

74LVC1G07

Buffer with open-drain output

Rev. 10 — 7 December 2011

Product data sheet

1. General description

The 74LVC1G07 provides the non-inverting buffer.

The output of this device is an open drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

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

Schmitt-trigger action at all inputs makes the circuit tolerant for slower input rise and fall time.

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)
 - ◆ 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
- -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 |
| 74LVC1G07GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74LVC1G07GV | -40 °C to +125 °C | SC-74A | plastic surface-mounted package; 5 leads | SOT753 |
| 74LVC1G07GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74LVC1G07GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |
| 74LVC1G07GN | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm | SOT1115 |
| 74LVC1G07GS | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm | SOT1202 |

4. Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| 74LVC1G07GW | VS |
| 74LVC1G07GV | V07 |
| 74LVC1G07GM | VS |
| 74LVC1G07GF | VS |
| 74LVC1G07GN | VS |
| 74LVC1G07GS | VS |

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

5. Functional diagram

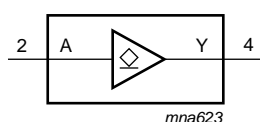


Fig 1. Logic symbol

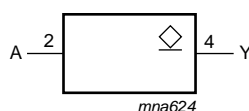


Fig 2. IEC logic symbol

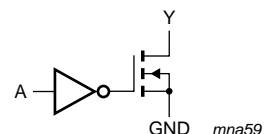
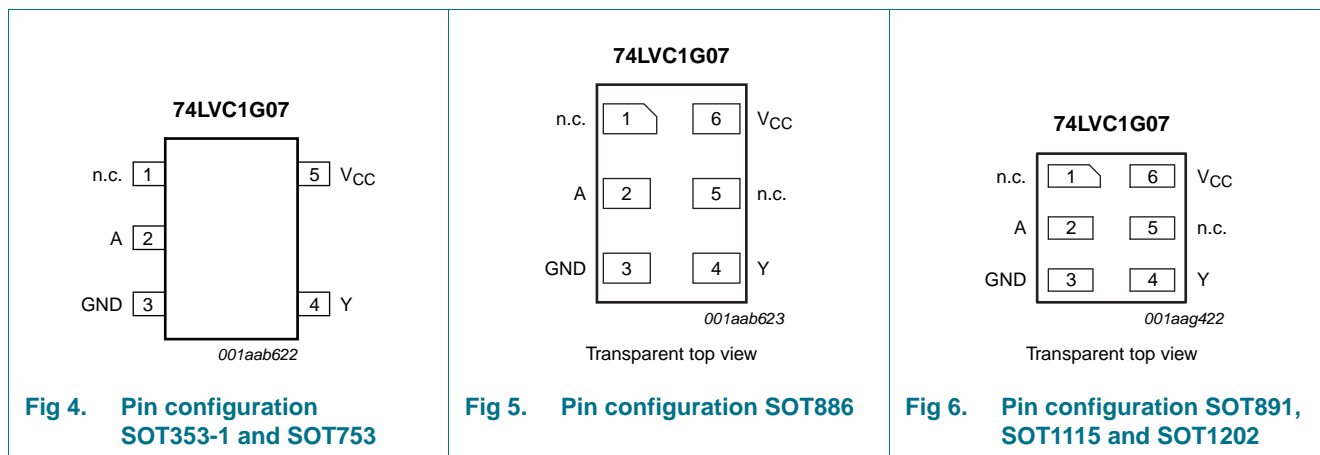


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol | Pin | | Description |
|-----------------|------------------|-------------------------------------|----------------|
| | SOT353-1, SOT753 | SOT886, SOT891, SOT1115 and SOT1202 | |
| n.c. | 1 | 1 | not connected |
| A | 2 | 2 | data input |
| GND | 3 | 3 | ground (0 V) |
| Y | 4 | 4 | data output |
| n.c. | - | 5 | not connected |
| V _{CC} | 5 | 6 | supply voltage |

7. Functional description

Table 4. Function table^[1]

| Input A | Output Y |
|---------|----------|
| L | L |
| H | Z |

[1] H = HIGH voltage level; L = LOW voltage level; 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 | $V_O < 0$ V | -50 | - | mA |
| V_O | output voltage | Active 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 6.5 V | - | 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 TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 package: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.

9. 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 | Active mode | 0 | - | 5.5 | V |
| | | Power-down mode; $V_{CC} = 0$ V | 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 | -40 °C to +85 °C | | | -40 °C to +125 °C | | Unit | | |
|-----------------|--------------------------|---|---------------------------|--|---------------------|---------------------|---------------------|------|------|----|
| | | | Min | Typ ^[1] | Max | Min | Max | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 1.65 V to 1.95 V | 0.65V _{CC} | - | - | 0.65V _{CC} | - | V | | |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | - | - | 1.7 | - | V | | |
| | | V _{CC} = 2.7 V to 3.6 V | 2.0 | - | - | 2.0 | - | V | | |
| | | V _{CC} = 4.5 V to 5.5 V | 0.7V _{CC} | - | - | 0.7V _{CC} | - | V | | |
| V _{IL} | LOW-level input voltage | V _{CC} = 1.65 V to 1.95 V | - | - | 0.35V _{CC} | - | 0.35V _{CC} | V | | |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | - | 0.7 | V | | |
| | | V _{CC} = 2.7 V to 3.6 V | - | - | 0.8 | - | 0.8 | V | | |
| | | V _{CC} = 4.5 V to 5.5 V | - | - | 0.3V _{CC} | - | 0.3V _{CC} | V | | |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | | | | | |
| | | I _O = 100 μA; V _{CC} = 1.65 V to 5.5 V | - | - | 0.10 | - | 0.10 | V | | |
| | | I _O = 4 mA; V _{CC} = 1.65 V | - | - | 0.45 | - | 0.70 | V | | |
| | | I _O = 8 mA; V _{CC} = 2.3 V | - | - | 0.30 | - | 0.45 | V | | |
| | | I _O = 12 mA; V _{CC} = 2.7 V | - | - | 0.40 | - | 0.60 | V | | |
| | | I _O = 24 mA; V _{CC} = 3.0 V | - | - | 0.55 | - | 0.80 | V | | |
| I _I | input leakage current | V _I = 5.5 V or GND; V _{CC} = 0 V to 5.5 V | ^[2] | ±0.1 | ±5 | - | ±100 | μA | | |
| | | I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = V _{CC} or GND; V _{CC} = 5.5 V | - | ±0.1 | ±10 | - | ±100 | μA |
| | | I _{OFF} | power-off leakage current | V _I or V _O = 5.5 V; V _{CC} = 0 V | - | ±0.1 | ±10 | - | ±200 | 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 | - | 0.1 | 10 | - | 200 | μA |
| | | ΔI _{CC} | additional supply current | per pin; V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 2.3 V to 5.5 V | ^[2] | 5 | 500 | - | 5000 | μA |
| | | C _I | input capacitance | V _{CC} = 3.3 V; V _I = GND to V _{CC} | - | 5.0 | - | - | - | 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. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for load 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 | A to Y; see Figure 7 ^[2] | | | | | | |
| | | V _{CC} = 1.65 V to 1.95 V | 1.0 | 2.6 | 6.7 | 1.0 | 8.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.5 | 1.7 | 5.5 | 0.5 | 7.0 | ns |
| | | V _{CC} = 2.7 V | 0.5 | 2.3 | 4.7 | 0.5 | 6.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.5 | 2.2 | 4.2 | 0.5 | 5.5 | ns |
| | | V _{CC} = 4.5 V to 5.5 V | 0.5 | 1.6 | 3.5 | 0.5 | 4.5 | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} ; V _{CC} = 3.3 V ^[3] | - | 7.0 | - | - | - | 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_{PLZ} and t_{PZL}.

[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;

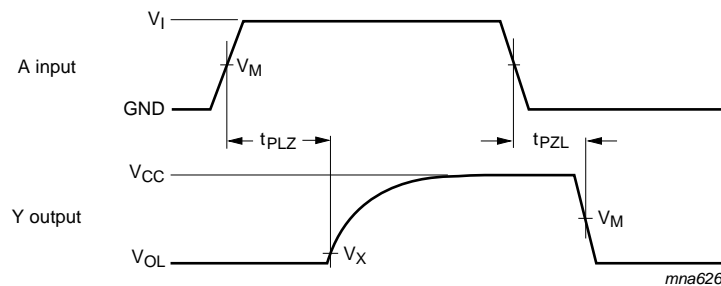
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

12. Waveforms



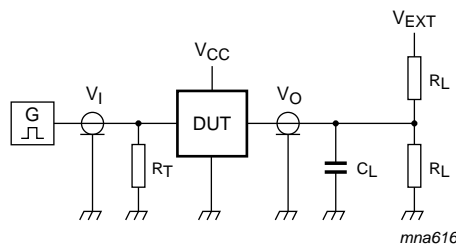
Measurement points are given in [Table 9](#).

V_{OL} is the typical output voltage level that occurs with the output load.

Fig 7. The input (A) to output (Y) propagation delays

Table 9. Measurement points

| Supply voltage | Input | Output | |
|------------------|-------------|-------------|-------------------|
| V_{CC} | V_M | V_M | V_X |
| 1.65 V to 1.95 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 V$ |
| 2.3 V to 2.7 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.15 V$ |
| 2.7 V | 1.5 V | 1.5 V | $V_{OL} + 0.3 V$ |
| 3.0 V to 3.6 V | 1.5 V | 1.5 V | $V_{OL} + 0.3 V$ |
| 4.5 V to 5.5 V | $0.5V_{CC}$ | $0.5V_{CC}$ | $V_{OL} + 0.3 V$ |



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 8. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage | Input | | Load | | V_{EXT} |
|------------------|----------|-----------------------|-------|--------------|--------------------|
| V_{CC} | V_I | t_r, t_f | C_L | R_L | t_{pZL}, t_{PLZ} |
| 1.65 V to 1.95 V | V_{CC} | $\leq 2.0 \text{ ns}$ | 30 pF | 1 k Ω | $2V_{CC}$ |
| 2.3 V to 2.7 V | V_{CC} | $\leq 2.0 \text{ ns}$ | 30 pF | 500 Ω | $2V_{CC}$ |
| 2.7 V | 2.7 V | $\leq 2.5 \text{ ns}$ | 50 pF | 500 Ω | 6 V |
| 3.0 V to 3.6 V | 2.7 V | $\leq 2.5 \text{ ns}$ | 50 pF | 500 Ω | 6 V |
| 4.5 V to 5.5 V | V_{CC} | $\leq 2.5 \text{ ns}$ | 50 pF | 500 Ω | $2V_{CC}$ |

13. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

SOT353-1

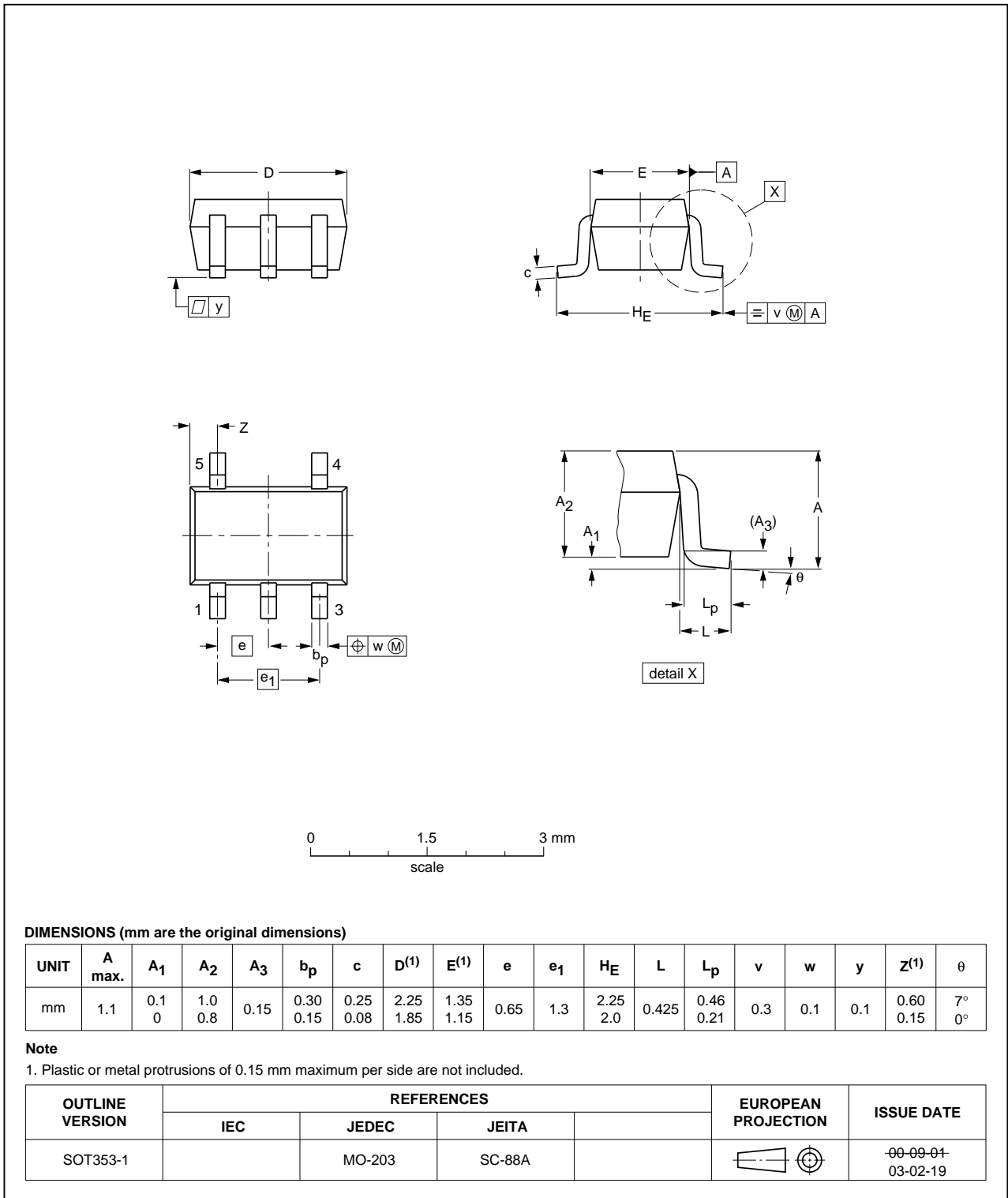


Fig 9. Package outline SOT353-1 (TSSOP5)

Plastic surface-mounted package; 5 leads

SOT753

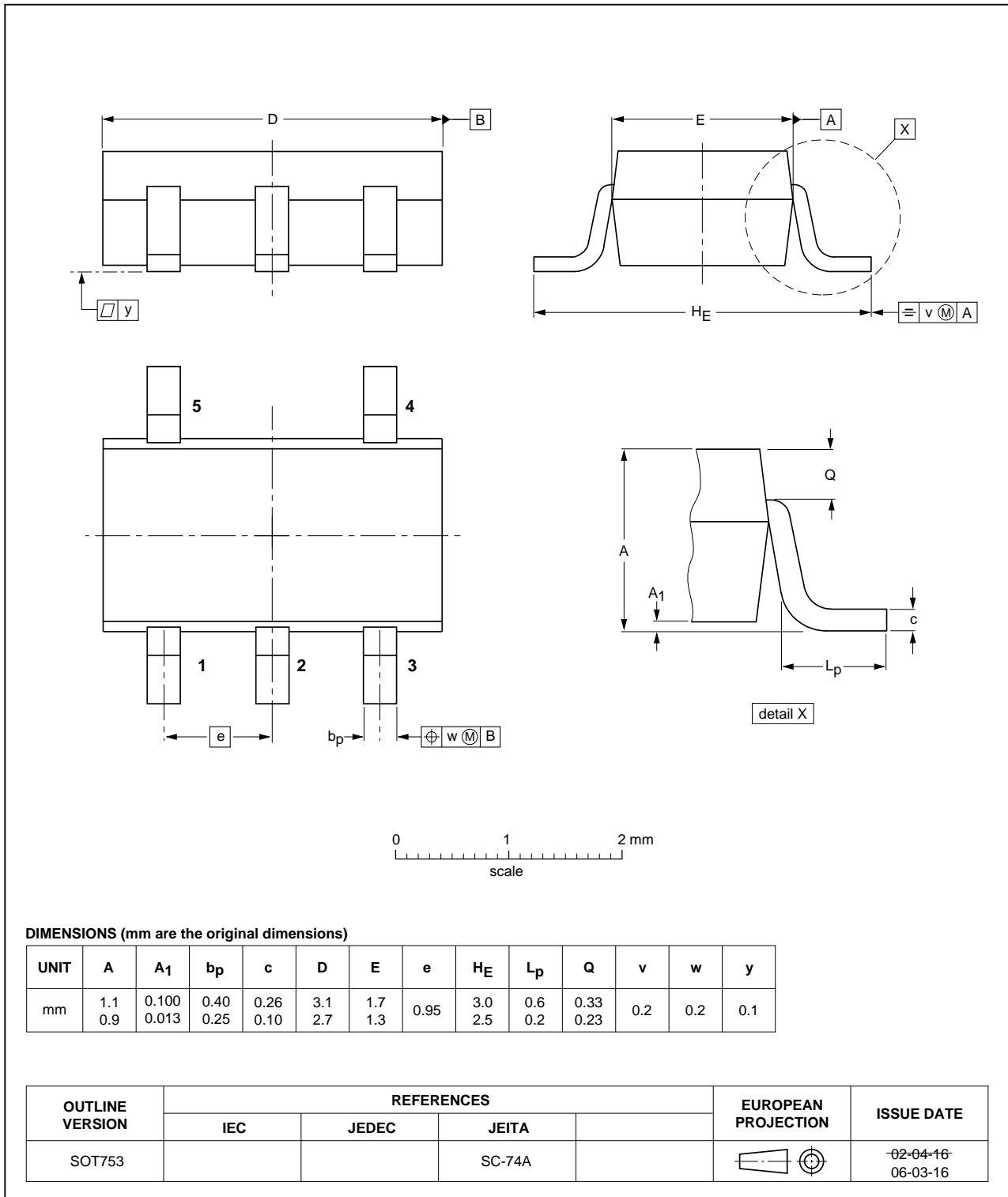


Fig 10. Package outline SOT753 (SC-74A)

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

SOT886

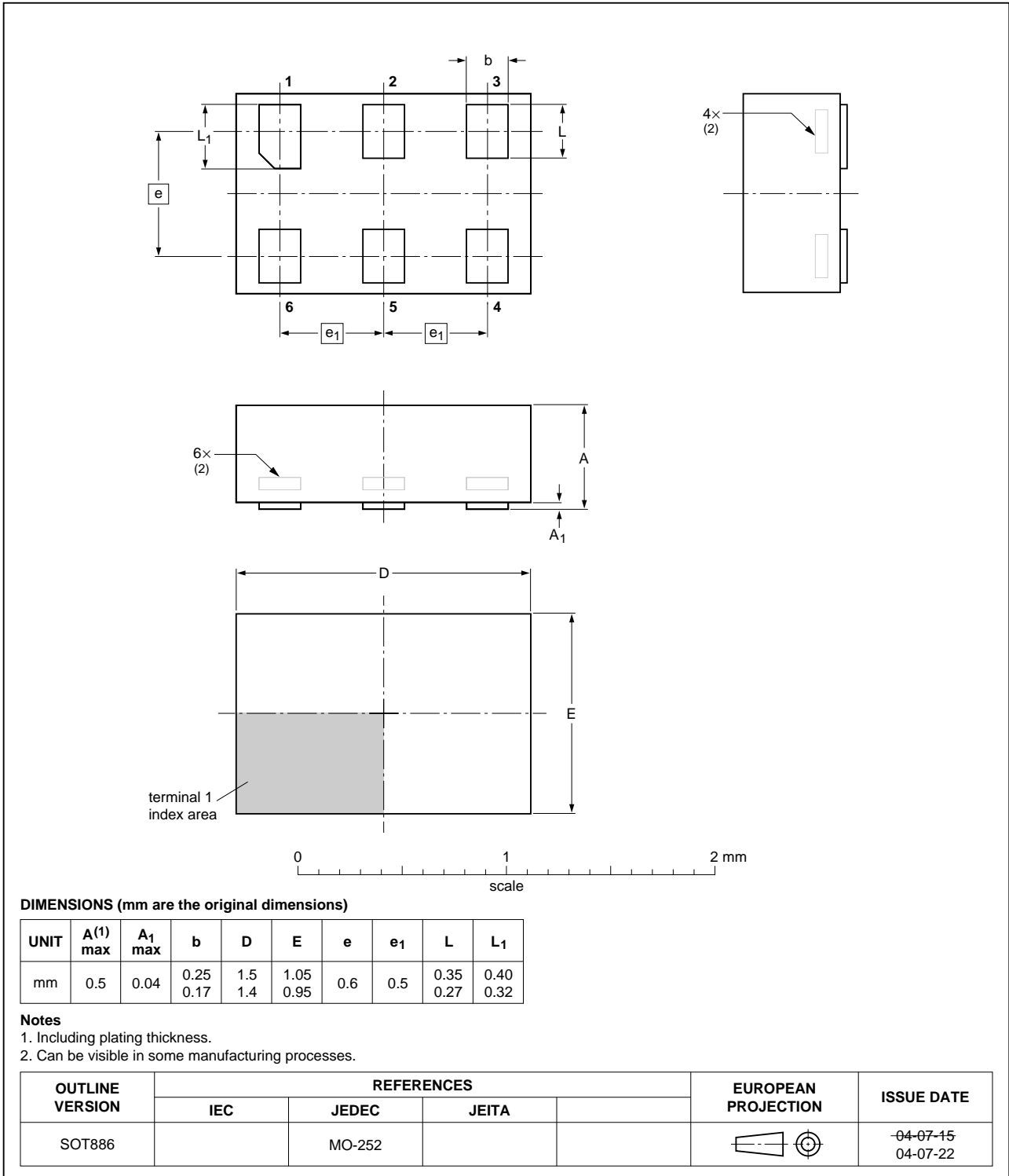


Fig 11. Package outline SOT886 (XSON6)

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

SOT891

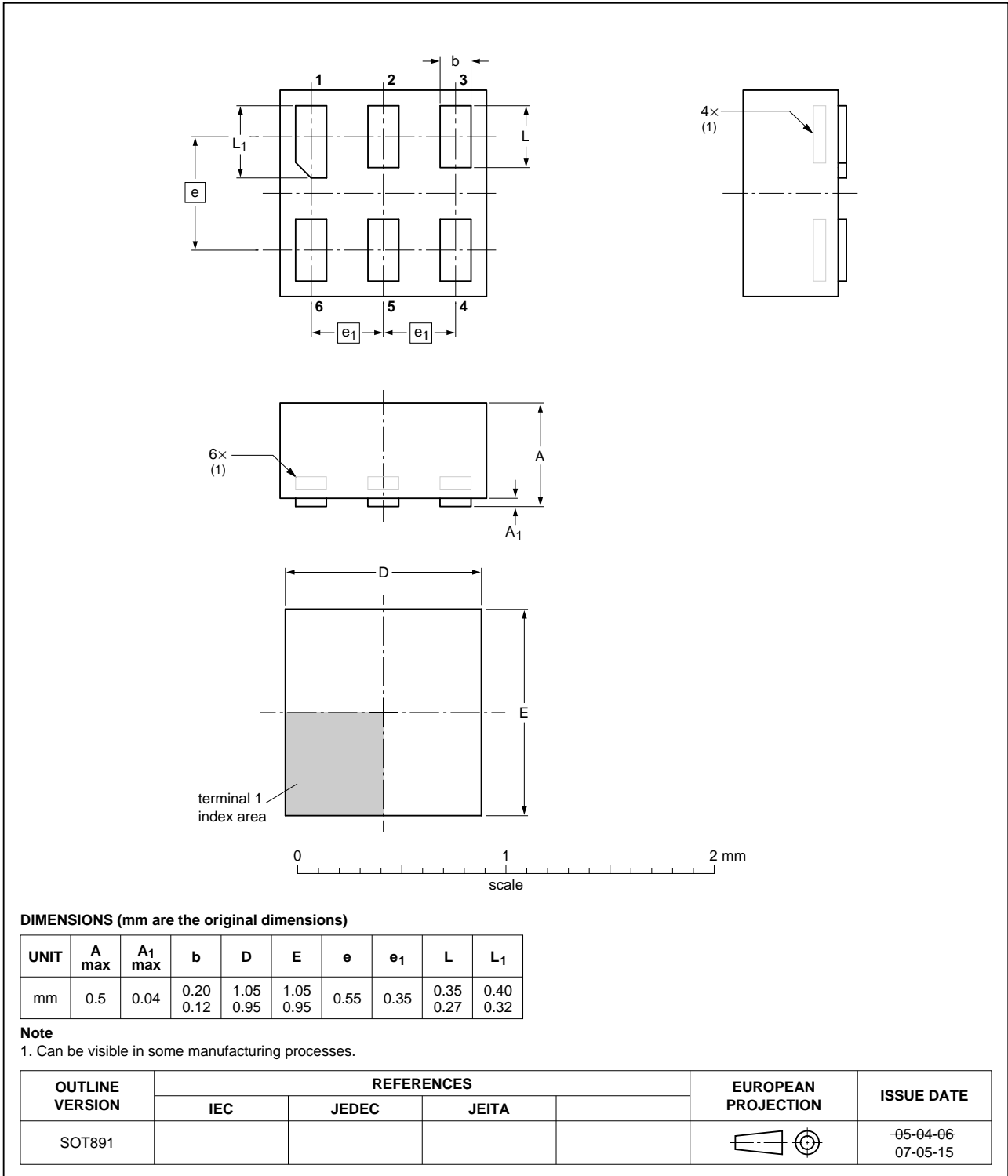


Fig 12. Package outline SOT891 (XSON6)

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

SOT1115

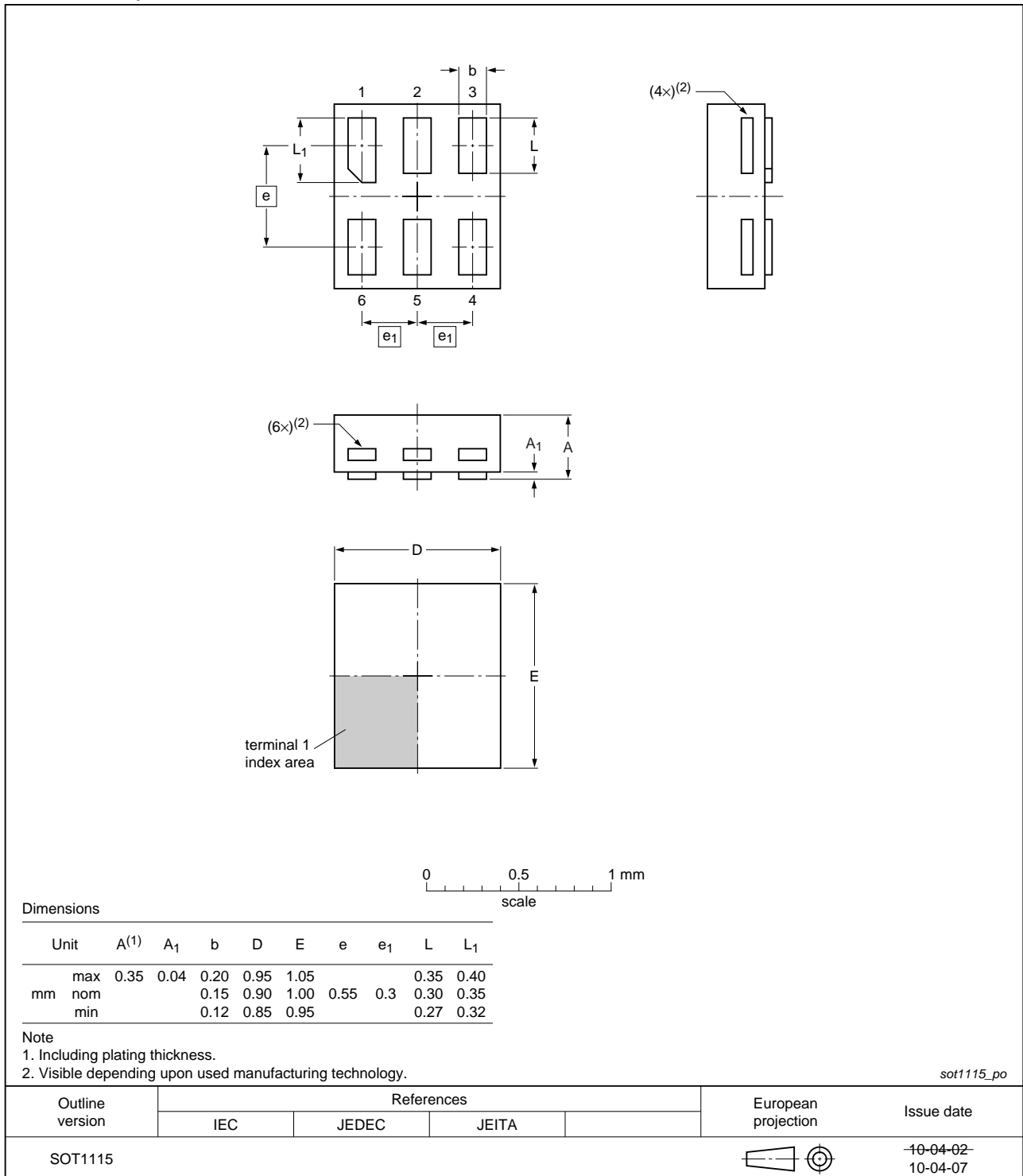


Fig 13. Package outline SOT1115 (XSON6)

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

SOT1202

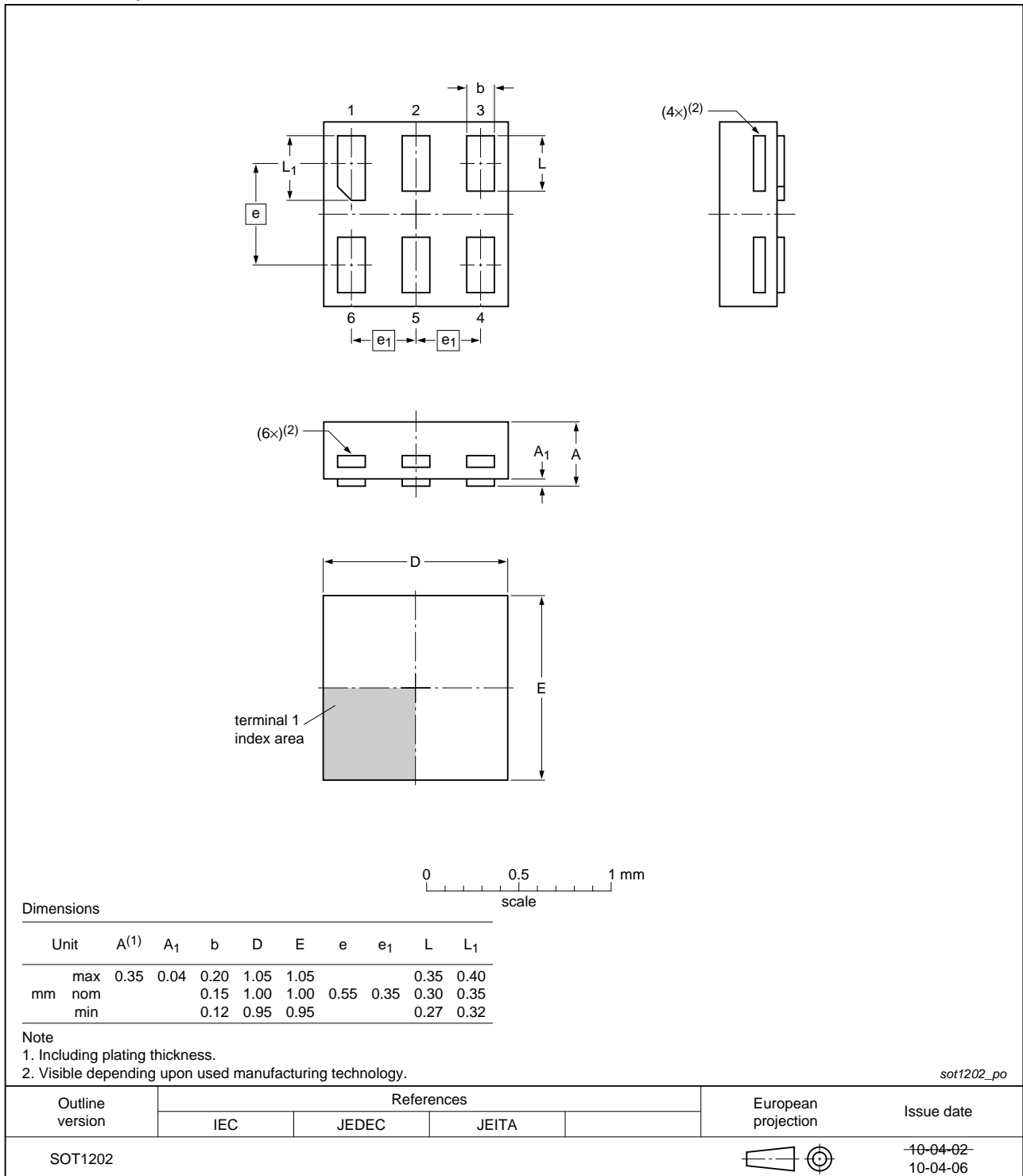


Fig 14. Package outline SOT1202 (XSON6)

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 |
|----------------|--|-----------------------|---------------|---------------|
| 74LVC1G07 v.10 | 20111207 | Product data sheet | - | 74LVC1G07 v.9 |
| Modifications: | <ul style="list-style-type: none"> Legal pages updated. | | | |
| 74LVC1G07 v.9 | 20100824 | Product data sheet | - | 74LVC1G07 v.8 |
| 74LVC1G07 v.8 | 20070717 | Product data sheet | - | 74LVC1G07 v.7 |
| 74LVC1G07 v.7 | 20070515 | Product data sheet | - | 74LVC1G07 v.6 |
| 74LVC1G07 v.6 | 20040907 | Product specification | - | 74LVC1G07 v.5 |
| 74LVC1G07 v.5 | 20030307 | Product specification | - | 74LVC1G07 v.4 |
| 74LVC1G07 v.4 | 20021002 | Product specification | - | 74LVC1G07 v.3 |
| 74LVC1G07 v.3 | 20020528 | Product specification | - | 74LVC1G07 v.2 |
| 74LVC1G07 v.2 | 20010406 | Product specification | - | 74LVC1G07 v.1 |
| 74LVC1G07 v.1 | 20001122 | Product specification | - | - |

16. Legal information

16.1 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. |
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[1] Please consult the most recently issued document before initiating or completing a design.

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

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