

74AUP1G86

Low-power 2-input EXCLUSIVE-OR gate

Rev. 02 — 28 June 2006

Product data sheet

1. General description

The 74AUP1G86 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

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 the damaging backflow current through the device when it is powered down.

The 74AUP1G86 provides the single 2-input EXCLUSIVE-OR function.

2. Features

- 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-A114-C Class 3A. Exceeds 5000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101-C exceeds 1000 V
- Low static power consumption; $I_{CC} = 0.9 \mu\text{A}$ (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 $+125\text{ }^{\circ}\text{C}$

PHILIPS

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|-------------|-------------------|--------|---|----------|
| | Temperature range | Name | Description | |
| 74AUP1G86GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AUP1G86GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74AUP1G86GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |

4. Marking

Table 2. Marking

| Type number | Marking code |
|-------------|--------------|
| 74AUP1G86GW | pH |
| 74AUP1G86GM | pH |
| 74AUP1G86GF | pH |

5. Functional diagram

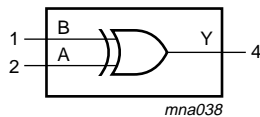


Fig 1. Logic symbol

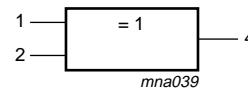


Fig 2. IEC logic symbol

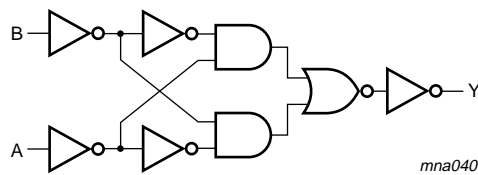
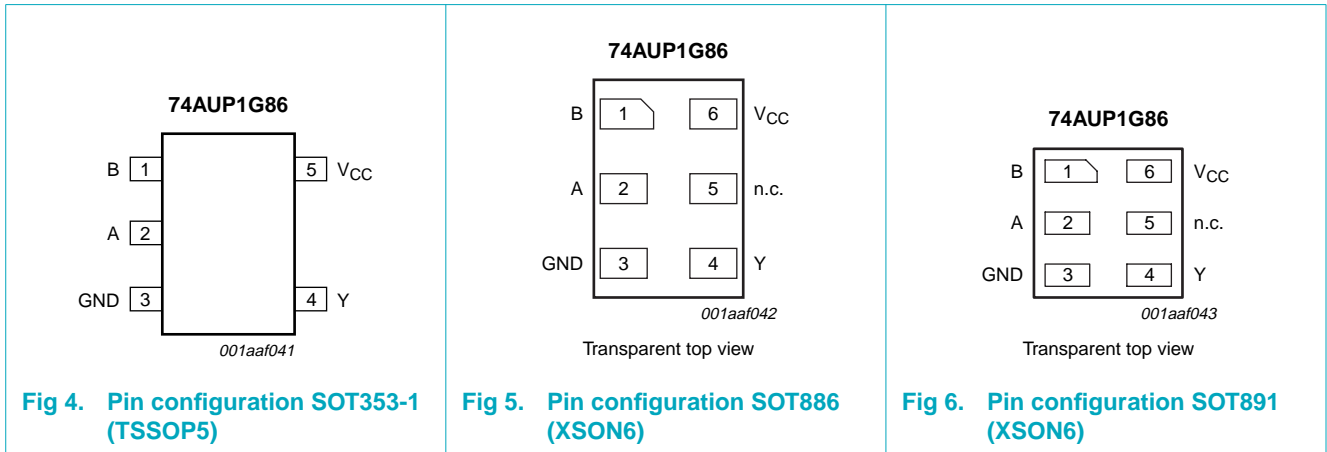


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol | Pin | | Description |
|-----------------|--------|-------|----------------|
| | TSSOP5 | XSON6 | |
| B | 1 | 1 | data input B |
| A | 2 | 2 | data input A |
| GND | 3 | 3 | ground (0 V) |
| Y | 4 | 4 | data output Y |
| n.c. | - | 5 | not connected |
| V _{CC} | 5 | 6 | supply voltage |

7. Functional description

Table 4. Function table^[1]

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

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

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} | quiescent 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 input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For TSSOP5 packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.
For XSON6 packages: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

9. Recommended operating conditions

Table 6. Recommended 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 | 0 | 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-state 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-state 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-state 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 |
| | | I _O = -4.0 mA; V _{CC} = 3.0 V | 2.6 | - | - | V |
| V _{OL} | LOW-state 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 _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.44 | V |
| I _I | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.1 | μA |
| I _{OFF} | power-off leakage current | 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} | quiescent 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 quiescent 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} | - | 0.8 | - | pF |
| C _O | output capacitance | V _O = GND; V _{CC} = 0 V | - | 1.7 | - | 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-state 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-state 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-state 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-state 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} | quiescent 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 quiescent 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 |
|---|--------------------------------------|---|----------------------|-----|----------------------|---------------|
| $T_{amb} = -40\text{ °C to }+125\text{ °C}$ | | | | | | |
| V_{IH} | HIGH-state input voltage | $V_{CC} = 0.8\text{ V}$ | $0.75 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 0.9\text{ V to }1.95\text{ V}$ | $0.70 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.6 | - | - | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 2.0 | - | - | V |
| V_{IL} | LOW-state input voltage | $V_{CC} = 0.8\text{ V}$ | - | - | $0.25 \times V_{CC}$ | V |
| | | $V_{CC} = 0.9\text{ V to }1.95\text{ V}$ | - | - | $0.30 \times V_{CC}$ | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | - | - | 0.7 | V |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | - | - | 0.9 | V |
| V_{OH} | HIGH-state output voltage | $V_I = V_{IH}\text{ or }V_{IL}$ | | | | |
| | | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | $V_{CC} - 0.11$ | - | - | V |
| | | $I_O = -1.1\text{ mA}; V_{CC} = 1.1\text{ V}$ | $0.6 \times V_{CC}$ | - | - | V |
| | | $I_O = -1.7\text{ mA}; V_{CC} = 1.4\text{ V}$ | 0.93 | - | - | V |
| | | $I_O = -1.9\text{ mA}; V_{CC} = 1.65\text{ V}$ | 1.17 | - | - | V |
| | | $I_O = -2.3\text{ mA}; V_{CC} = 2.3\text{ V}$ | 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 |
| V_{OL} | LOW-state output voltage | $V_I = V_{IH}\text{ or }V_{IL}$ | | | | |
| | | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | - | - | 0.11 | V |
| | | $I_O = 1.1\text{ mA}; V_{CC} = 1.1\text{ V}$ | - | - | $0.33 \times V_{CC}$ | V |
| | | $I_O = 1.7\text{ mA}; V_{CC} = 1.4\text{ V}$ | - | - | 0.41 | V |
| | | $I_O = 1.9\text{ mA}; V_{CC} = 1.65\text{ V}$ | - | - | 0.39 | 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_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 |
| | | $V_I\text{ or }V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V}$ | - | - | ± 0.75 | μA |
| I_{OFF} | power-off leakage current | $V_I\text{ or }V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V}$ | - | - | ± 0.75 | μA |
| ΔI_{OFF} | additional power-off leakage current | $V_I\text{ or }V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V to }0.2\text{ V}$ | - | - | ± 0.75 | μA |
| I_{CC} | quiescent supply current | $V_I = \text{GND or }V_{CC}; I_O = 0\text{ A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | - | - | 1.4 | μA |
| ΔI_{CC} | additional quiescent supply current | $V_I = V_{CC} - 0.6\text{ V}; I_O = 0\text{ A}; V_{CC} = 3.3\text{ V}$ | [1] | - | 75 | μA |

[1] One input at $V_{CC} - 0.6\text{ V}$, 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 8](#)

| Symbol | Parameter | Conditions | Min | Typ [1] | Max | Unit |
|---|---|---|-----|---------|------|------|
| $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 5\text{ pF}$ | | | | | | |
| t_{PHL} , t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | 21.2 | - | ns |
| | | $V_{CC} = 1.1\text{ V to }1.3\text{ V}$ | 2.3 | 5.9 | 13.1 | ns |
| | | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$ | 1.8 | 4.1 | 7.7 | ns |
| | | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 1.5 | 3.3 | 5.9 | ns |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.2 | 2.6 | 4.4 | ns |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 1.0 | 2.3 | 4.0 | ns |
| $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 10\text{ pF}$ | | | | | | |
| t_{PHL} , t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | 24.7 | - | ns |
| | | $V_{CC} = 1.1\text{ V to }1.3\text{ V}$ | 2.6 | 6.8 | 14.8 | ns |
| | | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$ | 2.2 | 4.8 | 8.7 | ns |
| | | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 1.8 | 3.9 | 6.7 | ns |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.5 | 3.1 | 5.2 | ns |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 1.3 | 2.9 | 4.8 | ns |
| $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 15\text{ pF}$ | | | | | | |
| t_{PHL} , t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | 28.2 | - | ns |
| | | $V_{CC} = 1.1\text{ V to }1.3\text{ V}$ | 3.0 | 7.6 | 16.5 | ns |
| | | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$ | 2.4 | 5.3 | 9.6 | ns |
| | | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 2.1 | 4.4 | 7.5 | ns |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.8 | 3.6 | 5.9 | ns |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 1.6 | 3.3 | 5.4 | ns |
| $T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 30\text{ pF}$ | | | | | | |
| t_{PHL} , t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | 38.5 | - | ns |
| | | $V_{CC} = 1.1\text{ V to }1.3\text{ V}$ | 3.9 | 9.9 | 21.5 | ns |
| | | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$ | 3.2 | 6.9 | 12.5 | ns |
| | | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 2.8 | 5.7 | 9.8 | ns |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 2.4 | 4.7 | 7.6 | ns |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 2.2 | 4.4 | 7.1 | ns |

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

| Symbol | Parameter | Conditions | Min | Typ [1] | Max | Unit |
|--------------------------------|-------------------------------|--|-----|---------|-----|------|
| T_{amb} = 25 °C | | | | | | |
| C _{PD} | power dissipation capacitance | f = 1 MHz; V _I = GND to V _{CC} | [2] | | | |
| | | V _{CC} = 0.8 V | - | 2.7 | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 2.9 | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 3.0 | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 3.1 | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 3.6 | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 4.2 | - | pF |

- [1] All typical values are measured at nominal V_{CC}.
- [2] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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.

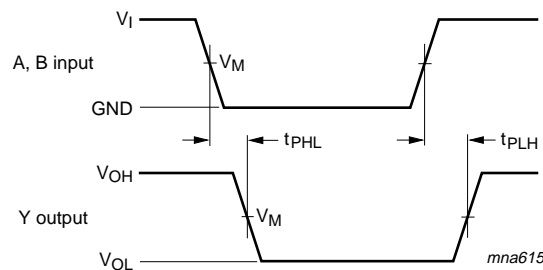
Table 9. Dynamic characteristics
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#)

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|-------------------------------------|---|------------------------------------|------------------|------|-------------------|------|------|
| | | | Min | Max | Min | Max | |
| C_L = 5 pF | | | | | | | |
| t _{PHL} , t _{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 2.1 | 14.3 | 2.1 | 15.8 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.6 | 8.8 | 1.6 | 9.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.4 | 6.9 | 1.4 | 7.6 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.1 | 5.3 | 1.1 | 5.9 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.9 | 4.7 | 0.9 | 5.2 | ns |
| C_L = 10 pF | | | | | | | |
| t _{PHL} , t _{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 16.2 | 2.4 | 17.9 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.9 | 10.0 | 1.9 | 11.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.7 | 8.0 | 1.7 | 8.8 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.4 | 6.2 | 1.4 | 6.9 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.3 | 5.6 | 1.3 | 6.2 | ns |

Table 9. Dynamic characteristics ...continued
 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 | Max | Min | Max | |
| $C_L = 15 \text{ pF}$ | | | | | | | |
| t_{PHL}, t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | | |
| | | $V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$ | 2.7 | 18.1 | 2.7 | 20.0 | ns |
| | | $V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$ | 2.2 | 11.3 | 2.2 | 12.5 | ns |
| | | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 1.9 | 9.0 | 1.9 | 9.9 | ns |
| | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | 1.6 | 7.0 | 1.6 | 7.7 | ns |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ | 1.5 | 6.4 | 1.5 | 7.1 | ns |
| $C_L = 30 \text{ pF}$ | | | | | | | |
| t_{PHL}, t_{PLH} | HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y | see Figure 7 | | | | | |
| | | $V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$ | 3.5 | 24.1 | 3.5 | 26.6 | ns |
| | | $V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$ | 2.8 | 14.8 | 2.8 | 16.3 | ns |
| | | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 2.5 | 11.7 | 2.5 | 12.9 | ns |
| | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | 2.2 | 9.1 | 2.2 | 10.1 | ns |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ | 2.1 | 8.3 | 2.1 | 9.2 | ns |

12. Waveforms

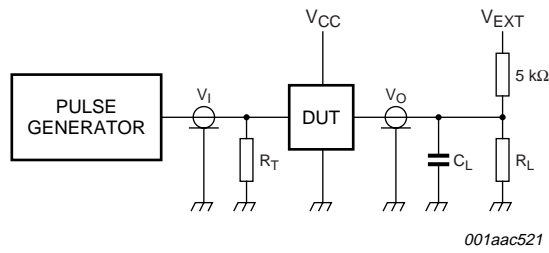


Measurement points are given in [Table 10](#).
 Logic levels: V_{OL} and V_{OH} are typical output voltage drop that occur with the output load.

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

Table 10. 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} | $\leq 3.0 \text{ ns}$ |



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

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

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

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

Fig 8. Load circuitry for switching times

Table 11. 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

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

SOT353-1

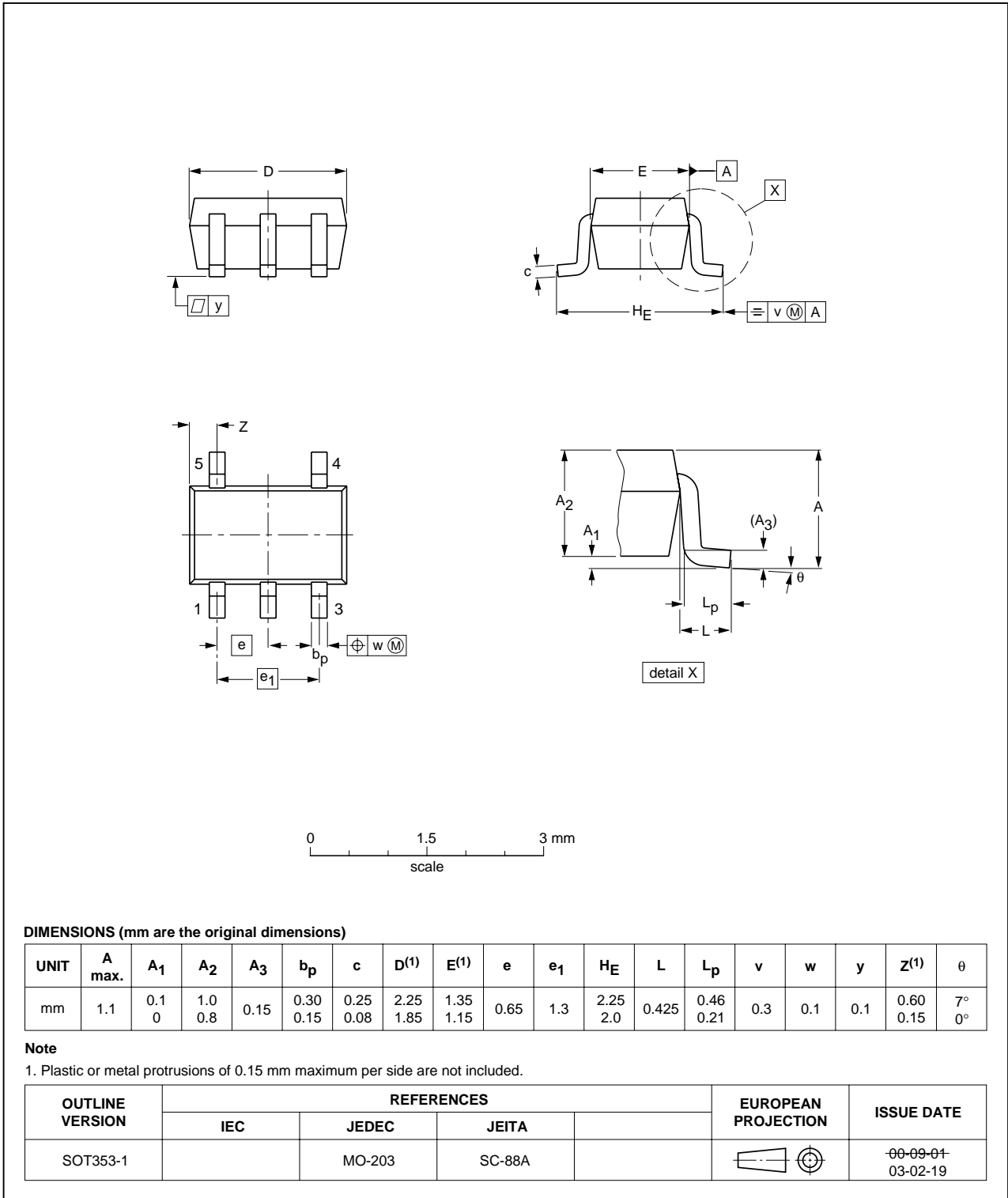


Fig 9. Package outline SOT353-1 (TSSOP5)

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

SOT886

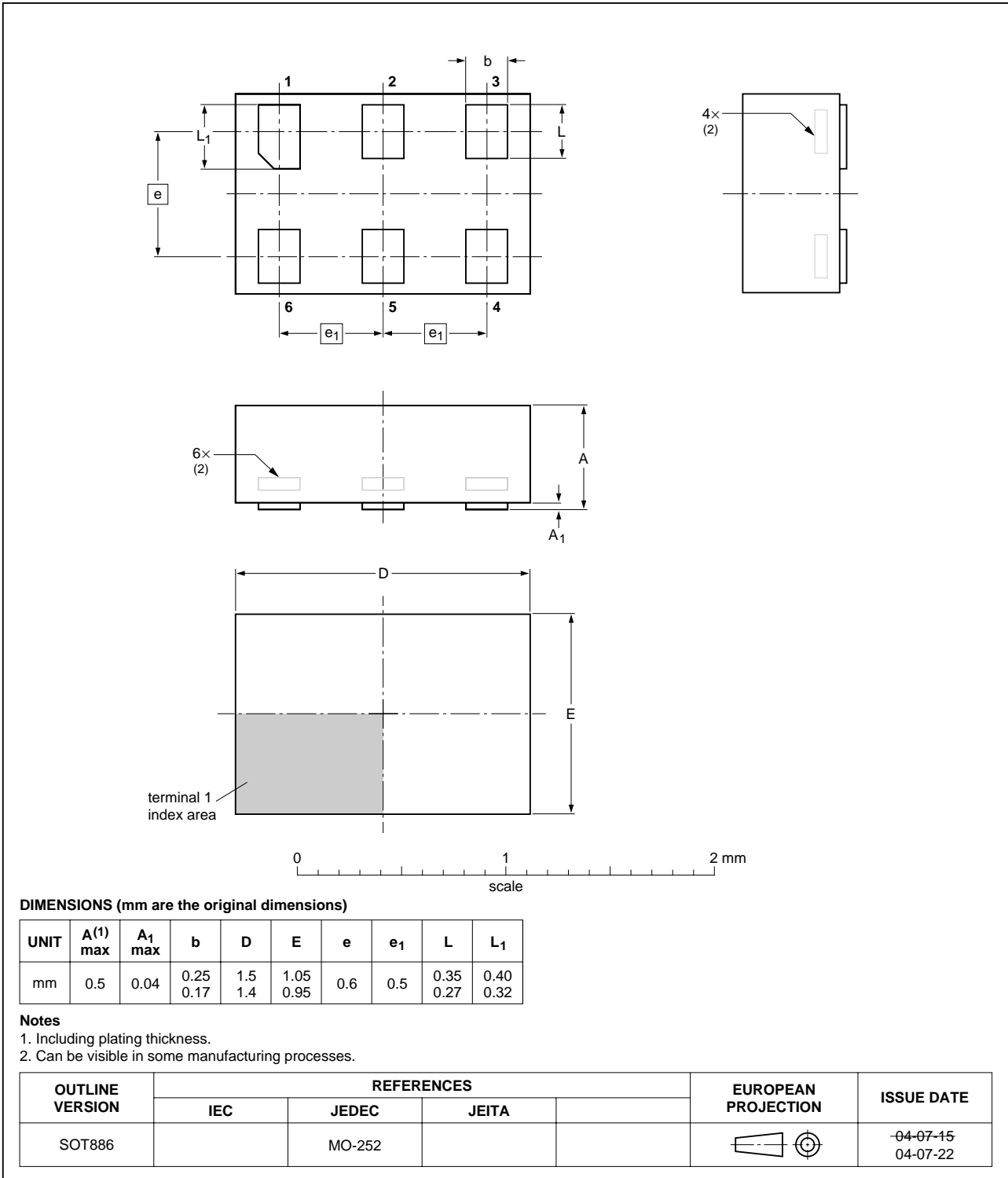


Fig 10. Package outline SOT886 (XSON6)

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

SOT891

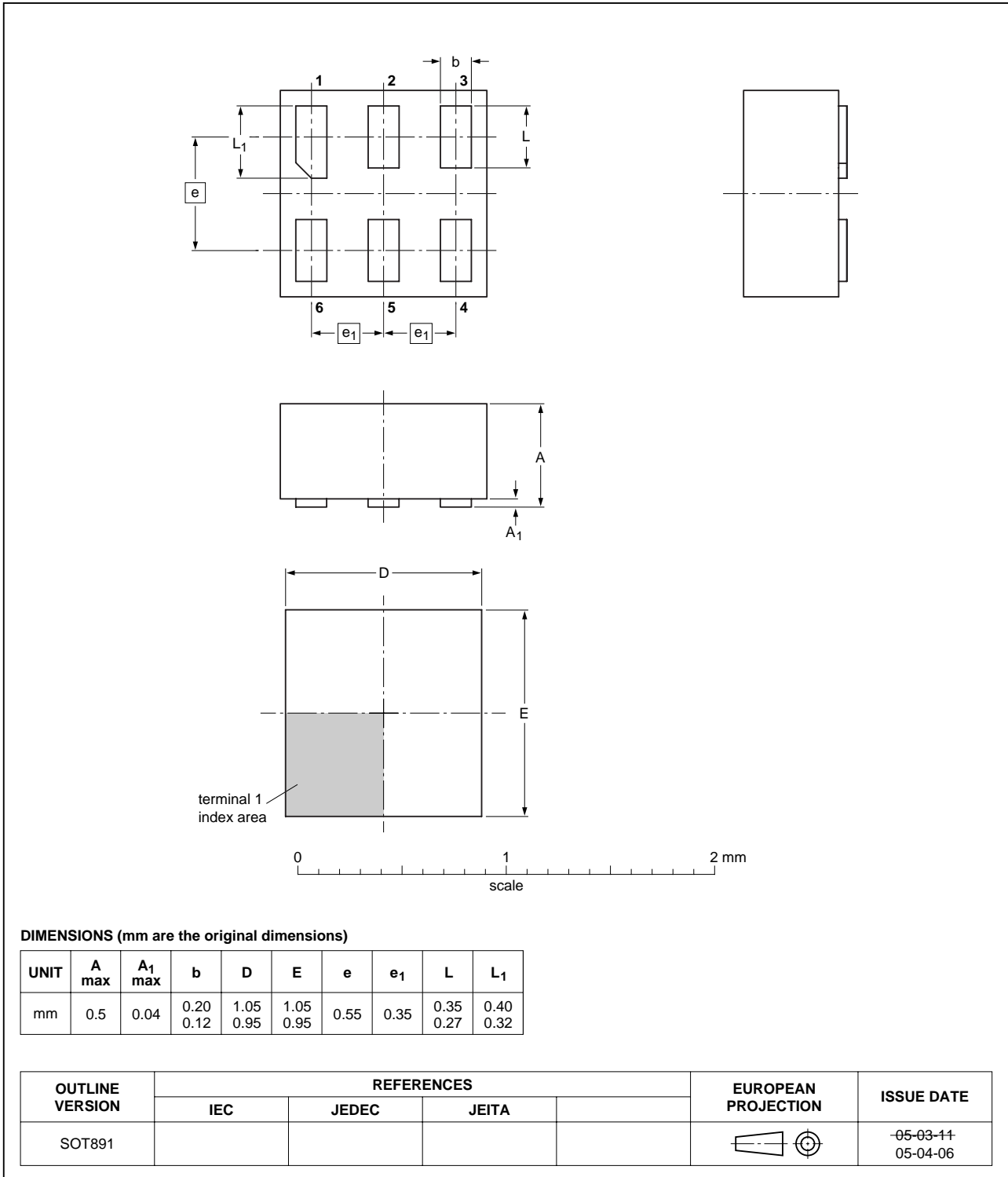


Fig 11. Package outline SOT891 (XSON6)

14. Abbreviations

Table 12. 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 |
| TTL | Transistor Transistor Logic |

15. Revision history

Table 13. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|--------------------|---------------|-------------|
| 74AUP1G86_2 | 20060628 | Product data sheet | - | 74AUP1G86_1 |
| Modifications: | <ul style="list-style-type: none">• ESD HBM and C_{PD} values modified in Section 2, Table 8• Added type number 74AUP1G86GF (XSON6/SOT891) package | | | |
| 74AUP1G86_1 | 20050805 | Product data sheet | - | - |

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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. |
| 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.semiconductors.philips.com>.

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