

# 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	$f = 10\text{ MHz}$ ; $V_I = GND\text{ to }V_{CC}$	[1]			
		$V_{CC} = 1.8\text{ V}$	-	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  $\mu\text{W}$ ).

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

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

### 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

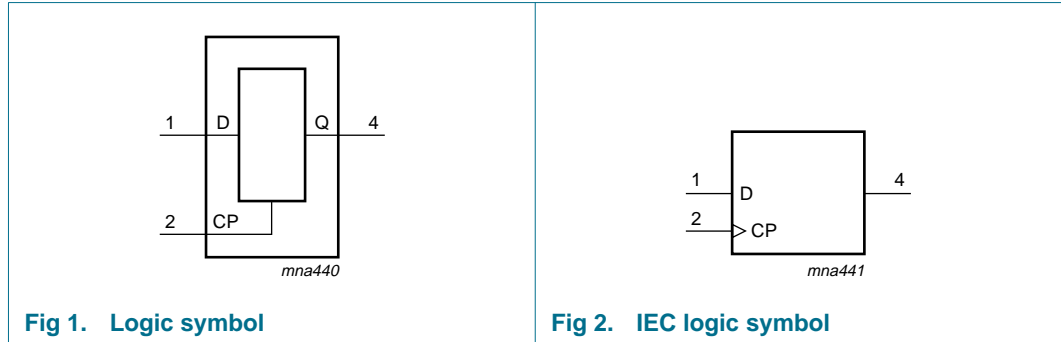


Fig 1. Logic symbol

Fig 2. IEC logic symbol

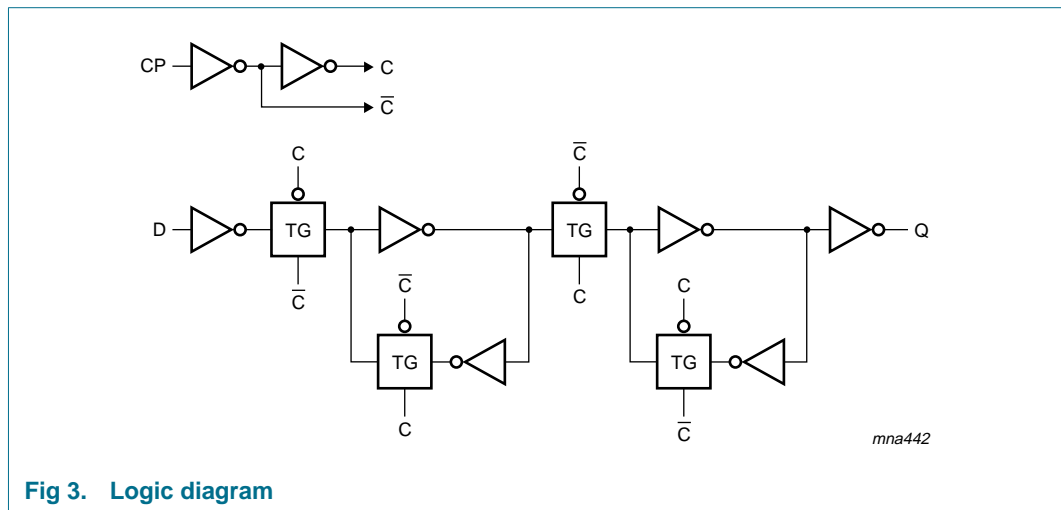


Fig 3. Logic diagram

## 7. Pinning information

### 7.1 Pinning

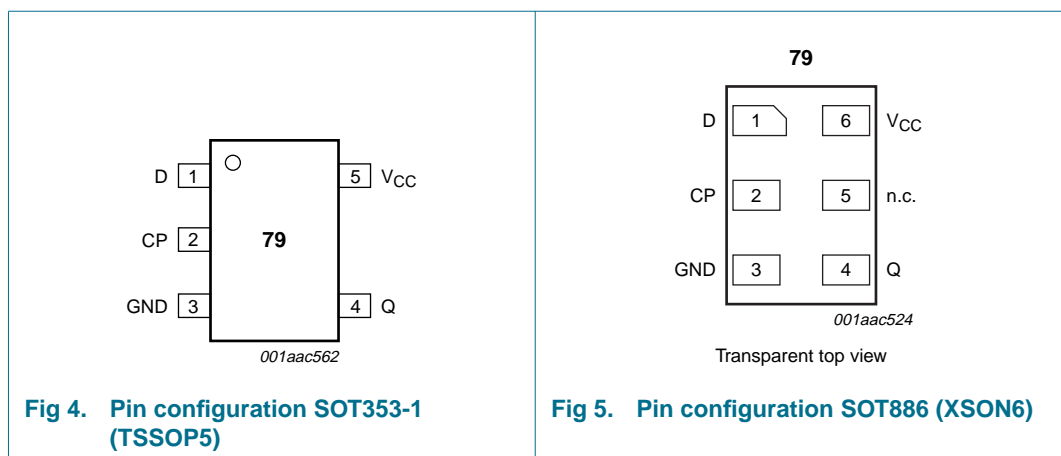


Fig 4. Pin configuration SOT353-1 (TSSOP5)

Fig 5. Pin configuration SOT886 (XSON6)

## 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 <sub>CC</sub>	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 <sub>CC</sub>	supply voltage		-0.5	+4.6	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	-	-50	mA
V <sub>I</sub>	input voltage		[1] -0.5	+4.6	V
I <sub>OK</sub>	output clamping current	V <sub>O</sub> > V <sub>CC</sub> or V <sub>O</sub> < 0 V	-	±50	mA
V <sub>O</sub>	output voltage	active mode	[1] -0.5	V <sub>CC</sub> + 0.5	V
		Power-down mode	[1] -0.5	+4.6	V
I <sub>O</sub>	output current	V <sub>O</sub> = 0 V to V <sub>CC</sub>	-	±20	mA
I <sub>CC</sub>	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
<b><math>T_{amb} = 25\text{ °C}</math></b>						
$V_{IH}$	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 <sub>OH</sub>	HIGH-state 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-state 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>LI</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>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>	quiescent 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 quiescent supply current (per pin)	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>	-	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
C <sub>o</sub>	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-state 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-state 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

**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 <sub>OH</sub>	HIGH-state 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
I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.55	-	-	V		
V <sub>OL</sub>	LOW-state 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>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.45	V		
I <sub>LI</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
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>	quiescent 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 quiescent supply current (per pin)	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
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-state 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-state 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

**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 <sub>OH</sub>	HIGH-state 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
V <sub>OL</sub>	LOW-state 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>LI</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>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	-	-
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>	quiescent 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 quiescent supply current (per pin)	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.

## 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
<b>T<sub>amb</sub> = 25 °C; C<sub>L</sub> = 5 pF</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay CP to Q	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 0.8 V	-	19.7	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.6	5.5	11.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.0	3.8	7.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.7	3.1	5.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.4	2.3	4.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	2.0	3.4	ns



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

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
$f_{\text{clk(max)}}$	maximum clock frequency	see <a href="#">Figure 6</a>				
		$V_{\text{CC}} = 0.8 \text{ V}$	-	53	-	MHz
		$V_{\text{CC}} = 1.1 \text{ V to } 1.3 \text{ V}$	-	203	-	MHz
		$V_{\text{CC}} = 1.4 \text{ V to } 1.6 \text{ V}$	-	347	-	MHz
		$V_{\text{CC}} = 1.65 \text{ V to } 1.95 \text{ V}$	-	435	-	MHz
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	-	550	-	MHz
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	-	619	-	MHz
<b><math>T_{\text{amb}} = 25 \text{ }^\circ\text{C}</math>; <math>C_{\text{L}} = 10 \text{ pF}</math></b>						
$t_{\text{PHL}}, t_{\text{PLH}}$	propagation delay CP to Q	see <a href="#">Figure 6</a>				
		$V_{\text{CC}} = 0.8 \text{ V}$	-	23.1	-	ns
		$V_{\text{CC}} = 1.1 \text{ V to } 1.3 \text{ V}$	3.1	6.3	12.3	ns
		$V_{\text{CC}} = 1.4 \text{ V to } 1.6 \text{ V}$	2.5	4.4	8.1	ns
		$V_{\text{CC}} = 1.65 \text{ V to } 1.95 \text{ V}$	2.1	3.6	6.3	ns
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	1.8	2.8	4.7	ns
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	1.7	2.5	4.1	ns
$f_{\text{clk(max)}}$	maximum clock frequency	see <a href="#">Figure 6</a>				
		$V_{\text{CC}} = 0.8 \text{ V}$	-	52	-	MHz
		$V_{\text{CC}} = 1.1 \text{ V to } 1.3 \text{ V}$	-	192	-	MHz
		$V_{\text{CC}} = 1.4 \text{ V to } 1.6 \text{ V}$	-	324	-	MHz
		$V_{\text{CC}} = 1.65 \text{ V to } 1.95 \text{ V}$	-	421	-	MHz
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	-	486	-	MHz
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	-	550	-	MHz
<b><math>T_{\text{amb}} = 25 \text{ }^\circ\text{C}</math>; <math>C_{\text{L}} = 15 \text{ pF}</math></b>						
$t_{\text{PHL}}, t_{\text{PLH}}$	propagation delay CP to Q	see <a href="#">Figure 6</a>				
		$V_{\text{CC}} = 0.8 \text{ V}$	-	26.6	-	ns
		$V_{\text{CC}} = 1.1 \text{ V to } 1.3 \text{ V}$	3.5	7.1	13.6	ns
		$V_{\text{CC}} = 1.4 \text{ V to } 1.6 \text{ V}$	2.8	5.0	9.2	ns
		$V_{\text{CC}} = 1.65 \text{ V to } 1.95 \text{ V}$	2.4	4.1	7.1	ns
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	2.2	3.2	5.4	ns
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	2.0	2.9	4.5	ns
$f_{\text{clk(max)}}$	maximum clock frequency	see <a href="#">Figure 6</a>				
		$V_{\text{CC}} = 0.8 \text{ V}$	-	50	-	MHz
		$V_{\text{CC}} = 1.1 \text{ V to } 1.3 \text{ V}$	-	181	-	MHz
		$V_{\text{CC}} = 1.4 \text{ V to } 1.6 \text{ V}$	-	301	-	MHz
		$V_{\text{CC}} = 1.65 \text{ V to } 1.95 \text{ V}$	-	407	-	MHz
		$V_{\text{CC}} = 2.3 \text{ V to } 2.7 \text{ V}$	-	422	-	MHz
		$V_{\text{CC}} = 3.0 \text{ V to } 3.6 \text{ V}$	-	481	-	MHz

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

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

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

Symbol	Parameter	Conditions	Min	Typ <sup>[1]</sup>	Max	Unit
t <sub>W</sub>	CP pulse width HIGH or LOW	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 0.8 V	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.4	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.3	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.7	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.6	-	ns
C <sub>PD</sub>	power dissipation capacitance	f = 10 MHz <sup>[2] [3]</sup>				
		V <sub>CC</sub> = 0.8 V	-	2.2	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.2	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.2	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	2.3	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	2.6	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	3.0	-	pF

- [1] All typical values are measured at nominal V<sub>CC</sub>.
- [2] 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;  
 N = number of inputs switching;  
 Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.
- [3] The condition is V<sub>I</sub> = GND to V<sub>CC</sub>.

**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	
<b>C<sub>L</sub> = 5 pF</b>							
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay CP to Q	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.4	12.9	2.4	14.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.8	8.1	1.8	9.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	6.4	1.5	7.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.1	4.7	1.1	5.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.9	4.0	0.9	4.4	ns
f <sub>clk(max)</sub>	maximum clock frequency	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	170	-	170	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	310	-	300	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	400	-	390	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	490	-	480	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	550	-	510	-	MHz
<b>C<sub>L</sub> = 10 pF</b>							
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay CP to Q	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.8	14.4	2.8	15.9	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.2	9.5	2.2	10.5	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.9	7.5	1.9	8.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	5.6	1.5	6.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.3	4.5	1.3	5.0	ns
f <sub>clk(max)</sub>	maximum clock frequency	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	150	-	150	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	280	-	230	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	310	-	250	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	370	-	360	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	410	-	360	-	MHz
<b>C<sub>L</sub> = 15 pF</b>							
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay CP to Q	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.2	15.6	3.2	17.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.5	10.7	2.5	11.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.2	8.5	2.2	9.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.9	6.3	1.9	7.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.6	5.0	1.6	5.5	ns
f <sub>clk(max)</sub>	maximum clock frequency	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	120	-	120	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	190	-	160	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	240	-	190	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	300	-	270	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	320	-	300	-	MHz

**Table 10: Dynamic characteristics ...continued**  
 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	
<b>C<sub>L</sub> = 30 pF</b>							
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay CP to Q	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	4.2	23.3	4.2	25.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.3	14.3	3.3	15.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.0	11.3	3.0	12.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.7	8.5	2.7	9.4	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.6	7.2	2.6	7.9	ns
f <sub>clk(max)</sub>	maximum clock frequency	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	70	-	70	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	120	-	110	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	150	-	120	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	190	-	170	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	200	-	190	-	MHz
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>							
t <sub>su(H)</sub>	set-up time HIGH D to CP	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	1.6	-	1.6	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.0	-	1.0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.9	-	0.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7	-	0.7	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.6	-	0.6	-	ns
t <sub>su(L)</sub>	set-up time LOW D to CP	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	1.6	-	1.6	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.0	-	1.0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.9	-	0.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.8	-	0.8	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.0	-	1.0	-	ns
t <sub>h</sub>	hold time D to CP	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	0	-	0	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	0	-	0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	0	-	0	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0	-	0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0	-	0	-	ns
t <sub>w</sub>	CP pulse width HIGH or LOW	see <a href="#">Figure 6</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.5	-	3.5	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.0	-	2.0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.9	-	1.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.0	-	2.0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.2	-	2.2	-	ns

13. Waveforms

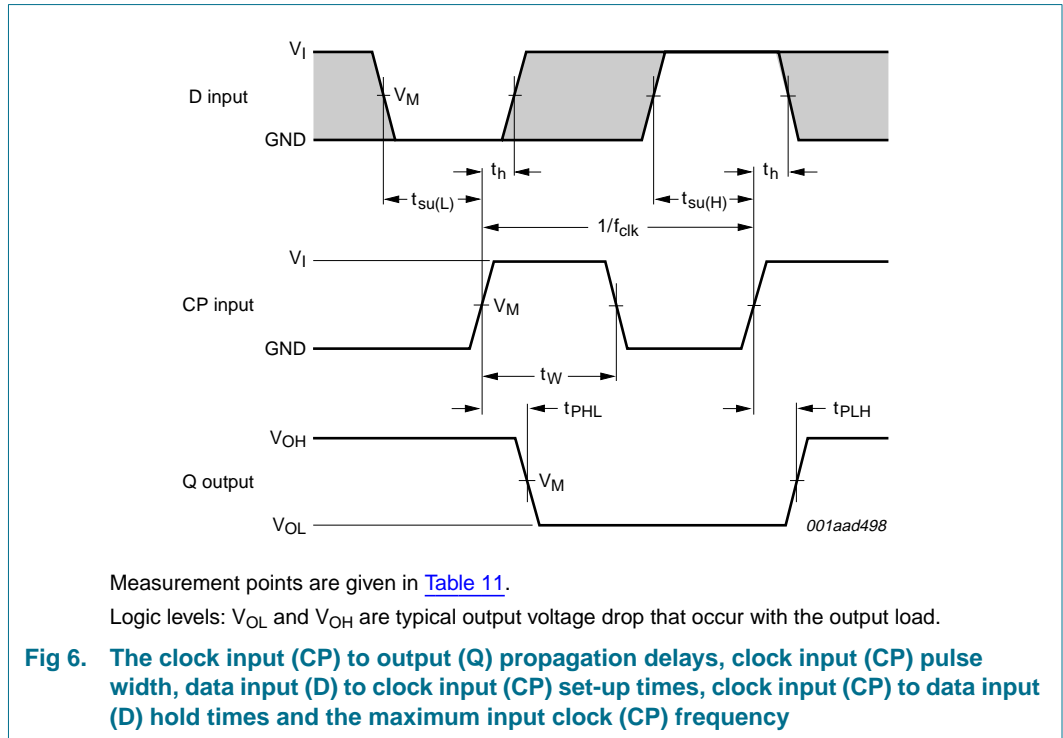


Table 11: Measurement points

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

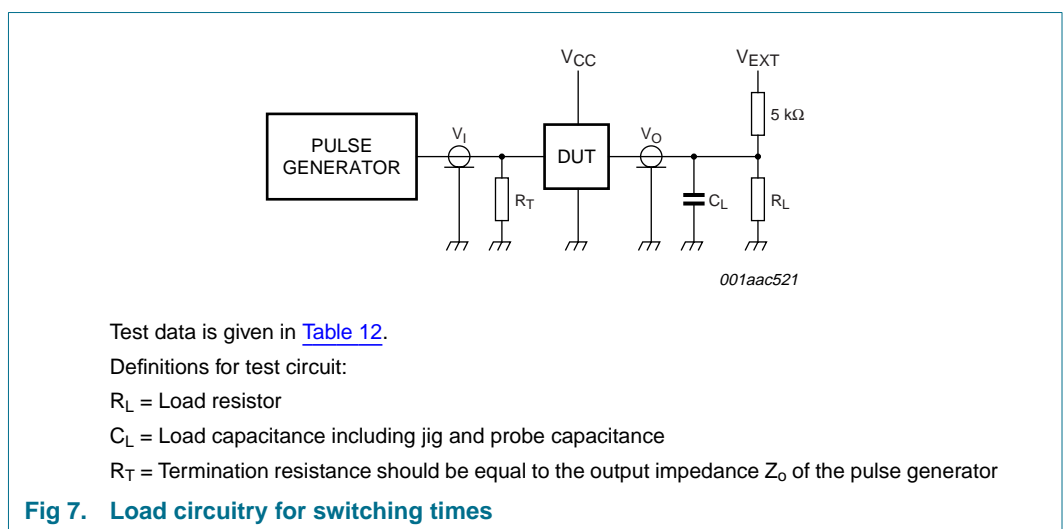


Table 12: Test data

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 $\Omega$ or 1 M $\Omega$	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  $R_L = 1 \text{ M}\Omega$ .

14. Package outline

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

SOT353-1

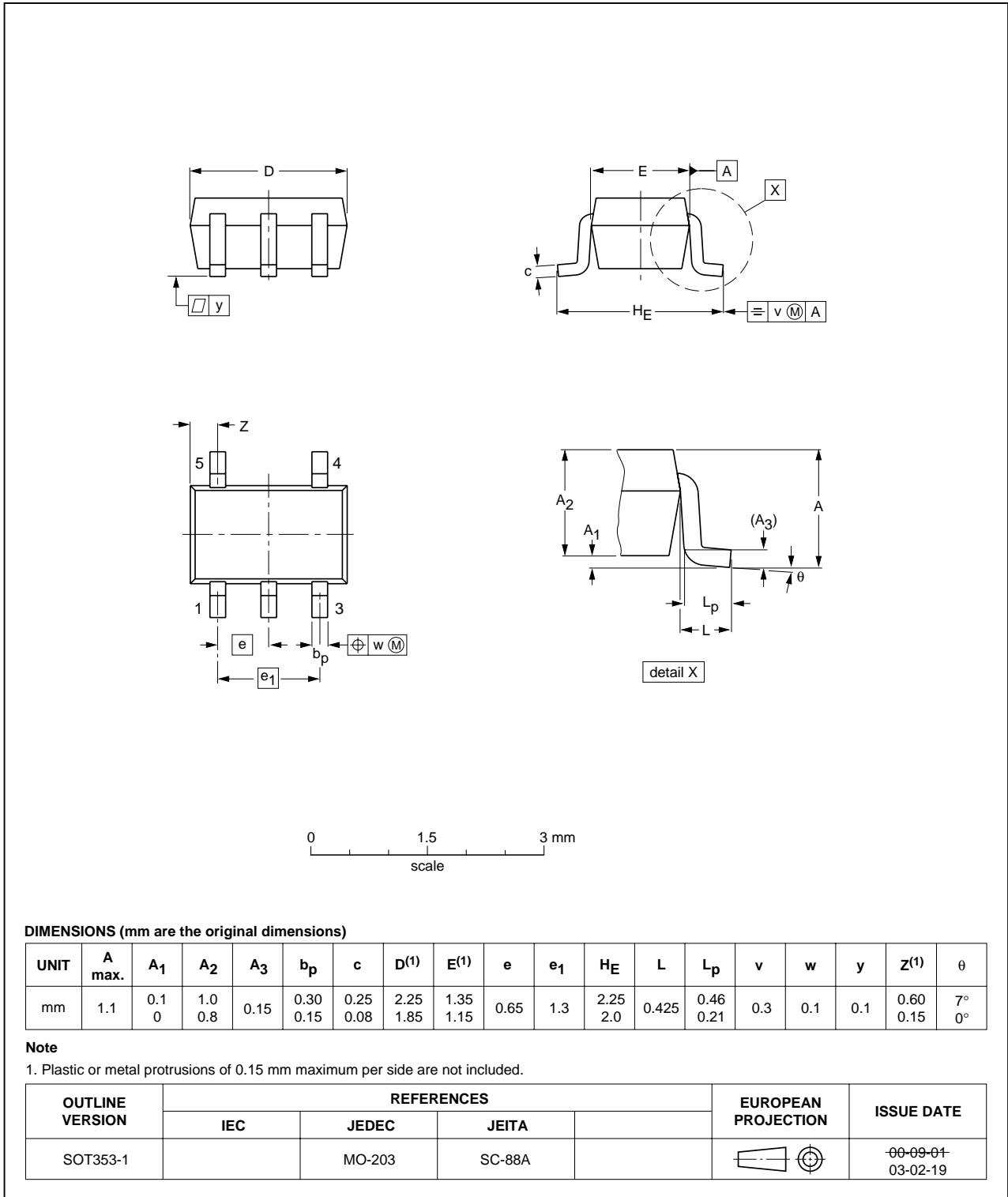


Fig 8. Package outline SOT353-1 (TSSOP5)



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

SOT886

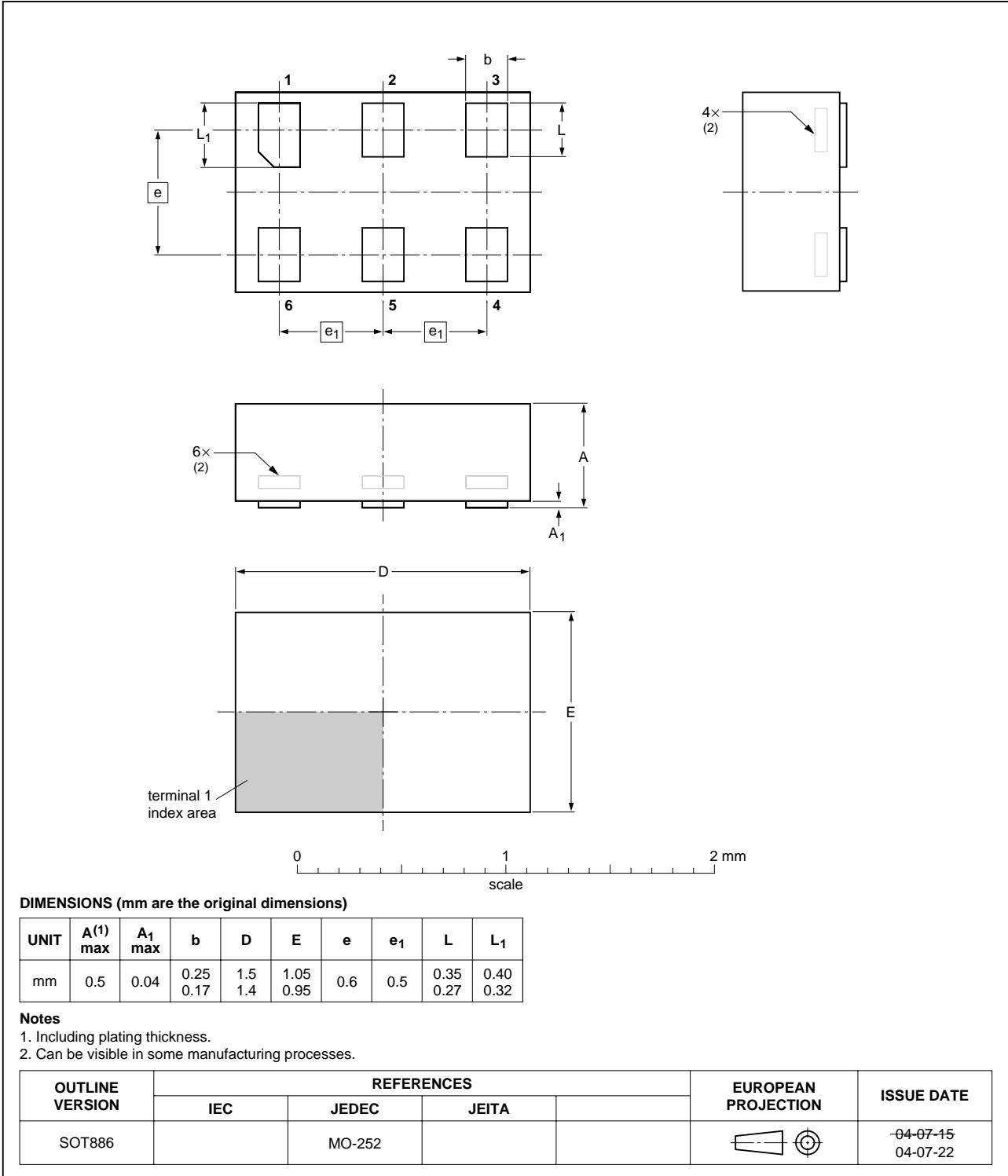


Fig 9. Package outline SOT886 (XSON6)

## 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	-

## 17. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 18. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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

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

## 19. Disclaimers

**Life support** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors

## 21. Contact information

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

For sales office addresses, send an email to: [sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com)

customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

## 20. Trademarks

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

## 22. Contents

1	General description . . . . .	1
2	Features . . . . .	1
3	Quick reference data . . . . .	2
4	Ordering information . . . . .	2
5	Marking . . . . .	2
6	Functional diagram . . . . .	3
7	Pinning information . . . . .	3
7.1	Pinning . . . . .	3
7.2	Pin description . . . . .	4
8	Functional description . . . . .	4
8.1	Function table . . . . .	4
9	Limiting values . . . . .	4
10	Recommended operating conditions . . . . .	5
11	Static characteristics . . . . .	5
12	Dynamic characteristics . . . . .	8
13	Waveforms . . . . .	14
14	Package outline . . . . .	16
15	Abbreviations . . . . .	18
16	Revision history . . . . .	18
17	Data sheet status . . . . .	19
18	Definitions . . . . .	19
19	Disclaimers . . . . .	19
20	Trademarks . . . . .	19
21	Contact information . . . . .	19



© Koninklijke Philips Electronics N.V. 2005

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 12 September 2005  
Document number: 9397 750 14682

Published in The Netherlands