

74AUP1G175

Low-power D-type flip-flop with reset; positive-edge trigger

Rev. 01 — 15 November 2006

Product data sheet

1. General description

The 74AUP1G175 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 74AUP1G175 is a single positive-edge triggered D-type flip-flop with individual data (D) input, clock (CP) input, master reset (\overline{MR}) input, and Q output. The master reset (\overline{MR}) is an asynchronous active LOW input and operates independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up time prior to the LOW-to-HIGH clock transition, for predictable operation.

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-D 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 $+125 \text{ }^\circ\text{C}$

3. Ordering information

Table 1. Ordering information

| Type number | Package | | | Version |
|--------------|-------------------|-------|--|---------|
| | Temperature range | Name | Description | |
| 74AUP1G175GW | -40 °C to +125 °C | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |
| 74AUP1G175GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |
| 74AUP1G175GF | -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 |
|--------------|--------------|
| 74AUP1G175GW | aT |
| 74AUP1G175GM | aT |
| 74AUP1G175GF | aT |

5. Functional diagram

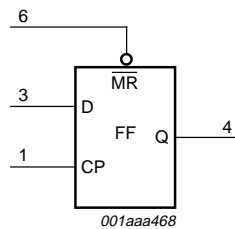


Fig 1. Logic symbol

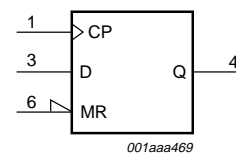


Fig 2. IEC logic symbol

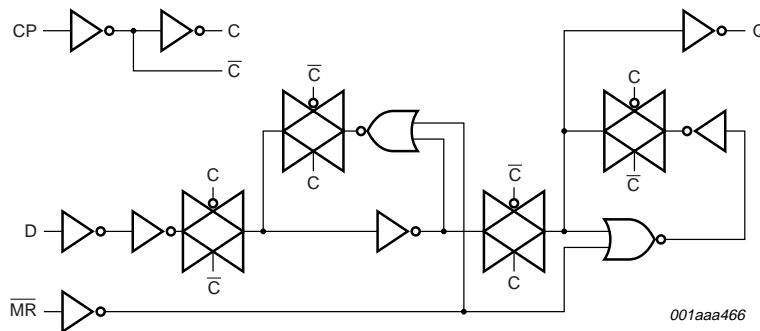
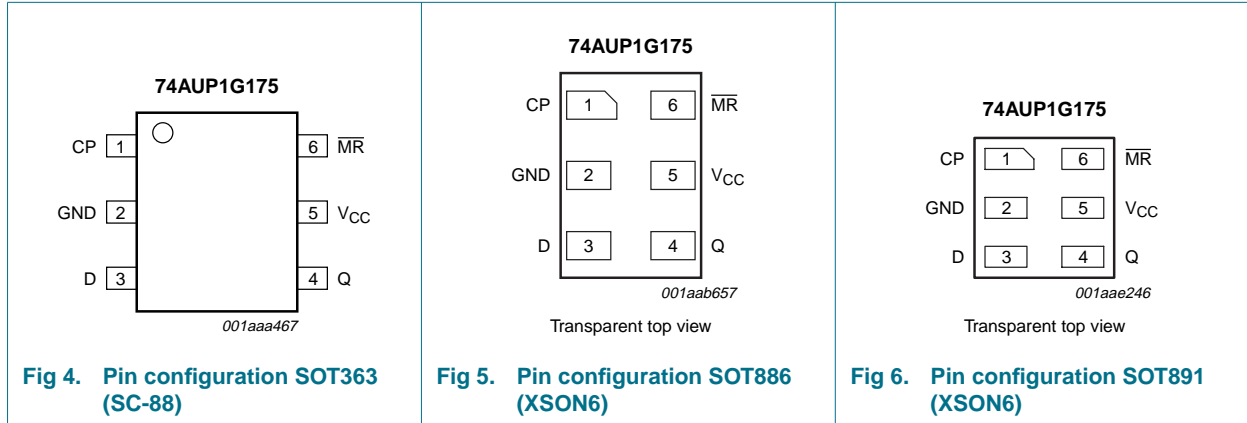


Fig 3. Logic diagram

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

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

7. Functional description

Table 4. Function table^[1]

| Operating mode | Input | | | Output |
|----------------|-------|----|---|--------|
| | MR | CP | D | Q |
| Reset (clear) | L | X | X | L |
| Load '1' | H | ↑ | h | H |
| Load '0' | H | ↑ | l | L |

[1] H = HIGH voltage level;
 h = HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition;
 L = LOW voltage level;
 l = LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition;
 ↑ = LOW-to-HIGH CP transition;
 X = don't care.

8. Limiting values

Table 5. Limiting values

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 | $V_O > V_{CC}$ or $V_O < 0$ 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 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-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 _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} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 0.5 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] | - | 40 | μA |
| C _I | input capacitance | V _{CC} = 0 V to 3.6 V; V _I = GND or V _{CC} | - | 0.8 | - | 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-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 _{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 _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.50 | V | |
| I _I | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.75 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V | - | - | ±0.75 | μA |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.75 | μA |
| I _{CC} | supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 1.4 | μA |
| ΔI _{CC} | additional supply current | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] | - | 75 | μA |

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

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

| Symbol | Parameter | Conditions | 25 °C | | | –40 °C to +125 °C | | | Unit |
|----------------------------------|-------------------|--|-------|--------------------|------|-------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| C_L = 5 pF | | | | | | | | | |
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 21.1 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 5.9 | 11.7 | 2.2 | 11.9 | 12.0 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.0 | 4.1 | 6.8 | 1.8 | 7.3 | 7.6 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.6 | 3.3 | 5.4 | 1.3 | 5.9 | 6.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.3 | 2.5 | 3.6 | 1.1 | 4.0 | 4.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.2 | 2.1 | 2.9 | 1.0 | 3.3 | 3.5 | ns |
| | | MR to Q; see Figure 8 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 17.4 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 5.2 | 9.7 | 2.2 | 10.0 | 12.0 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.3 | 3.8 | 4.9 | 2.1 | 6.4 | 6.6 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.8 | 3.1 | 4.9 | 1.7 | 5.4 | 5.6 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.8 | 2.6 | 3.6 | 1.5 | 4.0 | 4.0 | ns |
| V _{CC} = 3.0 V to 3.6 V | 1.6 | 2.4 | 3.1 | 1.3 | 3.3 | 3.6 | 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 | - | 200 | - | 170 | - | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 345 | - | 310 | - | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 435 | - | 400 | - | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 550 | - | 490 | - | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 615 | - | 550 | - | - | MHz |

Table 8. Dynamic characteristics ...continuedVoltages 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 | Max (85 °C) | Max (125 °C) | |
| C_L = 10 pF | | | | | | | | | |
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 24.7 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.6 | 6.8 | 13.3 | 2.4 | 13.6 | 13.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.3 | 4.8 | 7.9 | 2.0 | 8.4 | 8.7 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.1 | 3.9 | 6.1 | 1.8 | 6.6 | 6.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.7 | 3.0 | 4.3 | 1.5 | 4.7 | 5.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.6 | 2.7 | 3.6 | 1.3 | 4.0 | 4.2 | ns |
| | | MR to Q; see Figure 8 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 21.0 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.6 | 6.2 | 11.5 | 2.6 | 11.7 | 13.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.5 | 4.4 | 5.9 | 2.4 | 7.6 | 7.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.5 | 3.7 | 5.7 | 2.2 | 6.3 | 6.3 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.1 | 3.2 | 4.3 | 1.9 | 4.7 | 4.9 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | 3.0 | 3.9 | 1.8 | 4.1 | 4.3 | 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 | - | 190 | - | 150 | - | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 320 | - | 280 | - | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 420 | - | 310 | - | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 485 | - | 370 | - | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 550 | - | 410 | - | - | MHz |
| C_L = 15 pF | | | | | | | | | |
| t _{pd} | propagation delay | CP to Q; see Figure 7 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 28.1 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.0 | 7.6 | 14.8 | 2.8 | 15.2 | 15.4 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.7 | 5.3 | 8.7 | 2.3 | 9.4 | 9.9 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.3 | 4.4 | 6.8 | 2.1 | 7.4 | 7.9 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.1 | 3.5 | 5.0 | 1.9 | 5.3 | 5.6 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | 3.1 | 4.3 | 1.7 | 4.7 | 4.9 | ns |
| | | MR to Q; see Figure 8 ^[2] | | | | | | | |
| | | V _{CC} = 0.8 V | - | 24.6 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.1 | 7.0 | 13.2 | 2.9 | 13.5 | 15.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.1 | 5.0 | 6.7 | 2.6 | 8.6 | 9.1 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.6 | 4.3 | 6.5 | 2.5 | 7.2 | 7.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.6 | 3.7 | 5.0 | 2.2 | 5.4 | 5.5 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.4 | 3.5 | 4.4 | 2.1 | 4.8 | 5.0 | ns |

Table 8. Dynamic characteristics ...continuedVoltages 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 | Max (85 °C) | Max (125 °C) | |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 50 | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 180 | - | 120 | - | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 300 | - | 190 | - | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 405 | - | 240 | - | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 420 | - | 300 | - | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 480 | - | 320 | - | - | MHz |
| C_L = 30 pF | | | | | | | | | |
| t _{pd} | propagation delay | CP to Q; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 38.4 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.6 | 9.8 | 19.5 | 3.4 | 20.6 | 21.0 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.3 | 6.9 | 11.2 | 3.2 | 12.4 | 13.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.1 | 5.7 | 8.8 | 2.9 | 9.6 | 10.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.0 | 4.6 | 6.4 | 2.6 | 6.9 | 7.3 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.8 | 4.2 | 5.7 | 2.5 | 6.5 | 6.9 | ns |
| | | M \bar{R} to Q; see Figure 8 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 35.1 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.9 | 9.3 | 18.0 | 3.7 | 18.6 | 19.8 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.9 | 6.6 | 8.7 | 3.6 | 11.6 | 12.2 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.6 | 5.6 | 8.6 | 3.4 | 9.6 | 9.7 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.5 | 4.8 | 6.4 | 2.9 | 7.2 | 7.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 3.3 | 4.6 | 5.7 | 3.1 | 6.4 | 6.9 | ns |
| f _{max} | maximum frequency | CP; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 35 | - | - | - | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 130 | - | 70 | - | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 200 | - | 120 | - | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 240 | - | 150 | - | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 275 | - | 190 | - | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 300 | - | 200 | - | - | MHz |

Table 8. Dynamic characteristics ...continuedVoltages 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 | Max (85 °C) | Max (125 °C) | |
| C_L = 5 pF, 10 pF, 15 pF and 30 pF | | | | | | | | | |
| t _w | pulse width | CP; HIGH or LOW; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 5.25 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.6 | - | 1.5 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.0 | - | 0.9 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.75 | - | 0.7 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.6 | - | 0.4 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.55 | - | 0.4 | - | - | ns |
| | | MR; LOW; see Figure 8 | | | | | | | |
| | | V _{CC} = 0.8 V | - | 9.0 | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 3.0 | - | 4.9 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.75 | - | 2.5 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 1.35 | - | 1.8 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.9 | - | 1.1 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.8 | - | 0.8 | - | - | ns |
| t _{rec} | recovery time | MR; see Figure 8 | | | | | | | |
| | | V _{CC} = 0.8 V | - | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | -1.1 | - | -1.2 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | -2.0 | - | -0.8 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | -0.5 | - | -0.7 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | -0.9 | - | -0.4 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | -1.0 | - | -0.2 | - | - | ns |
| t _{su(H)} | setup time HIGH | D to CP; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.5 | - | 1.2 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.4 | - | 0.8 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.5 | - | 0.6 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.3 | - | 0.5 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.2 | - | 0.5 | - | - | ns |
| t _{su(L)} | setup time LOW | D to CP; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.8 | - | 1.7 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.6 | - | 1.1 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.4 | - | 0.9 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.4 | - | 0.9 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.5 | - | 0.9 | - | - | ns |

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

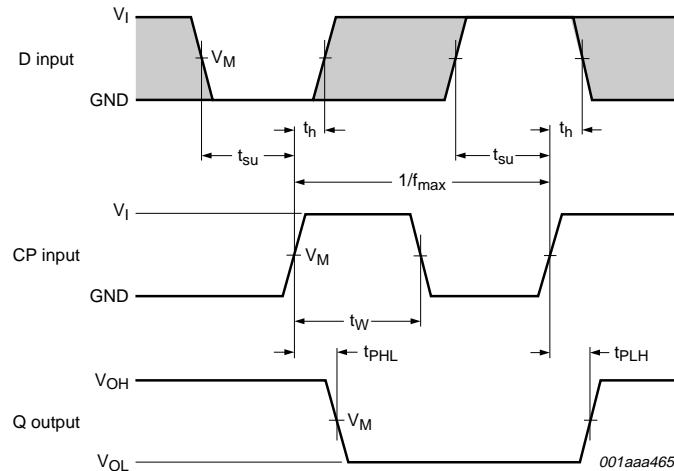
| Symbol | Parameter | Conditions | 25 °C | | | -40 °C to +125 °C | | | Unit |
|-----------------|-------------------------------|--|-------|--------------------|-----|-------------------|-------------|--------------|------|
| | | | Min | Typ ^[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| t _h | hold time | D to CP; see Figure 7 | | | | | | | |
| | | V _{CC} = 0.8 V | - | - | - | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | -0.7 | - | 0.2 | - | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | -0.5 | - | 0 | - | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | -0.5 | - | 0 | - | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | -0.3 | - | 0 | - | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | -0.4 | - | 0 | - | - | ns |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; [3] V _I = GND to V _{CC} | | | | | | | |
| | | V _{CC} = 0.8 V | - | 1.8 | - | - | - | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 1.9 | - | - | - | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.9 | - | - | - | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 2.0 | - | - | - | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 2.3 | - | - | - | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 2.7 | - | - | - | - | pF |

[1] All typical values are measured at nominal V_{CC}.[2] t_{pd} is the same as t_{PLH} and t_{PHL}.[3] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).P_D = C_{PD} × V_{CC}² × f_i × N + Σ(C_L × V_{CC}² × 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.

12. Waveforms

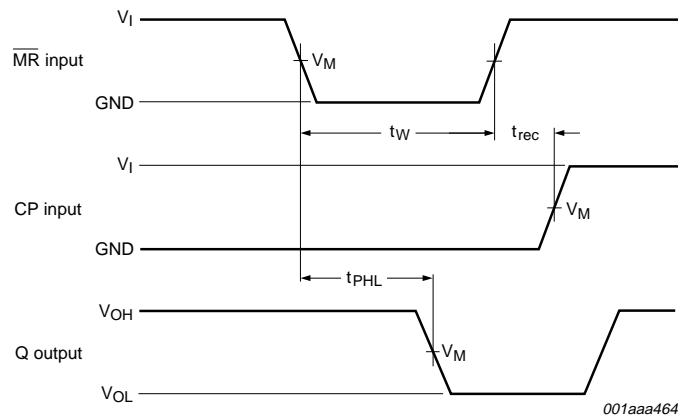


Measurement points are given in [Table 9](#).

The shaded areas indicate when the input is permitted to change for predictable output performance.

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

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



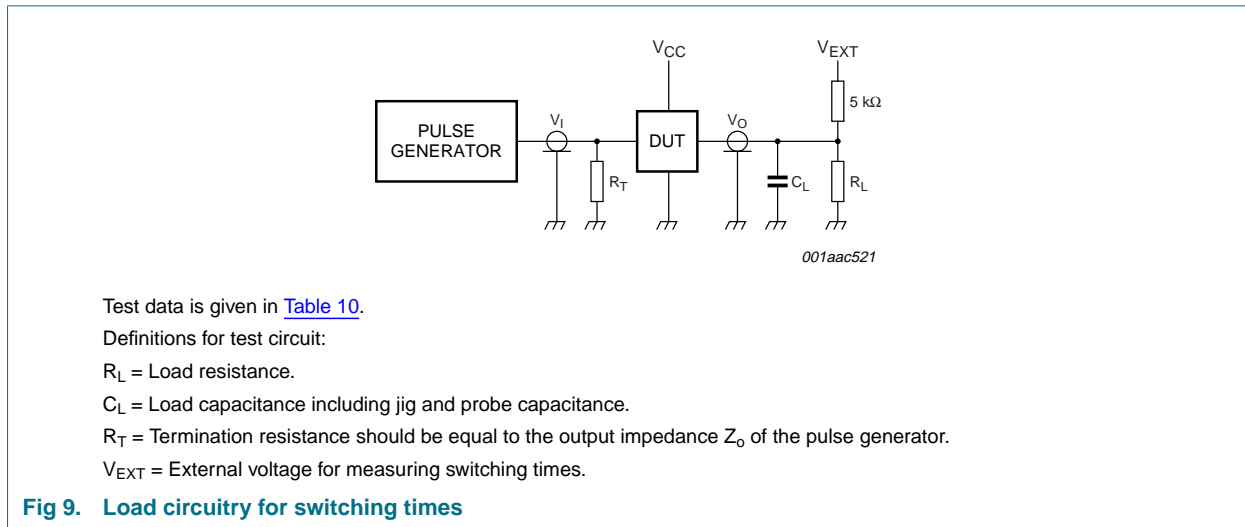
Measurement points are given in [Table 9](#).

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

Fig 8. The master reset (\overline{MR}) input to output (Q) propagation delays, the master reset pulse width and the \overline{MR} to CP recovery time

Table 9. Measurement points

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

**Table 10. Test data**

| Supply voltage | Load | | V_{EXT} | | |
|----------------|------------------------------|--------------|-----------------------|-----------------------|-----------------------|
| V_{CC} | C_L | R_L [1] | t_{PLH} , t_{PHL} | t_{PZH} , t_{PHZ} | t_{PZL} , t_{PLZ} |
| 0.8 V to 3.6 V | 5 pF, 10 pF, 15 pF and 30 pF | 5 kΩ or 1 MΩ | open | GND | $2 \times V_{CC}$ |

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

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

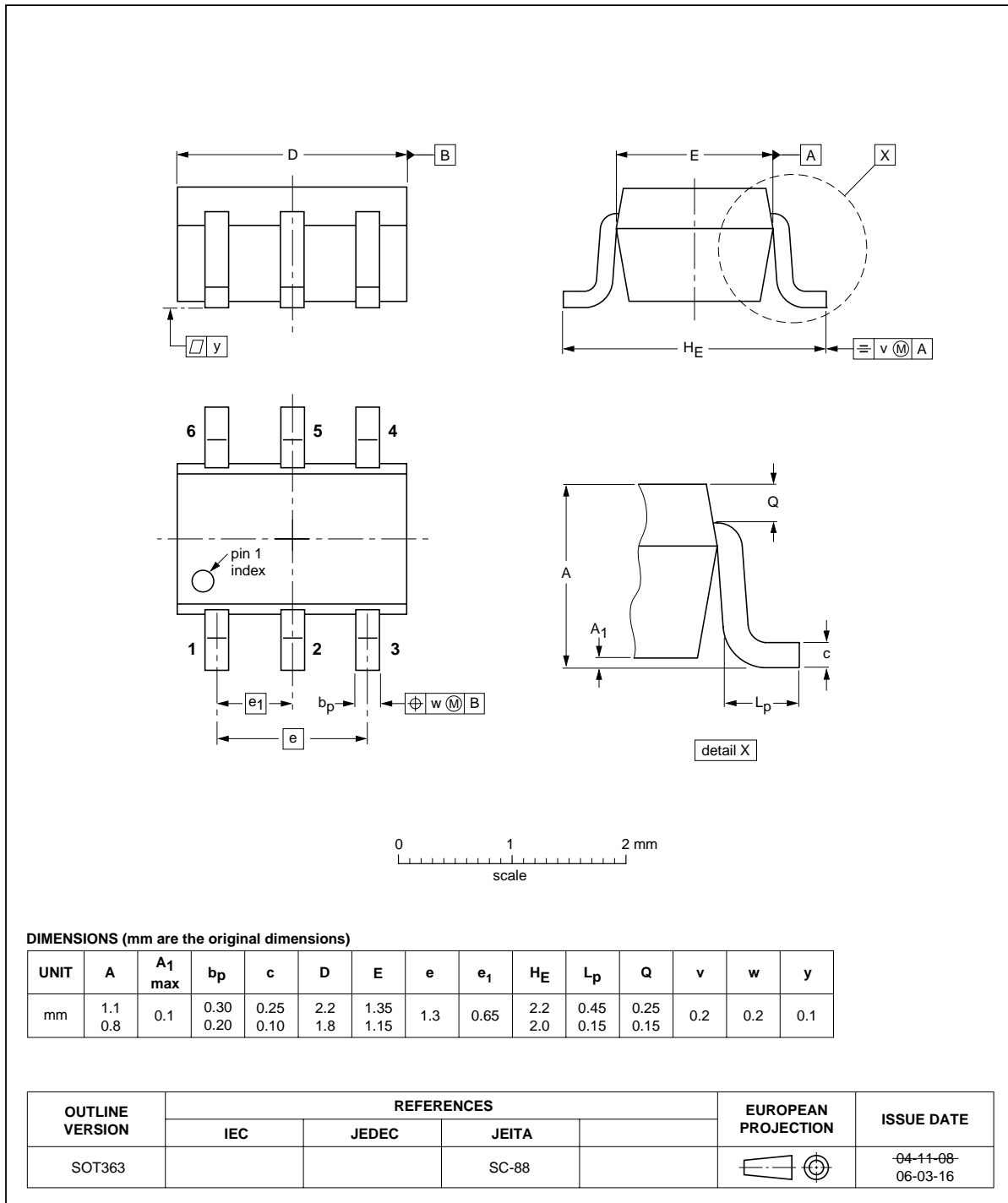


Fig 10. Package outline SOT363 (SC-88)

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

SOT886

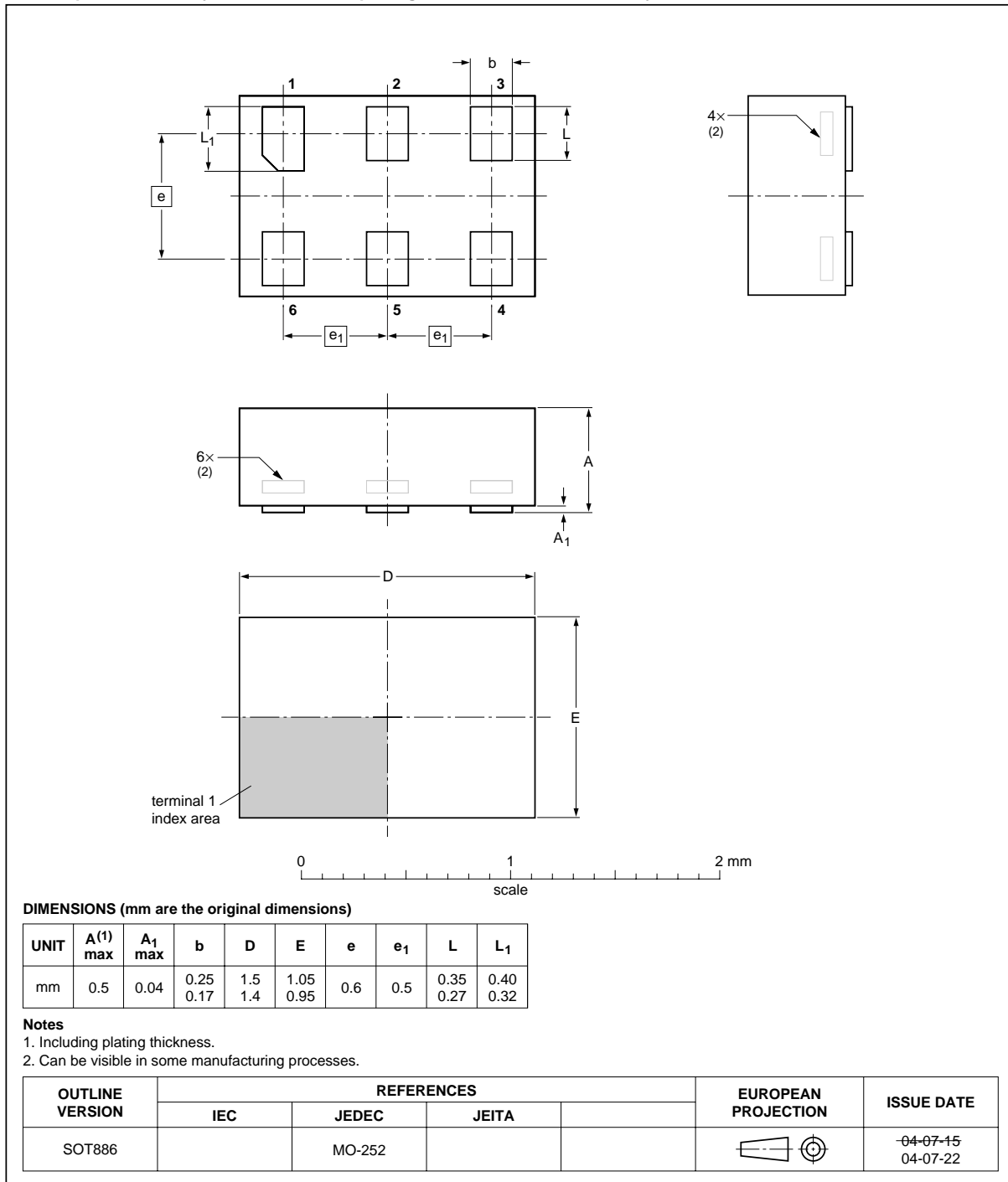


Fig 11. Package outline SOT886 (XSON6)

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

SOT891

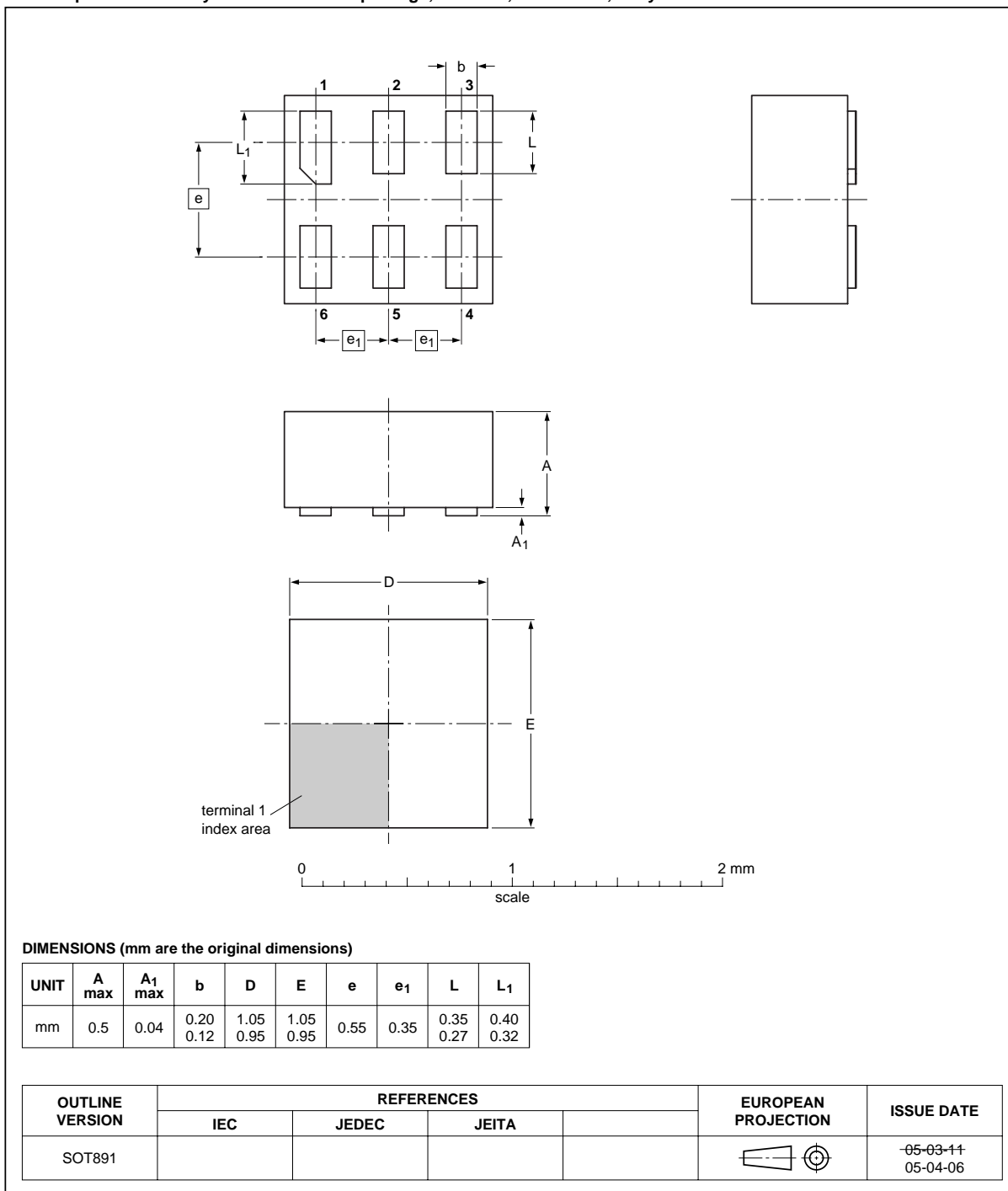


Fig 12. Package outline SOT891 (XSON6)

14. Abbreviations

Table 11. 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 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| 74AUP1G175_1 | 20061115 | 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>.

16.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

16.3 Disclaimers

General — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or

malfunction of a NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

Terms and conditions of sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

16.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

17. Contact information

For additional information, please visit: <http://www.nxp.com>

For sales office addresses, send an email to: salesaddresses@nxp.com

18. Contents

| | | |
|------|--|----|
| 1 | General description | 1 |
| 2 | Features | 1 |
| 3 | Ordering information | 2 |
| 4 | Marking | 2 |
| 5 | Functional diagram | 2 |
| 6 | Pinning information | 3 |
| 6.1 | Pinning | 3 |
| 6.2 | Pin description | 3 |
| 7 | Functional description | 3 |
| 8 | Limiting values | 4 |
| 9 | Recommended operating conditions | 4 |
| 10 | Static characteristics | 5 |
| 11 | Dynamic characteristics | 8 |
| 12 | Waveforms | 13 |
| 13 | Package outline | 15 |
| 14 | Abbreviations | 18 |
| 15 | Revision history | 18 |
| 16 | Legal information | 19 |
| 16.1 | Data sheet status | 19 |
| 16.2 | Definitions | 19 |
| 16.3 | Disclaimers | 19 |
| 16.4 | Trademarks | 19 |
| 17 | Contact information | 19 |
| 18 | Contents | 20 |



Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2006.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 15 November 2006

Document identifier: 74AUP1G175_1

www.DataSheet4U.com