

# 74LVC2G38

Dual 2-input NAND gate; open drain

Rev. 13 — 3 July 2017

Product data sheet

## 1 General description

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The 74LVC2G38 provides a 2-input NAND function.

The outputs of the 74LVC2G38 devices are open-drain and can be connected to other open-drain outputs to implement active-LOW, wired-OR or active-HIGH wired-AND functions.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in a mixed 3.3 V and 5 V environment.

This device is fully specified for partial power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

## 2 Features and benefits

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- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant outputs for interfacing with 5 V logic
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM EIA/JESD22-A114F exceeds 2 000 V
  - MM EIA/JESD22-A115-A exceeds 200 V
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- CMOS low power consumption
- Open-drain outputs
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Multiple package options
- Specified from  $-40$  °C to  $+85$  °C and  $-40$  °C to  $+125$  °C

### 3 Ordering information

Table 1. Ordering information

| Type number | Package           |        |                                                                                                                 |          |
|-------------|-------------------|--------|-----------------------------------------------------------------------------------------------------------------|----------|
|             | Temperature range | Name   | Description                                                                                                     | Version  |
| 74LVC2G38DP | -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 |
| 74LVC2G38DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                                      | SOT765-1 |
| 74LVC2G38GT | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm                     | SOT833-1 |
| 74LVC2G38GF | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1 x 0.5 mm                             | SOT1089  |
| 74LVC2G38GM | -40 °C to +125 °C | XQFN8  | plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 x 1.6 x 0.5 mm                       | SOT902-2 |
| 74LVC2G38GN | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm                           | SOT1116  |
| 74LVC2G38GS | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm                          | SOT1203  |
| 74LVC2G38GX | -40 °C to +125 °C | X2SON8 | plastic thermal enhanced extremely thin small outline package; no leads; 8 terminals; body 1.35 x 0.8 x 0.35 mm | SOT1233  |

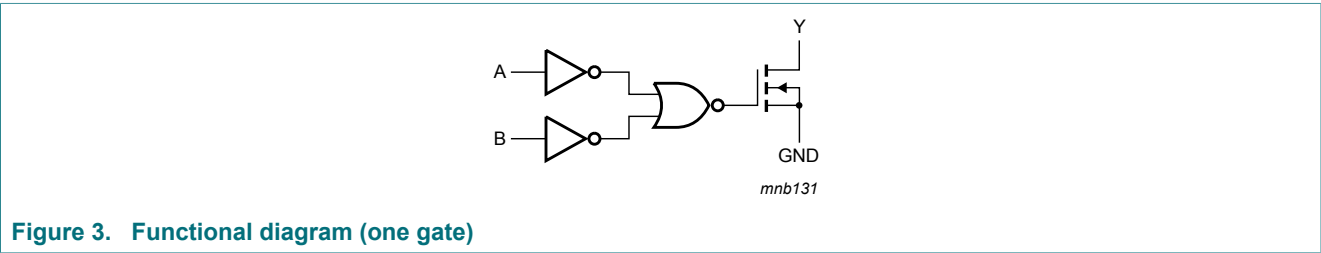
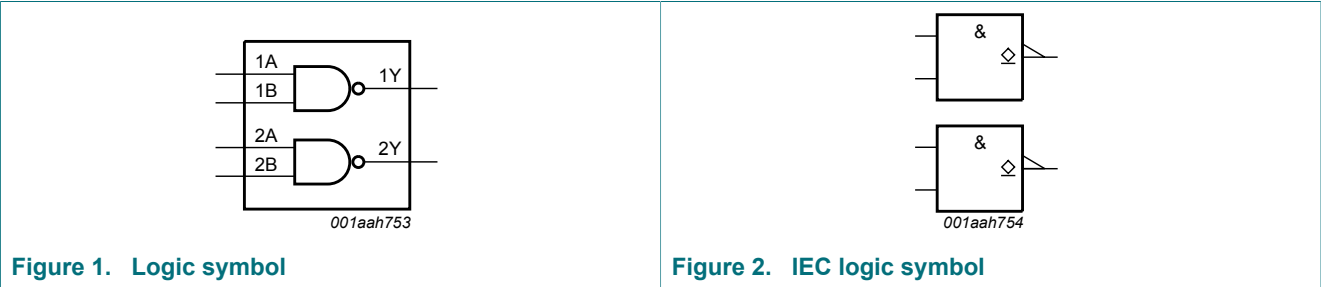
### 4 Marking

Table 2. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74LVC2G38DP | Y38                         |
| 74LVC2G38DC | Y38                         |
| 74LVC2G38GT | Y38                         |
| 74LVC2G38GF | YB                          |
| 74LVC2G38GM | Y38                         |
| 74LVC2G38GN | YB                          |
| 74LVC2G38GS | YB                          |
| 74LVC2G38GX | YB                          |

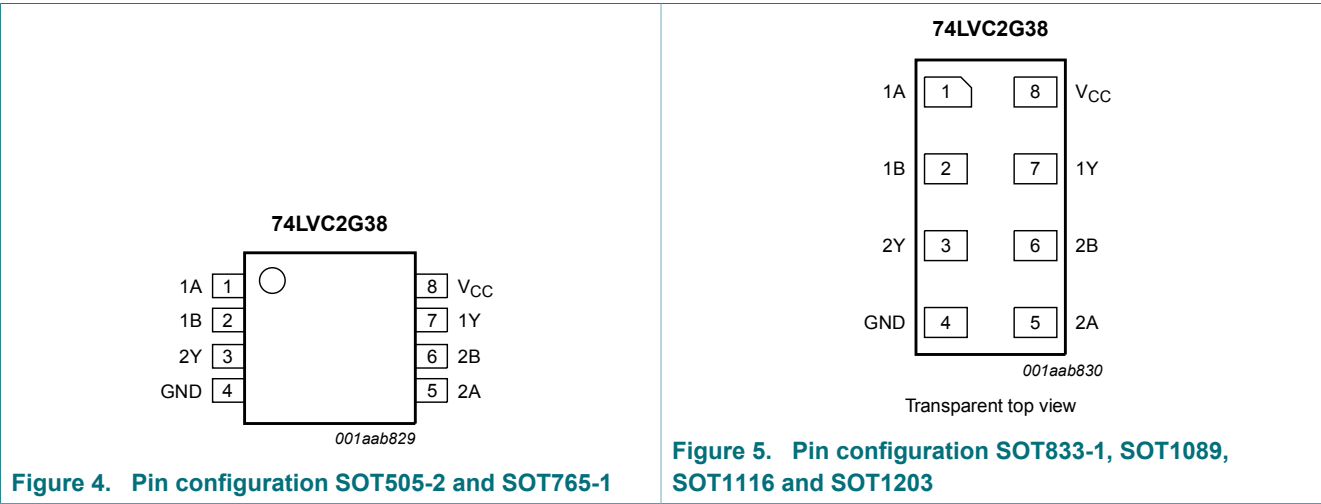
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

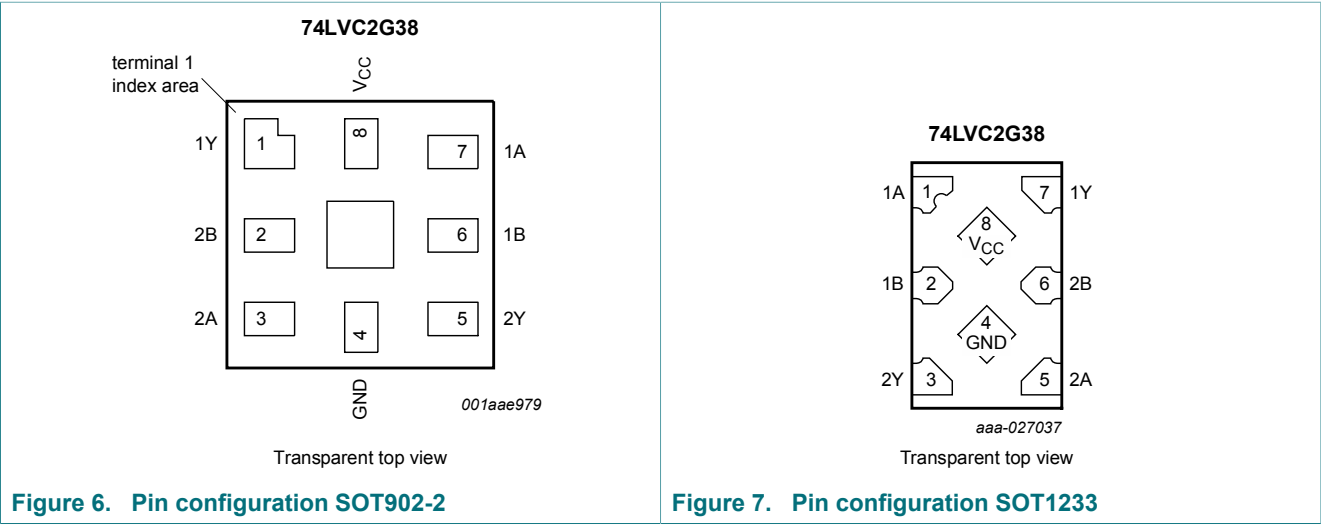
5 Functional diagram



6 Pinning information

6.1 Pinning





6.2 Pin description

Table 3. Pin description

| Symbol          | Pin                                                                 |          | Description    |
|-----------------|---------------------------------------------------------------------|----------|----------------|
|                 | SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT1116, SOT1203 and SOT1233 | SOT902-2 |                |
| 1A, 2A          | 1, 5                                                                | 7, 3     | data input     |
| 1B, 2B          | 2, 6                                                                | 6, 2     | data input     |
| GND             | 4                                                                   | 4        | ground (0 V)   |
| 1Y, 2Y          | 7, 3                                                                | 1, 5     | data output    |
| V <sub>CC</sub> | 8                                                                   | 8        | supply voltage |

7 Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; Z = high-impedance OFF-state.

| Input |    | Output |
|-------|----|--------|
| nA    | nB | nY     |
| L     | L  | Z      |
| L     | H  | Z      |
| H     | L  | Z      |
| H     | H  | L      |

## 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    |
| $V_O$     | output voltage          | Active mode [1] [2]               | -0.5 | +6.5 | V    |
|           |                         | Power-down mode [1] [2]           | -0.5 | +6.5 | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V                       | -50  | -    | mA   |
| $I_{OK}$  | output clamping current | $V_O > V_{CC}$ or $V_O < 0$ V     | -    | ±50  | mA   |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$           | -    | ±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] | -    | 300  | mW   |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] When  $V_{CC} = 0$  V (Power-down mode), the output voltage can be 5.5 V in normal operation.

[3] For TSSOP8 package: above 55 °C the value of  $P_{tot}$  derates linearly with 2.5 mW/K.  
 For VSSOP8 package: above 110 °C the value of  $P_{tot}$  derates linearly with 8 mW/K.  
 For XSON8 and XQFN8 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.  
 For X2SON8 package: above 118 °C the value of  $P_{tot}$  derates linearly with 7.7 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    |
| $V_O$               | output voltage                      | Active mode                | 0    | $V_{CC}$ | V    |
|                     |                                     | disable mode               | 0    | 5.5      | V    |
|                     |                                     | Power-down mode            | 0    | 5.5      | 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 |

## 10 Static characteristics

**Table 7. Static characteristics**

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

| Symbol                                                                         | Parameter                 | Conditions                                                                                                                          | Min                         | Typ <sup>[1]</sup> | Max                         | Unit          |
|--------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------|-----------------------------|---------------|
| $T_{\text{amb}} = -40\text{ }^{\circ}\text{C to } +85\text{ }^{\circ}\text{C}$ |                           |                                                                                                                                     |                             |                    |                             |               |
| $V_{\text{IH}}$                                                                | HIGH-level input voltage  | $V_{\text{CC}} = 1.65\text{ V to } 1.95\text{ V}$                                                                                   | $0.65 \times V_{\text{CC}}$ | -                  | -                           | V             |
|                                                                                |                           | $V_{\text{CC}} = 2.3\text{ V to } 2.7\text{ V}$                                                                                     | 1.7                         | -                  | -                           | V             |
|                                                                                |                           | $V_{\text{CC}} = 2.7\text{ V to } 3.6\text{ V}$                                                                                     | 2.0                         | -                  | -                           | V             |
|                                                                                |                           | $V_{\text{CC}} = 4.5\text{ V to } 5.5\text{ V}$                                                                                     | $0.7 \times V_{\text{CC}}$  | -                  | -                           | V             |
| $V_{\text{IL}}$                                                                | LOW-level input voltage   | $V_{\text{CC}} = 1.65\text{ V to } 1.95\text{ V}$                                                                                   | -                           | -                  | $0.35 \times V_{\text{CC}}$ | V             |
|                                                                                |                           | $V_{\text{CC}} = 2.3\text{ V to } 2.7\text{ V}$                                                                                     | -                           | -                  | 0.7                         | V             |
|                                                                                |                           | $V_{\text{CC}} = 2.7\text{ V to } 3.6\text{ V}$                                                                                     | -                           | -                  | 0.8                         | V             |
|                                                                                |                           | $V_{\text{CC}} = 4.5\text{ V to } 5.5\text{ V}$                                                                                     | -                           | -                  | $0.3 \times V_{\text{CC}}$  | V             |
| $V_{\text{OL}}$                                                                | LOW-level output voltage  | $V_{\text{I}} = V_{\text{IH}} \text{ or } V_{\text{IL}}$                                                                            |                             |                    |                             |               |
|                                                                                |                           | $I_{\text{O}} = 100\text{ }\mu\text{A}; V_{\text{CC}} = 1.65\text{ V to } 5.5\text{ V}$                                             | -                           | -                  | 0.1                         | V             |
|                                                                                |                           | $I_{\text{O}} = 4\text{ mA}; V_{\text{CC}} = 1.65\text{ V}$                                                                         | -                           | 0.08               | 0.45                        | V             |
|                                                                                |                           | $I_{\text{O}} = 8\text{ mA}; V_{\text{CC}} = 2.3\text{ V}$                                                                          | -                           | 0.14               | 0.3                         | V             |
|                                                                                |                           | $I_{\text{O}} = 12\text{ mA}; V_{\text{CC}} = 2.7\text{ V}$                                                                         | -                           | 0.19               | 0.4                         | V             |
|                                                                                |                           | $I_{\text{O}} = 24\text{ mA}; V_{\text{CC}} = 3.0\text{ V}$                                                                         | -                           | 0.37               | 0.55                        | V             |
|                                                                                |                           | $I_{\text{O}} = 32\text{ mA}; V_{\text{CC}} = 4.5\text{ V}$                                                                         | -                           | 0.43               | 0.55                        | V             |
| $I_{\text{I}}$                                                                 | input leakage current     | $V_{\text{I}} = 5.5\text{ V or GND}; V_{\text{CC}} = 0\text{ V to } 5.5\text{ V}$                                                   | -                           | $\pm 0.1$          | $\pm 1$                     | $\mu\text{A}$ |
| $I_{\text{OZ}}$                                                                | OFF-state output current  | $V_{\text{I}} = V_{\text{IH}} \text{ or } V_{\text{IL}}; V_{\text{O}} = V_{\text{CC}} \text{ or GND}; V_{\text{CC}} = 5.5\text{ V}$ | -                           | $\pm 0.1$          | $\pm 2$                     | $\mu\text{A}$ |
| $I_{\text{OFF}}$                                                               | power-off leakage current | $V_{\text{I}} \text{ or } V_{\text{O}} = 5.5\text{ V}; V_{\text{CC}} = 0\text{ V}$                                                  | -                           | $\pm 0.1$          | $\pm 2$                     | $\mu\text{A}$ |
| $I_{\text{CC}}$                                                                | supply current            | $V_{\text{I}} = 5.5\text{ V or GND}; V_{\text{CC}} = 1.65\text{ V to } 5.5\text{ V}; I_{\text{O}} = 0\text{ A}$                     | -                           | 0.1                | 4                           | $\mu\text{A}$ |
| $\Delta I_{\text{CC}}$                                                         | additional supply current | per pin; $V_{\text{I}} = V_{\text{CC}} - 0.6\text{ V}; V_{\text{CC}} = 2.3\text{ V to } 5.5\text{ V}; I_{\text{O}} = 0\text{ A}$    | -                           | 5                  | 500                         | $\mu\text{A}$ |
| $C_{\text{I}}$                                                                 | input capacitance         |                                                                                                                                     | -                           | 2.5                | -                           | pF            |

| Symbol                                      | Parameter                 | Conditions                                                                                      | Min                  | Typ <sup>[1]</sup> | Max                  | Unit          |
|---------------------------------------------|---------------------------|-------------------------------------------------------------------------------------------------|----------------------|--------------------|----------------------|---------------|
| $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |                           |                                                                                                 |                      |                    |                      |               |
| $V_{IH}$                                    | HIGH-level input voltage  | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                                                       | $0.65 \times V_{CC}$ | -                  | -                    | V             |
|                                             |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                         | 1.7                  | -                  | -                    | V             |
|                                             |                           | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$                                                         | 2.0                  | -                  | -                    | V             |
|                                             |                           | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                                                         | $0.7 \times V_{CC}$  | -                  | -                    | V             |
| $V_{IL}$                                    | LOW-level input voltage   | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$                                                       | -                    | -                  | $0.35 \times V_{CC}$ | V             |
|                                             |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$                                                         | -                    | -                  | 0.7                  | V             |
|                                             |                           | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$                                                         | -                    | -                  | 0.8                  | V             |
|                                             |                           | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$                                                         | -                    | -                  | $0.3 \times V_{CC}$  | V             |
| $V_{OL}$                                    | LOW-level output voltage  | $V_I = V_{IH}\text{ or }V_{IL}$                                                                 |                      |                    |                      |               |
|                                             |                           | $I_O = 100\text{ }\mu\text{A}; V_{CC} = 1.65\text{ V to }5.5\text{ V}$                          | -                    | -                  | 0.1                  | V             |
|                                             |                           | $I_O = 4\text{ mA}; V_{CC} = 1.65\text{ V}$                                                     | -                    | -                  | 0.70                 | V             |
|                                             |                           | $I_O = 8\text{ mA}; V_{CC} = 2.3\text{ V}$                                                      | -                    | -                  | 0.45                 | V             |
|                                             |                           | $I_O = 12\text{ mA}; V_{CC} = 2.7\text{ V}$                                                     | -                    | -                  | 0.60                 | V             |
|                                             |                           | $I_O = 24\text{ mA}; V_{CC} = 3.0\text{ V}$                                                     | -                    | -                  | 0.80                 | V             |
|                                             |                           | $I_O = 32\text{ mA}; V_{CC} = 4.5\text{ V}$                                                     | -                    | -                  | 0.80                 | V             |
| $I_I$                                       | input leakage current     | $V_I = 5.5\text{ V or GND}; V_{CC} = 0\text{ V to }5.5\text{ V}$                                | -                    | -                  | $\pm 1$              | $\mu\text{A}$ |
| $I_{OZ}$                                    | OFF-state output current  | $V_I = V_{IH}\text{ or }V_{IL}; V_O = V_{CC}\text{ or GND}; V_{CC} = 5.5\text{ V}$              | -                    | $\pm 0.1$          | $\pm 2$              | $\mu\text{A}$ |
| $I_{OFF}$                                   | power-off leakage current | $V_I\text{ or }V_O = 5.5\text{ V}; V_{CC} = 0\text{ V}$                                         | -                    | -                  | $\pm 2$              | $\mu\text{A}$ |
| $I_{CC}$                                    | supply current            | $V_I = 5.5\text{ V or GND}; V_{CC} = 1.65\text{ V to }5.5\text{ V}; I_O = 0\text{ A}$           | -                    | -                  | 4                    | $\mu\text{A}$ |
| $\Delta I_{CC}$                             | additional supply current | per pin; $V_I = V_{CC} - 0.6\text{ V}; V_{CC} = 2.3\text{ V to }5.5\text{ V}; I_O = 0\text{ A}$ | -                    | -                  | 500                  | $\mu\text{A}$ |

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

## 11 Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground 0 V); for test circuit see [Figure 9](#).

| Symbol           | Parameter                          | Conditions                                                       | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |      | Unit |
|------------------|------------------------------------|------------------------------------------------------------------|------------------|--------------------|-----|-------------------|------|------|
|                  |                                    |                                                                  | Min              | Typ <sup>[1]</sup> | Max | Min               | Max  |      |
| t <sub>PZL</sub> | OFF-state to LOW propagation delay | nA, nB to nY; see <a href="#">Figure 8</a>                       |                  |                    |     |                   |      |      |
|                  |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                               | 1.2              | 3.0                | 8.6 | 1.2               | 10.8 | ns   |
|                  |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                 | 0.7              | 1.8                | 4.8 | 0.7               | 6.0  | ns   |
|                  |                                    | V <sub>CC</sub> = 2.7 V                                          | 0.7              | 2.5                | 4.4 | 0.7               | 5.5  | ns   |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                 | 0.7              | 2.1                | 4.1 | 0.7               | 5.2  | ns   |
|                  |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                 | 0.5              | 1.5                | 3.3 | 0.5               | 4.2  | ns   |
| t <sub>PLZ</sub> | LOW to OFF-state propagation delay | nA, nB to nY; see <a href="#">Figure 8</a>                       |                  |                    |     |                   |      |      |
|                  |                                    | V <sub>CC</sub> = 1.65 V to 1.95 V                               | 1.2              | 3.0                | 8.6 | 1.2               | 10.8 | ns   |
|                  |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V                                 | 0.7              | 1.8                | 4.8 | 0.7               | 6.0  | ns   |
|                  |                                    | V <sub>CC</sub> = 2.7 V                                          | 0.7              | 2.5                | 4.4 | 0.7               | 5.5  | ns   |
|                  |                                    | V <sub>CC</sub> = 3.0 V to 3.6 V                                 | 0.7              | 2.1                | 4.1 | 0.7               | 5.2  | ns   |
|                  |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V                                 | 0.5              | 1.5                | 3.3 | 0.5               | 4.2  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance      | per gate; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[2]</sup> | -                | 5                  | -   | -                 | -    | pF   |

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

[2] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

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

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

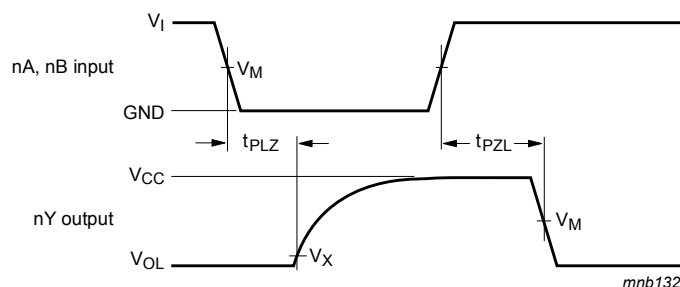
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

### 11.1 Waveforms and test circuit



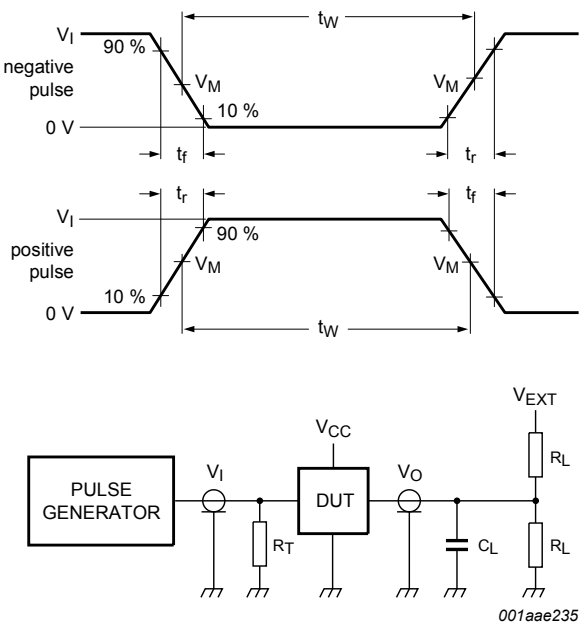
Measurement points are given in [Table 9](#)

**Figure 8. Inputs nA and nB to output nY propagation delay times**



Table 9. Measurement points

| Supply voltage   | Input                 | Output                   |                       |
|------------------|-----------------------|--------------------------|-----------------------|
| V <sub>CC</sub>  | V <sub>M</sub>        | V <sub>X</sub>           | V <sub>M</sub>        |
| 1.65 V to 1.95 V | 0.5 x V <sub>CC</sub> | V <sub>OL</sub> + 0.15 V | 0.5 x V <sub>CC</sub> |
| 2.3 V to 2.7 V   | 0.5 x V <sub>CC</sub> | V <sub>OL</sub> + 0.15 V | 0.5 x V <sub>CC</sub> |
| 2.7 V            | 1.5 V                 | V <sub>OL</sub> + 0.3 V  | 1.5 V                 |
| 3.0 V to 3.6 V   | 1.5 V                 | V <sub>OL</sub> + 0.3 V  | 1.5 V                 |
| 4.5 V to 5.5 V   | 0.5 x V <sub>CC</sub> | V <sub>OL</sub> + 0.3 V  | 0.5 x V <sub>CC</sub> |



Test data is given in [Table 10](#)  
Definitions for test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

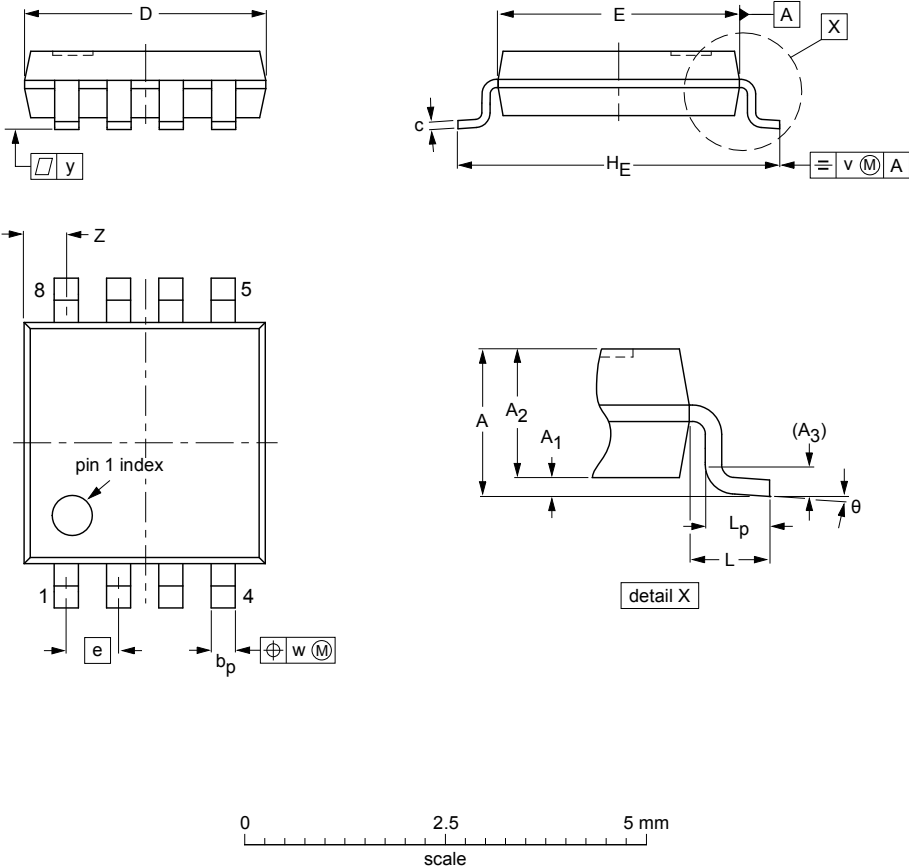
Figure 9. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage   | Input           |                                 | Load           |                | V <sub>EXT</sub>                    |
|------------------|-----------------|---------------------------------|----------------|----------------|-------------------------------------|
| V <sub>CC</sub>  | V <sub>I</sub>  | t <sub>r</sub> , t <sub>f</sub> | C <sub>L</sub> | R <sub>L</sub> | t <sub>PLZ</sub> , t <sub>PZL</sub> |
| 1.65 V to 1.95 V | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 1 kΩ           | 2 x V <sub>CC</sub>                 |
| 2.3 V to 2.7 V   | V <sub>CC</sub> | ≤ 2.0 ns                        | 30 pF          | 500 Ω          | 2 x V <sub>CC</sub>                 |
| 2.7 V            | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | 6 V                                 |
| 3.0 V to 3.6 V   | 2.7 V           | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | 6 V                                 |
| 4.5 V to 5.5 V   | V <sub>CC</sub> | ≤ 2.5 ns                        | 50 pF          | 500 Ω          | 2 x V <sub>CC</sub>                 |

12 Package outline

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



DIMENSIONS (mm are the original dimensions)

| UNIT | A<br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c            | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | H <sub>E</sub> | L   | L <sub>p</sub> | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|--------------|------------------|------------------|------|----------------|-----|----------------|-----|------|-----|------------------|----------|
| mm   | 1.1       | 0.15<br>0.00   | 0.95<br>0.75   | 0.25           | 0.38<br>0.22   | 0.18<br>0.08 | 3.1<br>2.9       | 3.1<br>2.9       | 0.65 | 4.1<br>3.9     | 0.5 | 0.47<br>0.33   | 0.2 | 0.13 | 0.1 | 0.70<br>0.35     | 8°<br>0° |

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

| OUTLINE<br>VERSION | REFERENCES |       |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|------------|
|                    | IEC        | JEDEC | JEITA |  |                        |            |
| SOT505-2           |            | ---   |       |  |                        | 02-01-16   |

Figure 10. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

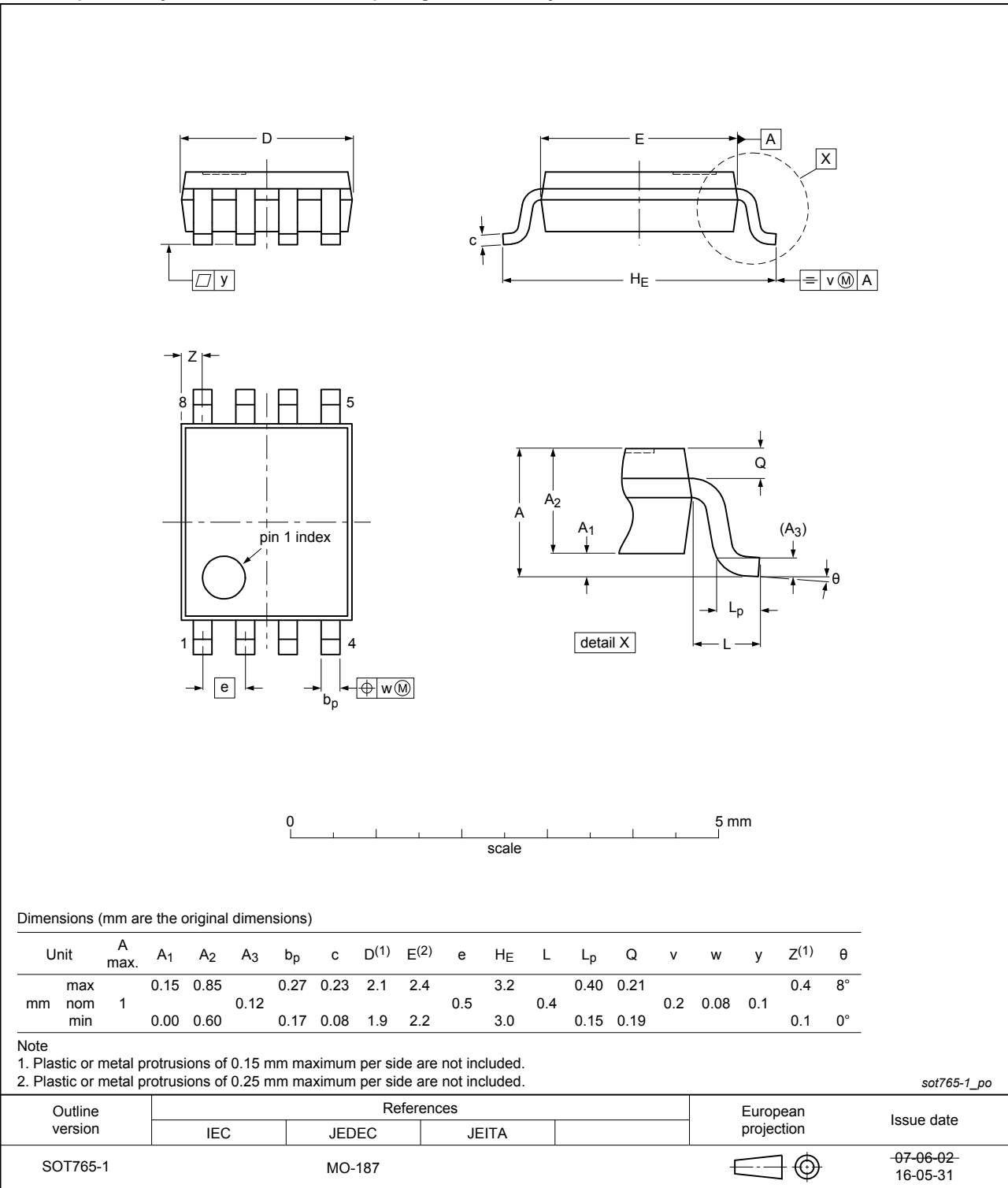
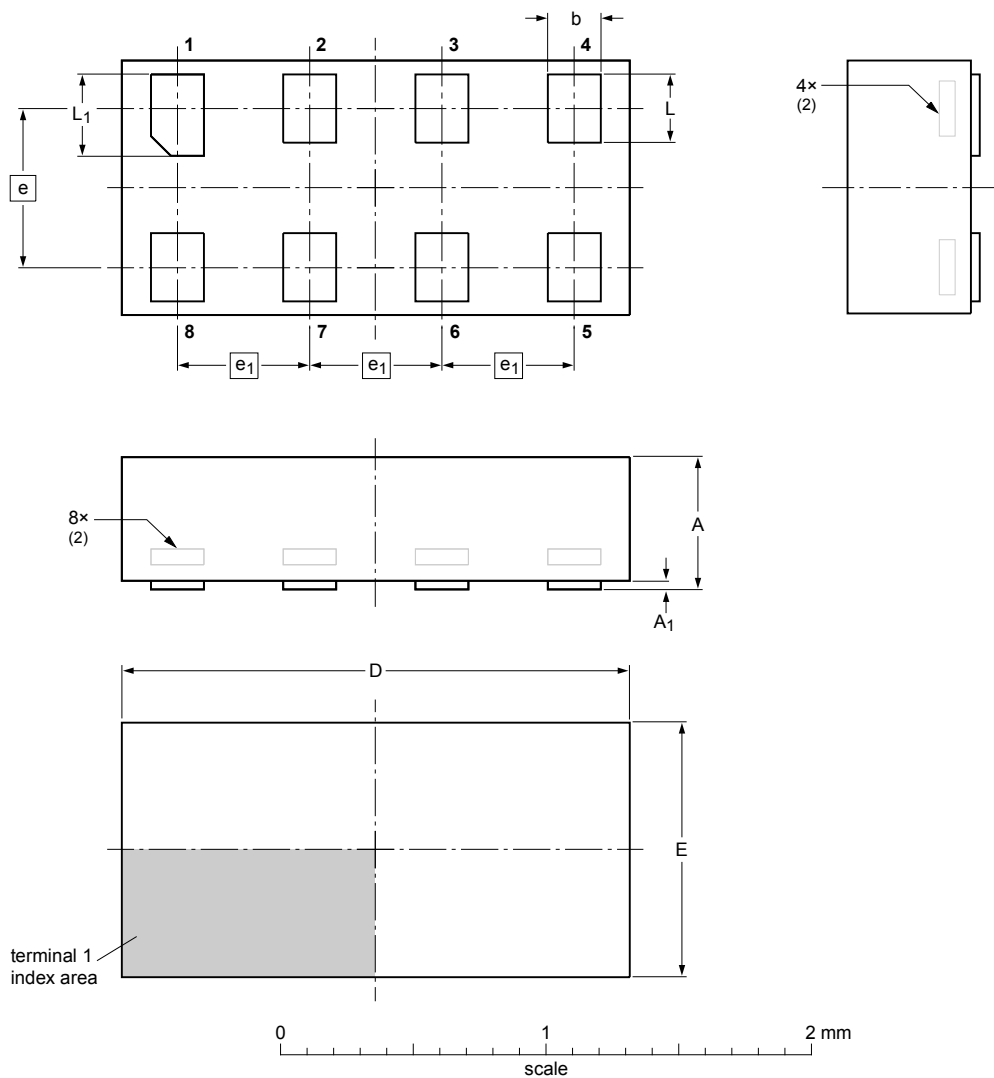


Figure 11. Package outline SOT765-1 (VSSOP8)

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

SOT833-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sup>(1)</sup><br>max | A <sub>1</sub><br>max | b            | D          | E            | e   | e <sub>1</sub> | L            | L <sub>1</sub> |
|------|-------------------------|-----------------------|--------------|------------|--------------|-----|----------------|--------------|----------------|
| mm   | 0.5                     | 0.04                  | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5            | 0.35<br>0.27 | 0.40<br>0.32   |

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

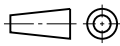
| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|--------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                                                                                       |                      |
| SOT833-1           | ---        | MO-252 | ---   |  |  | 07-11-14<br>07-12-07 |

Figure 12. Package outline SOT833-1 (XSON8)

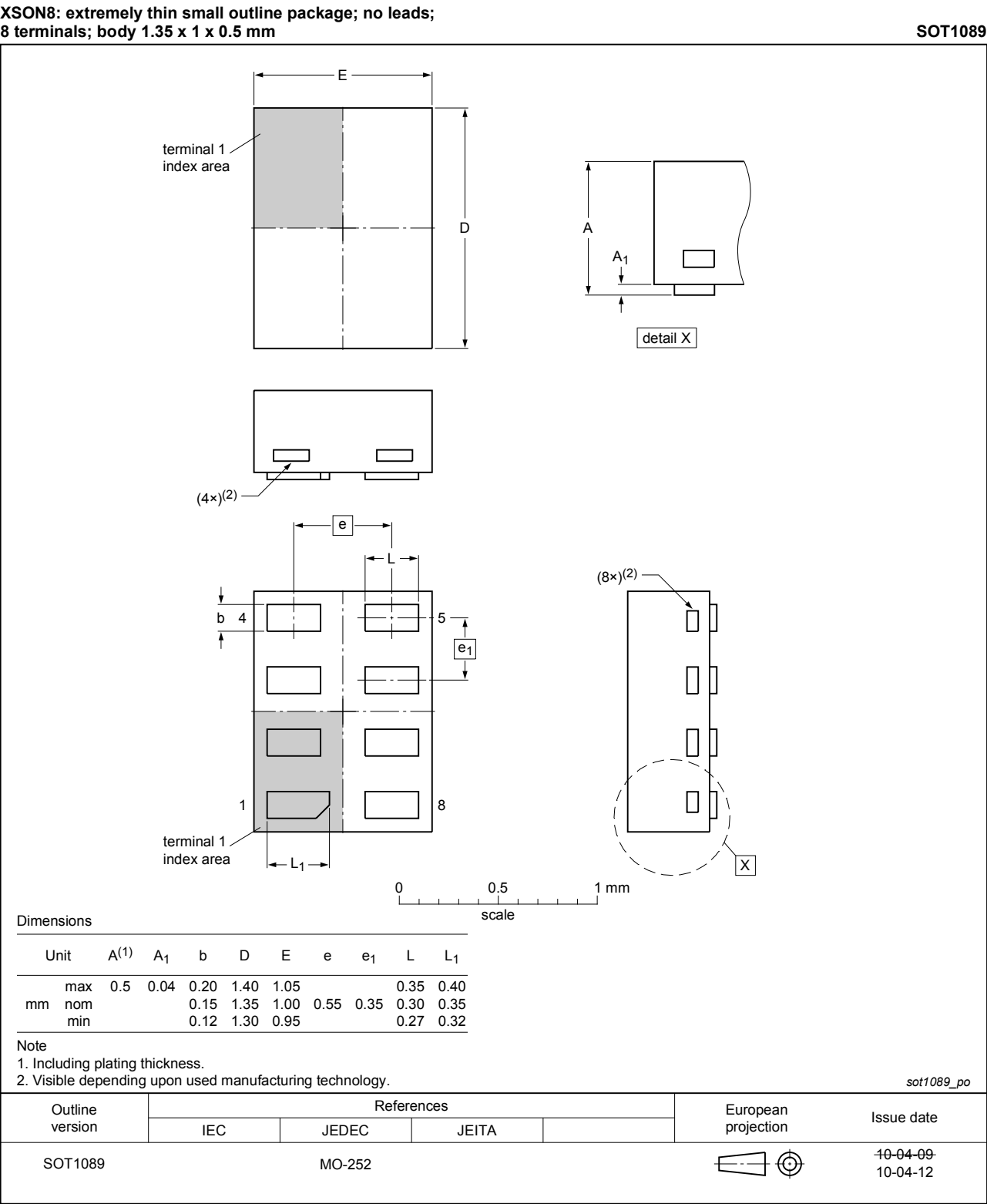


Figure 13. Package outline SOT1089 (XSON8)

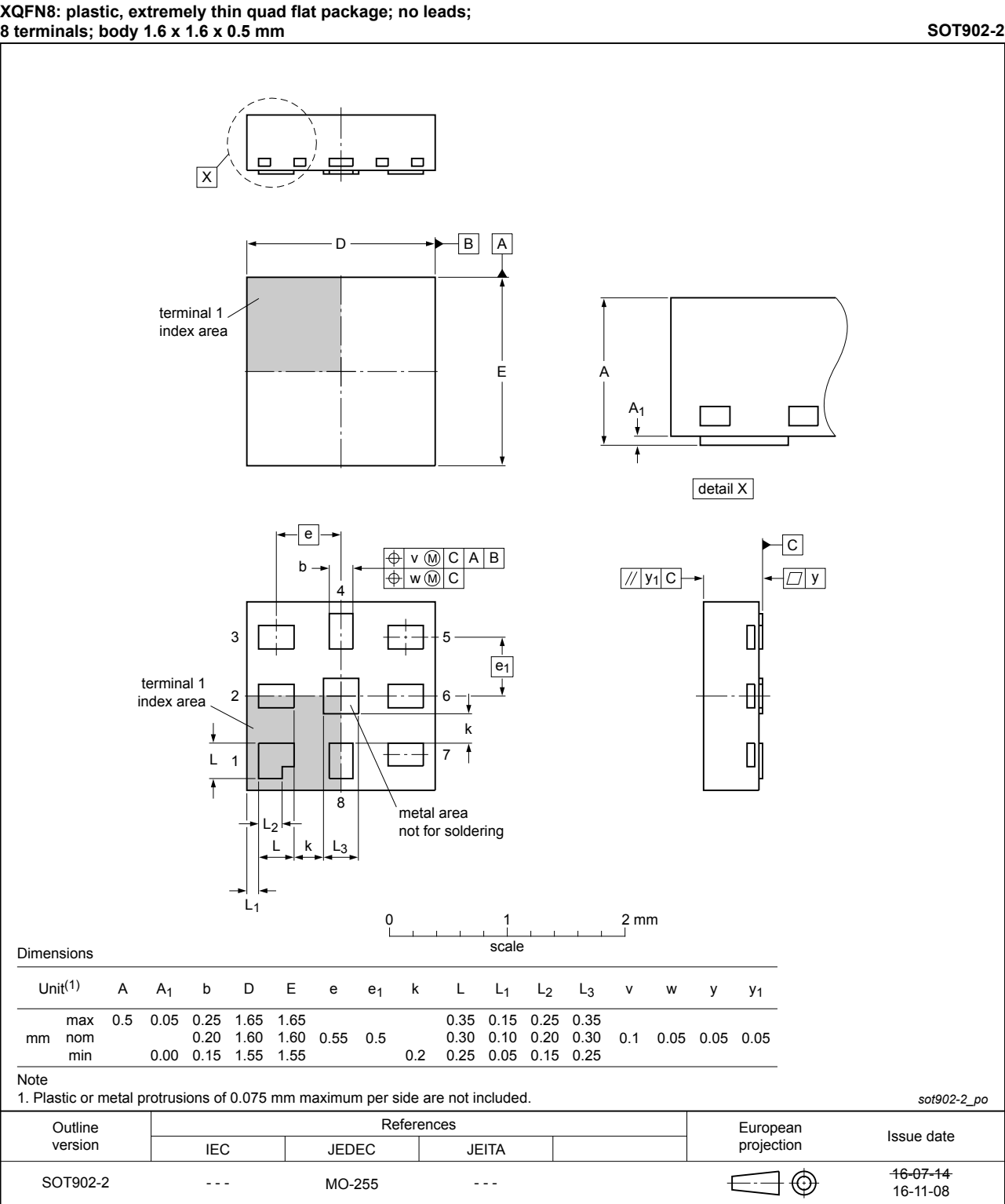
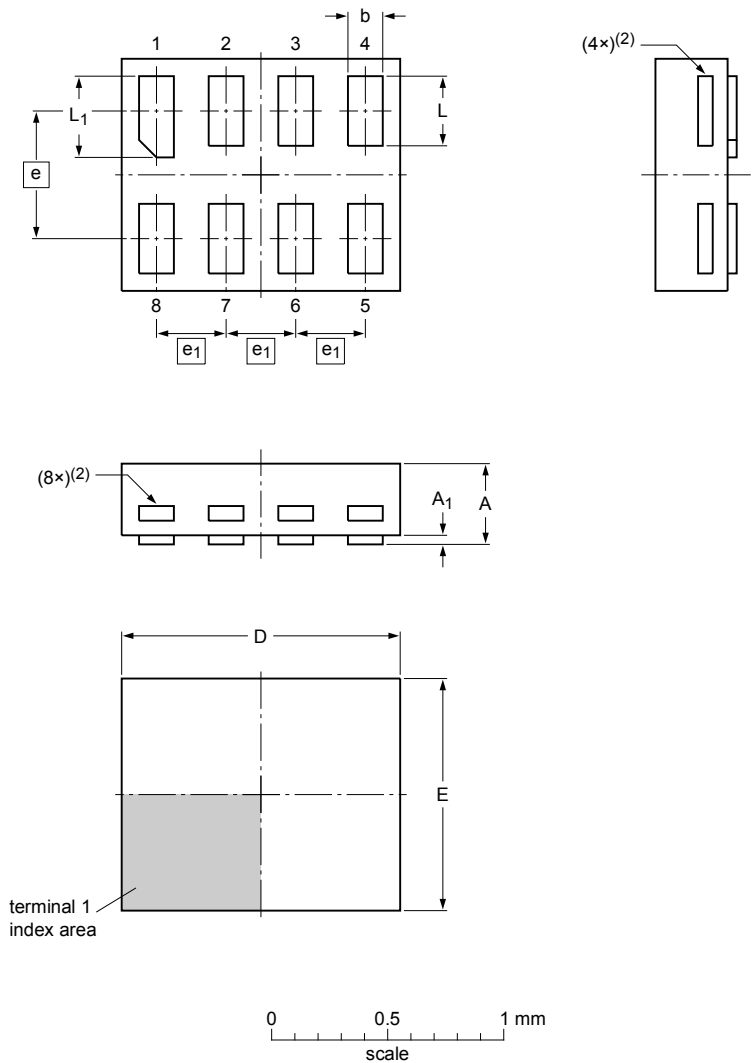


Figure 14. Package outline SOT902-2 (XQFN8)

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

SOT1116



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm   | max              | 0.35           | 0.04 | 0.20 | 1.25 | 1.05 |                | 0.35 | 0.40           |
|      | nom              |                |      | 0.15 | 1.20 | 1.00 | 0.55           | 0.30 | 0.35           |
|      | min              |                |      | 0.12 | 1.15 | 0.95 |                | 0.27 | 0.32           |

Note

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

sot1116\_po

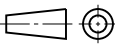
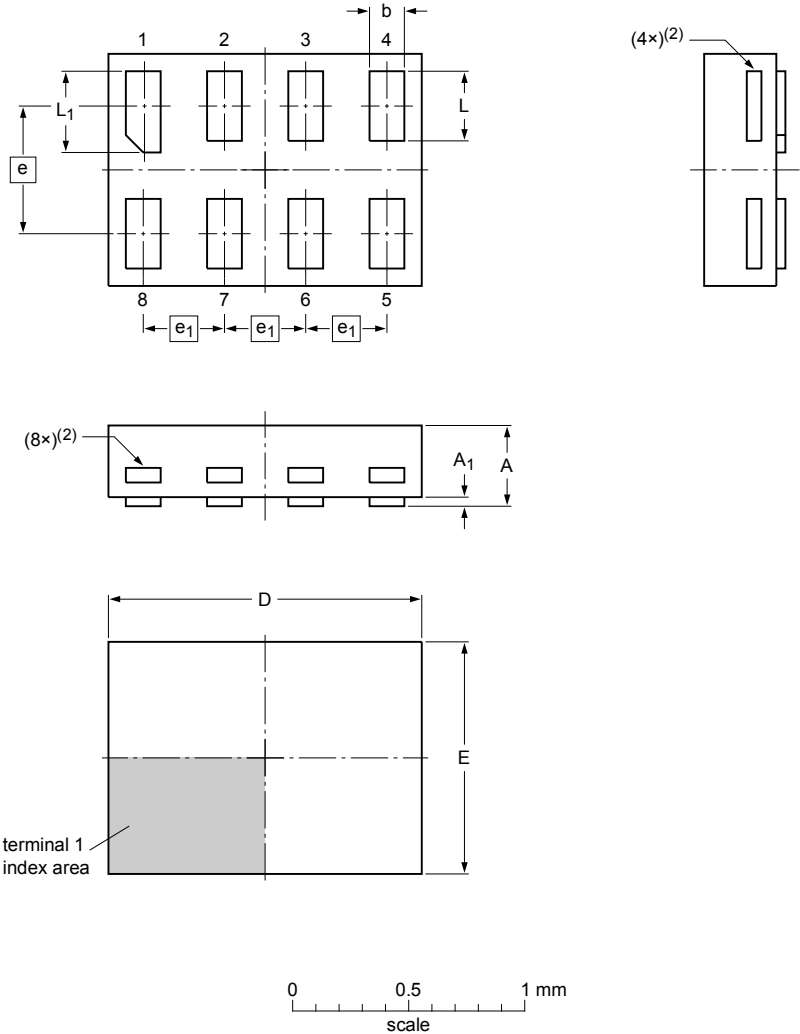
| Outline version | References |       |       |  | European projection                                                                   | Issue date             |
|-----------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|------------------------|
|                 | IEC        | JEDEC | JEITA |  |                                                                                       |                        |
| SOT1116         |            |       |       |  |  | -10-04-02-<br>10-04-07 |

Figure 15. 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



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm   | max              | 0.35           | 0.04 | 0.20 | 1.40 | 1.05 |                | 0.35 | 0.40           |
|      | nom              |                |      | 0.15 | 1.35 | 1.00 | 0.55           | 0.30 | 0.35           |
|      | min              |                |      | 0.12 | 1.30 | 0.95 |                | 0.27 | 0.32           |

Note

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

sot1203\_po

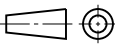
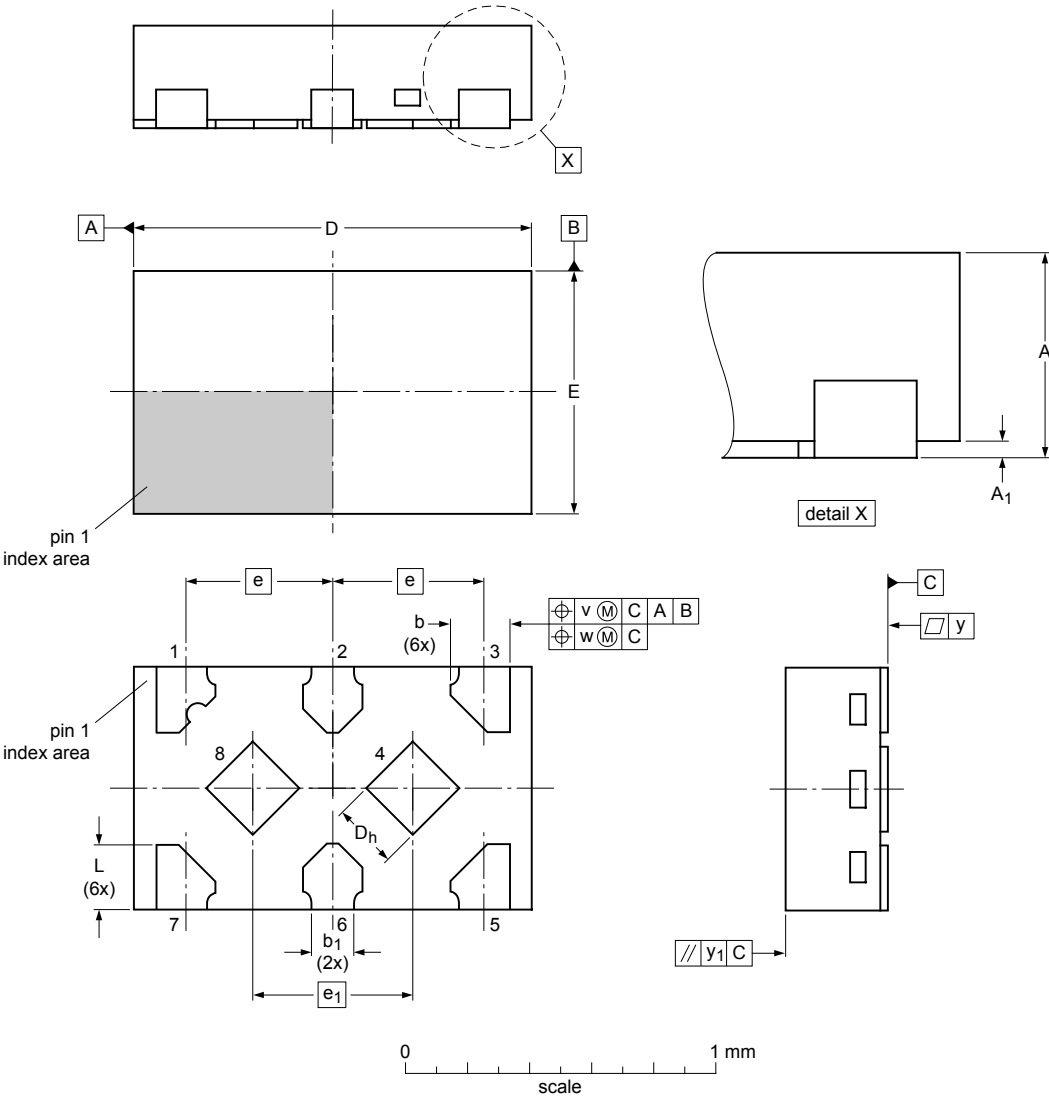
| Outline version | References |       |       |  | European projection                                                                   | Issue date           |
|-----------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                 | IEC        | JEDEC | JEITA |  |                                                                                       |                      |
| SOT1203         |            |       |       |  |  | 10-04-02<br>10-04-06 |

Figure 16. Package outline SOT1203 (XSON8)



X2SON8: plastic thermal enhanced extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 0.8 x 0.35 mm

SOT1233



Dimensions (mm are the original dimensions)

| Unit | A    | A <sub>1</sub> | b    | b <sub>1</sub> | D    | D <sub>h</sub> | E    | e   | e <sub>1</sub> | L    | v   | w    | y    | y <sub>1</sub> |
|------|------|----------------|------|----------------|------|----------------|------|-----|----------------|------|-----|------|------|----------------|
| max  | 0.35 | 0.04           | 0.25 |                | 1.40 | 0.27           | 0.85 |     |                | 0.27 |     |      |      |                |
| nom  | 0.32 |                | 0.20 | 0.15           | 1.35 | 0.22           | 0.80 | 0.5 | 0.54           | 0.22 | 0.1 | 0.05 | 0.05 | 0.05           |
| min  | 0.30 | 0.00           | 0.15 | (ref)          | 1.30 | 0.17           | 0.75 |     |                | 0.17 |     |      |      |                |

sot1233\_po

| Outline version | References |       |       |  | European projection | Issue date           |
|-----------------|------------|-------|-------|--|---------------------|----------------------|
|                 | IEC        | JEDEC | JEITA |  |                     |                      |
| SOT1233         |            | ---   |       |  |                     | 16-04-21<br>17-01-05 |

Figure 17. Package outline SOT1233 (X2SON8)

## 13 Abbreviations

Table 11. 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 12. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                   | Data sheet status     | Change notice | Supersedes     |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|----------------|
| 74LVC2G38 v.13 | 20170703                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.12 |
| 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>Added type number 74LVC2G38GX (SOT1233 / X2SON8).</li> <li>Type number 74LVC2G38GD removed.</li> </ul> |                       |               |                |
| 74LVC2G38 v.12 | 20161215                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.11 |
| 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>                                                                                                                                                                                             |                       |               |                |
| 74LVC2G38 v.11 | 20130408                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.10 |
| Modifications: | <ul style="list-style-type: none"> <li>For type number 74LVC2G38GD XSON8U has changed to XSON8.</li> </ul>                                                                                                                                                                                                                                     |                       |               |                |
| 74LVC2G38 v.10 | 20120628                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.9  |
| Modifications: | <ul style="list-style-type: none"> <li>For type number 74LVC2G38GM the SOT code has changed to SOT902-2.</li> </ul>                                                                                                                                                                                                                            |                       |               |                |
| 74LVC2G38 v.9  | 20111128                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.8  |
| Modifications: | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>                                                                                                                                                                                                                                                                         |                       |               |                |
| 74LVC2G38 v.8  | 20101104                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.7  |
| 74LVC2G38 v.7  | 20090320                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.6  |
| 74LVC2G38 v.6  | 20080219                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.5  |
| 74LVC2G38 v.5  | 20070904                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.4  |
| 74LVC2G38 v.4  | 20060516                                                                                                                                                                                                                                                                                                                                       | Product data sheet    | -             | 74LVC2G38 v.3  |
| 74LVC2G38 v.3  | 20050201                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74LVC2G38 v.2  |
| 74LVC2G38 v.2  | 20041018                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | 74LVC2G38 v.1  |
| 74LVC2G38 v.1  | 20031027                                                                                                                                                                                                                                                                                                                                       | Product specification | -             | -              |

## 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".

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