

74LVC2G17

Dual non-inverting Schmitt trigger with 5 V tolerant input

Rev. 9 — 15 December 2016

Product data sheet

1. General description

The 74LVC2G17 provides two non-inverting buffers with Schmitt trigger input. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

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

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

2. Features and benefits

- 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)
 - ◆ JESD-8B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- ± 24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low-power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- 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 | |
| 74LVC2G17GW | -40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| 74LVC2G17GV | -40 °C to +125 °C | TSOP6 | plastic surface-mounted package (TSOP6); 6 leads | SOT457 |
| 74LVC2G17GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74LVC2G17GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |
| 74LVC2G17GN | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm | SOT1115 |
| 74LVC2G17GS | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm | SOT1202 |

5. Marking

Table 2. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| 74LVC2G17GW | VV |
| 74LVC2G17GV | VV |
| 74LVC2G17GM | VV |
| 74LVC2G17GF | VV |
| 74LVC2G17GN | VV |
| 74LVC2G17GS | VV |

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

6. Functional diagram

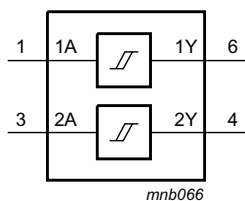


Fig 1. Logic symbol

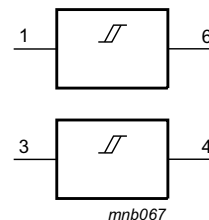


Fig 2. IEC logic symbol

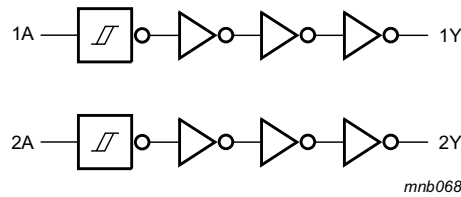


Fig 3. Logic diagram

7. Pinning information

7.1 Pinning

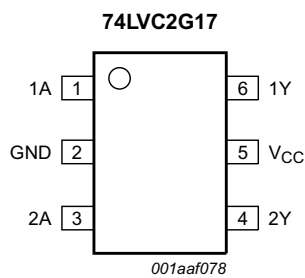


Fig 4. Pin configuration SOT363 and SOT457

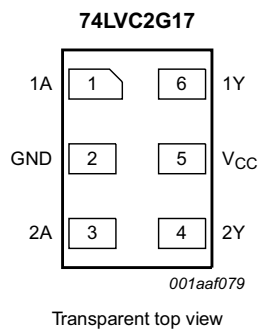


Fig 5. Pin configuration SOT886

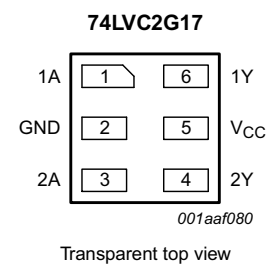


Fig 6. Pin configuration SOT891, SOT1115 and SOT1202

7.2 Pin description

Table 3. Pin description

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

8. Functional description

Table 4. Function table^[1]

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

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

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 | $V_O < 0$ V | - | -50 | mA |
| V_O | output voltage | Active mode | [1][2] -0.5 | $V_{CC} + 0.5$ | V |
| | | Power-down mode | [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] - | 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 SC-88 and SC-74 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

10. Recommended operating conditions

Table 6. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------|------------|------|-----|----------|------|
| V_{CC} | supply voltage | | 1.65 | - | 5.5 | V |
| V_I | input voltage | | 0 | - | 5.5 | V |
| V_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 | Min | Typ | Max | Unit |
|----------------------------------|--------------------------|---|-----|-----|------|------|
| $T_{amb} = -40$ °C to +85 °C [1] | | | | | | |
| V_{OL} | LOW-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | |
| | | $I_O = 100$ μ A; $V_{CC} = 1.65$ V to 5.5 V | - | - | 0.1 | V |
| | | $I_O = 4$ mA; $V_{CC} = 1.65$ V | - | - | 0.45 | V |
| | | $I_O = 8$ mA; $V_{CC} = 2.3$ V | - | - | 0.3 | V |
| | | $I_O = 12$ mA; $V_{CC} = 2.7$ V | - | - | 0.4 | V |
| | | $I_O = 24$ mA; $V_{CC} = 3.0$ V | - | - | 0.55 | V |
| | | $I_O = 32$ mA; $V_{CC} = 4.5$ V | - | - | 0.55 | V |

Table 7. Static characteristics ...continued

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|---------------------------|--|-----------------------|------|------|------|
| 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 |
| | | I _O = -4 mA; V _{CC} = 1.65 V | 1.2 | - | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.9 | - | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 2.2 | - | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.3 | - | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.8 | - | - | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 5.5 V | - | ±0.1 | ±1 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±2 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | 0.1 | 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 | - | 5 | 500 | μA |
| C _I | input capacitance | | - | 3.5 | - | pF |
| T_{amb} = -40 °C to +125 °C | | | | | | |
| 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 | V |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | - | 0.70 | V |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.45 | V |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.60 | V |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.80 | V |
| | | I _O = 32 mA; V _{CC} = 4.5 V | - | - | 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 |
| | | I _O = -4 mA; V _{CC} = 1.65 V | 0.95 | - | - | V |
| | | I _O = -8 mA; V _{CC} = 2.3 V | 1.7 | - | - | V |
| | | I _O = -12 mA; V _{CC} = 2.7 V | 1.9 | - | - | V |
| | | I _O = -24 mA; V _{CC} = 3.0 V | 2.0 | - | - | V |
| | | I _O = -32 mA; V _{CC} = 4.5 V | 3.4 | - | - | V |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 5.5 V | - | ±0.1 | ±1 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | - | ±2 | μA |
| I _{CC} | supply current | V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V | - | - | 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 | - | - | 500 | μA |

[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

12. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#).

| 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 Figure 7 ^[2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 5.6 | 10.5 | 1.5 | 13.1 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 3.7 | 6.5 | 1.0 | 8.5 | ns |
| | | V _{CC} = 2.7 V | 1.0 | 3.8 | 6.5 | 1.0 | 8.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.0 | 3.6 | 5.7 | 1.0 | 7.1 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 1.0 | 2.7 | 4.3 | 1.0 | 5.4 | ns |
| C _{PD} | power dissipation capacitance | per buffer; V _{CC} = 3.3 V; V _I = GND to V _{CC} ^[3] | - | 16.3 | - | - | - | pF |

[1] Typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.8 V, 2.5 V, 2.7 V, 3.3 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;

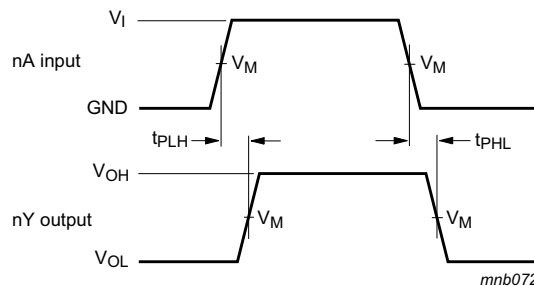
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

∑(C_L × V_{CC}² × f_o) = sum of outputs.

13. Waveforms



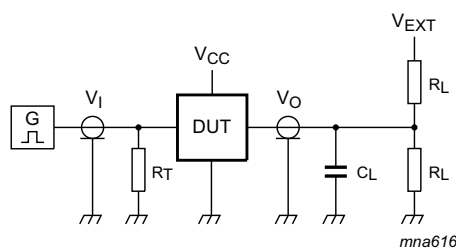
Measurement points are given in [Table 9](#).

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

Fig 7. The input (nA) to output (nY) propagation delays and the output transition times

Table 9. 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 | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ |



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

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

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

Fig 8. Test circuit for measuring switching times

Table 10. Test data

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

14. Transfer characteristics

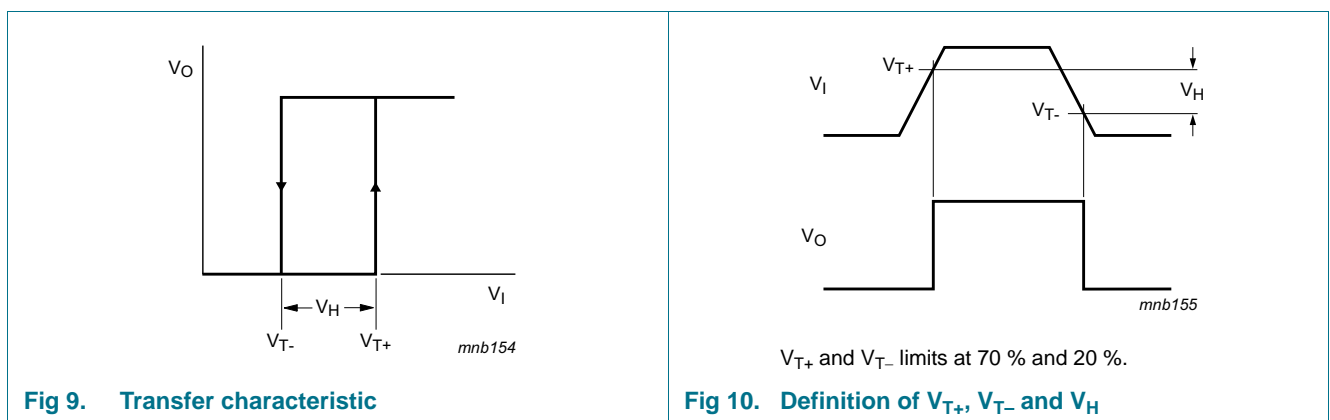
Table 11. Transfer characteristics

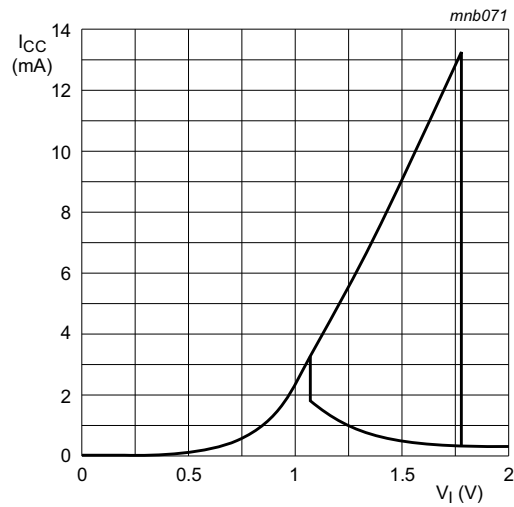
At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

| 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 Figure 9 and Figure 10 | | | | | | |
| | | 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 |
| V _{T-} | negative-going threshold voltage | see Figure 9 and Figure 10 | | | | | | |
| | | 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 _{CC} = 5.5 V | 1.20 | 1.86 | 2.30 | 1.20 | 2.50 | V |
| V _H | hysteresis voltage | (V _{T+} - V _{T-}); see Figure 9 , Figure 10 and Figure 11 | | | | | | |
| | | 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.

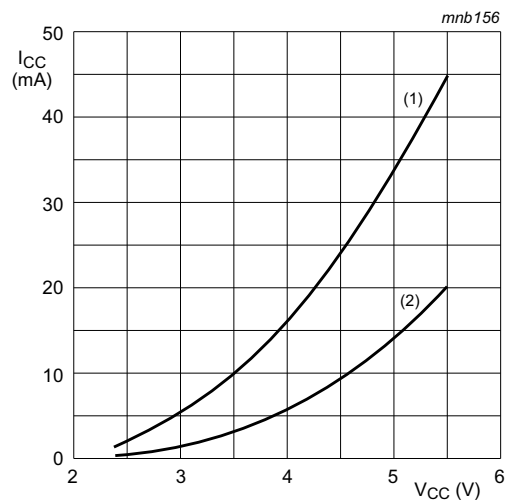
15. Waveforms transfer characteristics





$V_{CC} = 3.0$ V.

Fig 11. Typical transfer characteristic



- (1) Positive-going edge
- (2) Negative-going edge

Linear change of V_I between 0.8 V to 2.0 V. All values given are typical unless otherwise specified.

Fig 12. Average I_{CC} as a function of V_{CC}

16. Package outline

Plastic surface-mounted package; 6 leads

SOT363

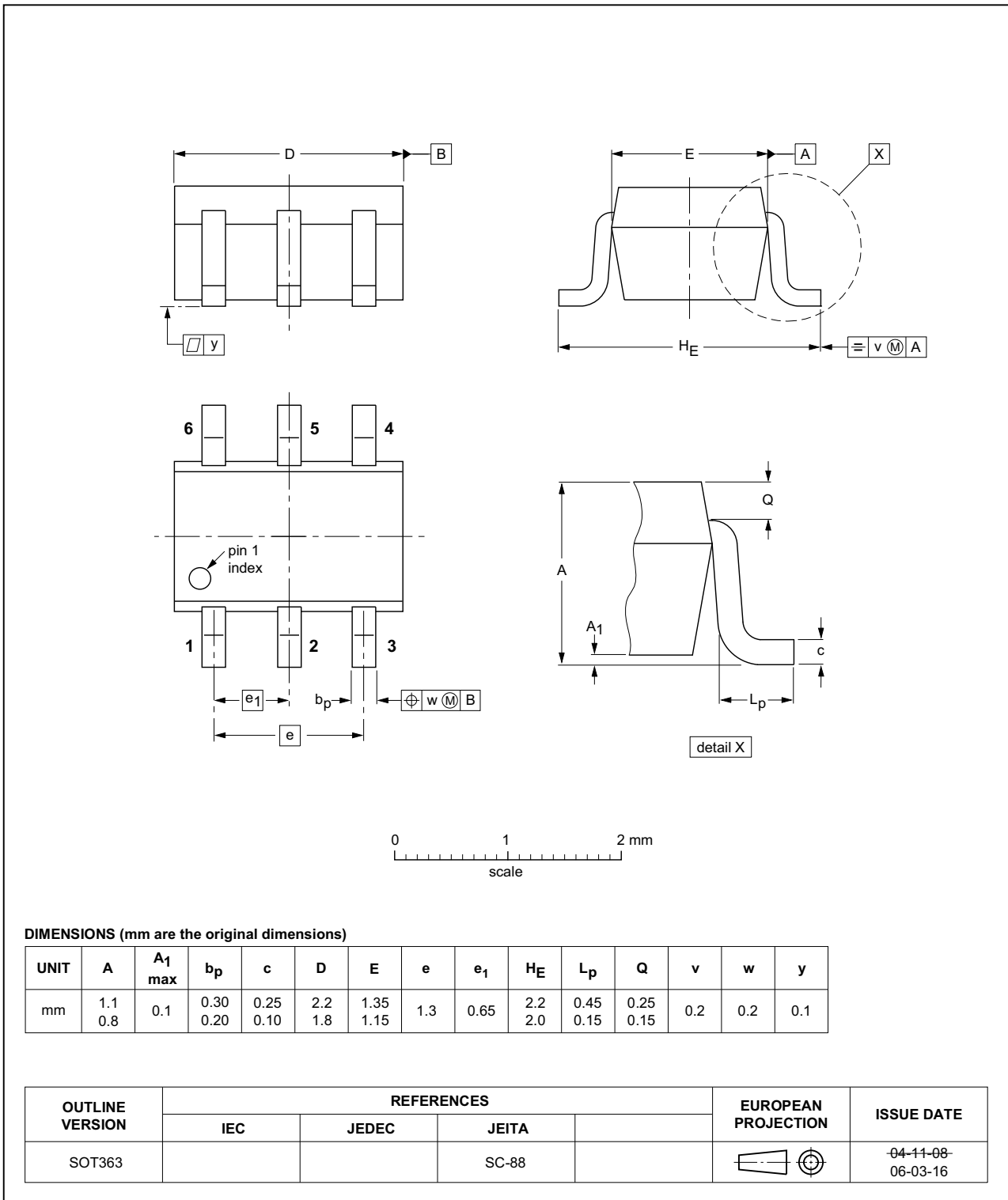


Fig 13. Package outline SOT363 (SC-88)

Plastic surface-mounted package (TSOP6); 6 leads

SOT457

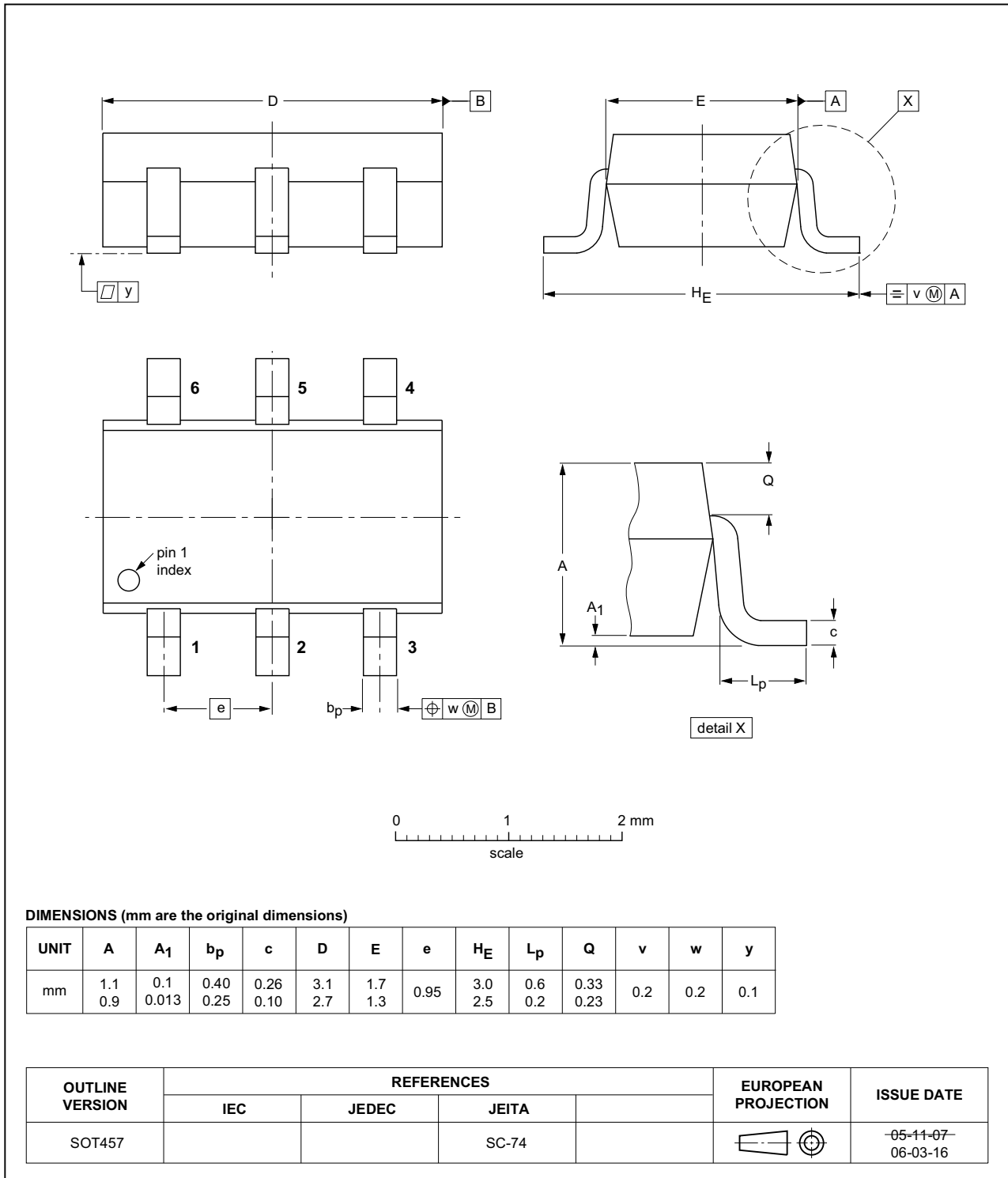


Fig 14. Package outline SOT457 (SC-74)

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

SOT886

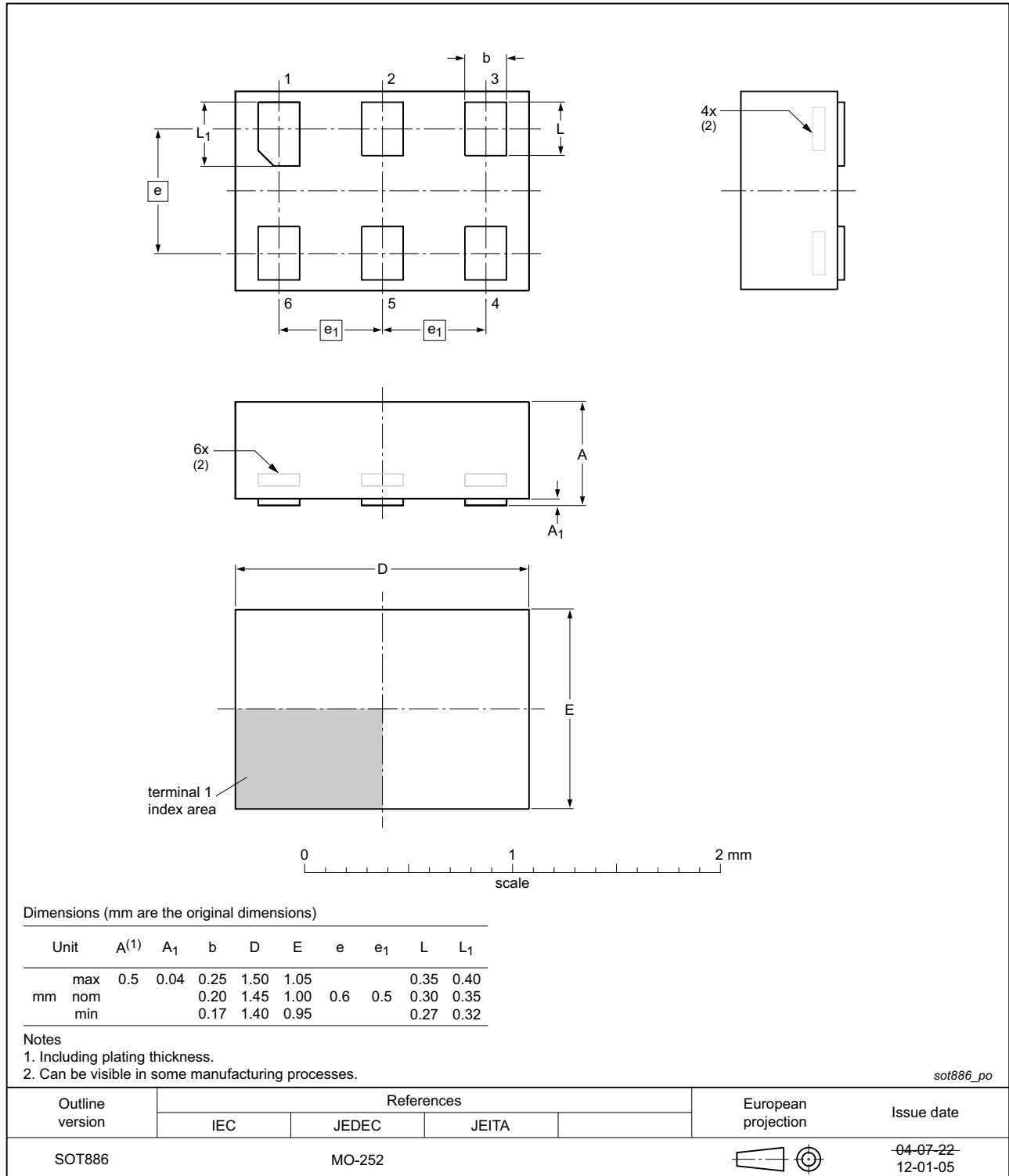


Fig 15. Package outline SOT886 (XSON6)

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

SOT891

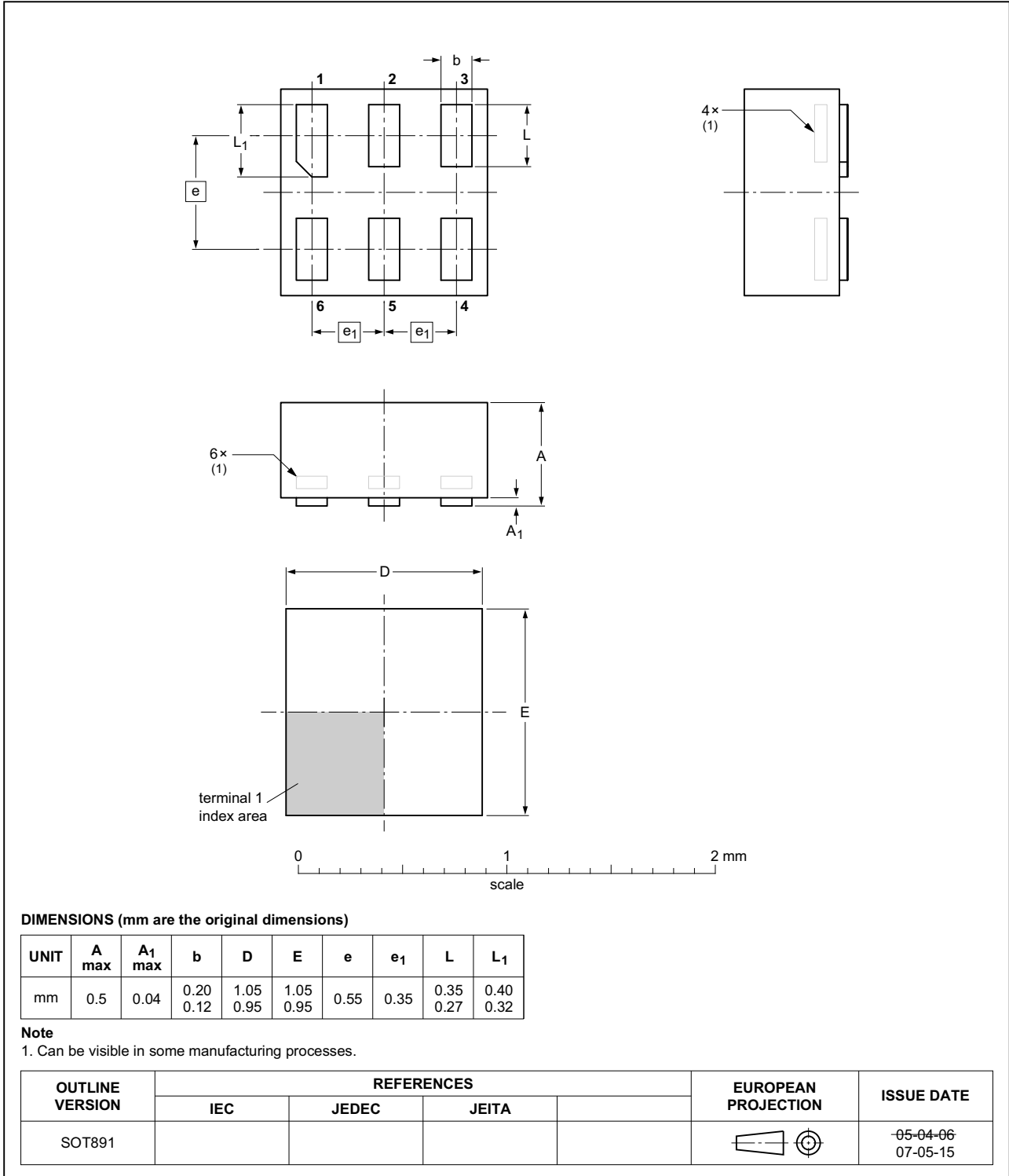


Fig 16. Package outline SOT891 (XSON6)

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

SOT1115

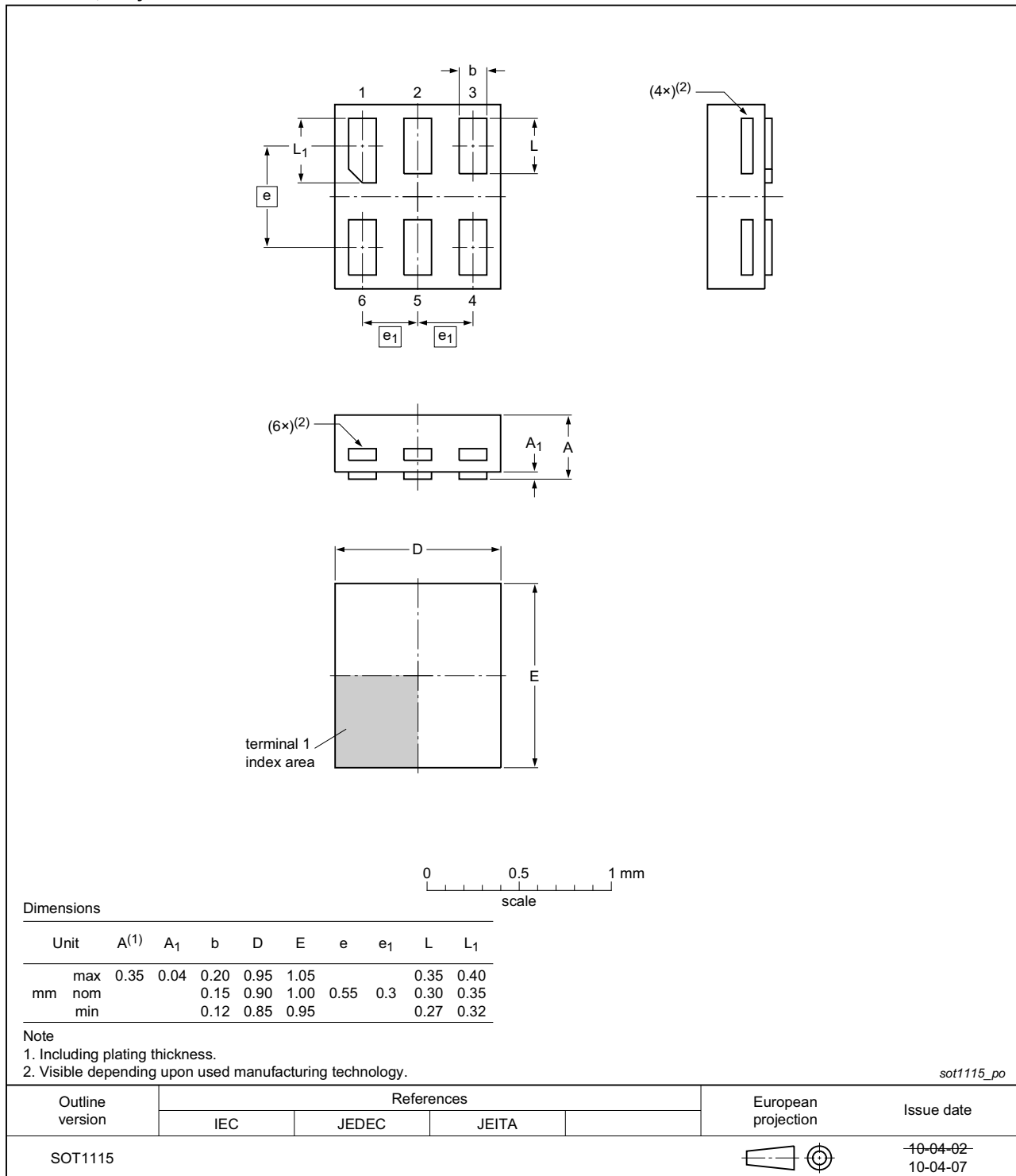


Fig 17. Package outline SOT1115 (XSON6)

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

SOT1202

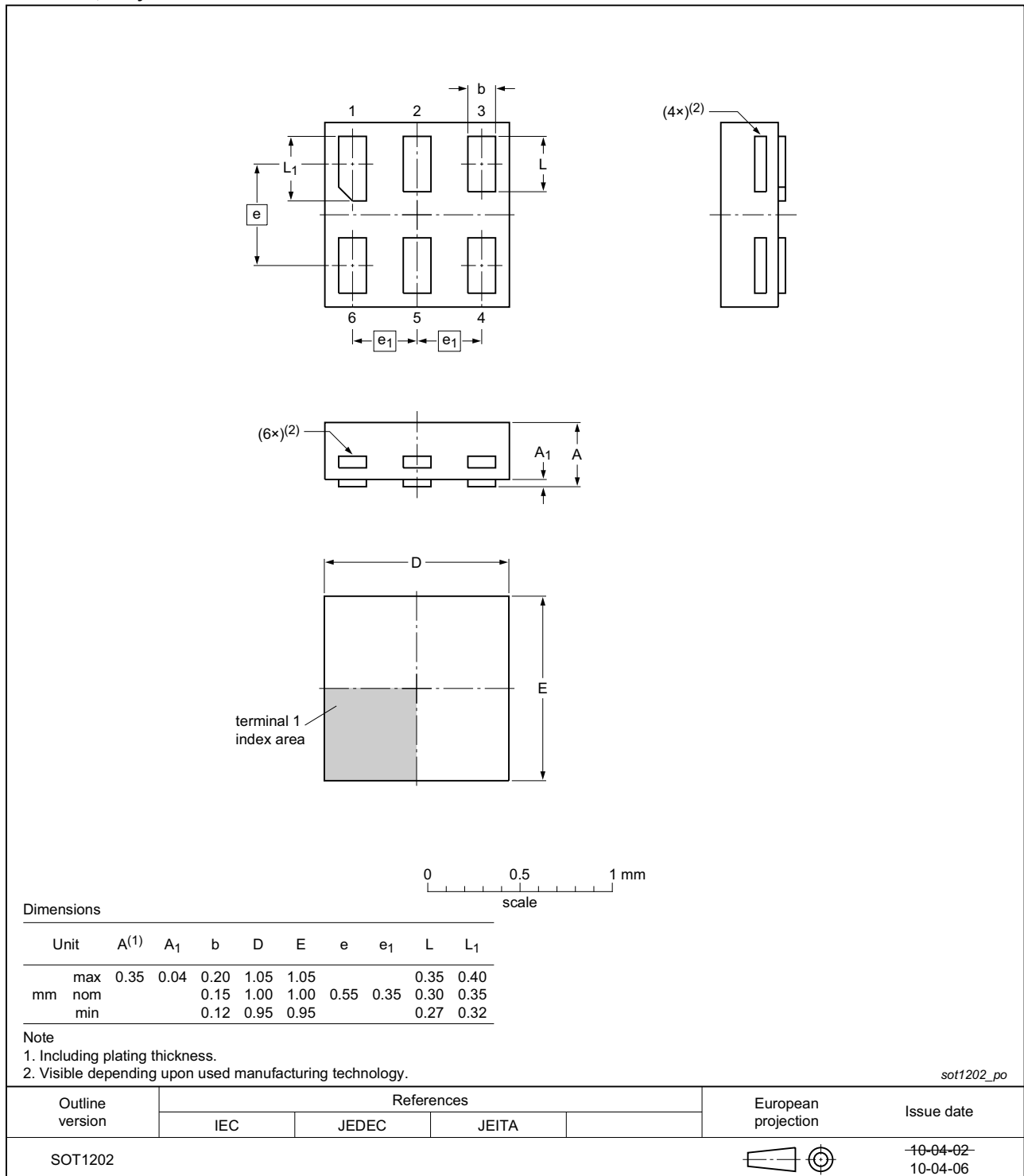


Fig 18. Package outline SOT1202 (XSON6)

17. Abbreviations

Table 12. 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 |

18. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|-----------------------|---------------|---------------|
| 74LVC2G17 v.9 | 20161215 | Product data sheet | - | 74LVC2G17 v.8 |
| Modifications: | <ul style="list-style-type: none"> Table 7: The maximum limits for leakage current and supply current have changed. | | | |
| 74LVC2G17 v.8 | 20130502 | Product data sheet | - | 74LVC2G17 v.7 |
| Modifications: | <ul style="list-style-type: none"> Table 3: the description of pin 6 changed from data input to data output. | | | |
| 74LVC2G17 v.6 | 20110921 | Product data sheet | - | 74LVC2G17 v.5 |
| 74LVC2G17 v.5 | 20100806 | Product data sheet | - | 74LVC2G17 v.4 |
| 74LVC2G17 v.4 | 20061009 | Product data sheet | - | 74LVC2G17 v.3 |
| 74LVC2G17 v.3 | 20050926 | Product data sheet | - | 74LVC2G17 v.2 |
| 74LVC2G17 v.2 | 20040908 | Product specification | - | 74LVC2G17 v.1 |
| 74LVC2G17 v.1 | 20030813 | Product specification | - | - |

19. Legal information

19.1 Data sheet status

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

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

19.2 Definitions

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