

74AUP1T97

Low-power configurable gate with voltage-level translator

Rev. 6 — 28 March 2017

Product data sheet

1 General description

The 74AUP1T97 provides low-power, low-voltage configurable logic gate functions. The output state is determined by eight patterns of 3-bit input. The user can choose the logic functions MUX, AND, OR, NAND, NOR, inverter and buffer. All inputs can be connected to V_{CC} or GND.

This device ensures a very low static and dynamic power consumption across the entire V_{CC} range from 2.3 V to 3.6 V.

The 74AUP1T97 is designed for logic-level translation applications with input switching levels that accept 1.8 V low-voltage CMOS signals, while operating from either a single 2.5 V or 3.3 V supply voltage.

The wide supply voltage range ensures normal operation as battery voltage drops from 3.6 V to 2.3 V.

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.

Schmitt trigger inputs make the circuit tolerant to slower input rise and fall times across the entire V_{CC} range.

2 Features and benefits

- Wide supply voltage range from 2.3 V to 3.6 V
- High noise immunity
- ESD protection:
 - HBM JESD22-A114F Class 3A exceeds 5 000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101E exceeds 1 000 V
- Low static power consumption; $I_{CC} = 1.5 \mu\text{A}$ (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 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 | |
| 74AUP1T97GW | -40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| 74AUP1T97GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm | SOT886 |
| 74AUP1T97GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1 x 0.5 mm | SOT891 |
| 74AUP1T97GN | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm | SOT1115 |
| 74AUP1T97GS | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm | SOT1202 |
| 74AUP1T97GX | -40 °C to +125 °C | X2SON6 | plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 x 0.8 x 0.35 mm | SOT1255 |
| 74AUP1T97UK | -40 °C to +125 °C | WLCSP6 | wafer level chip-scale package; 6 bumps; 0.65 x 0.44 x 0.27 mm | SOT1454-1 |

4 Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| 74AUP1T97GW | 59 |
| 74AUP1T97GM | 59 |
| 74AUP1T97GF | 59 |
| 74AUP1T97GN | 59 |
| 74AUP1T97GS | 59 |
| 74AUP1T97GX | 59 |
| 74AUP1T97UK | 9 |

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

5 Pinning information

5.1 Pinning

Table 3. Pinning

| | |
|---|---|
| <p style="text-align: center;">74AUP1T97</p> <p style="text-align: center;">001aag500</p> | <p style="text-align: center;">74AUP1T97</p> <p style="text-align: center;">001aag501</p> <p style="text-align: center;">Transparent top view</p> |
| <p style="text-align: center;">74AUP1T97</p> <p style="text-align: center;">001aag502</p> <p style="text-align: center;">Transparent top view</p> | <p style="text-align: center;">74AUP1T97</p> <p style="text-align: center;">aaa-019832</p> <p style="text-align: center;">Transparent top view</p> |
| <p style="text-align: center;">74AUP1T97UK</p> <p style="text-align: center;">ball A1 index area</p> <p style="text-align: center;">aaa-018292</p> <p style="text-align: center;">Transparent top view</p> | <p style="text-align: center;">74AUP1T97UK</p> <p style="text-align: center;">aaa-018293</p> <p style="text-align: center;">Transparent top view</p> |

5.2 Pin description

Table 4. Pin description

| Symbol | Pin | | Description |
|-----------------|------------------------|--------|----------------|
| | SC88, XSON6 and X2SON6 | WLCSP6 | |
| B | 1 | A1 | data input |
| GND | 2 | B1 | ground (0 V) |
| A | 3 | C1 | data input |
| Y | 4 | C2 | data output |
| V _{CC} | 5 | B2 | supply voltage |
| C | 6 | A2 | data input |

6 Functional description

Table 5. Function table ^[1]

| Input | | | Output |
|-------|---|---|--------|
| C | B | A | Y |
| L | L | L | L |
| L | L | H | L |
| L | H | L | H |
| L | H | H | H |
| H | L | L | L |
| H | L | H | H |
| H | H | L | L |
| H | H | H | H |

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

7 Functional diagram

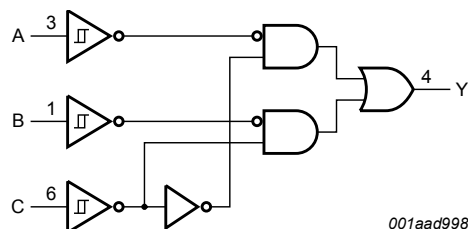


Figure 7. Logic symbol

8 Logic configurations

Table 6. Function selection table

| Logic function | Figure |
|--------------------------------------|-------------------------------|
| 2-input MUX | see Figure 8 |
| 2-input AND | see Figure 9 |
| 2-input OR with one input inverted | see Figure 10 |
| 2-input NAND with one input inverted | see Figure 10 |
| 2-input AND with one input inverted | see Figure 11 |
| 2-input NOR with one input inverted | see Figure 11 |
| 2-input OR | see Figure 12 |
| Inverter | see Figure 13 |
| Buffer | see Figure 14 |

| | |
|---|---|
| <p>Figure 8. 2-input MUX</p> | <p>Figure 9. 2-input AND gate</p> |
| <p>Figure 10. 2-input NAND gate with input A inverted or 2-input OR gate with input C inverted</p> | <p>Figure 11. 2-input NOR gate with input B inverted or 2-input AND gate with input C inverted</p> |
| <p>Figure 12. 2-input OR gate</p> | <p>Figure 13. Inverter</p> |

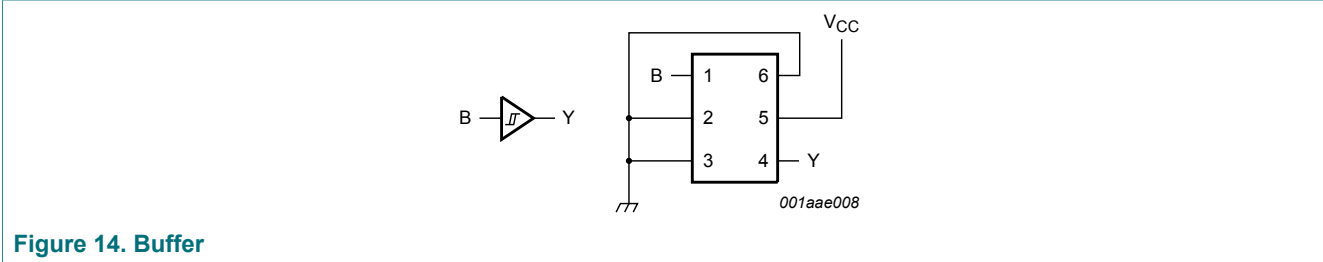


Figure 14. Buffer

9 Limiting values

Table 7. 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 SC-88 package: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
 For X2SON6 and XSON6 packages: above 118 °C the value of P_{tot} derates linearly with 7.8 mW/K.
 For WLCSP6 package: above 102.5 °C the value of P_{tot} derates linearly with 5.3 mW/K.

10 Recommended operating conditions

Table 8. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---------------------|---------------------------------|-----|----------|------|
| V_{CC} | supply voltage | | 2.3 | 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 |

11 Static characteristics

Table 9. Static characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|--------------------------------------|--|----------------|-----|-----------|---------------|
| $T_{amb} = 25\text{ °C}$ | | | | | | |
| V_{T+} | positive-going threshold voltage | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 0.60 | - | 1.10 | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 0.75 | - | 1.16 | V |
| V_{T-} | negative-going threshold voltage | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 0.35 | - | 0.60 | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 0.50 | - | 0.85 | V |
| V_H | hysteresis voltage | $(V_H = V_{T+} - V_{T-})$ | | | | |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 0.23 | - | 0.60 | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 0.25 | - | 0.56 | V |
| V_{OH} | HIGH-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | |
| | | $I_O = -20\text{ }\mu\text{A}$; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -2.3\text{ mA}$; $V_{CC} = 2.3\text{ V}$ | 2.05 | - | - | V |
| | | $I_O = -3.1\text{ mA}$; $V_{CC} = 2.3\text{ V}$ | 1.9 | - | - | V |
| | | $I_O = -2.7\text{ mA}$; $V_{CC} = 3.0\text{ V}$ | 2.72 | - | - | V |
| | | $I_O = -4.0\text{ mA}$; $V_{CC} = 3.0\text{ V}$ | 2.6 | - | - | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | |
| | | $I_O = 20\text{ }\mu\text{A}$; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$ | - | - | 0.10 | V |
| | | $I_O = 2.3\text{ mA}$; $V_{CC} = 2.3\text{ V}$ | - | - | 0.31 | V |
| | | $I_O = 3.1\text{ mA}$; $V_{CC} = 2.3\text{ V}$ | - | - | 0.44 | V |
| | | $I_O = 2.7\text{ mA}$; $V_{CC} = 3.0\text{ V}$ | - | - | 0.31 | V |
| | | $I_O = 4.0\text{ mA}$; $V_{CC} = 3.0\text{ V}$ | - | - | 0.44 | V |
| I_I | input leakage current | $V_I = \text{GND to }3.6\text{ V}$; $V_{CC} = 0\text{ V to }3.6\text{ V}$ | - | - | ± 0.1 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = 0\text{ V to }3.6\text{ V}$; $V_{CC} = 0\text{ V}$ | - | - | ± 0.1 | μA |
| ΔI_{OFF} | additional power-off leakage current | V_I or $V_O = 0\text{ V to }3.6\text{ V}$; $V_{CC} = 0\text{ V to }0.2\text{ V}$ | - | - | ± 0.2 | μA |
| I_{CC} | supply current | $V_I = \text{GND or }V_{CC}$; $I_O = 0\text{ A}$; $V_{CC} = 2.3\text{ V to }3.6\text{ V}$ | - | - | 1.2 | μA |
| C_I | input capacitance | $V_{CC} = 0\text{ V to }3.6\text{ V}$; $V_I = \text{GND or }V_{CC}$ | - | 0.8 | - | pF |
| C_O | output capacitance | $V_O = \text{GND}$; $V_{CC} = 0\text{ V}$ | - | 1.7 | - | pF |
| $T_{amb} = -40\text{ °C to }+85\text{ °C}$ | | | | | | |
| V_{T+} | positive-going threshold voltage | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 0.60 | - | 1.10 | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 0.75 | - | 1.19 | V |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------------|--------------------------------------|---|------------------------|-----|------|------|
| V _{T-} | negative-going threshold voltage | V _{CC} = 2.3 V to 2.7 V | 0.35 | - | 0.60 | V |
| | | V _{CC} = 3.0 V to 3.6 V | 0.50 | - | 0.85 | V |
| V _H | hysteresis voltage | (V _H = V _{T+} - V _{T-}) | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | 0.10 | - | 0.60 | V |
| | | V _{CC} = 3.0 V to 3.6 V | 0.15 | - | 0.56 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | I _O = -20 μA; V _{CC} = 2.3 V to 3.6 V | V _{CC} - 0.1 | - | - | 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 |
| | | I _O = -4.0 mA; V _{CC} = 3.0 V | 2.55 | - | - | V |
| V _{OL} | LOW-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | I _O = 20 μA; V _{CC} = 2.3 V to 3.6 V | - | - | 0.1 | 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 _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.45 | 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 | - | - | ±0.5 | μA |
| I _{CC} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 2.3 V to 3.6 V | - | - | 1.5 | μA |
| ΔI _{CC} | additional supply current | V _{CC} = 2.3 V to 2.7 V; I _O = 0 A [1] | - | - | 4 | μA |
| | | V _{CC} = 3.0 V to 3.6 V; I _O = 0 A [2] | - | - | 12 | μA |
| T _{amb} = -40 °C to +125 °C | | | | | | |
| V _{T+} | positive-going threshold voltage | V _{CC} = 2.3 V to 2.7 V | 0.60 | - | 1.10 | V |
| | | V _{CC} = 3.0 V to 3.6 V | 0.75 | - | 1.19 | V |
| V _{T-} | negative-going threshold voltage | V _{CC} = 2.3 V to 2.7 V | 0.33 | - | 0.64 | V |
| | | V _{CC} = 3.0 V to 3.6 V | 0.46 | - | 0.85 | V |
| V _H | hysteresis voltage | (V _H = V _{T+} - V _{T-}) | | | | |
| | | V _{CC} = 2.3 V to 2.7 V | 0.10 | - | 0.60 | V |
| | | V _{CC} = 3.0 V to 3.6 V | 0.15 | - | 0.56 | V |
| V _{OH} | HIGH-level output voltage | V _I = V _{T+} or V _{T-} | | | | |
| | | I _O = -20 μA; V _{CC} = 2.3 V to 3.6 V | V _{CC} - 0.11 | - | - | V |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------------------|---|------|-----|------------|---------------|
| | | $I_O = -2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$ | 1.77 | - | - | V |
| | | $I_O = -3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$ | 1.67 | - | - | V |
| | | $I_O = -2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$ | 2.40 | - | - | V |
| | | $I_O = -4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$ | 2.30 | - | - | V |
| V_{OL} | LOW-level output voltage | $V_I = V_{T+}$ or V_{T-} | | | | |
| | | $I_O = 20 \text{ }\mu\text{A}; V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$ | - | - | 0.11 | V |
| | | $I_O = 2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$ | - | - | 0.36 | V |
| | | $I_O = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$ | - | - | 0.50 | V |
| | | $I_O = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$ | - | - | 0.36 | V |
| | | $I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$ | - | - | 0.50 | V |
| I_I | input leakage current | $V_I = \text{GND to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$ | - | - | ± 0.75 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$ | - | - | ± 0.75 | μA |
| ΔI_{OFF} | additional power-off leakage current | V_I or $V_O = 0 \text{ V to } 3.6 \text{ V};$ $V_{CC} = 0 \text{ V to } 0.2 \text{ V}$ | - | - | ± 0.75 | μA |
| I_{CC} | supply current | $V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 2.3 \text{ V to } 3.6 \text{ V}$ | - | - | 3.5 | μA |
| ΔI_{CC} | additional supply current | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; I_O = 0 \text{ A}$ ^[1] | - | - | 7 | μA |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; I_O = 0 \text{ A}$ ^[2] | - | - | 22 | μA |

[1] One input at 0.3 V or 1.1 V, other input at V_{CC} or GND.

[2] One input at 0.45 V or 1.2 V, other input at V_{CC} or GND.

12 Dynamic characteristics

Table 10. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 16](#).

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | Unit |
|---|-------------------|--|-------|--------------------|-----|-------------------|----------------|-----------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 1.65 \text{ V to } 1.95 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |
| | | $C_L = 5 \text{ pF}$ | 2.2 | 3.5 | 5.5 | 0.5 | 6.8 | 7.5 | ns |
| | | $C_L = 10 \text{ pF}$ | 2.6 | 4.1 | 6.3 | 1.0 | 7.9 | 8.7 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.9 | 4.6 | 6.9 | 1.0 | 8.7 | 9.6 | ns |
| | | $C_L = 30 \text{ pF}$ | 3.7 | 5.8 | 8.4 | 1.5 | 10.8 | 11.9 | ns |
| $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 2.3 \text{ V to } 2.7 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |
| | | $C_L = 5 \text{ pF}$ | 1.8 | 3.4 | 5.5 | 0.5 | 6.0 | 6.6 | ns |
| | | $C_L = 10 \text{ pF}$ | 2.2 | 4.0 | 6.2 | 1.0 | 7.1 | 7.9 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.5 | 4.4 | 6.8 | 1.0 | 7.9 | 8.7 | ns |
| | | $C_L = 30 \text{ pF}$ | 3.2 | 5.6 | 8.3 | 1.5 | 10.0 | 11.0 | ns |
| $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}; V_I = 3.0 \text{ V to } 3.6 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |
| | | $C_L = 5 \text{ pF}$ | 1.4 | 3.1 | 5.0 | 0.5 | 5.5 | 6.1 | ns |
| | | $C_L = 10 \text{ pF}$ | 1.8 | 3.7 | 5.7 | 1.0 | 6.5 | 7.2 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.2 | 4.2 | 6.3 | 1.0 | 7.4 | 8.2 | ns |
| | | $C_L = 30 \text{ pF}$ | 2.9 | 5.3 | 7.9 | 1.5 | 9.5 | 10.5 | ns |
| $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 1.65 \text{ V to } 1.95 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |
| | | $C_L = 5 \text{ pF}$ | 2.1 | 2.9 | 3.9 | 0.5 | 8.0 | 8.8 | ns |
| | | $C_L = 10 \text{ pF}$ | 2.5 | 3.4 | 4.6 | 1.0 | 8.5 | 9.4 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.9 | 3.9 | 5.2 | 1.0 | 9.1 | 10.1 | ns |
| | | $C_L = 30 \text{ pF}$ | 3.6 | 5.0 | 6.7 | 1.5 | 9.8 | 10.8 | ns |
| $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 2.3 \text{ V to } 2.7 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |
| | | $C_L = 5 \text{ pF}$ | 1.7 | 2.8 | 4.2 | 0.5 | 5.3 | 5.9 | ns |
| | | $C_L = 10 \text{ pF}$ | 2.1 | 3.4 | 5.0 | 1.0 | 6.1 | 6.8 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.4 | 3.8 | 5.6 | 1.0 | 6.8 | 7.5 | ns |
| | | $C_L = 30 \text{ pF}$ | 3.2 | 5.0 | 7.1 | 1.5 | 8.5 | 9.4 | ns |
| $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}; V_I = 3.0 \text{ V to } 3.6 \text{ V}$ | | | | | | | | | |
| t_{pd} | propagation delay | A, B, C to Y; see Figure 15 ^[2] | | | | | | | |

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | Unit |
|----------------------------------|-------------------------------|---|-------|--------------------|-----|-------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| | | $C_L = 5 \text{ pF}$ | 1.4 | 2.7 | 4.2 | 0.5 | 4.7 | 5.2 | ns |
| | | $C_L = 10 \text{ pF}$ | 1.8 | 3.3 | 5.0 | 1.0 | 5.7 | 6.3 | ns |
| | | $C_L = 15 \text{ pF}$ | 2.1 | 3.8 | 5.6 | 1.0 | 6.2 | 6.9 | ns |
| | | $C_L = 30 \text{ pF}$ | 2.9 | 4.9 | 7.1 | 1.5 | 7.8 | 8.6 | ns |
| $T_{\text{amb}} = 25 \text{ °C}$ | | | | | | | | | |
| C_{PD} | power dissipation capacitance | $f_i = 1 \text{ MHz}; V_I = \text{GND to } V_{\text{CC}} \text{ [3]}$ | | | | | | | |
| | | $V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$ | - | 3.6 | - | - | - | - | pF |
| | | $V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$ | - | 4.3 | - | - | - | - | 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).
 $P_D = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i \times N + \sum(C_L \times V_{\text{CC}}^2 \times f_o)$ 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;
 $\sum(C_L \times V_{\text{CC}}^2 \times f_o)$ = sum of the outputs.

12.1 Waveforms and test circuit

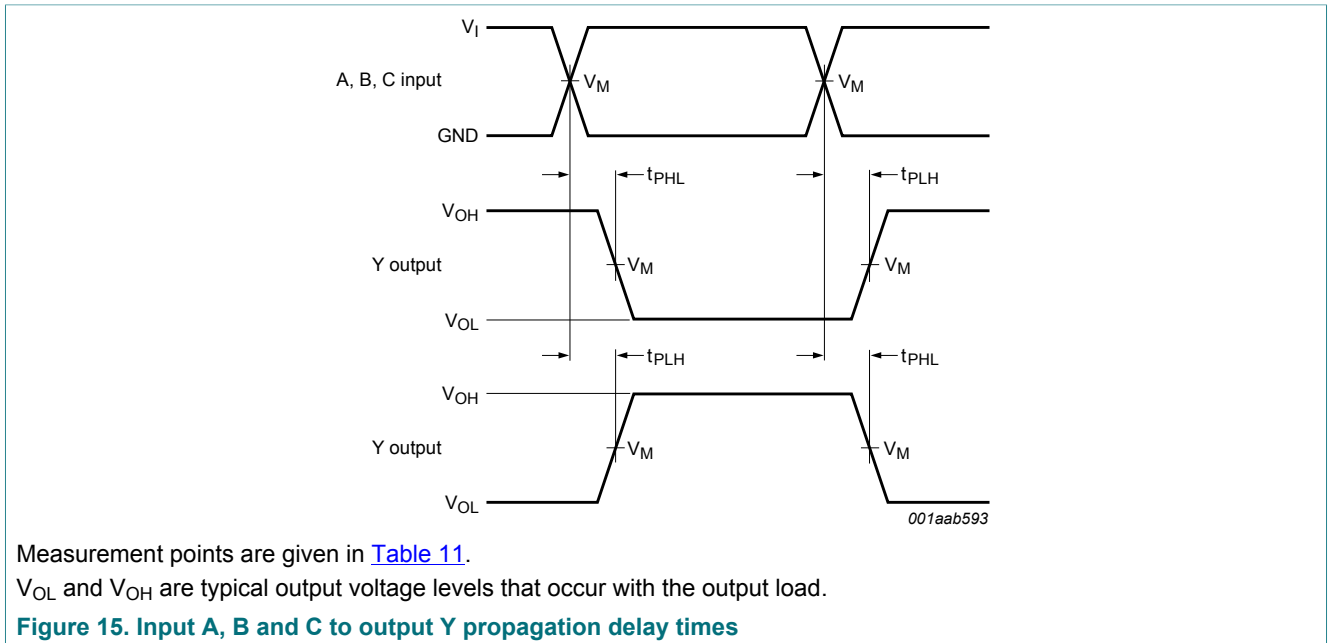
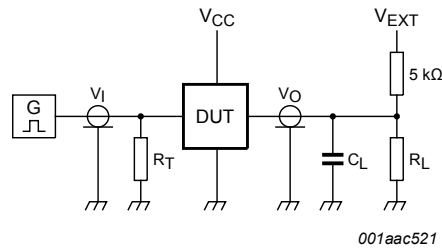


Table 11. Measurement points

| Supply voltage | Output | Input | | |
|----------------|-------------|----------|-----------------|---------------|
| V_{CC} | V_M | V_M | V_I | $t_r = t_f$ |
| 2.3 V to 3.6 V | $0.5V_{CC}$ | $0.5V_I$ | 1.65 V to 3.6 V | ≤ 3.0 ns |



Test data is given in [Table 12](#).

Definitions test circuit:

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

C_L = load capacitance including jig and probe capacitance.

R_L = load resistance.

Figure 16. Test circuit for measuring switching times

Table 12. 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} | |
| 2.3 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 $R_L = 5$ kΩ, for measuring propagation delays, setup and hold times and pulse width $R_L = 1$ MΩ.

13 Package outline

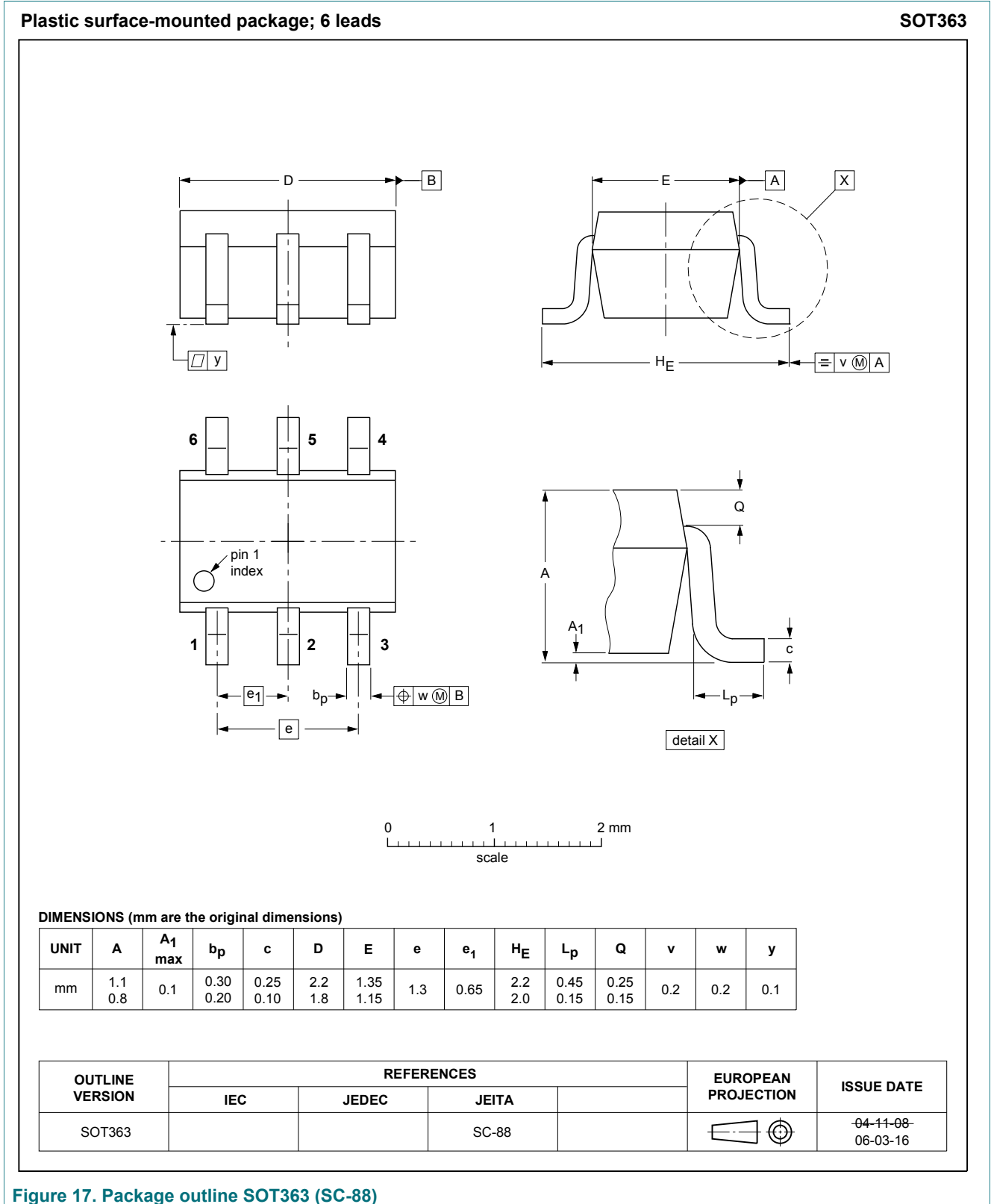
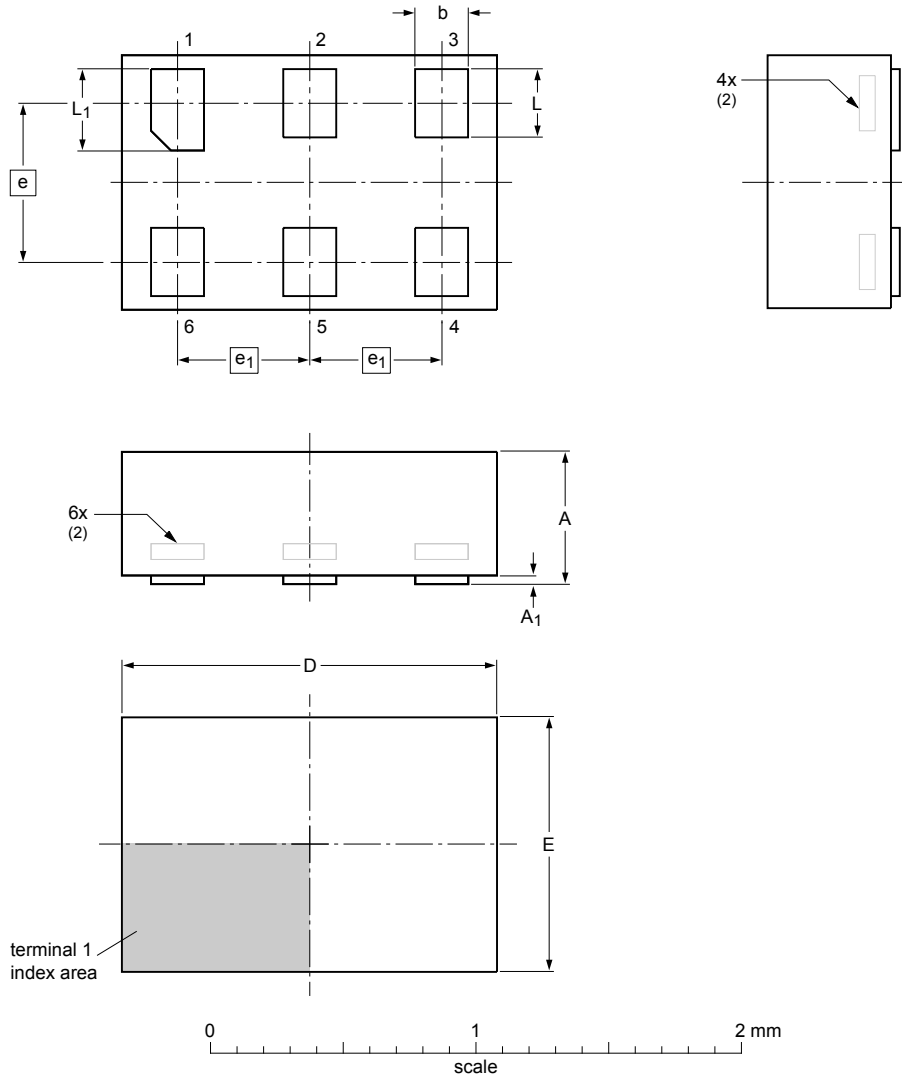


Figure 17. Package outline SOT363 (SC-88)

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

SOT886



Dimensions (mm are the original dimensions)

| Unit | A ⁽¹⁾ | A ₁ | b | D | E | e | e ₁ | L | L ₁ |
|------|------------------|----------------|------|------|------|-----|----------------|------|----------------|
| mm | max 0.5 | 0.04 | 0.25 | 1.50 | 1.05 | | | 0.35 | 0.40 |
| | nom | | 0.20 | 1.45 | 1.00 | 0.6 | 0.5 | 0.30 | 0.35 |
| | min | | 0.17 | 1.40 | 0.95 | | | 0.27 | 0.32 |

Notes

- Including plating thickness.
- Can be visible in some manufacturing processes.

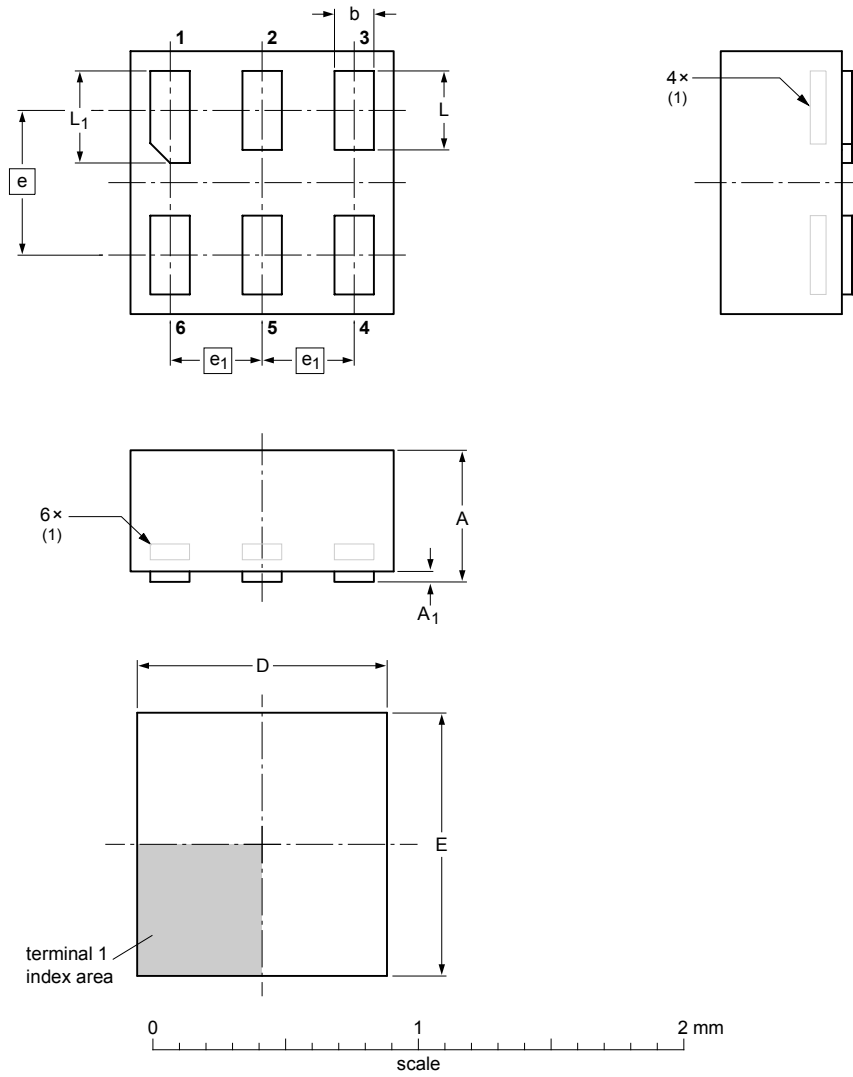
sot886_po

| Outline version | References | | | European projection | Issue date |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT886 | | MO-252 | | | 04-07-22 12-01-05 |

Figure 18. Package outline SOT886 (XSON6)

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

SOT891



DIMENSIONS (mm are the original dimensions)

| UNIT | A max | A ₁ max | b | D | E | e | e ₁ | L | L ₁ |
|------|----------|-----------------------|--------------|--------------|--------------|------|----------------|--------------|----------------|
| mm | 0.5 | 0.04 | 0.20 0.12 | 1.05 0.95 | 1.05 0.95 | 0.55 | 0.35 | 0.35 0.27 | 0.40 0.32 |

Note

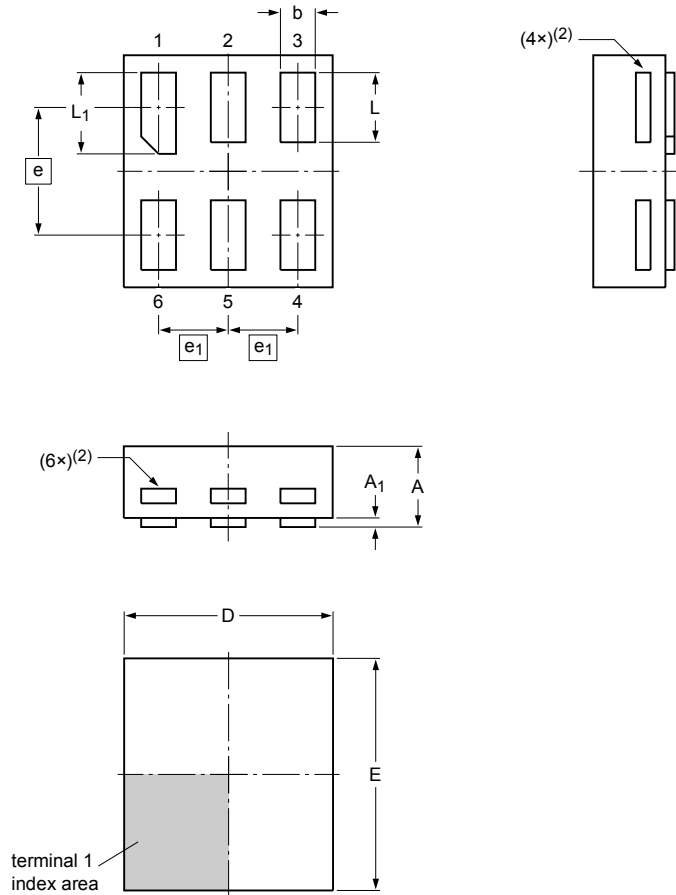
1. Can be visible in some manufacturing processes.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|------------------------|-----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT891 | | | | | -05-04-06 07-05-15 |

Figure 19. 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



Dimensions

| Unit | A ⁽¹⁾ | A ₁ | b | D | E | e | e ₁ | L | L ₁ |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm | max 0.35 | 0.04 | 0.20 | 0.95 | 1.05 | 0.35 | 0.40 | 0.35 | 0.40 |
| | nom 0.35 | | 0.15 | 0.90 | 1.00 | 0.55 | 0.3 | 0.30 | 0.35 |
| | min 0.35 | | 0.12 | 0.85 | 0.95 | | | 0.27 | 0.32 |

Note

- Including plating thickness.
- Visible depending upon used manufacturing technology.

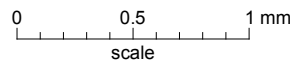
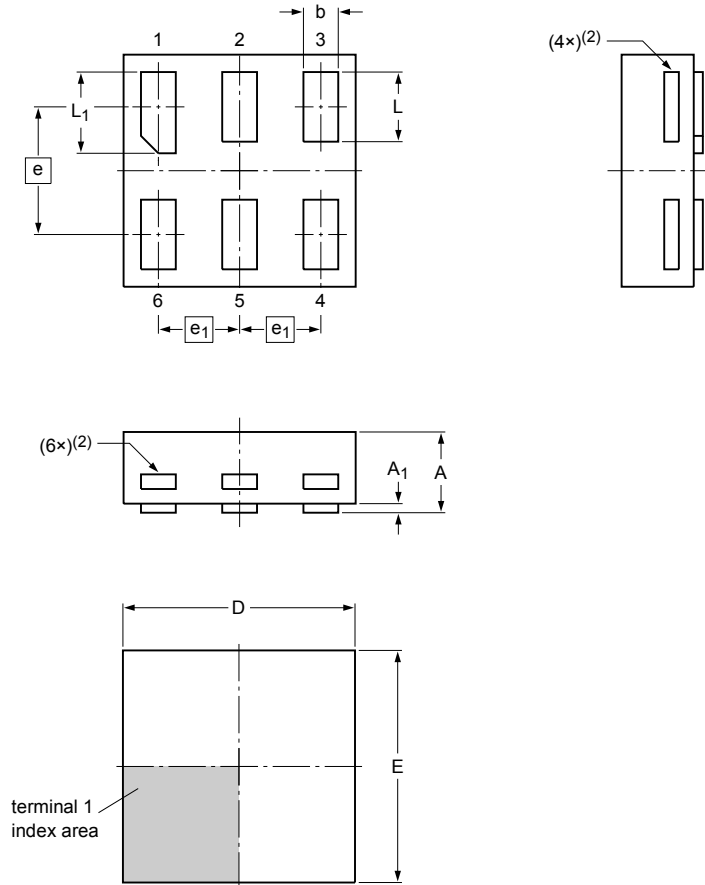
sot1115_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT1115 | | | | | | -10-04-02- 10-04-07 |

Figure 20. 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



Dimensions

| Unit | A ⁽¹⁾ | A ₁ | b | D | E | e | e ₁ | L | L ₁ |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm | max 0.35 | 0.04 | 0.20 | 1.05 | 1.05 | 0.35 | 0.30 | 0.35 | 0.40 |
| | nom 0.15 | 1.00 | 1.00 | 0.55 | 0.35 | 0.30 | 0.35 | | |
| | min 0.12 | 0.95 | 0.95 | | | 0.27 | 0.32 | | |

Note

- 1. Including plating thickness.
- 2. Visible depending upon used manufacturing technology.

sot1202_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT1202 | | | | | | -10-04-02- 10-04-06 |

Figure 21. Package outline SOT1202 (XSON6)

X2SON6: plastic thermal enhanced extremely thin small outline package; no leads;
6 terminals; body 1.0 x 0.8 x 0.35 mm

SOT1255

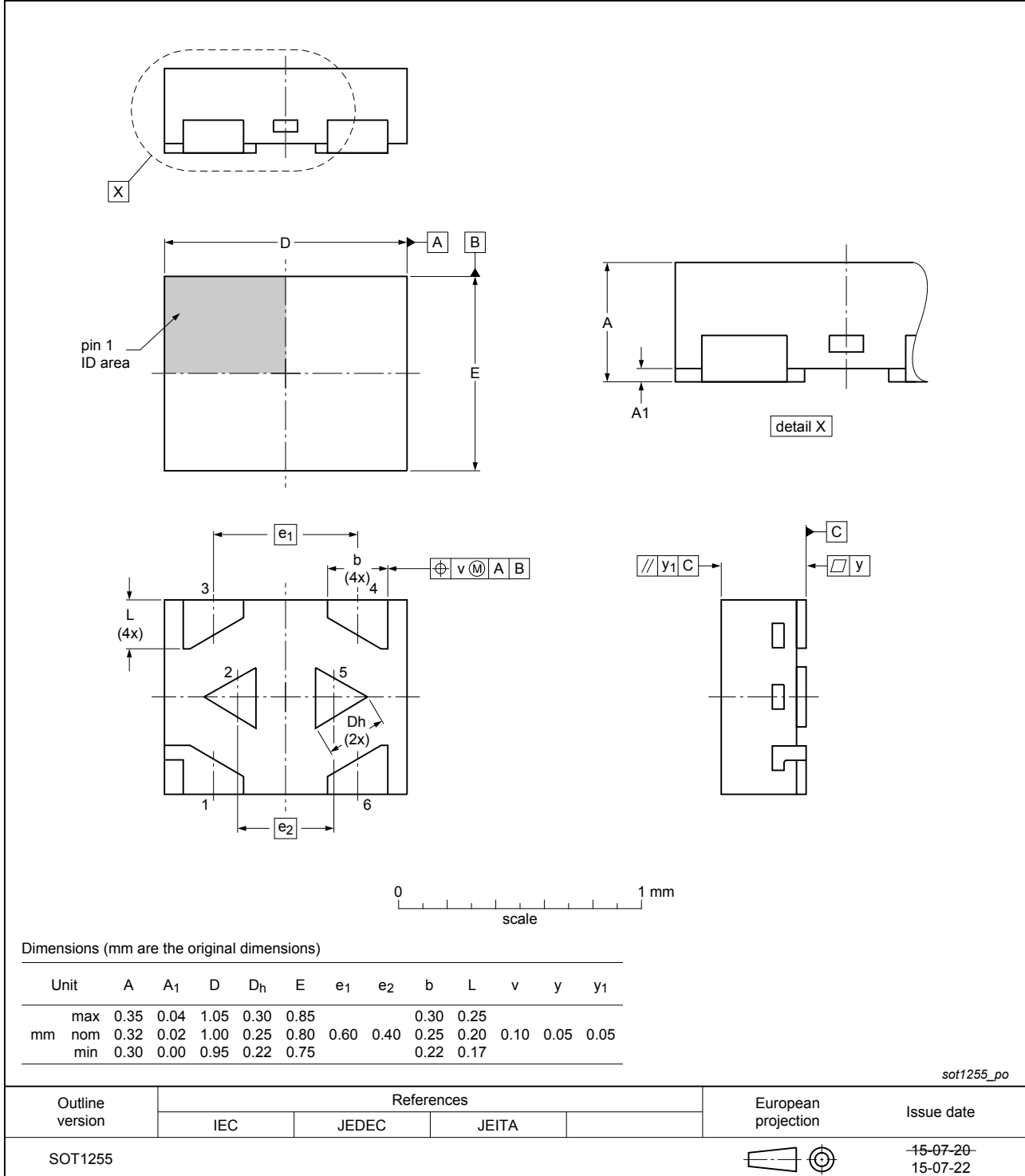


Figure 22. Package outline SOT1255 (X2SON6)

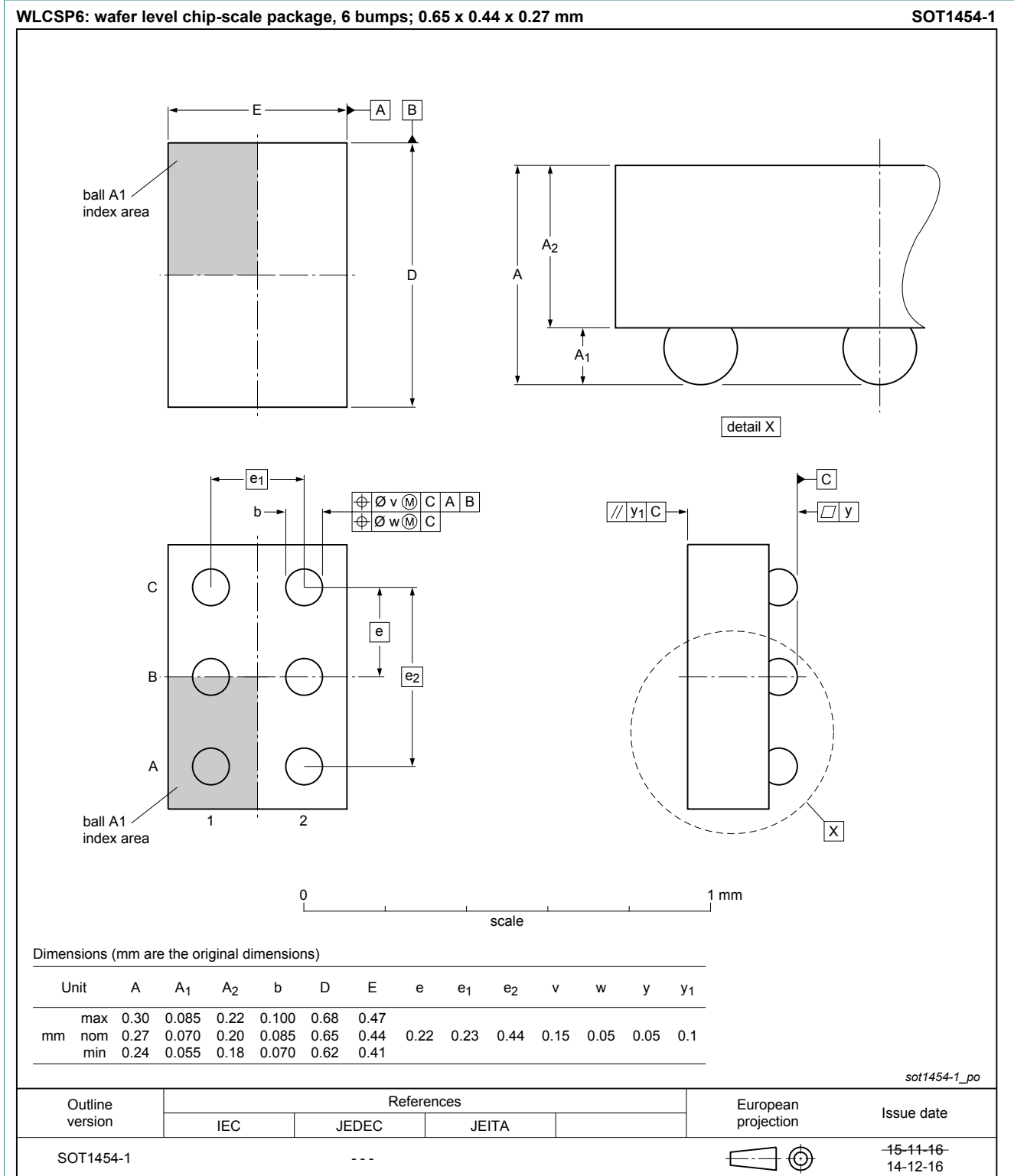


Figure 23. Package outline SOT1454-1 (WLCSP6)

14 Abbreviations

Table 13. Abbreviations

| Acronym | Description |
|---------|---|
| CDM | Charged Device Model |
| CMOS | Complementary Metal Oxide Semiconductor |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |

15 Revision history

Table 14. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|---------------|
| 74AUP1T97 v.6 | 20170328 | Product data sheet | - | 74AUP1T97 v.5 |
| Modifications: | <ul style="list-style-type: none"> Added type number 74AUP1T97UK (WLCSP6). | | | |
| 74AUP1T97 v.5 | 20150917 | Product data sheet | - | 74AUP1T97 v.4 |
| Modifications: | <ul style="list-style-type: none"> Added type number 74AUP1T97GX (SOT1255/X2SON6). | | | |
| 74AUP1T97 v.4 | 20120815 | Product data sheet | - | 74AUP1T97 v.3 |
| Modifications: | <ul style="list-style-type: none"> Package outline drawing of SOT886 (Figure 18) modified. | | | |
| 74AUP1T97 v.3 | 20111130 | Product data sheet | - | 74AUP1T97 v.2 |
| 74AUP1T97 v.2 | 20101018 | Product data sheet | - | 74AUP1T97 v.1 |
| 74AUP1T97 v.1 | 20071025 | Product data sheet | - | - |

16 Legal information

16.1 Data sheet status

| 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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