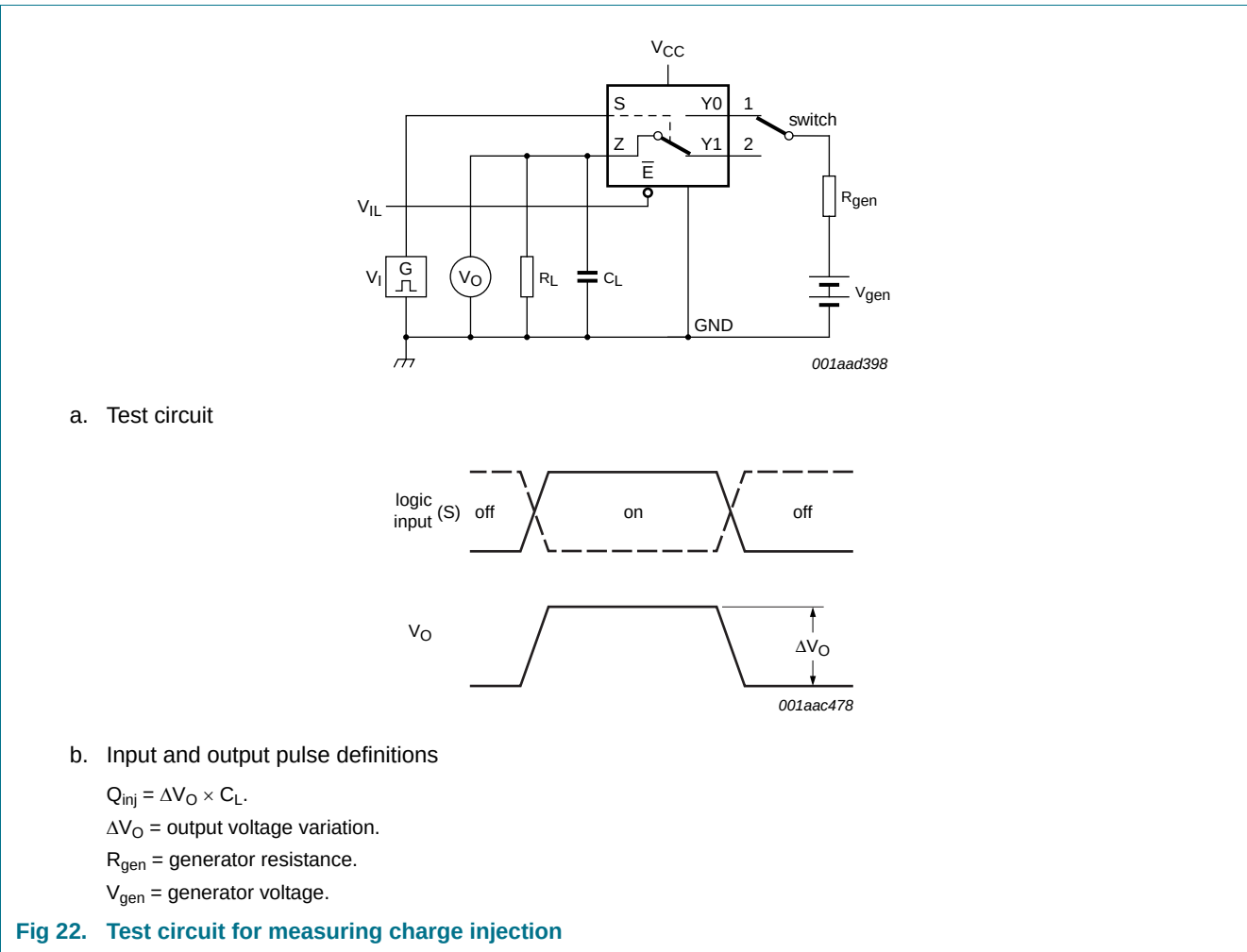
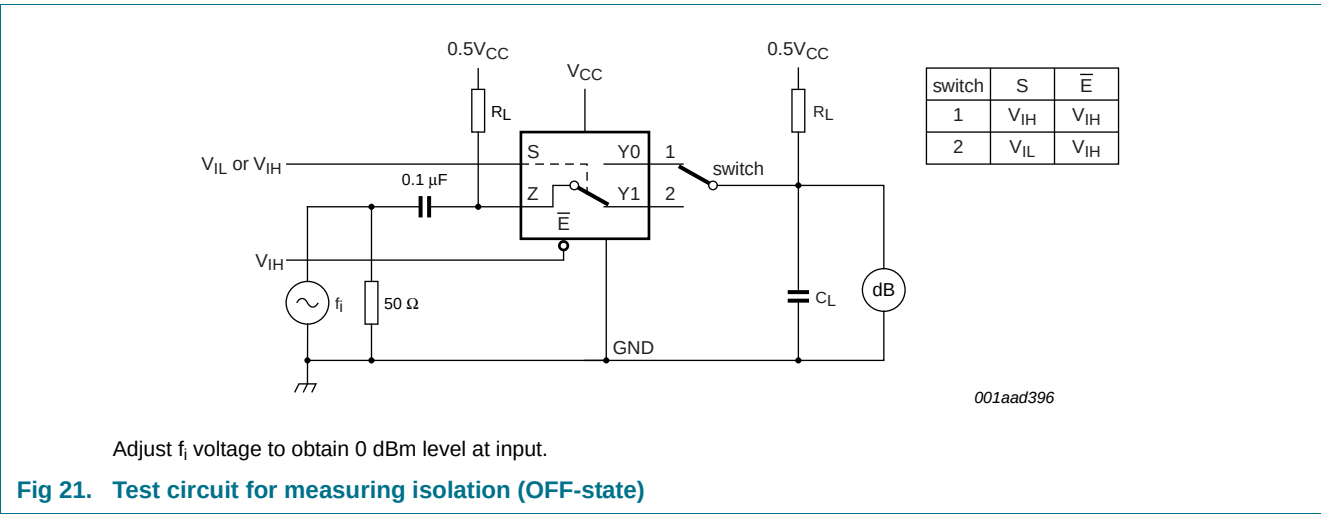
11.3 Test circuits



**Fig 19. Test circuit for measuring total harmonic distortion**



**Fig 20. 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

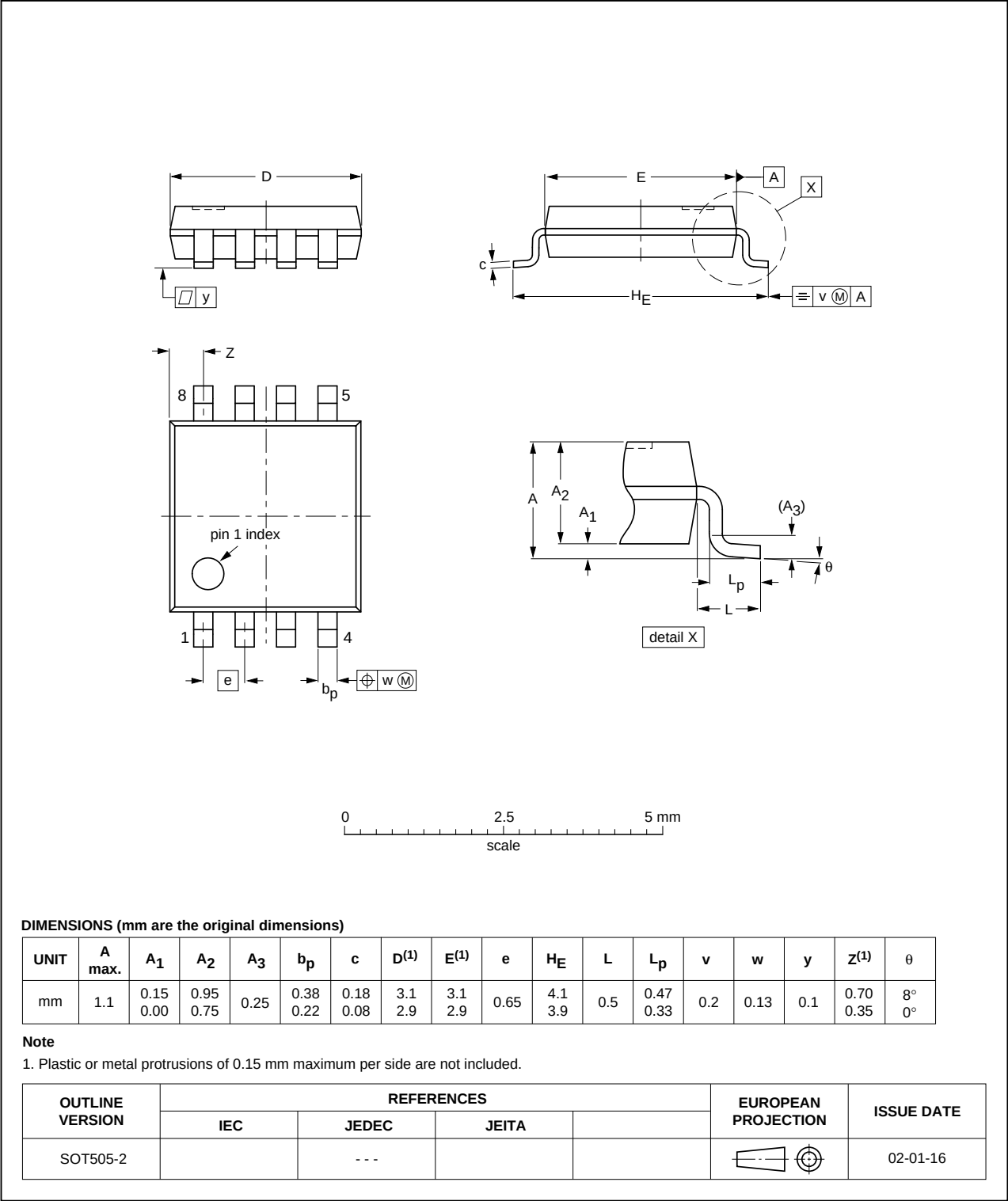


Fig 23. Package outline SOT505-2 (TSSOP8)



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

SOT765-1

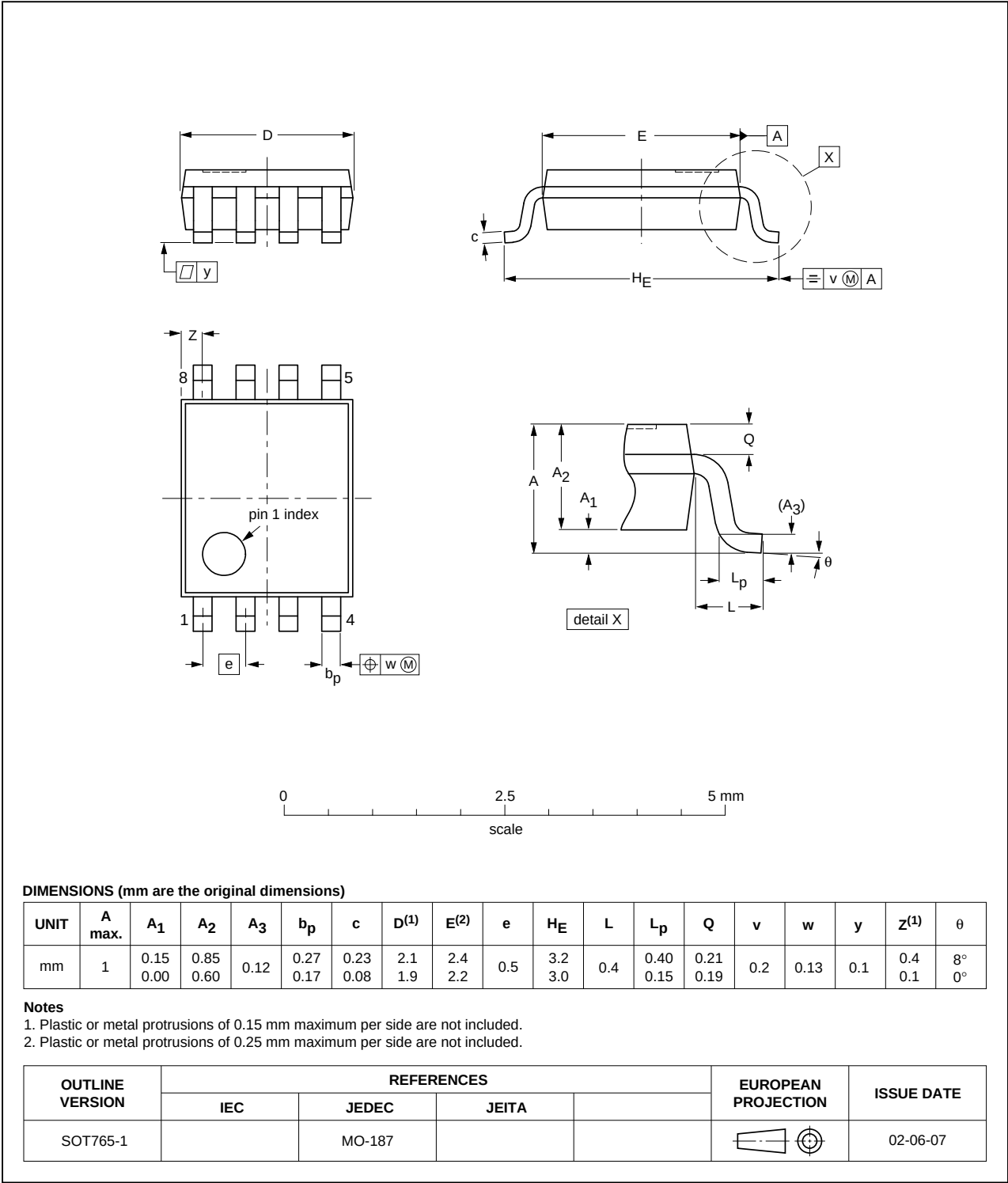


Fig 24. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

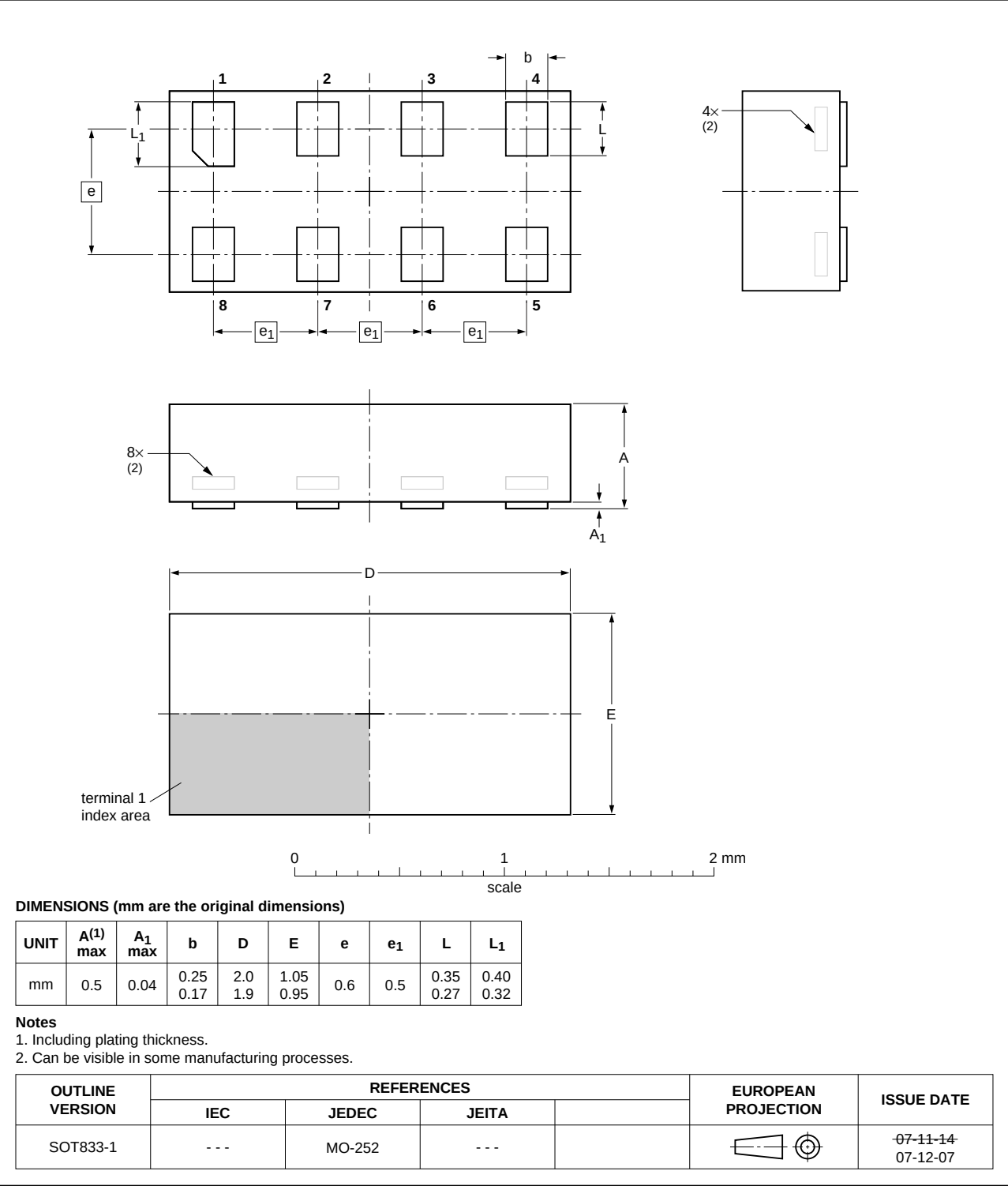


Fig 25. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 1 x 0.5 mm

SOT1089

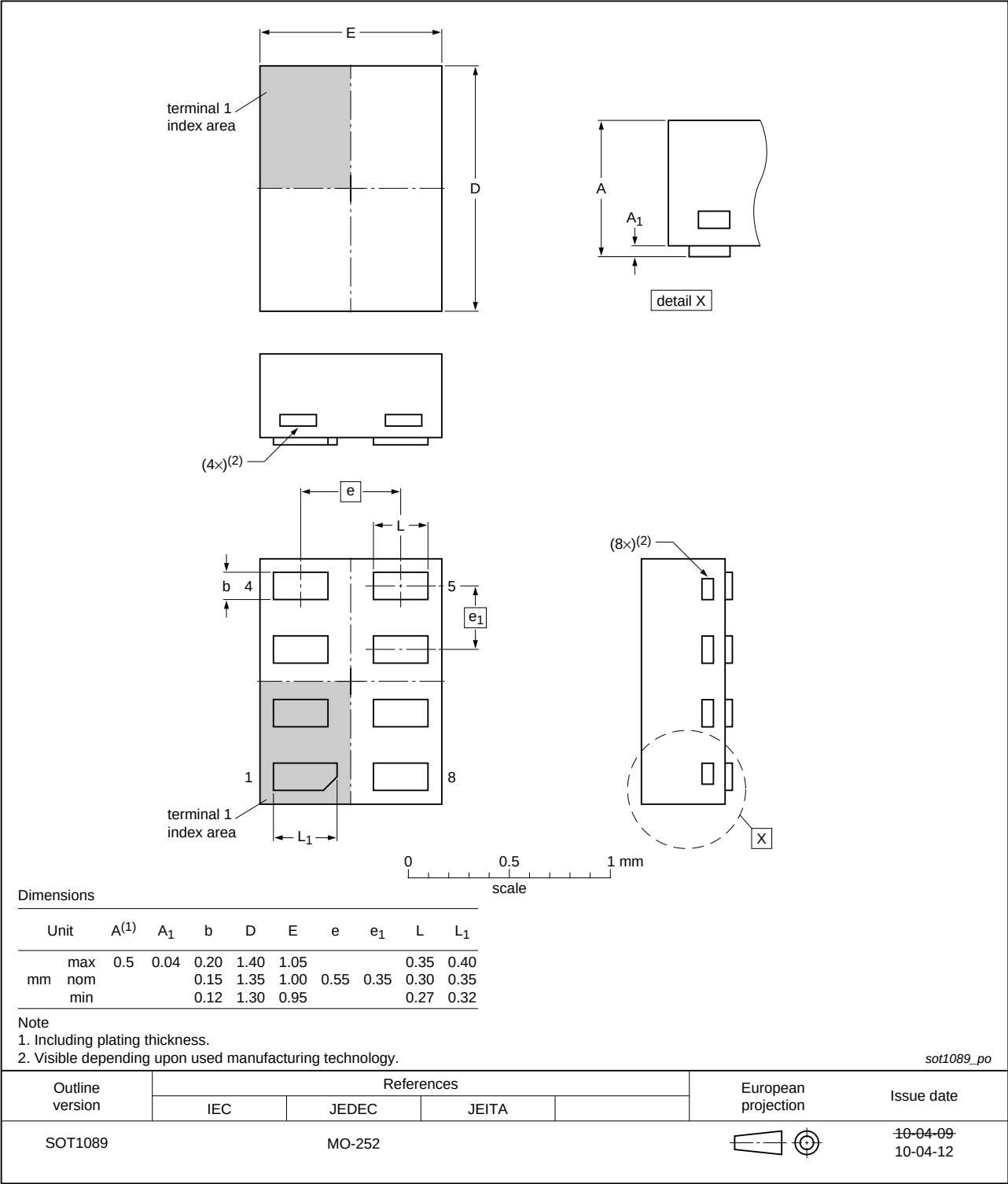


Fig 26. Package outline SOT1089 (XSON8)

XSON8: plastic extremely thin small outline package; no leads;  
8 terminals; body 3 x 2 x 0.5 mm

SOT996-2

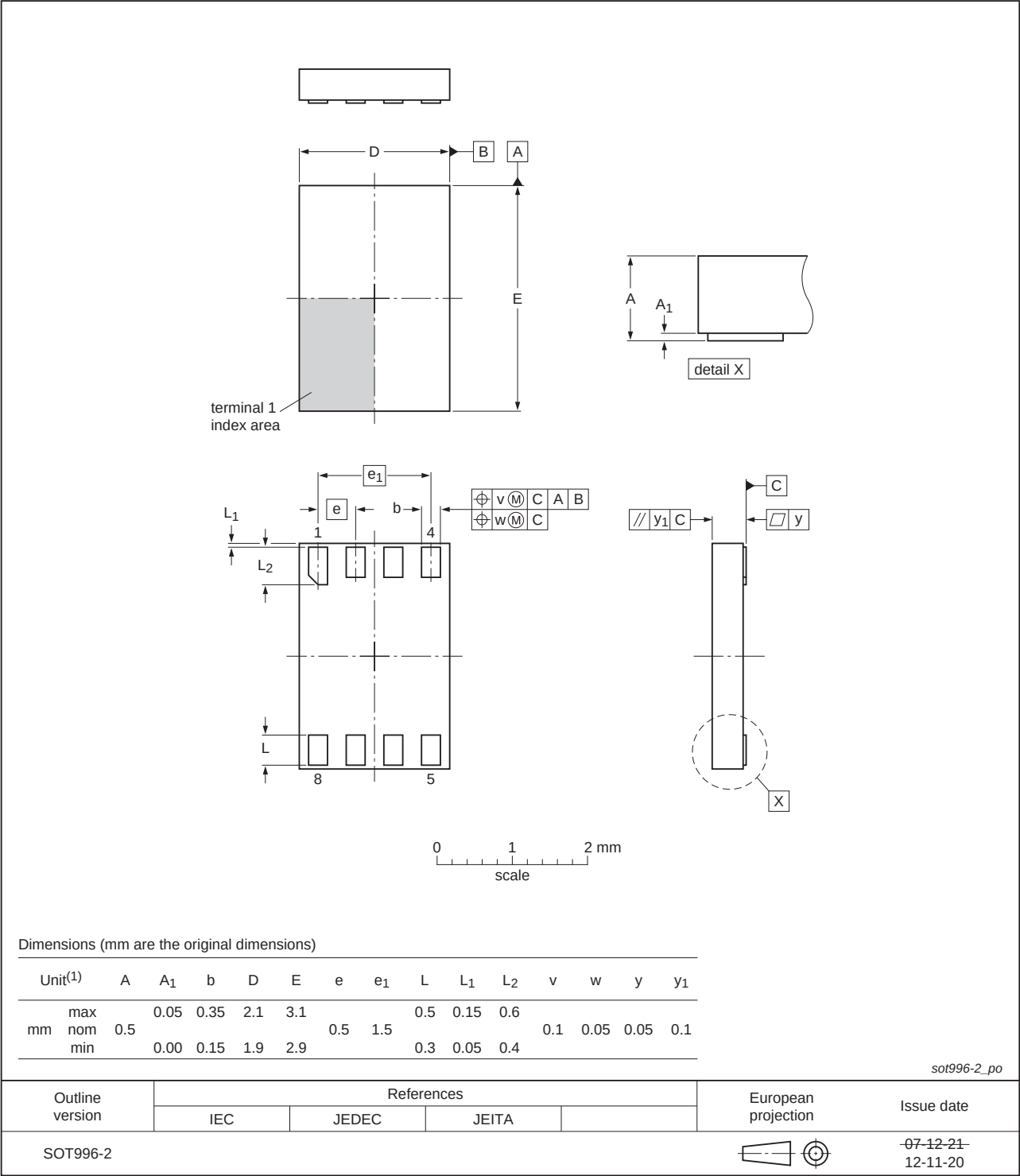


Fig 27. Package outline SOT996-2 (XSON8)

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

SOT902-2

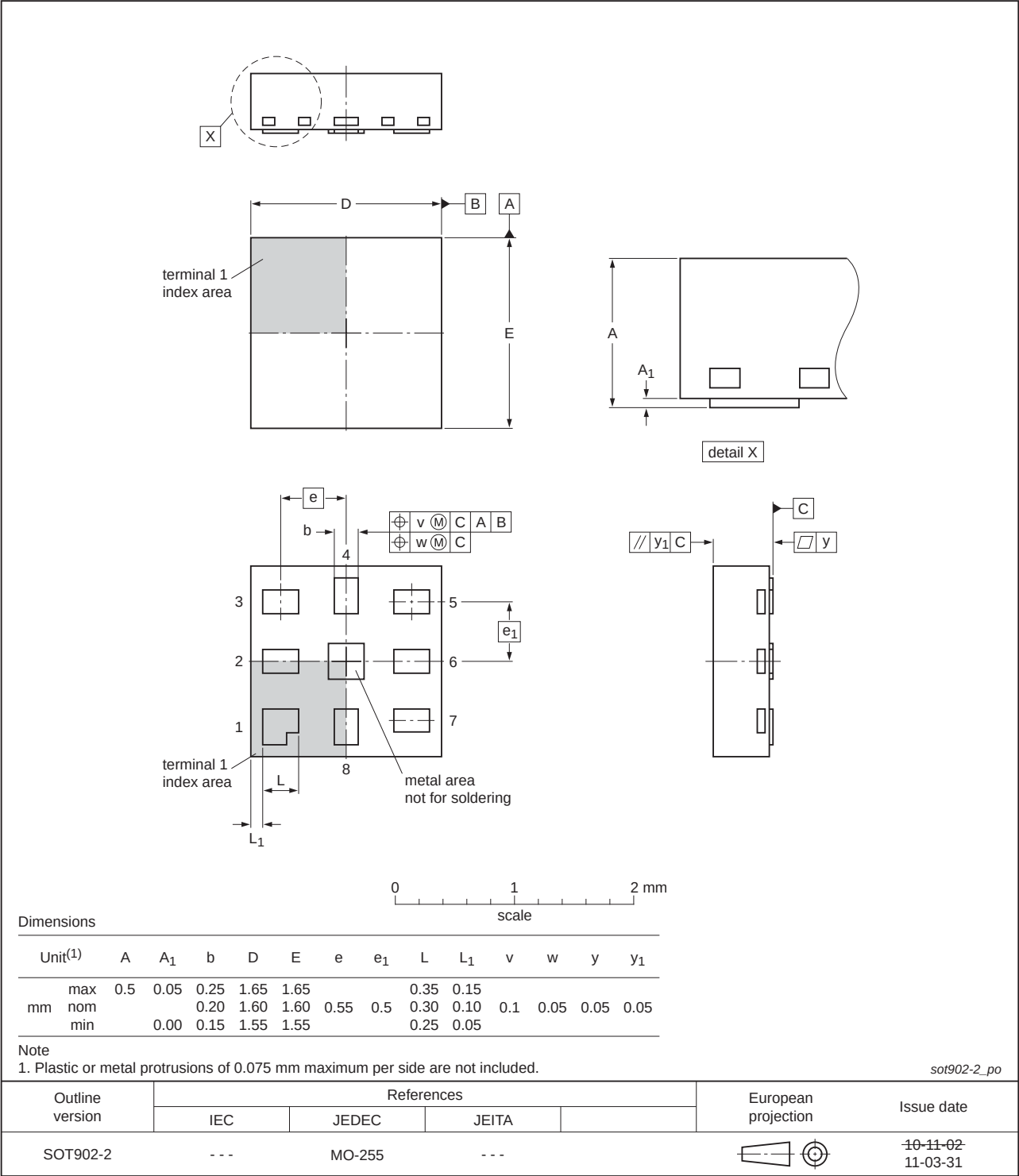


Fig 28. Package outline SOT902-2 (XQFN8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116

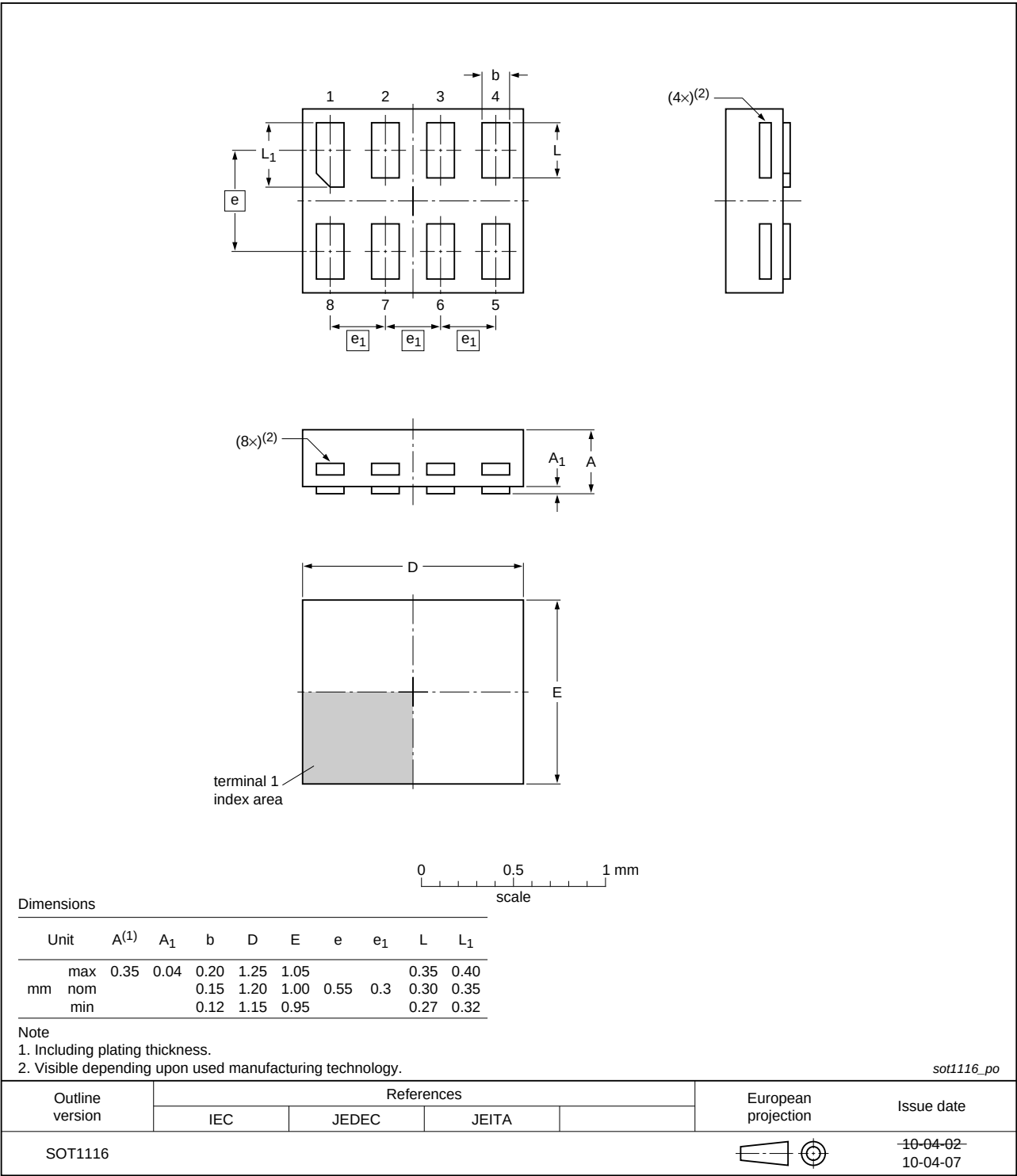


Fig 29. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203

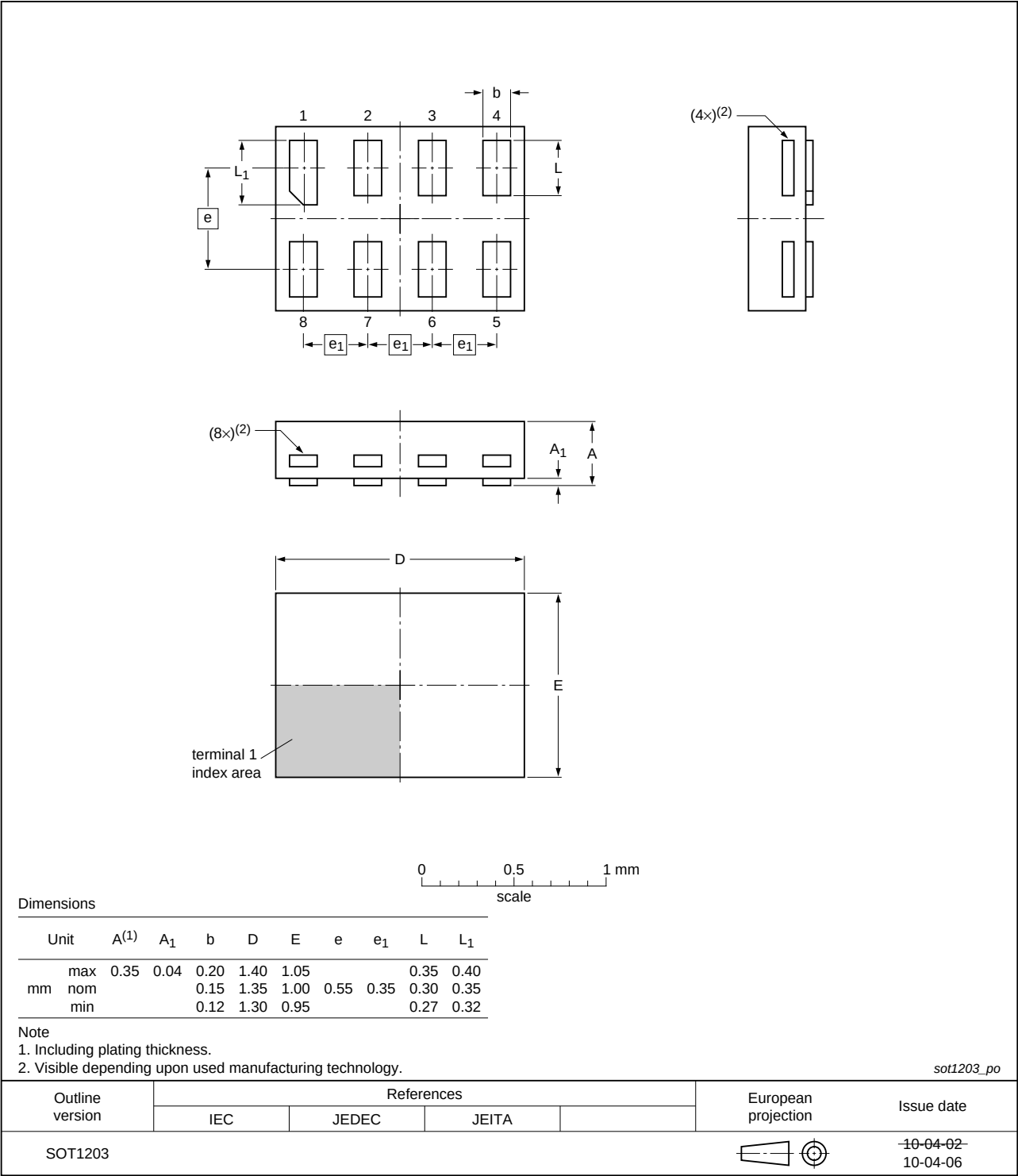


Fig 30. Package outline SOT1203 (XSON8)

## 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    |
|----------------|---------------------------------------------------------------------|--------------------|---------------|---------------|
| 74LVC1G53 v.9  | 20130405                                                            | Product data sheet | -             | 74LVC1G53 v.8 |
| Modifications: | • For type number 74LVC1G53GD XSON8U has changed to XSON8.          |                    |               |               |
| 74LVC1G53 v.8  | 20120622                                                            | Product data sheet | -             | 74LVC1G53 v.7 |
| Modifications: | • For type number 74LVC1G53GM the SOT code has changed to SOT902-2. |                    |               |               |
| 74LVC1G53 v.7  | 20111206                                                            | Product data sheet | -             | 74LVC1G53 v.6 |
| Modifications: | • Legal pages updated.                                              |                    |               |               |
| 74LVC1G53 v.6  | 20100621                                                            | Product data sheet | -             | 74LVC1G53 v.5 |
| 74LVC1G53 v.5  | 20080611                                                            | Product data sheet | -             | 74LVC1G53 v.4 |
| 74LVC1G53 v.4  | 20080303                                                            | Product data sheet | -             | 74LVC1G53 v.3 |
| 74LVC1G53 v.3  | 20070829                                                            | Product data sheet | -             | 74LVC1G53 v.2 |
| 74LVC1G53 v.2  | 20060410                                                            | Product data sheet | -             | 74LVC1G53 v.1 |
| 74LVC1G53 v.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>.

### 15.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 15.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or

malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

## 15.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 16. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

## 17. Contents

---

|           |                                                   |           |
|-----------|---------------------------------------------------|-----------|
| <b>1</b>  | <b>General description</b> . . . . .              | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits</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 . . . . .                         | 4         |
| <b>7</b>  | <b>Functional description</b> . . . . .           | <b>4</b>  |
| <b>8</b>  | <b>Limiting values</b> . . . . .                  | <b>5</b>  |
| <b>9</b>  | <b>Recommended operating conditions</b> . . . . . | <b>5</b>  |
| <b>10</b> | <b>Static characteristics</b> . . . . .           | <b>6</b>  |
| 10.1      | Test circuits . . . . .                           | 7         |
| 10.2      | ON resistance . . . . .                           | 7         |
| 10.3      | ON resistance test circuit and graphs . . . . .   | 8         |
| <b>11</b> | <b>Dynamic characteristics</b> . . . . .          | <b>11</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>24</b> |
| <b>14</b> | <b>Revision history</b> . . . . .                 | <b>24</b> |
| <b>15</b> | <b>Legal information</b> . . . . .                | <b>25</b> |
| 15.1      | Data sheet status . . . . .                       | 25        |
| 15.2      | Definitions . . . . .                             | 25        |
| 15.3      | Disclaimers . . . . .                             | 25        |
| 15.4      | Trademarks . . . . .                              | 26        |
| <b>16</b> | <b>Contact information</b> . . . . .              | <b>26</b> |
| <b>17</b> | <b>Contents</b> . . . . .                         | <b>27</b> |

---

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

---

© NXP B.V. 2013.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 5 April 2013

Document identifier: 74LVC1G53