74AUP1G07

Low-power buffer with open-drain output Rev. 01 — 10 October 2006

Product data sheet

General description 1.

The 74AUP1G07 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 74AUP1G07 provides the single non-inverting buffer with open-drain output. The output of the device is an open drain and can be connected to other open-drain outputs to implement active-LOW wired-OR or active-HIGH wired-AND functions.

Features 2.

- 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-D Class 3A exceeds 5000 V
 - MM JESD22-A115-A exceeds 200 V
 - ◆ CDM JESD22-C101-C exceeds 1000 V
- Low static power consumption; $I_{CC} = 0.9 \mu A$ (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 °C to +85 °C and -40 °C to +125 °C



Low-power buffer with open-drain output

3. Ordering information

Table 1. Ordering information

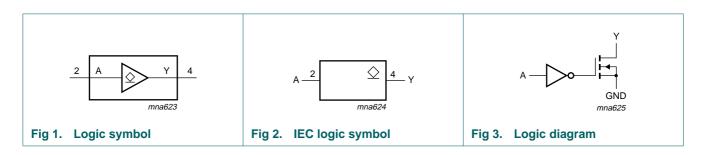
Type number	Package							
	Temperature range	Name	Description	Version				
74AUP1G07GW	–40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm	SOT353-1				
74AUP1G07GM	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886				
74AUP1G07GF	–40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1 \times 0.5 mm	SOT891				

4. Marking

Table 2. Marking

Type number	Marking code
74AUP1G07GW	pS
74AUP1G07GM	pS
74AUP1G07GF	pS

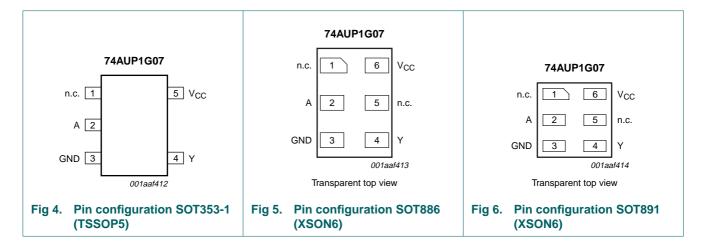
5. Functional diagram



Low-power buffer with open-drain output

6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. 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)
Υ	4	4	data output Y
n.c.	-	5	not connected
V _{CC}	5	6	supply voltage

7. Functional description

Table 4. Function table[1]

Input	Output
A	Υ
L	L
H	Z

- [1] H = HIGH voltage level;
 - L = LOW voltage level;
 - Z = high-impedance OFF state.

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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		<u>[1]</u> –0.5	+4.6	V
I_{OK}	output clamping current	V _O < 0 V	-	-50	mA
Vo	output voltage	Active mode and Power-down mode	<u>[1]</u> –0.5	+4.6	V
Io	output current	$V_O = 0 V \text{ to } V_{CC}$	-	+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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	[2] -	250	mW

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

9. Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		0.8	3.6	V
VI	input voltage		0	3.6	V
Vo	output voltage	Active mode and Power-down mode	0	3.6	V
T _{amb}	ambient temperature		-40	+125	°C
Δt/ΔV	input transition rise and fall rate	$V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	0	200	ns/V

^[2] For TSSOP5 packages: above 87.5 $^{\circ}$ C the value of P_{tot} derates linearly with 4.0 mW/K. For XSON6 packages: above 45 $^{\circ}$ C the value of P_{tot} derates linearly with 2.4 mW/K.

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10. Static characteristics

Table 7. Static characteristics

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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$T_{amb} = 2$	5 °C					
V_{IH}	HIGH-level 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 V to 2.7 V	1.6	-	-	V
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.0	-	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 0.8 \text{ V}$	-	-	$0.30 \times V_{\text{CC}}$	V
		$V_{CC} = 0.9 \text{ V to } 1.95 \text{ V}$	-	-	$0.35 \times V_{CC}$	V
		V_{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	-	-	0.9	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 20 μ A; V_{CC} = 0.8 V to 3.6 V	-	-	0.1	V
		$I_O = 1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$	-	-	$0.3\times V_{CC}$	V
		$I_O = 1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$	-	-	0.31	V
		$I_O = 1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.31	V
		$I_O = 2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.31	V
		$I_O = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.44	V
		$I_{O} = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.31	V
		$I_O = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.44	V
I _I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.1	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.2	μΑ
ΔI_{OFF}	additional power-off leakage current	V_1 or $V_0 = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V	-	-	±0.2	μΑ
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V	-	-	0.5	μΑ
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$	-	-	40	μΑ
Cı	input capacitance	V_{CC} = 0 V to 3.6 V; V_{I} = GND or V_{CC}	-	8.0	-	pF
Co	output capacitance	output enabled; $V_O = GND$; $V_{CC} = 0 V$	-	1.7	-	pF
		output disabled; $V_O = GND$; $V_{CC} = 0 V$	-	1.1	-	рF
T _{amb} = -	40 °C to +85 °C					
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	$0.70 \times V_{CC}$	-	-	V
		V _{CC} = 0.9 V to 1.95 V	$0.65 \times V_{CC}$	-	-	V
		V _{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		V_{CC} = 3.0 V to 3.6 V	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 0.8 V	-	-	$0.30 \times V_{CC}$	V
		V _{CC} = 0.9 V to 1.95 V	-	-	$0.35 \times V_{CC}$	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		V _{CC} = 3.0 V to 3.6 V	-	-	0.9	V

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Table 7. Static characteristics ...continued
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 20 μ A; V_{CC} = 0.8 V to 3.6 V	-	-	0.1	V
		$I_{O} = 1.1 \text{ mA}; V_{CC} = 1.1 \text{ V}$	-	-	$0.3 \times V_{CC}$	V
		$I_{O} = 1.7 \text{ mA}; V_{CC} = 1.4 \text{ V}$	-	-	0.37	V
		$I_{O} = 1.9 \text{ mA}; V_{CC} = 1.65 \text{ V}$	-	-	0.35	V
		$I_{O} = 2.3 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.33	V
		$I_{O} = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	0.45	V
		$I_{O} = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.33	V
		$I_{O} = 4.0 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	0.45	V
I _I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.5	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.5	μΑ
ΔI_{OFF}	additional power-off leakage current	V_1 or $V_0 = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V	-	-	±0.6	μΑ
Icc	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V	-	-	0.9	μΑ
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$	-	-	50	μΑ
T _{amb} = -	40 °C to +125 °C					
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	$0.75 \times V_{CC}$	-	-	V
		V _{CC} = 0.9 V to 1.95 V	$0.70 \times V_{CC}$	-	-	V
		V_{CC} = 2.3 V to 2.7 V	1.6	-	-	V
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.0	-	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 0.8 V	-	-	$0.25 \times V_{CC}$	V
		V _{CC} = 0.9 V to 1.95 V	-	-	$0.30 \times V_{CC}$	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	V
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	-	-	0.9	V
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 20 μ A; V_{CC} = 0.8 V to 3.6 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
l _l	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.75	μΑ
I _{OFF}	power-off leakage current	V_I or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.75	μΑ
ΔI_{OFF}	additional power-off leakage current	V_1 or $V_0 = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V	-	-	±0.75	μΑ
I _{CC}	supply current	V_I = GND or V_{CC} ; I_O = 0 A; V_{CC} = 0.8 V to 3.6 V	-	-	1.4	μΑ
ΔI_{CC}	additional supply current	$V_1 = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$	-	-	75	μΑ

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11. Dynamic characteristics

Table 8. Dynamic characteristics

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

Symbol	Parameter	Conditions		25 °C		-4	0 °C to +1	25 °C	Unit
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
$C_L = 5 pl$	F		'		•	•		•	
t _{pd}	propagation delay	A to Y; see Figure 7	2]						
		$V_{CC} = 0.8 V$	-	11.6	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	2.1	4.1	7.5	1.7	9.1	10.0	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	1.6	3.0	5.1	1.3	6.1	6.7	ns
		V_{CC} = 1.65 V to 1.95 V	1.6	2.7	4.0	1.2	5.0	5.5	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.1	2.1	3.2	0.9	4.0	4.4	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.4	2.2	2.8	1.1	3.3	3.6	ns
C _L = 10	ρF								
t _{pd}	propagation delay	A to Y; see Figure 7	2]						
		$V_{CC} = 0.8 V$	-	14.7	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	3.0	5.1	9.0	2.4	11.2	12.3	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	2.3	3.8	6.1	2.0	7.4	8.1	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.4	3.6	4.8	1.8	6.1	6.7	ns
		V_{CC} = 2.3 V to 2.7 V	1.7	2.8	3.8	1.3	4.8	5.3	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.2	3.1	4.2	1.6	4.5	5.0	ns
C _L = 15	ρF								
t_{pd}	propagation delay	A to Y; see Figure 7	2]						
		$V_{CC} = 0.8 V$	-	17.7	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	3.5	6.1	10.4	3.2	13.1	14.5	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	3.0	4.5	6.8	2.6	8.6	9.4	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	2.8	4.4	6.7	2.2	7.8	8.6	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	2.4	3.4	4.5	1.9	5.3	5.8	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.2	4.0	5.7	1.9	6.1	6.7	ns
$C_L = 30$	oF								
t_{pd}	propagation delay	A to Y; see Figure 7	<u>2]</u>						
		$V_{CC} = 0.8 V$	-	24.6	-	-	-	-	ns
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	4.8	9.0	15.6	4.3	18.8	20.7	ns
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$	4.1	6.7	9.4	3.7	11.8	13.0	ns
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	3.8	6.8	9.7	3.2	11.0	12.1	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	3.7	5.2	6.7	3.0	7.1	7.8	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	3.6	6.4	9.7	2.8	10.4	11.4	ns

Low-power buffer with open-drain output

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 Table 8.
 Dynamic characteristics ...continued

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

Symbol	Parameter	arameter Conditions		25 °C		-40 °C to +125 °C			Unit	
				Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
$C_L = 5 pl$	F, 10 pF, 15 pF and	30 pF								
C_PD	power dissipation capacitance	$f_i = 1 \text{ MHz};$ $V_I = \text{GND to } V_{CC}$	[3]							
		$V_{CC} = 0.8 \text{ V}$		-	0.5	-	-	-	-	pF
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$		-	0.6	-	-	-	-	pF
		$V_{CC} = 1.4 \text{ V to } 1.6 \text{ V}$		-	0.6	-	-	-	-	pF
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$		-	0.7	-	-	-	-	pF
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		-	0.9	-	-	-	-	pF
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$		-	1.2	-	-	-	-	pF

^[1] All typical values are measured at nominal V_{CC}.

[3] 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_0 = 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.

12. Waveforms

74AUP1G07 1

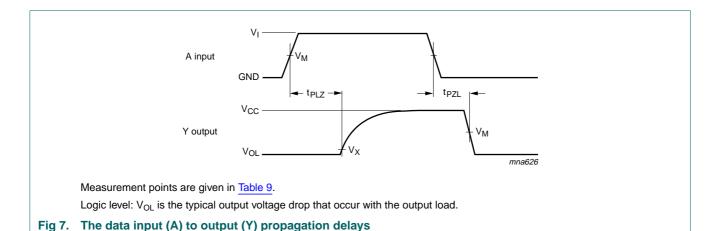
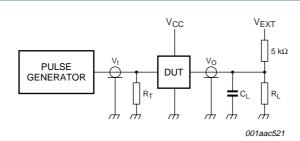


Table 9. Measurement	points		
Supply voltage	Input	Output	
V _{CC}	V _M	V _M	V _X
0.8 V to 1.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.1 V
1.65 V to 2.7 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.15 V
3.0 V to 3.6 V	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	V _{OL} + 0.3 V

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^[2] t_{pd} is the same as t_{PZL} and t_{PLZ} .

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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 8. Load circuitry for switching times

Table 10. Test data

Supply voltage	Load	V _{EXT}			
V _{CC}	CL	R _L [1]	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}
0.8 V to 3.6 V	5 pF, 10 pF, 15 pF and 30 pF	5 k Ω or 1 M Ω	open	GND	$2 \times V_{CC}$

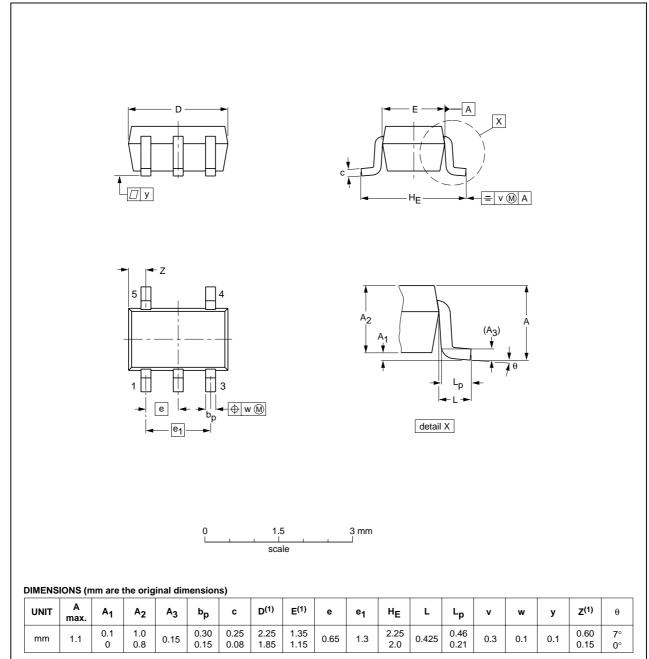
[1] For measuring enable and disable times R_L = 5 $k\Omega$, for measuring propagation delays, setup and hold times and pulse width R_L = 1 $M\Omega$.

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13. Package outline

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

SOT353-1



Note

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

	OUTLINE VERSION	REFERENCES			EUROPEAN	ISSUE DATE	
		IEC	JEDEC	JEITA		PROJECTION	ISSUE DATE
	SOT353-1		MO-203	SC-88A			-00-09-01- 03-02-19
l		l				,	00 02 10

Fig 9. Package outline SOT353-1 (TSSOP5)

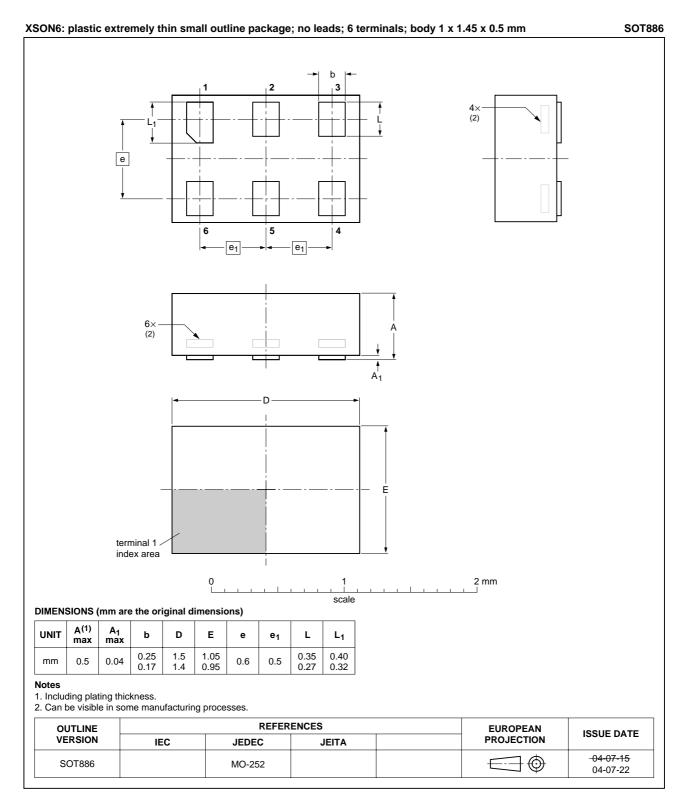


Fig 10. Package outline SOT886 (XSON6)

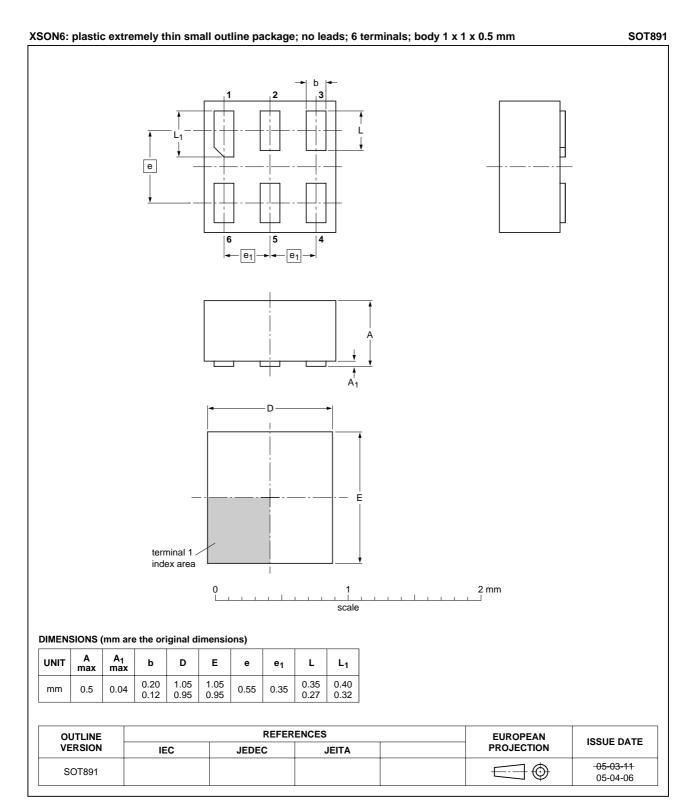


Fig 11. Package outline SOT891 (XSON6)

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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
74AUP1G07_1	20061010	Product data sheet	-	-

Low-power buffer with open-drain output

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	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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Low-power buffer with open-drain output

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