

74AUP1Z04

Low-power X-tal driver with enable and internal resistor

Rev. 5 — 9 August 2012

Product data sheet

1. General description

The 74AUP1Z04 combines the functions of the 74AUP1GU04 and 74AUP1G04 with enable circuitry and an internal bias resistor to provide a device optimized for use in crystal oscillator applications.

When not in use the \overline{EN} input can be driven HIGH, putting the device in a low power disable mode with $X1$ pulled HIGH via R_{PU} , $X2$ set LOW and Y set HIGH. Schmitt trigger action at the \overline{EN} input 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 is fully specified for partial power-down applications using I_{OFF} at output Y . The I_{OFF} circuitry disables the output Y , preventing the damaging backflow current through the device when it is powered down.

The integration of the two devices into the 74AUP1Z04 produces the benefits of a compact footprint, lower power dissipation and stable operation over a wide range of frequency and temperature.

2. Features and benefits

- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- ESD protection:
 - ◆ HBM JESD22-A114F Class 3A exceeds 5000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101E exceeds 1000 V
- Latch-up performance exceeds 100 mA per JESD78B 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 at output Y
- Multiple package options
- Specified from -40°C to $+85^{\circ}\text{C}$ and -40°C to $+125^{\circ}\text{C}$



3. Ordering information

Table 1. Ordering information

| Type number | Package | | | | Version |
|-------------|-------------------|-------|---|--|---------|
| | Temperature range | Name | Description | | |
| 74AUP1Z04GW | −40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | | SOT363 |
| 74AUP1Z04GM | −40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | | SOT886 |
| 74AUP1Z04GF | −40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm | | SOT891 |
| 74AUP1Z04GN | −40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm | | SOT1115 |
| 74AUP1Z04GS | −40 °C to +125 °C | XSON6 | extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm | | SOT1202 |

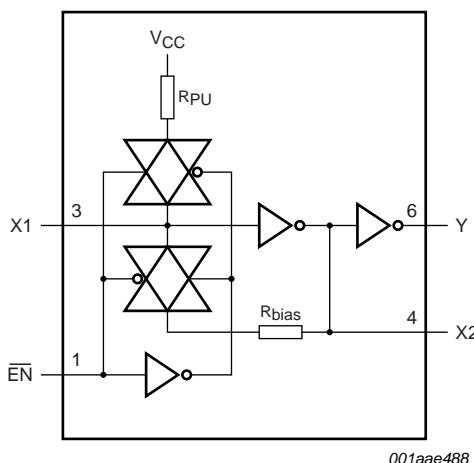
4. Marking

Table 2. Marking

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| 74AUP1Z04GW | a4 |
| 74AUP1Z04GM | a4 |
| 74AUP1Z04GF | a4 |
| 74AUP1Z04GN | a4 |
| 74AUP1Z04GS | a4 |

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

5. Functional diagram



R_{PU} = pull-up resistance.

R_{bias} = bias resistance.

Fig 1. Logic symbol

6. Pinning information

6.1 Pinning

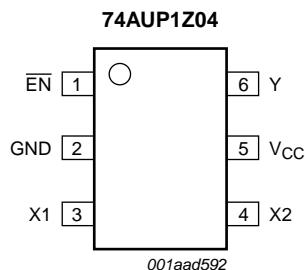


Fig 2. Pin configuration SOT363

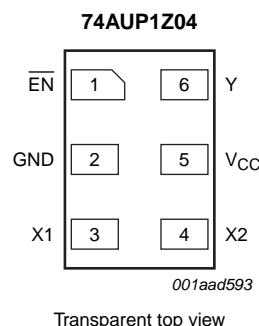


Fig 3. Pin configuration SOT886

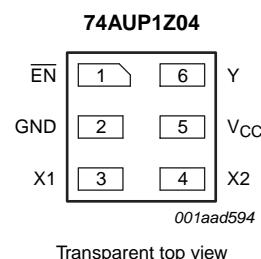


Fig 4. Pin configuration SOT891, SOT1115 and SOT1202

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | Description |
|-----------------|-----|---------------------------|
| EN | 1 | enable input (active LOW) |
| GND | 2 | ground (0 V) |
| X1 | 3 | data input |
| X2 | 4 | data output |
| V _{CC} | 5 | supply voltage |
| Y | 6 | data output |

7. Functional description

Table 4. Function table^[1]

| Input | | Output | |
|-------|----|--------|---|
| EN | X1 | X2 | Y |
| L | L | H | L |
| L | H | L | H |
| H | L | H | L |
| H | H | L | H |

[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 | | [1] -0.5 | V _{CC} + 0.5 | 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 packages: 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 | | 0 | V _{CC} | V |
| T _{AMB} | ambient temperature | | -40 | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | V _{CC} = 0.8 V to 3.6 V | - | 200 | ns/V |

10. Static characteristics

Table 7. Static characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|---------------------------|---|----------------------|-----|----------------------|------|
| $T_{amb} = 25^\circ\text{C}$ | | | | | | |
| V_{IH} | HIGH-level input voltage | X1 input | | | | |
| | | $V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | $0.75 \times V_{CC}$ | - | - | V |
| | | EN input | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | $0.70 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 0.9\text{ V to }1.95\text{ V}$ | $0.65 \times V_{CC}$ | - | - | 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-level input voltage | X1 input | | | | |
| | | $V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | - | - | $0.25 \times V_{CC}$ | V |
| | | EN input | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | - | $0.30 \times V_{CC}$ | V |
| | | $V_{CC} = 0.9\text{ V to }1.95\text{ V}$ | - | - | $0.35 \times V_{CC}$ | 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-level output voltage | Y output; V_I at X1 input = V_{IH} or V_{IL} | | | | |
| | | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -1.1\text{ mA}; V_{CC} = 1.1\text{ V}$ | $0.75 \times V_{CC}$ | - | - | V |
| | | $I_O = -1.7\text{ mA}; V_{CC} = 1.4\text{ V}$ | 1.11 | - | - | V |
| | | $I_O = -1.9\text{ mA}; V_{CC} = 1.65\text{ V}$ | 1.32 | - | - | 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 |
| | | X2 output; V_I = GND or V_{CC} | | | | |
| | | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -1.1\text{ mA}; V_{CC} = 1.1\text{ V}$ | $0.75 \times V_{CC}$ | - | - | V |
| | | $I_O = -1.7\text{ mA}; V_{CC} = 1.4\text{ V}$ | 1.11 | - | - | V |
| | | $I_O = -1.9\text{ mA}; V_{CC} = 1.65\text{ V}$ | 1.32 | - | - | 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 |

Table 7. Static characteristics ...continued

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------------------|--|-----|-----|---------------------|-------------------|
| V_{OL} | LOW-level output voltage | Y output; V_I at X1 input = V_{IH} or V_{IL} | | | | |
| | | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.1 | V |
| | | $I_O = 1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$ | - | - | $0.3 \times V_{CC}$ | V |
| | | $I_O = 1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$ | - | - | 0.31 | V |
| | | $I_O = 1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$ | - | - | 0.31 | 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 |
| | | X2 output; $V_I = \text{GND}$ or V_{CC} | | | | |
| | | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.1 | V |
| | | $I_O = 1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$ | - | - | $0.3 \times V_{CC}$ | V |
| | | $I_O = 1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$ | - | - | 0.31 | V |
| | | $I_O = 1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$ | - | - | 0.31 | 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 | X1 input | | | | |
| | | $V_I = \overline{EN} = V_{CC}; V_{CC} = 0 \text{ V}$ to 3.6 V | - | - | ± 0.1 | μA |
| | | \overline{EN} input | | | | |
| | | $V_I = \text{GND}$ to $3.6 \text{ V}; V_{CC} = 0 \text{ V}$ to 3.6 V | - | - | ± 0.1 | μA |
| I_{pu} | pull-up current | X1 input; $\overline{EN} = V_{CC}$ | | | | |
| | | $V_I = \text{GND}; V_{CC} = 0.8 \text{ V}$ to 3.6 V | - | - | 15 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = 0 \text{ V}$ to $3.6 \text{ V}; V_{CC} = 0 \text{ V}$ | [1] | - | - | ± 0.2 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 V | [1] | - | - | ± 0.2 μA |
| I_{CC} | supply current | $V_I = \text{GND}$ or $V_{CC}; I_O = 0 \text{ A}; \overline{EN} = \text{GND}; V_{CC} = 0.8 \text{ V}$ to 3.6 V | - | - | 75 | μA |
| ΔI_{CC} | additional supply current | \overline{EN} input | | | | |
| | | $V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$ | - | - | 40 | μA |
| C_I | input capacitance | X1 input | | | | |
| | | $V_{CC} = 0 \text{ V}$ to $3.6 \text{ V}; V_I = \text{GND}$ or V_{CC} | - | 1.3 | - | pF |
| | | \overline{EN} input | | | | |
| | | $V_{CC} = 0 \text{ V}$ to $3.6 \text{ V}; V_I = \text{GND}$ 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 | X2 output | | | | |
| | | $V_O = GND; V_{CC} = 0 V$ | - | 1.5 | - | pF |
| g_{fs} | forward transconductance | Y output | | | | |
| | | $V_O = GND; V_{CC} = 0 V$ | - | 1.7 | - | pF |
| R_{bias} | bias resistance | see Figure 10 and Figure 11 | | | | |
| | | $V_{CC} = 0.8 V$ | - | - | - | mA/V |
| | | $V_{CC} = 1.1 V$ to $1.3 V$ | 0.2 | - | 9.9 | mA/V |
| | | $V_{CC} = 1.4 V$ to $1.6 V$ | 3.9 | - | 17.7 | mA/V |
| | | $V_{CC} = 1.65 V$ to $1.95 V$ | 7.9 | - | 24.3 | mA/V |
| | | $V_{CC} = 2.3 V$ to $2.7 V$ | 18 | - | 30.7 | mA/V |
| | | $V_{CC} = 3.0 V$ to $3.6 V$ | 20.5 | - | 32.4 | mA/V |

 $T_{amb} = -40^{\circ}C$ to $+85^{\circ}C$

| | | | | | | |
|----------|--------------------------|------------------------------|----------------------|---|----------------------|---|
| V_{IH} | HIGH-level input voltage | X1 input | | | | |
| | | $V_{CC} = 0.8 V$ to $3.6 V$ | $0.75 \times V_{CC}$ | - | - | V |
| V_{IL} | LOW-level input voltage | EN input | | | | |
| | | $V_{CC} = 0.8 V$ | $0.70 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 0.9 V$ to $1.95 V$ | $0.65 \times V_{CC}$ | - | - | 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 |
| | | X1 input | | | | |
| | | $V_{CC} = 0.8 V$ to $3.6 V$ | - | - | $0.25 \times V_{CC}$ | V |
| | | EN input | | | | |
| | | $V_{CC} = 0.8 V$ | - | - | $0.30 \times V_{CC}$ | V |
| | | $V_{CC} = 0.9 V$ to $1.95 V$ | - | - | $0.35 \times V_{CC}$ | 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 |

Table 7. Static characteristics ...continued

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|---|--|---------------------|-----|---------------------|------|
| V_{OH} | HIGH-level output voltage Y output; V_I at X1 input = V_{IH} or V_{IL} | $I_O = -20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -1.1 mA; V_{CC} = 1.1 V$ | $0.7 \times V_{CC}$ | - | - | 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 |
| | | $I_O = -4.0 mA; V_{CC} = 3.0 V$ | 2.55 | - | - | V |
| | V_I at X1 input = V_{IH} or V_{IL} | $I_O = -20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | $V_{CC} - 0.1$ | - | - | V |
| | | $I_O = -1.1 mA; V_{CC} = 1.1 V$ | $0.7 \times V_{CC}$ | - | - | 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 |
| | | $I_O = -4.0 mA; V_{CC} = 3.0 V$ | 2.55 | - | - | V |
| V_{OL} | LOW-level output voltage Y output; V_I at X1 input = V_{IH} or V_{IL} | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.1 | V |
| | | $I_O = 1.1 mA; V_{CC} = 1.1 V$ | - | - | $0.3 \times V_{CC}$ | 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 |
| | X2 output; V_I = GND or V_{CC} | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.1 | V |
| | | $I_O = 1.1 mA; V_{CC} = 1.1 V$ | - | - | $0.3 \times V_{CC}$ | 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 |

Table 7. Static characteristics ...continued

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------------------|--|------|-----|-----------|-----------|
| I_I | input leakage current | X1 input | | | | |
| | | $V_I = \overline{EN} = V_{CC}$; $V_{CC} = 0$ V to 3.6 V | - | - | ± 0.5 | μA |
| I_{pu} | pull-up current | \overline{EN} input | | | | |
| | | $V_I = \text{GND}$ to 3.6 V; $V_{CC} = 0$ V to 3.6 V | - | - | ± 0.5 | μA |
| I_{OFF} | power-off leakage current | X1 input; $\overline{EN} = V_{CC}$ | | | | |
| ΔI_{OFF} | additional power-off leakage current | $V_I = \text{GND}$; $V_{CC} = 0.8$ V to 3.6 V | [1] | - | - | μA |
| | | $V_I = \text{GND}$ to 3.6 V; $V_{CC} = 0$ V to 0.2 V | [1] | - | - | μA |
| I_{CC} | supply current | $V_I = \text{GND}$ or V_{CC} ; $I_O = 0$ A; $\overline{EN} = \text{GND}$; $V_{CC} = 0.8$ V to 3.6 V | - | - | 75 | μA |
| ΔI_{CC} | additional supply current | \overline{EN} input | | | | |
| | | $V_I = V_{CC} - 0.6$ V; $I_O = 0$ A; $V_{CC} = 3.3$ V | - | - | 50 | μA |
| g_{fs} | forward transconductance | see Figure 10 and Figure 11 | | | | |
| | | $V_{CC} = 0.8$ V | - | - | - | mA/V |
| | | $V_{CC} = 1.1$ V to 1.3 V | - | - | 10.8 | mA/V |
| | | $V_{CC} = 1.4$ V to 1.6 V | 1.8 | - | 21.2 | mA/V |
| | | $V_{CC} = 1.65$ V to 1.95 V | 7.5 | - | 29.9 | mA/V |
| | | $V_{CC} = 2.3$ V to 2.7 V | 15.0 | - | 38.0 | mA/V |
| R_{bias} | bias resistance | $V_{CC} = 3.0$ V to 3.6 V | 17.8 | - | 39.2 | mA/V |
| | | $\overline{EN} = \text{GND}$; $f_i = 0$ Hz; $V_I = 0$ V or V_{CC} ; see Figure 5 ; for frequency behavior see Figure 6 | 1.07 | - | 3.11 | $M\Omega$ |

 $T_{amb} = -40$ °C to +125 °C

| | | | | | | |
|----------|--------------------------|----------------------------|----------------------|---|----------------------|---|
| V_{IH} | HIGH-level input voltage | X1 input | | | | |
| | | $V_{CC} = 0.8$ V to 3.6 V | $0.75 \times V_{CC}$ | - | - | V |
| V_{IL} | LOW-level input voltage | \overline{EN} input | | | | |
| | | $V_{CC} = 0.8$ V | $0.75 \times V_{CC}$ | - | - | V |
| | | $V_{CC} = 0.9$ V to 1.95 V | $0.70 \times V_{CC}$ | - | - | 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 |
| | | X1 input | | | | |
| | | $V_{CC} = 0.8$ V to 3.6 V | - | - | $0.25 \times V_{CC}$ | V |
| | | \overline{EN} input | | | | |
| | | $V_{CC} = 0.8$ V | - | - | $0.25 \times V_{CC}$ | V |
| | | $V_{CC} = 0.9$ V to 1.95 V | - | - | $0.30 \times V_{CC}$ | 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 |

Table 7. Static characteristics ...continued

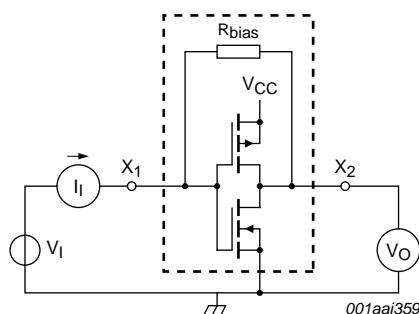
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------|---------------------------|--|---------------------|-----|----------------------|------|
| V_{OH} | HIGH-level output voltage | Y output; V_I at X1 input = V_{IH} or V_{IL} | | | | V |
| | | $I_O = -20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | $V_{CC} - 0.11$ | - | - | V |
| | | $I_O = -1.1 mA; V_{CC} = 1.1 V$ | $0.6 \times V_{CC}$ | - | - | 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 |
| | | $I_O = -4.0 mA; V_{CC} = 3.0 V$ | 2.30 | - | - | V |
| | | X2 output; $V_I = GND$ or V_{CC} | | | | V |
| | | $I_O = -20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | $V_{CC} - 0.11$ | - | - | V |
| | | $I_O = -1.1 mA; V_{CC} = 1.1 V$ | $0.6 \times V_{CC}$ | - | - | 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 |
| | | $I_O = -4.0 mA; V_{CC} = 3.0 V$ | 2.30 | - | - | V |
| V_{OL} | LOW-level output voltage | Y output; V_I at X1 input = V_{IH} or V_{IL} | | | | V |
| | | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.11 | V |
| | | $I_O = 1.1 mA; V_{CC} = 1.1 V$ | - | - | $0.33 \times V_{CC}$ | 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 |
| | | $I_O = 4.0 mA; V_{CC} = 3.0 V$ | - | - | 0.50 | V |
| | | X2 output; $V_I = GND$ or V_{CC} | | | | V |
| | | $I_O = 20 \mu A; V_{CC} = 0.8 V$ to $3.6 V$ | - | - | 0.11 | V |
| | | $I_O = 1.1 mA; V_{CC} = 1.1 V$ | - | - | $0.33 \times V_{CC}$ | 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 |
| | | $I_O = 4.0 mA; V_{CC} = 3.0 V$ | - | - | 0.50 | V |

Table 7. Static characteristics ...continued

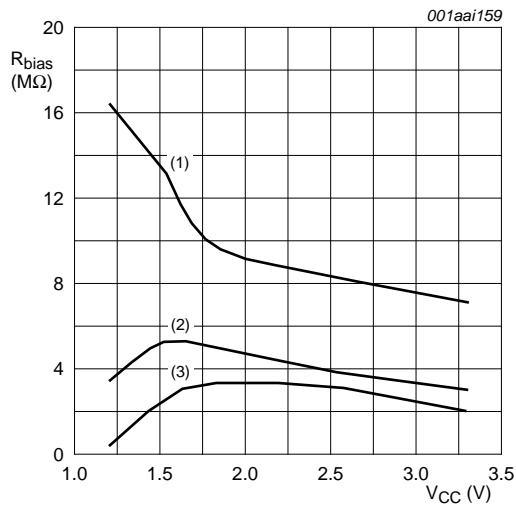
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|--------------------------------------|--|------|-----|------------|--------------------------|
| I_I | input leakage current | X1 input | | | | |
| | | $V_I = \overline{EN} = V_{CC}$; $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$ | - | - | ± 0.75 | μA |
| I_{pu} | pull-up current | \overline{EN} input | | | | |
| | | $V_I = \text{GND to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 3.6 \text{ V}$ | - | - | ± 0.75 | μA |
| I_{OFF} | power-off leakage current | V_I or $V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V}$ | [1] | - | - | ± 0.75 μA |
| ΔI_{OFF} | additional power-off leakage current | V_I or $V_O = 0 \text{ V to } 3.6 \text{ V}; V_{CC} = 0 \text{ V to } 0.2 \text{ V}$ | [1] | - | - | ± 0.75 μA |
| I_{CC} | supply current | $V_I = \text{GND or } V_{CC}; I_O = 0 \text{ A}; \overline{EN} = \text{GND}; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$ | - | - | 75 | μA |
| ΔI_{CC} | additional supply current | \overline{EN} input | | | | |
| g_{fs} | forward transconductance | $V_{CC} = V_I = 0.8 \text{ V}$ | - | - | - | mA/V |
| | | $V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$ | - | - | 10.8 | mA/V |
| | | $V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$ | 1.8 | - | 21.2 | mA/V |
| | | $V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$ | 6.9 | - | 29.9 | mA/V |
| | | $V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$ | 13.4 | - | 38.0 | mA/V |
| | | $V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$ | 15.8 | - | 39.2 | mA/V |
| R_{bias} | bias resistance | $\overline{EN} = \text{GND}; f_I = 0 \text{ Hz}; V_I = 0 \text{ V or } V_{CC}$; see Figure 5; for frequency behavior see Figure 6 | 1.07 | - | 3.11 | $\text{M}\Omega$ |

[1] Only for output Y and input \overline{EN} .

$$R_{bias} = \left| \frac{V_O - V_I}{I_I} \right|$$

Fig 5. Test circuit for measuring bias resistance



- (1) $f_i = 30$ kHz.
- (2) $f_i = 1$ MHz.
- (3) $f_i = 10$ MHz.

Fig 6. Typical bias resistance versus supply voltage

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | Unit |
|-----------------------------|-------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| C_L = 5 pF | | | | | | | | | |
| t _{pd} | propagation delay | X1 to X2; see Figure 7 | [2] | | | | | | |
| | | $V_{CC} = 0.8$ V | - | 12.8 | - | - | - | - | ns |
| | | $V_{CC} = 1.1$ V to 1.3 V | 1.2 | 3.0 | 3.9 | 1.2 | 3.9 | 3.9 | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 1.0 | 2.2 | 2.6 | 1.0 | 2.7 | 2.7 | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 0.8 | 1.9 | 2.3 | 0.8 | 2.4 | 2.5 | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 0.7 | 1.6 | 1.9 | 0.7 | 2.0 | 2.0 | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 0.7 | 1.4 | 1.6 | 0.7 | 1.7 | 1.7 | ns |
| | | X1 to Y; see Figure 8 | [2] | | | | | | |
| | | $V_{CC} = 0.8$ V | - | 39.2 | - | - | - | - | ns |
| | | $V_{CC} = 1.1$ V to 1.3 V | 2.5 | 8.0 | 10.7 | 2.3 | 10.8 | 10.9 | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 2.2 | 5.5 | 6.6 | 2.0 | 7.0 | 7.0 | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 1.8 | 4.4 | 5.5 | 1.7 | 5.9 | 6.0 | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 1.5 | 3.5 | 4.1 | 1.4 | 4.4 | 4.5 | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 1.5 | 3.1 | 3.5 | 1.4 | 3.8 | 3.8 | ns |

Table 8. Dynamic characteristics ...continued

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | Unit |
|------------------------------|-------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| C_L = 10 pF | | | | | | | | | |
| t _{pd} | propagation delay | X1 to X2; see Figure 7 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 20.9 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 1.4 | 4.1 | 5.4 | 1.3 | 5.6 | 5.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.3 | 2.9 | 3.6 | 1.2 | 3.8 | 3.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.2 | 2.5 | 3.0 | 1.1 | 3.2 | 3.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 0.9 | 2.0 | 2.4 | 0.8 | 2.5 | 2.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.9 | 1.8 | 2.1 | 0.8 | 2.3 | 2.3 | ns |
| | | X1 to Y; see Figure 8 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 46.6 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.7 | 9.2 | 12.4 | 2.5 | 12.7 | 12.7 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.5 | 6.3 | 7.8 | 2.2 | 8.2 | 8.2 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.3 | 5.0 | 6.2 | 2.2 | 6.7 | 6.7 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.8 | 4.0 | 4.7 | 1.7 | 5.0 | 5.1 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.9 | 3.6 | 4.2 | 1.8 | 4.5 | 4.5 | ns |
| C_L = 15 pF | | | | | | | | | |
| t _{pd} | propagation delay | X1 to X2; see Figure 7 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 28.9 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 1.7 | 5.2 | 7.1 | 1.6 | 7.2 | 7.3 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.6 | 3.6 | 4.4 | 1.6 | 4.7 | 4.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.3 | 3.0 | 3.7 | 1.3 | 3.9 | 4.0 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.0 | 2.4 | 2.9 | 1.0 | 3.1 | 3.1 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.1 | 2.2 | 2.5 | 1.0 | 2.7 | 2.7 | ns |
| | | X1 to Y; see Figure 8 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 53.9 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.1 | 10.4 | 14.2 | 2.8 | 14.6 | 14.7 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.9 | 7.0 | 8.5 | 2.7 | 9.2 | 9.3 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.5 | 5.6 | 6.9 | 2.3 | 7.4 | 7.5 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.1 | 4.5 | 5.4 | 2.0 | 5.7 | 5.7 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.3 | 4.1 | 4.7 | 2.1 | 5.1 | 5.1 | ns |

Table 8. Dynamic characteristics ...continued

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

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +125 °C | | | Unit |
|---|-------------------------------|--|--------------------------|--------------------|------|--------------------------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| C_L = 30 pF | | | | | | | | | |
| t _{pd} | propagation delay | X1 to X2; see Figure 7 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 52.8 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 8.5 | 11.8 | 2.3 | 12.2 | 12.4 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.2 | 5.6 | 6.8 | 2.0 | 7.5 | 7.6 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.0 | 4.5 | 5.6 | 1.9 | 6.2 | 6.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.5 | 3.7 | 4.2 | 1.4 | 4.6 | 4.6 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.7 | 3.3 | 3.7 | 1.6 | 4.0 | 4.2 | ns |
| | | X1 to Y; see Figure 8 | [2] | | | | | | |
| | | V _{CC} = 0.8 V | - | 77.6 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.7 | 13.8 | 19.2 | 3.3 | 19.8 | 20.1 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.4 | 9.2 | 11.2 | 3.1 | 12.2 | 12.3 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.4 | 7.4 | 8.8 | 3.1 | 9.7 | 9.7 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.6 | 5.9 | 6.7 | 2.4 | 7.4 | 7.4 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 3.2 | 5.4 | 6.2 | 2.9 | 6.7 | 6.9 | ns |
| C_L = 5 pF, 10 pF, 15 pF and 30 pF | | | | | | | | | |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; \overline{EN} = GND; V _I = GND to V _{CC} | [3][4][5] | | | | | | |
| | | V _{CC} = 0.8 V | - | 6.8 | - | - | - | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 12.0 | - | - | - | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 18.2 | - | - | - | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 19.2 | - | - | - | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 21.9 | - | - | - | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 24.9 | - | - | - | - | pF |

[1] All typical values are measured at nominal V_{CC}.[2] t_{pd} is the same as t_{PLH} and t_{PHL}.

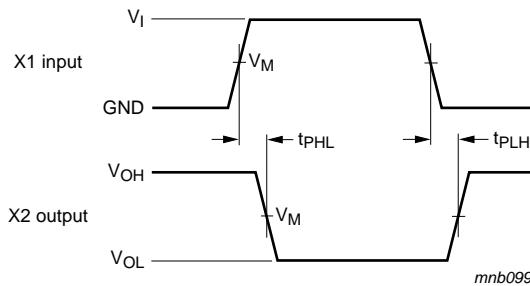
[3] All specified values are the average typical values over all stated loads.

[4] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ 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;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.[5] Feedback current is included in the C_{PD}.

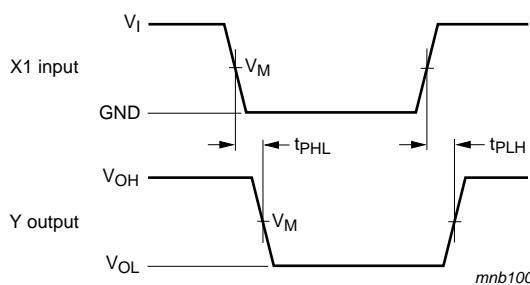
12. Waveforms



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

Logic levels: V_{OL} and V_{OH} are typical output voltage drop that occur with the output load.

Fig 7. The input (X1) to output (X2) propagation delays



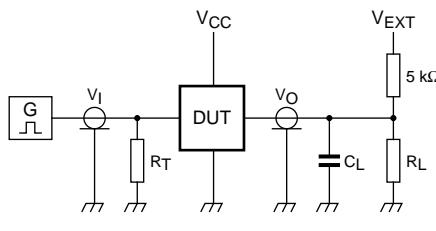
Measurement points are given in [Table 9](#).

Logic levels: V_{OL} and V_{OH} are typical output voltage drop that occur with the output load.

Fig 8. The input (X1) to output (Y) propagation delays

Table 9. Measurement points

| Supply voltage | Output | Input | | |
|----------------|---------------------|---------------------|----------|-----------------------|
| V_{CC} | V_M | V_M | V_I | $t_r = t_f$ |
| 0.8 V to 3.6 V | $0.5 \times V_{CC}$ | $0.5 \times V_{CC}$ | V_{CC} | $\leq 3.0 \text{ ns}$ |



Test data is given in [Table 10](#).

Definitions for test circuit:

R_L = Load resistance.

C_L = Load capacitance including jig and probe capacitance.

R_T = Termination resistance should be equal to the output impedance Z_0 of the pulse generator.

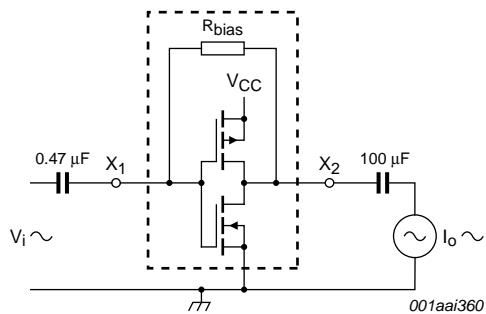
V_{EXT} = External voltage for measuring switching times.

Fig 9. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage | Load | R_L ^[1] | V_{EXT} |
|----------------|---------------------------------------|----------------------|-----------|
| 0.8 V to 3.6 V | C_L 5 pF, 10 pF, 15 pF and 30 pF | 5 kΩ or 1 MΩ | open |

[1] For measuring enable and disable times $R_L = 5 \text{ k}\Omega$, for measuring propagation delays, setup and hold times and pulse width $R_L = 1 \text{ M}\Omega$.

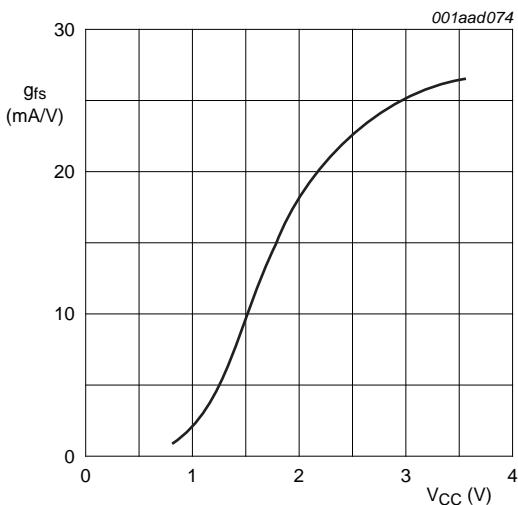


$$g_{fs} = \frac{\Delta I_O}{\Delta V_I}$$

$f_i = 1$ kHz.

V_O is constant.

Fig 10. Test set-up for measuring forward transconductance



T_{amb} = 25 °C.

Fig 11. Typical forward transconductance as a function of supply voltage

13. Application information

Crystal controlled oscillator circuits are widely used in clock pulse generators because of their excellent frequency stability and wide operating frequency range. The use of the 74AUP1Z04 provides the additional advantages of low power dissipation, stable operation over a wide range of frequency and temperature and a very small footprint. This application information describes crystal characteristics, design and testing of crystal oscillator circuits based on the 74AUP1Z04.

13.1 Crystal characteristics

[Figure 12](#) is the equivalent circuit of a quartz crystal.

The reactive and resistive component of the impedance of the crystal alone and the crystal with a series and a parallel capacitance is shown in [Figure 13](#).

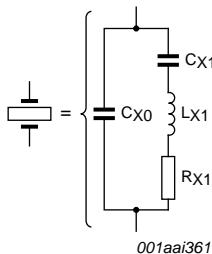
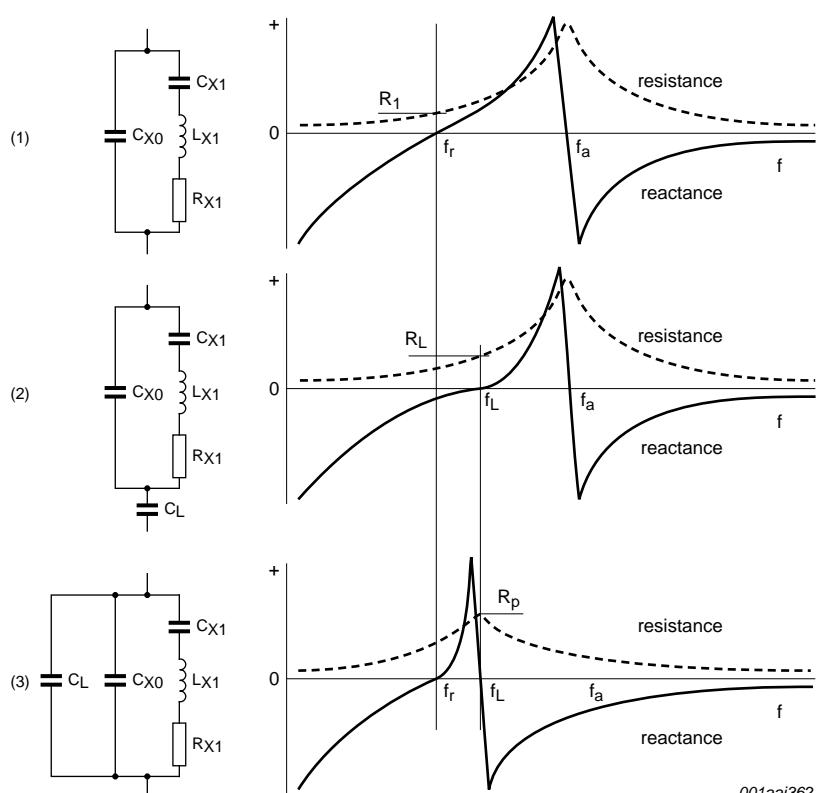


Fig 12. Equivalent circuit of a crystal



001aa1362

- (1) resonance
- (2) anti-resonance
- (3) load resonance

Fig 13. Reactance and resistance characteristics of a crystal

13.1.1 Design

[Figure 14](#) shows the recommended way to connect a crystal to the 74AUP1Z04. This circuit is basically a Pierce oscillator circuit in which the crystal is operating at its fundamental frequency and is tuned by the parallel load capacitance of C_1 and C_2 . C_1 and C_2 are in series with the crystal. They should be approximately equal. R_1 is the drive-limiting resistor and is set to approximately the same value as the reactance of C_1 at the crystal frequency ($R_1 = X_{C1}$). This will result in an input to the crystal of 50 % of the rail-to-rail output of X_2 . This keeps the drive level into the crystal within drive specifications (the designer should verify this). Overdriving the crystal can cause damage.

The internal bias resistor provides negative feedback and sets a bias point of the inverter near mid-supply, operating the 74AUP1GU04 portion in the high gain linear region.

To calculate the values of C_1 and C_2 , the designer can use the formula:

$$C_L = \frac{C_1 \times C_2}{C_1 + C_2} + C_s$$

C_L is the load capacitance as specified by the crystal manufacturer, C_s is the stray capacitance of the circuit (for the 74AUP1Z04 this is equal to an input capacitance of 1.5 pF).

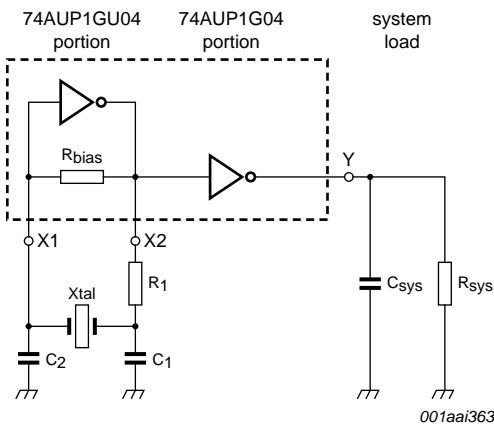


Fig 14. Crystal oscillator configuration for the 74AUP1Z04

13.1.2 Testing

After the calculations are performed for a particular crystal, the oscillator circuit should be tested. The following simple checks will verify the prototype design of a crystal controlled oscillator circuit. Perform them after laying out the board:

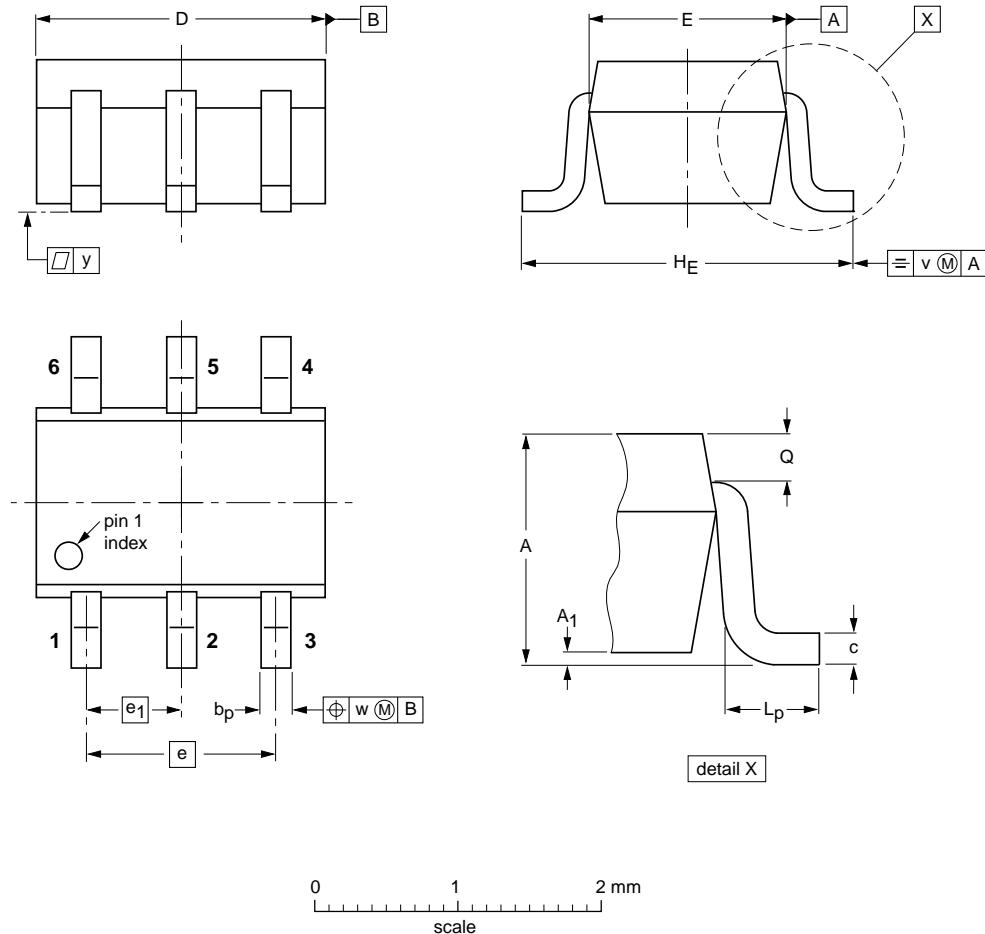
- Test the oscillator over worst-case conditions (lowest supply voltage, worst-case crystal and highest operating temperature). Adding series and parallel resistors can simulate a worst-case crystal.
- Insure that the circuit does not oscillate without the crystal.
- Check the frequency stability over a supply range greater than that which is likely to occur during normal operation.
- Check that the start-up time is within system requirements.

As the 74AUP1Z04 isolates the system loading, once the design is optimized, the single layout may work in multiple applications for any given crystal.

14. Package outline

Plastic surface-mounted package; 6 leads

SOT363



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A_1 max | b_p | c | D | E | e | e_1 | H_E | l_p | Q | v | w | y |
|------|------------|--------------|--------------|--------------|------------|--------------|-----|-------|------------|--------------|--------------|-----|-----|-----|
| mm | 1.1 0.8 | 0.1 | 0.30 0.20 | 0.25 0.10 | 2.2 1.8 | 1.35 1.15 | 1.3 | 0.65 | 2.2 2.0 | 0.45 0.15 | 0.25 0.15 | 0.2 | 0.2 | 0.1 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|--------------------|------------|-------|-------|--|------------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT363 | | | SC-88 | | | 04-11-08 06-03-16 |

Fig 15. 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

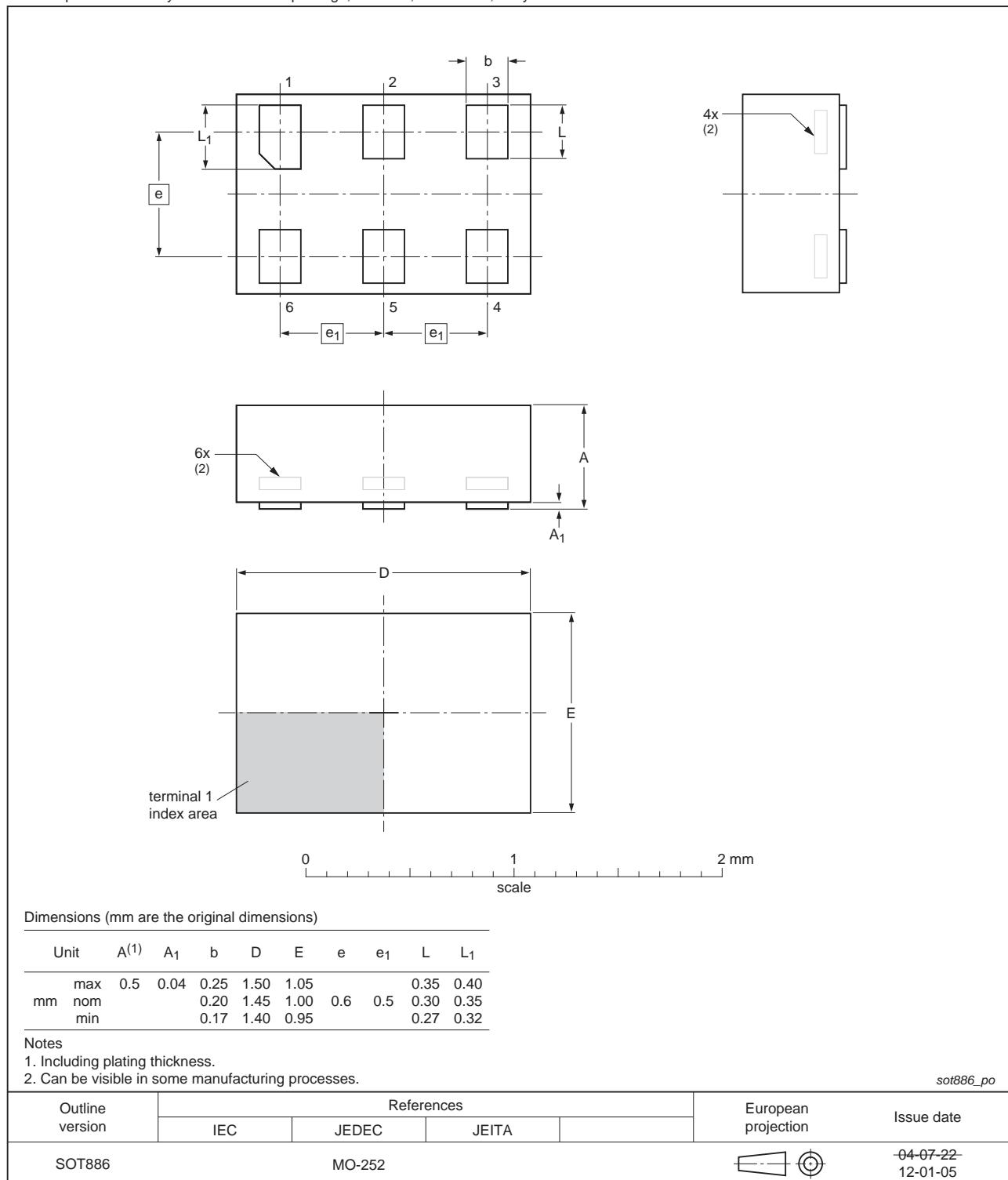
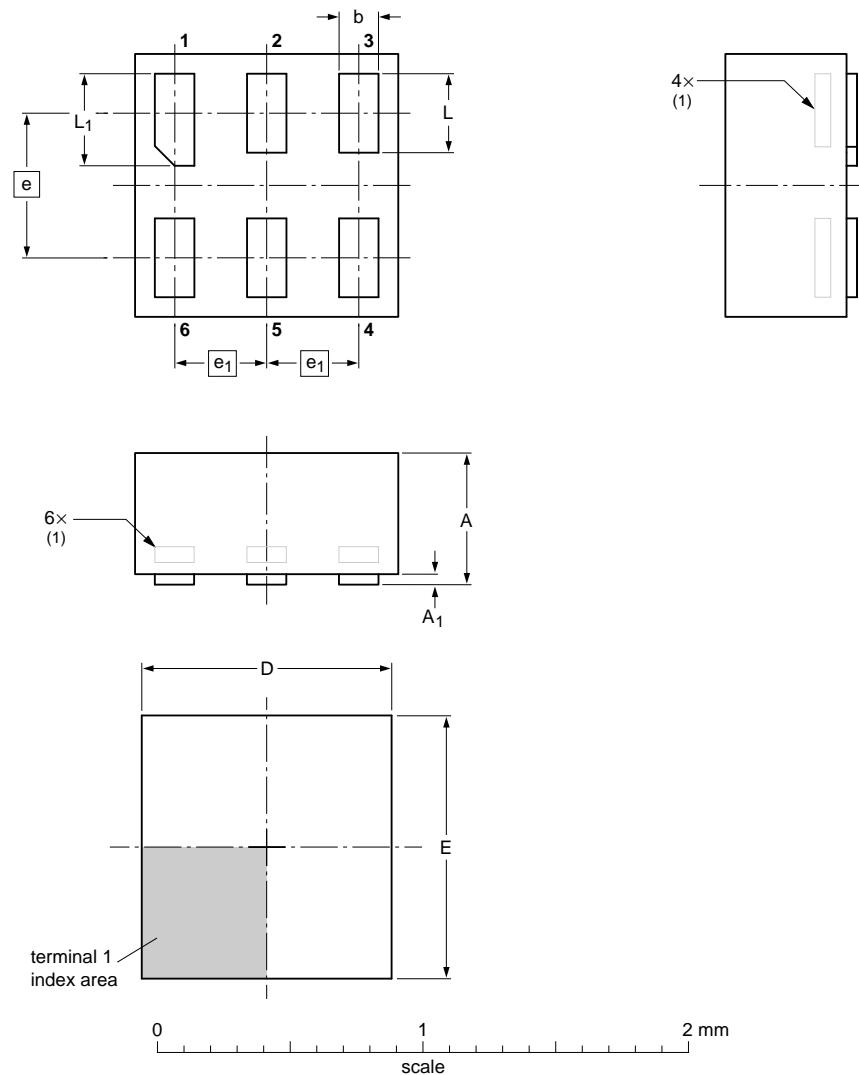


Fig 16. Package outline SOT886 (XSON6)

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 _{1max} | 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 |

Fig 17. 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

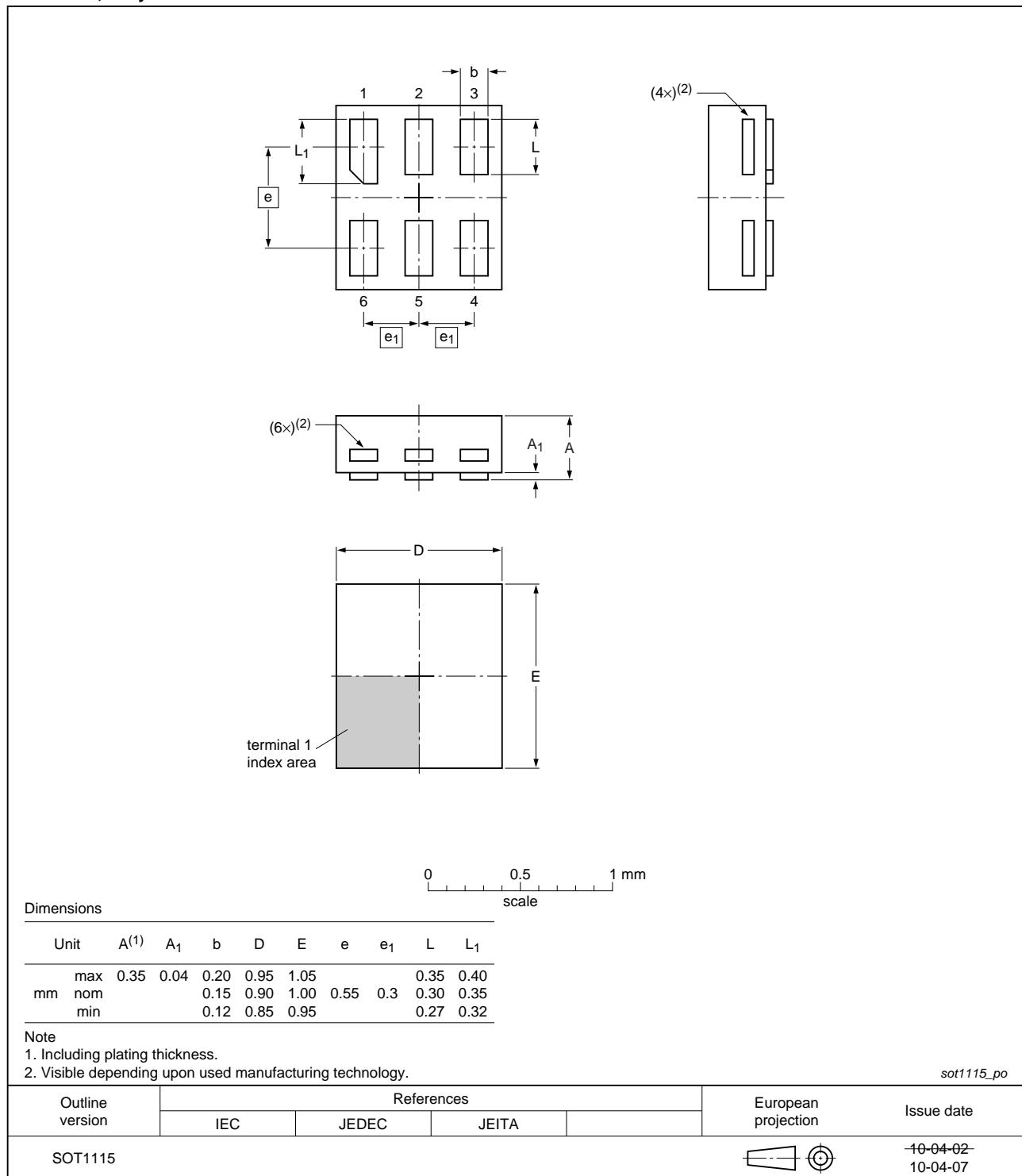


Fig 18. Package outline SOT1115 (XSON6)

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

SOT1202

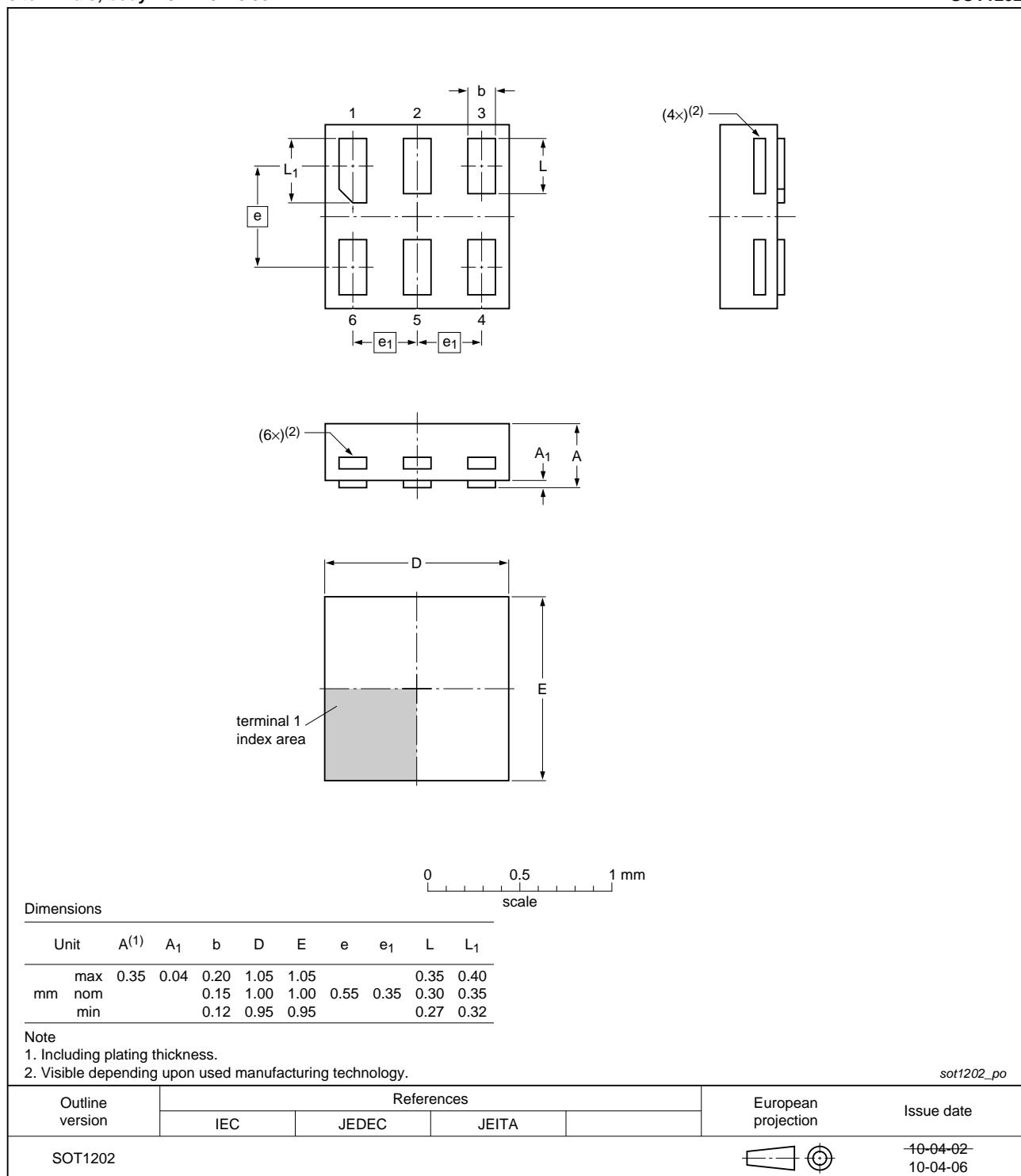


Fig 19. Package outline SOT1202 (XSON6)

15. Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|-------------------------|
| CDM | Charged Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |
| MM | Machine Model |

16. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|--------------------|---|---------------|
| 74AUP1Z04 v.5 | 20120809 | Product data sheet | - | 74AUP1Z04 v.4 |
| Modifications: | | | • Package outline drawing of SOT886 (Figure 16) modified. | |
| 74AUP1Z04 v.4 | 20111201 | Product data sheet | - | 74AUP1Z04 v.3 |
| Modifications: | | | • Legal pages updated. | |
| 74AUP1Z04 v.3 | 20100722 | Product data sheet | - | 74AUP1Z04 v.2 |
| 74AUP1Z04 v.2 | 20080703 | Product data sheet | - | 74AUP1Z04 v.1 |
| 74AUP1Z04 v.1 | 20061212 | Product data sheet | - | - |

17. Legal information

17.1 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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