74AUP1G14

Low-power Schmitt-trigger inverter

Rev. 01 — 20 July 2005 **Product data sheet**

1. General description

The 74AUP1G14 is a high-performance, low-power, low-voltage, Si-gate CMOS device, superior to most advanced CMOS compatible TTL families.

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 74AUP1G14 provides a single inverting Schmitt-trigger which accepts standard input signals. It is capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

The inputs switch at different points for positive and negative-going signals. The difference between the positive voltage $V_{(th)LH}$ and the negative voltage $V_{(th)HL}$ is defined as the input hysteresis voltage V_{hys}.

2. Features

- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- 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 μA (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 °C to +85 °C and –40 °C to +125 °C

3. Applications

- Wave and pulse shaper
- Astable multivibrator
- Monostable multivibrator

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4. Quick reference data

Table 1: Quick reference data

GND = 0 V; T_{amb} = 25 °C; t_r = t_f ≤ 3 ns.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_{PHL}, t_{PLH}	propagation delay A to Y	C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 0.8 V		-	20.3	-	ns
		C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 1.1 V to 1.3 V		3.0	5.9	11.7	ns
		C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 1.4 V to 1.6 V		2.6	4.3	7.6	ns
		C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 1.65 V to 1.95 V		2.2	3.7	6.2	ns
		C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 2.3 V to 2.7 V		2.0	3.1	4.8	ns
		C_L = 5 pF; R_L = 1 MΩ; V_{CC} = 3.0 V to 3.6 V		1.9	2.8	4.0	ns
C_i	input capacitance			-	0.8	-	pF
C_{PD}	power dissipation capacitance	V_{CC} = 1.8 V; f = 10 MHz	[1] [2]	-	4.6	-	pF
		V_{CC} = 3.3 V; f = 10 MHz	[1] [2]	-	6.1	-	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.

[2] The condition is V_I = GND to V_{CC}.

5. Ordering information

Table 2: Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP1G14GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AUP1G14GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886

6. Marking

Table 3: Marking

Type number	Marking code
74AUP1G14GW	pF
74AUP1G14GM	pF

7. Functional diagram

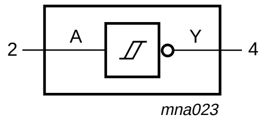


Fig 1. Logic symbol

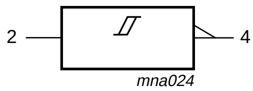


Fig 2. IEC logic symbol

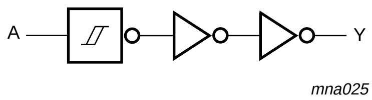


Fig 3. Logic diagram

8. Pinning information

8.1 Pinning

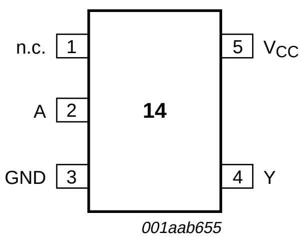
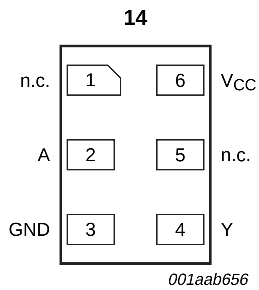


Fig 4. Pin configuration SOT353-1 (TSSOP5)



Transparent top view

Fig 5. Pin configuration SOT886 (XSON6)

8.2 Pin description

Table 4: Pin description

Symbol	Pin		Description
	TSSOP5	XSON6	
n.c.	1	1	not connected
A	2	2	data input A
GND	3	3	ground (0 V)
Y	4	4	data output Y
n.c.	-	5	not connected
V_{CC}	5	6	supply voltage

9. Functional description

9.1 Function table

Table 5: Function table [1]

Input	Output
A	**Y**
L	H
H	L

[1] H = HIGH voltage level;
L = LOW voltage level.

10. 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
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 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.

11. 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 V	0	3.6	V
T_{amb}	ambient temperature		–40	+125	°C

12. 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 °C						
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
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.6	-	-	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_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.44	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	-	-	±0.2	μA
ΔI_{OFF}	additional power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V to 0.2 V	-	-	±0.2	μA
I_{CC}	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	V_I = V_{CC} – 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	-	-	40	μA
C_i	input capacitance	V_I = GND or V_{CC}; V_{CC} = 0 V to 3.6 V	-	0.8	-	pF
C_o	output capacitance	V_O = GND; V_{CC} = 0 V	-	1.7	-	pF

Table 8: Static characteristics *…continued*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = –40 °C to +85 °C						
V_{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	$V_I = V_{CC}$ – 0.6 V; I_O = 0 A; V_{CC} = 3.3 V	-	-	50	µA
T_{amb} = –40 °C to +125 °C						
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
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.30	-	-	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_{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	-	-	$0.33 \times V_{CC}$	V
		I_O = 1.7 mA; V_{CC} = 1.4 V	-	-	0.41	V
		I_O = 1.9 mA; V_{CC} = 1.65 V	-	-	0.39	V
		I_O = 2.3 mA; V_{CC} = 2.3 V	-	-	0.36	V
		I_O = 3.1 mA; V_{CC} = 2.3 V	-	-	0.50	V
		I_O = 2.7 mA; V_{CC} = 3.0 V	-	-	0.36	V
		I_O = 4.0 mA; V_{CC} = 3.0 V	-	-	0.50	V
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	-	-	±0.75	μA
ΔI_{OFF}	additional power-off leakage current	V_I or V_O = 0 V to 3.6 V; V_{CC} = 0 V to 0.2 V	-	-	±0.75	μA
I_{CC}	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	$V_I = V_{CC} - 0.6$ V; I_O = 0 A; V_{CC} = 3.3 V	-	-	75	μA

13. 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 A to Y	see Figure 6				
		V_{CC} = 0.8 V	-	20.3	-	ns
		V_{CC} = 1.1 V to 1.3 V	3.0	5.9	11.7	ns
		V_{CC} = 1.4 V to 1.6 V	2.6	4.3	7.6	ns
		V_{CC} = 1.65 V to 1.95 V	2.2	3.7	6.2	ns
		V_{CC} = 2.3 V to 2.7 V	2.0	3.1	4.8	ns
		V_{CC} = 3.0 V to 3.6 V	1.9	2.8	4.0	ns
T_{amb} = 25 °C; C_L = 10 pF						
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6				
		V_{CC} = 0.8 V	-	23.9	-	ns
		V_{CC} = 1.1 V to 1.3 V	3.5	6.7	13.4	ns
		V_{CC} = 1.4 V to 1.6 V	3.0	5.0	8.7	ns
		V_{CC} = 1.65 V to 1.95 V	2.7	4.3	7.0	ns
		V_{CC} = 2.3 V to 2.7 V	2.4	3.6	5.5	ns
		V_{CC} = 3.0 V to 3.6 V	2.4	3.4	4.6	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 [1]	Max	Unit
T_{amb} = 25 °C; C_L = 15 pF							
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6					
		V_{CC} = 0.8 V		-	27.3	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.9	7.5	14.0	ns
		V_{CC} = 1.4 V to 1.6 V		3.3	5.5	9.7	ns
		V_{CC} = 1.65 V to 1.95 V		3.0	4.7	7.9	ns
		V_{CC} = 2.3 V to 2.7 V		2.8	4.1	5.9	ns
		V_{CC} = 3.0 V to 3.6 V		2.7	3.8	5.0	ns
T_{amb} = 25 °C; C_L = 30 pF							
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6					
		V_{CC} = 0.8 V		-	37.7	-	ns
		V_{CC} = 1.1 V to 1.3 V		5.1	9.8	17.8	ns
		V_{CC} = 1.4 V to 1.6 V		4.3	7.1	12.3	ns
		V_{CC} = 1.65 V to 1.95 V		3.9	6.0	10.1	ns
		V_{CC} = 2.3 V to 2.7 V		3.6	5.2	7.4	ns
		V_{CC} = 3.0 V to 3.6 V		3.5	4.9	6.3	ns
T_{amb} = 25 °C							
C_{PD}	power dissipation capacitance	f = 10 MHz	[2] [3]				
		V_{CC} = 0.8 V		-	3.4	-	pF
		V_{CC} = 1.1 V to 1.3 V		-	3.9	-	pF
		V_{CC} = 1.4 V to 1.6 V		-	4.2	-	pF
		V_{CC} = 1.65 V to 1.95 V		-	4.6	-	pF
		V_{CC} = 2.3 V to 2.7 V		-	5.4	-	pF
		V_{CC} = 3.0 V to 3.6 V		-	6.1	-	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).

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

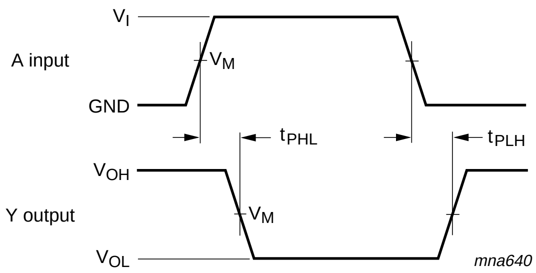
[3] The condition is V_I = GND to V_{CC}.

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 A to Y	see Figure 6					
		V_{CC} = 1.1 V to 1.3 V	2.2	13.6	2.2	15.0	ns
		V_{CC} = 1.4 V to 1.6 V	1.8	8.9	1.8	9.8	ns
		V_{CC} = 1.65 V to 1.95 V	1.9	7.3	1.9	8.1	ns
		V_{CC} = 2.3 V to 2.7 V	1.7	5.9	1.7	6.5	ns
		V_{CC} = 3.0 V to 3.6 V	1.7	4.9	1.7	5.4	ns
C_L = 10 pF							
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6					
		V_{CC} = 1.1 V to 1.3 V	2.5	15.8	2.5	17.4	ns
		V_{CC} = 1.4 V to 1.6 V	2.2	10.3	2.2	11.4	ns
		V_{CC} = 1.65 V to 1.95 V	2.3	8.4	2.3	9.3	ns
		V_{CC} = 2.3 V to 2.7 V	2.1	6.8	2.1	7.5	ns
		V_{CC} = 3.0 V to 3.6 V	2.1	5.6	2.1	6.2	ns
C_L = 15 pF							
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6					
		V_{CC} = 1.1 V to 1.3 V	2.8	17.3	2.8	19.1	ns
		V_{CC} = 1.4 V to 1.6 V	2.9	11.5	2.9	12.7	ns
		V_{CC} = 1.65 V to 1.95 V	2.6	9.4	2.6	10.4	ns
		V_{CC} = 2.3 V to 2.7 V	2.5	7.4	2.5	8.2	ns
		V_{CC} = 3.0 V to 3.6 V	2.4	6.1	2.4	6.8	ns
C_L = 30 pF							
t_{PHL}, t_{PLH}	propagation delay A to Y	see Figure 6					
		V_{CC} = 1.1 V to 1.3 V	4.5	20.5	4.5	22.6	ns
		V_{CC} = 1.4 V to 1.6 V	3.8	14.7	3.8	16.2	ns
		V_{CC} = 1.65 V to 1.95 V	3.4	12.0	3.4	13.2	ns
		V_{CC} = 2.3 V to 2.7 V	3.3	8.8	3.3	9.7	ns
		V_{CC} = 3.0 V to 3.6 V	3.2	7.3	3.2	8.1	ns

14. Waveforms



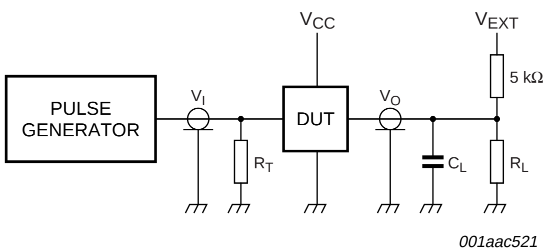
Measurement points are given in Table 11.

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

Fig 6. The data input (A) to output (Y) propagation delays

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



Test data is given in Table 12.

Definitions for test circuit:

R_L = Load resistor

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

Fig 7. Load circuitry for switching times

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 kΩ or 1 MΩ	open	GND	$2 \times V_{CC}$

[1] For measuring enable and disable times R_L = 5 kΩ, for measuring propagation delays, setup and hold times and pulse width R_L = 1 MΩ.

15. Transfer characteristics

Table 13: Transfer characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
$V_{(th)LH}$	positive-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.30	-	0.60	V
		V_{CC} = 1.1 V	0.53	-	0.90	V
		V_{CC} = 1.4 V	0.74	-	1.11	V
		V_{CC} = 1.65 V	0.91	-	1.29	V
		V_{CC} = 2.3 V	1.37	-	1.77	V
		V_{CC} = 3.0 V	1.88	-	2.29	V
$V_{(th)HL}$	negative-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.10	-	0.60	V
		V_{CC} = 1.1 V	0.26	-	0.65	V
		V_{CC} = 1.4 V	0.39	-	0.75	V
		V_{CC} = 1.65 V	0.47	-	0.84	V
		V_{CC} = 2.3 V	0.69	-	1.04	V
		V_{CC} = 3.0 V	0.88	-	1.24	V
V_{hys}	hysteresis voltage ($V_{(th)LH} - V_{(th)HL}$)	see Figure 8, Figure 9, Figure 10 and Figure 11				
		V_{CC} = 0.8 V	0.07	-	0.50	V
		V_{CC} = 1.1 V	0.08	-	0.46	V
		V_{CC} = 1.4 V	0.18	-	0.56	V
		V_{CC} = 1.65 V	0.27	-	0.66	V
		V_{CC} = 2.3 V	0.53	-	0.92	V
		V_{CC} = 3.0 V	0.79	-	1.31	V
T_{amb} = −40 °C to +85 °C						
$V_{(th)LH}$	positive-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.30	-	0.60	V
		V_{CC} = 1.1 V	0.53	-	0.90	V
		V_{CC} = 1.4 V	0.74	-	1.11	V
		V_{CC} = 1.65 V	0.91	-	1.29	V
		V_{CC} = 2.3 V	1.37	-	1.77	V
		V_{CC} = 3.0 V	1.88	-	2.29	V
$V_{(th)HL}$	negative-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.10	-	0.60	V
		V_{CC} = 1.1 V	0.26	-	0.65	V
		V_{CC} = 1.4 V	0.39	-	0.75	V
		V_{CC} = 1.65 V	0.47	-	0.84	V
		V_{CC} = 2.3 V	0.69	-	1.04	V
		V_{CC} = 3.0 V	0.88	-	1.24	V

Table 13: Transfer characteristics *...continued*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{hys}	hysteresis voltage ($V_{(th)LH} - V_{(th)HL}$)	see Figure 8, Figure 9, Figure 10 and Figure 11				
		V_{CC} = 0.8 V	0.07	-	0.50	V
		V_{CC} = 1.1 V	0.08	-	0.46	V
		V_{CC} = 1.4 V	0.18	-	0.56	V
		V_{CC} = 1.65 V	0.27	-	0.66	V
		V_{CC} = 2.3 V	0.53	-	0.92	V
		V_{CC} = 3.0 V	0.79	-	1.31	V
T_{amb} = −40 °C to +125 °C						
$V_{(th)LH}$	positive-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.30	-	0.62	V
		V_{CC} = 1.1 V	0.53	-	0.92	V
		V_{CC} = 1.4 V	0.74	-	1.13	V
		V_{CC} = 1.65 V	0.91	-	1.31	V
		V_{CC} = 2.3 V	1.37	-	1.80	V
		V_{CC} = 3.0 V	1.88	-	2.32	V
$V_{(th)HL}$	negative-going threshold voltage	see Figure 8 and Figure 9				
		V_{CC} = 0.8 V	0.10	-	0.60	V
		V_{CC} = 1.1 V	0.26	-	0.65	V
		V_{CC} = 1.4 V	0.39	-	0.75	V
		V_{CC} = 1.65 V	0.47	-	0.84	V
		V_{CC} = 2.3 V	0.69	-	1.04	V
		V_{CC} = 3.0 V	0.88	-	1.24	V
V_{hys}	hysteresis voltage ($V_{(th)LH} - V_{(th)HL}$)	see Figure 8, Figure 9, Figure 10 and Figure 11				
		V_{CC} = 0.8 V	0.07	-	0.50	V
		V_{CC} = 1.1 V	0.08	-	0.46	V
		V_{CC} = 1.4 V	0.18	-	0.56	V
		V_{CC} = 1.65 V	0.27	-	0.66	V
		V_{CC} = 2.3 V	0.53	-	0.92	V
		V_{CC} = 3.0 V	0.79	-	1.31	V

16. Waveforms transfer characteristics

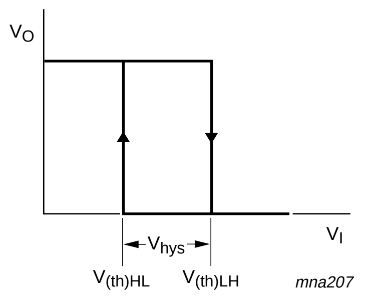
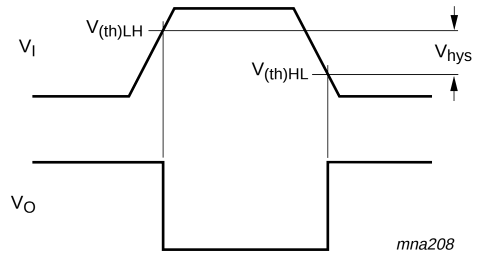


Fig 8. Transfer characteristic



$V_{(th)LH}$ and $V_{(th)HL}$ limits at 70 % and 20 %.

Fig 9. Definition of $V_{(th)LH}$, $V_{(th)HL}$ and V_{hys}

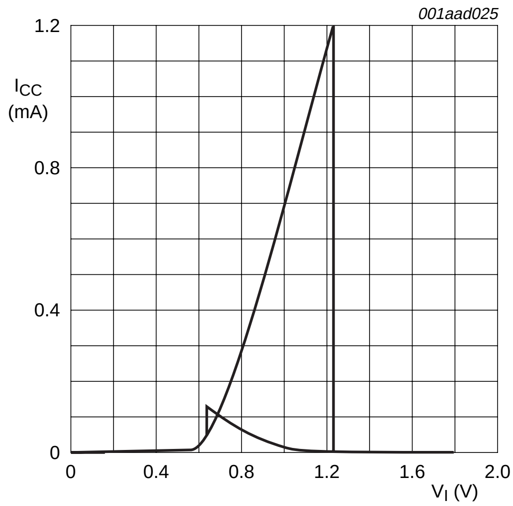


Fig 10. Typical transfer characteristics; V_{CC} = 1.8 V

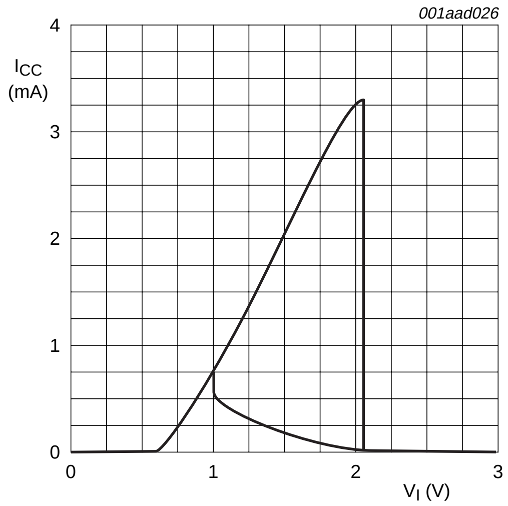


Fig 11. Typical transfer characteristics; V_{CC} = 3.0 V

17. Application information

The slow input rise and fall times cause additional power dissipation, this can be calculated using the following formula:

$P_{ad} = f_i \times (t_r \times I_{CC(AV)} + t_f \times I_{CC(AV)}) \times V_{CC}$ where:

P_{ad} = additional power dissipation (μW);

f_i = input frequency (MHz);

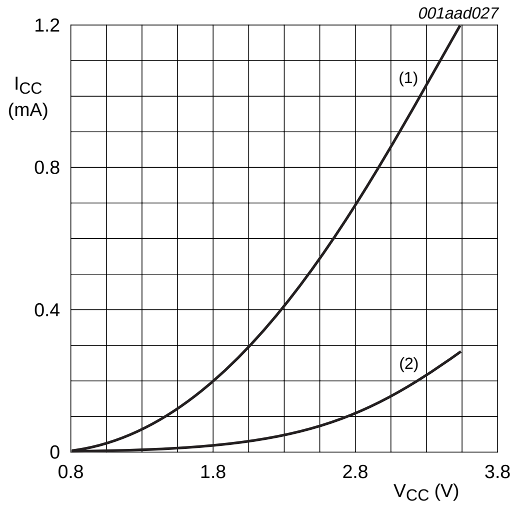
t_r = input rise time (ns); 10 % to 90 %;

t_f = input fall time (ns); 90 % to 10 %;

$I_{CC(AV)}$ = average additional supply current (μA).

Average I_{CC} differs with positive or negative input transitions, as shown in Figure 12.

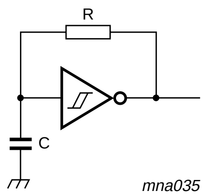
An example of a relaxation circuit using the 74AUP1G14 is shown in Figure 13.



(1) Positive-going edge.

(2) Negative-going edge.

Fig 12. Average I_{CC} as a function of V_{CC}



$$f = \frac{1}{T} \approx \frac{1}{a \times RC}$$

Average values for variable a are given in Table 14.

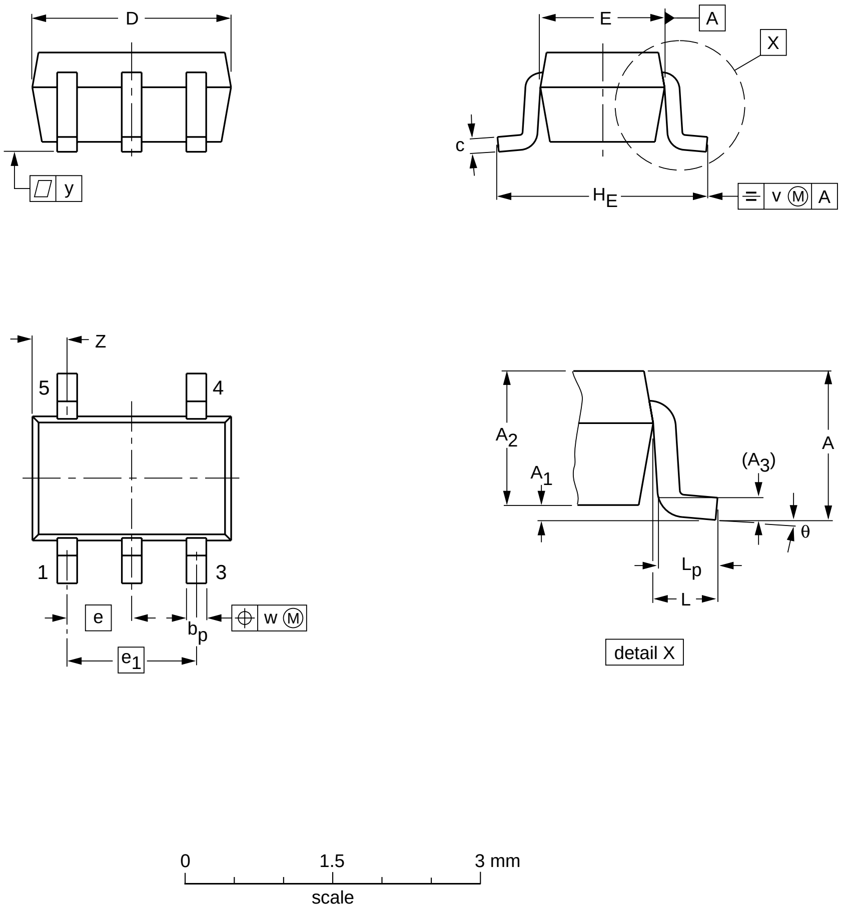
Fig 13. Relaxation oscillator

Table 14: Variable values

Supply voltage	Variable a
1.1 V	1.28
1.5 V	1.22
1.8 V	1.24
2.8 V	1.34
3.3 V	1.45

18. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm **SOT353-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	e_1	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.1 0	1.0 0.8	0.15	0.30 0.15	0.25 0.08	2.25 1.85	1.35 1.15	0.65	1.3	2.25 2.0	0.425	0.46 0.21	0.3	0.1	0.1	0.60 0.15	7° 0°

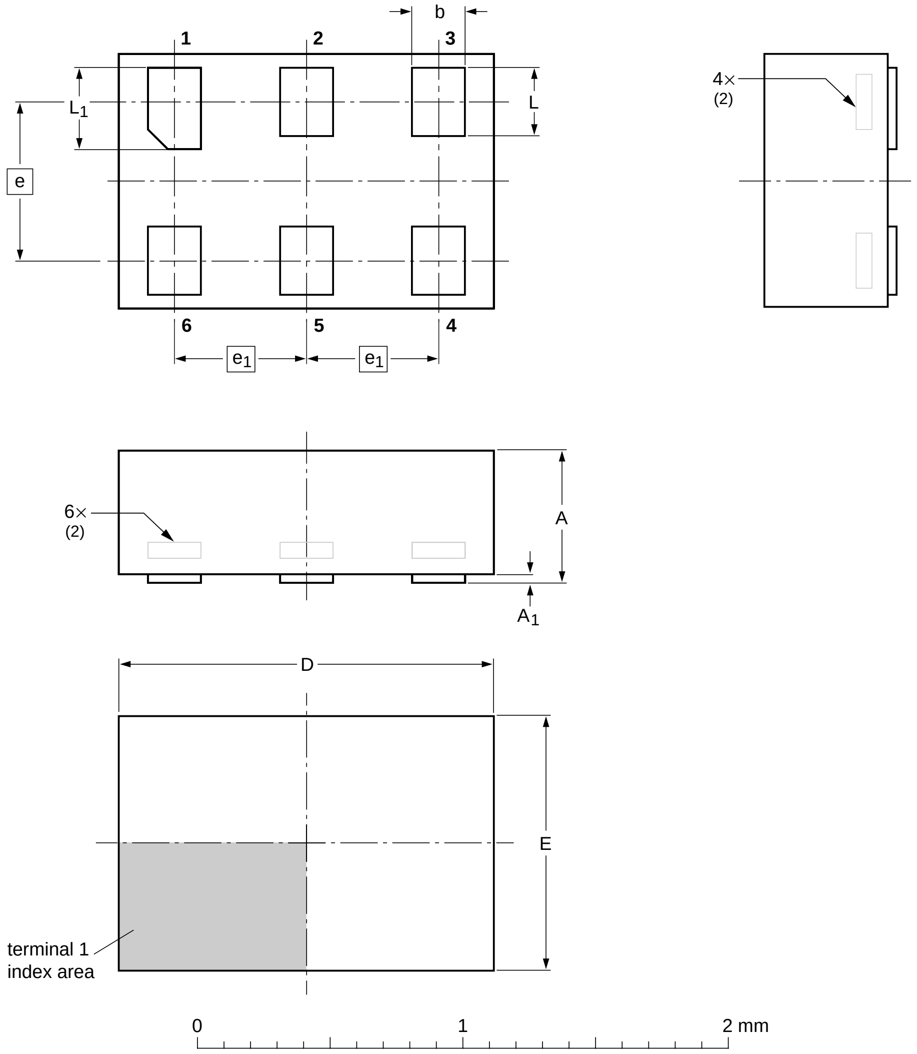
Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT353-1		MO-203	SC-88A			~~00-09-01~~ 03-02-19

Fig 14. 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**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max	A_1 max	b	D	E	e	e_1	L	L_1
mm	0.5	0.04	0.25 0.17	1.5 1.4	1.05 0.95	0.6	0.5	0.35 0.27	0.40 0.32

Notes

1. Including plating thickness.
2. Can be visible in some manufacturing processes.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT886		MO-252				~~04-07-15~~ 04-07-22

Fig 15. Package outline SOT886 (XSON6)

19. Abbreviations

Table 15: 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

20. Revision history

Table 16: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74AUP1G14_1	20050720	Product data sheet	-	9397 750 14676	-

21. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	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.

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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.

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26. Contents

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