

# 74AUP1G374

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

Rev. 02 — 23 May 2008

Product data sheet

## 1. General description

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

## 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-A114E 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

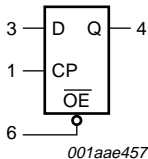
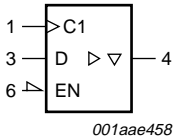
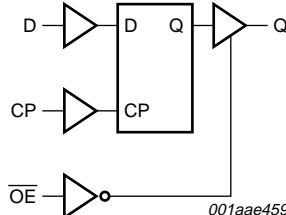
Type number	Package			Version
	Temperature range	Name	Description	
74AUP1G374GW	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363
74AUP1G374GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AUP1G374GF	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1 × 0.5 mm	SOT891

### 4. Marking

Table 2. Marking

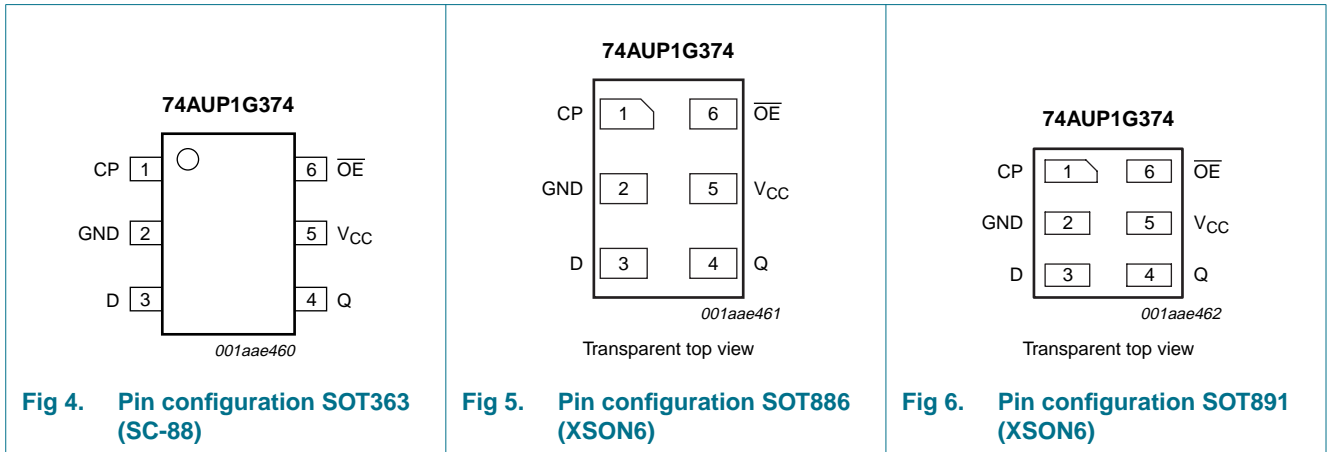
Type number	Marking code
74AUP1G374GW	aX
74AUP1G374GM	aX
74AUP1G374GF	aX

### 5. Functional diagram

 <p><b>Fig 1. Logic symbol</b></p>	 <p><b>Fig 2. IEC logic symbol</b></p>	 <p><b>Fig 3. Logic diagram</b></p>
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## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3. Pin description

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

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

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

[1] H = HIGH voltage level;  
 h = HIGH voltage level one set-up time prior to the HIGH-to-LOW LE transition;  
 L = LOW voltage level;  
 l = LOW voltage level one set-up time prior to the HIGH-to-LOW LE transition;  
 Z = high-impedance OFF-state;  
 ↑ = LOW-to-HIGH clock transition.

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+4.6	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$V_I$	input voltage		[1] -0.5	+4.6	V
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	$\pm 50$	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 $V_{CC}$	-	$\pm 20$	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
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.75 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.11	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.32	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	2.05	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.72	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.6	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.31	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.31	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.31	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.44	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.31	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.44	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.1	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.1	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.2	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.5	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	[1]	-	40	μA
C <sub>I</sub>	input capacitance	V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	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 <sub>O</sub>	output capacitance	output enabled; V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF
		output disabled; V <sub>CC</sub> = 0 V to 3.6 V; V <sub>O</sub> = GND or V <sub>CC</sub>	-	1.5	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.7 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.03	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.30	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.97	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.85	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.67	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.37	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.35	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.33	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.33	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.5	μA
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.5	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.6	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.9	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	<a href="#">[1]</a> -	-	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
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.75 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.25 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.11	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.6 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	0.93	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.17	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.77	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.67	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.40	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.30	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.11	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.33 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.41	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.39	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.36	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.50	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	V
I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.50	V		
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.75	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.75	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.75	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.75	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	1.4	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	[1]	-	75	μA

[1] One input at V<sub>CC</sub> - 0.6 V, other input at V<sub>CC</sub> 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 <sup>[1]</sup>	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 5 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 7</a> <sup>[2]</sup>	-	23.6	-	-	-	-	-	ns
		V <sub>CC</sub> = 0.8 V	-	23.6	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.4	6.3	13.1	2.3	13.3	2.3	13.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.1	4.3	7.4	1.8	8.0	1.8	8.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.6	3.4	5.8	1.4	6.4	1.4	6.7	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.4	2.5	3.8	1.1	4.3	1.1	4.5	ns
t <sub>en</sub>	enable time	OE to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>	-	21.7	-	-	-	-	-	ns
		V <sub>CC</sub> = 0.8 V	-	21.7	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.3	5.2	8.1	3.0	9.1	3.0	10.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.6	4.1	5.6	2.4	6.1	2.4	6.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.3	3.4	4.6	2.0	5.1	2.0	5.6	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.0	2.8	3.7	1.8	4.0	1.8	4.4	ns
t <sub>dis</sub>	disable time	OE to Q; see <a href="#">Figure 8</a> <sup>[4]</sup>	-	9.8	-	-	-	-	-	ns
		V <sub>CC</sub> = 0.8 V	-	9.8	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.9	4.5	7.0	2.8	7.2	2.8	7.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.3	3.3	4.9	2.1	5.1	2.1	5.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.2	3.2	4.5	2.1	4.7	2.1	5.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	2.3	3.1	1.5	3.4	1.5	3.7	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 7</a>	-	53	-	-	-	-	-	MHz
		V <sub>CC</sub> = 0.8 V	-	53	-	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	203	-	170	-	170	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	347	-	310	-	300	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	435	-	400	-	390	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	550	-	490	-	480	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	619	-	550	-	510	-	MHz



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

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C				Unit
			Min	Typ <sup>[1]</sup>	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 10 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 7</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 0.8 V	-	27.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.7	7.2	14.7	2.5	15.0	2.5	15.1	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.3	4.9	8.6	2.0	9.1	2.0	9.4	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.1	4.0	6.5	1.9	7.0	1.9	7.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.8	3.1	4.4	1.5	4.9	1.5	5.1	ns
t <sub>en</sub>	enable time	$\overline{\text{OE}}$ to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>								
		V <sub>CC</sub> = 0.8 V	-	25.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.8	6.5	10.2	3.5	10.6	3.5	11.7	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.1	4.7	6.5	2.7	7.1	2.7	7.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.7	4.0	5.4	2.5	6.0	2.5	6.6	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.4	3.4	4.5	2.2	4.7	2.2	5.2	ns
t <sub>dis</sub>	disable time	$\overline{\text{OE}}$ to Q; see <a href="#">Figure 8</a> <sup>[4]</sup>								
		V <sub>CC</sub> = 0.8 V	-	11.7	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.9	5.6	8.3	3.9	8.4	3.9	9.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.1	4.2	5.8	3.0	6.1	3.0	6.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.2	4.3	5.7	3.1	5.9	3.1	6.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.3	3.1	4.0	2.2	4.2	2.2	4.6	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	52	-	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	192	-	150	-	150	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	324	-	280	-	230	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	421	-	310	-	250	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	486	-	370	-	360	-	MHz
f <sub>max</sub>	maximum frequency	V <sub>CC</sub> = 3.0 V to 3.6 V	-	550	-	410	-	360	-	MHz

**C<sub>L</sub> = 15 pF**

t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 7</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 0.8 V	-	30.6	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.0	8.0	16.2	2.8	16.5	2.8	16.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.8	5.5	9.3	2.4	10.1	2.4	10.4	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.3	4.5	7.2	2.1	7.9	2.1	8.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	3.5	5.0	1.9	5.5	1.9	5.7	ns
f <sub>max</sub>	maximum frequency	V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	3.1	4.3	1.7	4.7	1.7	5.0	ns

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C				Unit
			Min	Typ <sup>[1]</sup>	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t <sub>en</sub>	enable time	$\overline{OE}$ to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>								
		V <sub>CC</sub> = 0.8 V	-	28.6	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	4.3	7.4	11.6	3.9	12.1	3.9	13.3	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.5	5.3	7.2	3.1	8.0	3.1	8.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.1	4.5	6.1	2.8	6.7	2.8	7.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.7	3.8	5.0	2.5	5.4	2.5	5.9	ns
t <sub>dis</sub>	disable time	$\overline{OE}$ to Q; see <a href="#">Figure 8</a> <sup>[4]</sup>								
		V <sub>CC</sub> = 0.8 V	-	13.5	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	5.0	6.8	9.5	4.9	9.6	4.9	10.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.9	5.1	6.8	3.8	7.0	3.8	7.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	4.3	5.4	7.0	4.1	7.2	4.1	7.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.0	3.9	4.9	2.9	5.1	2.9	5.6	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	181	-	120	-	120	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	301	-	190	-	160	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	407	-	240	-	190	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	422	-	300	-	270	-	MHz
C <sub>L</sub> = 30 pF	propagation delay	CP to Q; see <a href="#">Figure 7</a> <sup>[2]</sup>								
		V <sub>CC</sub> = 0.8 V	-	40.8	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.7	10.3	20.5	3.5	21.2	3.5	21.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.3	7.0	11.6	3.2	12.6	3.2	13.3	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.2	5.8	9.1	2.9	9.8	2.9	10.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.0	4.7	6.5	2.6	7.0	2.6	7.4	ns
t <sub>en</sub>	enable time	$\overline{OE}$ to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>								
		V <sub>CC</sub> = 0.8 V	-	39.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	5.6	9.8	15.7	5.0	16.5	5.0	18.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	4.6	7.0	9.5	4.1	10.6	4.1	11.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	4.1	5.9	7.9	3.7	8.6	3.7	9.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.7	5.0	6.6	3.3	7.1	3.3	7.8	ns
t <sub>en</sub>	enable time	$\overline{OE}$ to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>								
		V <sub>CC</sub> = 0.8 V	-	39.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	5.6	9.8	15.7	5.0	16.5	5.0	18.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	4.6	7.0	9.5	4.1	10.6	4.1	11.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	4.1	5.9	7.9	3.7	8.6	3.7	9.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.7	5.0	6.6	3.3	7.1	3.3	7.8	ns
t <sub>en</sub>	enable time	$\overline{OE}$ to Q; see <a href="#">Figure 8</a> <sup>[3]</sup>								
		V <sub>CC</sub> = 0.8 V	-	39.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	5.6	9.8	15.7	5.0	16.5	5.0	18.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	4.6	7.0	9.5	4.1	10.6	4.1	11.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	4.1	5.9	7.9	3.7	8.6	3.7	9.5	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.7	5.0	6.6	3.3	7.1	3.3	7.8	ns

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

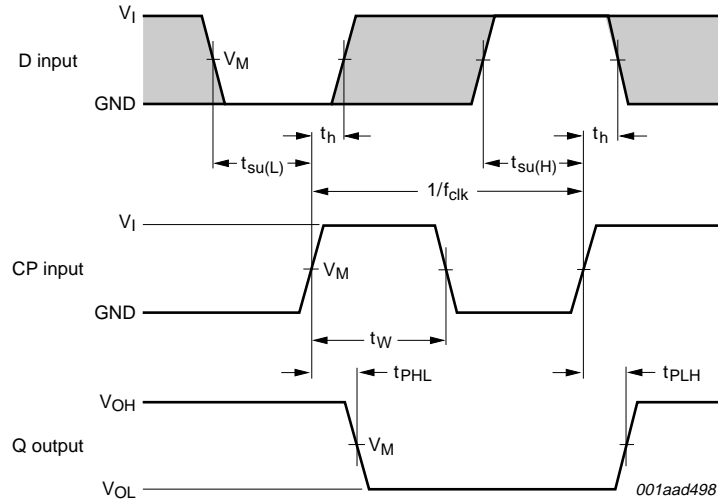
Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C				Unit
			Min	Typ <sup>[1]</sup>	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t <sub>dis</sub>	disable time	OE to Q; see <a href="#">Figure 8</a> <sup>[4]</sup>								
		V <sub>CC</sub> = 0.8 V	-	19.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	8.1	10.2	13.3	8.0	13.5	8.0	14.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	6.4	7.8	9.7	6.3	10.0	6.3	11.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	7.4	8.8	10.7	7.2	10.9	7.2	12.0	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	5.2	6.3	7.5	5.1	7.8	5.1	8.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	7.5	8.8	10.3	7.4	10.5	7.4	11.6	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	28	-	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	128	-	70	-	70	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	206	-	120	-	110	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	262	-	150	-	120	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	269	-	190	-	170	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	309	-	200	-	190	-	MHz
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>										
t <sub>w</sub>	pulse width	CP; HIGH or LOW; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	5.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	1.5	-	3.2	-	3.5	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.9	-	1.5	-	1.7	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.7	-	1.0	-	1.1	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.5	-	0.8	-	0.8	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.5	-	0.7	-	0.8	-	ns
t <sub>su(H)</sub>	set-up time HIGH	D to CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	2.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.5	-	1.4	-	1.4	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.3	-	1.0	-	1.0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.3	-	0.9	-	0.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.3	-	0.7	-	0.7	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.2	-	0.6	-	0.6	-	ns
t <sub>su(L)</sub>	set-up time LOW	D to CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	3.5	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.8	-	1.8	-	1.8	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.6	-	1.2	-	1.2	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.5	-	1.1	-	1.1	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.4	-	1.0	-	1.0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.5	-	1.0	-	1.0	-	ns

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C				Unit
			Min	Typ <sup>[1]</sup>	Max	Min (85 °C)	Max (85 °C)	Min (125 °C)	Max (125 °C)	
t <sub>h</sub>	hold time	D to CP; see <a href="#">Figure 7</a>								
		V <sub>CC</sub> = 0.8 V	-	-2.8	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	-0.7	-	0	-	0	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	-0.4	-	0	-	0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-0.4	-	0	-	0	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-0.3	-	0	-	0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-0.4	-	0	-	0	-	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub> ; <a href="#">[5]</a> f <sub>i</sub> = 1 MHz; output enabled								
		V <sub>CC</sub> = 0.8 V	-	1.7	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	1.8	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.8	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	2.0	-	-	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	2.3	-	-	-	-	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	2.8	-	-	-	-	-	pF

- [1] All typical values are measured at nominal V<sub>CC</sub>.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.
- [4] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.
- [5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> 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<sub>i</sub> = input frequency in MHz;  
 f<sub>o</sub> = output frequency in MHz;  
 C<sub>L</sub> = output load capacitance in pF;  
 V<sub>CC</sub> = supply voltage in V;  
 Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs;  
 N = number of inputs switching.

12. Waveforms

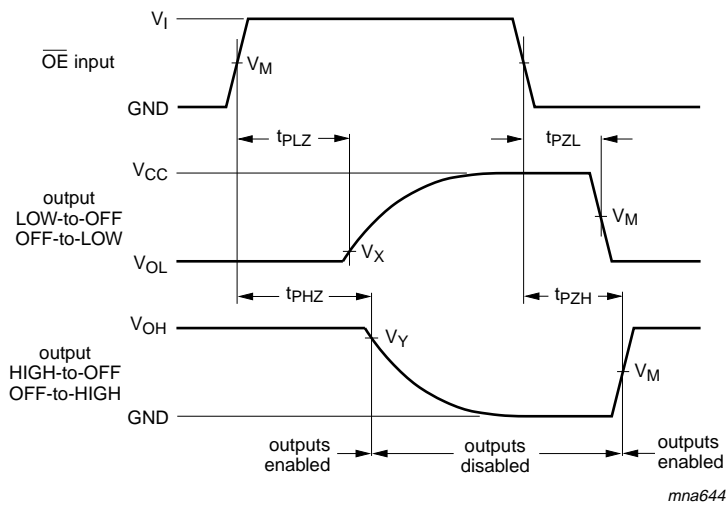


Measurement points are given in [Table 9](#).  
 The shaded areas indicate when the input is permitted to change for predictable output performance.  
 Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

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

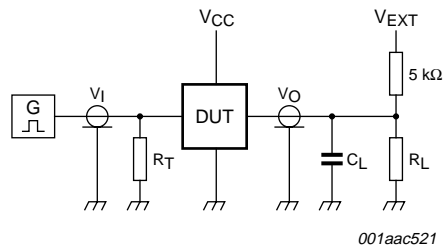
**Table 9. Measurement points**

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



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

**Fig 8. Enable and disable times**



Test data is given in [Table 10](#).  
 Definitions for test circuit:  
 $R_L$  = Load resistance.  
 $C_L$  = Load capacitance including jig and probe capacitance.  
 $R_T$  = Termination resistance should be equal to the output impedance  $Z_o$  of the pulse generator.  
 $V_{EXT}$  = External voltage for measuring switching times.

**Fig 9. Load circuitry for switching times**

**Table 10. Test data**

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

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

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363



Fig 10. Package outline SOT363 (SC-88)

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

SOT886

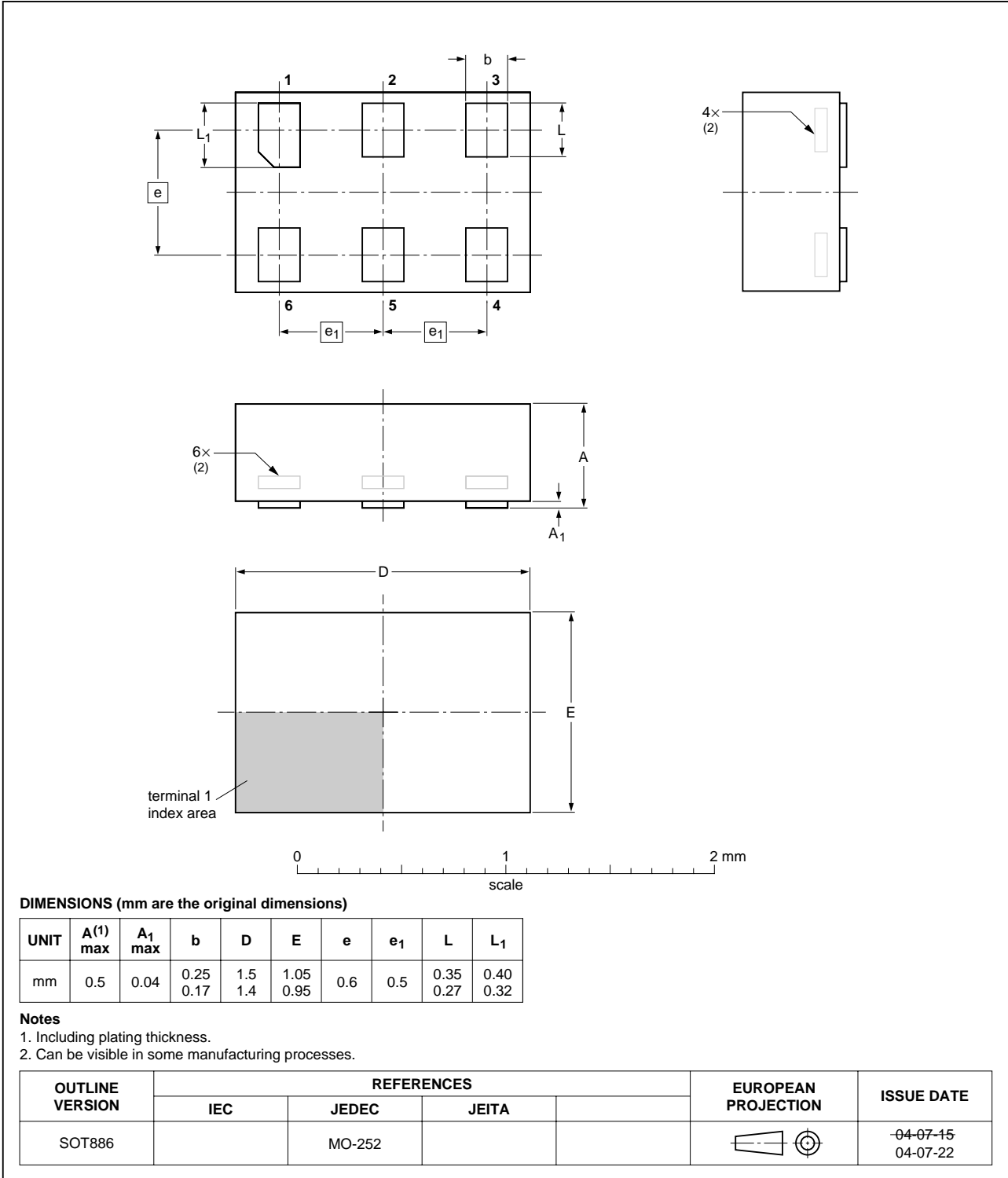


Fig 11. Package outline SOT886 (XSON6)



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

SOT891

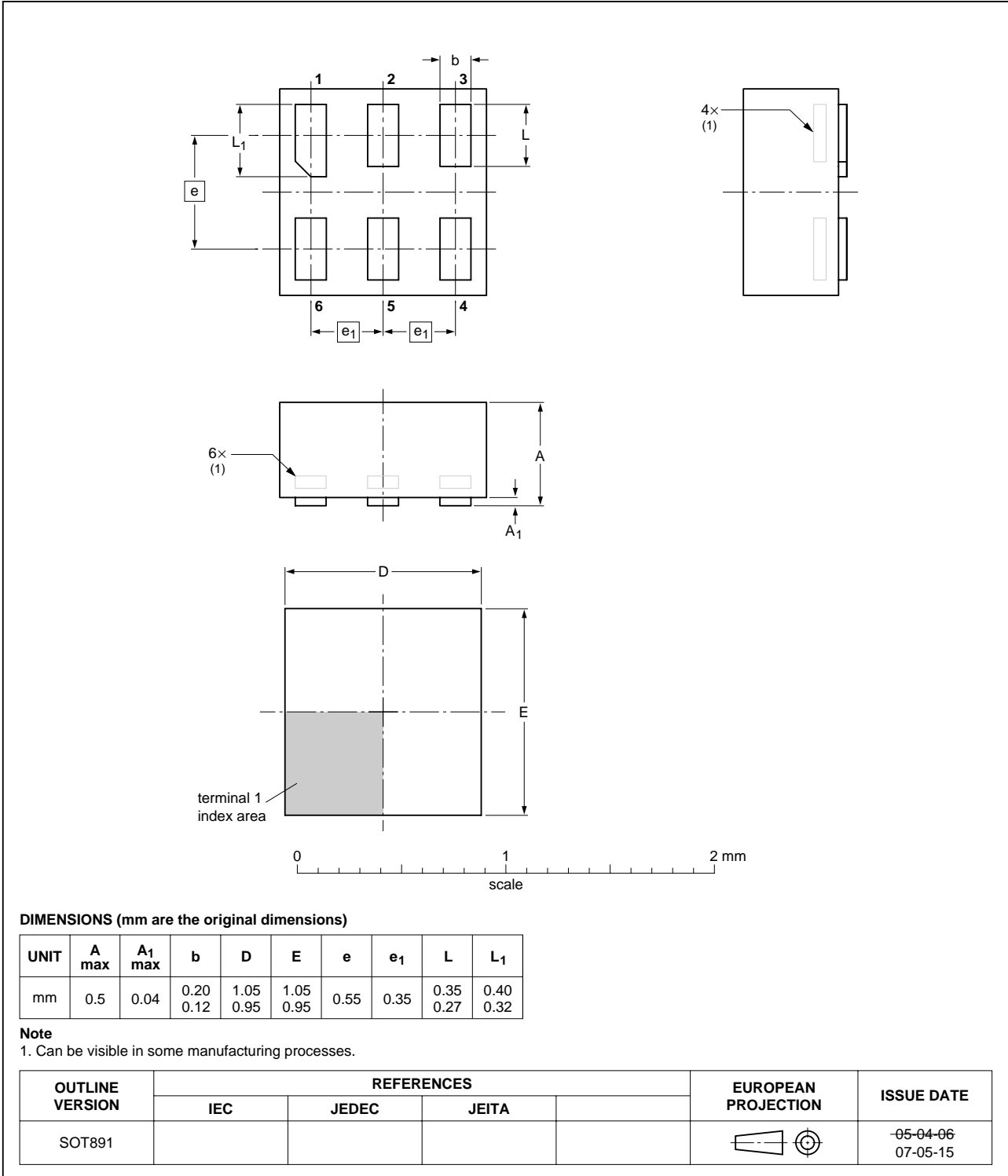


Fig 12. Package outline SOT891 (XSON6)

## 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
74AUP1G374_2	20080523	Product data sheet	-	74AUP1G374_1
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 10 "Static characteristics"</a>: Changed: input capacitance.</li> <li>• <a href="#">Section 11 "Dynamic characteristics"</a>: Changed: enable times, disable times and typical power dissipation capacitance.</li> <li>• Table 9 and Table 10 of the previous version are merged into <a href="#">Table 9</a>.</li> </ul>			
74AUP1G374_1	20061114	Product data sheet	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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**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

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