

74LVC3G17

Triple non-inverting Schmitt trigger with 5 V tolerant input

Rev. 15 — 24 August 2023

Product data sheet

1. General description

The 74LVC3G17 is a triple buffer with Schmitt-trigger inputs. Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of these devices as translators in mixed 3.3 V and 5 V environments.

This device is fully specified for partial power down applications using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the potentially 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
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Complies with JEDEC standards
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
 - JESD36 (4.5 V to 5.5 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to $+85$ °C and -40 °C to $+125$ °C

3. Applications

- Wave and pulse shapers for highly noisy environments

4. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-----------------------------|-------------------|--------|---|--------------------------|
| | Temperature range | Name | Description | |
| 74LVC3G17DP | -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 |
| 74LVC3G17DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74LVC3G17GT | -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 |
| 74LVC3G17GF | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm | SOT1089 |
| 74LVC3G17GN | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm | SOT1116 |
| 74LVC3G17GS | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm | SOT1203 |

5. Marking

Table 2. Marking codes

| Type number | Marking code [1] |
|-------------|------------------|
| 74LVC3G17DP | V17 |
| 74LVC3G17DC | V17 |
| 74LVC3G17GT | V17 |
| 74LVC3G17GF | VV |
| 74LVC3G17GN | VV |
| 74LVC3G17GS | VV |

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

6. Functional diagram

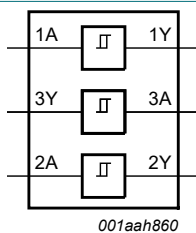


Fig. 1. Logic symbol

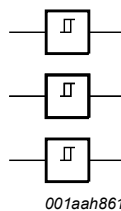


Fig. 2. IEC logic symbol

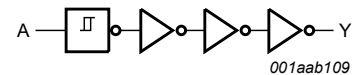
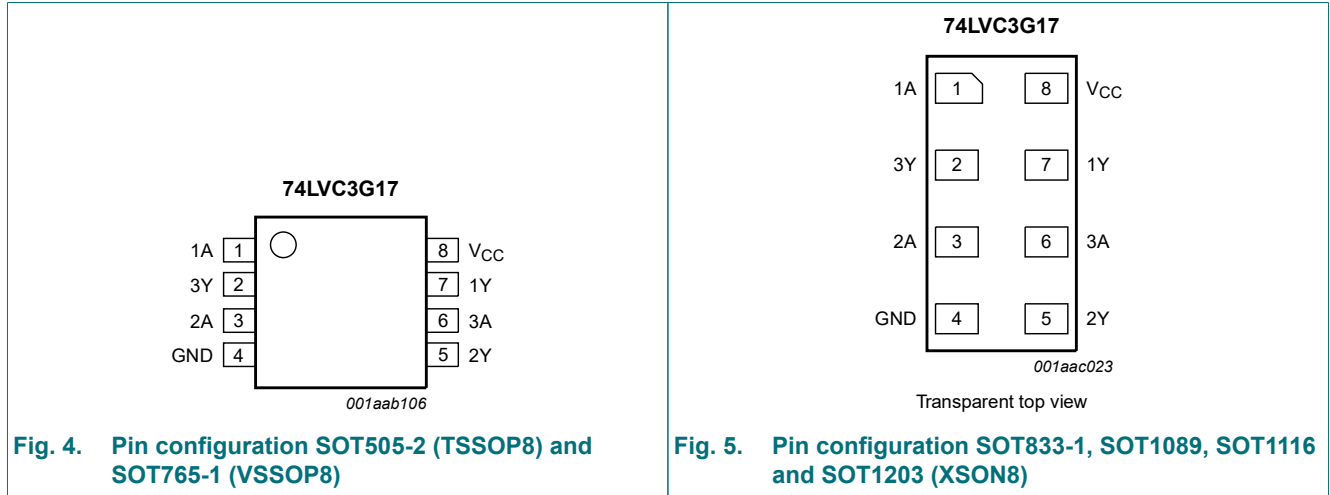


Fig. 3. Logic diagram (one gate)

7. Pinning information

7.1. Pinning



7.2. Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|---------|----------------|
| 1A, 2A, 3A | 1, 3, 6 | data input |
| GND | 4 | ground (0 V) |
| 1Y, 2Y, 3Y | 7, 5, 2 | data output |
| V _{CC} | 8 | supply voltage |

8. Functional description

Table 4. Function table

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

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

9. 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 | - | ±50 | mA |
| V_O | output voltage | Active mode | [1] -0.5 | $V_{CC} + 0.5$ | V |
| | | Power-down mode; $V_{CC} = 0$ V | [1] [2] -0.5 | +6.5 | V |
| 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] - | 250 | mW |

[1] The minimum 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 SOT505-2 (TSSOP8) package: P_{tot} derates linearly with 4.6 mW/K above 96 °C.

For SOT765-1 (VSSOP8) package: P_{tot} derates linearly with 4.9 mW/K above 99 °C.

For SOT833-1 (XSON8) package: P_{tot} derates linearly with 3.1 mW/K above 68 °C.

For SOT1089 (XSON8) package: P_{tot} derates linearly with 4.0 mW/K above 88 °C.

For SOT1116 (XSON8) package: P_{tot} derates linearly with 4.2 mW/K above 90 °C.

For SOT1203 (XSON8) package: P_{tot} derates linearly with 3.6 mW/K above 81 °C.

10. 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 | | 0 | V_{CC} | V |
| T_{amb} | ambient temperature | | -40 | +125 | °C |

11. Static characteristics

Table 7. Static characteristics

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

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|------------------|---------------------------|--|-----------------------|---------|------|-----------------------|------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | |
| | | I _O = 100 µA; V _{CC} = 1.65 V to 5.5 V | - | - | 0.1 | - | 0.1 | V |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | - | 0.45 | - | 0.70 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.3 | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.4 | - | 0.60 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.55 | - | 0.80 | V |
| | | I _O = 32 mA; V _{CC} = 4.5 V | - | - | 0.55 | - | 0.80 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | | | |
| | | I _O = -100 µA; V _{CC} = 1.65 V to 5.5 V | V _{CC} - 0.1 | - | - | V _{CC} - 0.1 | - | V |
| | | I _O = -4 mA; V _{CC} = 1.65 V | 1.2 | - | - | 0.95 | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.9 | - | - | 1.7 | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 2.2 | - | - | 1.9 | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.3 | - | - | 2.0 | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.8 | - | - | 3.4 | - | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V [2] | - | ±0.1 | ±1 | - | ±1 | µA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±2 | - | ±2 | µA |
| I _{CC} | supply current | V _I = 5.5 V or GND; I _O = 0 A; V _{CC} = 1.65 V to 5.5 V [2] | - | 0.1 | 4 | - | 4 | µA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V [2] | - | 5 | 500 | - | 500 | µA |
| C _I | input capacitance | | - | 3.5 | - | - | - | pF |

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

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

11.1. Transfer characteristics

Table 8. Transfer characteristics

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

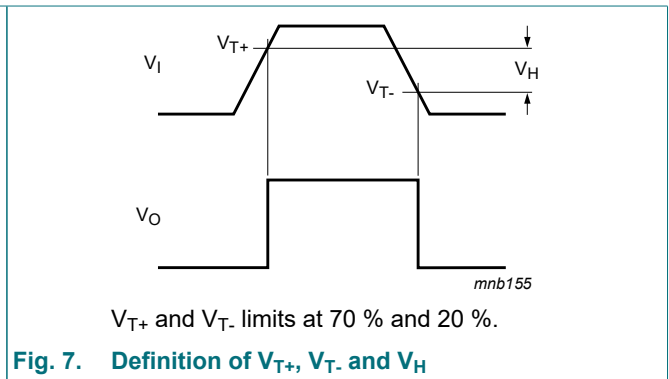
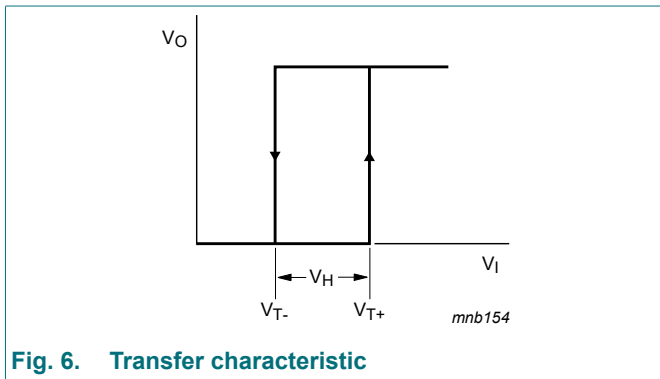
| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------|----------------------------------|---|------------------|---------|------|-------------------|------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| V _{T+} | positive-going threshold voltage | see Fig. 6 and Fig. 7 | | | | | | |
| | | V _{CC} = 1.8 V | 0.70 | 1.10 | 1.50 | 0.70 | 1.70 | V |
| | | V _{CC} = 2.3 V | 1.00 | 1.40 | 1.80 | 1.00 | 2.00 | V |
| | | V _{CC} = 3.0 V | 1.30 | 1.76 | 2.20 | 1.30 | 2.40 | V |
| | | V _{CC} = 4.5 V | 1.90 | 2.47 | 3.10 | 1.90 | 3.30 | V |
| | | V _{CC} = 5.5 V | 2.20 | 2.91 | 3.60 | 2.20 | 3.80 | V |

Triple non-inverting Schmitt trigger with 5 V tolerant input

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|-----------------|----------------------------------|---|------------------|---------|------|-------------------|------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| V _{T-} | negative-going threshold voltage | see Fig. 6 and Fig. 7 | | | | | | |
| | | V _{CC} = 1.8 V | 0.25 | 0.61 | 0.90 | 0.25 | 1.10 | V |
| | | V _{CC} = 2.3 V | 0.40 | 0.80 | 1.15 | 0.40 | 1.35 | V |
| | | V _{CC} = 3.0 V | 0.60 | 1.04 | 1.50 | 0.60 | 1.70 | V |
| | | V _{CC} = 4.5 V | 1.00 | 1.55 | 2.00 | 1.00 | 2.20 | V |
| V _H | hysteresis voltage | (V _{T+} - V _{T-}); see Fig. 6, Fig. 7 and Fig. 8 | | | | | | |
| | | V _{CC} = 1.8 V | 0.15 | 0.49 | 1.00 | 0.15 | 1.20 | V |
| | | V _{CC} = 2.3 V | 0.25 | 0.60 | 1.10 | 0.25 | 1.30 | V |
| | | V _{CC} = 3.0 V | 0.40 | 0.73 | 1.20 | 0.40 | 1.40 | V |
| | | V _{CC} = 4.5 V | 0.60 | 0.92 | 1.50 | 0.60 | 1.70 | V |
| | | V _{CC} = 5.5 V | 0.70 | 1.02 | 1.70 | 0.70 | 1.90 | V |

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

11.2. Waveforms transfer characteristics



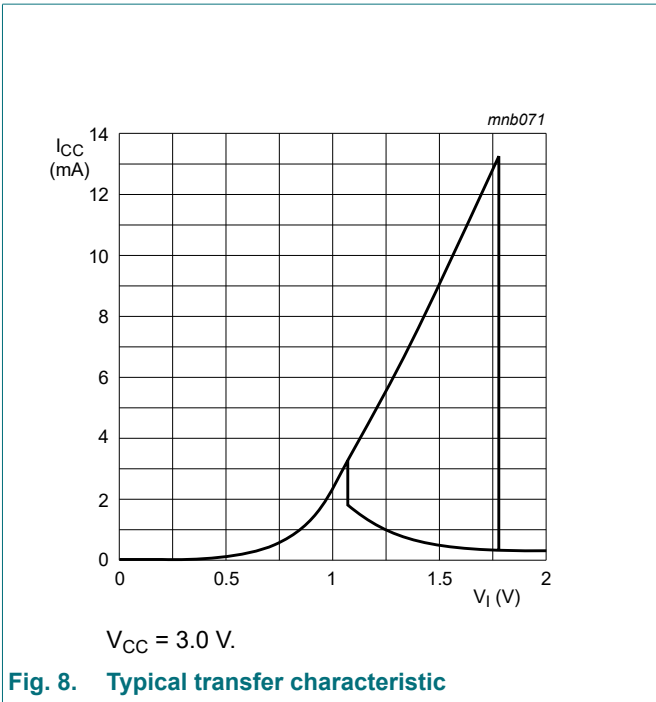


Fig. 8. Typical transfer characteristic

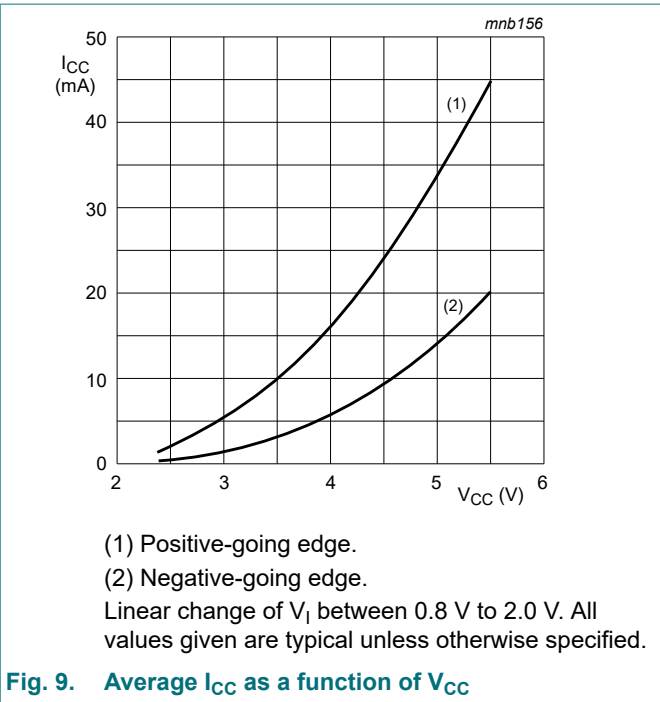


Fig. 9. Average I_{CC} as a function of V_{CC}

12. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 11.

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit |
|----------|-------------------------------|---|------------------|---------|------|-------------------|------|------|
| | | | Min | Typ [1] | Max | Min | Max | |
| t_{pd} | propagation delay | nA to nY; see Fig. 10 [2] | | | | | | |
| | | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 1.5 | 5.6 | 10.5 | 1.5 | 13.1 | ns |
| | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | 1.0 | 3.7 | 6.5 | 1.0 | 8.5 | ns |
| | | $V_{CC} = 2.7 \text{ V}$ | 1.0 | 3.8 | 6.5 | 1.0 | 8.5 | ns |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ | 1.0 | 3.6 | 5.7 | 1.0 | 7.1 | ns |
| | | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | 1.0 | 2.7 | 4.3 | 1.0 | 5.4 | ns |
| C_{PD} | power dissipation capacitance | per buffer; $V_{CC} = 3.3 \text{ V}; V_1 = \text{GND to } V_{CC}$ [3] | - | 16.3 | - | - | - | pF |

[1] Typical values are measured at $T_{amb} = 25 \text{ °C}$ and $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}, 3.3 \text{ V}$ and 5.0 V respectively.

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

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

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

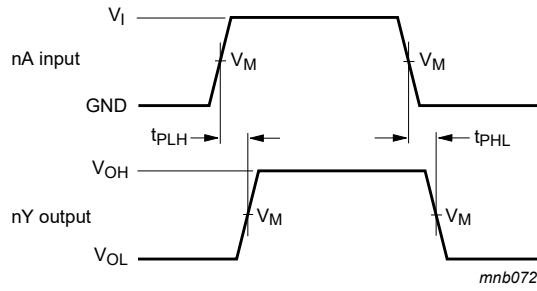
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12.1. Waveforms and test circuit



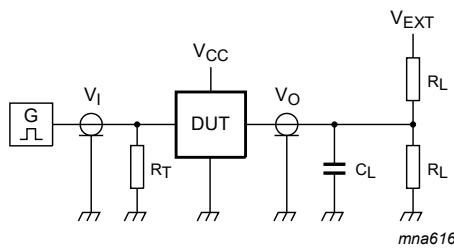
Measurement points are given in [Table 10](#).

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

Fig. 10. The input (nA) to output (nY) propagation delays and the output transition times

Table 10. Measurement points

| Supply voltage | Input | Output |
|------------------|---------------------|---------------------|
| V_{CC} | V_M | V_M |
| 1.65 V to 1.95 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.3 V to 2.7 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |
| 2.7 V | 1.5 V | 1.5 V |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V |
| 4.5 V to 5.5 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |



Test data is given in [Table 11](#).

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.

Fig. 11. Test circuit for measuring switching times

Table 11. Test data

| Supply voltage | Input | | Load | | V_{EXT} | | |
|------------------|----------|---------------|-------|--------------|--------------------|--------------------|--------------------|
| | V_I | t_r, t_f | C_L | R_L | t_{PLH}, t_{PHL} | t_{PZH}, t_{PHZ} | t_{PZL}, t_{PLZ} |
| 1.65 V to 1.95 V | V_{CC} | ≤ 2.0 ns | 30 pF | 1 k Ω | open | GND | $2 \times V_{CC}$ |
| 2.3 V to 2.7 V | V_{CC} | ≤ 2.0 ns | 30 pF | 500 Ω | open | GND | $2 \times V_{CC}$ |
| 2.7 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 6 V |
| 3.0 V to 3.6 V | 2.7 V | ≤ 2.5 ns | 50 pF | 500 Ω | open | GND | 6 V |
| 4.5 V to 5.5 V | V_{CC} | ≤ 2.5 ns | 50 pF | 500 Ω | 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

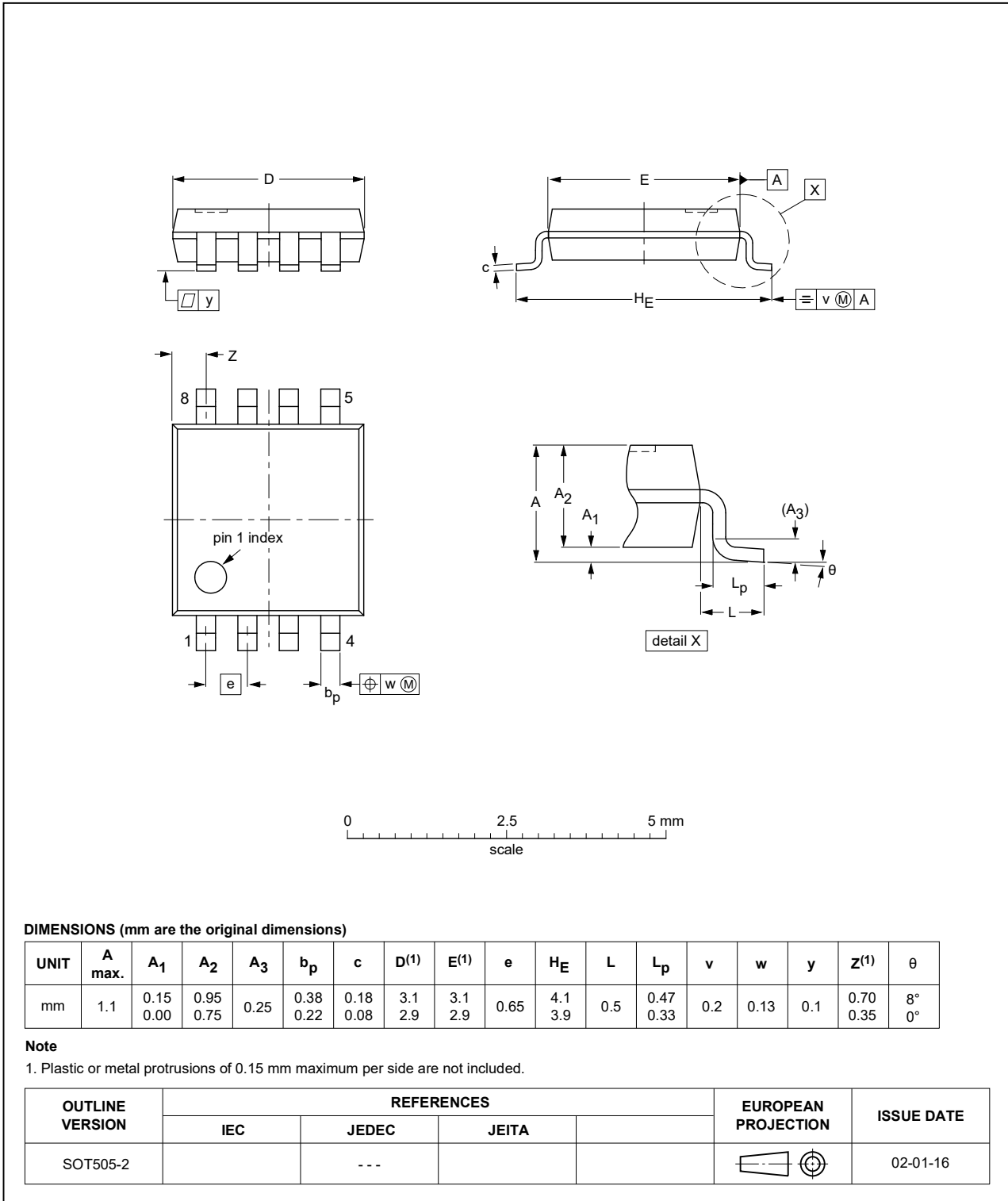


Fig. 12. Package outline SOT505-2 (TSSOP8)

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

SOT765-1

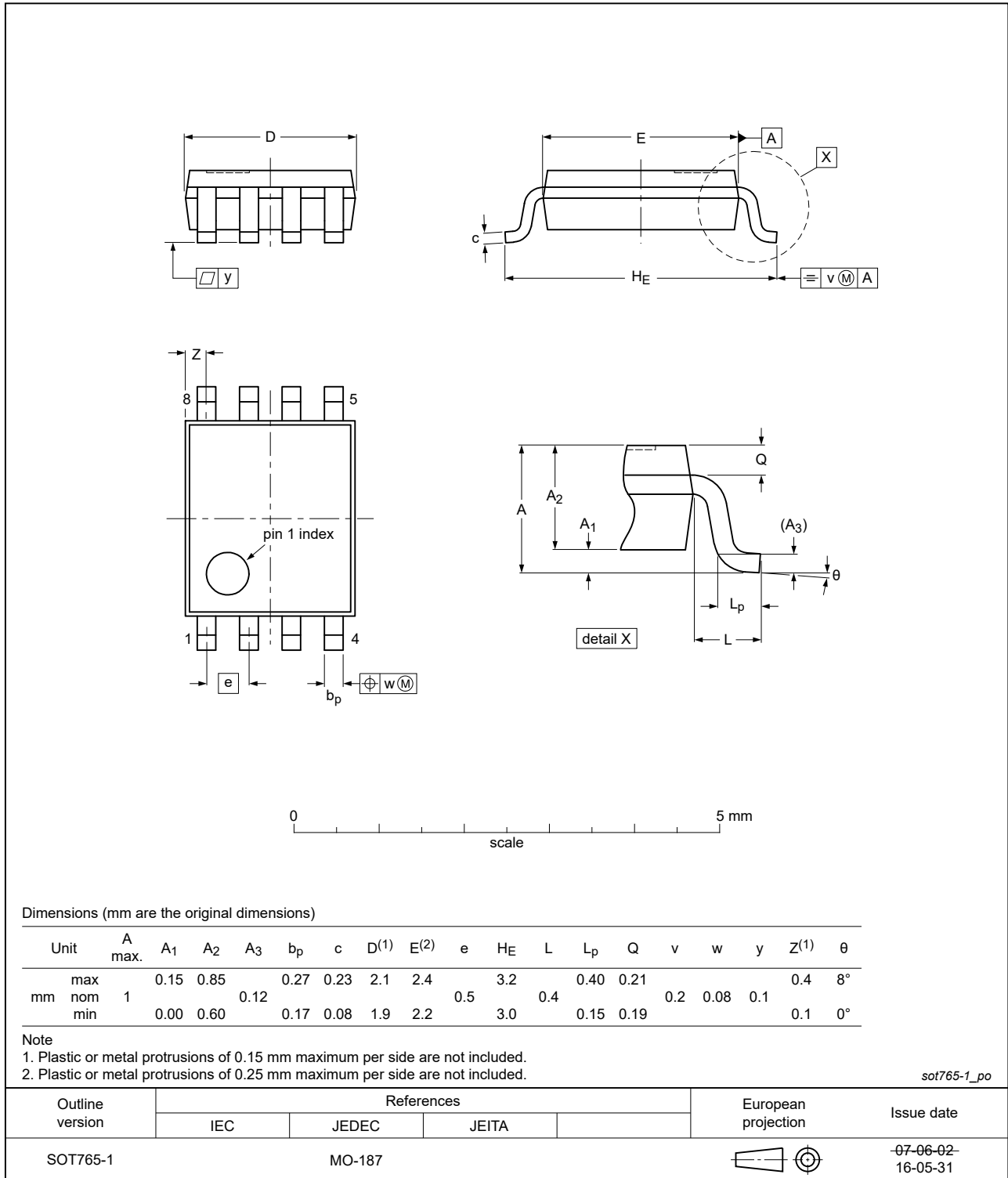


Fig. 13. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

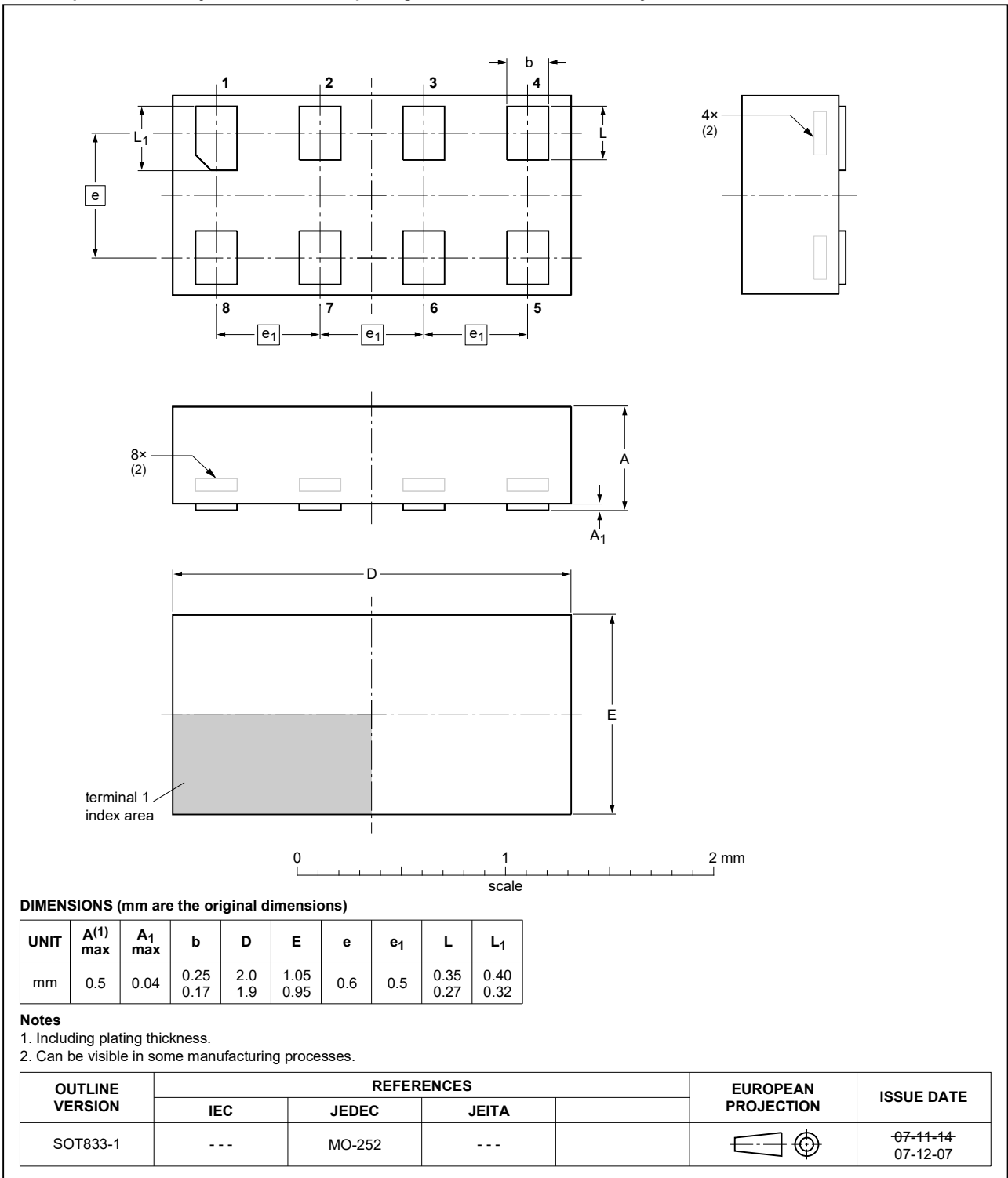


Fig. 14. Package outline SOT833-1 (XSON8)

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

SOT1089

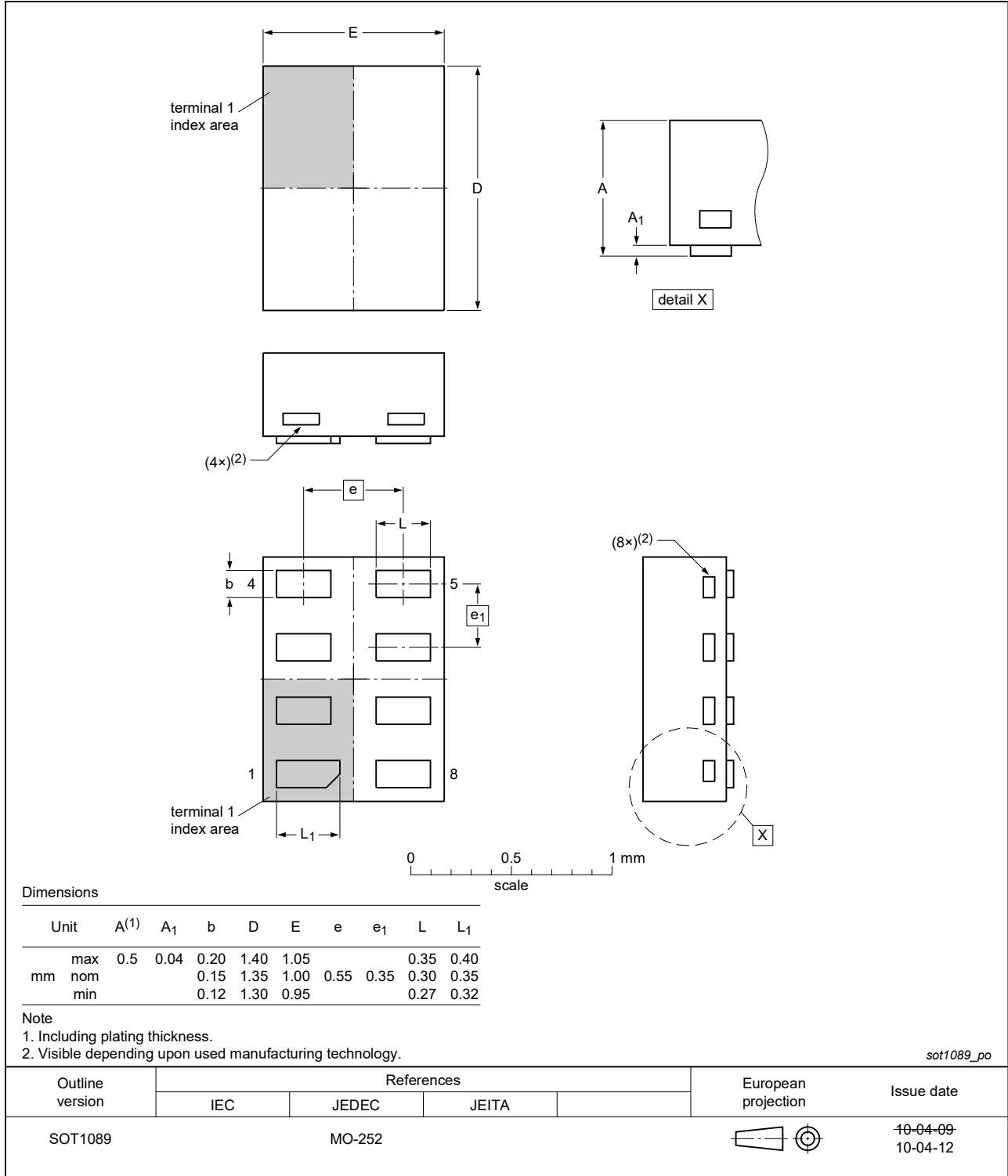


Fig. 15. Package outline SOT1089 (XSON8)

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

SOT1116

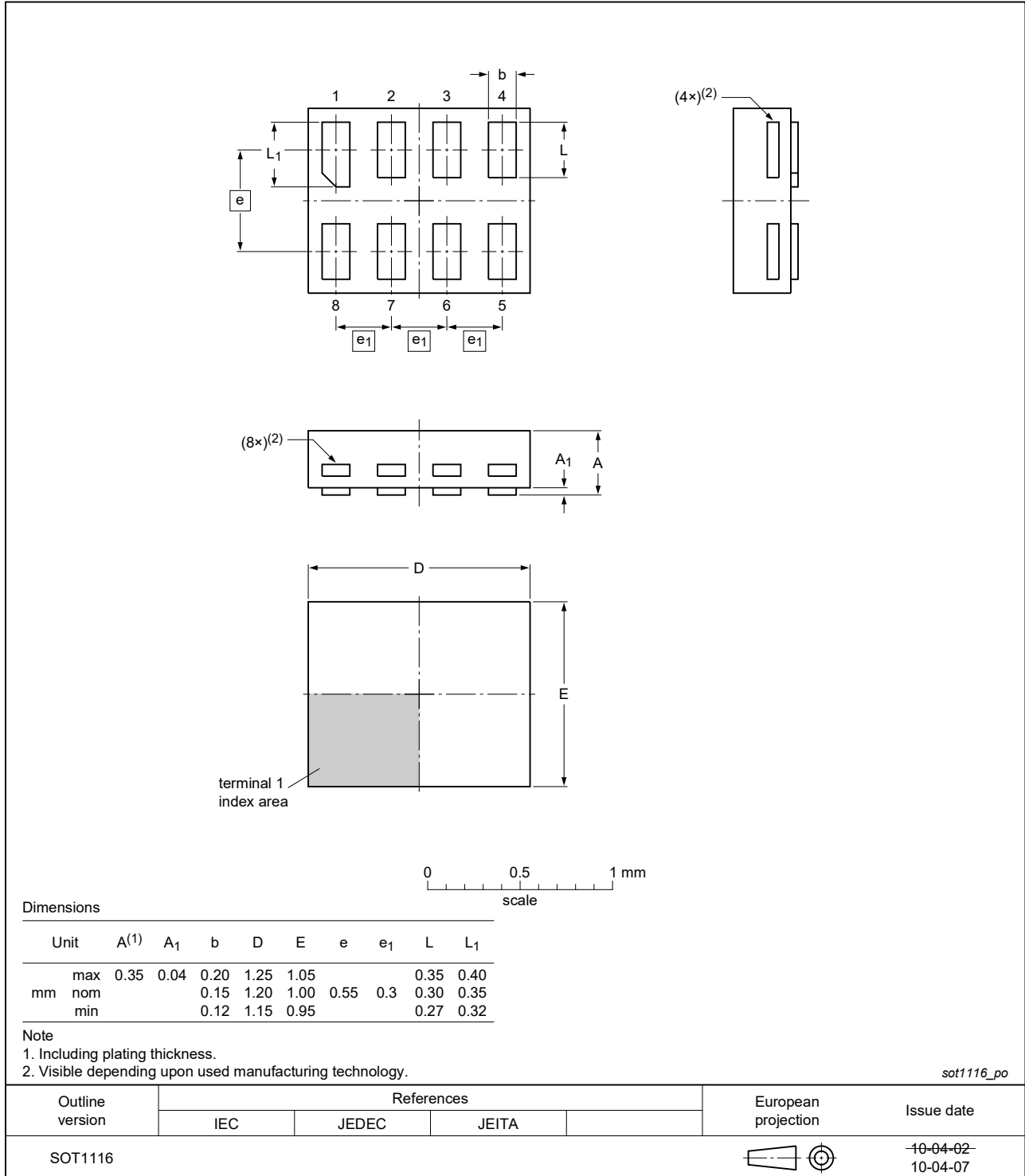


Fig. 16. Package outline SOT1116 (XSON8)

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

SOT1203

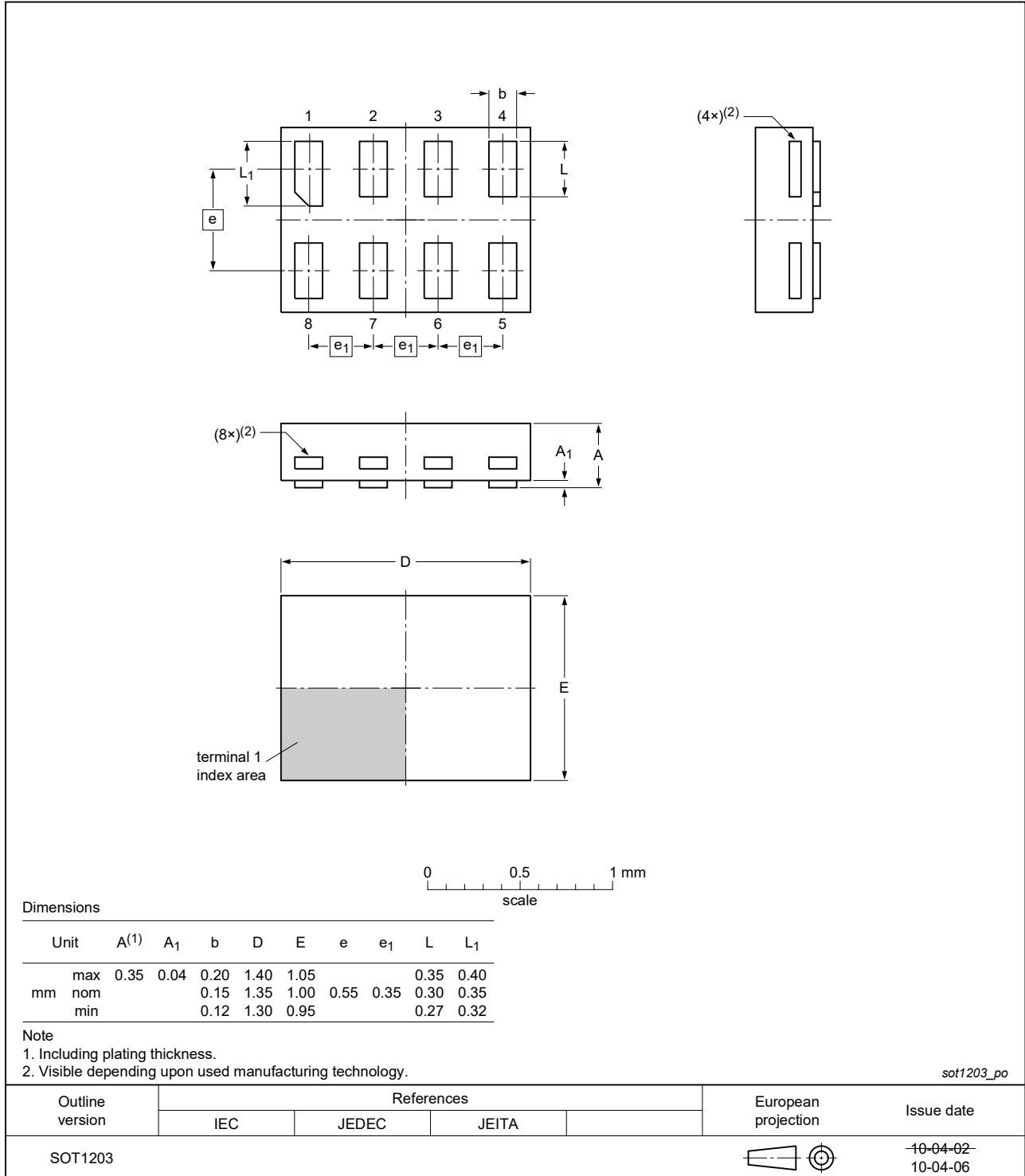


Fig. 17. Package outline SOT1203 (XSON8)

14. Abbreviations

Table 12. Abbreviations

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

15. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|-----------------------|---------------|----------------|
| 74LVC3G17 v.15 | 20230824 | Product data sheet | - | 74LVC3G17 v.14 |
| Modifications: | <ul style="list-style-type: none"> Section 2: ESD specification updated according to the latest JEDEC standard. | | | |
| 74LVC3G17 v.14 | 20210826 | Product data sheet | - | 74LVC3G17 v.13 |
| Modifications: | <ul style="list-style-type: none"> Section 1 and Section 2 updated. Type number 74LVC3G17GM (SOT902-2/XQFN8) removed. Section 9: Derating values for P_{tot} total power dissipation updated. | | | |
| 74LVC3G17 v.13 | 20181127 | Product data sheet | - | 74LVC3G17 v.12 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Type numbers 74LVC3G17GD (SOT996-2) removed. | | | |
| 74LVC3G17 v.12 | 20161215 | Product data sheet | - | 74LVC3G17 v.11 |
| Modifications: | <ul style="list-style-type: none"> Table 7: The maximum limits for leakage current and supply current have changed. | | | |
| 74LVC3G17 v.11 | 20130409 | Product data sheet | - | 74LVC3G17 v.10 |
| Modifications: | <ul style="list-style-type: none"> For type number 74LVC3G17GD XSON8U has changed to XSON8. | | | |
| 74LVC3G17 v.10 | 20120706 | Product data sheet | - | 74LVC3G17 v.9 |
| Modifications: | <ul style="list-style-type: none"> For type number 74LVC3G17GM the SOT code has changed to SOT902-2. | | | |
| 74LVC3G17 v.9 | 20111123 | Product data sheet | - | 74LVC3G17 v.8 |
| Modifications: | <ul style="list-style-type: none"> Legal pages updated. | | | |
| 74LVC3G17 v.8 | 20110921 | Product data sheet | - | 74LVC3G17 v.7 |
| 74LVC3G17 v.7 | 20101104 | Product data sheet | - | 74LVC3G17 v.6 |
| 74LVC3G17 v.6 | 20080606 | Product data sheet | - | 74LVC3G17 v.5 |
| 74LVC3G17 v.5 | 20080313 | Product data sheet | - | 74LVC3G17 v.4 |
| 74LVC3G17 v.4 | 20070521 | Product data sheet | - | 74LVC3G17 v.3 |
| 74LVC3G17 v.3 | 20050131 | Product data sheet | - | 74LVC3G17 v.2 |
| 74LVC3G17 v.2 | 20041103 | Product specification | - | 74LVC3G17 v.1 |
| 74LVC3G17 v.1 | 20040624 | Product specification | - | - |

16. Legal information

Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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