

# 74LVC2G241

Dual buffer/line driver; 3-state

Rev. 13 — 8 April 2013

Product data sheet

## 1. General description

The 74LVC2G241 is a dual non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs  $\overline{1OE}$  and 2OE:

- A HIGH level at pin  $\overline{1OE}$  causes output 1Y to assume a high-impedance OFF-state.
- A LOW level at pin 2OE causes output 2Y to assume a high-impedance OFF-state.

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

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of the 74LVC2G241 as a translator 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 a damaging backflow current through the device when it is powered down.

## 2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output 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)
  - ◆ JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- $\pm 24$  mA output drive ( $V_{CC} = 3.0$  V)
- CMOS low power consumption
- 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  |
| 74LVC2G241DP | -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 |
| 74LVC2G241DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                  | SOT765-1 |
| 74LVC2G241GT | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm | SOT833-1 |
| 74LVC2G241GF | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm         | SOT1089  |
| 74LVC2G241GD | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 3 × 2 × 0.5 mm    | SOT996-2 |
| 74LVC2G241GM | -40 °C to +125 °C | XQFN8  | plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 × 1.6 × 0.5 mm   | SOT902-2 |
| 74LVC2G241GN | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm       | SOT1116  |
| 74LVC2G241GS | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm      | SOT1203  |

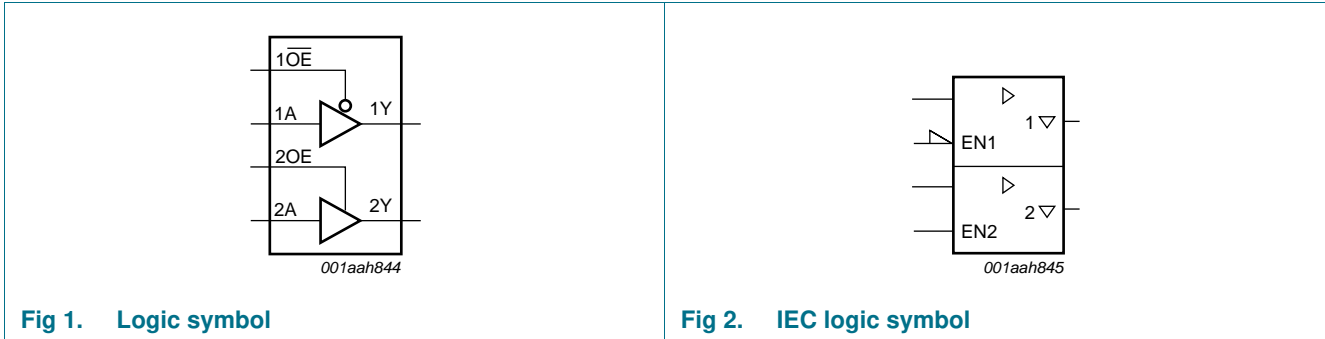
### 4. Marking

Table 2. Marking codes

| Type number  | Marking code <sup>[1]</sup> |
|--------------|-----------------------------|
| 74LVC2G241DP | V241                        |
| 74LVC2G241DC | V41                         |
| 74LVC2G241GT | V41                         |
| 74LVC2G241GF | V1                          |
| 74LVC2G241GD | V41                         |
| 74LVC2G241GM | V41                         |
| 74LVC2G241GN | V1                          |
| 74LVC2G241GS | V1                          |

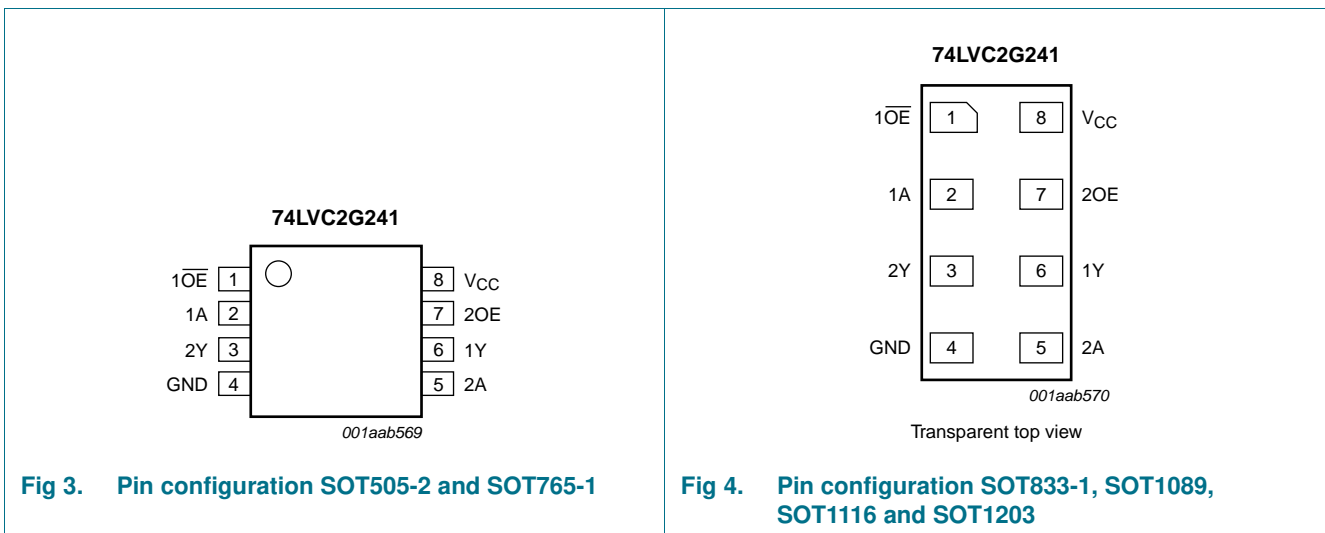
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

## 5. Functional diagram



## 6. Pinning information

### 6.1 Pinning



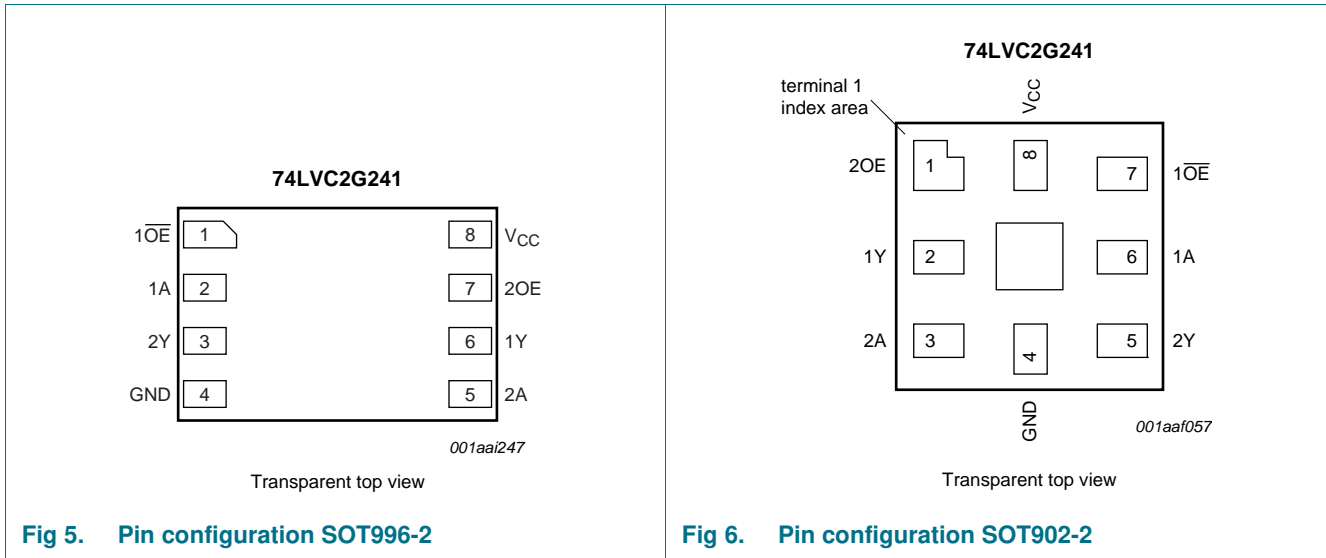


Fig 5. Pin configuration SOT996-2

Fig 6. Pin configuration SOT902-2

6.2 Pin description

Table 3. Pin description

| Symbol           | Pin  |          | Description                       |
|------------------|--|----------|-----------------------------------|
|                  | SOT505-2, SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203 | SOT902-2 |                                   |
| $\overline{1OE}$ | 1  | 7        | output enable input (active LOW)  |
| 1A, 2A           | 2, 5   | 6, 3     | data input                        |
| GND              | 4  | 4        | ground (0 V)                      |
| 1Y, 2Y           | 6, 3   | 2, 5     | data output                       |
| 2OE              | 7  | 1        | output enable input (active HIGH) |
| V <sub>CC</sub>  | 8  | 8        | supply voltage                    |

7. Functional description

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

| Input            |    |     |    | Output |    |
|------------------|----|-----|----|--------|----|
| $\overline{1OE}$ | 1A | 2OE | 2A | 1Y     | 2Y |
| L                | L  | H   | L  | L      | L  |
| L                | H  | H   | H  | H      | H  |
| H                | X  | L   | X  | Z      | Z  |

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

## 8. Limiting values

**Table 5. Limiting values**

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

| Symbol    | Parameter               | Conditions                    | Min         | Max            | Unit |
|-----------|-------------------------|-------------------------------|-------------|----------------|------|
| $V_{CC}$  | supply voltage          |                               | -0.5        | +6.5           | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V                   | -50         | -              | mA   |
| $V_I$     | input voltage           |                               | [1] -0.5    | +6.5           | V    |
| $I_{OK}$  | output clamping current | $V_O > V_{CC}$ or $V_O < 0$ V | -           | $\pm 50$       | mA   |
| $V_O$     | output voltage          | enable mode                   | [1] -0.5    | $V_{CC} + 0.5$ | V    |
|           |                         | disable mode                  | [1] -0.5    | +6.5           | V    |
|           |                         | Power-down mode               | [1][2] -0.5 | +6.5           | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$       | -           | $\pm 50$       | 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 | $T_{amb} = -40$ °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 packages: above 55 °C the value of  $P_{tot}$  derates linearly at 2.5 mW/K.

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

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

## 9. Recommended operating conditions

**Table 6. Operating conditions**

| Symbol              | Parameter                           | Conditions                               | Min  | Max      | Unit |
|---------------------|-------------------------------------|--|------|----------|------|
| $V_{CC}$            | supply voltage                      |  | 1.65 | 5.5      | V    |
| $V_I$               | input voltage                       |  | 0    | 5.5      | V    |
| $V_O$               | output voltage                      | $V_{CC} = 1.65$ V to 5.5 V; enable mode  | 0    | $V_{CC}$ | V    |
|                     |                                     | $V_{CC} = 1.65$ V to 5.5 V; disable mode | 0    | 5.5      | V    |
|                     |                                     | $V_{CC} = 0$ 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 |
|---|---------------------------|--|------------------------|--------------------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b> |                           |  |                        |                    |                        |      |
| 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> | -                  | -                      | V    |
|   |                           | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.7                    | -                  | -                      | V    |
|   |                           | V <sub>CC</sub> = 2.7 V to 3.6 V   | 2.0                    | -                  | -                      | V    |
|   |                           | V <sub>CC</sub> = 4.5 V to 5.5 V   | 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> | V    |
|   |                           | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                      | -                  | 0.7                    | V    |
|   |                           | V <sub>CC</sub> = 2.7 V to 3.6 V   | -                      | -                  | 0.8                    | V    |
|   |                           | V <sub>CC</sub> = 4.5 V to 5.5 V   | -                      | -                  | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OL</sub>                           | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>  |                        |                    |                        |      |
|   |                           | I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V   | -                      | -                  | 0.1                    | V    |
|   |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V  | -                      | -                  | 0.45                   | V    |
|   |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V   | -                      | -                  | 0.3                    | V    |
|   |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V  | -                      | -                  | 0.4                    | V    |
|   |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V  | -                      | -                  | 0.55                   | V    |
|   |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V  | -                      | -                  | 0.55                   | V    |
| V <sub>OH</sub>                           | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>  |                        |                    |                        |      |
|   |                           | I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V  | V <sub>CC</sub> - 0.1  | -                  | -                      | V    |
|   |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V   | 1.2                    | -                  | -                      | V    |
|   |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V  | 1.9                    | -                  | -                      | V    |
|   |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V   | 2.2                    | -                  | -                      | V    |
|   |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V   | 2.3                    | -                  | -                      | V    |
|   |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V   | 3.8                    | -                  | -                      | V    |
| I <sub>I</sub>                            | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V  | -                      | ±0.1               | ±5                     | μA   |
| I <sub>OZ</sub>                           | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND; V <sub>CC</sub> = 3.6 V | -                      | ±0.1               | ±10                    | μA   |
| I <sub>OFF</sub>                          | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V  | -                      | ±0.1               | ±10                    | μA   |
| I <sub>CC</sub>                           | supply current            | V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 1.65 V to 5.5 V                       | -                      | 0.1                | 10                     | μA   |
| ΔI <sub>CC</sub>                          | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.3 V to 5.5 V    | -                      | 5                  | 500                    | μA   |
| C <sub>I</sub>                            | input capacitance         |  | -                      | 2                  | -                      | pF   |

**Table 7. Static characteristics ...continued**

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

| Symbol                                     | Parameter                 | Conditions  | Min                    | Typ <sup>[1]</sup> | Max                    | Unit |
|--|---------------------------|---|------------------------|--------------------|------------------------|------|
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                           |   |                        |                    |                        |      |
| 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> | -                  | -                      | V    |
|  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V  | 1.7                    | -                  | -                      | V    |
|  |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | 2.0                    | -                  | -                      | V    |
|  |                           | V <sub>CC</sub> = 4.5 V to 5.5 V  | 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> | V    |
|  |                           | V <sub>CC</sub> = 2.3 V to 2.7 V  | -                      | -                  | 0.7                    | V    |
|  |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | -                      | -                  | 0.8                    | V    |
|  |                           | V <sub>CC</sub> = 4.5 V to 5.5 V  | -                      | -                  | 0.3 × V <sub>CC</sub>  | V    |
| V <sub>OL</sub>                            | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |                        |                    |                        |      |
|  |                           | I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V  | -                      | -                  | 0.1                    | V    |
|  |                           | I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V   | -                      | -                  | 0.70                   | V    |
|  |                           | I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V  | -                      | -                  | 0.45                   | V    |
|  |                           | I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V   | -                      | -                  | 0.60                   | V    |
|  |                           | I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V   | -                      | -                  | 0.80                   | V    |
|  |                           | I <sub>O</sub> = 32 mA; V <sub>CC</sub> = 4.5 V   | -                      | -                  | 0.80                   | V    |
| V <sub>OH</sub>                            | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>   |                        |                    |                        |      |
|  |                           | I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 1.65 V to 5.5 V   | V <sub>CC</sub> - 0.1  | -                  | -                      | V    |
|  |                           | I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V  | 0.95                   | -                  | -                      | V    |
|  |                           | I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V   | 1.7                    | -                  | -                      | V    |
|  |                           | I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V  | 1.9                    | -                  | -                      | V    |
|  |                           | I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V  | 2.0                    | -                  | -                      | V    |
|  |                           | I <sub>O</sub> = -32 mA; V <sub>CC</sub> = 4.5 V  | 3.4                    | -                  | -                      | V    |
| I <sub>I</sub>                             | input leakage current     | V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V   | -                      | -                  | ±20                    | μA   |
| I <sub>OZ</sub>                            | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND;<br>V <sub>CC</sub> = 3.6 V | -                      | -                  | ±20                    | μA   |
| I <sub>OFF</sub>                           | power-off leakage current | V <sub>I</sub> or V <sub>O</sub> = 5.5 V; V <sub>CC</sub> = 0 V   | -                      | -                  | ±20                    | μA   |
| I <sub>CC</sub>                            | supply current            | V <sub>I</sub> = 5.5 V or GND; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 1.65 V to 5.5 V                       | -                      | -                  | 40                     | μA   |
| ΔI <sub>CC</sub>                           | additional supply current | per pin; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A;<br>V <sub>CC</sub> = 2.3 V to 5.5 V    | -                      | -                  | 5                      | mA   |

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

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 10](#).

| Symbol                           | Parameter         | Conditions   | -40 °C to +85 °C |                    |      | -40 °C to +125 °C |      | Unit |
|----------------------------------|-------------------|--|------------------|--------------------|------|-------------------|------|------|
|                                  |                   |  | Min              | Typ <sup>[1]</sup> | Max  | Min               | Max  |      |
| t <sub>pd</sub>                  | propagation delay | nA to nY; see <a href="#">Figure 7</a> <sup>[2]</sup>  |                  |                    |      |                   |      |      |
|                                  |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                     | 1.0              | 4.5                | 8.8  | 1.0               | 11.0 | ns   |
|                                  |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                       | 0.5              | 2.8                | 4.9  | 0.5               | 6.3  | ns   |
|                                  |                   | V <sub>CC</sub> = 2.7 V                                | 1.0              | 2.8                | 4.7  | 1.0               | 5.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                       | 0.5              | 2.6                | 4.3  | 0.5               | 5.4  | ns   |
|                                  |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                       | 0.5              | 2.1                | 3.7  | 0.5               | 4.6  | ns   |
| t <sub>en</sub>                  | enable time       | 1OE to 1Y; see <a href="#">Figure 8</a> <sup>[3]</sup> |                  |                    |      |                   |      |      |
|                                  |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                     | 1.5              | 5.2                | 9.9  | 1.5               | 12.4 | ns   |
|                                  |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                       | 1.0              | 3.1                | 5.6  | 1.0               | 7.0  | ns   |
|                                  |                   | V <sub>CC</sub> = 2.7 V                                | 1.5              | 3.2                | 5.5  | 1.5               | 6.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                       | 0.5              | 2.7                | 4.7  | 0.5               | 5.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                       | 0.5              | 2.0                | 3.8  | 0.5               | 4.8  | ns   |
|                                  |                   | 2OE to 2Y; see <a href="#">Figure 9</a> <sup>[3]</sup> |                  |                    |      |                   |      |      |
|                                  |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                     | 1.0              | 4.3                | 8.8  | 1.0               | 11.0 | ns   |
|                                  |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                       | 1.0              | 2.7                | 4.7  | 1.0               | 5.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 2.7 V                                | 1.0              | 2.7                | 4.6  | 1.0               | 5.8  | ns   |
|                                  |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                       | 1.0              | 2.5                | 4.1  | 1.0               | 5.1  | ns   |
| V <sub>CC</sub> = 4.5 V to 5.5 V | 0.5               | 1.9  | 3.3              | 0.5                | 4.1  | ns                |      |      |
| t <sub>dis</sub>                 | disable time      | 1OE to 1Y; see <a href="#">Figure 8</a> <sup>[4]</sup> |                  |                    |      |                   |      |      |
|                                  |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                     | 1.0              | 3.2                | 11.6 | 1.0               | 14.1 | ns   |
|                                  |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                       | 0.5              | 2.2                | 5.8  | 0.5               | 7.6  | ns   |
|                                  |                   | V <sub>CC</sub> = 2.7 V                                | 1.0              | 2.8                | 4.6  | 1.0               | 5.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                       | 1.0              | 2.6                | 4.4  | 1.0               | 5.7  | ns   |
|                                  |                   | V <sub>CC</sub> = 4.5 V to 5.5 V                       | 0.5              | 2.0                | 3.4  | 0.5               | 4.6  | ns   |
|                                  |                   | 2OE to 2Y; see <a href="#">Figure 9</a> <sup>[4]</sup> |                  |                    |      |                   |      |      |
|                                  |                   | V <sub>CC</sub> = 1.65 V to 1.95 V                     | 1.0              | 3.6                | 12.5 | 1.0               | 15.2 | ns   |
|                                  |                   | V <sub>CC</sub> = 2.3 V to 2.7 V                       | 0.5              | 2.0                | 5.2  | 0.5               | 6.9  | ns   |
|                                  |                   | V <sub>CC</sub> = 2.7 V                                | 1.5              | 3.2                | 4.9  | 1.5               | 6.3  | ns   |
|                                  |                   | V <sub>CC</sub> = 3.0 V to 3.6 V                       | 1.0              | 2.8                | 4.2  | 1.0               | 5.4  | ns   |
| V <sub>CC</sub> = 4.5 V to 5.5 V | 0.5               | 2.0  | 3.3              | 0.5                | 4.4  | ns                |      |      |



**Table 8. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 10](#).

| Symbol          | Parameter                     | Conditions   | -40 °C to +85 °C |                    |     | -40 °C to +125 °C |     | Unit |
|-----------------|-------------------------------|--|------------------|--------------------|-----|-------------------|-----|------|
|                 |                               |  | Min              | Typ <sup>[1]</sup> | Max | Min               | Max |      |
| C <sub>PD</sub> | power dissipation capacitance | per buffer; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[5]</sup> |                  |                    |     |                   |     |      |
|                 |                               | output enabled   | -                | 20                 | -   | -                 | -   | pF   |
|                 |                               | output disabled  | -                | 5                  | -   | -                 | -   | pF   |

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

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

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

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

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

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

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

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

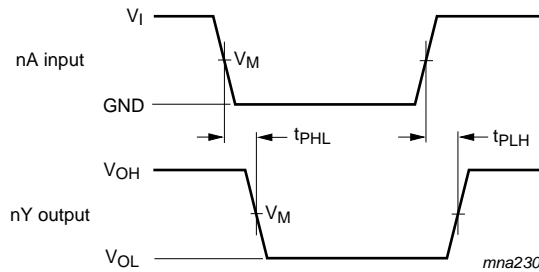
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

## 12. Waveforms



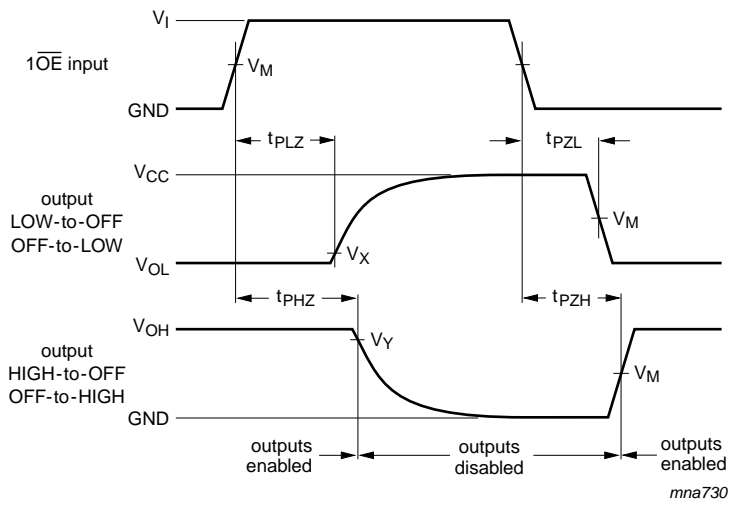
Measurement points are given in [Table 9](#).

Logic levels: V<sub>OL</sub> and V<sub>OH</sub> are typical output voltage levels that occur with the output load.

**Fig 7. The data input (nA) to output (nY) propagation delays**

**Table 9. Measurement points**

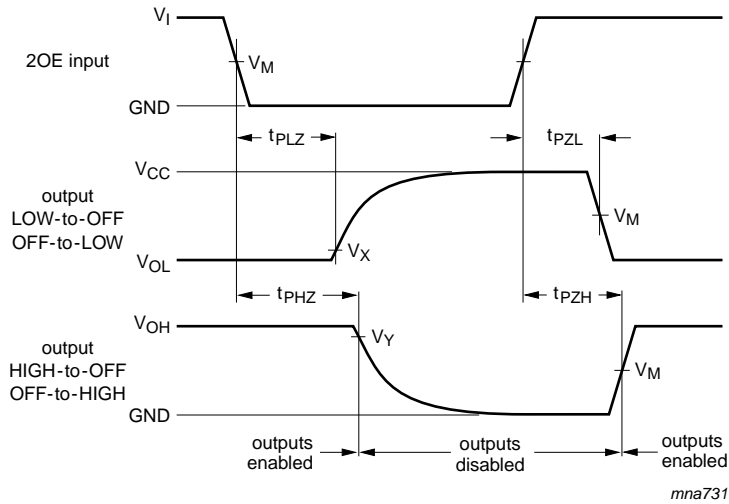
| Supply voltage   | Input                 | Output                |                          |                          |
|------------------|-----------------------|-----------------------|--------------------------|--------------------------|
| V <sub>CC</sub>  | V <sub>M</sub>        | V <sub>M</sub>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



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

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

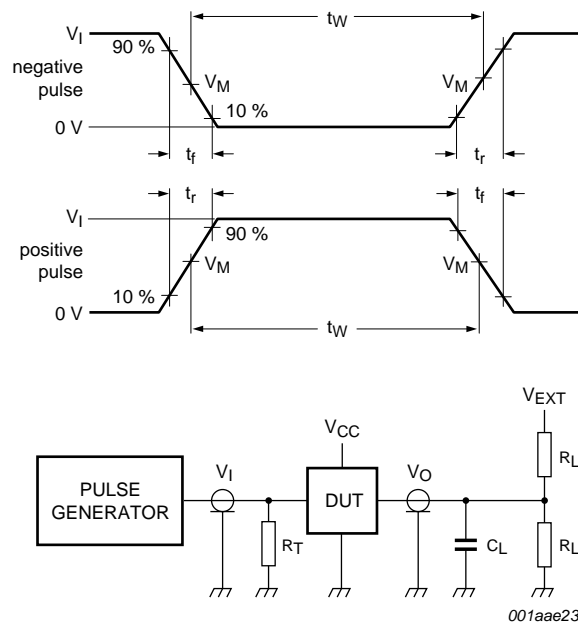
**Fig 8. Enable and disable times for input 1OE**



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

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

**Fig 9. Enable and disable times for input 2OE**



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.

$V_{EXT}$  = Test voltage for switching times.

**Fig 10. Test circuit for measuring switching times**

**Table 10. Test data**

| Supply voltage   | Input    | Load  |              | $V_{EXT}$          |                    |                    |
|------------------|----------|-------|--------------|--------------------|--------------------|--------------------|
|                  | $V_I$    | $C_L$ | $R_L$        | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 1.65 V to 1.95 V | $V_{CC}$ | 30 pF | 1 k $\Omega$ | open               | GND                | $2 \times V_{CC}$  |
| 2.3 V to 2.7 V   | $V_{CC}$ | 30 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |
| 2.7 V            | 2.7 V    | 50 pF | 500 $\Omega$ | open               | GND                | 6 V                |
| 3.0 V to 3.6 V   | 2.7 V    | 50 pF | 500 $\Omega$ | open               | GND                | 6 V                |
| 4.5 V to 5.5 V   | $V_{CC}$ | 50 pF | 500 $\Omega$ | open               | GND                | $2 \times V_{CC}$  |

13. Package outline

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

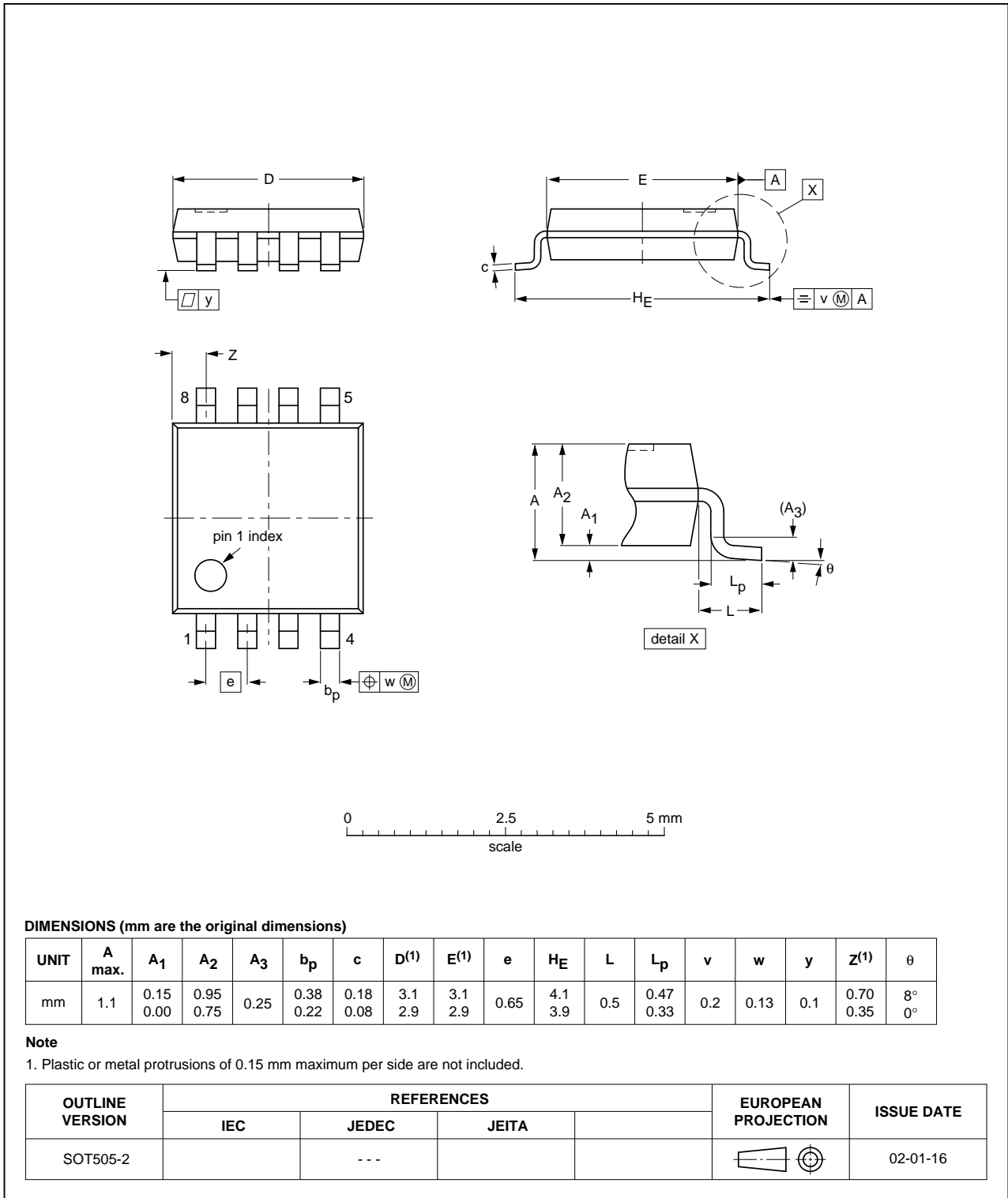


Fig 11. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

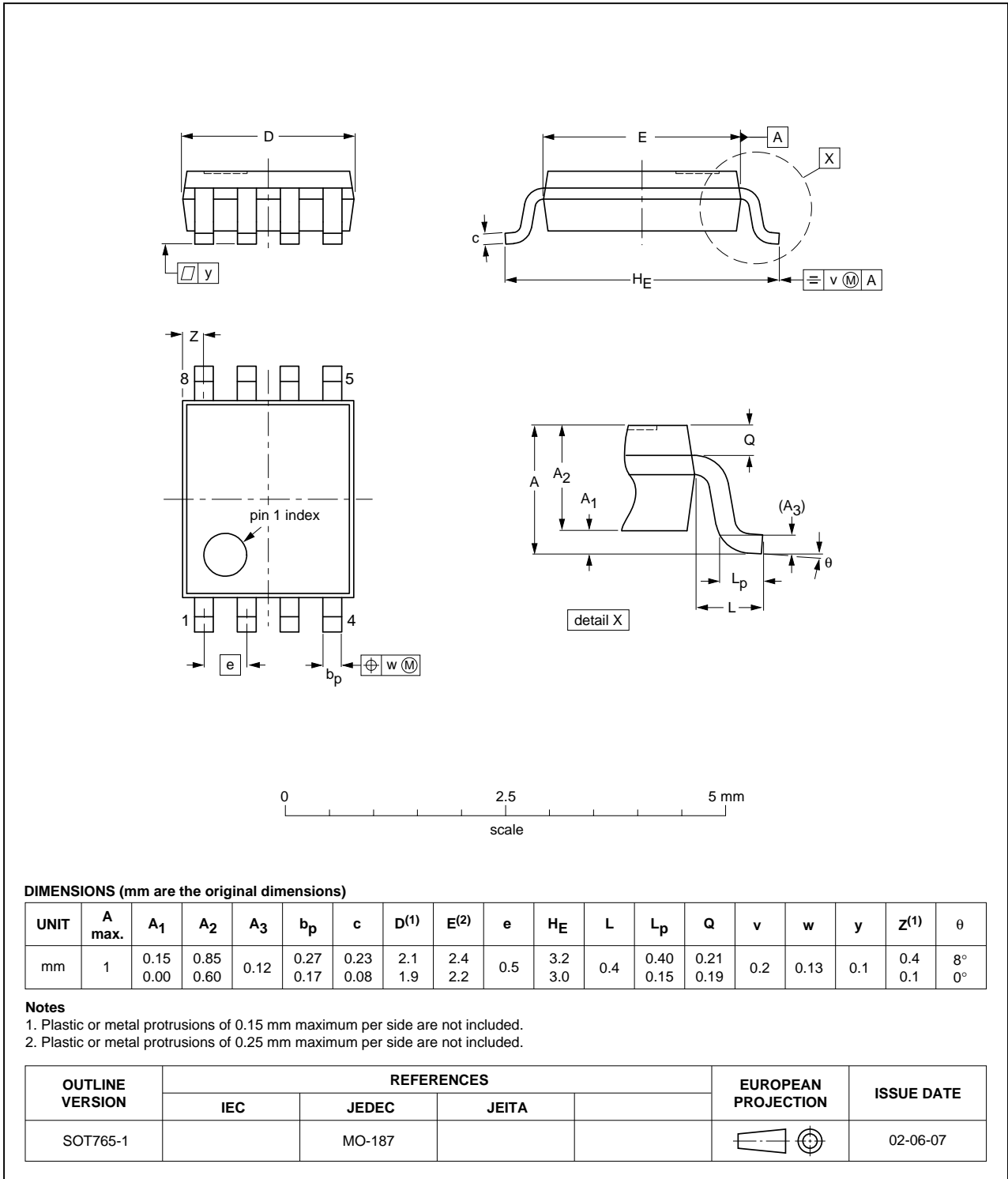


Fig 12. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

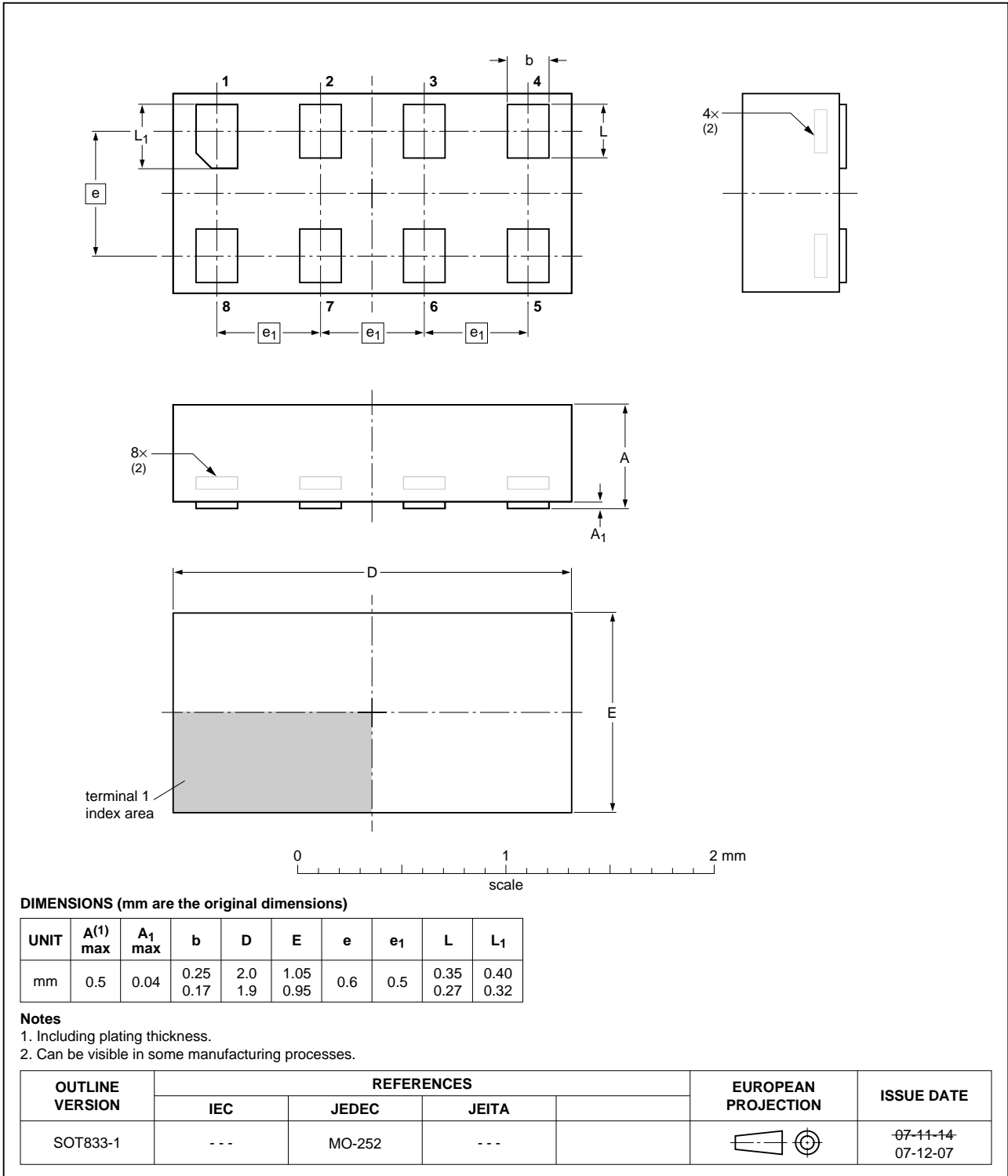
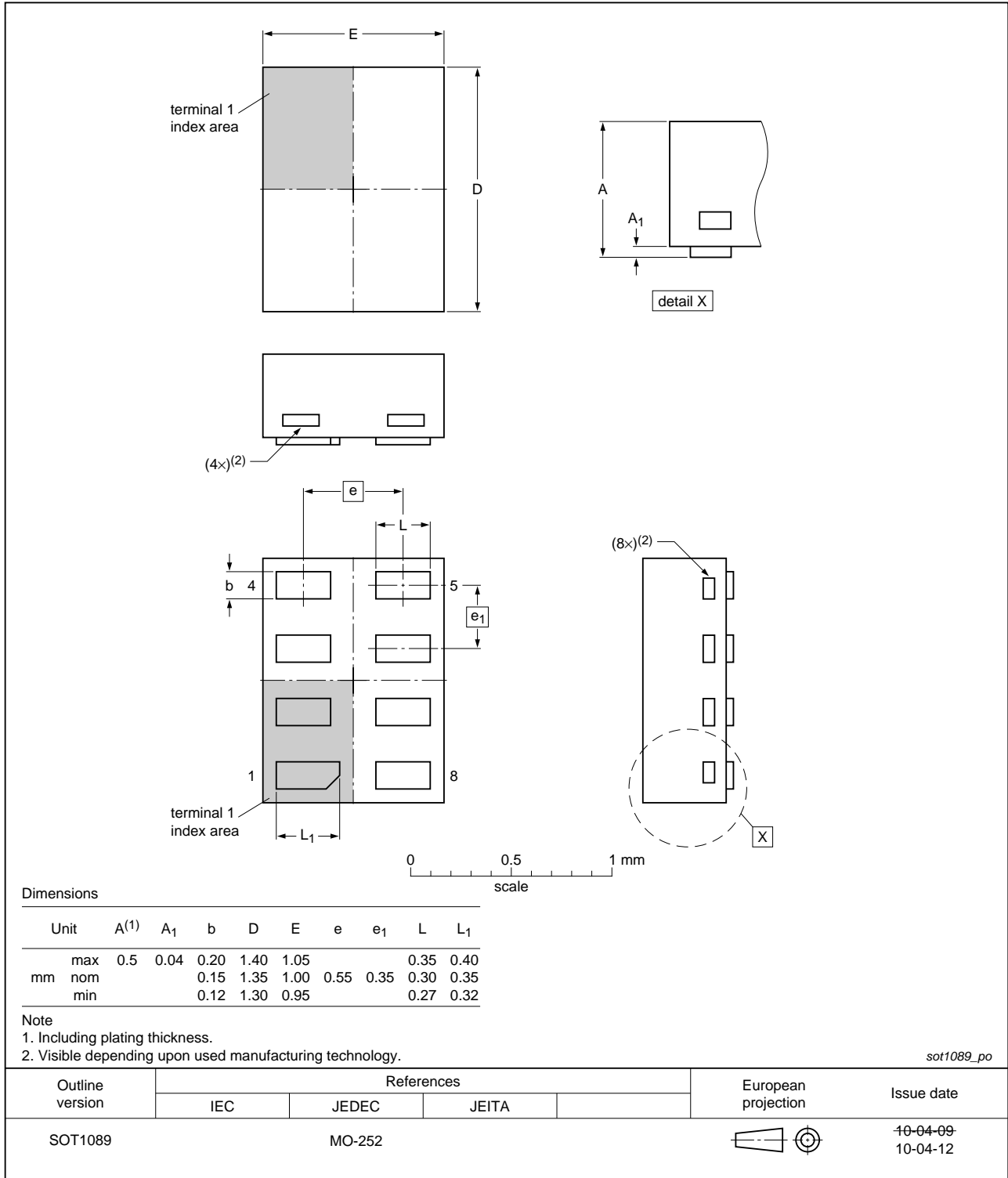


Fig 13. Package outline SOT833-1 (XSON8)

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

**SOT1089**



**Fig 14. Package outline SOT1089 (XSON8)**

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

SOT996-2

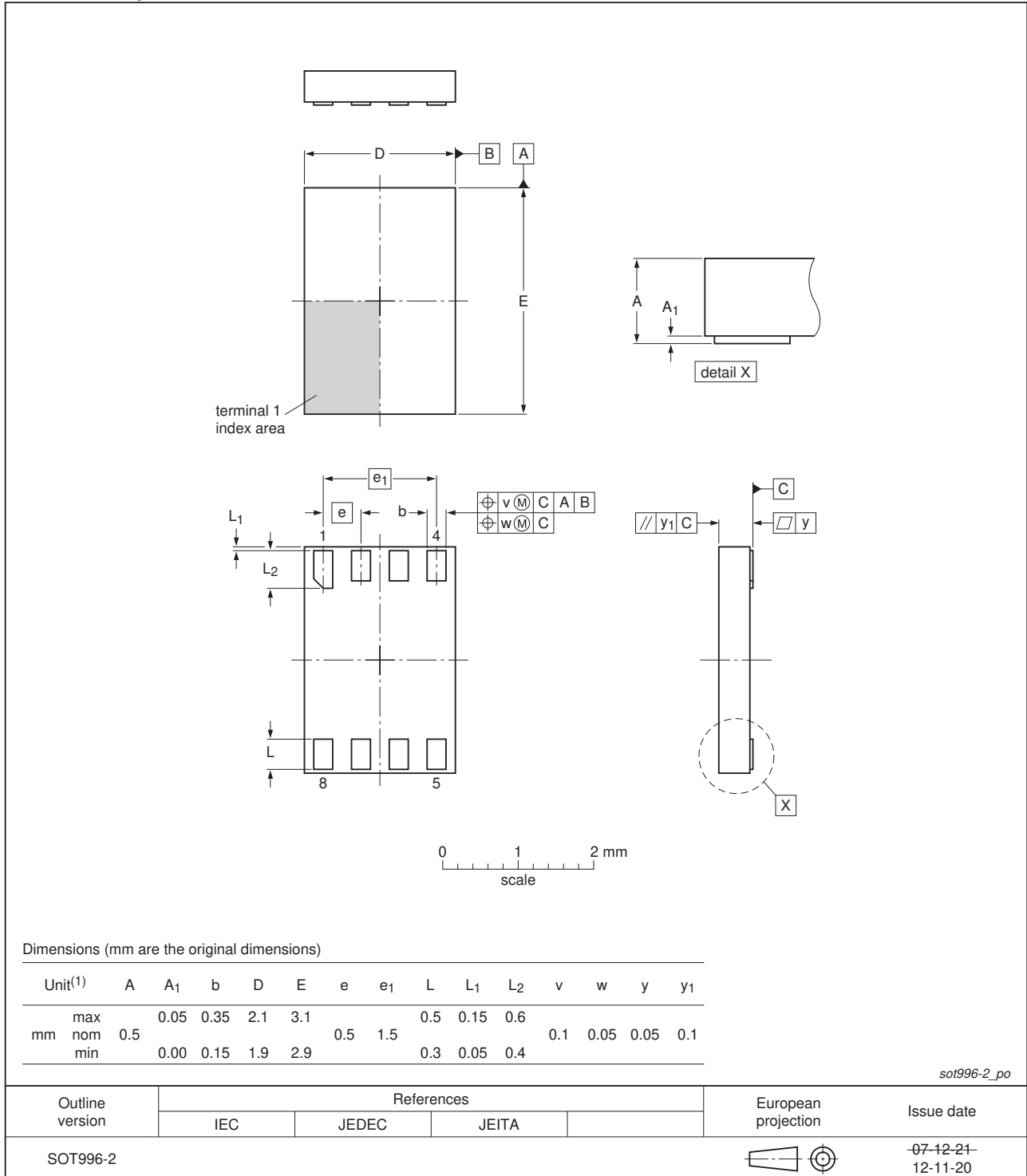


Fig 15. Package outline SOT996-2 (XSON8)



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

SOT902-2

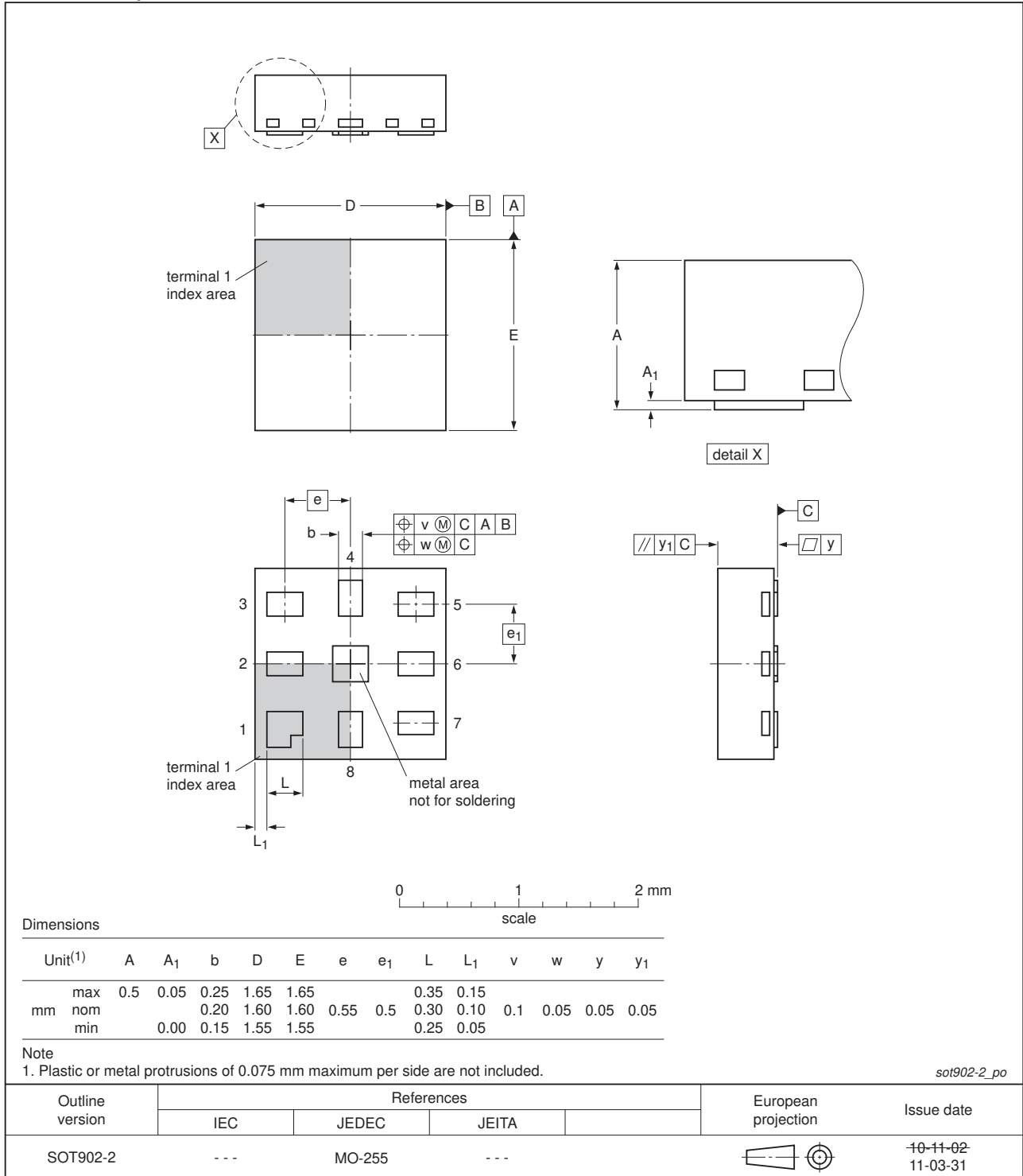


Fig 16. Package outline SOT902-2 (XQFN8)

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

SOT1116

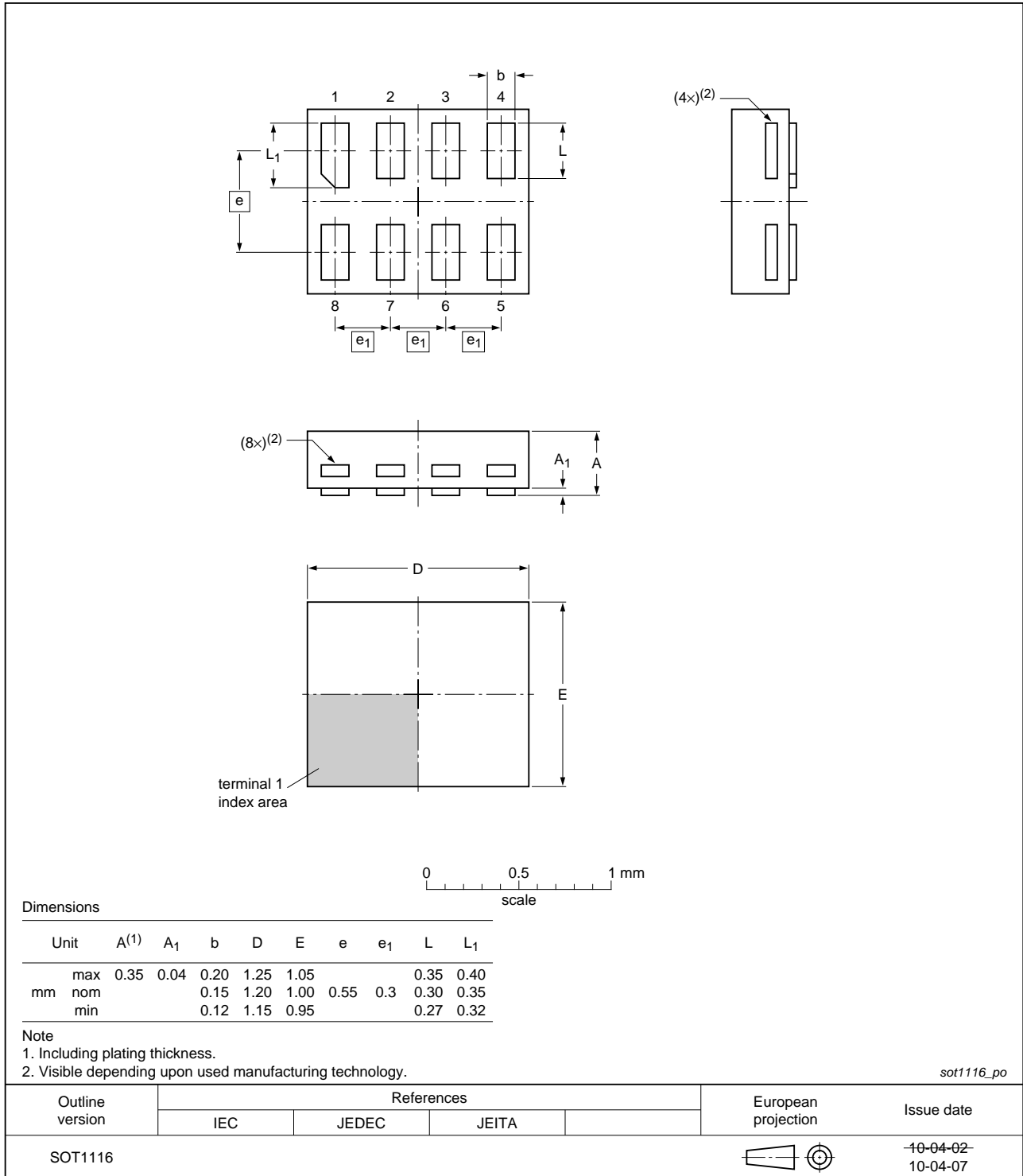


Fig 17. Package outline SOT1116 (XSON8)

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

SOT1203

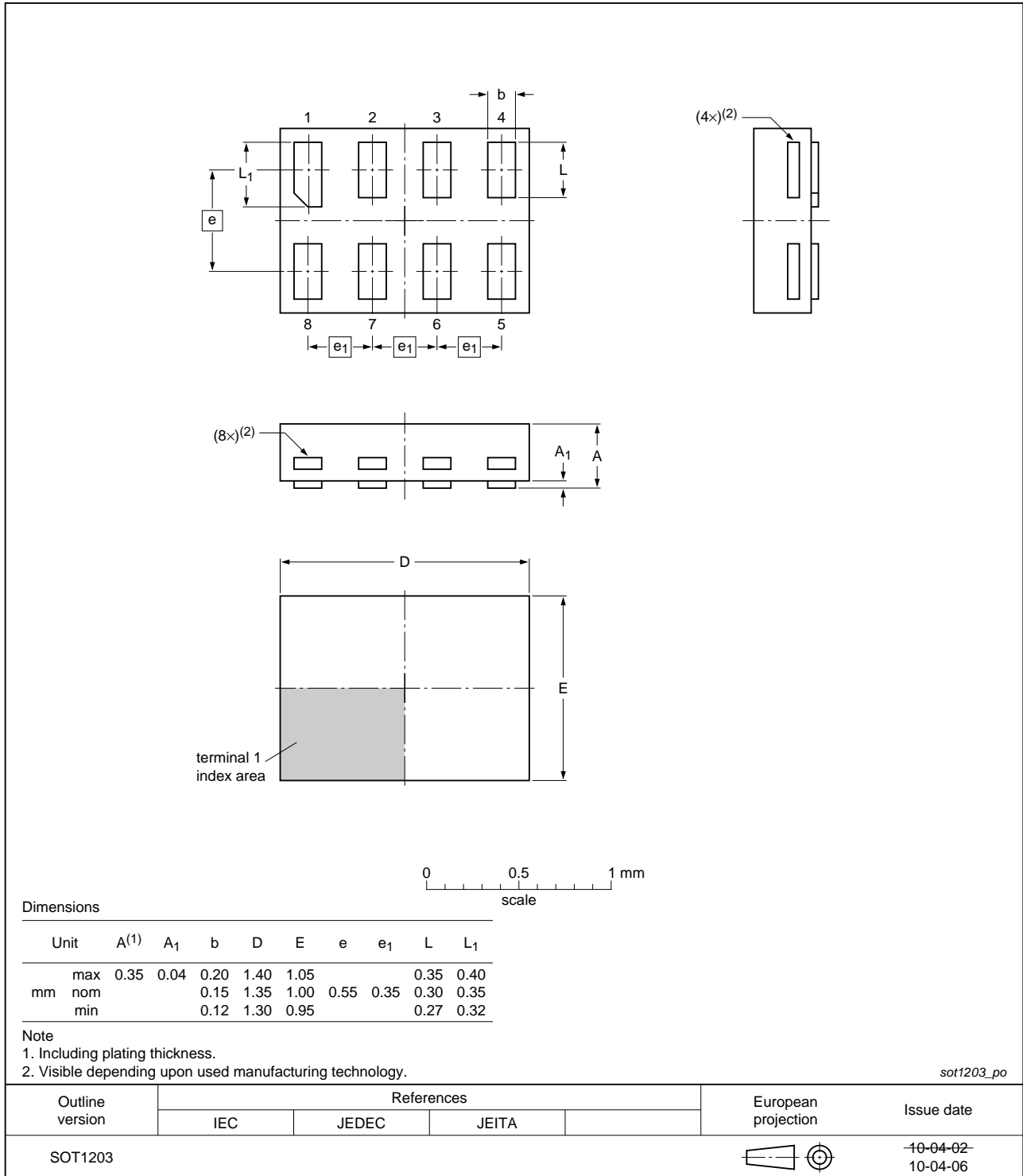


Fig 18. Package outline SOT1203 (XSON8)

## 14. 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             |

## 15. Revision history

Table 12. Revision history

| Document ID     | Release date   | Data sheet status     | Change notice | Supersedes      |
|-----------------|--|-----------------------|---------------|-----------------|
| 74LVC2G241 v.13 | 20130408   | Product data sheet    | -             | 74LVC2G241 v.12 |
| Modifications:  | <ul style="list-style-type: none"> <li>For type number 74LVC2G241GD XSON8U has changed to XSON8.</li> </ul>          |                       |               |                 |
| 74LVC2G241 v.12 | 20120622   | Product data sheet    | -             | 74LVC2G241 v.11 |
| Modifications:  | <ul style="list-style-type: none"> <li>For type number 74LVC2G241GM the SOT code has changed to SOT902-2.</li> </ul> |                       |               |                 |
| 74LVC2G241 v.11 | 20111129   | Product data sheet    | -             | 74LVC2G241 v.10 |
| Modifications:  | <ul style="list-style-type: none"> <li>Legal pages updated.</li> </ul>   |                       |               |                 |
| 74LVC2G241 v.10 | 20100806   | Product data sheet    | -             | 74LVC2G241 v.9  |
| 74LVC2G241 v.9  | 20080610   | Product data sheet    | -             | 74LVC2G241 v.8  |
| 74LVC2G241 v.8  | 20080312   | Product data sheet    | -             | 74LVC2G241 v.7  |
| 74LVC2G241 v.7  | 20071005   | Product data sheet    | -             | 74LVC2G241 v.6  |
| 74LVC2G241 v.6  | 20060922   | Product data sheet    | -             | 74LVC2G241 v.5  |
| 74LVC2G241 v.5  | 20050202   | Product specification | -             | 74LVC2G241 v.4  |
| 74LVC2G241 v.4  | 20040922   | Product specification | -             | 74LVC2G241 v.3  |
| 74LVC2G241 v.3  | 20030311   | Product specification | -             | 74LVC2G241 v.2  |
| 74LVC2G241 v.2  | 20030129   | Product specification | -             | 74LVC2G241 v.1  |
| 74LVC2G241 v.1  | 20021030   | Product specification | -             | -               |

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| 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.                                     |

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