# 74LVC1G384

**Bilateral switch**

**Rev. 4 — 6 December 2011**                                    **Product data sheet**

## 1. General description

The 74LVC1G384 provides one single pole, single throw analog switch function. It has two input/output terminals (Y and Z) and an active LOW enable input pin ($\overline{E}$). When pin $\overline{E}$ is HIGH, the analog switch is turned off.

Schmitt trigger action at the enable input 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
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 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
- Enable input accepts voltages up to 5.5 V
- 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 |
| 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 |

**Table 1.** **Ordering information** *…continued*

| Type number | Package | | | |
| --- | --- | --- | --- | --- |
| | Temperature range | Name | Description | Version |
| 74LVC1G384GF | −40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |
| 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 |

# 4. Marking

**Table 2.** **Marking**

| Type number | Marking code[1] |
| --- | --- |
| 74LVC1G384GW | YL |
| 74LVC1G384GV | YL |
| 74LVC1G384GM | YL |
| 74LVC1G384GF | YL |
| 74LVC1G384GN | YL |
| 74LVC1G384GS | YL |

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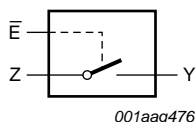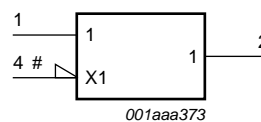
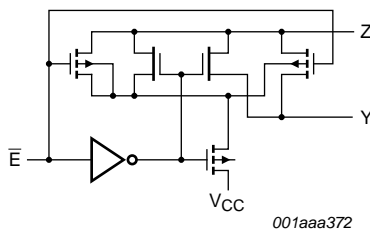# 5. Functional diagram



**Fig 1.** **Logic symbol**



**Fig 2.** **IEC logic symbol**



**Fig 3.** **Logic diagram**

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# 6. Pinning information

## 6.1 Pinning



**Fig 4.** **Pin configuration SOT353-1 and SOT753**



Transparent top view

**Fig 5.** **Pin configuration SOT886**



Transparent top view

**Fig 6.** **Pin configuration SOT891, SOT1115 and SOT1202**
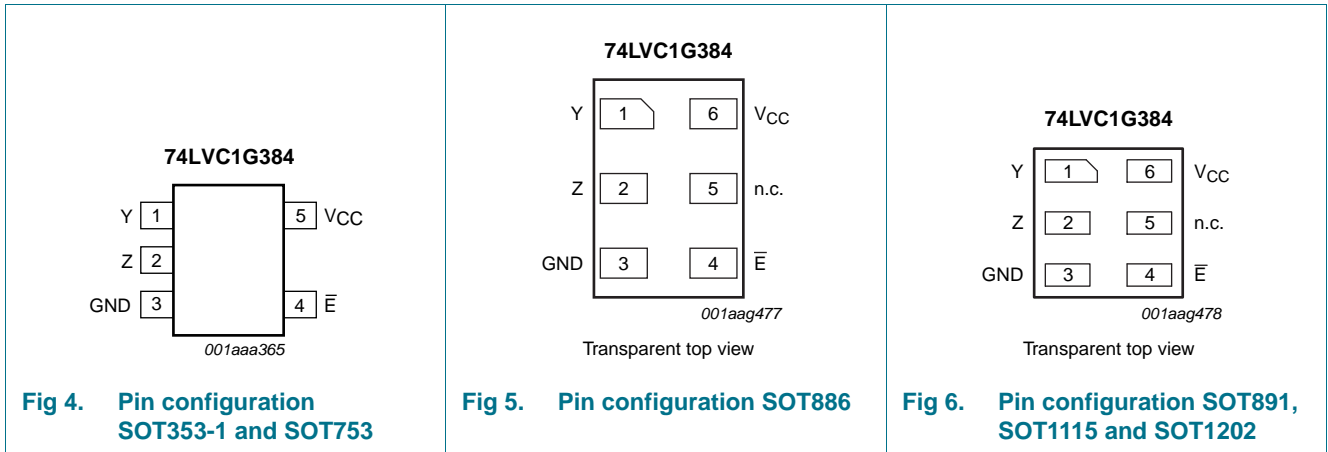
## 6.2 Pin description

**Table 3.** **Pin description**

| Symbol | Pin | | Description |
|---|---|---|---|
| | **SOT353-1, SOT753** | **SOT886, SOT891, SOT1115 and SOT1202** | |
| Y | 1 | 1 | independent input or output |
| Z | 2 | 2 | independent output or input |
| GND | 3 | 3 | ground (0 V) |
| $\overline{E}$ | 4 | 4 | enable input (active LOW) |
| n.c. | - | 5 | not connected |
| $V_{CC}$ | 5 | 6 | supply voltage |

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## 7. Functional description

**Table 4. Function table[1]**

| Input E̅ | Switch |
|---|---|
| L | ON-state |
| H | OFF-state |

[1] H = HIGH voltage level; L = LOW voltage level.

## 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 | $V_I < −0.5$ V or $V_I > V_{CC} + 0.5$ V | | −50 | - | mA |
| $I_{SK}$ | switch clamping current | $V_I < −0.5$ V or $V_I > V_{CC} + 0.5$ V | | - | ±50 | mA |
| $V_{SW}$ | switch voltage | enable and disable mode | [2] | −0.5 | $V_{CC} + 0.5$ | V |
| $I_{SW}$ | switch current | $V_{SW} > −0.5$ V or $V_{SW} < V_{CC} + 0.5$ V | | - | ±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 | $T_{amb} = −40$ ° C to +125 °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 TSSOP5 and SC-74A packages: above 87.5 °C the value of $P_{tot}$ derates linearly with 4.0 mW/K.
For XSON6 package: above 118 °C the value of $P_{tot}$ derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

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

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## 10. Static characteristics

**Table 7. Static characteristics**

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

| Symbol | Parameter | Conditions | | −40 °C to +85 °C | | | −40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[1] | Max | Min | Max | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | | $0.65V_{CC}$ | - | - | $0.65\ V_{CC}$ | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 1.7 | - | - | 1.7 | - | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | | 2.0 | - | - | 2.0 | - | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | $0.7V_{CC}$ | - | - | $0.7V_{CC}$ | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 1.65 V to 1.95 V | | - | - | $0.35V_{CC}$ | - | $0.35V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | - | - | 0.7 | - | 0.7 | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | | - | - | 0.8 | - | 0.8 | V |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | - | - | $0.3V_{CC}$ | - | $0.3V_{CC}$ | V |
| $I_I$ | input leakage current | pin $\overline{E}$; $V_I$ = 5.5 V or GND; $V_{CC}$ = 0 V to 5.5 V | [2] | - | ±0.1 | ±5 | - | 100 | μA |
| $I_{S(OFF)}$ | OFF-state leakage current | $V_{CC}$ = 5.5 V; see Figure 7 | [2] | - | ±0.1 | ±5 | - | 200 | μA |
| $I_{S(ON)}$ | ON-state leakage current | $V_{CC}$ = 5.5 V; see Figure 8 | [2] | - | ±0.1 | ±5 | - | 200 | μA |
| $I_{CC}$ | supply current | $V_I$ = 5.5 V or GND; $V_{SW}$ = GND or $V_{CC}$; $V_{CC}$ = 1.65 V to 5.5 V | [2] | - | 0.1 | 10 | - | 200 | μA |
| $\Delta I_{CC}$ | additional supply current | pin $\overline{E}$; $V_I = V_{CC} - 0.6$ V; $V_{SW}$ = GND or $V_{CC}$; $V_{CC}$ = 5.5 V | [2] | - | 5 | 500 | - | 5000 | μA |
| $C_I$ | input capacitance | | | - | 2.0 | - | - | - | pF |
| $C_{S(OFF)}$ | OFF-state capacitance | | | - | 5.0 | - | - | - | pF |
| $C_{S(ON)}$ | ON-state capacitance | | | - | 9.5 | - | - | - | pF |

[1] All typical values are measured at $T_{amb}$ = 25 °C.

[2] These typical values are measured at $V_{CC}$ = 3.3 V.

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## 10.1 Test circuits



$V_I = V_{CC}$ or GND and $V_O$ = 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[1] | Max | Min | Max | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I$ = GND to $V_{CC}$; see Figure 9 | | | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 34.0 | 130 | - | 195 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 12.0 | 30 | - | 45 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 10.4 | 25 | - | 38 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 7.8 | 20 | - | 30 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 6.2 | 15 | - | 23 | Ω |
| $R_{ON(rail)}$ | ON resistance (rail) | $V_I$ = GND; see Figure 9 | | | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 8.2 | 18 | - | 27 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 7.1 | 16 | - | 24 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 6.9 | 14 | - | 21 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 6.5 | 12 | - | 18 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 5.8 | 10 | - | 15 | Ω |
| | | $V_I$ = $V_{CC}$; see Figure 9 | | | | - | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 10.4 | 30 | - | 45 | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 7.6 | 20 | - | 30 | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 7.0 | 18 | - | 27 | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 6.1 | 15 | - | 23 | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 4.9 | 10 | - | 15 | Ω |

**Table 8.    ON resistance** …*continued*

*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[1] | Max | Min | Max | |
| $R_{ON(flat)}$ | ON resistance (flatness) | $V_I$ = GND to $V_{CC}$ [2] | | | | | | |
| | | $I_{SW}$ = 4 mA; $V_{CC}$ = 1.65 V to 1.95 V | - | 26.0 | - | - | - | Ω |
| | | $I_{SW}$ = 8 mA; $V_{CC}$ = 2.3 V to 2.7 V | - | 5.0 | - | - | - | Ω |
| | | $I_{SW}$ = 12 mA; $V_{CC}$ = 2.7 V | - | 3.5 | - | - | - | Ω |
| | | $I_{SW}$ = 24 mA; $V_{CC}$ = 3 V to 3.6 V | - | 2.0 | - | - | - | Ω |
| | | $I_{SW}$ = 32 mA; $V_{CC}$ = 4.5 V to 5.5 V | - | 1.5 | - | - | - | Ω |

[1]    Typical values are measured at $T_{amb}$ = 25 °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.

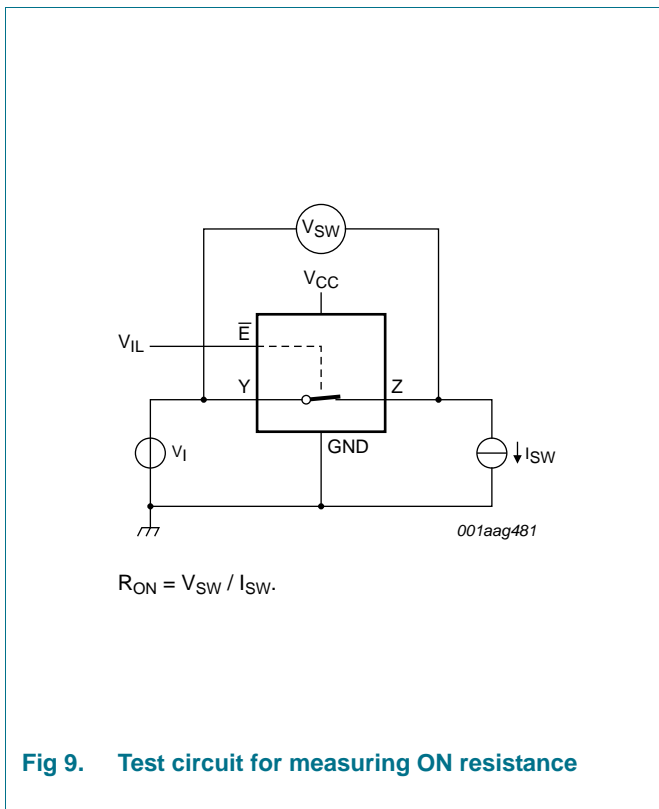## 10.3  ON resistance test circuit and graphs



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

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



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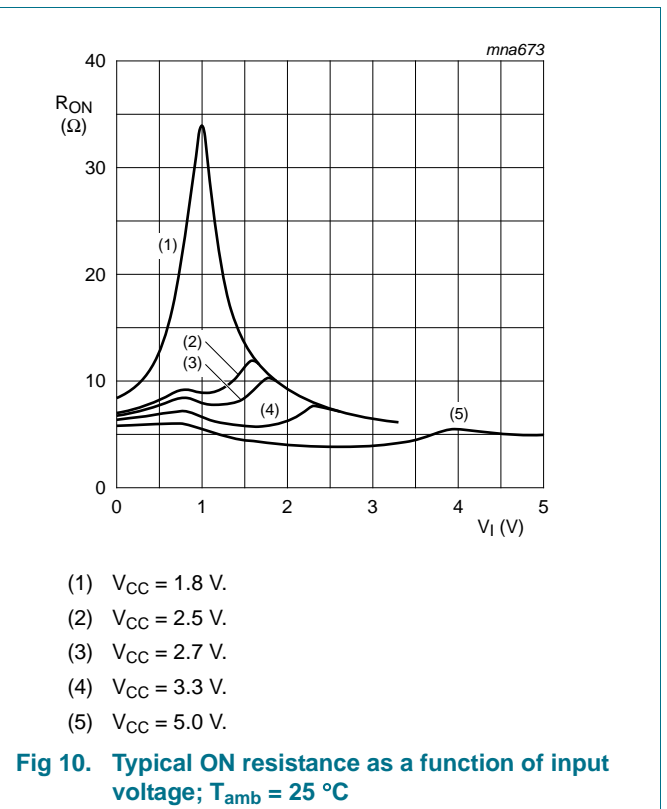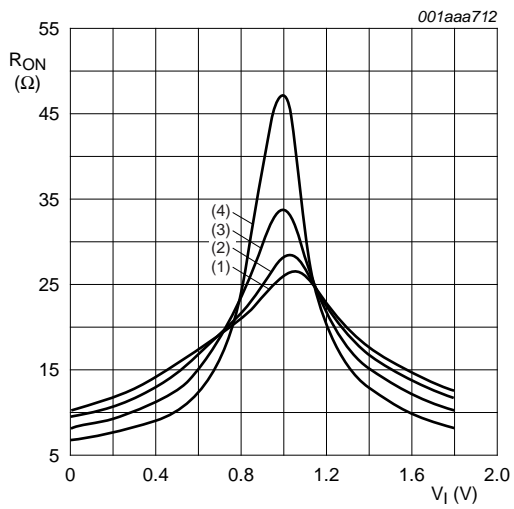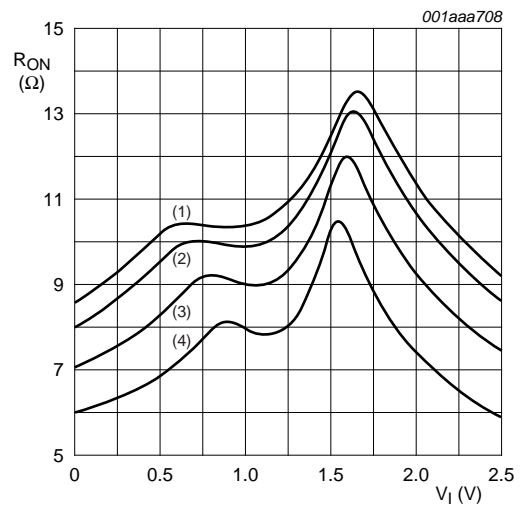(4)   $V_{CC}$ = 3.3 V.
(5)   $V_{CC}$ = 5.0 V.

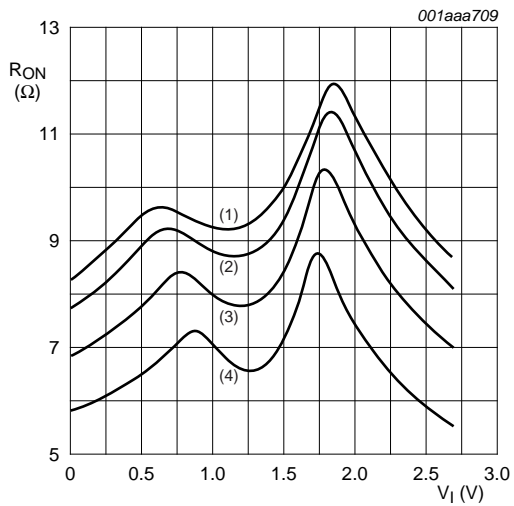**Fig 10.   Typical ON resistance as a function of input voltage; $T_{amb}$ = 25 °C**

(1)  $T_{amb}$ = 125 °C.

(2)  $T_{amb}$ = 85 °C.

(3)  $T_{amb}$ = 25 °C.

(4)  $T_{amb}$ = −40 °C.

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



(1)  $T_{amb}$ = 125 °C.

(2)  $T_{amb}$ = 85 °C.

(3)  $T_{amb}$ = 25 °C.

(4)  $T_{amb}$ = −40 °C.

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



(1)  $T_{amb}$ = 125 °C.

(2)  $T_{amb}$ = 85 °C.

(3)  $T_{amb}$ = 25 °C.

(4)  $T_{amb}$ = −40 °C.

**Fig 13.  ON resistance as a function of input voltage; $V_{CC}$ = 2.7 V**
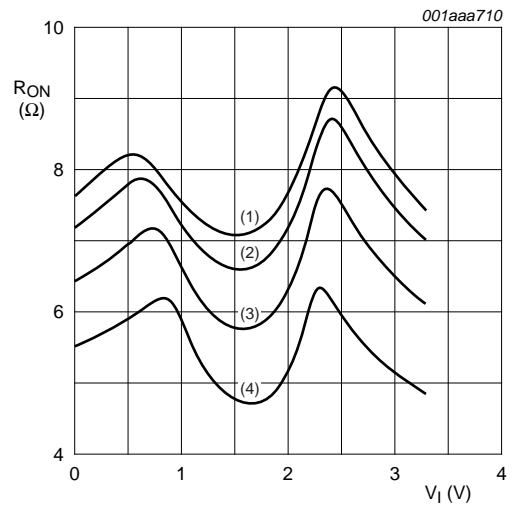


(1)  $T_{amb}$ = 125 °C.

(2)  $T_{amb}$ = 85 °C.

(3)  $T_{amb}$ = 25 °C.

(4)  $T_{amb}$ = −40 °C.

**Fig 14.  ON resistance as a function of input voltage; $V_{CC}$ = 3.3 V**
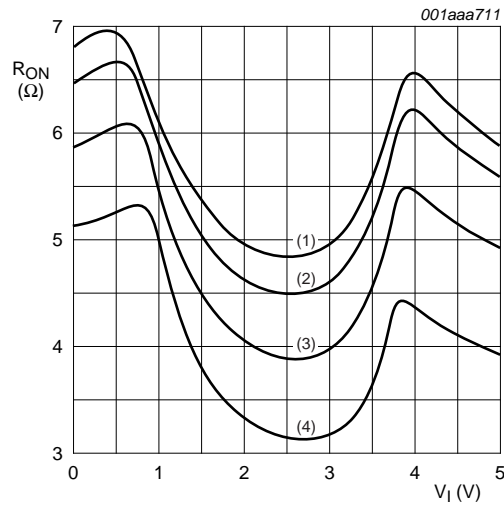
(1)  $T_{amb}$ = 125 °C.

(2)  $T_{amb}$ = 85 °C.

(3)  $T_{amb}$ = 25 °C.

(4)  $T_{amb}$ = −40 °C.

**Fig 15.  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 Figure 18.*

| Symbol | Parameter | Conditions | −40 °C to +85 °C | | | −40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | |
| $t_{pd}$ | propagation delay | Y to Z or Z to Y; see Figure 16 [2][3] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 0.8 | 2.0 | - | 3.0 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 0.4 | 1.2 | - | 2.0 | ns |
| | | $V_{CC}$ = 2.7 V | - | 0.4 | 1.0 | - | 1.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 0.3 | 0.8 | - | 1.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | - | 0.2 | 0.6 | - | 1.0 | ns |
| $t_{en}$ | enable time | $\overline{E}$ to Y or Z; see Figure 17 [4] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 1.0 | 10.0 | 12.0 | 1.0 | 15.5 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.0 | 5.7 | 6.5 | 1.0 | 8.5 | ns |
| | | $V_{CC}$ = 2.7 V | 1.0 | 5.4 | 6.0 | 1.0 | 8.0 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.0 | 4.8 | 5.0 | 1.0 | 6.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | 1.0 | 3.3 | 4.2 | 1.0 | 5.5 | ns |

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**Table 9.** **Dynamic characteristics** *…continued*

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Figure 18.*

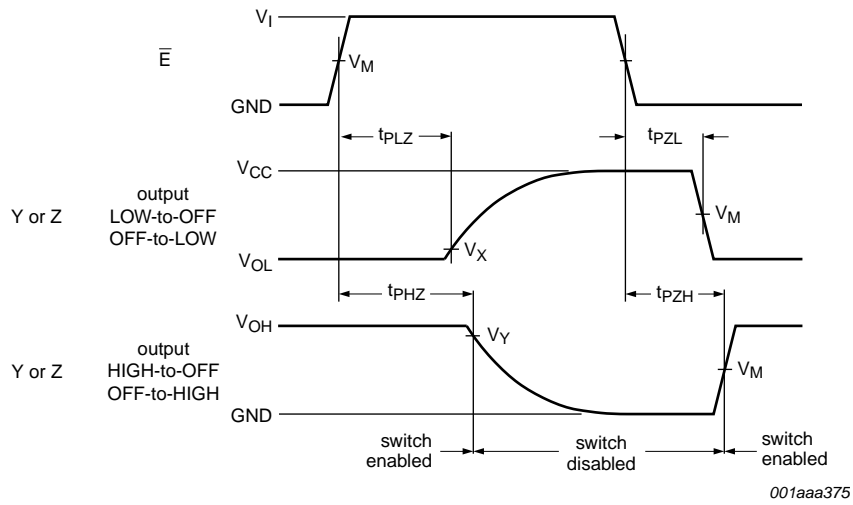| Symbol | Parameter | Conditions | | –40 °C to +85 °C | | | –40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[1] | Max | Min | Max | |
| $t_{dis}$ | disable time | $\overline{E}$ to Y or Z; see Figure 17 | [5] | | | | | | |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | 1.0 | 7.4 | 10.0 | 1.0 | 13.0 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 1.0 | 4.1 | 6.9 | 1.0 | 9.0 | ns |
| | | $V_{CC}$ = 2.7 V | | 1.0 | 4.9 | 7.5 | 1.0 | 9.5 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | | 1.0 | 5.4 | 6.5 | 1.0 | 8.5 | ns |
| | | $V_{CC}$ = 4.5 V to 5.5 V | | 1.0 | 3.6 | 5.0 | 1.0 | 6.5 | ns |
| $C_{PD}$ | power dissipation capacitance | $C_L$ = 50 pF; $f_i$ = 10 MHz; $V_I$ = GND to $V_{CC}$ | [6] | | | | | | |
| | | $V_{CC}$ = 2.5 V | | - | 13.7 | - | - | - | pF |
| | | $V_{CC}$ = 3.3 V | | - | 15.2 | - | - | - | pF |
| | | $V_{CC}$ = 5.0 V | | - | 18.3 | - | - | - | pF |

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

[2]  $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$.

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

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

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

[6]  $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in μW).

$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma\{(C_L + C_{S(ON)}) \times V_{CC}^2 \times f_o\}$ where:

$f_i$ = input frequency in MHz;

$f_o$ = output frequency in MHz;

$C_L$ = output load capacitance in pF;

$C_{S(ON)}$ = maximum ON-state switch capacitance in pF;

$V_{CC}$ = supply voltage in V;

N = number of inputs switching;

$\Sigma\{(C_L + C_{S(ON)}) \times V_{CC}^2 \times f_o\}$ = sum of the outputs.

## 11.1  Waveforms and test circuit
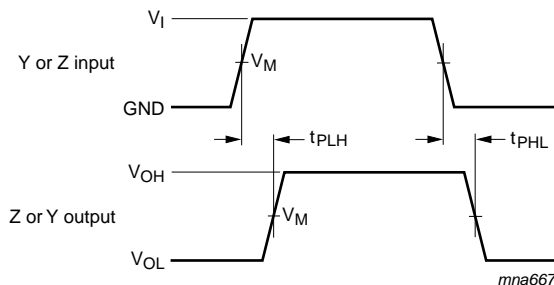


Measurement points are given in Table 10.

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

**Fig 16.  Input (Y or Z) to output (Z or Y) propagation delays**

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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.  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 | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 2.3 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 2.7 V | 1.5 V | 1.5 V | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |
| 4.5 V to 5.5 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |

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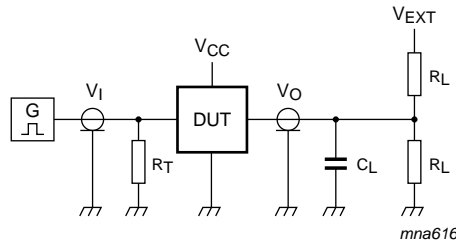
Test data is given in Table 11.

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 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$V_{CC}$ |
| 2.3 V to 2.7 V | $V_{CC}$ | $\leq$ 2.0 ns | 30 pF | 500 $\Omega$ | open | GND | 2$V_{CC}$ |
| 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$V_{CC}$ |

## 11.2 Additional dynamic characteristics

**Table 12. Additional dynamic characteristics**
*At recommended operating conditions; typical values measured at $T_{amb}$ = 25 °C.*

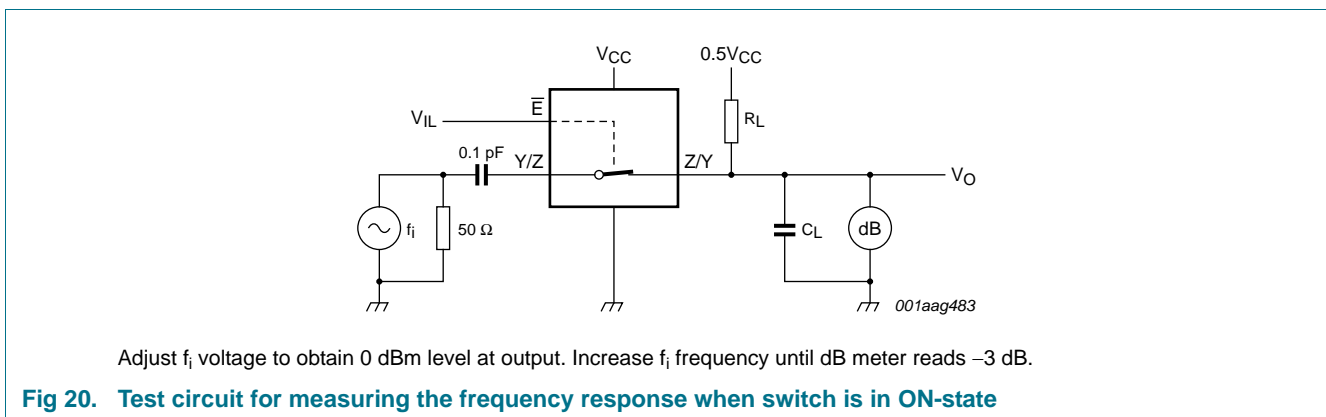| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| THD | total harmonic distortion | $R_L$ = 10 k$\Omega$; $C_L$ = 50 pF; $f_i$ = 1 kHz; see Figure 19 | | | | |
| | | $V_{CC}$ = 1.65 V | - | 0.032 | - | % |
| | | $V_{CC}$ = 2.3 V | - | 0.008 | - | % |
| | | $V_{CC}$ = 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 Figure 19 | | | | |
| | | $V_{CC}$ = 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 | - | % |

**Table 12.   Additional dynamic characteristics** *…continued*

*At recommended operating conditions; typical values measured at $T_{amb} = 25\ ℃$.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $f_{(-3dB)}$ | −3 dB frequency response | $R_L = 600\ \Omega$; $C_L = 50$ pF; see Figure 20 | | | | |
| | | $V_{CC} = 1.65$ V | - | 135 | - | MHz |
| | | $V_{CC} = 2.3$ V | - | 145 | - | MHz |
| | | $V_{CC} = 3.0$ V | - | 150 | - | MHz |
| | | $V_{CC} = 4.5$ V | - | 155 | - | MHz |
| | | $R_L = 50\ \Omega$; $C_L = 5$ pF; see Figure 20 | | | | |
| | | $V_{CC} = 1.65$ V | - | > 500 | - | MHz |
| | | $V_{CC} = 2.3$ V | - | > 500 | - | MHz |
| | | $V_{CC} = 3.0$ V | - | > 500 | - | MHz |
| | | $V_{CC} = 4.5$ V | - | > 500 | - | MHz |
| | | $R_L = 50\ \Omega$; $C_L = 10$ pF; see Figure 20 | | | | |
| | | $V_{CC} = 1.65$ V | - | 200 | - | MHz |
| | | $V_{CC} = 2.3$ V | - | 350 | - | MHz |
| | | $V_{CC} = 3.0$ V | - | 410 | - | MHz |
| | | $V_{CC} = 4.5$ V | - | 440 | - | MHz |
| $\alpha_{iso}$ | isolation (OFF-state) | $R_L = 600\ \Omega$; $C_L = 50$ pF; $f_i = 1$ MHz; see Figure 21 | | | | |
| | | $V_{CC} = 1.65$ V | - | −46 | - | dB |
| | | $V_{CC} = 2.3$ V | - | −46 | - | dB |
| | | $V_{CC} = 3.0$ V | - | −46 | - | dB |
| | | $V_{CC} = 4.5$ V | - | −46 | - | dB |
| | | $R_L = 50\ \Omega$; $C_L = 5$ pF; $f_i = 1$ MHz; see Figure 21 | | | | |
| | | $V_{CC} = 1.65$ V | - | −37 | - | dB |
| | | $V_{CC} = 2.3$ V | - | −37 | - | dB |
| | | $V_{CC} = 3.0$ V | - | −37 | - | dB |
| | | $V_{CC} = 4.5$ V | - | −37 | - | dB |
| $V_{ct}$ | crosstalk voltage | between digital input and switch; $R_L = 600\ \Omega$; $C_L = 50$ pF; $f_i = 1$ MHz; $t_r = t_f = 2$ ns; see Figure 22 | | | | |
| | | $V_{CC} = 1.65$ V | - | 69 | - | mV |
| | | $V_{CC} = 2.3$ V | - | 87 | - | mV |
| | | $V_{CC} = 3.0$ V | - | 156 | - | mV |
| | | $V_{CC} = 4.5$ V | - | 302 | - | mV |

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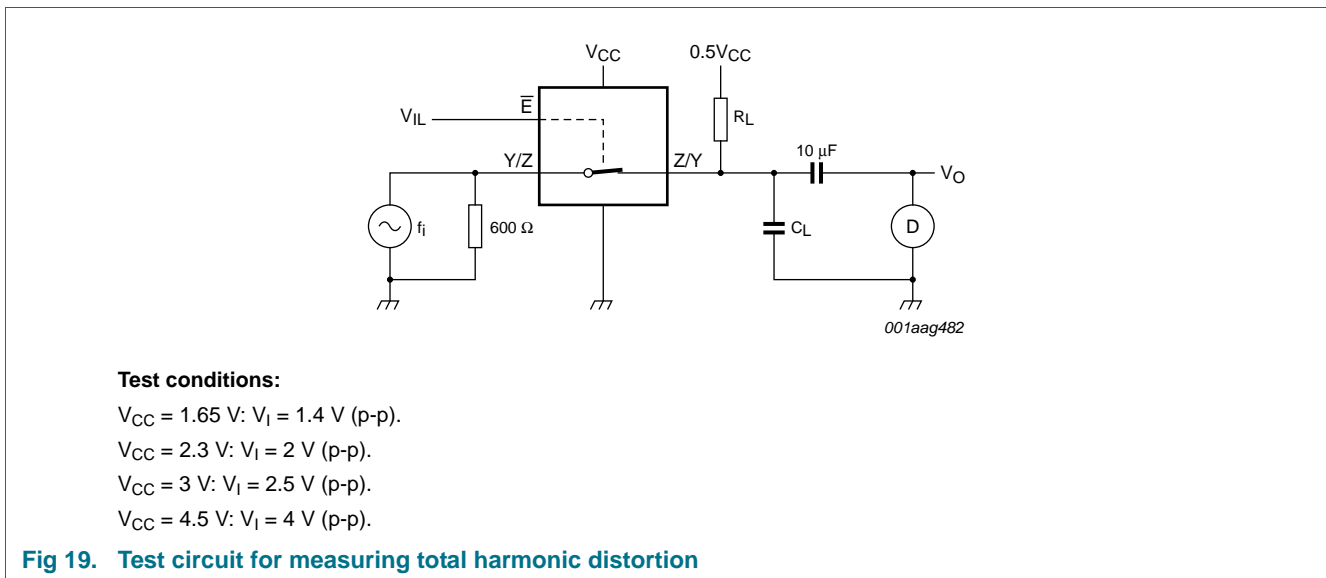**Product data sheet**                    **Rev. 4 — 6 December 2011**                    **13 of 25**

**Table 12.    Additional dynamic characteristics** *…continued*

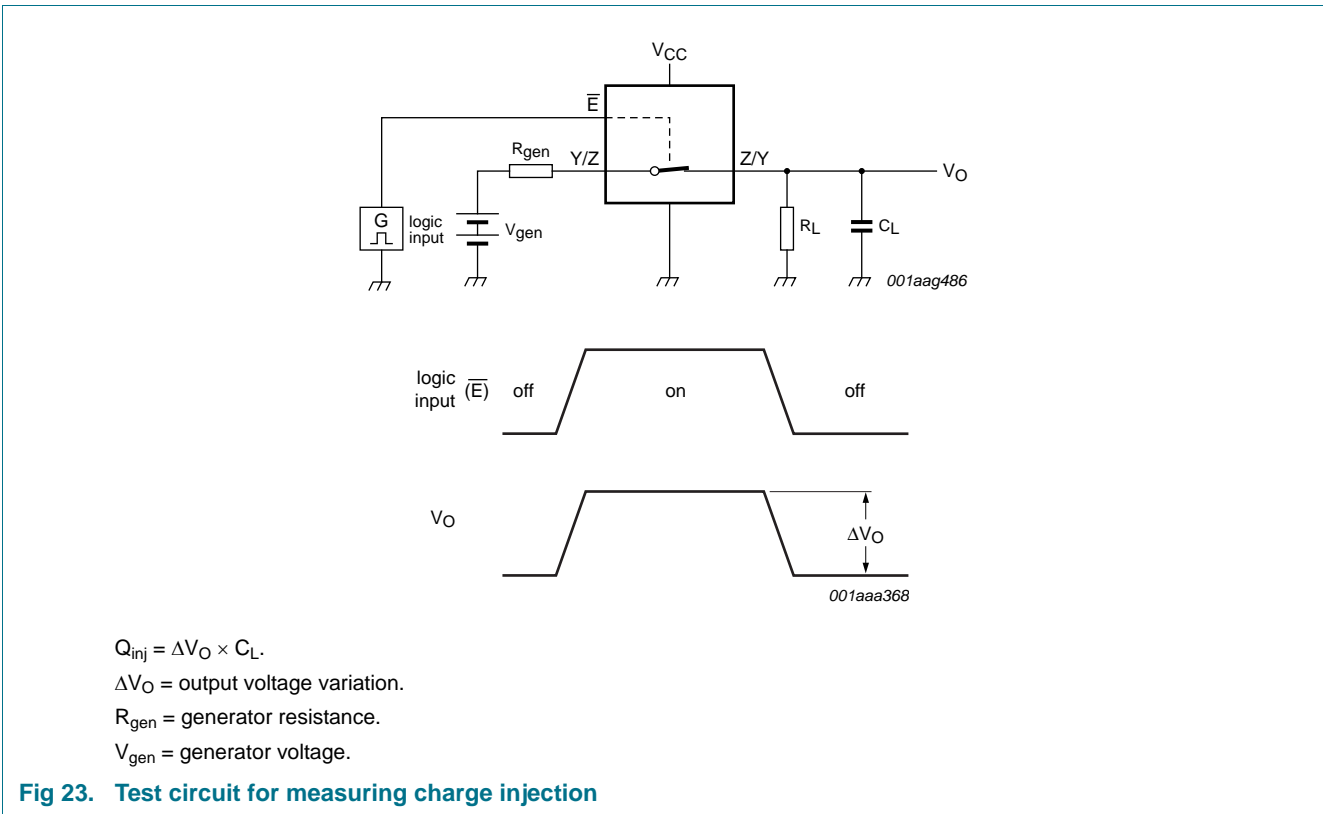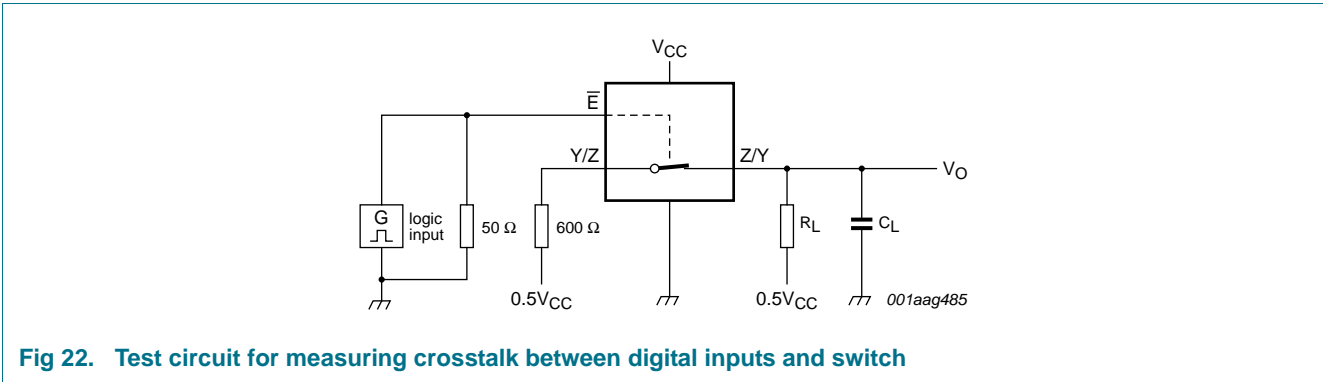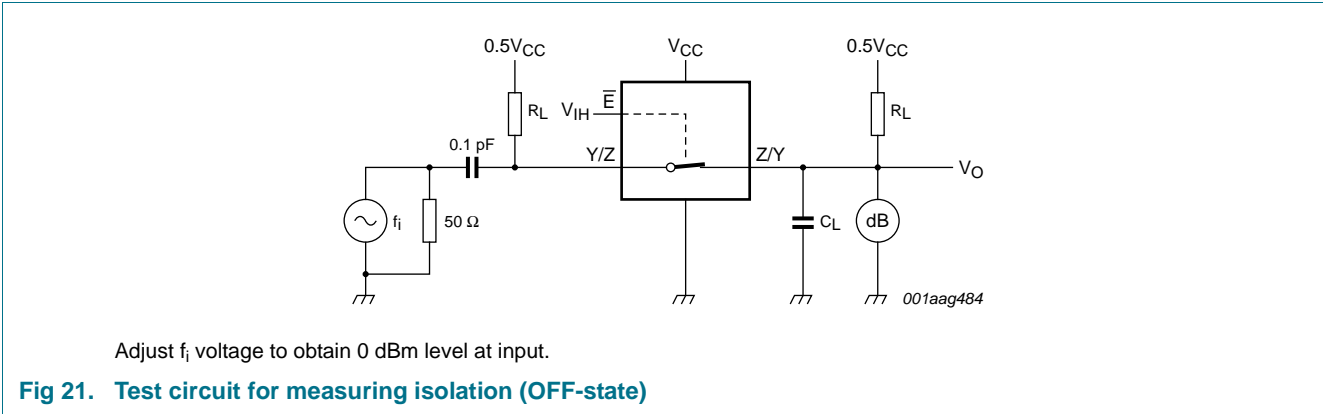*At recommended operating conditions; typical values measured at $T_{amb} = 25$ °C.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------|------------|-----|-----|-----|------|
| $Q_{inj}$ | charge injection | $C_L = 0.1$ nF; $V_{gen} = 0$ V; $R_{gen} = 0$ $\Omega$; $f_i = 1$ MHz; $R_L = 1$ M$\Omega$; see [Section 11](#) | | | | |
| | | $V_{CC} = 1.8$ V | - | 3.3 | - | pC |
| | | $V_{CC} = 2.5$ V | - | 4.1 | - | pC |
| | | $V_{CC} = 3.3$ V | - | 5.0 | - | pC |
| | | $V_{CC} = 4.5$ V | - | 6.4 | - | pC |
| | | $V_{CC} = 5.5$ V | - | 7.5 | - | pC |

## 11.3  Test circuits



**Test conditions:**

$V_{CC} = 1.65$ V: $V_I = 1.4$ V (p-p).

$V_{CC} = 2.3$ V: $V_I = 2$ V (p-p).

$V_{CC} = 3$ V: $V_I = 2.5$ V (p-p).

$V_{CC} = 4.5$ V: $V_I = 4$ V (p-p).

**Fig 19.   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 20.   Test circuit for measuring the frequency response when switch is in ON-state**

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

**Fig 21. Test circuit for measuring isolation (OFF-state)**

**Fig 22. 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 23. Test circuit for measuring charge injection**

## 12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1



**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | A₁ | A₂ | A₃ | bₚ | c | D⁽¹⁾ | E⁽¹⁾ | e | e₁ | Hₑ | L | Lₚ | v | w | y | Z⁽¹⁾ | θ |
|------|--------|-----|-----|------|------|------|------|------|------|-----|------|-------|------|-----|-----|-----|------|-----|
| mm | 1.1 | 0.1 0 | 1.0 0.8 | 0.15 | 0.30 0.15 | 0.25 0.08 | 2.25 1.85 | 1.35 1.15 | 0.65 | 1.3 | 2.25 2.0 | 0.425 | 0.46 0.21 | 0.3 | 0.1 | 0.1 | 0.60 0.15 | 7° 0° |

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|------|------|---|---------------------|------------|
| | IEC | JEDEC | JEITA | | | |
| SOT353-1 | | MO-203 | SC-88A | | | ~~00-09-01~~ 03-02-19 |
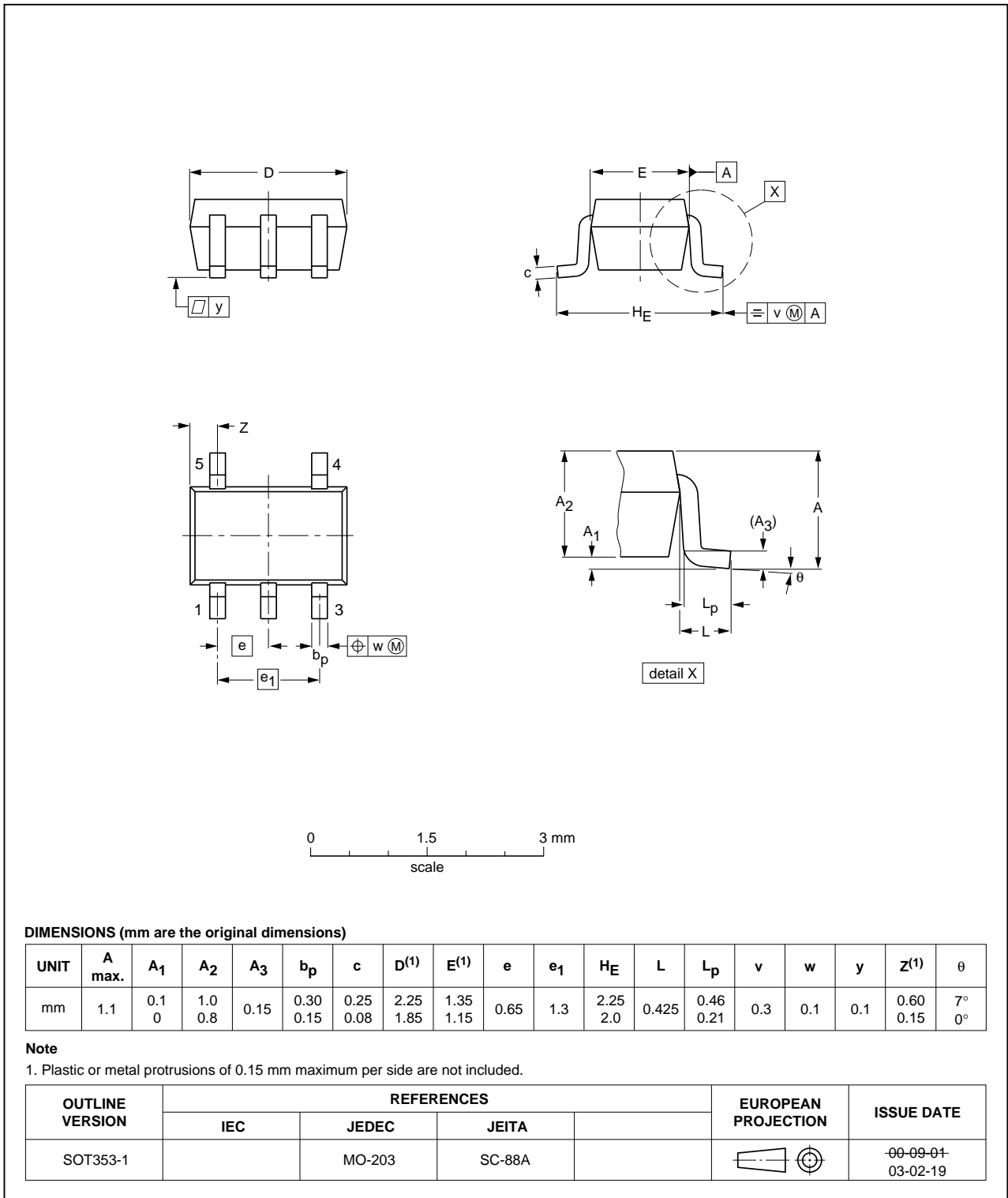
**Fig 24.  Package outline SOT353-1 (TSSOP5)**

**Plastic surface-mounted package; 5 leads**

SOT753



**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | A$_1$ | b$_p$ | c | D | E | e | H$_E$ | L$_p$ | Q | v | w | y |
|------|-----|-------|-------|------|-----|-----|------|-------|-------|------|-----|-----|-----|
| mm | 1.1<br>0.9 | 0.100<br>0.013 | 0.40<br>0.25 | 0.26<br>0.10 | 3.1<br>2.7 | 1.7<br>1.3 | 0.95 | 3.0<br>2.5 | 0.6<br>0.2 | 0.33<br>0.23 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|-------|---|---------------------|------------|
| | IEC | JEDEC | JEITA | | | |
| SOT753 | | | SC-74A | | | ~~02-04-16~~<br>06-03-16 |

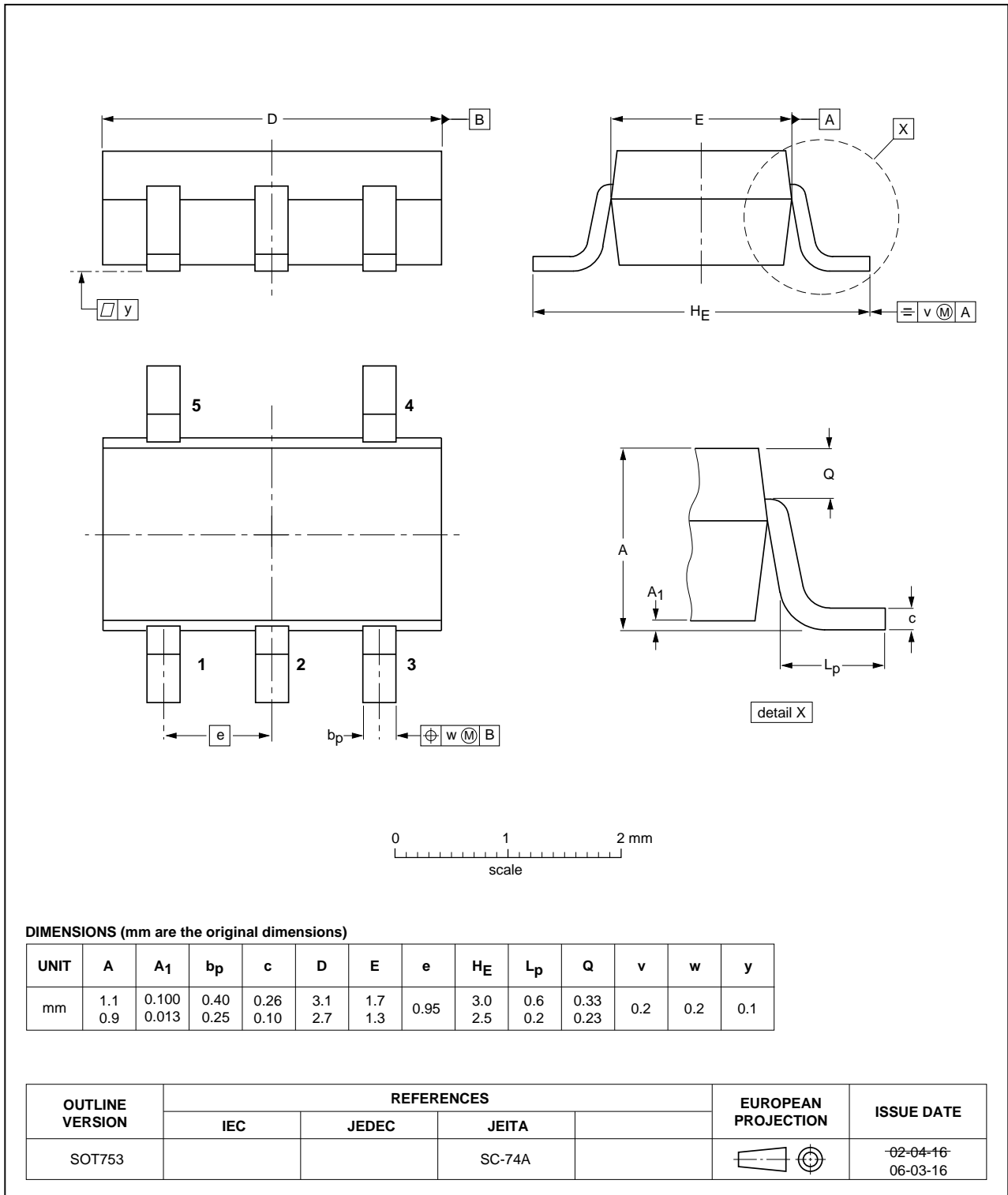**Fig 25.  Package outline SOT753 (SC-74A)**

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm                    SOT886
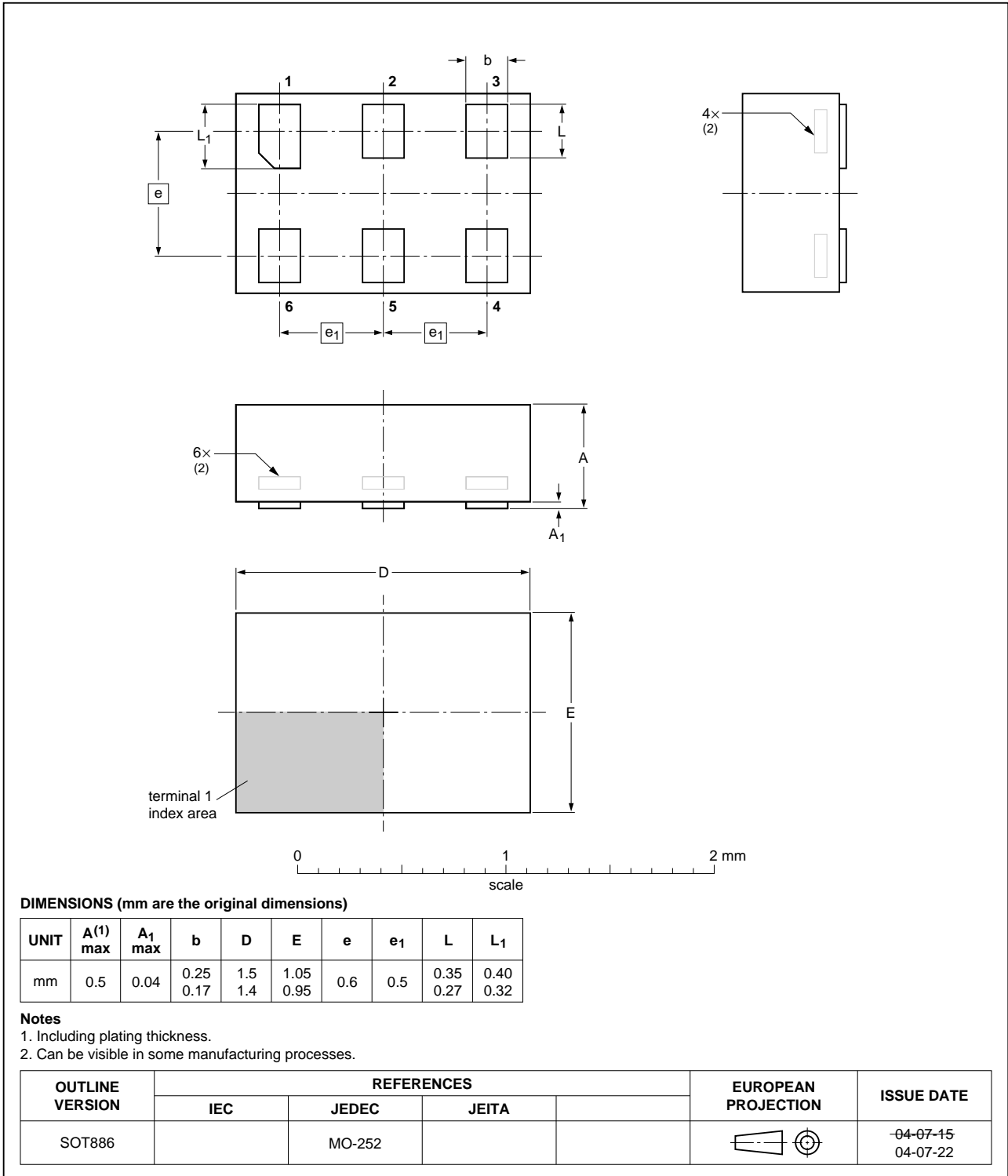


**DIMENSIONS (mm are the original dimensions)**

| UNIT | A(1) max | A₁ max | b | D | E | e | e₁ | L | L₁ |
|------|----------|--------|---|---|---|---|----|---|----|
| mm | 0.5 | 0.04 | 0.25 0.17 | 1.5 1.4 | 1.05 0.95 | 0.6 | 0.5 | 0.35 0.27 | 0.40 0.32 |

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

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--------|--------|---|---------------------|------------|
| | IEC | JEDEC | JEITA | | | |
| SOT886 | | MO-252 | | | | ~~04-07-15~~ 04-07-22 |

**Fig 26.  Package outline SOT886 (XSON6)**

**XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm**          **SOT891**
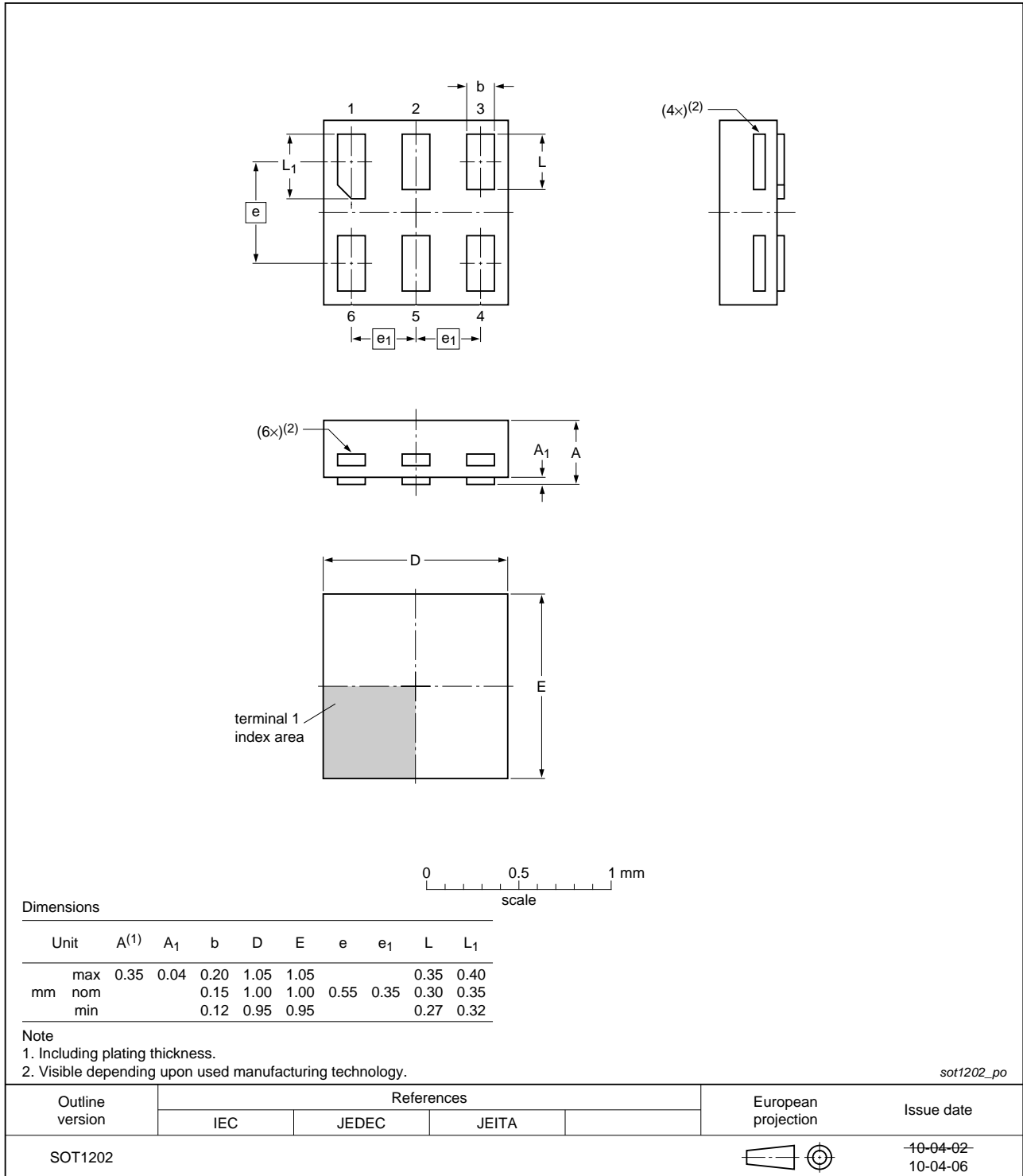


**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max | A$_1$ max | b | D | E | e | e$_1$ | L | L$_1$ |
|------|-------|-----------|---|---|---|---|-------|---|-------|
| mm | 0.5 | 0.04 | 0.20 0.12 | 1.05 0.95 | 1.05 0.95 | 0.55 | 0.35 | 0.35 0.27 | 0.40 0.32 |

**Note**
1. Can be visible in some manufacturing processes.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|--|--|--|---------------------|------------|
| | IEC | JEDEC | JEITA | | | |
| SOT891 | | | | | | ~~05-04-06~~ 07-05-15 |

**Fig 27.   Package outline SOT891 (XSON6)**

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

SOT1115



**Dimensions**

| Unit | | A[1] | A$_1$ | b | D | E | e | e$_1$ | L | L$_1$ |
|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 0.35 | 0.04 | 0.20 | 0.95 | 1.05 | | | 0.35 | 0.40 |
| | nom | | | 0.15 | 0.90 | 1.00 | 0.55 | 0.3 | 0.30 | 0.35 |
| | min | | | 0.12 | 0.85 | 0.95 | | | 0.27 | 0.32 |

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

sot1115_po

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1115 | | | | | | ~~10-04-02~~ 10-04-07 |

**Fig 28.  Package outline SOT1115 (XSON6)**

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

**SOT1202**



Dimensions

| | Unit | A[1] | A$_1$ | b | D | E | e | e$_1$ | L | L$_1$ |
|---|---|---|---|---|---|---|---|---|---|---|
| | max | 0.35 | 0.04 | 0.20 | 1.05 | 1.05 | | | 0.35 | 0.40 |
| mm | nom | | | 0.15 | 1.00 | 1.00 | 0.55 | 0.35 | 0.30 | 0.35 |
| | min | | | 0.12 | 0.95 | 0.95 | | | 0.27 | 0.32 |

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

*sot1202_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1202 | | | | | | ~~10-04-02~~ 10-04-06 |

**Fig 29.   Package outline SOT1202 (XSON6)**

# 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.4 | 20111206 | Product data sheet | - | 74LVC1G384 v.3 |
| Modifications: | • Legal pages updated. | | | |
| 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 | - | - |

# 15. Legal information

## 15.1 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 URL http://www.nxp.com.

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## 17. Contents