

74AUP1G374

Low-power D-type flip-flop; positive-edge trigger; 3-state

Rev. 8 — 29 November 2012

Product data sheet

1. General description

The 74AUP1G374 provides the single D-type flip-flop with 3-state output. The flip-flop will store the state of data input (D) that meet the set-up and hold times requirements on the LOW-to-HIGH CP transition. When pin \overline{OE} is LOW, the contents of the flip-flop is available at the (Q) output. When pin \overline{OE} is HIGH, the output goes to the high-impedance OFF-state. Operation of input pin \overline{OE} does not affect the state of the flip-flop.

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.

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 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 | |
| 74AUP1G374GW | -40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| 74AUP1G374GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74AUP1G374GF | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | SOT891 |
| 74AUP1G374GN | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm | SOT1115 |
| 74AUP1G374GS | -40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm | SOT1202 |

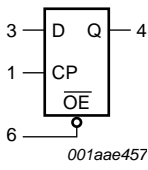
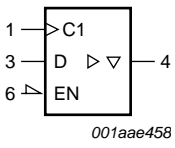
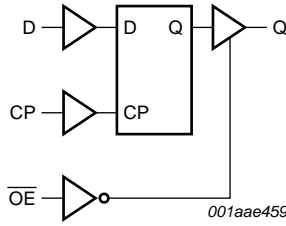
4. Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|--------------|-----------------------------|
| 74AUP1G374GW | aX |
| 74AUP1G374GM | aX |
| 74AUP1G374GF | aX |
| 74AUP1G374GN | aX |
| 74AUP1G374GS | aX |

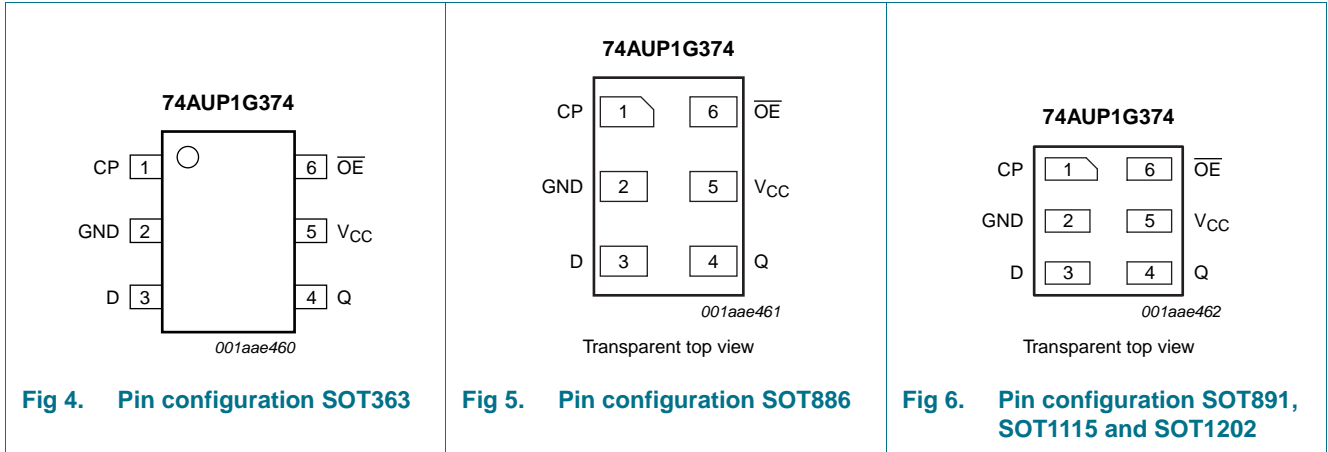
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram

| | | |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
|  <p>Fig 1. Logic symbol</p> |  <p>Fig 2. IEC logic symbol</p> |  <p>Fig 3. Logic diagram</p> |
|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|-------------------------------------------|
| CP | 1 | clock input (LOW-to-HIGH, edge-triggered) |
| GND | 2 | ground (0 V) |
| D | 3 | data input |
| Q | 4 | 3-state flip-flop output |
| V _{CC} | 5 | supply voltage |
| \overline{OE} | 6 | output enable input (active LOW) |

7. Functional description

Table 4. Function table^[1]

| Operating mode | Input | | | Internal flip-flop | Output Q |
|----------------------------------|-----------------|----|---|--------------------|----------|
| | \overline{OE} | CP | D | | |
| Load and read register | L | ↑ | l | L | L |
| | L | ↑ | h | H | H |
| Load register and disable output | H | ↑ | l | L | Z |
| | H | ↑ | h | H | Z |

[1] H = HIGH voltage level;
 h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition;
 L = LOW voltage level;
 l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition;
 Z = high-impedance OFF-state;
 ↑ = LOW-to-HIGH clock 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 SC-88 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 | 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-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 |
| | | | | | | |
| I _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = 0 V 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} | 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 | 11 | - | 40 | μA |
| C _I | input capacitance | V _{CC} = 0 V to 3.6 V; V _I = GND or V _{CC} | - | 0.8 | - | 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 |
|-------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------|-----|------------------------|------|
| C _O | output capacitance | output enabled; V _O = GND; V _{CC} = 0 V | - | 1.7 | - | pF |
| | | output disabled; V _{CC} = 0 V to 3.6 V; V _O = GND or V _{CC} | - | 1.5 | - | pF |
| 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 _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 _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = 0 V 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 _{OZ} | OFF-state output current | V _I = V _{IH} or V _{IL} ; V _O = 0 V 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 9](#).

| Symbol | Parameter | Conditions | 25 °C | | | –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 | CP to Q; see Figure 7 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 23.6 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 6.3 | 13.1 | 2.3 | 13.3 | 2.3 | 13.4 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.1 | 4.3 | 7.4 | 1.8 | 8.0 | 1.8 | 8.2 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.6 | 3.4 | 5.8 | 1.4 | 6.4 | 1.4 | 6.7 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.4 | 2.5 | 3.8 | 1.1 | 4.3 | 1.1 | 4.5 | ns |
| t _{en} | enable time | $\overline{\text{OE}}$ to Q; see Figure 8 ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 21.7 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.3 | 5.2 | 8.1 | 3.0 | 9.1 | 3.0 | 10.0 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.6 | 4.1 | 5.6 | 2.4 | 6.1 | 2.4 | 6.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.3 | 3.4 | 4.6 | 2.0 | 5.1 | 2.0 | 5.6 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.0 | 2.8 | 3.7 | 1.8 | 4.0 | 1.8 | 4.4 | ns |
| t _{dis} | disable time | $\overline{\text{OE}}$ to Q; see Figure 8 ^[4] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 9.8 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.9 | 4.5 | 7.0 | 2.8 | 7.2 | 2.8 | 7.9 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.3 | 3.3 | 4.9 | 2.1 | 5.1 | 2.1 | 5.6 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.2 | 3.2 | 4.5 | 2.1 | 4.7 | 2.1 | 5.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.6 | 2.3 | 3.1 | 1.5 | 3.4 | 1.5 | 3.7 | ns |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | | |
| | | 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 |

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

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | | Unit |
|------------------------------|-------------------|------------------------------------------------------|-------|--------------------|------|-------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| C_L = 10 pF | | | | | | | | | | |
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 27.1 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.7 | 7.2 | 14.7 | 2.5 | 15.0 | 2.5 | 15.1 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.3 | 4.9 | 8.6 | 2.0 | 9.1 | 2.0 | 9.4 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.1 | 4.0 | 6.5 | 1.9 | 7.0 | 1.9 | 7.3 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.8 | 3.1 | 4.4 | 1.5 | 4.9 | 1.5 | 5.1 | ns |
| t _{en} | enable time | OE to Q; see Figure 8 ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 25.1 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.8 | 6.5 | 10.2 | 3.5 | 10.6 | 3.5 | 11.7 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.1 | 4.7 | 6.5 | 2.7 | 7.1 | 2.7 | 7.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.7 | 4.0 | 5.4 | 2.5 | 6.0 | 2.5 | 6.6 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.4 | 3.4 | 4.5 | 2.2 | 4.7 | 2.2 | 5.2 | ns |
| t _{dis} | disable time | OE to Q; see Figure 8 ^[4] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 11.7 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.9 | 5.6 | 8.3 | 3.9 | 8.4 | 3.9 | 9.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.1 | 4.2 | 5.8 | 3.0 | 6.1 | 3.0 | 6.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.2 | 4.3 | 5.7 | 3.1 | 5.9 | 3.1 | 6.5 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.3 | 3.1 | 4.0 | 2.2 | 4.2 | 2.2 | 4.6 | ns |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | | |
| | | 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 |
| f _{max} | maximum frequency | V _{CC} = 3.0 V to 3.6 V | - | 550 | - | 410 | - | 360 | - | MHz |

C_L = 15 pF

| | | | | | | | | | | |
|----------------------------------|-------------------|------------------------------------------------------|-----|------|------|-----|------|-----|------|----|
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 30.6 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.0 | 8.0 | 16.2 | 2.8 | 16.5 | 2.8 | 16.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.8 | 5.5 | 9.3 | 2.4 | 10.1 | 2.4 | 10.4 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.3 | 4.5 | 7.2 | 2.1 | 7.9 | 2.1 | 8.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.1 | 3.5 | 5.0 | 1.9 | 5.5 | 1.9 | 5.7 | ns |
| V _{CC} = 3.0 V to 3.6 V | 2.0 | 3.1 | 4.3 | 1.7 | 4.7 | 1.7 | 5.0 | ns | | |

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

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | | Unit |
|------------------|-------------------|-------------------------------------------------------------------|-------|--------------------|------|-------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| t _{en} | enable time | \overline{OE} to Q; see Figure 8 ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 28.6 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 4.3 | 7.4 | 11.6 | 3.9 | 12.1 | 3.9 | 13.3 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.5 | 5.3 | 7.2 | 3.1 | 8.0 | 3.1 | 8.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.1 | 4.5 | 6.1 | 2.8 | 6.7 | 2.8 | 7.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.7 | 3.8 | 5.0 | 2.5 | 5.4 | 2.5 | 5.9 | ns |
| t _{dis} | disable time | \overline{OE} to Q; see Figure 8 ^[4] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 13.5 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 5.0 | 6.8 | 9.5 | 4.9 | 9.6 | 4.9 | 10.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.9 | 5.1 | 6.8 | 3.8 | 7.0 | 3.8 | 7.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 4.3 | 5.4 | 7.0 | 4.1 | 7.2 | 4.1 | 7.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.0 | 3.9 | 4.9 | 2.9 | 5.1 | 2.9 | 5.6 | ns |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | | |
| | | 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 |
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 40.8 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.7 | 10.3 | 20.5 | 3.5 | 21.2 | 3.5 | 21.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.3 | 7.0 | 11.6 | 3.2 | 12.6 | 3.2 | 13.3 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.2 | 5.8 | 9.1 | 2.9 | 9.8 | 2.9 | 10.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.0 | 4.7 | 6.5 | 2.6 | 7.0 | 2.6 | 7.4 | ns |
| t _{en} | enable time | \overline{OE} to Q; see Figure 8 ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 39.0 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 5.6 | 9.8 | 15.7 | 5.0 | 16.5 | 5.0 | 18.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 4.6 | 7.0 | 9.5 | 4.1 | 10.6 | 4.1 | 11.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 4.1 | 5.9 | 7.9 | 3.7 | 8.6 | 3.7 | 9.5 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.7 | 5.0 | 6.6 | 3.3 | 7.1 | 3.3 | 7.8 | ns |
| t _{en} | enable time | \overline{OE} to Q; see Figure 8 ^[3] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 39.0 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 5.6 | 9.8 | 15.7 | 5.0 | 16.5 | 5.0 | 18.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 4.6 | 7.0 | 9.5 | 4.1 | 10.6 | 4.1 | 11.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 4.1 | 5.9 | 7.9 | 3.7 | 8.6 | 3.7 | 9.5 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.7 | 5.0 | 6.6 | 3.3 | 7.1 | 3.3 | 7.8 | ns |

C_L = 30 pF

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

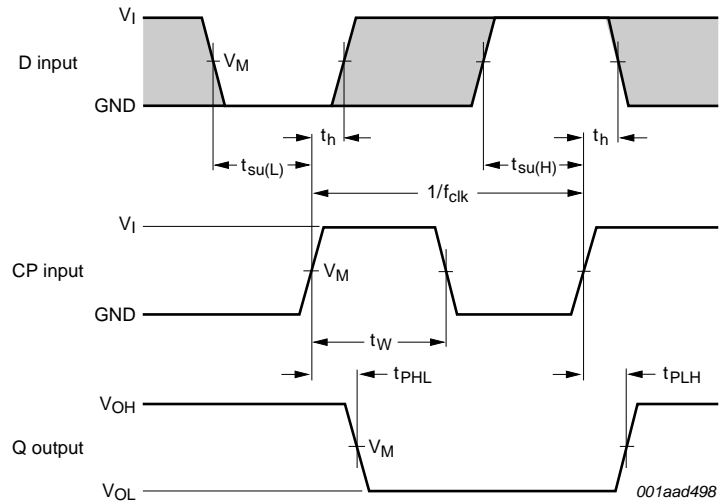
| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | | Unit |
|--------------------|-------------------|-------------------------------------------------------------------|-------|--------------------|------|-------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| t _{dis} | disable time | \overline{OE} to Q; see Figure 8 ^[4] | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 19.0 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 8.1 | 10.2 | 13.3 | 8.0 | 13.5 | 8.0 | 14.9 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 6.4 | 7.8 | 9.7 | 6.3 | 10.0 | 6.3 | 11.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 7.4 | 8.8 | 10.7 | 7.2 | 10.9 | 7.2 | 12.0 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 5.2 | 6.3 | 7.5 | 5.1 | 7.8 | 5.1 | 8.6 | ns |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | | |
| | | 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 |
| t _w | pulse width | CP; HIGH or LOW; see Figure 7 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 5.1 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.5 | - | 3.2 | - | 3.5 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.9 | - | 1.5 | - | 1.7 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.7 | - | 1.0 | - | 1.1 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.5 | - | 0.8 | - | 0.8 | - | ns |
| t _{su(H)} | set-up time HIGH | D to CP; see Figure 7 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 2.1 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.5 | - | 1.4 | - | 1.4 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.3 | - | 1.0 | - | 1.0 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.3 | - | 0.9 | - | 0.9 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.3 | - | 0.7 | - | 0.7 | - | ns |
| t _{su(L)} | set-up time LOW | D to CP; see Figure 7 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 3.5 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.8 | - | 1.8 | - | 1.8 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.6 | - | 1.2 | - | 1.2 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.5 | - | 1.1 | - | 1.1 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.4 | - | 1.0 | - | 1.0 | - | ns |
| t _{su(L)} | set-up time LOW | V _{CC} = 3.0 V to 3.6 V | - | 0.5 | - | 1.0 | - | 1.0 | - | ns |

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

| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | | Unit |
|-----------------|-------------------------------|---------------------------------------------------------------------------------------------------------|-------|--------------------|-----|-------------------|-------------|--------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min (85 °C) | Max (85 °C) | Min (125 °C) | Max (125 °C) | |
| t _h | hold time | D to CP; see Figure 7 | | | | | | | | |
| | | V _{CC} = 0.8 V | - | -2.8 | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | -0.7 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | -0.4 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | -0.4 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | -0.3 | - | 0 | - | 0 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | -0.4 | - | 0 | - | 0 | - | ns |
| C _{PD} | power dissipation capacitance | V _I = GND to V _{CC} ; [5] f _i = 1 MHz; output enabled | | | | | | | | |
| | | V _{CC} = 0.8 V | - | 1.7 | - | - | - | - | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.8 | - | - | - | - | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.8 | - | - | - | - | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 2.0 | - | - | - | - | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 2.3 | - | - | - | - | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 2.8 | - | - | - | - | - | pF |

- [1] All typical values are measured at nominal V_{CC}.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL}.
- [3] t_{en} is the same as t_{PZH} and t_{PZL}.
- [4] t_{dis} is the same as t_{PHZ} and t_{PLZ}.
- [5] 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;
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs;
 N = number of inputs switching.

12. Waveforms

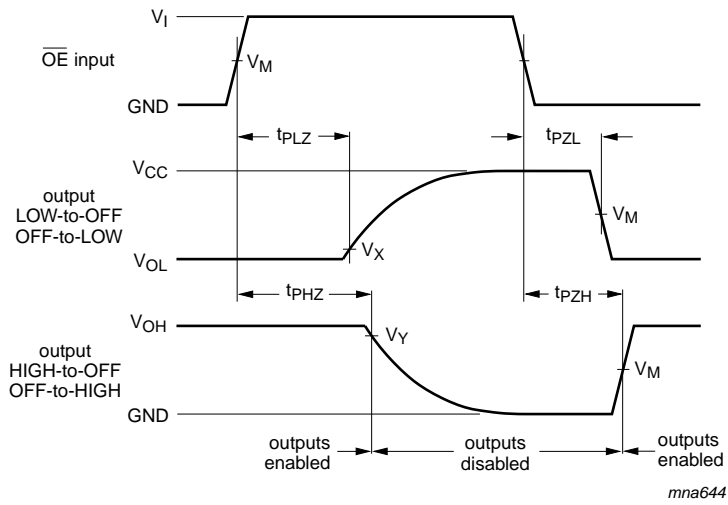


Measurement points are given in [Table 9](#).
 The shaded areas indicate when the input is permitted to change for predictable output performance.
 Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 7. The clock input (CP) to output (Q) propagation delays, clock input (CP) pulse width, data input (D) to clock input (CP) set-up times, clock input (CP) to data input (D) hold times and the maximum frequency (CP)

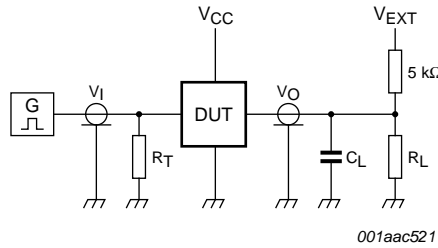
Table 9. Measurement points

| Supply voltage | Input | | | Output | | |
|-----------------|---------------------|----------|---------------|---------------------|-------------------|-------------------|
| V_{CC} | V_M | V_I | $t_r = t_f$ | V_M | V_X | V_Y |
| 0.8 V to 1.6 V | $0.5 \times V_{CC}$ | V_{CC} | ≤ 3.0 ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.1$ V | $V_{OH} - 0.1$ V |
| 1.65 V to 2.7 V | $0.5 \times V_{CC}$ | V_{CC} | ≤ 3.0 ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.15$ V | $V_{OH} - 0.15$ V |
| 3.0 V to 3.6 V | $0.5 \times V_{CC}$ | V_{CC} | ≤ 3.0 ns | $0.5 \times V_{CC}$ | $V_{OL} + 0.3$ V | $V_{OH} - 0.3$ V |



Measurement points are given in [Table 9](#).
 Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig 8. Enable and disable times



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 9. 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, set-up and hold times and pulse width $R_L = 1 \text{ M}\Omega$.

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

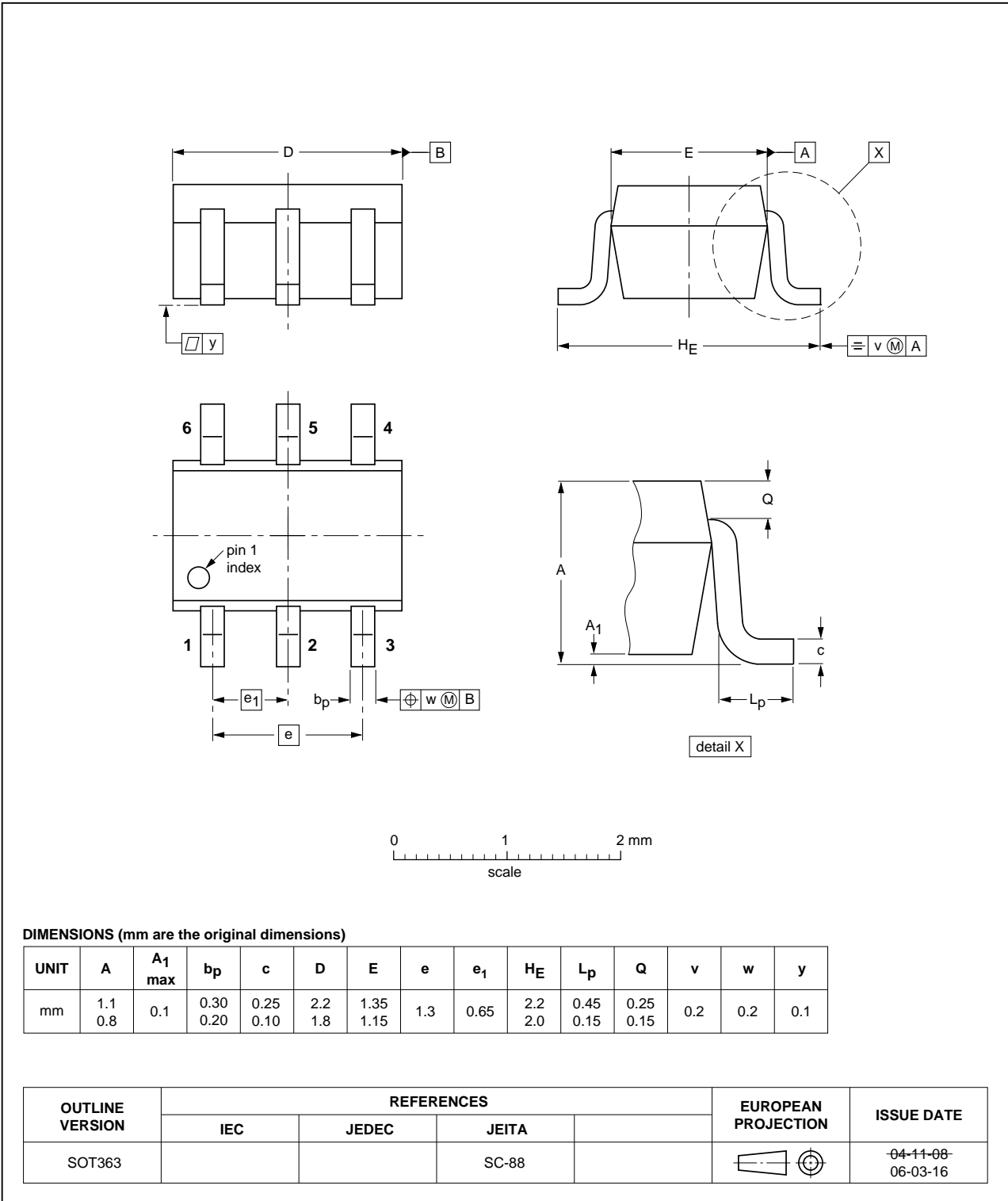


Fig 10. Package outline SOT363 (SC-88)

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

SOT886

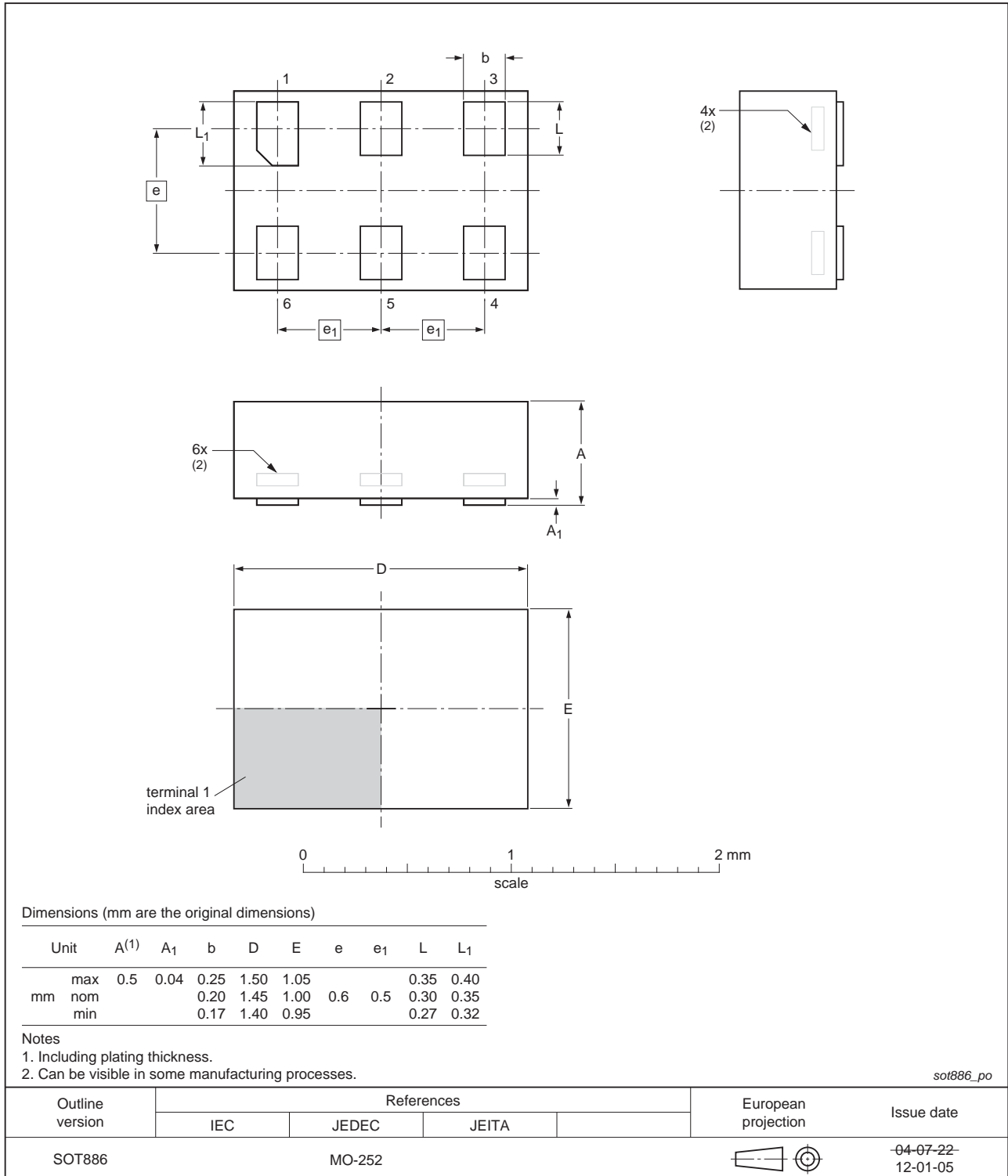


Fig 11. Package outline SOT886 (XSON6)

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

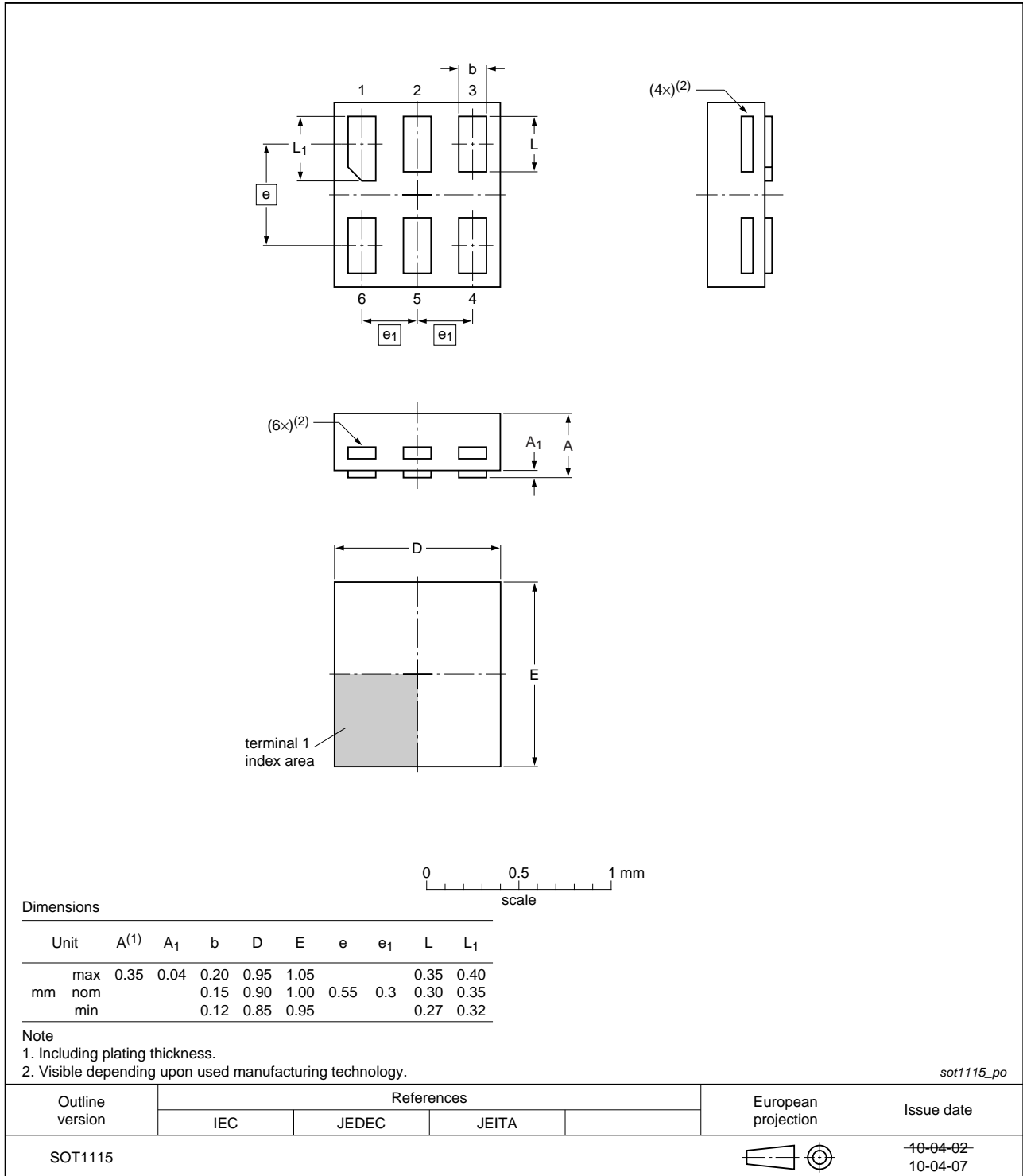


Fig 13. Package outline SOT1115 (XSON6)

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

SOT1202

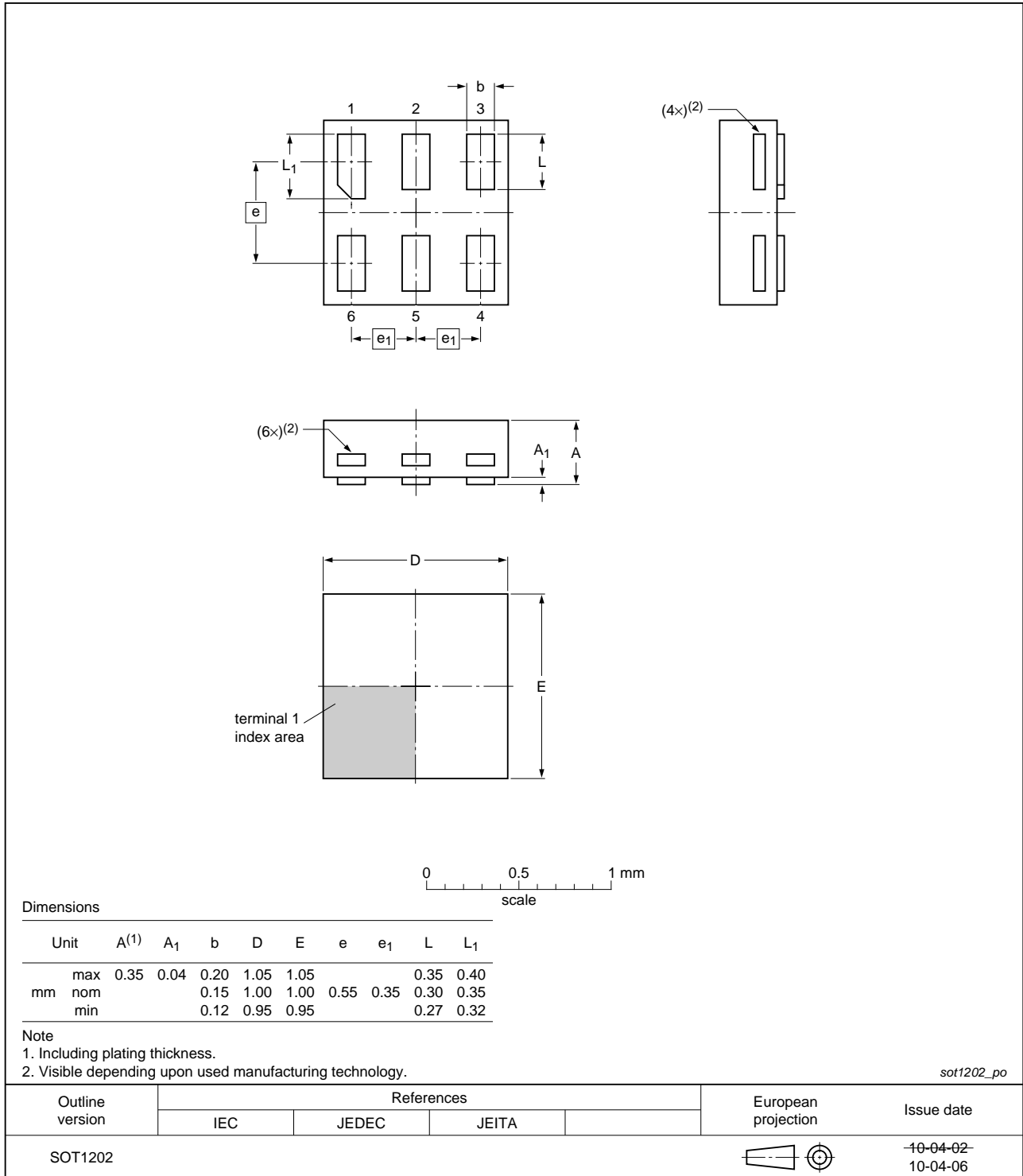


Fig 14. Package outline SOT1202 (XSON6)

14. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|-------------------------|
| 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 |
|----------------|---------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|----------------|
| 74AUP1G374 v.8 | 20121129 | Product data sheet | - | 74AUP1G374 v.7 |
| Modifications: | <ul style="list-style-type: none"> Class 3A added to ESD list item. | | | |
| 74AUP1G374 v.7 | 20120704 | Product data sheet | - | 74AUP1G374 v.6 |
| Modifications: | <ul style="list-style-type: none"> Package outline drawing of SOT886 (Figure 11) modified. | | | |
| 74AUP1G374 v.6 | 20111205 | Product data sheet | - | 74AUP1G374 v.5 |
| 74AUP1G374 v.5 | 20100714 | Product data sheet | - | 74AUP1G374 v.4 |
| 74AUP1G374 v.4 | 20090626 | Product data sheet | - | 74AUP1G374 v.3 |
| 74AUP1G374 v.3 | 20090414 | Product data sheet | - | 74AUP1G374 v.2 |
| 74AUP1G374 v.2 | 20080523 | Product data sheet | - | 74AUP1G374 v.1 |
| 74AUP1G374 v.1 | 20061114 | Product data sheet | - | - |

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. |
| 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.nxp.com>.

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Date of release: 29 November 2012

Document identifier: 74AUP1G374



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Телефон: +7 812 627 14 35

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Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331