

# 74LVC1G384

## Bilateral switch

Rev. 8 — 8 February 2022

Product data sheet

## 1. General description

The 74LVC1G384 is a single pole, single throw analog switch. It has two input/output terminals (Y and Z) and an enable pin (E). When E is HIGH, the analog switch is turned off. Control inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

Schmitt-trigger action at control inputs makes the circuit tolerant of slower input rise and fall times.

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- Very low ON resistance:
  - 7.5 Ω (typical) at V<sub>CC</sub> = 2.7 V
  - 6.5 Ω (typical) at V<sub>CC</sub> = 3.3 V
  - 6 Ω (typical) at V<sub>CC</sub> = 5 V
- ESD protection:
  - HBM EIA/JESD22-A114-A exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V
- 32 mA continuous switch current
- High noise immunity
- CMOS low power dissipation
- TTL interface compatibility at 3.3 V
- Latch-up performance meets requirements of JESD 78 Class I
- Overvoltage tolerant inputs to 5.5 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           | Description       |  |  | Version  |
|--------------|-------------------|-------------------|--|--|----------|
|              |                   | Temperature range | Name   |  |          |
| 74LVC1G384GW | -40 °C to +125 °C | TSSOP5            | plastic thin shrink small outline package; 5 leads; body width 1.25 mm   |  | SOT353-1 |
| 74LVC1G384GV | -40 °C to +125 °C | SC-74A            | plastic surface-mounted package; 5 leads   |  | SOT753   |
| 74LVC1G384GM | -40 °C to +125 °C | XSON6             | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm                    |  | SOT886   |
| 74LVC1G384GN | -40 °C to +125 °C | XSON6             | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm                          |  | SOT1115  |
| 74LVC1G384GS | -40 °C to +125 °C | XSON6             | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm                          |  | SOT1202  |
| 74LVC1G384GX | -40 °C to +125 °C | X2SON5            | plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 × 0.8 × 0.35 mm |  | SOT1226  |

## 4. Marking

Table 2. Marking

| Type number  | Marking code[1] |
|--------------|-----------------|
| 74LVC1G384GW | YL              |
| 74LVC1G384GV | YL              |
| 74LVC1G384GM | YL              |
| 74LVC1G384GN | YL              |
| 74LVC1G384GS | YL              |
| 74LVC1G384GX | YL              |

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

## 5. Functional diagram

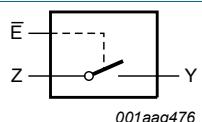


Fig. 1. Logic symbol

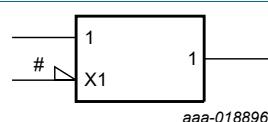


Fig. 2. IEC logic symbol

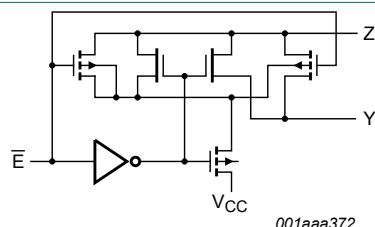


Fig. 3. Logic diagram

## 6. Pinning information

### 6.1. Pinning

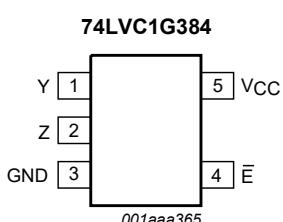
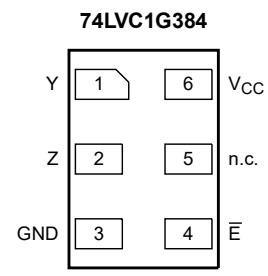


Fig. 4. Pin configuration SOT353-1 (TSSOP5) and SOT753 (SC-74A)



Transparent top view

Fig. 5. Pin configuration SOT886 (XSON6)

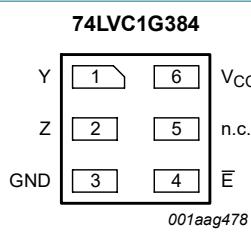


Fig. 6. Pin configuration SOT1115 and SOT1202 (XSON6)

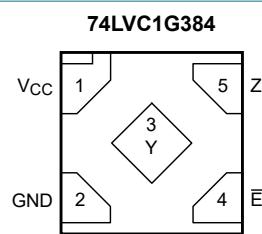


Fig. 7. Pin configuration SOT1226 (X2SON5)

## 6.2. Pin description

Table 3. Pin description

| Symbol          | Pin              |       |        | Description                 |
|-----------------|------------------|-------|--------|-----------------------------|
|                 | TSSOP5 and SC-74 | XSON6 | X2SON5 |                             |
| Y               | 1                | 1     | 3      | independent input or output |
| Z               | 2                | 2     | 5      | independent output or input |
| GND             | 3                | 3     | 2      | ground (0 V)                |
| $\bar{E}$       | 4                | 4     | 4      | enable input (active LOW)   |
| n.c.            | -                | 5     | -      | not connected               |
| V <sub>CC</sub> | 5                | 6     | 1      | supply voltage              |

## 7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level.

| Input $\bar{E}$ | Switch    |
|-----------------|-----------|
| L               | ON-state  |
| H               | 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 | $T_{amb} = -40 \text{ }^{\circ}\text{C}$ to $+125 \text{ }^{\circ}\text{C}$ | [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 SOT353-1 (TSSOP5) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.

For SOT753 (SC-74A) package:  $P_{tot}$  derates linearly with 3.8 mW/K above 85 °C.

For SOT886 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.

For SOT1115 (XSON6) package:  $P_{tot}$  derates linearly with 3.2 mW/K above 71 °C.

For SOT1202 (XSON6) package:  $P_{tot}$  derates linearly with 3.3 mW/K above 74 °C.

For SOT1226 (X2SON5) package:  $P_{tot}$  derates linearly with 3.0 mW/K above 67 °C.

## 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                      | [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 $2.7 \text{ V}$ | -    | -   | 20       | ns/V |
|                     |                                     | $V_{CC} = 2.7 \text{ V}$ to $5.5 \text{ V}$  | -    | -   | 10       | ns/V |

[1] To avoid sinking GND current from terminal Z when switch current flows in terminal Y, 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 Y. In this case, there is no limit for the voltage drop across the switch.

## 10. Static characteristics

**Table 7. Static characteristics**

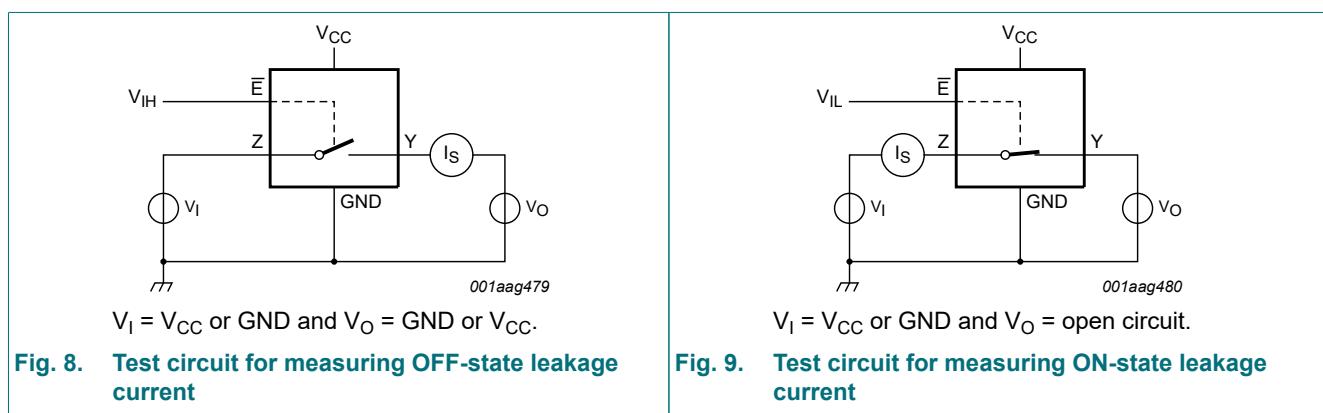
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol              | Parameter                 | Conditions  | -40 °C to +85 °C       |        |                        | -40 °C to +125 °C      |                        | Unit   |
|---------------------|---------------------------|---|------------------------|--------|------------------------|------------------------|------------------------|--------|
|                     |                           |   | Min                    | Typ[1] | Max                    | Min                    | Max                    |        |
| V <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> = 2.7 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> = 2.7 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 E; V <sub>I</sub> = 5.5 V or GND; [2]<br>V <sub>CC</sub> = 0 V to 5.5 V   | -                      | ±0.1   | ±1                     | -                      | ±1                     | µA     |
| I <sub>S(OFF)</sub> | OFF-state leakage current | V <sub>CC</sub> = 5.5 V; see Fig. 8 [2]   | -                      | ±0.1   | ±0.2                   | -                      | ±0.5                   | µA     |
| I <sub>S(ON)</sub>  | ON-state leakage current  | V <sub>CC</sub> = 5.5 V; see Fig. 9 [2]   | -                      | ±0.1   | ±1                     | -                      | ±2                     | 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         | [2]                    | -      | 0.1                    | 4                      | -                      | 4 µA   |
| ΔI <sub>CC</sub>    | additional supply current | pin E; 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 | [2]                    | -      | 5                      | 500                    | -                      | 500 µA |
| C <sub>I</sub>      | input capacitance         |   | -                      | 2.0    | -                      | -                      | -                      | pF     |
| C <sub>S(OFF)</sub> | OFF-state capacitance     |   | -                      | 5.0    | -                      | -                      | -                      | pF     |
| C <sub>S(ON)</sub>  | ON-state capacitance      |   | -                      | 9.5    | -                      | -                      | -                      | pF     |

[1] All 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**

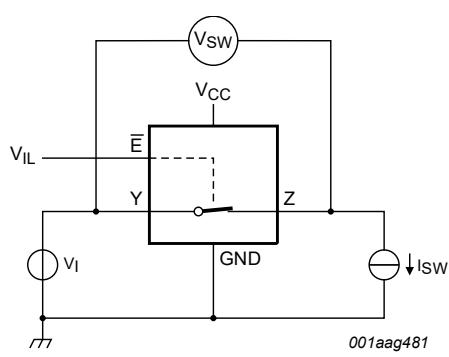
At recommended operating conditions; voltages are referenced to GND (ground 0 V); for graphs see [Fig. 11 to Fig. 16](#).

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

[1] Typical values are measured at  $T_{amb} = 25 \text{ }^{\circ}\text{C}$  and nominal  $V_{CC}$ .

[2] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical  $V_{CC}$  and temperature.

### 10.3. ON resistance test circuit and graphs



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

Fig. 10. Test circuit for measuring ON resistance

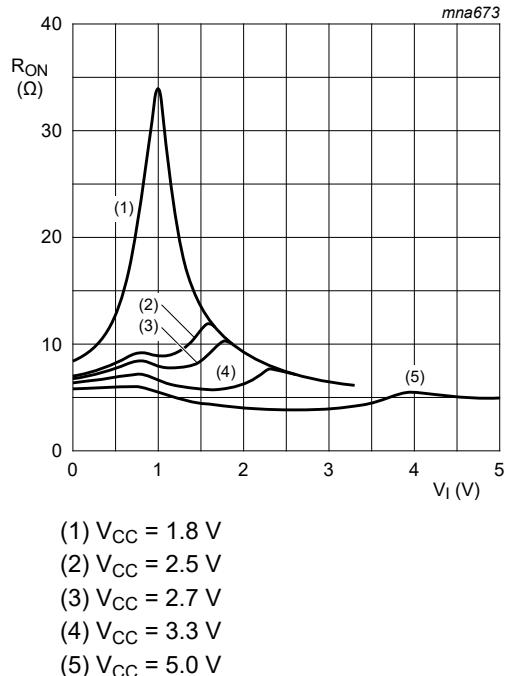


Fig. 11. Typical ON resistance as a function of input voltage;  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

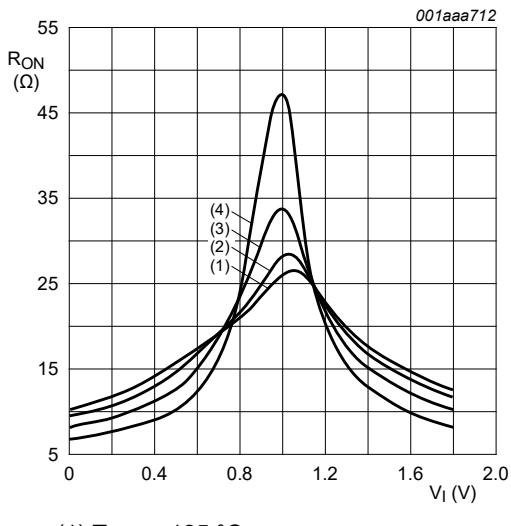


Fig. 12. ON resistance as a function of input voltage;  $V_{CC} = 1.8 \text{ V}$

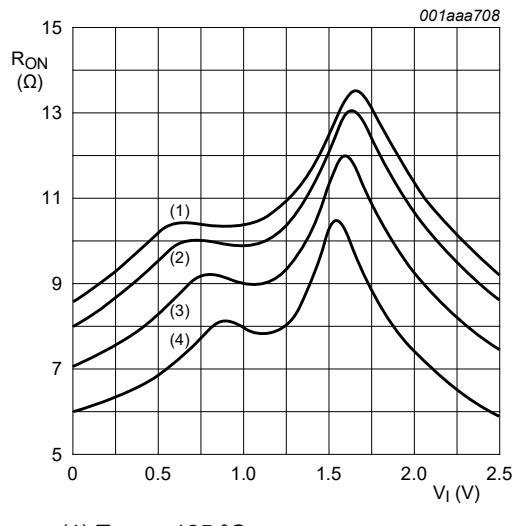
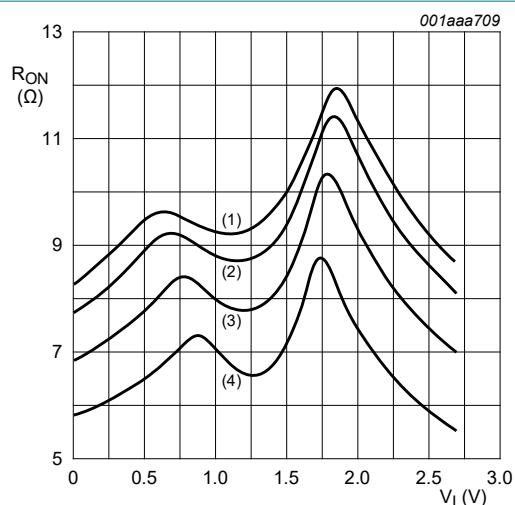
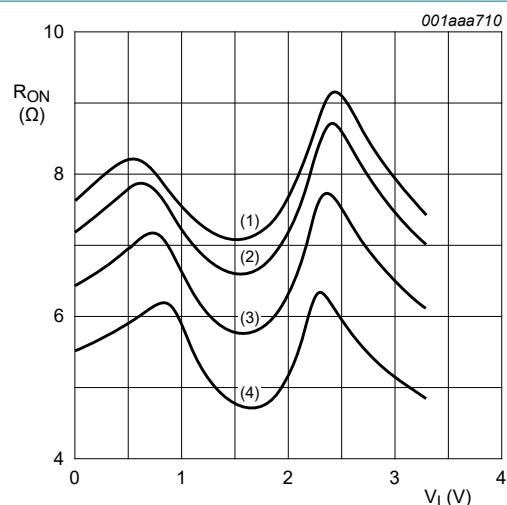


Fig. 13. ON resistance as a function of input voltage;  $V_{CC} = 2.5 \text{ V}$



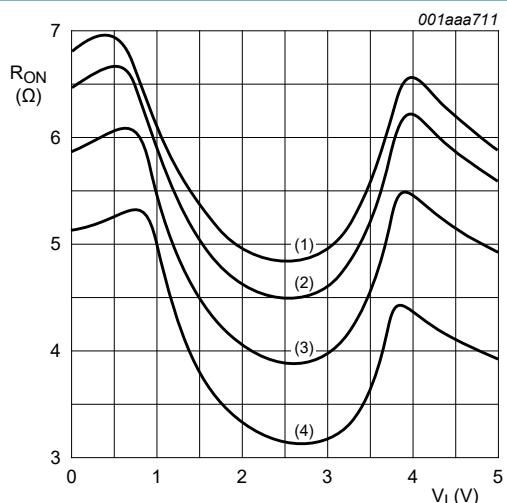
- (1)  $T_{amb} = 125$  °C
- (2)  $T_{amb} = 85$  °C
- (3)  $T_{amb} = 25$  °C
- (4)  $T_{amb} = -40$  °C

Fig. 14. ON resistance as a function of input voltage;  
 $V_{CC} = 2.7$  V



- (1)  $T_{amb} = 125$  °C
- (2)  $T_{amb} = 85$  °C
- (3)  $T_{amb} = 25$  °C
- (4)  $T_{amb} = -40$  °C

Fig. 15. ON resistance as a function of input voltage;  
 $V_{CC} = 3.3$  V



- (1)  $T_{amb} = 125$  °C
- (2)  $T_{amb} = 85$  °C
- (3)  $T_{amb} = 25$  °C
- (4)  $T_{amb} = -40$  °C

Fig. 16. ON resistance as a function of input voltage;  $V_{CC} = 5.0$  V

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 19.

| Symbol           | Parameter                     | Conditions  | -40 °C to +85 °C |        |      | -40 °C to +125 °C |      | Unit |
|------------------|-------------------------------|---|------------------|--------|------|-------------------|------|------|
|                  |                               |   | Min              | Typ[1] | Max  | Min               | Max  |      |
| t <sub>pd</sub>  | propagation delay             | Y to Z or Z to Y; see Fig. 17   | [2]              |        |      |                   |      |      |
|                  |                               |   | [3]              |        |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V  | -                | 0.8    | 2.0  | -                 | 3.0  | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V  | -                | 0.4    | 1.2  | -                 | 2.0  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V   | -                | 0.4    | 1.0  | -                 | 1.5  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V  | -                | 0.3    | 0.8  | -                 | 1.5  | ns   |
| t <sub>en</sub>  | enable time                   | Ē to Y or Z; see Fig. 18  | [4]              |        |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V  | 1.0              | 10.0   | 12.0 | 1.0               | 15.5 | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V  | 1.0              | 5.7    | 6.5  | 1.0               | 8.5  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V   | 1.0              | 5.4    | 6.0  | 1.0               | 8.0  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V  | 1.0              | 4.8    | 5.0  | 1.0               | 6.5  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V  | 1.0              | 3.3    | 4.2  | 1.0               | 5.5  | ns   |
| t <sub>dis</sub> | disable time                  | Ē to Y or Z; see Fig. 18  | [5]              |        |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 1.65 V to 1.95 V  | 1.0              | 7.4    | 10.0 | 1.0               | 13.0 | ns   |
|                  |                               | V <sub>CC</sub> = 2.3 V to 2.7 V  | 1.0              | 4.1    | 6.9  | 1.0               | 9.0  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V   | 1.0              | 4.9    | 7.5  | 1.0               | 9.5  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V  | 1.0              | 5.4    | 6.5  | 1.0               | 8.5  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V to 5.5 V  | 1.0              | 3.6    | 5.0  | 1.0               | 6.5  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | C <sub>L</sub> = 50 pF; f <sub>i</sub> = 10 MHz;<br>V <sub>I</sub> = GND to V <sub>CC</sub> | [6]              |        |      |                   |      |      |
|                  |                               | V <sub>CC</sub> = 2.5 V   | -                | 13.7   | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 3.3 V   | -                | 15.2   | -    | -                 | -    | pF   |
|                  |                               | V <sub>CC</sub> = 5.0 V   | -                | 18.3   | -    | -                 | -    | pF   |

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

[2] 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).

[3] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[4] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.

[5] t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[6] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in  $\mu$ W).

P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N +  $\Sigma$ {(C<sub>L</sub> + C<sub>S(ON)</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

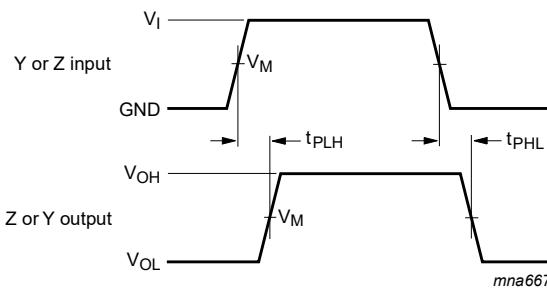
C<sub>S(ON)</sub> = maximum ON-state switch capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching;

$\Sigma$ {(C<sub>L</sub> + C<sub>S(ON)</sub>) × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>} = sum of the outputs.

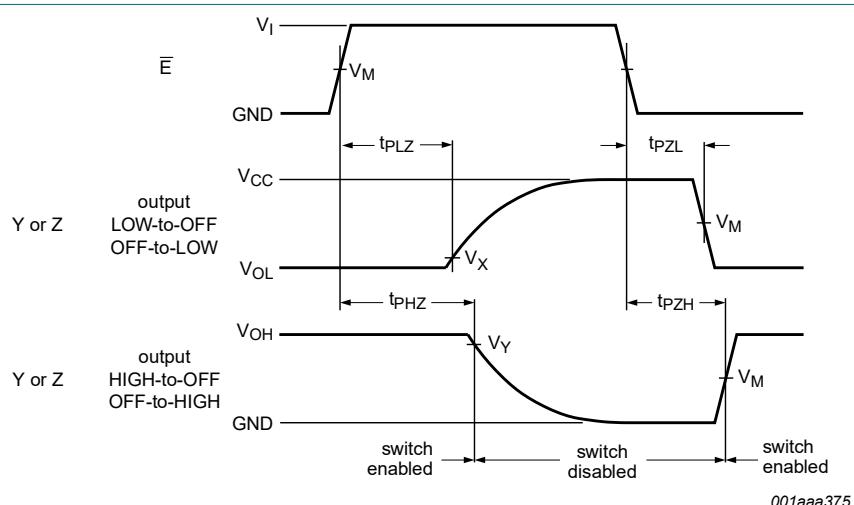
## 11.1. Waveforms and test circuit



Measurement points are given in [Table 10](#).

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig. 17. Input (Y or Z) to output (Z or Y) propagation delays**



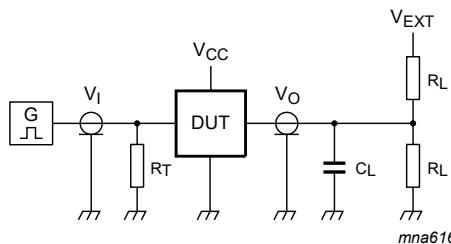
Measurement points are given in [Table 10](#).

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig. 18. Enable and disable times**

**Table 10. Measurement points**

| Supply voltage   | Input               | Output              |                           |                           |
|------------------|---------------------|---------------------|---------------------------|---------------------------|
| $V_{CC}$         | $V_M$               | $V_M$               | $V_X$                     | $V_Y$                     |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | $V_{OL} + 0.15 \text{ V}$ | $V_{OH} - 0.15 \text{ V}$ |
| 2.3 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            | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |
| 3.0 V to 3.6 V   | 1.5 V               | 1.5 V               | $V_{OL} + 0.3 \text{ V}$  | $V_{OH} - 0.3 \text{ V}$  |
| 4.5 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 for 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. 19. 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            | 2.7 V    | $\leq 2.5$ ns | 50 pF 500 $\Omega$ open GND 6 V                                      |
| 3.0 V to 3.6 V   | 2.7 V    | $\leq 2.5$ ns | 50 pF 500 $\Omega$ open GND 6 V                                      |
| 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

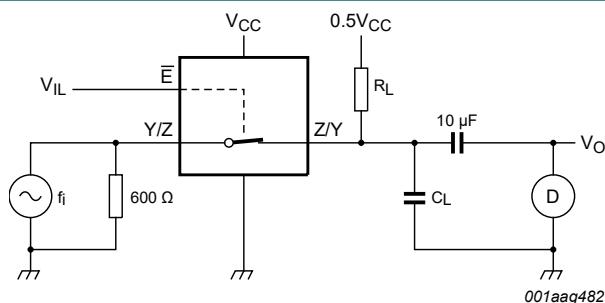
**Table 12. Additional dynamic characteristics**

At recommended operating conditions; typical values measured at  $T_{amb} = 25$  °C.

| Symbol | Parameter                 | Conditions   | Min | Typ   | Max | Unit |
|--------|---------------------------|--|-----|-------|-----|------|
| THD    | total harmonic distortion | $R_L = 10$ k $\Omega$ ; $C_L = 50$ pF; $f_i = 1$ kHz; see <a href="#">Fig. 20</a>  |     |       |     |      |
|        |                           | $V_{CC} = 1.65$ V  | -   | 0.032 | -   | %    |
|        |                           | $V_{CC} = 2.3$ V   | -   | 0.008 | -   | %    |
|        |                           | $V_{CC} = 3.0$ V   | -   | 0.006 | -   | %    |
|        |                           | $V_{CC} = 4.5$ V   | -   | 0.001 | -   | %    |
|        |                           | $R_L = 10$ k $\Omega$ ; $C_L = 50$ pF; $f_i = 10$ kHz; see <a href="#">Fig. 20</a> |     |       |     |      |
|        |                           | $V_{CC} = 1.65$ V  | -   | 0.068 | -   | %    |
|        |                           | $V_{CC} = 2.3$ V   | -   | 0.009 | -   | %    |
|        |                           | $V_{CC} = 3.0$ V   | -   | 0.008 | -   | %    |
|        |                           | $V_{CC} = 4.5$ V   | -   | 0.006 | -   | %    |

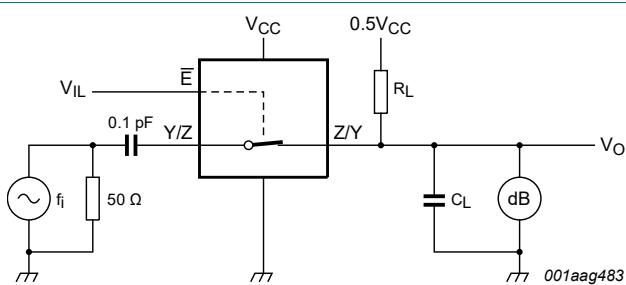
| Symbol              | Parameter                | Conditions  | Min | Typ   | Max | Unit |
|---------------------|--------------------------|---|-----|-------|-----|------|
| $f_{(-3\text{dB})}$ | -3 dB frequency response | $R_L = 600 \Omega$ ; $C_L = 50 \text{ pF}$ ; see <a href="#">Fig. 21</a>  |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | 135   | -   | MHz  |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | 145   | -   | MHz  |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | 150   | -   | MHz  |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | 155   | -   | MHz  |
|                     |                          | $R_L = 50 \Omega$ ; $C_L = 5 \text{ pF}$ ; see <a href="#">Fig. 21</a>  |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | > 500 | -   | MHz  |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | > 500 | -   | MHz  |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | > 500 | -   | MHz  |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | > 500 | -   | MHz  |
|                     |                          | $R_L = 50 \Omega$ ; $C_L = 10 \text{ pF}$ ; see <a href="#">Fig. 21</a>   |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | 200   | -   | MHz  |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | 350   | -   | MHz  |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | 410   | -   | MHz  |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | 440   | -   | MHz  |
| $\alpha_{iso}$      | isolation (OFF-state)    | $R_L = 600 \Omega$ ; $C_L = 50 \text{ pF}$ ; $f_i = 1 \text{ MHz}$ ; see <a href="#">Fig. 22</a>  |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | -46   | -   | dB   |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | -46   | -   | dB   |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | -46   | -   | dB   |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | -46   | -   | dB   |
|                     |                          | $R_L = 50 \Omega$ ; $C_L = 5 \text{ pF}$ ; $f_i = 1 \text{ MHz}$ ; see <a href="#">Fig. 22</a>  |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | -37   | -   | dB   |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | -37   | -   | dB   |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | -37   | -   | dB   |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | -37   | -   | dB   |
| $V_{ct}$            | crosstalk voltage        | between digital input and switch; $R_L = 600 \Omega$ ; $C_L = 50 \text{ pF}$ ; $f_i = 1 \text{ MHz}$ ; $t_r = t_f = 2 \text{ ns}$ ; see <a href="#">Fig. 23</a> |     |       |     |      |
|                     |                          | $V_{CC} = 1.65 \text{ V}$   | -   | 69    | -   | mV   |
|                     |                          | $V_{CC} = 2.3 \text{ V}$  | -   | 87    | -   | mV   |
|                     |                          | $V_{CC} = 3.0 \text{ V}$  | -   | 156   | -   | mV   |
|                     |                          | $V_{CC} = 4.5 \text{ V}$  | -   | 302   | -   | mV   |
| $Q_{inj}$           | charge injection         | $C_L = 0.1 \text{ nF}$ ; $V_{gen} = 0 \text{ V}$ ; $R_{gen} = 0 \Omega$ ; $f_i = 1 \text{ MHz}$ ; $R_L = 1 \text{ M}\Omega$ ; see <a href="#">Fig. 24</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


**Test conditions:**

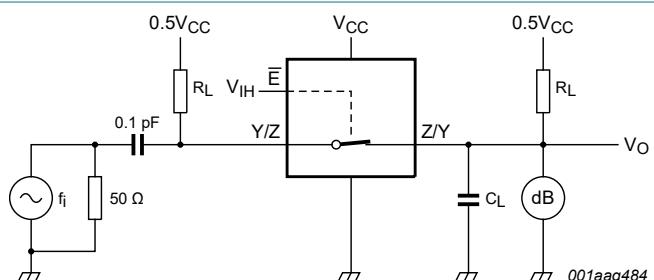
- $V_{CC} = 1.65 \text{ V}$ :  $V_I = 1.4 \text{ V}$  (p-p)
- $V_{CC} = 2.3 \text{ V}$ :  $V_I = 2 \text{ V}$  (p-p)
- $V_{CC} = 3 \text{ V}$ :  $V_I = 2.5 \text{ V}$  (p-p)
- $V_{CC} = 4.5 \text{ V}$ :  $V_I = 4 \text{ V}$  (p-p)

Fig. 20. 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. 21. Test circuit for measuring the frequency response when switch is in ON-state



Adjust  $f_i$  voltage to obtain 0 dBm level at input.

Fig. 22. Test circuit for measuring isolation (OFF-state)

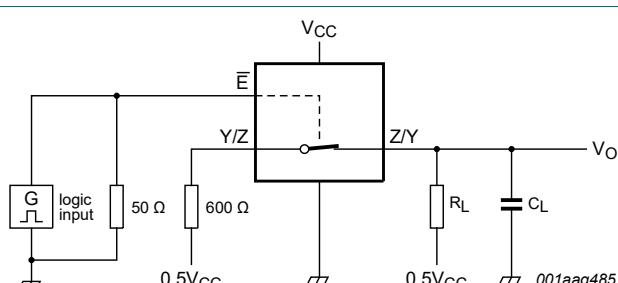
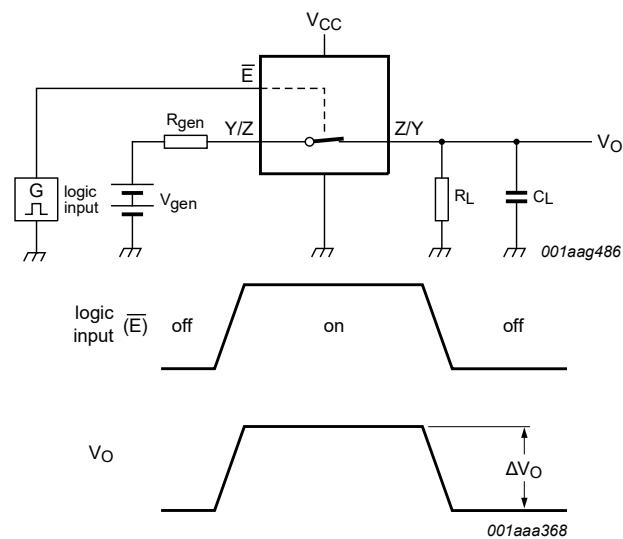


Fig. 23. Test circuit for measuring crosstalk between digital inputs and switch



$$Q_{inj} = \Delta V_O \times C_L$$

$\Delta V_O$  = output voltage variation

$R_{gen}$  = generator resistance

$V_{gen}$  = generator voltage

Fig. 24. Test circuit for measuring charge injection

## 12. Package outline

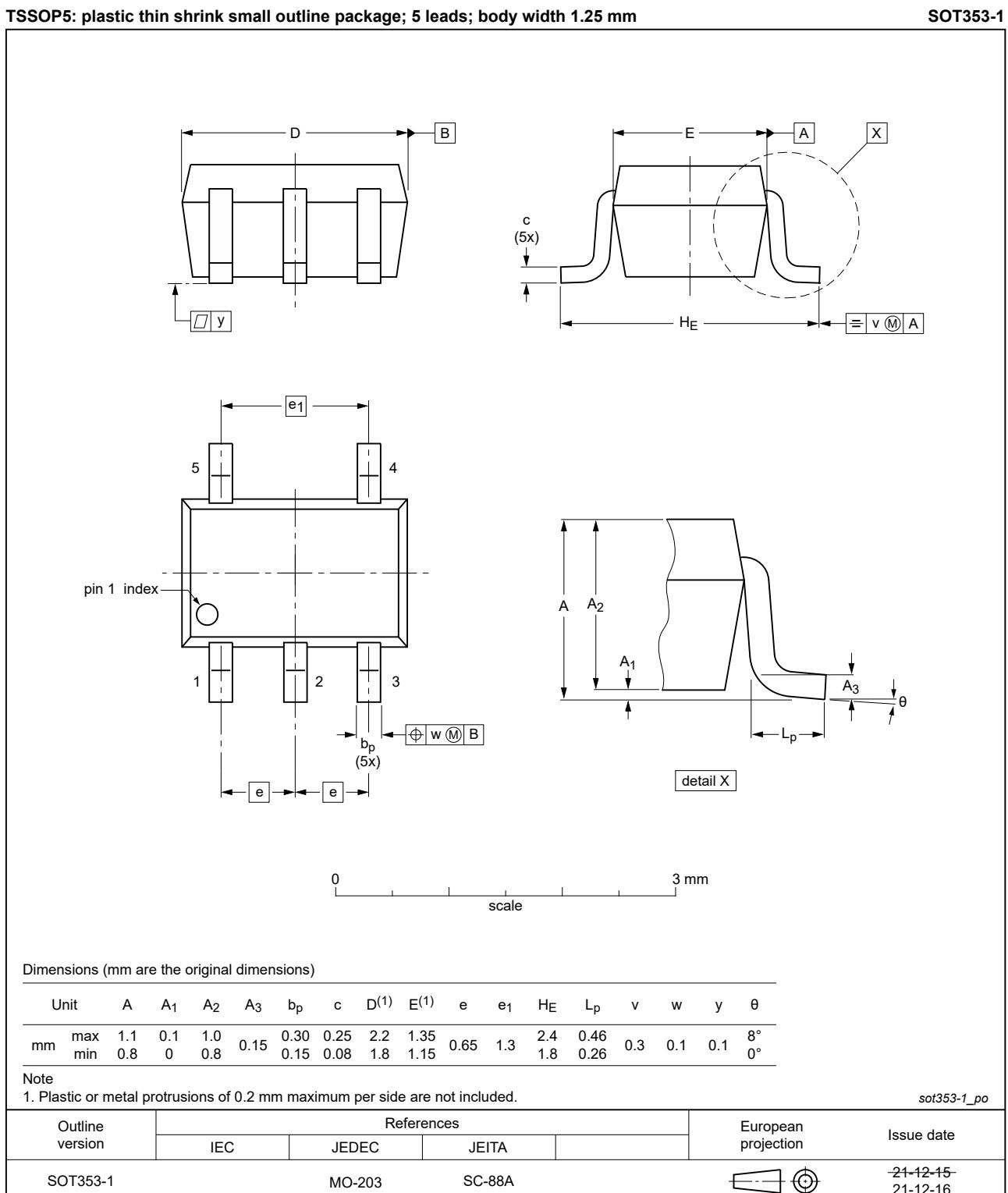


Fig. 25. Package outline SOT353-1 (TSSOP5)

## Plastic surface-mounted package; 5 leads

SOT753

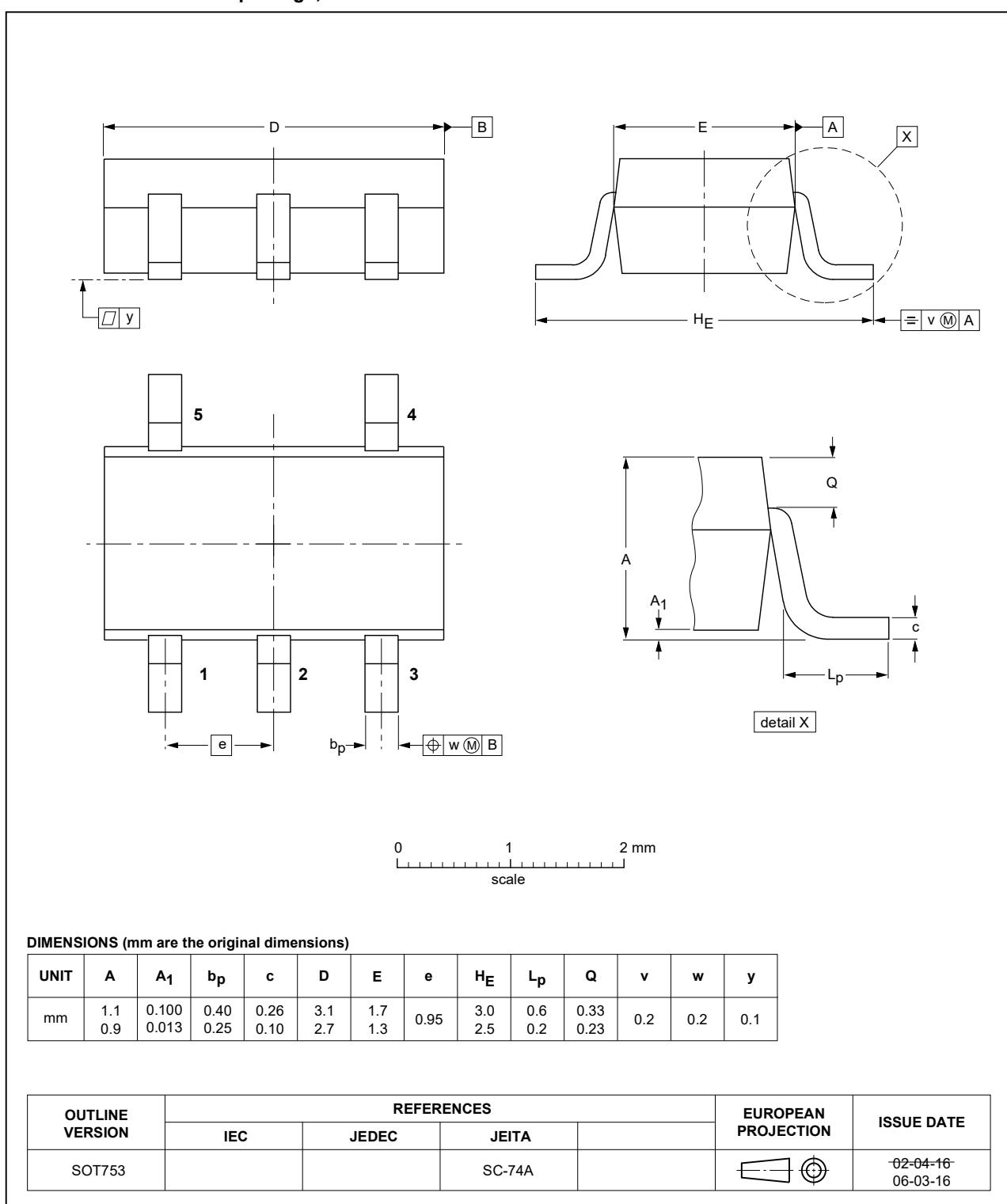
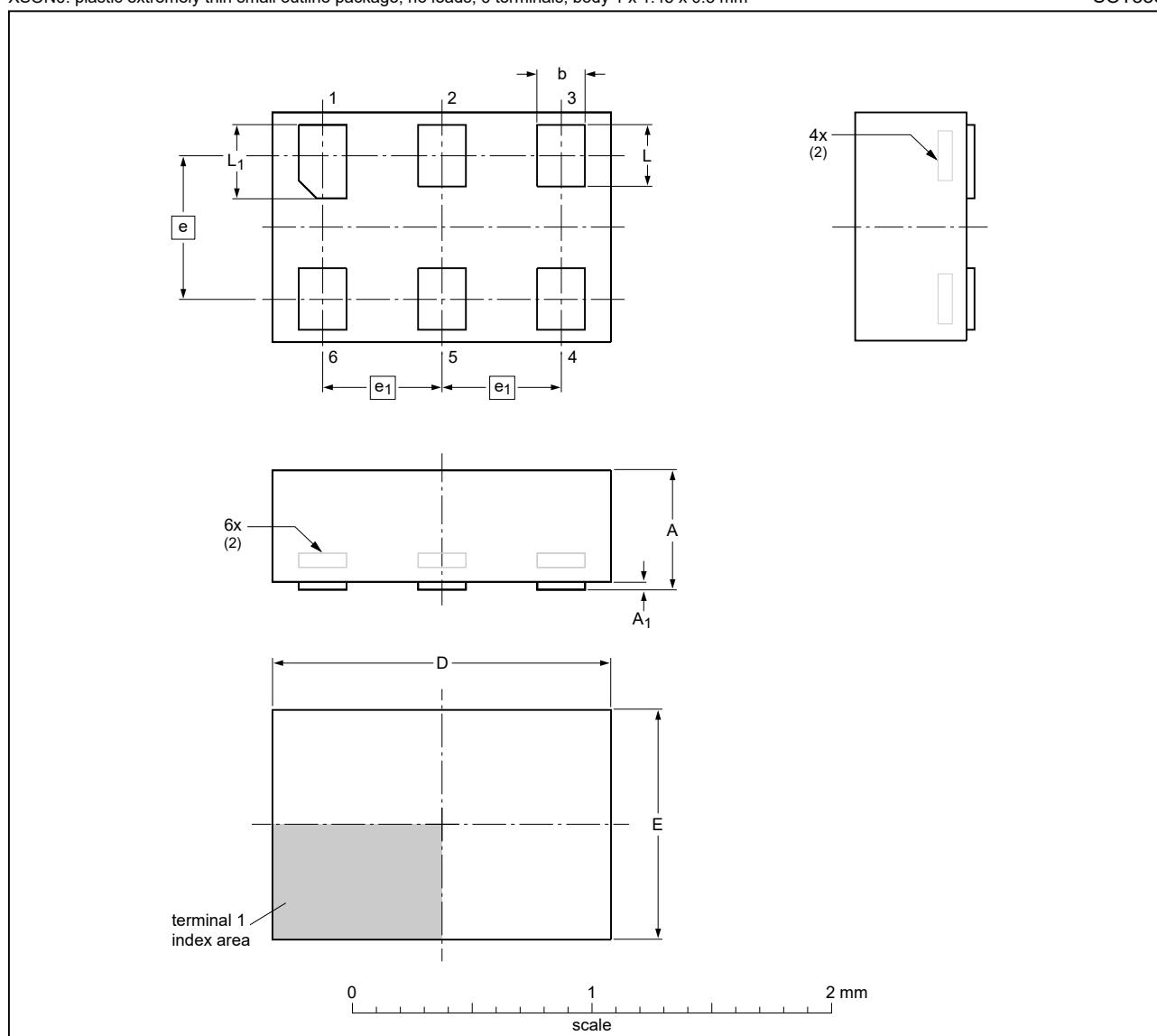


Fig. 26. Package outline SOT753 (SC-74A)

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886



Dimensions (mm are the original dimensions)

| Unit | $A^{(1)}$ | $A_1$ | $b$  | $D$  | $E$  | $e$  | $e_1$ | $L$  | $L_1$ |
|------|-----------|-------|------|------|------|------|-------|------|-------|
| mm   | max       | 0.5   | 0.04 | 0.25 | 1.50 | 1.05 |       | 0.35 | 0.40  |
| mm   | nom       |       |      | 0.20 | 1.45 | 1.00 | 0.6   | 0.30 | 0.35  |
| mm   | min       |       |      | 0.17 | 1.40 | 0.95 |       | 0.27 | 0.32  |

## Notes

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

sot886\_po

| Outline version | References |       |       | European projection | Issue date           |
|-----------------|------------|-------|-------|---------------------|----------------------|
|                 | IEC        | JEDEC | JEITA |                     |                      |
| SOT886          | MO-252     |       |       |                     | 04-07-22<br>12-01-05 |

Fig. 27. Package outline SOT886 (XSON6)

XSON6: extremely thin small outline package; no leads;  
6 terminals; body 0.9 x 1.0 x 0.35 mm

SOT1115

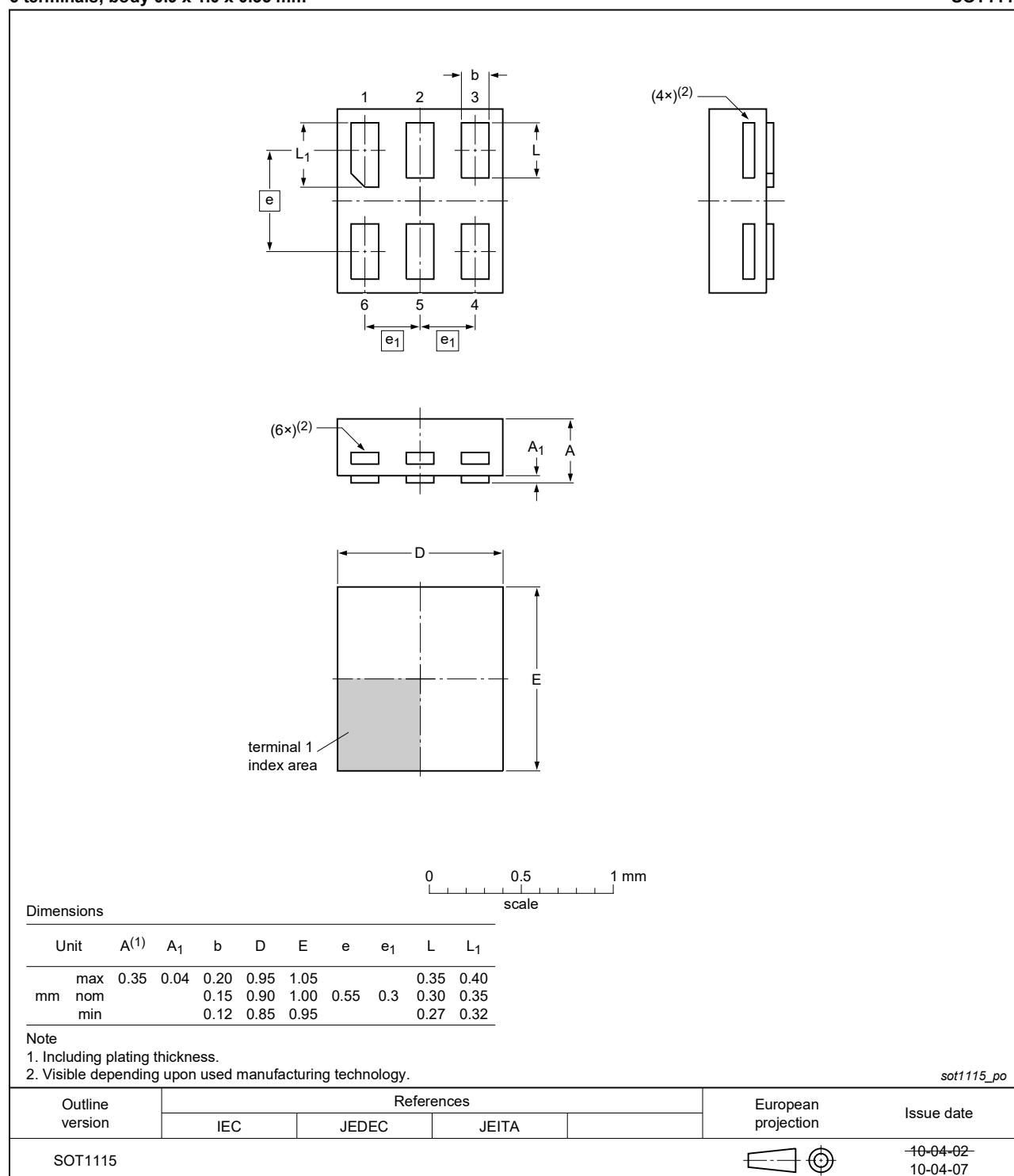


Fig. 28. Package outline SOT1115 (XSON6)

XSON6: extremely thin small outline package; no leads;  
6 terminals; body  $1.0 \times 1.0 \times 0.35$  mm

SOT1202

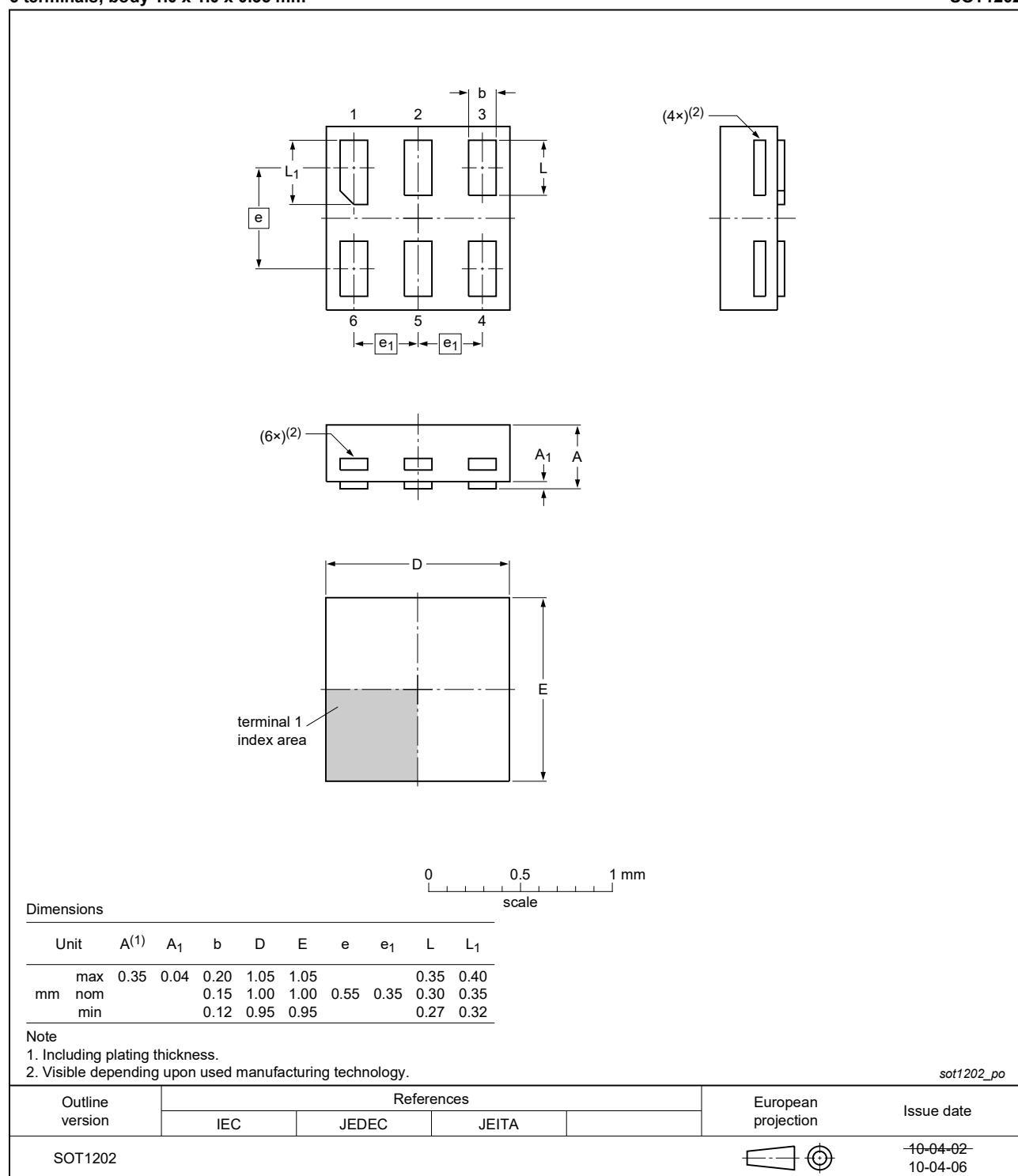


Fig. 29. Package outline SOT1202 (XSON6)

X2SON5: plastic thermal enhanced extremely thin small outline package; no leads;  
5 terminals; body 0.8 x 0.8 x 0.35 mm

SOT1226

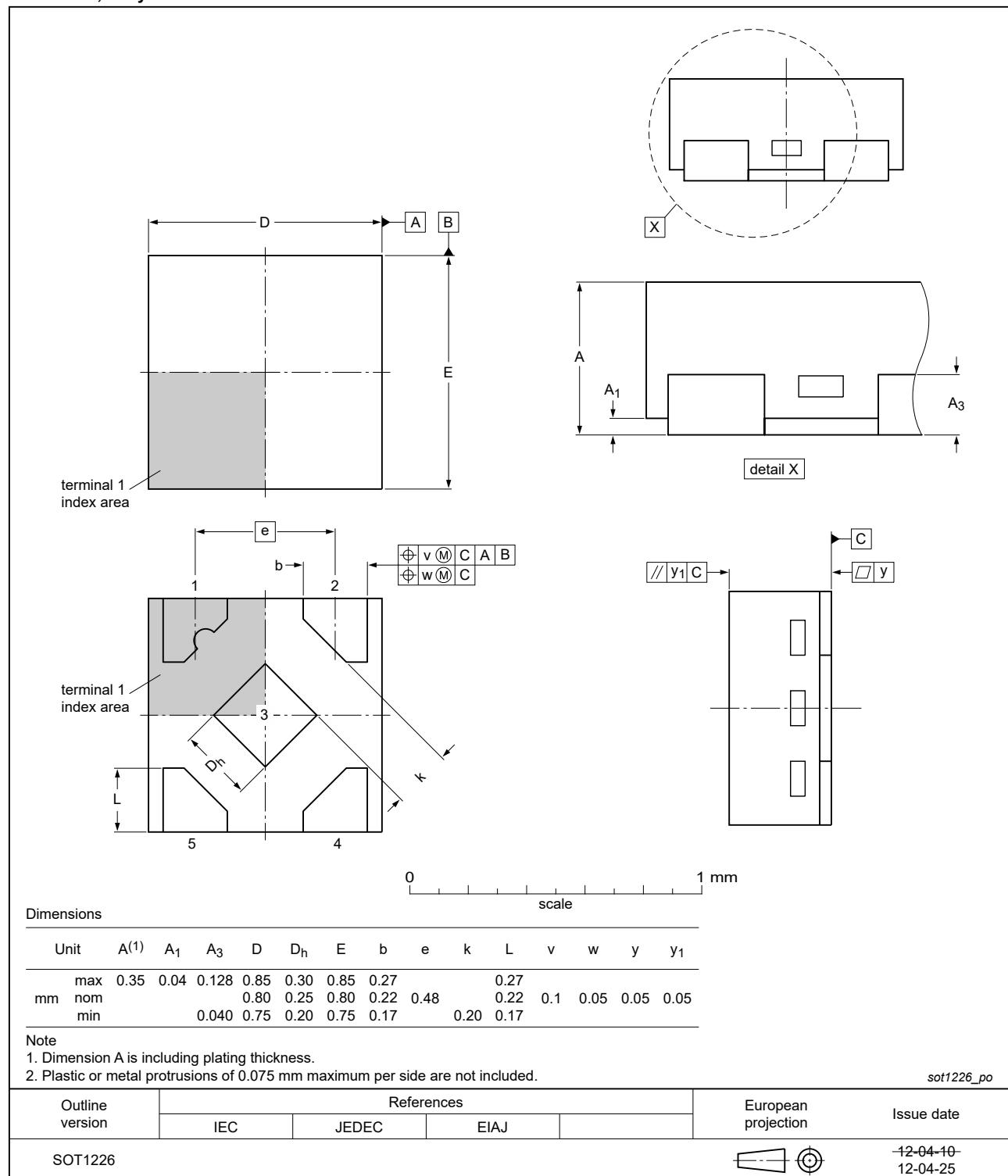


Fig. 30. Package outline SOT1226 (X2SON5)

## 13. Abbreviations

**Table 13. Abbreviations**

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

## 14. Revision history

**Table 14. Revision history**

| Document ID    | Release date   | Data sheet status  | Change notice | Supersedes     |
|----------------|--|--------------------|---------------|----------------|
| 74LVC1G384 v.8 | 20220208   | Product data sheet | -             | 74LVC1G384 v.7 |
| Modifications: | <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li><a href="#">Table 5</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> <li><a href="#">Fig. 25</a>: Package outline drawing SOT353-1 (TSSOP5) has changed.</li> <li>Type number 74LVC1G384GF (SOT891/XSON6) removed.</li> </ul> |                    |               |                |
| 74LVC1G384 v.7 | 20161207   | Product data sheet | -             | 74LVC1G384 v.6 |
| Modifications: | <ul style="list-style-type: none"> <li><a href="#">Table 7</a>: The maximum limits for leakage current and supply current have changed.</li> </ul>   |                    |               |                |
| 74LVC1G384 v.6 | 20150903   | Product data sheet | -             | 74LVC1G384 v.5 |
| Modifications: | <ul style="list-style-type: none"> <li>Added type number 74LVC1G384GX (SOT1226)</li> </ul>   |                    |               |                |
| 74LVC1G384 v.5 | 20150115   | Product data sheet | -             | 74LVC1G384 v.4 |
| Modifications: | <ul style="list-style-type: none"> <li>SOT886 (XSON6) package outline drawing modified.</li> </ul>   |                    |               |                |
| 74LVC1G384 v.4 | 20111206   | Product data sheet | -             | 74LVC1G384 v.3 |
| Modifications: | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>   |                    |               |                |
| 74LVC1G384 v.3 | 20101103   | Product data sheet | -             | 74LVC1G384 v.2 |
| 74LVC1G384 v.2 | 20070829   | Product data sheet | -             | 74LVC1G384 v.1 |
| 74LVC1G384 v.1 | 20040226   | Product data sheet | -             | -              |

## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | 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 <https://www.nexperia.com>.

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Date of release: 8 February 2022