

74AUP2G80

Low-power dual D-type flip-flop; positive-edge trigger

Rev. 8 — 21 January 2013

Product data sheet

1. General description

The 74AUP2G80 provides the dual positive-edge triggered D-type flip-flop. Information on the data input is transferred to the \bar{Q} output on the LOW-to-HIGH transition of the clock pulse. The input pin D must be stable one setup time prior to the LOW-to-HIGH clock transition for predictable operation.

Schmitt trigger action at all inputs makes the circuit tolerant to 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

- 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 JESD78 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 | | | Version |
|-------------|-------------------|--------|---|----------|
| | Temperature range | Name | Description | |
| 74AUP2G80DC | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |
| 74AUP2G80GT | -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 |
| 74AUP2G80GF | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm | SOT1089 |
| 74AUP2G80GD | -40 °C to +125 °C | XSON8 | plastic extremely thin small outline package; no leads; 8 terminals; body 3 × 2 × 0.5 mm | SOT996-2 |
| 74AUP2G80GM | -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 |
| 74AUP2G80GN | -40 °C to +125 °C | XSON8 | extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm | SOT1116 |
| 74AUP2G80GS | -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 ^[1] |
|-------------|-----------------------------|
| 74AUP2G80DC | p80 |
| 74AUP2G80GT | p80 |
| 74AUP2G80GF | pT |
| 74AUP2G80GD | p80 |
| 74AUP2G80GM | p80 |
| 74AUP2G80GN | pT |
| 74AUP2G80GS | pT |

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

5. Functional diagram

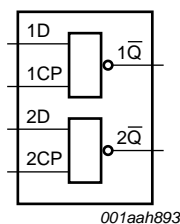


Fig 1. Logic symbol

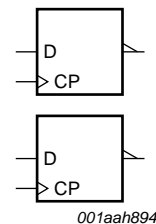


Fig 2. IEC logic symbol

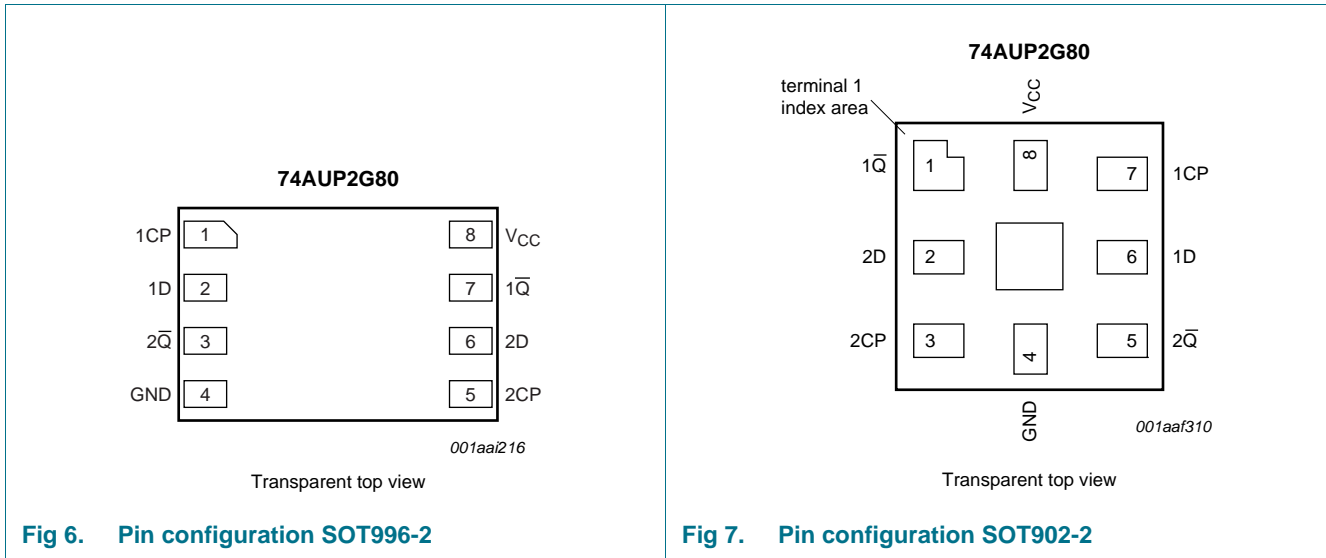


Fig 6. Pin configuration SOT996-2

Fig 7. Pin configuration SOT902-2

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | | Description |
|-----------------|--|----------|----------------|
| | SOT765-1, SOT833-1, SOT1089, SOT996-2, SOT1116 and SOT1203 | SOT902-2 | |
| 1CP, 2CP | 1, 5 | 7, 3 | clock input |
| 1D, 2D | 2, 6 | 6, 2 | data input |
| GND | 4 | 4 | ground (0 V) |
| 1Q, 2Q | 7, 3 | 1, 5 | data output |
| V _{CC} | 8 | 8 | supply voltage |

7. Functional description

Table 4. Function table^[1]

| Input | | | Output |
|-------|----|--|--------|
| nCP | nD | | nQ |
| ↑ | L | | H |
| ↑ | H | | L |
| L | X | | q̄ |

[1] H = HIGH voltage level;
 L = LOW voltage level;
 ↑ = LOW-to-HIGH CP transition;
 X = don't care;
 q̄ = lower case letter indicates the state of referenced input, one setup time prior to the LOW-to-HIGH CP transition.

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} | - | ± 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 |
|--------------------------------|--------------------------------------|--|------------------------|-----|------------------------|------|
| T_{amb} = 25 °C | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 0.8 V | 0.70 × V _{CC} | - | - | V |
| | | V _{CC} = 0.9 V to 1.95 V | 0.65 × V _{CC} | - | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | - | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 0.8 V | - | - | 0.30 × V _{CC} | V |
| | | V _{CC} = 0.9 V to 1.95 V | - | - | 0.35 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | V _{CC} = 3.0 V to 3.6 V | - | - | 0.9 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.1 | - | - | V |
| | | I _O = -1.1 mA; V _{CC} = 1.1 V | 0.75 × V _{CC} | - | - | V |
| | | I _O = -1.7 mA; V _{CC} = 1.4 V | 1.11 | - | - | V |
| | | I _O = -1.9 mA; V _{CC} = 1.65 V | 1.32 | - | - | V |
| | | I _O = -2.3 mA; V _{CC} = 2.3 V | 2.05 | - | - | V |
| | | I _O = -3.1 mA; V _{CC} = 2.3 V | 1.9 | - | - | V |
| | | I _O = -2.7 mA; V _{CC} = 3.0 V | 2.72 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | I _O = 1.1 mA; V _{CC} = 1.1 V | - | - | 0.3 × V _{CC} | V |
| | | I _O = 1.7 mA; V _{CC} = 1.4 V | - | - | 0.31 | V |
| | | I _O = 1.9 mA; V _{CC} = 1.65 V | - | - | 0.31 | V |
| | | I _O = 2.3 mA; V _{CC} = 2.3 V | - | - | 0.31 | V |
| | | I _O = 3.1 mA; V _{CC} = 2.3 V | - | - | 0.44 | V |
| | | I _O = 2.7 mA; V _{CC} = 3.0 V | - | - | 0.31 | V |
| I _I | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.1 | μA |
| | | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V | - | - | ±0.2 | μA |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.2 | μA |
| I _{CC} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 0.5 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] - | - | 40 | μA |
| C _I | input capacitance | V _{CC} = 0 V to 3.6 V; V _I = GND or V _{CC} | - | 0.6 | - | pF |
| C _O | output capacitance | V _O = GND; V _{CC} = 0 V | - | 1.3 | - | 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 |
|---|--------------------------------------|--|------------------------|-----|------------------------|------|
| T_{amb} = -40 °C to +85 °C | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 0.8 V | 0.70 × V _{CC} | - | - | V |
| | | V _{CC} = 0.9 V to 1.95 V | 0.65 × V _{CC} | - | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | - | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 0.8 V | - | - | 0.30 × V _{CC} | V |
| | | V _{CC} = 0.9 V to 1.95 V | - | - | 0.35 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | V _{CC} = 3.0 V to 3.6 V | - | - | 0.9 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.1 | - | - | V |
| | | I _O = -1.1 mA; V _{CC} = 1.1 V | 0.7 × V _{CC} | - | - | V |
| | | I _O = -1.7 mA; V _{CC} = 1.4 V | 1.03 | - | - | V |
| | | I _O = -1.9 mA; V _{CC} = 1.65 V | 1.30 | - | - | V |
| | | I _O = -2.3 mA; V _{CC} = 2.3 V | 1.97 | - | - | V |
| | | I _O = -3.1 mA; V _{CC} = 2.3 V | 1.85 | - | - | V |
| | | I _O = -2.7 mA; V _{CC} = 3.0 V | 2.67 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | I _O = 1.1 mA; V _{CC} = 1.1 V | - | - | 0.3 × V _{CC} | V |
| | | I _O = 1.7 mA; V _{CC} = 1.4 V | - | - | 0.37 | V |
| | | I _O = 1.9 mA; V _{CC} = 1.65 V | - | - | 0.35 | V |
| | | I _O = 2.3 mA; V _{CC} = 2.3 V | - | - | 0.33 | V |
| | | I _O = 3.1 mA; V _{CC} = 2.3 V | - | - | 0.45 | V |
| | | I _O = 2.7 mA; V _{CC} = 3.0 V | - | - | 0.33 | V |
| I _I | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.5 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V | - | - | ±0.5 | μA |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.6 | μA |
| I _{CC} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 0.9 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] | - | 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 |
|--|--------------------------------------|--|------------------------|-----|------------------------|------|
| T_{amb} = -40 °C to +125 °C | | | | | | |
| V _{IH} | HIGH-level input voltage | V _{CC} = 0.8 V | 0.75 × V _{CC} | - | - | V |
| | | V _{CC} = 0.9 V to 1.95 V | 0.70 × V _{CC} | - | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | - | - | V |
| V _{IL} | LOW-level input voltage | V _{CC} = 0.8 V | - | - | 0.25 × V _{CC} | V |
| | | V _{CC} = 0.9 V to 1.95 V | - | - | 0.30 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | V _{CC} = 3.0 V to 3.6 V | - | - | 0.9 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.11 | - | - | V |
| | | I _O = -1.1 mA; V _{CC} = 1.1 V | 0.6 × V _{CC} | - | - | V |
| | | I _O = -1.7 mA; V _{CC} = 1.4 V | 0.93 | - | - | V |
| | | I _O = -1.9 mA; V _{CC} = 1.65 V | 1.17 | - | - | V |
| | | I _O = -2.3 mA; V _{CC} = 2.3 V | 1.77 | - | - | V |
| | | I _O = -3.1 mA; V _{CC} = 2.3 V | 1.67 | - | - | V |
| | | I _O = -2.7 mA; V _{CC} = 3.0 V | 2.40 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V | - | - | 0.11 | V |
| | | I _O = 1.1 mA; V _{CC} = 1.1 V | - | - | 0.33 × V _{CC} | V |
| | | I _O = 1.7 mA; V _{CC} = 1.4 V | - | - | 0.41 | V |
| | | I _O = 1.9 mA; V _{CC} = 1.65 V | - | - | 0.39 | V |
| | | I _O = 2.3 mA; V _{CC} = 2.3 V | - | - | 0.36 | V |
| | | I _O = 3.1 mA; V _{CC} = 2.3 V | - | - | 0.50 | V |
| | | I _O = 2.7 mA; V _{CC} = 3.0 V | - | - | 0.36 | V |
| I _I | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.75 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V | - | - | ±0.75 | μA |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.75 | μA |
| I _{CC} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 1.4 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] | - | 75 | μA |

[1] One input at V_{CC} - 0.6 V, other input at V_{CC} or GND.

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | | Unit |
|------------------------------|-------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| C_L = 5 pF | | | | | | | | | | |
| t _{pd} | propagation delay | nCP to nQ̄; see Figure 8 | [2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 20.9 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.9 | 6.0 | 12.9 | 2.6 | 14.3 | 2.6 | 15.7 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.9 | 4.2 | 7.6 | 2.0 | 8.9 | 2.0 | 9.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.7 | 3.4 | 5.9 | 1.6 | 7.0 | 1.6 | 7.7 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.4 | 2.6 | 4.3 | 1.2 | 5.6 | 1.2 | 6.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.2 | 2.2 | 3.6 | 1.0 | 4.4 | 1.0 | 4.8 | ns |
| f _{max} | maximum frequency | nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 53 | - | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 203 | - | 170 | - | 170 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 347 | - | 310 | - | 300 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 435 | - | 400 | - | 390 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 550 | - | 490 | - | 480 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 619 | - | 550 | - | 510 | - | MHz |
| C_L = 10 pF | | | | | | | | | | |
| t _{pd} | propagation delay | nCP to nQ̄; see Figure 8 | [2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 24.6 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.3 | 6.9 | 14.9 | 3.0 | 16.5 | 3.0 | 18.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.6 | 4.8 | 8.8 | 2.3 | 10.3 | 2.3 | 11.3 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.3 | 3.9 | 6.8 | 2.0 | 8.1 | 2.0 | 8.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.9 | 3.1 | 5.1 | 1.7 | 6.3 | 1.7 | 6.9 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.8 | 2.7 | 4.4 | 1.4 | 4.9 | 1.4 | 5.4 | ns |
| f _{max} | maximum frequency | nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 52 | - | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 192 | - | 150 | - | 150 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 324 | - | 280 | - | 230 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 421 | - | 310 | - | 250 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 486 | - | 370 | - | 360 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 550 | - | 410 | - | 360 | - | MHz |

Table 8. Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V; for test circuit see [Figure 10](#)).

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | | Unit |
|---|-------------------|---|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| C_L = 15 pF | | | | | | | | | | |
| t _{pd} | propagation delay | nCP to nQ̄; see Figure 8 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 28.2 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.0 | 7.6 | 16.7 | 3.4 | 18.6 | 3.4 | 20.5 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.0 | 5.3 | 9.8 | 2.6 | 11.5 | 2.6 | 12.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.6 | 4.4 | 7.6 | 2.3 | 9.1 | 2.3 | 10.0 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.2 | 3.5 | 5.7 | 2.0 | 6.9 | 2.0 | 7.6 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.9 | 3.1 | 5.0 | 1.8 | 5.5 | 1.8 | 6.1 | ns |
| f _{max} | maximum frequency | nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 50 | - | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 181 | - | 120 | - | 120 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 301 | - | 190 | - | 160 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 407 | - | 240 | - | 190 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 422 | - | 300 | - | 270 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 481 | - | 320 | - | 300 | - | MHz |
| C_L = 30 pF | | | | | | | | | | |
| t _{pd} | propagation delay | nCP to nQ̄; see Figure 8 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 38.8 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 4.9 | 9.8 | 20.7 | 4.4 | 24.7 | 4.4 | 27.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 4.0 | 6.8 | 12.7 | 3.5 | 15.0 | 3.5 | 16.5 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.5 | 5.6 | 9.9 | 2.2 | 11.9 | 2.2 | 13.1 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.1 | 4.5 | 7.5 | 2.8 | 9.3 | 2.8 | 10.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.9 | 4.1 | 6.4 | 2.7 | 7.5 | 2.7 | 8.3 | ns |
| f _{max} | maximum frequency | nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 28 | - | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 128 | - | 70 | - | 70 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 206 | - | 120 | - | 110 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 262 | - | 150 | - | 120 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 269 | - | 190 | - | 170 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 309 | - | 200 | - | 190 | - | MHz |
| C_L = 5 pF, 10 pF, 15 pF and 30 pF | | | | | | | | | | |
| t _{su(H)} | set-up time HIGH | nD to nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 2.5 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.5 | - | 2.3 | - | 2.3 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.3 | - | 1.2 | - | 1.2 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.3 | - | 0.8 | - | 0.8 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.2 | - | 0.6 | - | 0.6 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.2 | - | 0.4 | - | 0.4 | - | ns |

Table 8. Dynamic characteristics ...continued

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | | Unit |
|--------------------|-------------------------------------|---|--------------------------|--------------------|-----|--------------------------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| t _{su(L)} | set-up time LOW | nD to nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 1.7 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.3 | - | 1.9 | - | 1.9 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.2 | - | 1.3 | - | 1.3 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.2 | - | 1.1 | - | 1.1 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.3 | - | 0.8 | - | 0.8 | - | ns |
| t _h | hold time | nD to nCP; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | -2.1 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | -0.4 | - | 0.1 | - | 0.1 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | -0.3 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | -0.2 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | -0.2 | - | 0 | - | 0 | - | ns |
| t _w | pulse width | nCP HIGH or LOW; see Figure 9 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 5.2 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.0 | - | 3.0 | - | 3.0 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.8 | - | 2.0 | - | 2.0 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.6 | - | 2.0 | - | 2.0 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.5 | - | 2.0 | - | 2.0 | - | ns |
| C _{PD} | power dissipation capacitance | f = 1 MHz; V _i = GND to V _{CC} ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 1.8 | - | - | - | - | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.8 | - | - | - | - | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.9 | - | - | - | - | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 2.0 | - | - | - | - | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 2.4 | - | - | - | - | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 2.9 | - | - | - | - | pF | |

[1] All typical values are measured at nominal V_{CC}.

[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).

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

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;

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

12. Waveforms

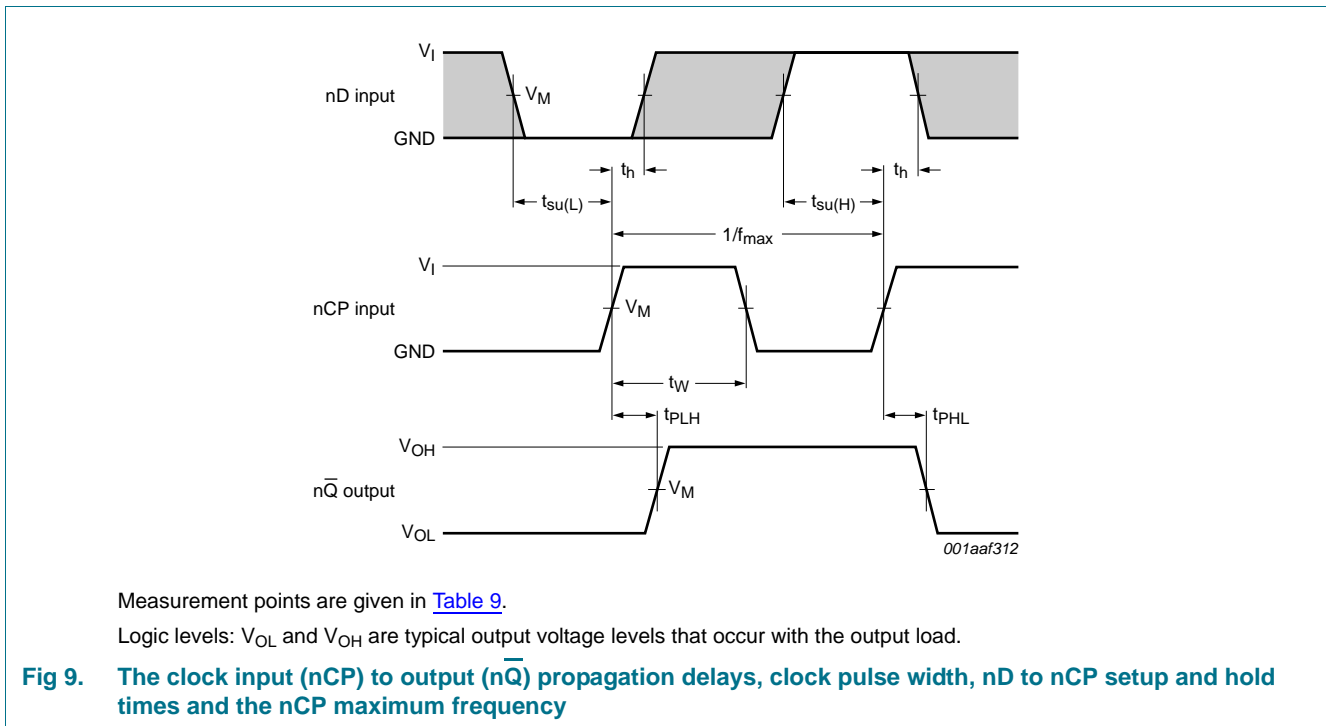
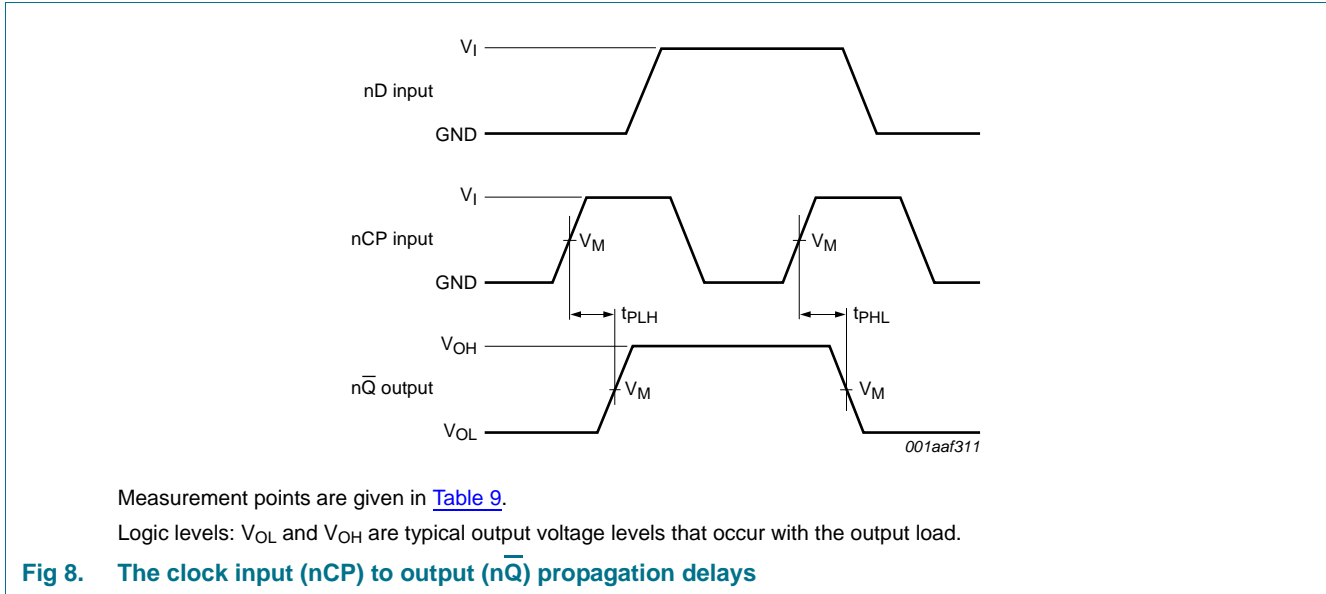
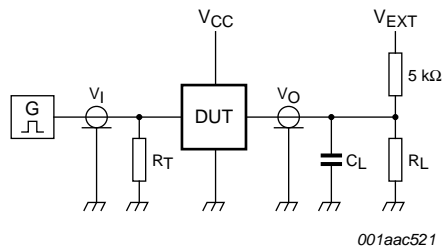


Table 9. Measurement points

| Supply voltage | Output | Input | | |
|----------------|---------------------|---------------------|----------|---------------|
| V_{CC} | V_M | V_M | V_I | $t_r = t_f$ |
| 0.8 V to 3.6 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | V_{CC} | ≤ 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 10. 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 | $2 \times V_{CC}$ |

[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

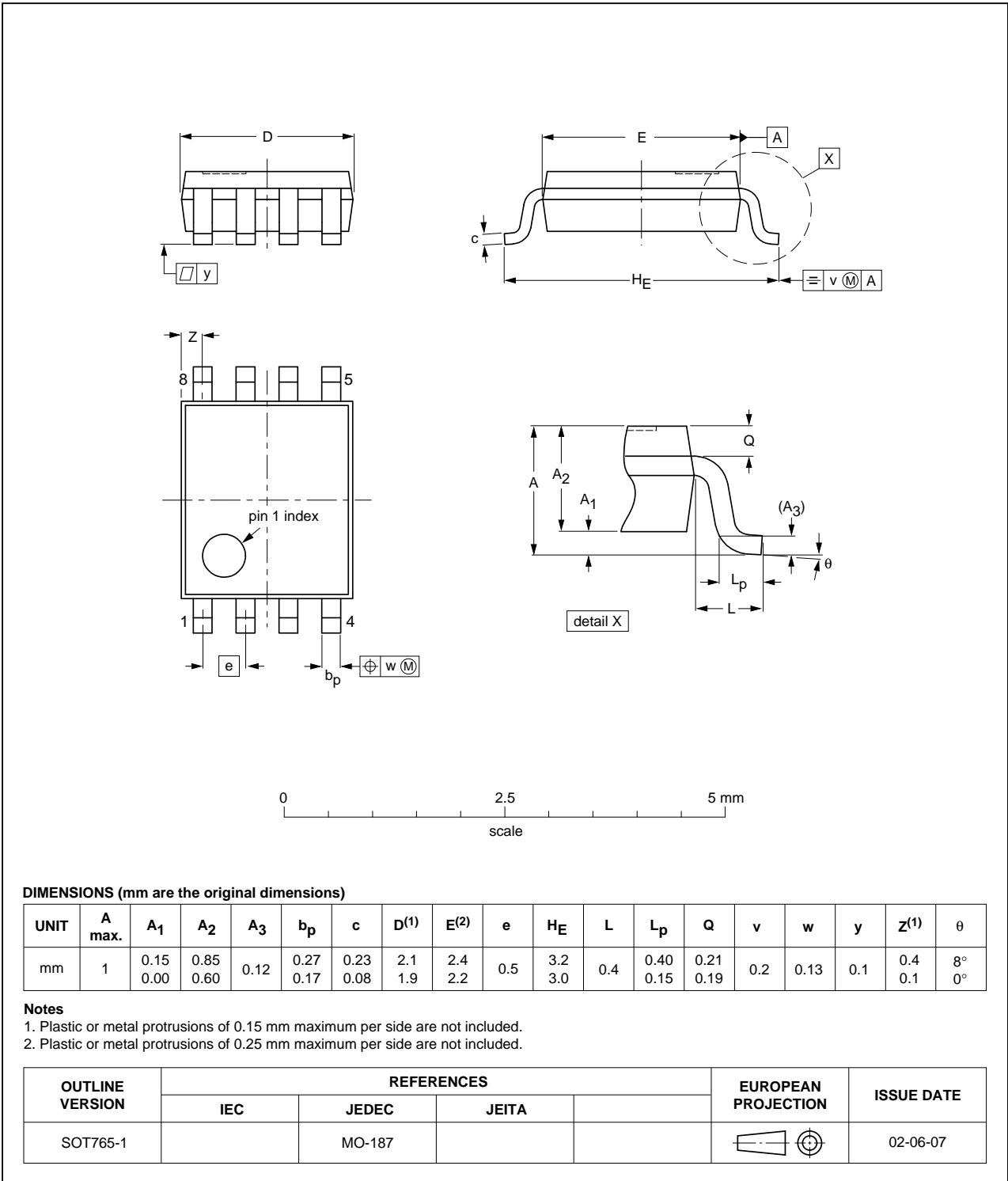


Fig 11. Package outline SOT765-1 (VSSOP8)

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

SOT833-1

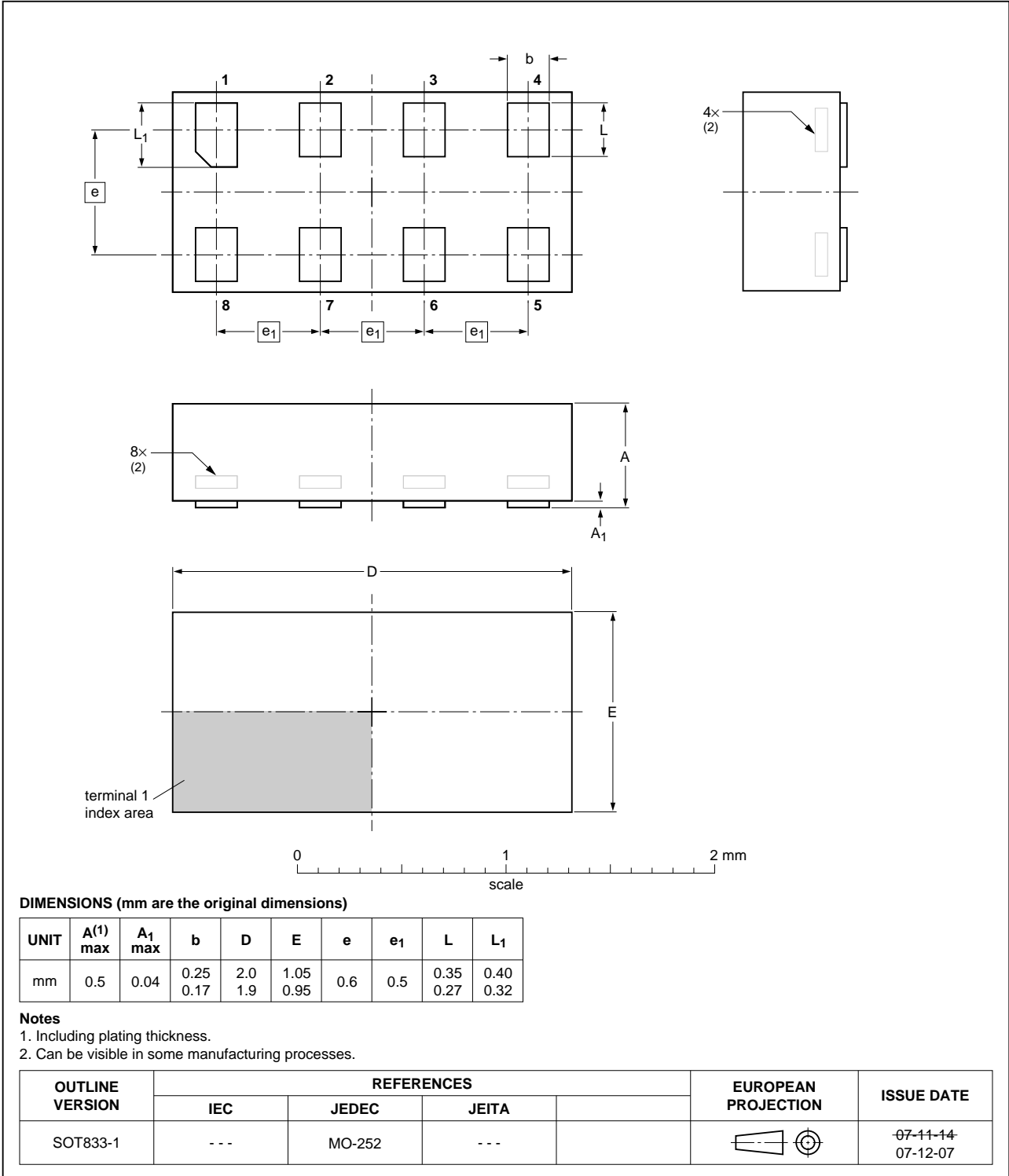


Fig 12. Package outline SOT833-1 (XSON8)

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

SOT1089

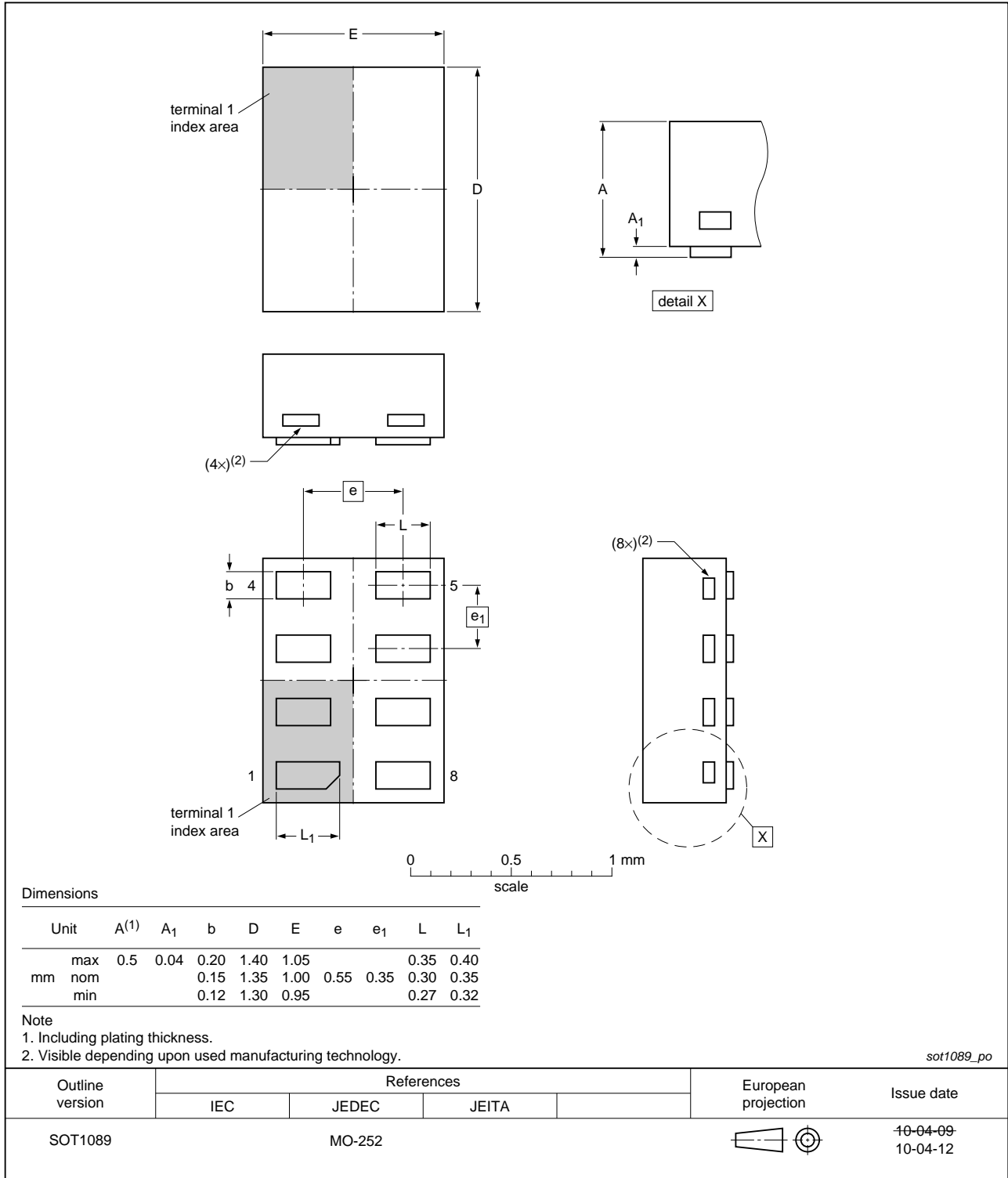


Fig 13. Package outline SOT1089 (XSON8)

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

SOT996-2

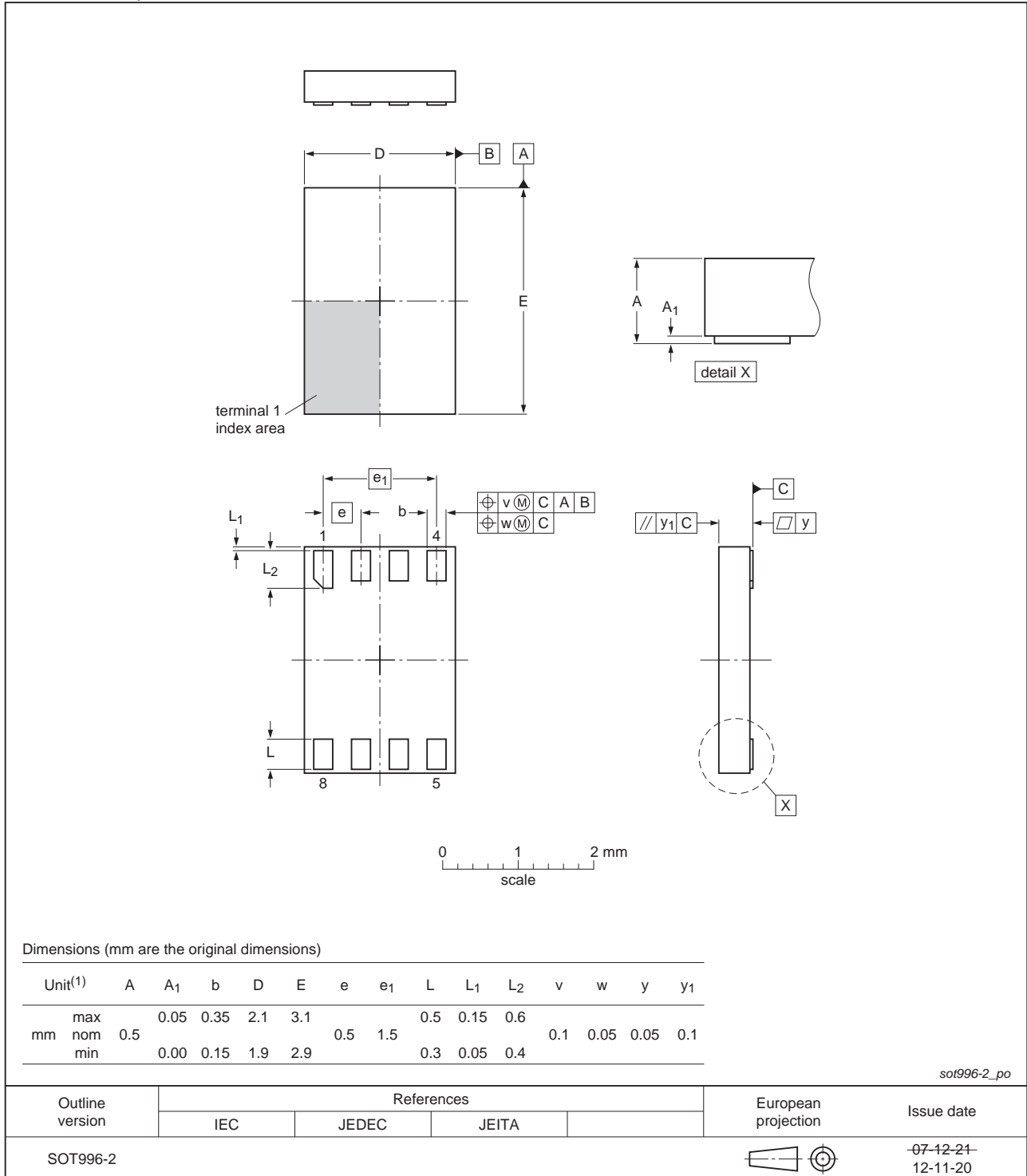


Fig 14. Package outline SOT996-2 (XSON8)

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

SOT902-2

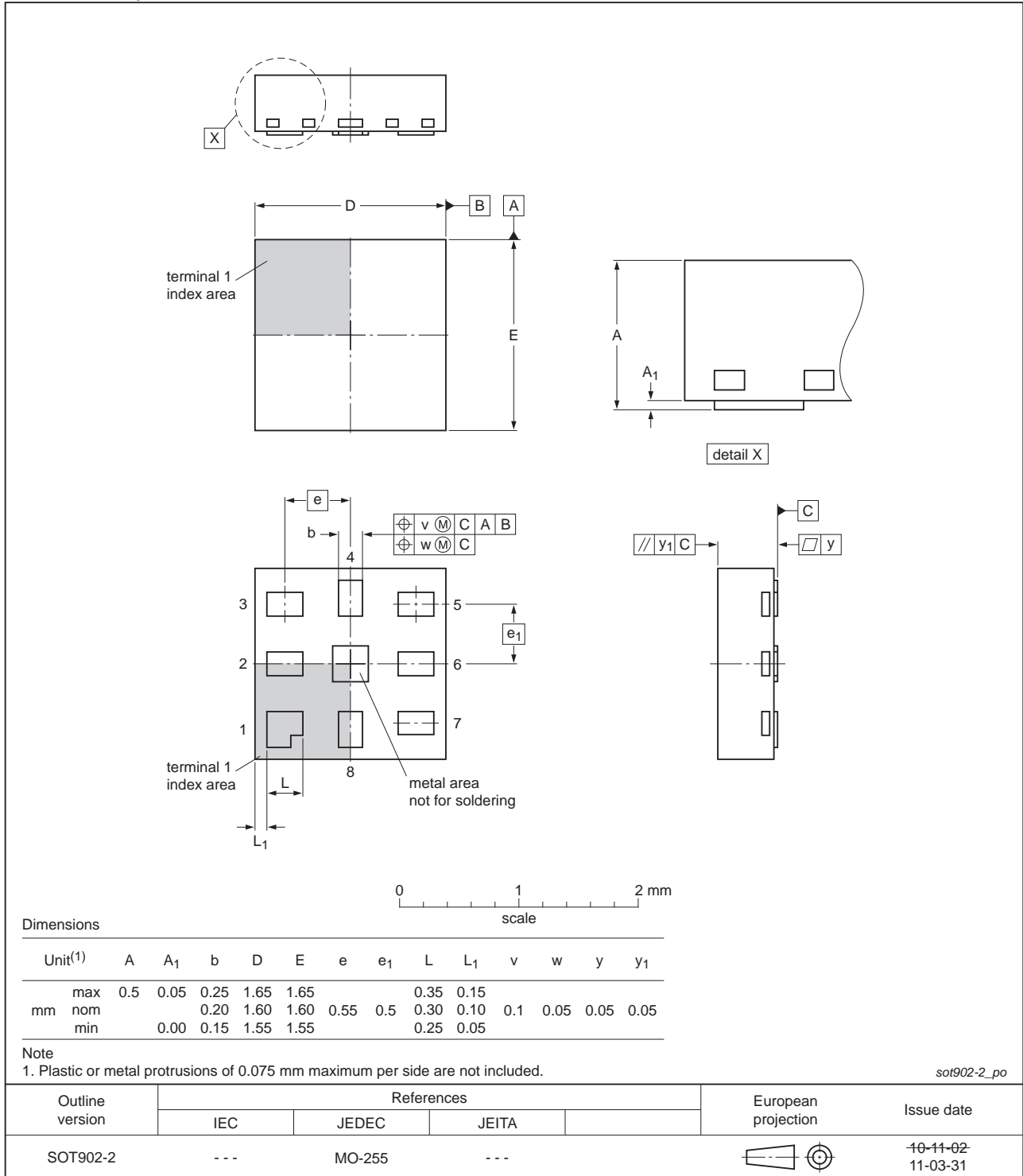


Fig 15. Package outline SOT902-2 (XQFN8)

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

SOT1116

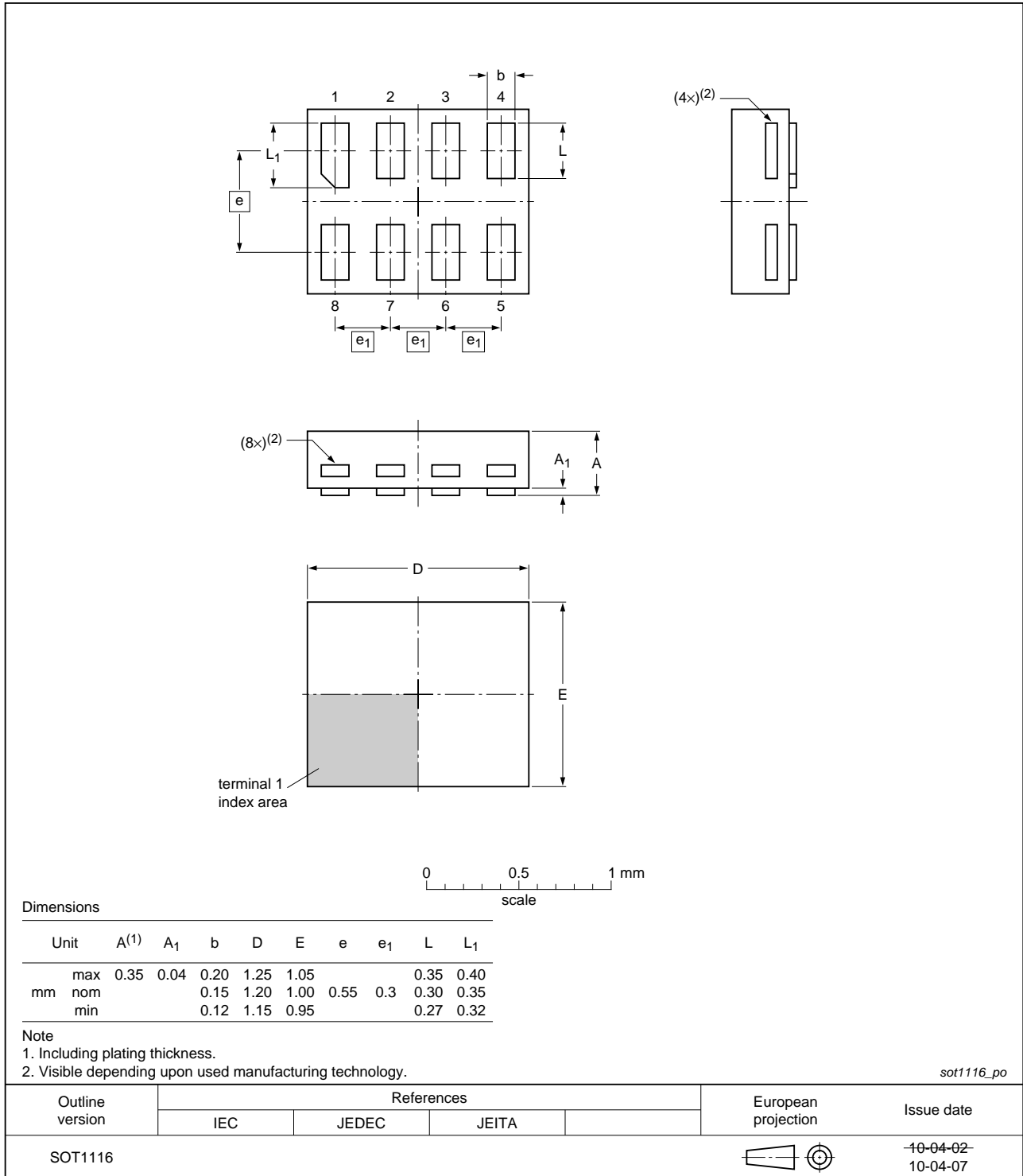


Fig 16. Package outline SOT1116 (XSON8)

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

SOT1203

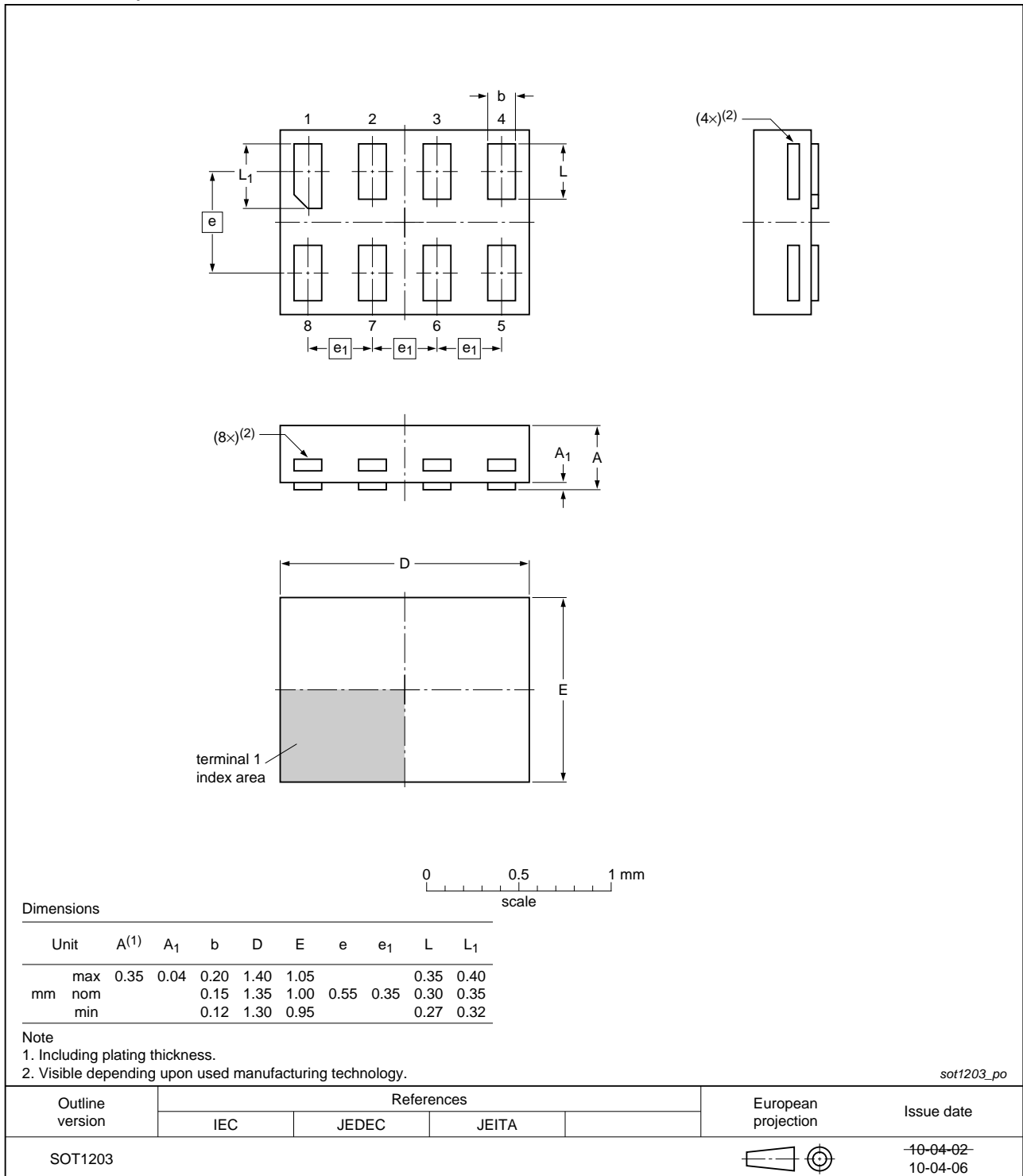


Fig 17. Package outline SOT1203 (XSON8)

14. Abbreviations

Table 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 |
|----------------|--|--------------------|---------------|---------------|
| 74AUP2G80 v.8 | 20130121 | Product data sheet | - | 74AUP2G80 v.7 |
| Modifications: | <ul style="list-style-type: none"> For type number 74AUP2G80GD XSON8U has changed to XSON8. | | | |
| 74AUP2G80 v.7 | 20120614 | Product data sheet | - | 74AUP2G80 v.6 |
| 74AUP2G80 v.6 | 20111207 | Product data sheet | - | 74AUP2G80 v.5 |
| 74AUP2G80 v.5 | 20101005 | Product data sheet | - | 74AUP2G80 v.4 |
| 74AUP2G80 v.4 | 20080602 | Product data sheet | - | 74AUP2G80 v.3 |
| 74AUP2G80 v.3 | 20080328 | Product data sheet | - | 74AUP2G80 v.2 |
| 74AUP2G80 v.2 | 20070801 | Product data sheet | - | 74AUP2G80 v.1 |
| 74AUP2G80 v.1 | 20060825 | Product data sheet | - | - |

16. Legal information

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| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
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| 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".

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