

# 74AUP3G04

## Low-power triple inverter

Rev. 7 — 29 January 2013

Product data sheet

## 1. General description

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The 74AUP3G04 provides a low-power, low-voltage triple inverting buffer.

Schmitt trigger action at all inputs makes the circuit tolerant of slower input rise and fall times across the entire  $V_{CC}$  range from 0.8 V to 3.6 V.

This device ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range from 0.8 V to 3.6 V.

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

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- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Complies with JEDEC standards:
  - ◆ JESD8-12 (0.8 V to 1.3 V)
  - ◆ JESD8-11 (0.9 V to 1.65 V)
  - ◆ JESD8-7 (1.2 V to 1.95 V)
  - ◆ JESD8-5 (1.8 V to 2.7 V)
  - ◆ JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - ◆ HBM JESD22-A114F Class 3A exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101E exceeds 1000 V
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78B Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of  $V_{CC}$
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from  $-40 \text{ }^\circ\text{C}$  to  $+85 \text{ }^\circ\text{C}$  and  $-40 \text{ }^\circ\text{C}$  to  $+125 \text{ }^\circ\text{C}$



### 3. Ordering information

Table 1. Ordering information

| Type number | Package           |        |   |          |
|-------------|-------------------|--------|---|----------|
|             | Temperature range | Name   | Description   | Version  |
| 74AUP3G04DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                  | SOT765-1 |
| 74AUP3G04GT | -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 |
| 74AUP3G04GF | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm         | SOT1089  |
| 74AUP3G04GD | -40 °C to +125 °C | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 3 × 2 × 0.5 mm    | SOT996-2 |
| 74AUP3G04GM | -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 |
| 74AUP3G04GN | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm       | SOT1116  |
| 74AUP3G04GS | -40 °C to +125 °C | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm      | SOT1203  |

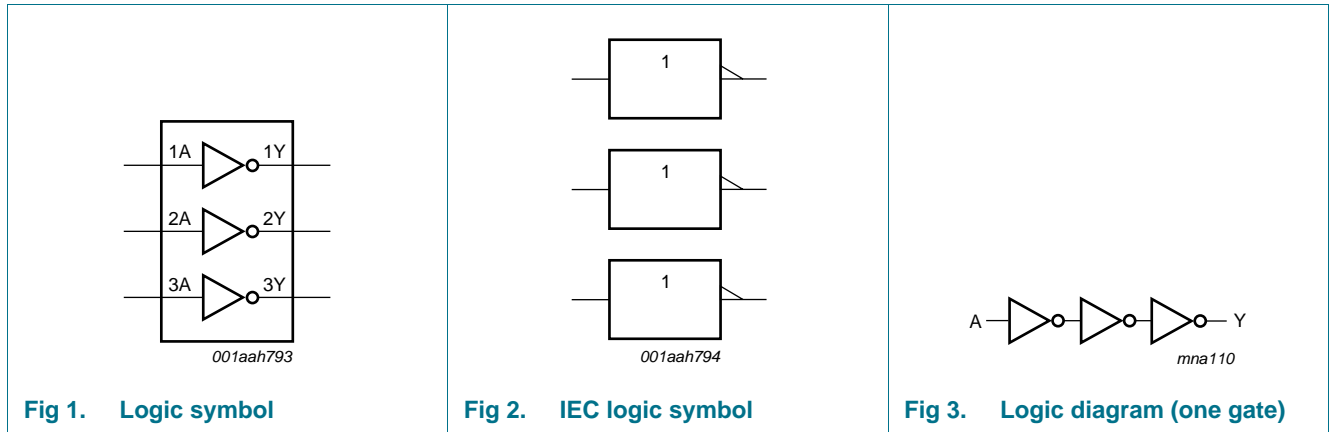
### 4. Marking

Table 2. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74AUP3G04DC | p04                         |
| 74AUP3G04GT | p04                         |
| 74AUP3G04GF | p4                          |
| 74AUP3G04GD | p04                         |
| 74AUP3G04GM | p04                         |
| 74AUP3G04GN | p4                          |
| 74AUP3G04GS | p4                          |

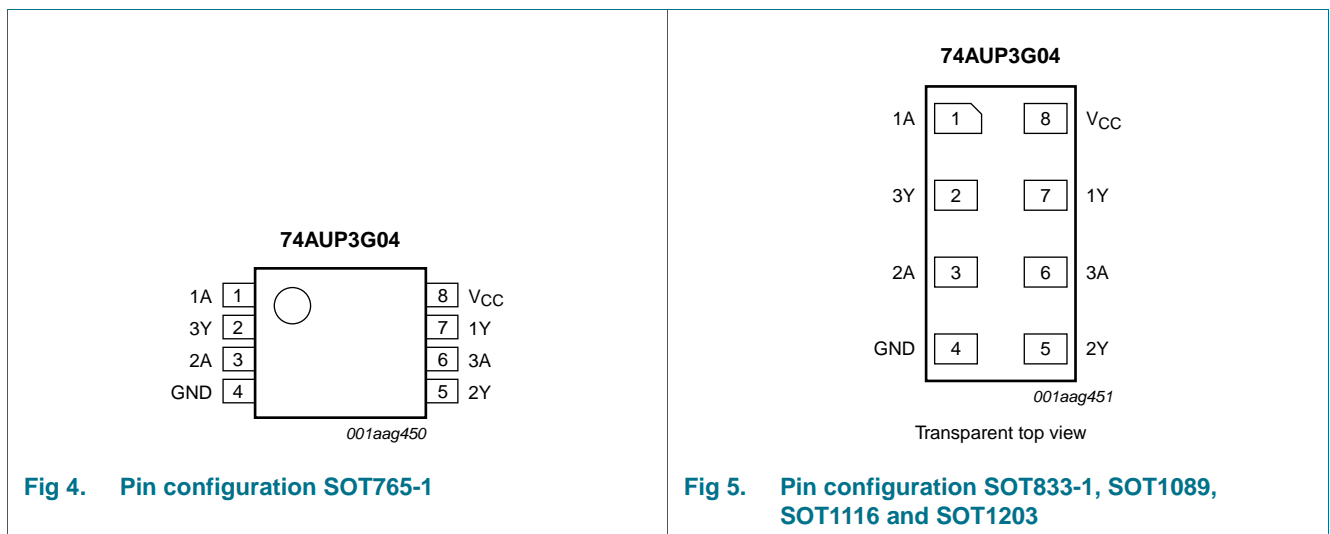
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

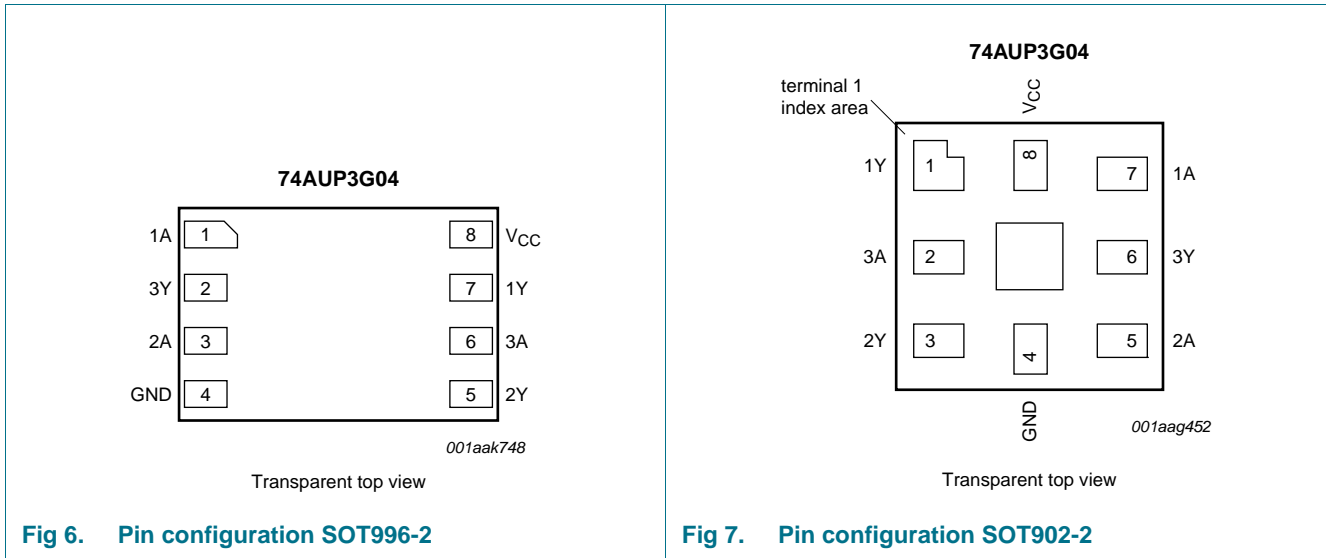
**5. Functional diagram**



**6. Pinning information**

**6.1 Pinning**





### 6.2 Pin description

Table 3. Pin description

| Symbol          | Pin  |          | Description    |
|-----------------|--|----------|----------------|
|                 | SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203 | SOT902-2 |                |
| 1A, 2A, 3A      | 1, 3, 6  | 7, 5, 2  | data input     |
| 1Y, 2Y, 3Y      | 7, 5, 2  | 1, 3, 6  | data output    |
| GND             | 4  | 4        | ground (0 V)   |
| V <sub>CC</sub> | 8  | 8        | supply voltage |

## 7. Functional description

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

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

[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     | +4.6     | V    |
| $I_{IK}$  | input clamping current  | $V_I < 0$ V                     | -50      | -        | mA   |
| $V_I$     | input voltage           |                                 | [1] -0.5 | +4.6     | V    |
| $I_{OK}$  | output clamping current | $V_O < 0$ V                     | -50      | -        | mA   |
| $V_O$     | output voltage          | Active mode and Power-down mode | [1] -0.5 | +4.6     | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CC}$         | -        | $\pm 20$ | mA   |
| $I_{CC}$  | supply current          |                                 | -        | 50       | mA   |
| $I_{GND}$ | ground current          |                                 | -50      | -        | mA   |
| $T_{stg}$ | storage temperature     |                                 | -65      | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to +125 °C   | [2] -    | 250      | mW   |

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

[2] For VSSOP8 packages: above 110 °C the value of  $P_{tot}$  derates linearly with 8.0 mW/K.  
For XSON8 and XQFN8 packages: above 118 °C the value of  $P_{tot}$  derates linearly with 7.8 mW/K.

## 9. Recommended operating conditions

**Table 6. Operating conditions**

| Symbol              | Parameter                           | Conditions                      | Min | Max      | Unit |
|---------------------|-------------------------------------|---------------------------------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                                 | 0.8 | 3.6      | V    |
| $V_I$               | input voltage                       |                                 | 0   | 3.6      | V    |
| $V_O$               | output voltage                      | Active mode                     | 0   | $V_{CC}$ | V    |
|                     |                                     | Power-down mode; $V_{CC} = 0$ V | 0   | 3.6      | V    |
| $T_{amb}$           | ambient temperature                 |                                 | -40 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 0.8$ V to 3.6 V       | -   | 200      | 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  | Max                 | Unit |
|--------------------------------|--|--|-----------------------|------|---------------------|------|
| <b>T<sub>amb</sub> = 25 °C</b> |  |  |                       |      |                     |      |
| V <sub>IH</sub>                | HIGH-level input voltage                         | V <sub>CC</sub> = 0.8 V  | 0.70V <sub>CC</sub>   | -    | -                   | V    |
|                                |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | 0.65V <sub>CC</sub>   | -    | -                   | V    |
|                                |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.6                   | -    | -                   | V    |
|                                |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | 2.0                   | -    | -                   | V    |
| V <sub>IL</sub>                | LOW-level input voltage                          | V <sub>CC</sub> = 0.8 V  | -                     | -    | 0.30V <sub>CC</sub> | V    |
|                                |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | -                     | -    | 0.35V <sub>CC</sub> | V    |
|                                |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                     | -    | 0.7                 | V    |
|                                |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                     | -    | 0.9                 | 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> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | V <sub>CC</sub> - 0.1 | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V  | 0.75V <sub>CC</sub>   | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V  | 1.11                  | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V   | 1.32                  | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V  | 2.05                  | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V  | 1.9                   | -    | -                   | V    |
|                                |  | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V  | 2.72                  | -    | -                   | 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> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | -                     | -    | 0.1                 | V    |
|                                |  | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V   | -                     | -    | 0.3V <sub>CC</sub>  | V    |
|                                |  | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V   | -                     | -    | 0.31                | V    |
|                                |  | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V  | -                     | -    | 0.31                | V    |
|                                |  | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V   | -                     | -    | 0.31                | V    |
|                                |  | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V   | -                     | -    | 0.44                | V    |
|                                |  | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V   | -                     | -    | 0.31                | V    |
|                                | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V | -  | -                     | 0.44 | V                   |      |
| I <sub>I</sub>                 | input leakage current                            | V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V                                    | -                     | -    | ±0.1                | μA   |
| I <sub>OFF</sub>               | power-off leakage current                        | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V                           | -                     | -    | ±0.2                | μA   |
| ΔI <sub>OFF</sub>              | additional power-off leakage current             | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V                  | -                     | -    | ±0.2                | μA   |
| I <sub>CC</sub>                | supply current                                   | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V | -                     | -    | 0.5                 | μA   |
| ΔI <sub>CC</sub>               | additional supply current                        | V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V          | -                     | -    | 40                  | μA   |
| C <sub>I</sub>                 | input capacitance                                | V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>                          | -                     | 1.0  | -                   | pF   |
| C <sub>O</sub>                 | output capacitance                               | V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V  | -                     | 1.8  | -                   | pF   |

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

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

| Symbol                                    | Parameter  | Conditions   | Min                   | Typ  | 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> = 0.8 V  | 0.70V <sub>CC</sub>   | -    | -                   | V    |
|   |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | 0.65V <sub>CC</sub>   | -    | -                   | V    |
|   |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.6                   | -    | -                   | V    |
|   |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | 2.0                   | -    | -                   | V    |
| V <sub>IL</sub>                           | LOW-level input voltage                          | V <sub>CC</sub> = 0.8 V  | -                     | -    | 0.30V <sub>CC</sub> | V    |
|   |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | -                     | -    | 0.35V <sub>CC</sub> | V    |
|   |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                     | -    | 0.7                 | V    |
|   |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                     | -    | 0.9                 | 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> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | V <sub>CC</sub> - 0.1 | -    | -                   | V    |
|   |  | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V  | 0.7V <sub>CC</sub>    | -    | -                   | V    |
|   |  | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V  | 1.03                  | -    | -                   | V    |
|   |  | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V   | 1.30                  | -    | -                   | V    |
|   |  | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V  | 1.97                  | -    | -                   | V    |
|   |  | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V  | 1.85                  | -    | -                   | V    |
|   |  | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V  | 2.67                  | -    | -                   | 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> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | -                     | -    | 0.1                 | V    |
|   |  | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V   | -                     | -    | 0.3V <sub>CC</sub>  | V    |
|   |  | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V   | -                     | -    | 0.37                | V    |
|   |  | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V  | -                     | -    | 0.35                | V    |
|   |  | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V   | -                     | -    | 0.33                | V    |
|   |  | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V   | -                     | -    | 0.45                | V    |
|   |  | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V   | -                     | -    | 0.33                | V    |
|   | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V | -  | -                     | 0.45 | V                   |      |
| I <sub>I</sub>                            | input leakage current                            | V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V                                    | -                     | -    | ±0.5                | μA   |
| I <sub>OFF</sub>                          | power-off leakage current                        | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V                           | -                     | -    | ±0.5                | μA   |
| ΔI <sub>OFF</sub>                         | additional power-off leakage current             | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V                  | -                     | -    | ±0.6                | μA   |
| I <sub>CC</sub>                           | supply current                                   | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V | -                     | -    | 0.9                 | μA   |
| ΔI <sub>CC</sub>                          | additional supply current                        | V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V          | -                     | -    | 50                  | μA   |

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

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

| Symbol                                     | Parameter  | Conditions   | Min                    | Typ  | 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> = 0.8 V  | 0.75V <sub>CC</sub>    | -    | -                   | V    |
|  |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | 0.70V <sub>CC</sub>    | -    | -                   | V    |
|  |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.6                    | -    | -                   | V    |
|  |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | 2.0                    | -    | -                   | V    |
| V <sub>IL</sub>                            | LOW-level input voltage                          | V <sub>CC</sub> = 0.8 V  | -                      | -    | 0.25V <sub>CC</sub> | V    |
|  |  | V <sub>CC</sub> = 0.9 V to 1.95 V  | -                      | -    | 0.30V <sub>CC</sub> | V    |
|  |  | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                      | -    | 0.7                 | V    |
|  |  | V <sub>CC</sub> = 3.0 V to 3.6 V   | -                      | -    | 0.9                 | 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> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V  | V <sub>CC</sub> - 0.11 | -    | -                   | V    |
|  |  | I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V  | 0.6V <sub>CC</sub>     | -    | -                   | V    |
|  |  | I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V  | 0.93                   | -    | -                   | V    |
|  |  | I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V   | 1.17                   | -    | -                   | V    |
|  |  | I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V  | 1.77                   | -    | -                   | V    |
|  |  | I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V  | 1.67                   | -    | -                   | V    |
|  |  | I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V  | 2.40                   | -    | -                   | 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> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V   | -                      | -    | 0.11                | V    |
|  |  | I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V   | -                      | -    | 0.33V <sub>CC</sub> | V    |
|  |  | I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V   | -                      | -    | 0.41                | V    |
|  |  | I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V  | -                      | -    | 0.39                | V    |
|  |  | I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V   | -                      | -    | 0.36                | V    |
|  |  | I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V   | -                      | -    | 0.50                | V    |
|  |  | I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V   | -                      | -    | 0.36                | V    |
|  | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V | -  | -                      | 0.50 | V                   |      |
| I <sub>I</sub>                             | input leakage current                            | V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V                                    | -                      | -    | ±0.75               | μA   |
| I <sub>OFF</sub>                           | power-off leakage current                        | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V                           | -                      | -    | ±0.75               | μA   |
| ΔI <sub>OFF</sub>                          | additional power-off leakage current             | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V                  | -                      | -    | ±0.75               | μA   |
| I <sub>CC</sub>                            | supply current                                   | V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V | -                      | -    | 1.4                 | μA   |
| ΔI <sub>CC</sub>                           | additional supply current                        | V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V          | -                      | -    | 75                  | μA   |



## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

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

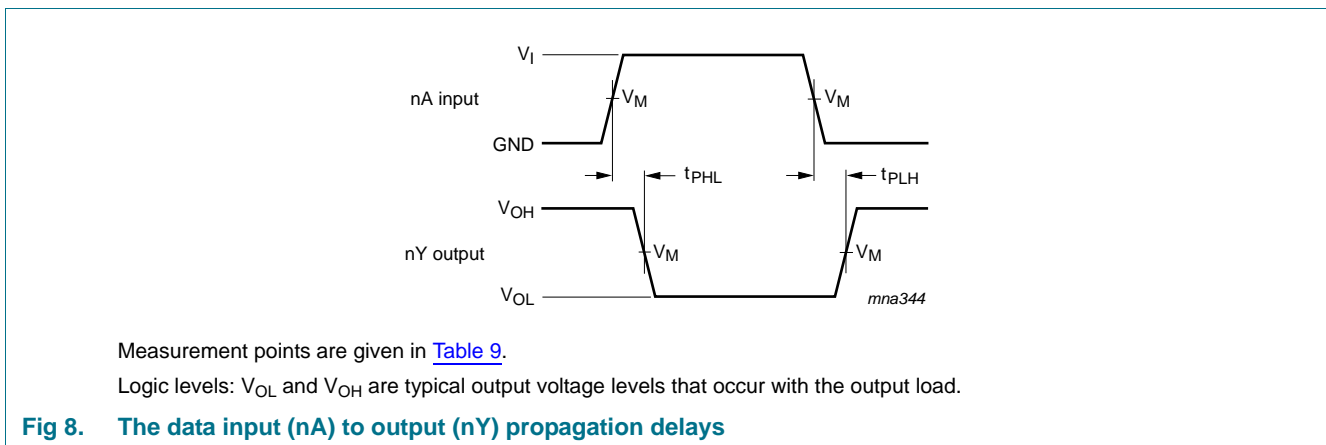
| Symbol                       | Parameter         | Conditions                             | 25 °C               |                    |      | -40 °C to +125 °C |             |              | Unit |
|------------------------------|-------------------|--|---------------------|--------------------|------|-------------------|-------------|--------------|------|
|                              |                   |  | Min                 | Typ <sup>[1]</sup> | Max  | Min               | Max (85 °C) | Max (125 °C) |      |
| <b>C<sub>L</sub> = 5 pF</b>  |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 16.0               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 2.4                 | 5.0                | 10.3 | 2.1               | 11.4        | 12.6         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 1.8                 | 3.6                | 6.4  | 1.6               | 7.4         | 8.2          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 1.5                 | 2.9                | 5.0  | 1.4               | 5.9         | 6.5          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 1.2                 | 2.4                | 3.9  | 1.1               | 4.5         | 5.0          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 1.1                 | 2.1                | 3.2  | 1.0               | 3.9         | 4.3          | ns   |
| <b>C<sub>L</sub> = 10 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 19.8               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 2.8                 | 5.9                | 12.2 | 2.6               | 13.7        | 15.1         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 2.3                 | 4.2                | 7.5  | 2.1               | 8.7         | 9.6          | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 2.0                 | 3.5                | 5.9  | 1.8               | 7.0         | 7.7          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 1.7                 | 2.9                | 4.6  | 1.5               | 5.4         | 6.0          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 1.6                 | 2.7                | 3.8  | 1.4               | 4.5         | 5.0          | ns   |
| <b>C<sub>L</sub> = 15 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 23.3               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 3.2                 | 6.7                | 13.0 | 3.0               | 15.8        | 17.4         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 2.6                 | 4.7                | 8.6  | 2.4               | 10.0        | 11.0         | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 2.3                 | 4.0                | 6.7  | 2.1               | 8.0         | 8.8          | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 2.1                 | 3.3                | 5.1  | 1.8               | 6.1         | 6.8          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 2.0                 | 3.1                | 4.2  | 1.8               | 5.0         | 5.5          | ns   |
| <b>C<sub>L</sub> = 30 pF</b> |                   |  |                     |                    |      |                   |             |              |      |
| t <sub>pd</sub>              | propagation delay | nA to nY; see <a href="#">Figure 8</a> | <a href="#">[2]</a> |                    |      |                   |             |              |      |
|                              |                   | V <sub>CC</sub> = 0.8 V                | -                   | 33.6               | -    | -                 | -           | -            | ns   |
|                              |                   | V <sub>CC</sub> = 1.1 V to 1.3 V       | 4.4                 | 8.9                | 16.0 | 4.0               | 19.0        | 20.9         | ns   |
|                              |                   | V <sub>CC</sub> = 1.4 V to 1.6 V       | 3.6                 | 6.3                | 10.8 | 3.2               | 12.9        | 14.2         | ns   |
|                              |                   | V <sub>CC</sub> = 1.65 V to 1.95 V     | 3.2                 | 5.3                | 9.0  | 2.9               | 10.5        | 11.6         | ns   |
|                              |                   | V <sub>CC</sub> = 2.3 V to 2.7 V       | 2.9                 | 4.5                | 6.5  | 2.6               | 7.6         | 8.4          | ns   |
|                              |                   | V <sub>CC</sub> = 3.0 V to 3.6 V       | 2.9                 | 4.2                | 5.4  | 2.6               | 6.2         | 6.9          | ns   |

**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 9](#).

| Symbol  | Parameter                     | Conditions  | 25 °C |                    |     | -40 °C to +125 °C |             |              | Unit |
|---|-------------------------------|---|-------|--------------------|-----|-------------------|-------------|--------------|------|
|   |                               |   | Min   | Typ <sup>[1]</sup> | Max | Min               | Max (85 °C) | Max (125 °C) |      |
| <b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b> |                               |   |       |                    |     |                   |             |              |      |
| C <sub>PD</sub>                                     | power dissipation capacitance | f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[3][4]</sup> |       |                    |     |                   |             |              |      |
|   |                               | V <sub>CC</sub> = 0.8 V   | -     | 2.5                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.1 V to 1.3 V  | -     | 2.7                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.4 V to 1.6 V  | -     | 2.8                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 1.65 V to 1.95 V  | -     | 3.0                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 2.3 V to 2.7 V  | -     | 3.5                | -   | -                 | -           | -            | pF   |
|   |                               | V <sub>CC</sub> = 3.0 V to 3.6 V  | -     | 4.0                | -   | -                 | -           | -            | pF   |

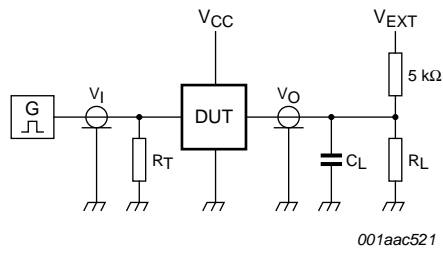
- [1] All typical values are measured at nominal V<sub>CC</sub>.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] All specified values are the average typical values over all stated loads.
- [4] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz;  
 f<sub>o</sub> = output frequency in MHz;  
 C<sub>L</sub> = load capacitance in pF;  
 V<sub>CC</sub> = supply voltage in V;  
 N = number of inputs switching;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

## 12. Waveforms



**Table 9. Measurement points**

| Supply voltage  | Output             | Input              |                 | t <sub>r</sub> = t <sub>f</sub> |
|-----------------|--------------------|--------------------|-----------------|---------------------------------|
| V <sub>CC</sub> | V <sub>M</sub>     | V <sub>M</sub>     | V <sub>I</sub>  |                                 |
| 0.8 V to 3.6 V  | 0.5V <sub>CC</sub> | 0.5V <sub>CC</sub> | V <sub>CC</sub> | ≤ 3.0 ns                        |



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 the output impedance  $Z_o$  of the pulse generator.

$V_{EXT}$  = External voltage for measuring switching times.

**Fig 9. Test circuit for measuring switching times**

**Table 10. Test data**

| Supply voltage | Load                          |              | $V_{EXT}$          |                    |                    |
|----------------|-------------------------------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$       | $C_L$                         | $R_L$ [1]    | $t_{PLH}, t_{PHL}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 0.8 V to 3.6 V | 5 pF, 10 pF, 15 pF, and 30 pF | 5 kΩ or 1 MΩ | open               | GND                | $2V_{CC}$          |

[1] For measuring enable and disable times,  $R_L = 5\text{ k}\Omega$ .

For measuring propagation delays, setup and hold times, and pulse width,  $R_L = 1\text{ M}\Omega$ .

13. Package outline

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

SOT765-1

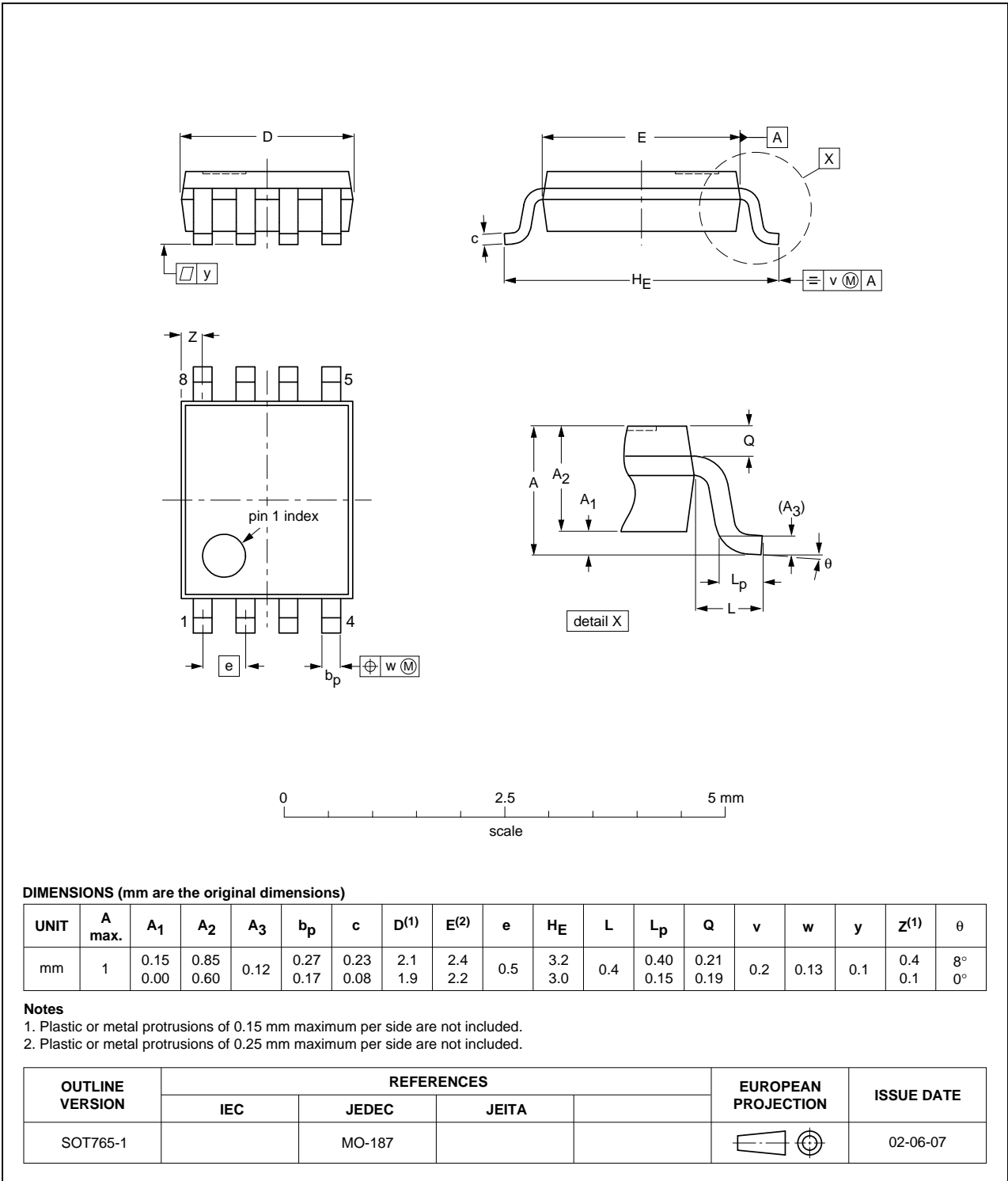


Fig 10. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

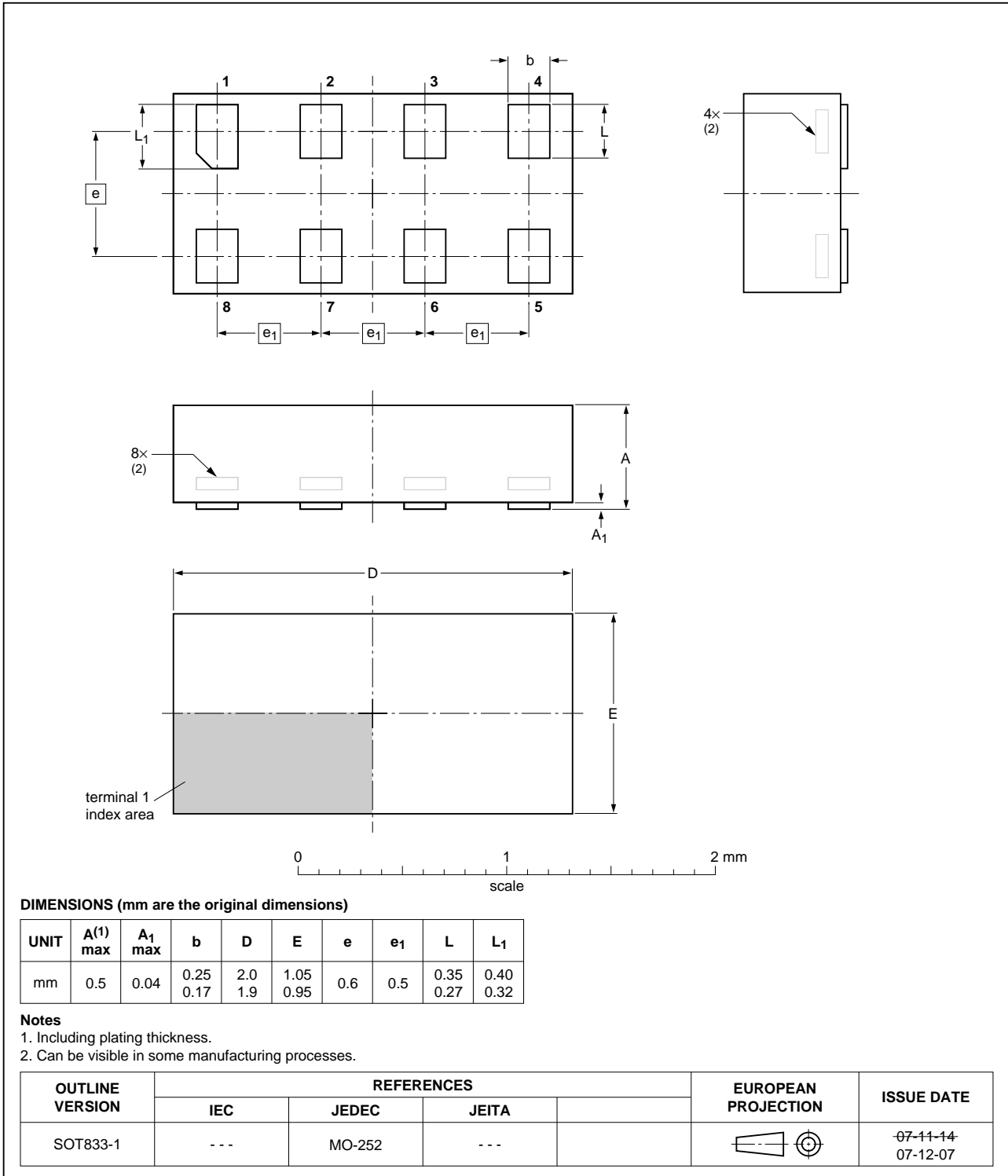
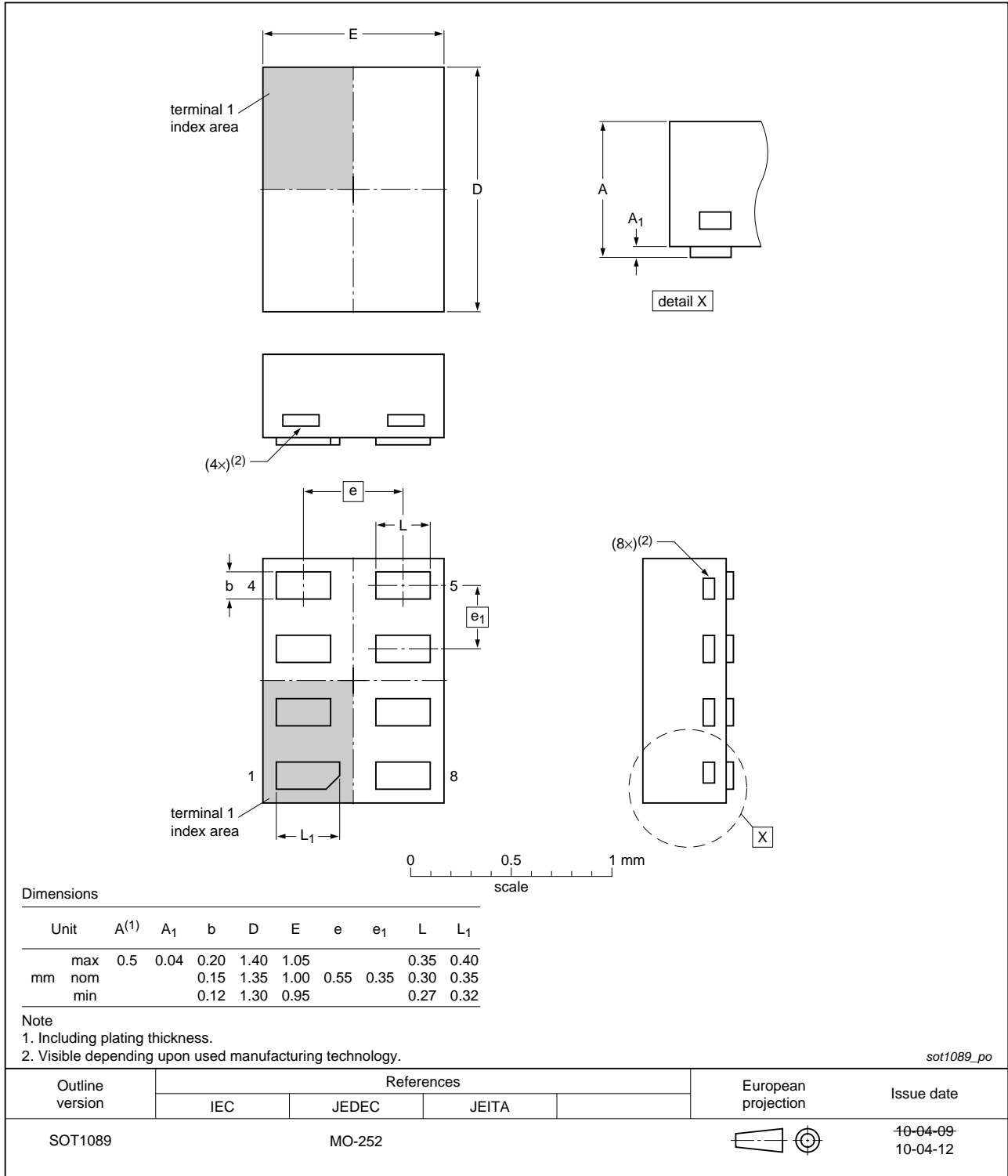


Fig 11. Package outline SOT833-1 (XSON8)

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

**SOT1089**



**Fig 12. 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

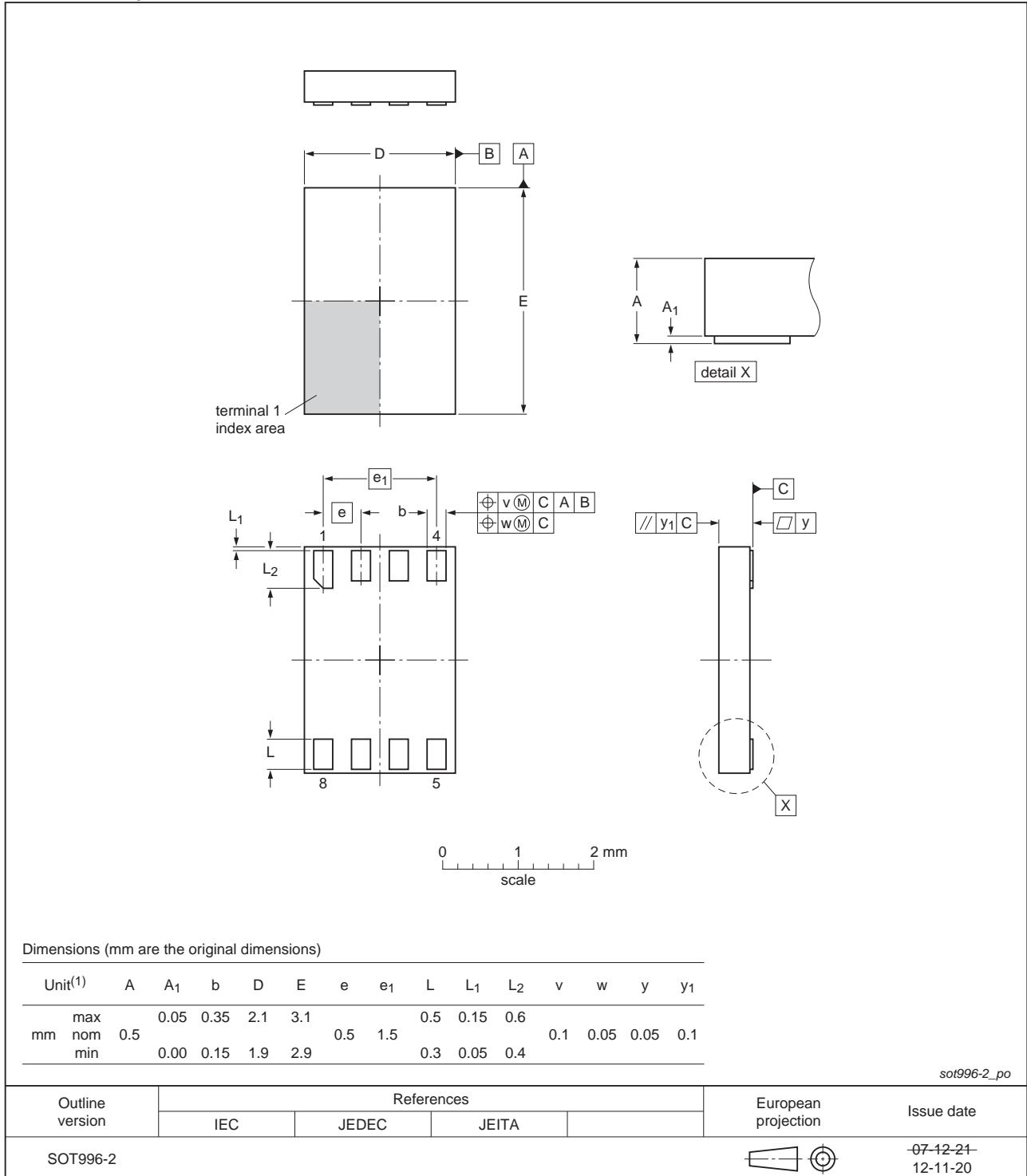


Fig 13. Package outline SOT996-2 (XSON8)

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

SOT902-2

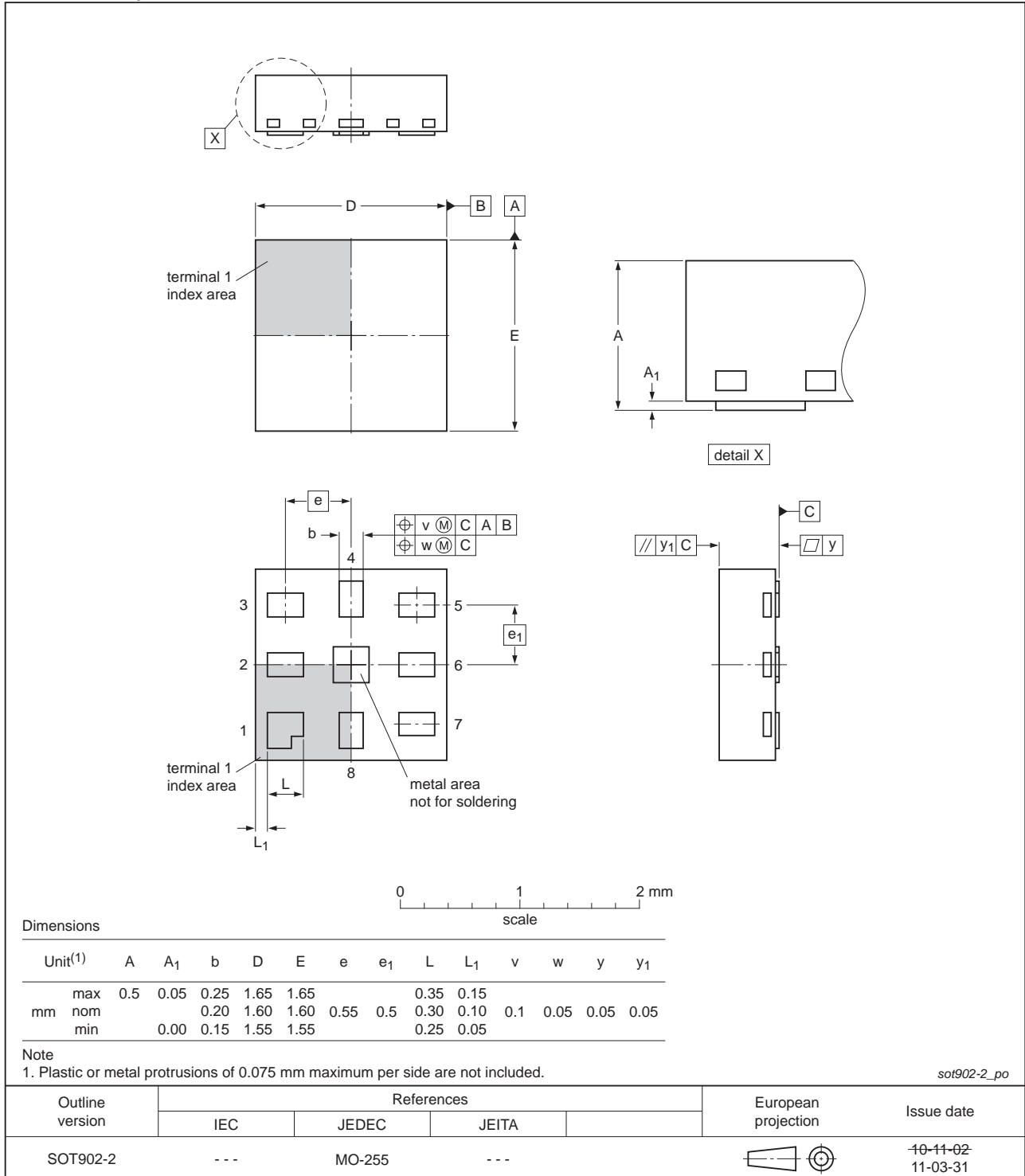


Fig 14. Package outline SOT902-2 (XQFN8)



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

SOT1116

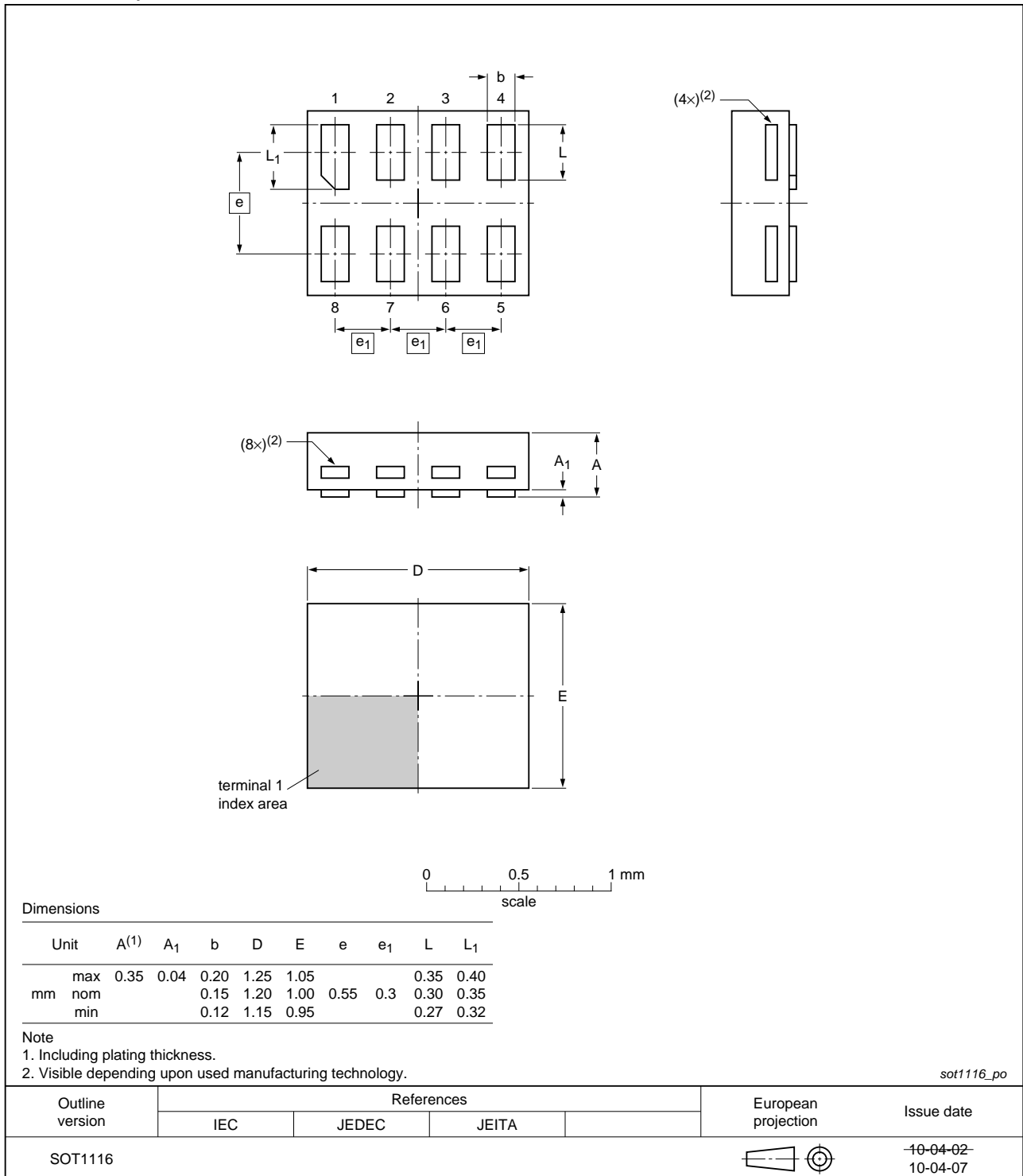


Fig 15. Package outline SOT1116 (XSON8)

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

SOT1203

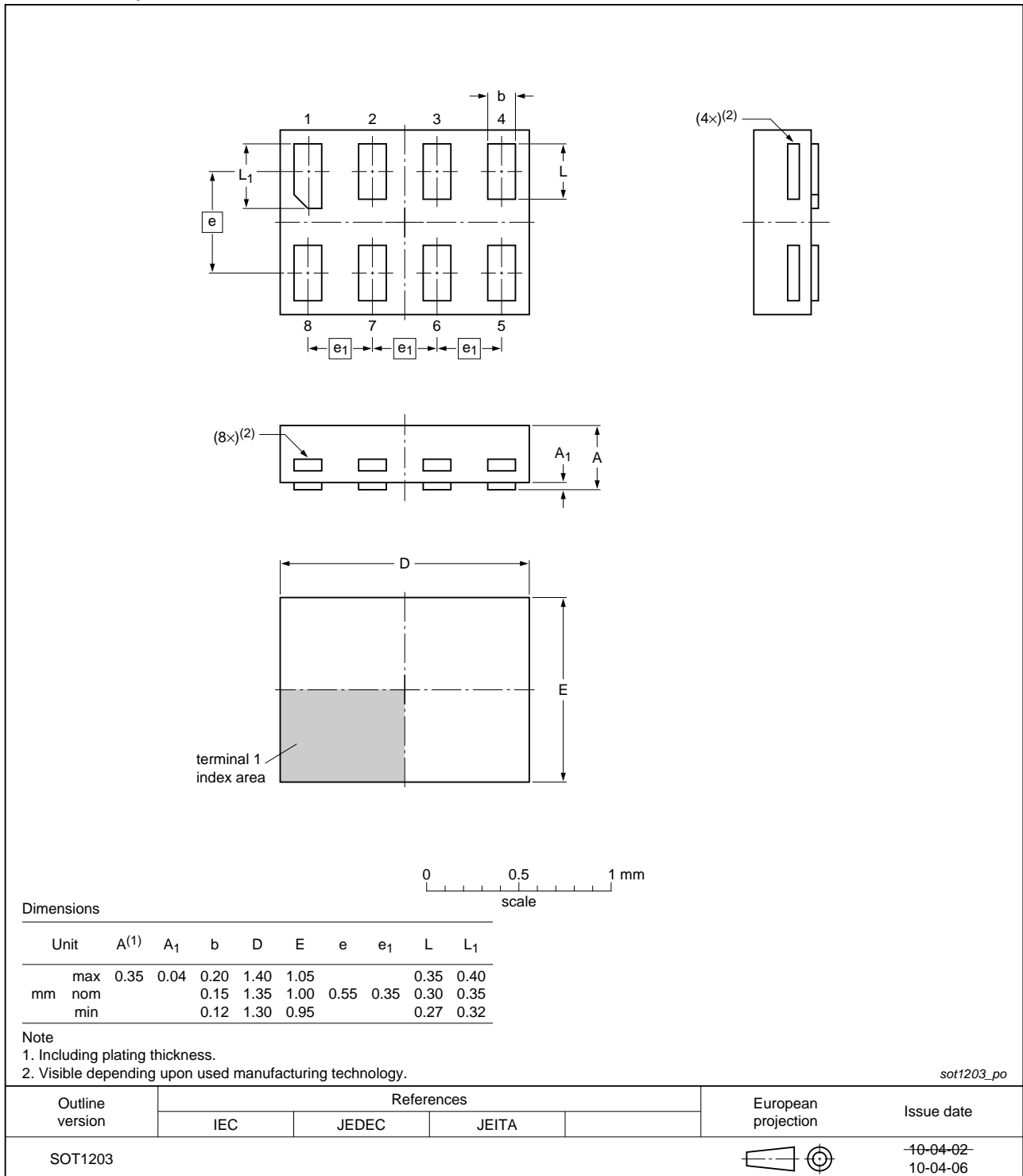


Fig 16. Package outline SOT1203 (XSON8)

## 14. Abbreviations

Table 11. Abbreviations

| Acronym | Description             |
|---------|-------------------------|
| CDM     | Charged Device Model    |
| DUT     | Device Under Test       |
| ESD     | ElectroStatic Discharge |
| HBM     | Human Body Model        |
| MM      | Machine Model           |

## 15. Revision history

Table 12. Revision history

| Document ID    | Release date   | Data sheet status  | Change notice | Supersedes    |
|----------------|--|--------------------|---------------|---------------|
| 74AUP3G04 v.7  | 20130129   | Product data sheet | -             | 74AUP3G04 v.6 |
| Modifications: | • For type number 74AUP3G04GD XSON8U has changed to XSON8. |                    |               |               |
| 74AUP3G04 v.6  | 20120614   | Product data sheet | -             | 74AUP3G04 v.5 |
| 74AUP3G04 v.5  | 20111209   | Product data sheet | -             | 74AUP3G04 v.4 |
| 74AUP3G04 v.4  | 20100730   | Product data sheet | -             | 74AUP3G04 v.3 |
| 74AUP3G04 v.3  | 20091008   | Product data sheet | -             | 74AUP3G04 v.2 |
| 74AUP3G04 v.2  | 20080313   | Product data sheet | -             | 74AUP3G04 v.1 |
| 74AUP3G04 v.1  | 20070524   | Product data sheet | -             | -             |

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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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[2] The term 'short data sheet' is explained in section "Definitions".

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