

74AUP1G79

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

Rev. 01 — 12 September 2005

Product data sheet

1. General description

The 74AUP1G79 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 74AUP1G79 provides the single positive-edge triggered D-type flip-flop. 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-C exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101-C exceeds 1000 V
- Low static power consumption; $I_{CC} = 0.9 \mu\text{A}$ (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- I_{OFF} circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

PHILIPS

3. Quick reference data

Table 1: Quick reference data
 $GND = 0\text{ V}$; $T_{amb} = 25\text{ °C}$; $t_r = t_f \leq 3\text{ ns}$.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|----------------------------------|---|-----|------|------|------|
| t_{PHL} , t_{PLH} | propagation delay CP to Q | $C_L = 5\text{ pF}$; $R_L = 1\text{ M}\Omega$ | | | | |
| | | $V_{CC} = 0.8\text{ V}$ | - | 19.7 | - | ns |
| | | $V_{CC} = 1.1\text{ V to }1.3\text{ V}$ | 2.6 | 5.5 | 11.0 | ns |
| | | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$ | 2.0 | 3.8 | 7.0 | ns |
| | | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$ | 1.7 | 3.1 | 5.4 | ns |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.4 | 2.3 | 4.0 | ns |
| | | $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | 1.2 | 2.0 | 3.4 | ns |
| $f_{clk(max)}$ | maximum clock frequency | $C_L = 30\text{ pF}$; $V_{CC} = 3.0\text{ V to }3.6\text{ V}$ | - | 309 | - | MHz |
| C_i | input capacitance | | - | 0.8 | - | pF |
| C_{PD} | power dissipation capacitance | $f = 10\text{ MHz}$; $V_I = GND\text{ to }V_{CC}$ | | | | |
| | | $V_{CC} = 1.8\text{ V}$ | - | 2.3 | - | pF |
| | | $V_{CC} = 3.3\text{ V}$ | - | 3.0 | - | pF |

[1] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$
 where:

 f_i = input frequency in MHz;

 f_o = output frequency in MHz;

 C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

 N = number of inputs switching;

 $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

4. Ordering information

Table 2: Ordering information

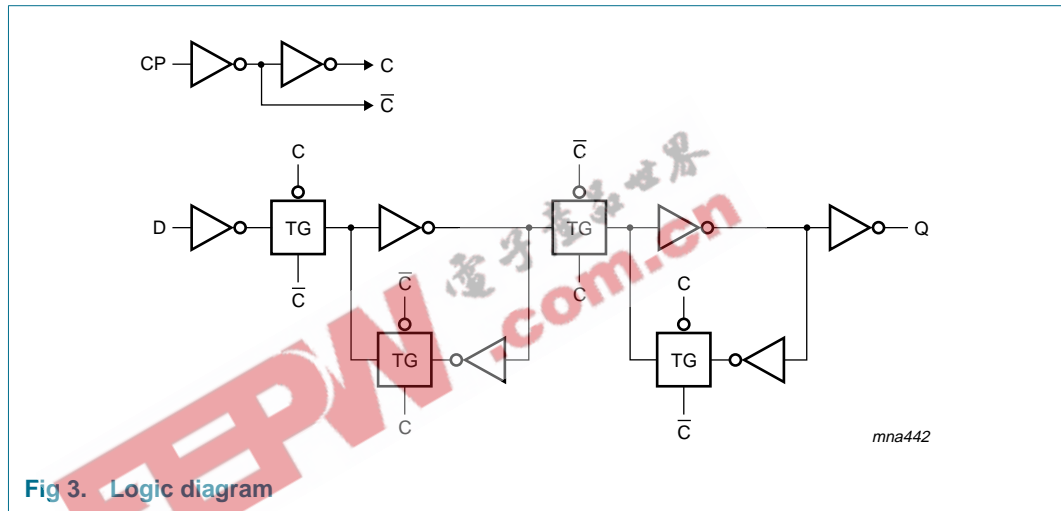
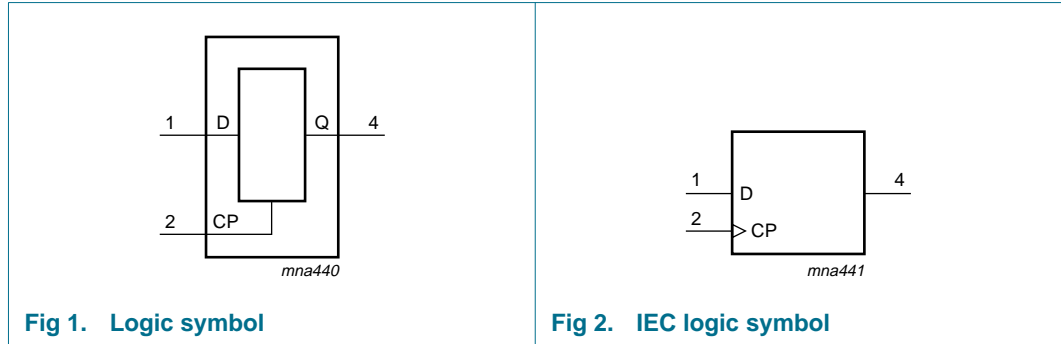
| Type number | Package | | | Version |
|-------------|-------------------|--------|---|----------|
| | Temperature range | Name | Description | |
| 74AUP1G79GW | -40 °C to +125 °C | TSSOP5 | plastic thin shrink small outline package; 5 leads; body width 1.25 mm | SOT353-1 |
| 74AUP1G79GM | -40 °C to +125 °C | XSON6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886 |

5. Marking

Table 3: Marking

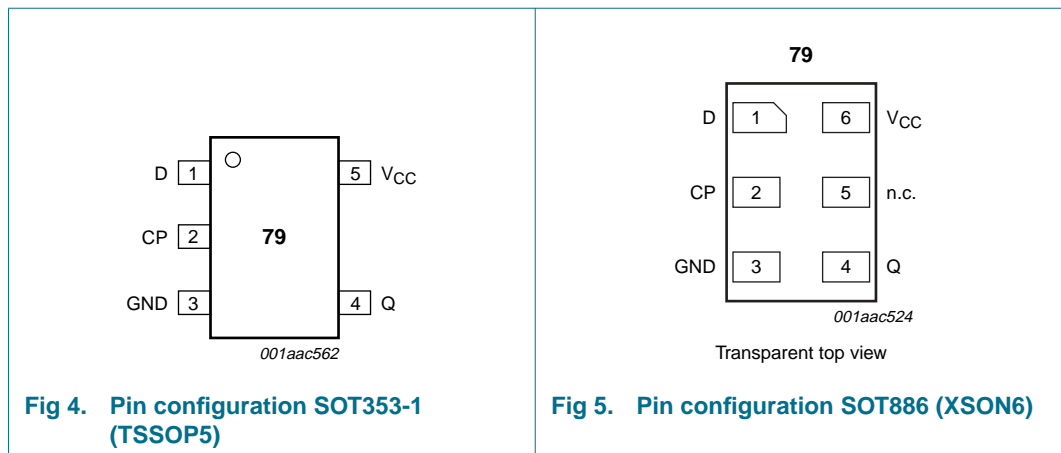
| Type number | Marking code |
|-------------|--------------|
| 74AUP1G79GW | pP |
| 74AUP1G79GM | pP |

6. Functional diagram



7. Pinning information

7.1 Pinning



7.2 Pin description

Table 4: Pin description

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

8. Functional description

8.1 Function table

Table 5: Function table [\[1\]](#)

| Input | | Output |
|-------|---|--------|
| CP | D | Q |
| ↑ | L | L |
| ↑ | H | H |
| L | X | q |

- [1] H = HIGH voltage level;
 L = LOW voltage level;
 ↑ = LOW-to-HIGH CP transition;
 X = don't care;
 q = lower case letter indicates the state of referenced input, one set-up time prior to the LOW-to-HIGH CP transition.

9. Limiting values

Table 6: 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 > V _{CC} or V _O < 0 V | - | ±50 | mA |
| V _O | output voltage | active mode | [1] -0.5 | V _{CC} + 0.5 | V |
| | | Power-down mode | [1] -0.5 | +4.6 | V |
| I _O | output current | V _O = 0 V to V _{CC} | - | ±20 | mA |
| I _{CC} | quiescent supply current | | - | +50 | mA |

Table 6: Limiting values ...continued

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|-------------------------|---|-----|------|------|
| I_{GND} | ground current | | - | -50 | mA |
| T_{stg} | storage temperature | | -65 | +150 | °C |
| P_{tot} | total power dissipation | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ [2] | - | 250 | mW |

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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

For XSON6 packages: above 45 °C the value of P_{tot} derates linearly with 2.4 mW/K.

10. Recommended operating conditions

Table 7: 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; $V_{CC} = 0\text{ V}$ | 0 | 3.6 | V |
| T_{amb} | ambient temperature | | -40 | +125 | °C |
| t_r, t_f | input rise and fall times | $V_{CC} = 0.8\text{ V to }3.6\text{ V}$ | 0 | 200 | ns/V |

11. Static characteristics

Table 8: Static characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--|--------------------------|--|----------------------|-----|----------------------|------|
| $T_{amb} = 25\text{ °C}$ | | | | | | |
| V_{IH} | HIGH-state input voltage | $V_{CC} = 0.8\text{ V}$ | $0.70 \times V_{CC}$ | - | - | 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-state input voltage | $V_{CC} = 0.8\text{ V}$ | - | - | $0.30 \times V_{CC}$ | 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 |

Table 8: 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-state output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.1 | - | - | V |
| | | I _O = -1.1 mA; V _{CC} = 1.1 V | 0.75 × V _{CC} | - | - | V |
| | | I _O = -1.7 mA; V _{CC} = 1.4 V | 1.11 | - | - | V |
| | | I _O = -1.9 mA; V _{CC} = 1.65 V | 1.32 | - | - | V |
| | | I _O = -2.3 mA; V _{CC} = 2.3 V | 2.05 | - | - | V |
| | | I _O = -3.1 mA; V _{CC} = 2.3 V | 1.9 | - | - | V |
| | | I _O = -2.7 mA; V _{CC} = 3.0 V | 2.72 | - | - | V |
| V _{OL} | LOW-state output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | I _O = 1.1 mA; V _{CC} = 1.1 V | - | - | 0.3 × V _{CC} | V |
| | | I _O = 1.7 mA; V _{CC} = 1.4 V | - | - | 0.31 | V |
| | | I _O = 1.9 mA; V _{CC} = 1.65 V | - | - | 0.31 | V |
| | | I _O = 2.3 mA; V _{CC} = 2.3 V | - | - | 0.31 | V |
| | | I _O = 3.1 mA; V _{CC} = 2.3 V | - | - | 0.44 | V |
| | | I _O = 2.7 mA; V _{CC} = 3.0 V | - | - | 0.31 | V |
| I _{LI} | 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 | - | - |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.2 | μA |
| I _{CC} | quiescent supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 0.5 | μA |
| ΔI _{CC} | additional quiescent supply current (per pin) | 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 |
| T_{amb} = -40 °C to +85 °C | | | | | | |
| V _{IH} | HIGH-state input voltage | V _{CC} = 0.8 V | 0.70 × V _{CC} | - | - | V |
| | | V _{CC} = 0.9 V to 1.95 V | 0.65 × V _{CC} | - | - | V |
| | | V _{CC} = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | - | - | V |
| V _{IL} | LOW-state input voltage | V _{CC} = 0.8 V | - | - | 0.30 × V _{CC} | V |
| | | V _{CC} = 0.9 V to 1.95 V | - | - | 0.35 × V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | V _{CC} = 3.0 V to 3.6 V | - | - | 0.9 | V |

Table 8: 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-state output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.1 | - | - | V |
| | | I _O = -1.1 mA; V _{CC} = 1.1 V | 0.7 × V _{CC} | - | - | V |
| | | I _O = -1.7 mA; V _{CC} = 1.4 V | 1.03 | - | - | V |
| | | I _O = -1.9 mA; V _{CC} = 1.65 V | 1.30 | - | - | V |
| | | I _O = -2.3 mA; V _{CC} = 2.3 V | 1.97 | - | - | V |
| | | I _O = -3.1 mA; V _{CC} = 2.3 V | 1.85 | - | - | V |
| | | I _O = -2.7 mA; V _{CC} = 3.0 V | 2.67 | - | - | V |
| I _O = -4.0 mA; V _{CC} = 3.0 V | 2.55 | - | - | V | | |
| V _{OL} | LOW-state output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = 20 μA; V _{CC} = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | I _O = 1.1 mA; V _{CC} = 1.1 V | - | - | 0.3 × V _{CC} | V |
| | | I _O = 1.7 mA; V _{CC} = 1.4 V | - | - | 0.37 | V |
| | | I _O = 1.9 mA; V _{CC} = 1.65 V | - | - | 0.35 | V |
| | | I _O = 2.3 mA; V _{CC} = 2.3 V | - | - | 0.33 | V |
| | | I _O = 3.1 mA; V _{CC} = 2.3 V | - | - | 0.45 | V |
| | | I _O = 2.7 mA; V _{CC} = 3.0 V | - | - | 0.33 | V |
| I _O = 4.0 mA; V _{CC} = 3.0 V | - | - | 0.45 | V | | |
| I _{LI} | input leakage current | V _I = GND to 3.6 V; V _{CC} = 0 V to 3.6 V | - | - | ±0.5 | μA |
| I _{OFF} | power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V | - | - | ±0.5 | μA |
| ΔI _{OFF} | additional power-off leakage current | V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V | - | - | ±0.6 | μA |
| I _{CC} | quiescent supply current | V _I = GND or V _{CC} ; I _O = 0 A; V _{CC} = 0.8 V to 3.6 V | - | - | 0.9 | μA |
| ΔI _{CC} | additional quiescent supply current (per pin) | V _I = V _{CC} - 0.6 V; I _O = 0 A; V _{CC} = 3.3 V | [1] | - | 50 | μA |
| T_{amb} = -40 °C to +125 °C | | | | | | |
| V _{IH} | HIGH-state 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-state 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 |

Table 8: 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-state output voltage | V _I = V _{IH} or V _{IL} | | | | |
| | | I _O = -20 μA; V _{CC} = 0.8 V to 3.6 V | V _{CC} - 0.11 | - | - | 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-state 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 _{LI} | 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 | - | - |
| 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} | quiescent 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 quiescent supply current (per pin) | 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.

12. Dynamic characteristics

Table 9: Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | Min | Typ [1] | Max | Unit |
|--|---------------------------|------------------------------------|-----|---------|------|------|
| T_{amb} = 25 °C; C_L = 5 pF | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 19.7 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.6 | 5.5 | 11.0 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.0 | 3.8 | 7.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.7 | 3.1 | 5.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.4 | 2.3 | 4.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.2 | 2.0 | 3.4 | ns |

Table 9: Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | Min | Typ ^[1] | Max | Unit |
|---|---------------------------|------------------------------------|-----|--------------------|------|------|
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 53 | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 203 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 347 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 435 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 550 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 619 | - | MHz |
| T_{amb} = 25 °C; C_L = 10 pF | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 23.1 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.1 | 6.3 | 12.3 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.5 | 4.4 | 8.1 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.1 | 3.6 | 6.3 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.8 | 2.8 | 4.7 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.7 | 2.5 | 4.1 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 52 | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 192 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 324 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 421 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 486 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 550 | - | MHz |
| T_{amb} = 25 °C; C_L = 15 pF | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 26.6 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 3.5 | 7.1 | 13.6 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.8 | 5.0 | 9.2 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.4 | 4.1 | 7.1 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 2.2 | 3.2 | 5.4 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.0 | 2.9 | 4.5 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 50 | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 181 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 301 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 407 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 422 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 481 | - | MHz |

Table 9: Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | Min | Typ ^[1] | Max | Unit |
|---|---------------------------|------------------------------------|-----|--------------------|------|------|
| T_{amb} = 25 °C; C_L = 30 pF | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 36.8 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 4.7 | 9.3 | 17.3 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 3.8 | 6.4 | 11.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 3.3 | 5.3 | 9.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 3.0 | 4.3 | 7.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 2.8 | 3.9 | 5.8 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 28 | - | MHz |
| | | V _{CC} = 1.1 V to 1.3 V | - | 128 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | - | 206 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | - | 262 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | - | 269 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | - | 309 | - | MHz |
| T_{amb} = 25 °C | | | | | | |
| t _{su(H)} | set-up time HIGH D to CP | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 3.4 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.8 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.5 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.5 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.4 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.4 | - | ns |
| t _{su(L)} | set-up time LOW D to CP | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | 3.0 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 0.9 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 0.6 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.5 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.5 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.7 | - | ns |
| t _h | hold time D to CP | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | -1.9 | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | -0.6 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | -0.4 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | -0.4 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | -0.4 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | -0.3 | - | ns |

Table 9: Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | Min | Typ ^[1] | Max | Unit |
|-----------------|-------------------------------|------------------------------------|-----|--------------------|-----|------|
| t _W | CP pulse width HIGH or LOW | see Figure 6 | | | | |
| | | V _{CC} = 0.8 V | - | - | - | ns |
| | | V _{CC} = 1.1 V to 1.3 V | - | 2.4 | - | ns |
| | | V _{CC} = 1.4 V to 1.6 V | - | 1.3 | - | ns |
| | | V _{CC} = 1.65 V to 1.95 V | - | 0.9 | - | ns |
| | | V _{CC} = 2.3 V to 2.7 V | - | 0.7 | - | ns |
| | | V _{CC} = 3.0 V to 3.6 V | - | 0.6 | - | ns |
| C _{PD} | power dissipation capacitance | f = 10 MHz ^{[2] [3]} | | | | |
| | | V _{CC} = 0.8 V | - | 2.2 | - | pF |
| | | V _{CC} = 1.1 V to 1.3 V | - | 2.2 | - | pF |
| | | V _{CC} = 1.4 V to 1.6 V | - | 2.2 | - | pF |
| | | V _{CC} = 1.65 V to 1.95 V | - | 2.3 | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 2.6 | - | pF |
| | | V _{CC} = 3.0 V to 3.6 V | - | 3.0 | - | pF |

[1] All typical values are measured at nominal V_{CC}.[2] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).P_D = C_{PD} × 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.[3] The condition is V_I = GND to V_{CC}.

Table 10: Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | −40 °C to +85 °C | | −40 °C to +125 °C | | Unit |
|-------------------------------------|------------------------------|------------------------------------|------------------|------|-------------------|------|------|
| | | | Min | Max | Min | Max | |
| C_L = 5 pF | | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 2.4 | 12.9 | 2.4 | 14.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.8 | 8.1 | 1.8 | 9.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 6.4 | 1.5 | 7.1 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.1 | 4.7 | 1.1 | 5.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 0.9 | 4.0 | 0.9 | 4.4 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 170 | - | 170 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | 310 | - | 300 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | 400 | - | 390 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | 490 | - | 480 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | 550 | - | 510 | - | MHz |
| C_L = 10 pF | | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 2.8 | 14.4 | 2.8 | 15.9 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.2 | 9.5 | 2.2 | 10.5 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.9 | 7.5 | 1.9 | 8.3 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.5 | 5.6 | 1.5 | 6.2 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.3 | 4.5 | 1.3 | 5.0 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 150 | - | 150 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | 280 | - | 230 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | 310 | - | 250 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | 370 | - | 360 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | 410 | - | 360 | - | MHz |
| C_L = 15 pF | | | | | | | |
| t _{PHL} , t _{PLH} | propagation delay CP to Q | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 3.2 | 15.6 | 3.2 | 17.2 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 2.5 | 10.7 | 2.5 | 11.8 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 2.2 | 8.5 | 2.2 | 9.4 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.9 | 6.3 | 1.9 | 7.0 | ns |
| | | V _{CC} = 3.0 V to 3.6 V | 1.6 | 5.0 | 1.6 | 5.5 | ns |
| f _{clk(max)} | maximum clock frequency | see Figure 6 | | | | | |
| | | V _{CC} = 1.1 V to 1.3 V | 120 | - | 120 | - | MHz |
| | | V _{CC} = 1.4 V to 1.6 V | 190 | - | 160 | - | MHz |
| | | V _{CC} = 1.65 V to 1.95 V | 240 | - | 190 | - | MHz |
| | | V _{CC} = 2.3 V to 2.7 V | 300 | - | 270 | - | MHz |
| | | V _{CC} = 3.0 V to 3.6 V | 320 | - | 300 | - | MHz |

Table 10: Dynamic characteristics ...continuedVoltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#)

| Symbol | Parameter | Conditions | -40 °C to +85 °C | | -40 °C to +125 °C | | Unit |
|--|-------------------------------|------------------------------|------------------|------|-------------------|------|------|
| | | | Min | Max | Min | Max | |
| $C_L = 30$ pF | | | | | | | |
| t_{PHL} , t_{PLH} | propagation delay CP to Q | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 4.2 | 23.3 | 4.2 | 25.6 | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 3.3 | 14.3 | 3.3 | 15.7 | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 3.0 | 11.3 | 3.0 | 12.4 | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 2.7 | 8.5 | 2.7 | 9.4 | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 2.6 | 7.2 | 2.6 | 7.9 | ns |
| $f_{clk(max)}$ | maximum clock frequency | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 70 | - | 70 | - | MHz |
| | | $V_{CC} = 1.4$ V to 1.6 V | 120 | - | 110 | - | MHz |
| | | $V_{CC} = 1.65$ V to 1.95 V | 150 | - | 120 | - | MHz |
| | | $V_{CC} = 2.3$ V to 2.7 V | 190 | - | 170 | - | MHz |
| | | $V_{CC} = 3.0$ V to 3.6 V | 200 | - | 190 | - | MHz |
| $C_L = 5$ pF, 10 pF, 15 pF and 30 pF | | | | | | | |
| $t_{su(H)}$ | set-up time HIGH D to CP | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 1.6 | - | 1.6 | - | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 1.0 | - | 1.0 | - | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 0.9 | - | 0.9 | - | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 0.7 | - | 0.7 | - | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 0.6 | - | 0.6 | - | ns |
| $t_{su(L)}$ | set-up time LOW D to CP | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 1.6 | - | 1.6 | - | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 1.0 | - | 1.0 | - | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 0.9 | - | 0.9 | - | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 0.8 | - | 0.8 | - | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 1.0 | - | 1.0 | - | ns |
| t_h | hold time D to CP | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 0 | - | 0 | - | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 0 | - | 0 | - | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 0 | - | 0 | - | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 0 | - | 0 | - | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 0 | - | 0 | - | ns |
| t_w | CP pulse width HIGH or LOW | see Figure 6 | | | | | |
| | | $V_{CC} = 1.1$ V to 1.3 V | 3.5 | - | 3.5 | - | ns |
| | | $V_{CC} = 1.4$ V to 1.6 V | 2.0 | - | 2.0 | - | ns |
| | | $V_{CC} = 1.65$ V to 1.95 V | 1.9 | - | 1.9 | - | ns |
| | | $V_{CC} = 2.3$ V to 2.7 V | 2.0 | - | 2.0 | - | ns |
| | | $V_{CC} = 3.0$ V to 3.6 V | 2.2 | - | 2.2 | - | ns |

13. Waveforms

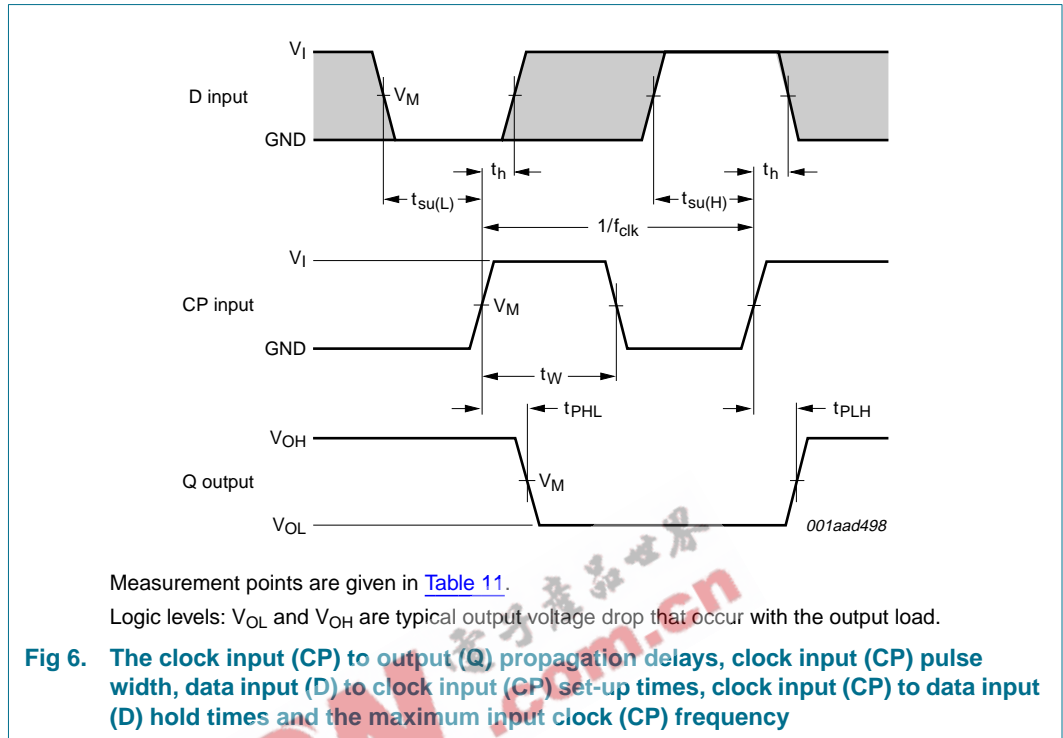


Table 11: Measurement points

| 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 |

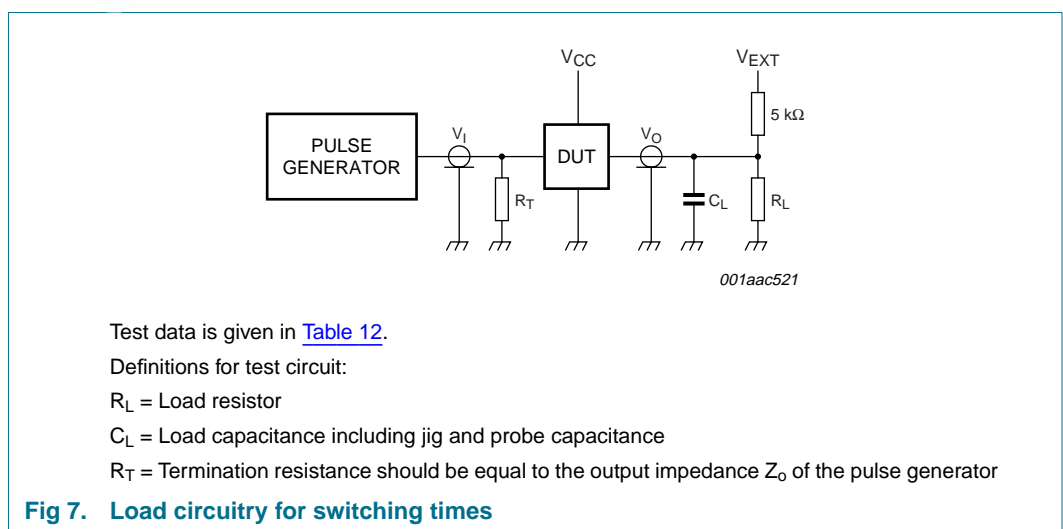


Table 12: Test data

| Supply voltage | Load | | V_{EXT} | | |
|----------------|---------------------------------|------------------------------|-----------------------|-----------------------|-----------------------|
| V_{CC} | C_L | R_L [1] | t_{PLH} , t_{PHL} | t_{PZH} , t_{PHZ} | t_{PZL} , t_{PLZ} |
| 0.8 V to 3.6 V | 5 pF, 10 pF, 15 pF and 30 pF | 5 k Ω or 1 M Ω | 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 $R_L = 1 \text{ M}\Omega$.

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14. Package outline

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

SOT353-1

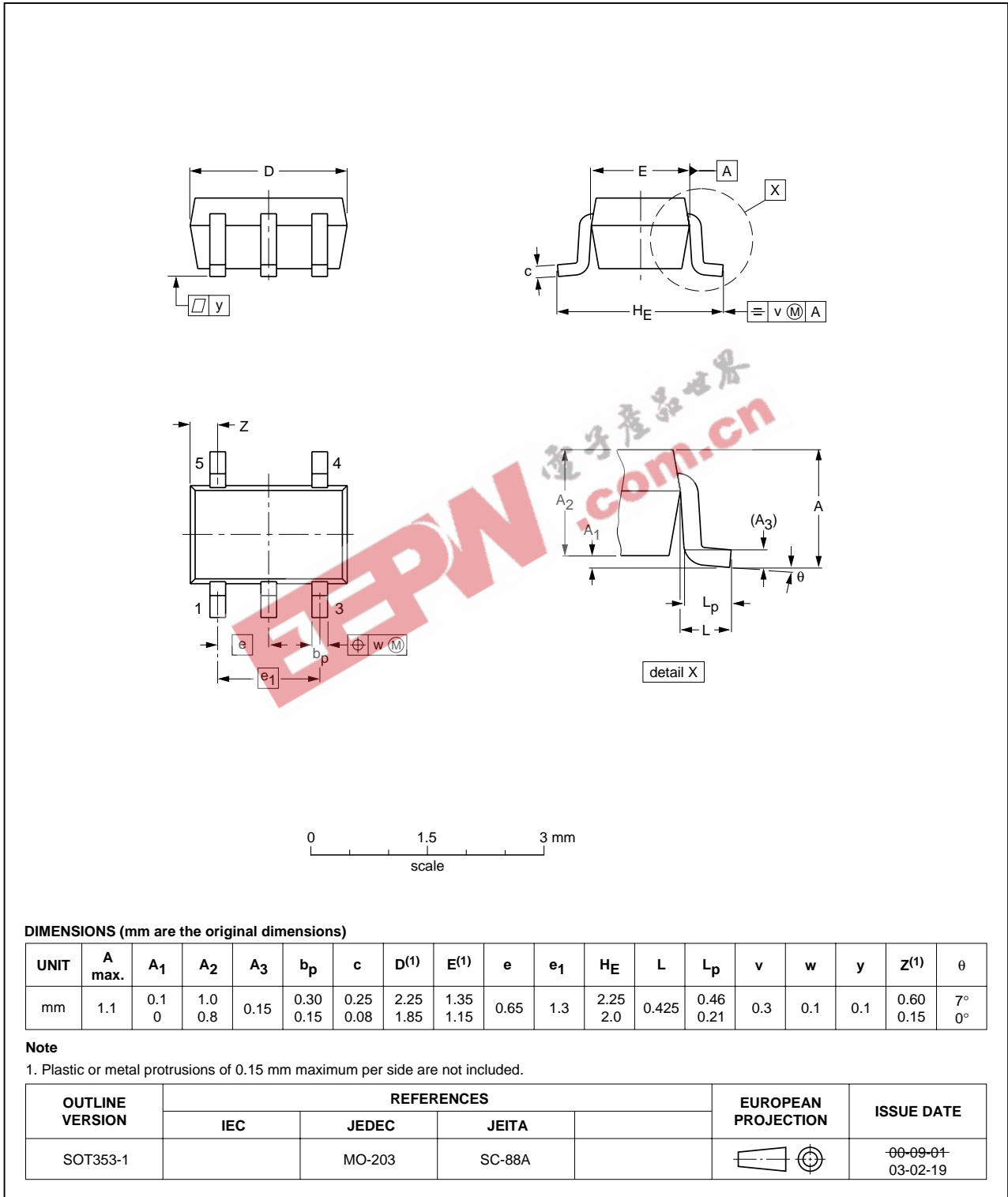


Fig 8. Package outline SOT353-1 (TSSOP5)

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

SOT886

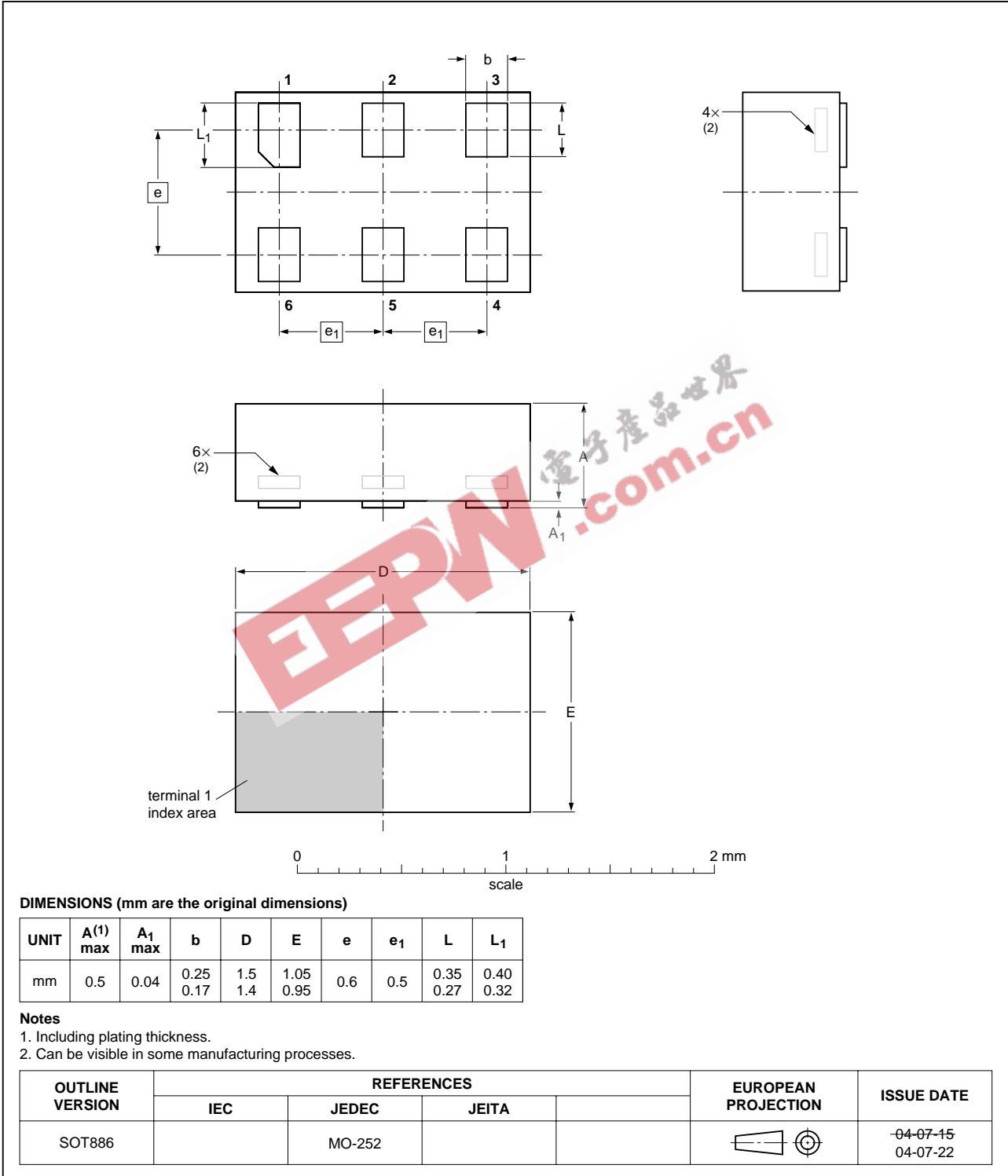


Fig 9. Package outline SOT886 (XSON6)

15. Abbreviations

Table 13: Abbreviations

| Acronym | Description |
|---------|---|
| CMOS | Complementary Metal Oxide Semiconductor |
| TTL | Transistor Transistor Logic |
| HBM | Human Body Model |
| ESD | ElectroStatic Discharge |
| MM | Machine Model |
| CDM | Charged Device Model |

16. Revision history

Table 14: Revision history

| Document ID | Release date | Data sheet status | Change notice | Doc. number | Supersedes |
|-------------|--------------|--------------------|---------------|----------------|------------|
| 74AUP1G79_1 | 20050912 | Product data sheet | - | 9397 750 14682 | - |

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17. Data sheet status

| Level | Data sheet status ^[1] | Product status ^{[2] [3]} | Definition |
|-------|----------------------------------|-----------------------------------|--|
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Date of release: 12 September 2005
Document number: 9397 750 14682

Published in The Netherlands