74AUP3G07

Low-power triple buffer with open-drain output Rev. 2 — 5 October 2016 P

Product data sheet

General description 1.

The 74AUP3G07 is a triple 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.

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.

2. **Features and benefits**

- 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-A114F Class 3A exceeds 5000 V
 - MM JESD22-A115-A exceeds 200 V
 - CDM JESD22-C101E exceeds 1000 V
- Low static power consumption; $I_{CC} = 0.9 \mu A$ (maximum)
- Latch-up performance exceeds 100 mA per JESD 78B 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



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3. Ordering information

Table 1. Ordering information

Type number	Package							
	Temperature range	Name	Description	Version				
74AUP3G07DC	-40 °C to +125 °C	VSSOP8	plastic very thin shrink small outline package; 8 leads; body width 2.3 mm	SOT765-1				
74AUP3G07GT	–40 °C to +125 °C	XSON8	plastic extremely thin small outline package; no leads; 8 terminals; body 1 \times 1.95 \times 0.5 mm	SOT833-1				
74AUP3G07GM	–40 °C to +125 °C	XQFN8	plastic, extremely thin quad flat package; no leads; 8 terminals; body 1.6 \times 1.6 \times 0.5 mm	SOT902-2				
74AUP3G07GN	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.2 \times 1.0 \times 0.35$ mm	SOT1116				
74AUP3G07GS	–40 °C to +125 °C	XSON8	extremely thin small outline package; no leads; 8 terminals; body $1.35 \times 1.0 \times 0.35$ mm	SOT1203				

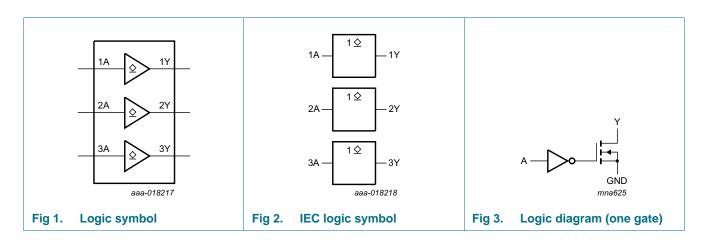
4. Marking

Table 2. Marking codes

Type number	Marking code ^[1]
74AUP3G07DC	p07
74AUP3G07GT	p07
74AUP3G07GM	p07
74AUP3G07GN	р7
74AUP3G07GS	р7

^[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

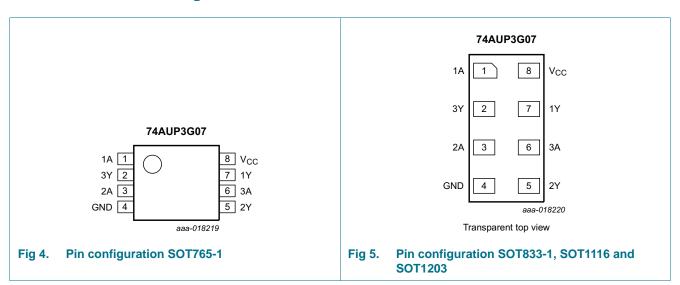
5. Functional diagram

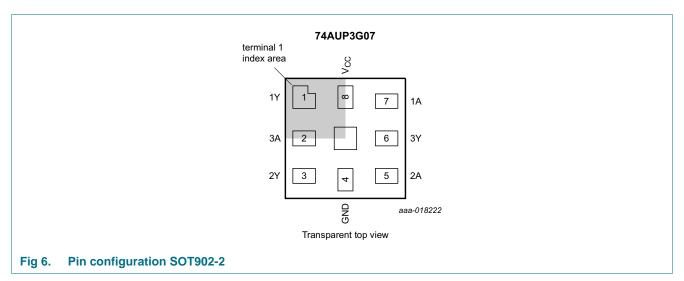


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6. Pinning information

6.1 Pinning





6.2 Pin description

Table 3. Pin description

Symbol	Pin	Description	
	SOT765-1, SOT833-1, SOT1116 and SOT1203	SOT902-2	
1A, 2A, 3A	1, 3, 6	7, 5, 2	data input
1Y, 2Y, 3Y	7, 5, 2	1, 3, 6	data output
GND	4	4	ground (0 V)
V _{CC}	8	8	supply voltage

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7. Functional description

Table 4. Function table[1]

Input nA	Output nY
L	L
Н	Z

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

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
VI	input voltage	[1]	-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 [1]	-0.5	+4.6	V
Io	output current	$V_O = 0 \text{ V to } V_{CC}$	-	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	$T_{amb} = -40 ^{\circ}\text{C} \text{ to } +125 ^{\circ}\text{C}$	-	250	mW

^[1] The minimum 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 V to 3.6 V	0	200	ns/V

^[2] For VSSOP8 packages: above 110 °C, the value of P_{tot} derates linearly with 8.0 mW/K. For XSON8 and XQFN8 packages: above 118 °C, the value of P_{tot} derates linearly with 7.8 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 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
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 20 \mu A; V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	0.1	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	$0.3 \times V_{CC}$	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
		$I_{O} = 2.7 \text{ mA}; V_{CC} = 3.0 \text{ V}$	-	-	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
l _{OZ}	OFF-state output current	$V_I = V_{IH}$; $V_O = 0 \ V$ to 3.6 V; $V_{CC} = 0 \ V$ to 3.6 V	-	-	±0.1	μΑ
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 0 \text{ V}$ to 3.6 V; $V_{CC} = 0 \text{ V}$	-	-	±0.2	μА
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	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	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	$V_{CC} = 0 \text{ V to } 3.6 \text{ V; } V_{I} = \text{GND or } V_{CC}$	-	0.7	-	pF
Co	output capacitance	$V_O = GND; V_{CC} = 0 V$	-	0.9	-	pF
T _{amb} = -	40 °C to +85 °C	-				1
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 × 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 × V _{CC}	V
		V _{CC} = 0.9 V to 1.95 V	-	-	0.35 × 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}				
		$I_O = 20 \mu A$; $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	0.1	V
		I _O = 1.1 mA; V _{CC} = 1.1 V	-	-	$0.3 \times V_{CC}$	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
		$I_{O} = 3.1 \text{ mA}; V_{CC} = 2.3 \text{ V}$	-	-	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
l _l	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.5	μΑ
l _{OZ}	OFF-state output current	$V_I = V_{IH}$; $V_O = 0 \text{ V to } 3.6 \text{ V}$; $V_{CC} = 0 \text{ V}$ 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 _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V to 0.2 V	-	-	±0.6	μΑ
I _{CC}	supply current	$V_{I} = GND \text{ or } V_{CC}; I_{O} = 0 \text{ A};$ $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	0.9	μΑ
ΔI_{CC}	additional supply current	$V_1 = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$	-	-	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 × 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	-	-	0.25 × V _{CC}	V
		V _{CC} = 0.9 V to 1.95 V	-	-	0.30 × 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
V _{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		$I_O = 20 \mu A$; $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	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 _I	input leakage current	V_I = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.75	μΑ
l _{OZ}	OFF-state output current	$V_{I} = V_{IH}$; $V_{O} = 0 \text{ V to } 3.6 \text{ V}$; $V_{CC} = 0 \text{ V}$ to 3.6 V	-	-	±0.75	μΑ
I _{OFF}	power-off leakage current	V_1 or $V_0 = 0$ V to 3.6 V; $V_{CC} = 0$ V	-	-	±0.75	μА

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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
ΔI_{OFF}	additional power-off leakage current	V_1 or $V_O = 0$ V to 3.6 V; $V_{CC} = 0$ V to 0.2 V	-	-	±0.75	μΑ
I _{CC}	supply current	$V_I = GND \text{ or } V_{CC}; I_O = 0 \text{ A};$ $V_{CC} = 0.8 \text{ V to } 3.6 \text{ V}$	-	-	1.4	μА
ΔI_{CC}	additional supply current	$V_I = V_{CC} - 0.6 \text{ V}; I_O = 0 \text{ A}; V_{CC} = 3.3 \text{ V}$	-	-	75	μΑ

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			–40 °C to +125 °C		
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C _L = 5 pl	F			•					
t _{pd}	propagation delay	nA to nY; see Figure 7							
		V _{CC} = 0.8 V	-	11.6	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	2.1	4.1	7.5	1.7	9.1	10.0	ns
		V _{CC} = 1.4 V to 1.6 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 V to 2.7 V	1.1	2.1	3.2	0.9	4.0	4.4	ns
		V _{CC} = 3.0 V to 3.6 V	1.4	2.2	2.8	1.1	3.3	3.6	ns
C _L = 10	ρF	1							
t _{pd}	propagation delay	nA to nY; see Figure 7							
		V _{CC} = 0.8 V	-	14.7	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.0	5.1	9.0	2.4	11.2	12.3	ns
		V _{CC} = 1.4 V to 1.6 V	2.3	3.8	6.1	2.0	7.4	8.1	ns
		V _{CC} = 1.65 V to 1.95 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 V to 3.6 V	2.2	3.1	4.2	1.6	4.5	5.0	ns
C _L = 15	ρF							1	
t _{pd}	propagation delay	nA to nY; see Figure 7							
		V _{CC} = 0.8 V	-	17.7	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	3.5	6.1	10.4	3.2	13.1	14.5	ns
		V _{CC} = 1.4 V to 1.6 V	3.0	4.5	6.8	2.6	8.6	9.4	ns
		V _{CC} = 1.65 V to 1.95 V	2.8	4.4	6.7	2.2	7.8	8.6	ns
		V _{CC} = 2.3 V to 2.7 V	2.4	3.4	4.5	1.9	5.3	5.8	ns
		V _{CC} = 3.0 V to 3.6 V	2.2	4.0	5.7	1.9	6.1	6.7	ns

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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	Conditions		25 °C		-4	0 °C to +	125 °C	Unit
			Min	Typ[1]	Max	Min	Max (85 °C)	Max (125 °C)	
C _L = 30 p	οF								
t _{pd}	propagation delay	nA to nY; see Figure 7							
		V _{CC} = 0.8 V	-	26.7	-	-	-	-	ns
		V _{CC} = 1.1 V to 1.3 V	4.8	9.0	15.6	4.3	18.8	20.7	ns
		V _{CC} = 1.4 V to 1.6 V	4.1	6.7	9.4	3.7	11.8	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.8	6.8	9.7	3.2	11.0	12.1	ns
		V _{CC} = 2.3 V to 2.7 V	3.7	5.2	6.7	3.0	7.1	7.8	ns
		V _{CC} = 3.0 V to 3.6 V	3.6	6.4	9.7	2.8	10.4	11.4	ns
C _L = 5 pl	F, 10 pF, 15 pF and	30 pF						1	
C _{PD}	power dissipation	$f_i = 1 \text{ MHz}; V_I = \text{GND to } V_{CC}$ [3][4]							
	capacitance	V _{CC} = 0.8 V	-	0.5	-	-	-	-	рF
		V _{CC} = 1.1 V to 1.3 V	-	0.6	-	-	-	-	рF
		V _{CC} = 1.4 V to 1.6 V	-	0.6	-	-	-	-	рF
		V _{CC} = 1.65 V to 1.95 V	-	0.7	-	-	-	-	рF
		V _{CC} = 2.3 V to 2.7 V	-	0.9	-	-	-	-	pF
		V _{CC} = 3.0 V to 3.6 V	-	1.2	-	-	-	-	pF

- [1] All typical values are measured at nominal V_{CC}.
- [2] t_{pd} is the same as t_{PZL} and t_{PLZ} .
- [3] All specified values are the average typical values over all stated loads.
- [4] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N$ where:

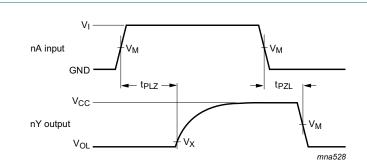
 f_i = input frequency in MHz;

V_{CC} = supply voltage in V;

N = number of inputs switching.

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12. Waveforms



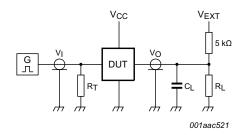
Measurement points are given in Table 9.

Logic level: V_{OL} is the typical output voltage level that occurs with the output load.

Fig 7. The data input (nA) to output (nY) propagation delays

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



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_0 of the pulse generator.

 V_{EXT} = External voltage for measuring switching times.

Fig 8. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load		V _{EXT}		
V _{CC}	VI	t _r , t _f	CL	R _L [1]	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t_{PZL}, t_{PLZ}
0.8 V to 3.6 V	V _{CC}	≤ 3 ns	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 Ω , for measuring propagation delays, set-up and hold times and pulse width R_L = 1 M Ω .

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13. Package outline

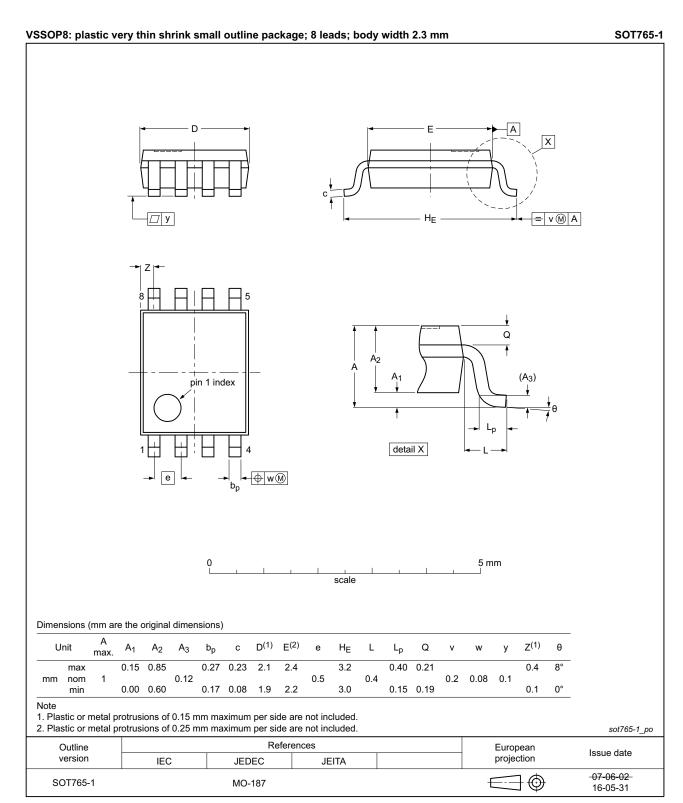


Fig 9. Package outline SOT765-1 (VSSOP8)

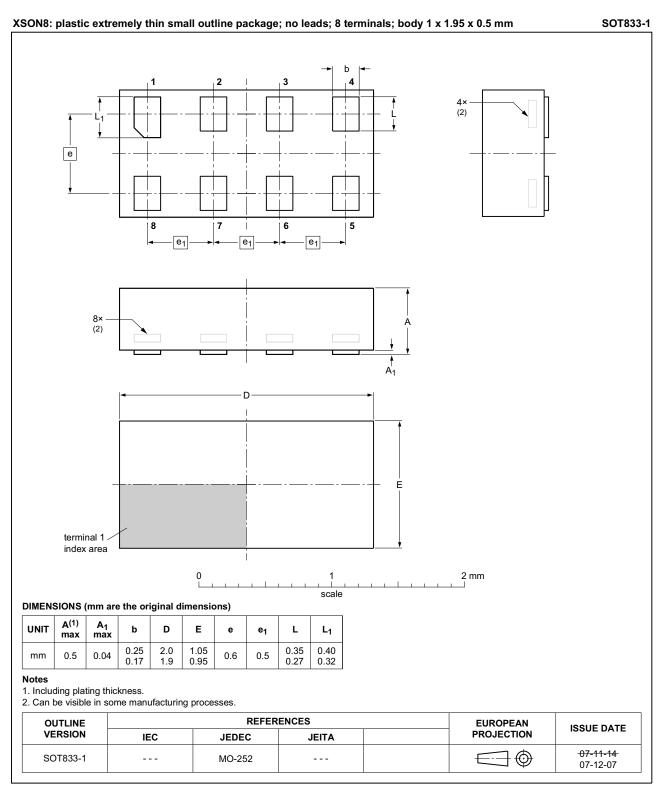


Fig 10. Package outline SOT833-1 (XSON8)

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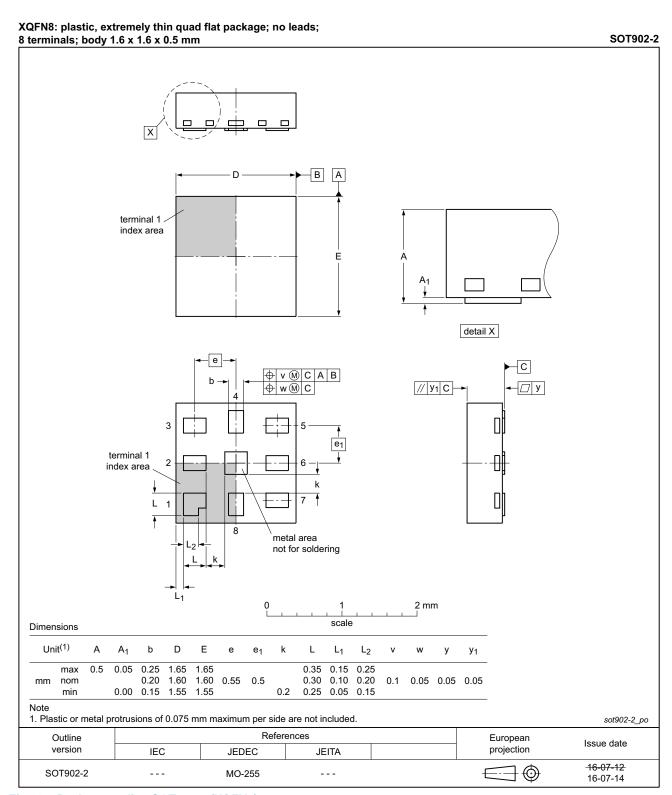


Fig 11. Package outline SOT902-2 (XQFN8)

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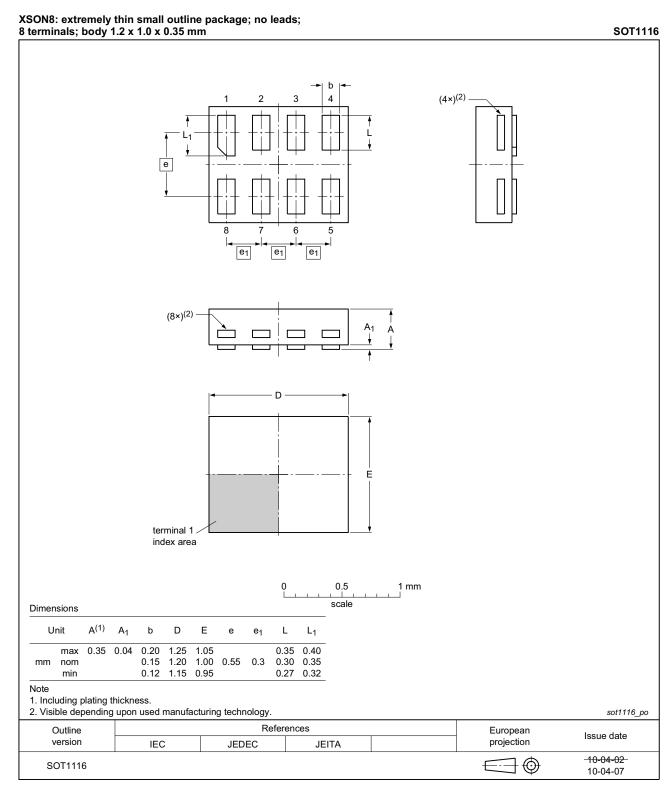


Fig 12. Package outline SOT1116 (XSON8)

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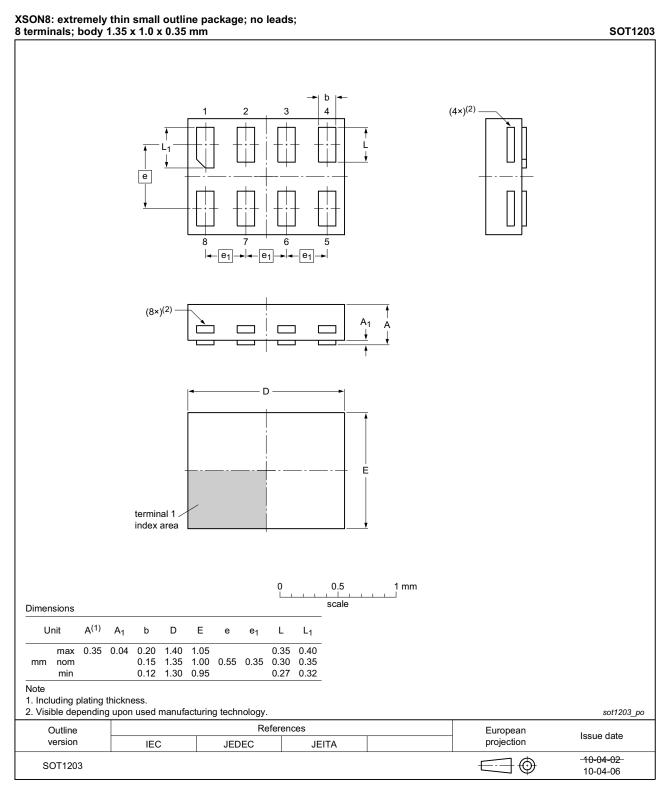


Fig 13. Package outline SOT1203 (XSON8)

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14. Abbreviations

Table 11. Abbreviations

Acronym	Description		
CDM	Charged Device Model		
DUT	Device Under Test		
ESD	ElectroStatic Discharge		
HBM	Human Body Model		
MM	Machine Model		

15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AUP3G07 v.2	20161005	Product data sheet	-	74AUP3G07 v.1	
Modifications:	Type numbers 74AUP3G07GD and 74AUP3G07GF removed.				
74AUP3G07 v.1	20150608	Product data sheet	-	-	

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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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