

# 74AUP1G02

## Low-power 2-input NOR gate

Rev. 02 — 28 June 2006

Product data sheet

## 1. General description

The 74AUP1G02 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 74AUP1G02 provides the single 2-input NOR function.

## 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 Class 3A. Exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM JESD22-C101-C exceeds 1000 V
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot  $< 10\%$  of  $V_{CC}$
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- Multiple package options
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

**PHILIPS**

### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AUP1G02GW	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1
74AUP1G02GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AUP1G02GF	-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
74AUP1G02GW	pB
74AUP1G02GM	pB
74AUP1G02GF	pB

### 5. Functional diagram

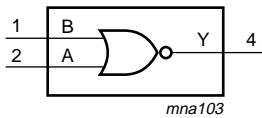


Fig 1. Logic symbol

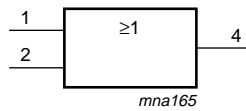


Fig 2. IEC logic symbol

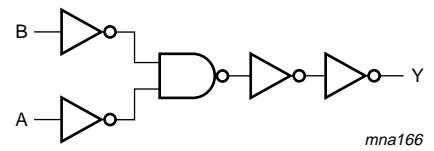
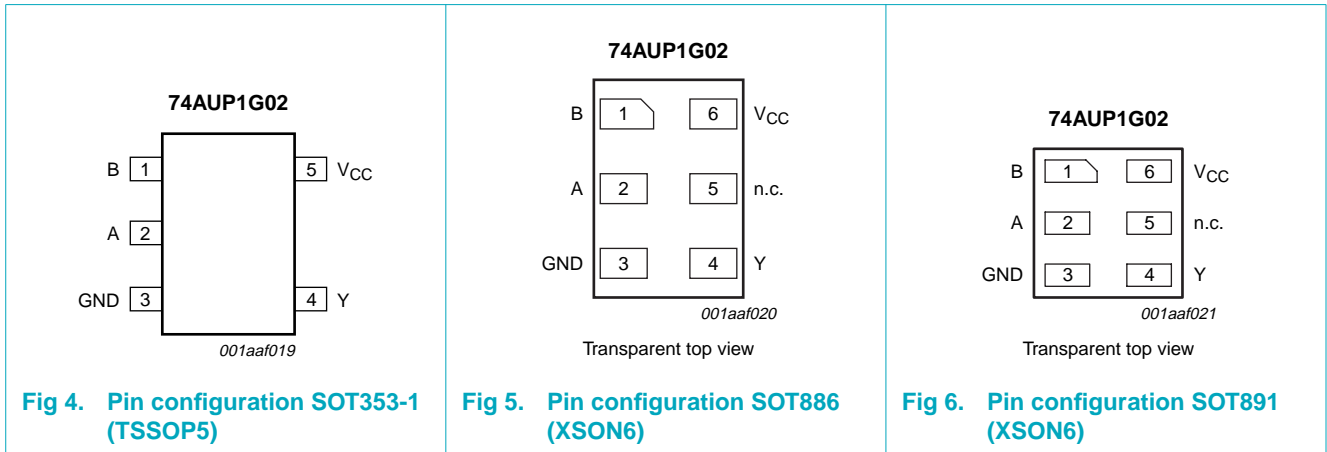


Fig 3. Logic diagram

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3. Pin description

Symbol	Pin		Description
	TSSOP5	XSON6	
B	1	1	data input B
A	2	2	data input A
GND	3	3	ground (0 V)
Y	4	4	data output Y
n.c.	-	5	not connected
V <sub>CC</sub>	5	6	supply voltage

## 7. Functional description

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

Input		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

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

## 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 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.

## 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-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
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>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>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	<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

**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 +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
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
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>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
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	[1]	-	50	μA

**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = -40\text{ °C to }+125\text{ °C}</math></b>						
$V_{IH}$	HIGH-state input voltage	$V_{CC} = 0.8\text{ V}$	$0.75 \times V_{CC}$	-	-	V
		$V_{CC} = 0.9\text{ V to }1.95\text{ V}$	$0.70 \times V_{CC}$	-	-	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	$V_{CC} = 0.8\text{ V}$	-	-	$0.25 \times V_{CC}$	V
		$V_{CC} = 0.9\text{ V to }1.95\text{ V}$	-	-	$0.30 \times V_{CC}$	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
$V_{OH}$	HIGH-state output voltage	$V_I = V_{IH}\text{ or }V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$	$V_{CC} - 0.11$	-	-	V
		$I_O = -1.1\text{ mA}; V_{CC} = 1.1\text{ V}$	$0.6 \times V_{CC}$	-	-	V
		$I_O = -1.7\text{ mA}; V_{CC} = 1.4\text{ V}$	0.93	-	-	V
		$I_O = -1.9\text{ mA}; V_{CC} = 1.65\text{ V}$	1.17	-	-	V
		$I_O = -2.3\text{ mA}; V_{CC} = 2.3\text{ V}$	1.77	-	-	V
		$I_O = -3.1\text{ mA}; V_{CC} = 2.3\text{ V}$	1.67	-	-	V
		$I_O = -2.7\text{ mA}; V_{CC} = 3.0\text{ V}$	2.40	-	-	V
		$I_O = -4.0\text{ mA}; V_{CC} = 3.0\text{ V}$	2.30	-	-	V
$V_{OL}$	LOW-state output voltage	$V_I = V_{IH}\text{ or }V_{IL}$				
		$I_O = 20\text{ }\mu\text{A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$	-	-	0.11	V
		$I_O = 1.1\text{ mA}; V_{CC} = 1.1\text{ V}$	-	-	$0.33 \times V_{CC}$	V
		$I_O = 1.7\text{ mA}; V_{CC} = 1.4\text{ V}$	-	-	0.41	V
		$I_O = 1.9\text{ mA}; V_{CC} = 1.65\text{ V}$	-	-	0.39	V
		$I_O = 2.3\text{ mA}; V_{CC} = 2.3\text{ V}$	-	-	0.36	V
		$I_O = 3.1\text{ mA}; V_{CC} = 2.3\text{ V}$	-	-	0.50	V
		$I_O = 2.7\text{ mA}; V_{CC} = 3.0\text{ V}$	-	-	0.36	V
		$I_O = 4.0\text{ mA}; V_{CC} = 3.0\text{ V}$	-	-	0.50	V
$I_I$	input leakage current	$V_I = \text{GND to }3.6\text{ V}; V_{CC} = 0\text{ V to }3.6\text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$I_{OFF}$	power-off leakage current	$V_I\text{ or }V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$\Delta I_{OFF}$	additional power-off leakage current	$V_I\text{ or }V_O = 0\text{ V to }3.6\text{ V}; V_{CC} = 0\text{ V to }0.2\text{ V}$	-	-	$\pm 0.75$	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = \text{GND or }V_{CC}; I_O = 0\text{ A}; V_{CC} = 0.8\text{ V to }3.6\text{ V}$	-	-	1.4	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	$V_I = V_{CC} - 0.6\text{ V}; I_O = 0\text{ A}; V_{CC} = 3.3\text{ V}$	[1]	-	75	$\mu\text{A}$

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

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#)

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 5\text{ pF}</math></b>						
$t_{PHL}$ , $t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>				
		$V_{CC} = 0.8\text{ V}$	-	17.0	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	2.5	5.1	10.8	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	1.6	3.7	6.7	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	1.3	3.0	5.3	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.0	2.4	3.9	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.0	2.2	3.4	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 10\text{ pF}</math></b>						
$t_{PHL}$ , $t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>				
		$V_{CC} = 0.8\text{ V}$	-	20.4	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	2.4	6.0	12.8	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	1.9	4.3	7.9	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	1.6	3.6	6.2	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.4	3.0	4.7	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.3	2.7	4.2	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 15\text{ pF}</math></b>						
$t_{PHL}$ , $t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>				
		$V_{CC} = 0.8\text{ V}$	-	23.9	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	3.4	6.8	14.6	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	2.3	4.8	8.9	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	1.9	4.0	7.0	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.7	3.4	5.4	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	1.6	3.2	4.8	ns
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math>; <math>C_L = 30\text{ pF}</math></b>						
$t_{PHL}$ , $t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>				
		$V_{CC} = 0.8\text{ V}$	-	34.2	-	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	4.6	9.0	19.9	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	3.4	6.4	11.8	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	2.6	5.3	9.3	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2.4	4.5	7.1	ns
		$V_{CC} = 3.0\text{ V to }3.6\text{ V}$	2.3	4.2	6.4	ns



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

Symbol	Parameter	Conditions	Min	Typ [1]	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
C <sub>PD</sub>	power dissipation capacitance	f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub>	[2]			
		V <sub>CC</sub> = 0.8 V	-	2.6	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.7	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.9	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	3.1	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	3.5	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	4.1	-	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;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

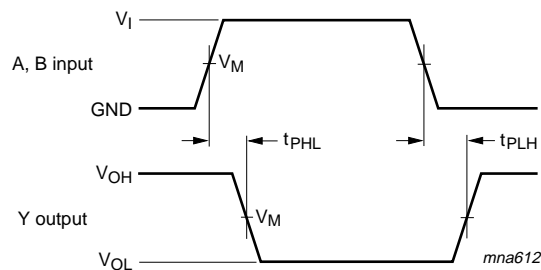
**Table 9. Dynamic characteristics**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 8](#)

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>	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.1	12.1	2.1	13.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.4	7.8	1.4	8.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.1	6.2	1.1	6.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.9	4.6	0.9	5.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	0.8	4.0	0.8	4.4	ns
<b>C<sub>L</sub> = 10 pF</b>							
t <sub>PHL</sub> , t <sub>PLH</sub>	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>					
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.2	14.3	2.2	15.8	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.7	9.2	1.7	10.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	7.3	1.5	8.1	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.2	5.6	1.2	6.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	5.0	1.2	5.5	ns

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

Symbol	Parameter	Conditions	-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Max	Min	Max	
<b><math>C_L = 15 \text{ pF}</math></b>							
$t_{PHL}, t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>					
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	3.1	16.4	3.1	18.1	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.0	10.4	2.0	11.5	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.7	8.3	1.7	9.2	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.5	6.3	1.5	7.0	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.4	5.7	1.4	6.3	ns
<b><math>C_L = 30 \text{ pF}</math></b>							
$t_{PHL}, t_{PLH}$	HIGH-to-LOW and LOW-to-HIGH propagation delay A or B to Y	see <a href="#">Figure 7</a>					
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	4.1	22.4	4.1	24.7	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.9	13.9	2.9	15.3	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.3	11.1	2.3	12.3	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.1	8.5	2.1	9.4	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.1	7.7	2.1	8.5	ns

## 12. Waveforms

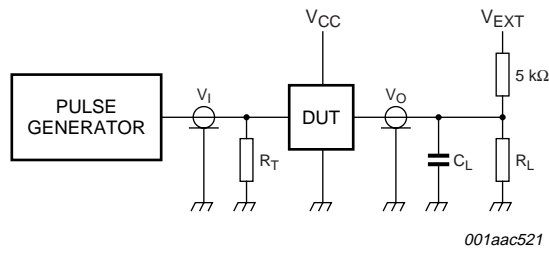


Measurement points are given in [Table 10](#).  
 Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

**Fig 7. The data input (A or B) to output (Y) propagation delays**

**Table 10. 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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{CC}$	$\leq 3.0 \text{ ns}$



Test data is given in [Table 11](#).

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 8. Load circuitry for switching times**

**Table 11. Test data**

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

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

13. Package outline

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

SOT353-1

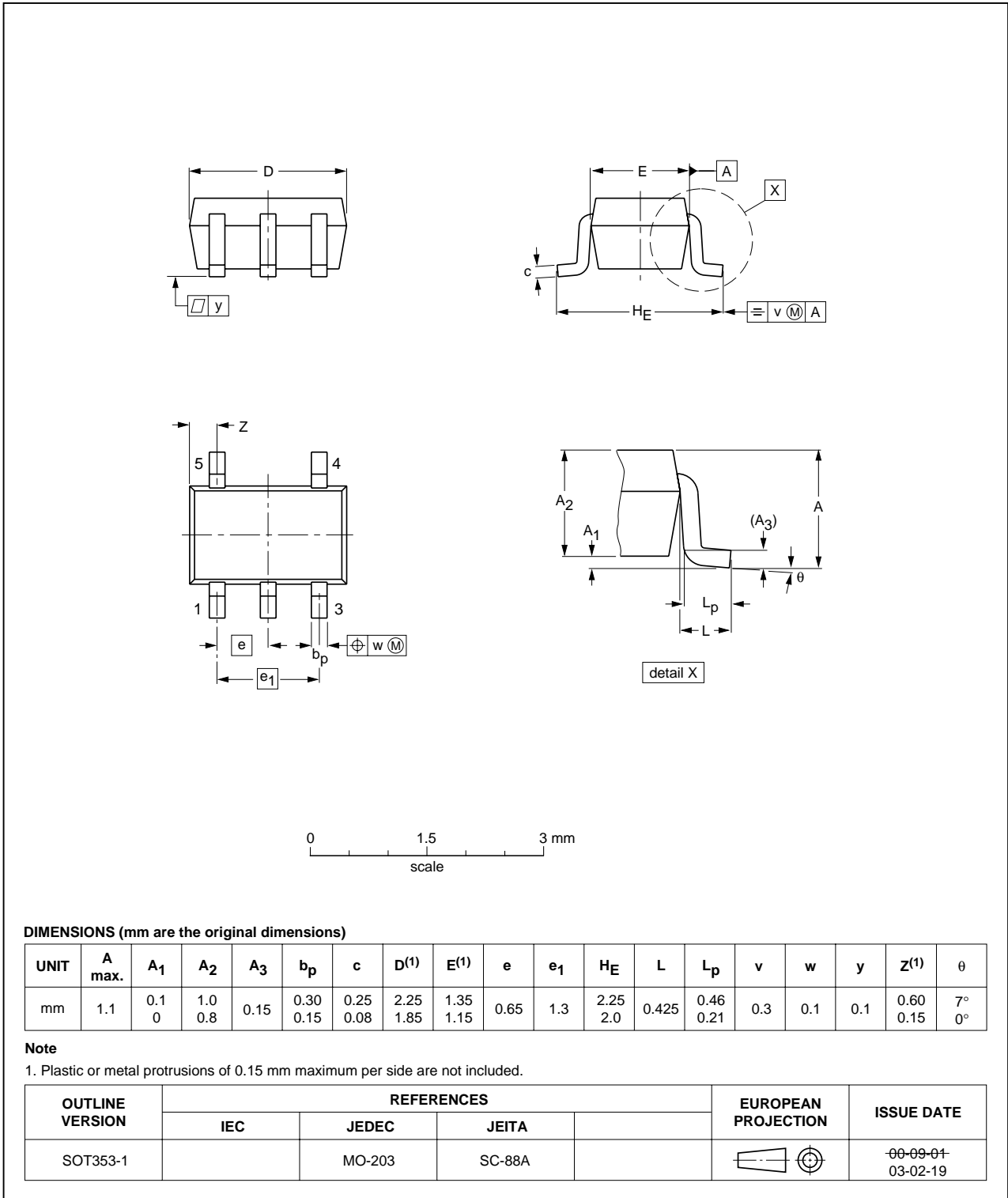


Fig 9. Package outline SOT353-1 (TSSOP5)

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

SOT886



Fig 10. Package outline SOT886 (XSON6)

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

SOT891

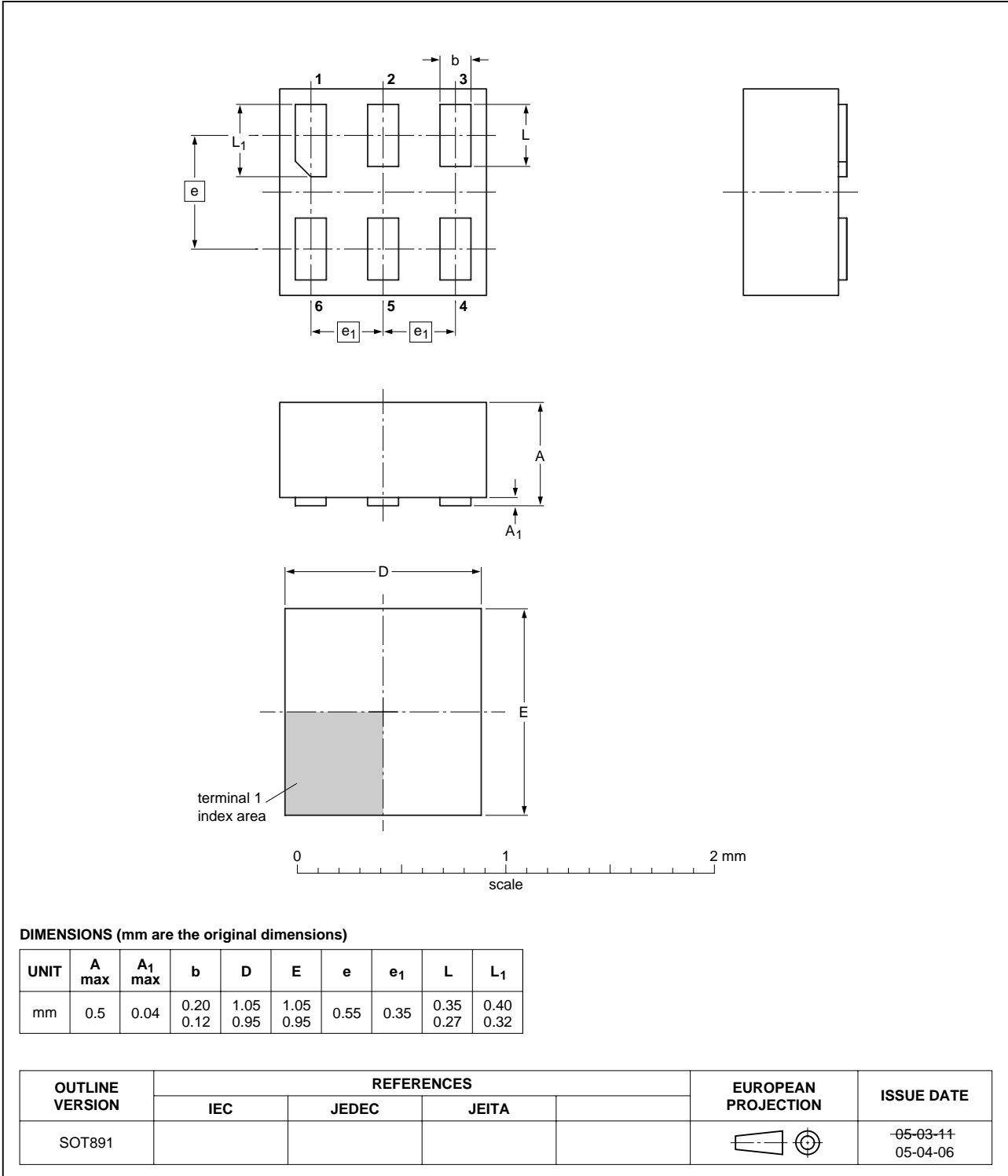


Fig 11. Package outline SOT891 (XSON6)

## 14. Abbreviations

Table 12: 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 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G02_2	20060628	Product data sheet	-	74AUP1G02_1
Modifications:	<ul style="list-style-type: none"><li>• ESD HBM and <math>C_{PD}</math> values modified in <a href="#">Section 2</a>, <a href="#">Table 8</a></li><li>• Added type number 74AUP1G02GF (XSON6/SOT891) package</li></ul>			
74AUP1G02_1	20050718	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".

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