74AUP2G07

Low-power dual buffer with open-drain output

Rev. 11 — 26 July 2023

Product data sheet

1. General description

The 74AUP2G07 is a dual buffer with open-drain outputs. Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times. This device ensures 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 potentially 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
- CMOS low power dissipation
- · High noise immunity
- Overvoltage tolerant inputs to 3.6 V
- Low noise overshoot and undershoot < 10 % of V_{CC}
- I_{OFF} circuitry provides partial Power-down mode operation
- · Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Low static-power consumption; I_{CC} = 0.9 μA (maximum)
- · Complies with JEDEC standards:
 - JESD8-12 (0.8 V to 1.3 V)
 - JESD8-11 (0.9 V to 1.65 V)
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.7 V)
 - JESD8C (2.7 V to 3.6 V)
- ESD protection:
 - HBM: ANSI/ESDA/JEDEC JS-001 class 3A exceeds 5000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- 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	Package									
	Temperature range Name Description										
74AUP2G07GW	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	SOT363-2							
74AUP2G07GM	-40 °C to +125 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886							
74AUP2G07GN	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	<u>SOT1115</u>							
74AUP2G07GS	-40 °C to +125 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202							
74AUP2G07GX	-40 °C to +125 °C	X2SON6	plastic thermal enhanced extremely thin small outline package; no leads; 6 terminals; body 1.0 × 0.8 × 0.32 mm	SOT1255-2							

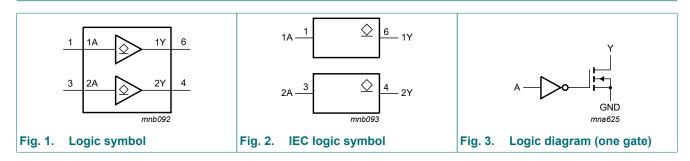
4. Marking

Table 2. Marking

Table 2. Marking						
Type number	Marking code[1]					
74AUP2G07GW	p7					
74AUP2G07GM	p7					
74AUP2G07GN	p7					
74AUP2G07GS	p7					
74AUP2G07GX	р7					

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

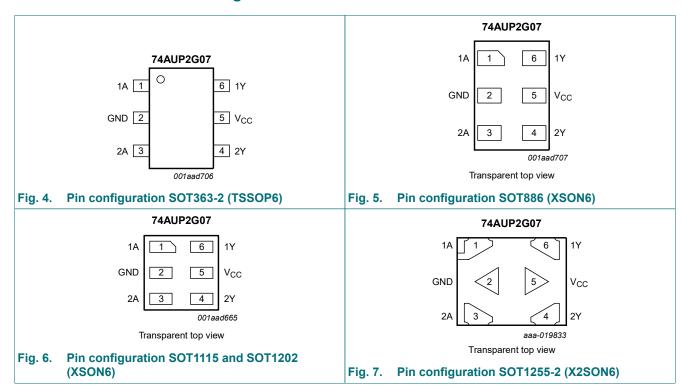
5. Functional diagram



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6. Pinning information

6.1. Pinning



6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
1A	1	data input
GND	2	ground (0 V)
2A	3	data input
2Y	4	data output
V _{CC}	5	supply voltage
1Y	6	data output

7. Functional description

Table 4. Function table

 $H = HIGH \text{ voltage level}; L = LOW \text{ voltage level}; Z = high-impedance OFF state.}$

Input	Output
nA	nY
L	L
Н	Z

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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
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	$T_{amb} = -40 ^{\circ}\text{C to } +125 ^{\circ}\text{C}$ [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		8.0	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

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 × 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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^[2] For SOT363-2 (TSSOP6) package: Ptot derates linearly with 3.7 mW/K above 83 °C.

For SOT886 (XSON6) package: Ptot derates linearly with 3.3 mW/K above 74 °C.

For SOT1115 (XSON6) package: P_{tot} derates linearly with 3.2 mW/K above 71 °C.

For SOT1202 (XSON6) package: P_{tot} derates linearly with 3.3 mW/K above 74 °C.

For SOT1255-2 (X2SON6) package: Ptot derates linearly with 3.3 mW/K above 75 °C.

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{OL}	LOW-level 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 _I	input leakage current	V_{I} = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.1	μA
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	μA
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 0 \text{ V to } 3.6 \text{ V; } V_{CC} = 0 \text{ V}$	-	-	±0.2	μA
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	μA
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	$V_{CC} = 0 \text{ V to } 3.6 \text{ V; } V_I = \text{GND or } V_{CC}$	-	0.7	-	pF
Co	output capacitance	$V_O = GND; V_{CC} = 0 V$	-	0.9	-	pF
T _{amb} = -4	40 °C to +85 °C			'	1	1
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	0.70 × 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
V _{OL}	LOW-level 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

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
l _l	input leakage current	V_{I} = GND to 3.6 V; V_{CC} = 0 V to 3.6 V	-	-	±0.5	μA
I _{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	-	-	±0.5	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
Δl _{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
I _{CC}	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} = -4	40 °C to +125 °C					
V _{IH}	HIGH-level input voltage	V _{CC} = 0.8 V	0.75 × 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 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 × 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
l _l	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	$V_I = V_{IH}$; $V_O = 0 \text{ V to } 3.6 \text{ V}$; $V_{CC} = 0 \text{ V to } 3.6 \text{ V}$	-	-	±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	μΑ
Δl _{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	μA
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 Fig. 9.

Symbol	Parameter	Conditions		25 °C			°C to 5 °C		°C to 5 °C	Unit
			Min	Typ [1]	Max	Min	Max	Min	Max	
C _L = 5 p	F									
t _{pd}	propagation	nA to nY; see Fig. 8 [2]								
	delay	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	1.7	10.0	ns
		V _{CC} = 1.4 V to 1.6 V	1.6	3.0	5.1	1.3	6.1	1.3	6.7	ns
		V _{CC} = 1.65 V to 1.95 V	1.6	2.7	4.0	1.2	5.0	1.2	5.5	ns
		V _{CC} = 2.3 V to 2.7 V	1.1	2.1	3.2	0.9	4.0	0.9	4.4	ns
		V _{CC} = 3.0 V to 3.6 V	1.4	2.2	2.8	1.1	3.3	1.1	3.6	ns
C _L = 10	pF									
t _{pd}	propagation	nA to nY; see Fig. 8 [2]								
	delay	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	2.4	12.3	ns
		V _{CC} = 1.4 V to 1.6 V	2.3	3.8	6.1	2.0	7.4	2.0	8.1	ns
		V _{CC} = 1.65 V to 1.95 V	2.4	3.6	4.8	1.8	6.1	1.8	6.7	ns
		V _{CC} = 2.3 V to 2.7 V	1.7	2.8	3.8	1.3	4.8	1.3	5.3	ns
		V _{CC} = 3.0 V to 3.6 V	2.2	3.1	4.2	1.6	4.5	1.6	5.0	ns
C _L = 15	pF									
t _{pd}	propagation	nA to nY; see Fig. 8 [2]								
	delay	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	3.2	14.5	ns
		V _{CC} = 1.4 V to 1.6 V	3.0	4.5	6.8	2.6	8.6	2.6	9.4	ns
		V _{CC} = 1.65 V to 1.95 V	2.8	4.4	6.7	2.2	7.8	2.2	8.6	ns
		V _{CC} = 2.3 V to 2.7 V	2.4	3.4	4.5	1.9	5.3	1.9	5.8	ns
		V _{CC} = 3.0 V to 3.6 V	2.2	4.0	5.7	1.9	6.1	1.9	6.7	ns
C _L = 30	pF									
t _{pd}	propagation	nA to nY; see Fig. 8 [2]								
	delay	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	4.3	20.7	ns
		V _{CC} = 1.4 V to 1.6 V	4.1	6.7	9.4	3.7	11.8	3.7	13.0	ns
		V _{CC} = 1.65 V to 1.95 V	3.8	6.8	9.7	3.2	11.0	3.2	12.1	ns
		V _{CC} = 2.3 V to 2.7 V	3.7	5.2	6.7	3.0	7.1	3.0	7.8	ns
		V _{CC} = 3.0 V to 3.6 V	3.6	6.4	9.7	2.8	10.4	2.8	11.4	ns

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Symbol	Symbol Parameter Conditions 25 °C Min Typ [1] Max		25 °C		-40 ° +85		_	°C to 5 °C	Unit				
			Min	Typ [1]	Max	Min	Max	Min	Max				
C _L = 5 p	F, 10 pF, 15 pF	and 30 pF											
C _{PD}	power	$f_i = 1 \text{ MHz}; V_I = \text{GND to } V_{CC}$ [3][4]											
	dissipation capacitance	V _{CC} = 0.8 V	-	0.5	-	-	-	-	-	pF			
	capacitaricc	oapaonanoo	capacitarios		V _{CC} = 1.1 V to 1.3 V	-	0.6	-	-	-	-	-	pF
		V _{CC} = 1.4 V to 1.6 V	-	0.6	-	-	-	-	-	pF			
		V _{CC} = 1.65 V to 1.95 V	-	0.7	-	-	-	-	-	pF			
		V _{CC} = 2.3 V to 2.7 V	-	0.9	-	-	-	-	-	pF			
		V _{CC} = 3.0 V to 3.6 V	-	1.2	-	-	-	-	-	pF			

- All typical values are measured at nominal V_{CC}.
- t_{pd} is the same as t_{PZL} and t_{PLZ} .
- All specified values are the average typical values over all stated loads.
- C_{PD} is used to determine the dynamic power dissipation (P_D in μ W). $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N$ where:

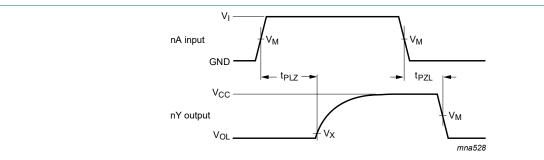
 f_i = input frequency in MHz;

 V_{CC} = supply voltage in V;

N = number of inputs switching.

Low-power dual buffer with open-drain output

11.1. Waveforms and test circuit



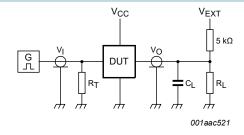
Measurement points are given in Table 9.

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

Fig. 8. The data input (nA) to output (nY) propagation delays

Table 9. Measurement points

Supply voltage	Input			Output	
V _{CC}	V _M	V _I	$t_r = t_f$	V _M	V _X
0.8 V to 1.6 V	0.5 × V _{CC}	V _{CC}	≤ 3.0 ns	0.5 × V _{CC}	V _{OL} + 0.1 V
1.65 V to 2.7 V	0.5 × V _{CC}	V _{CC}	≤ 3.0 ns	0.5 × V _{CC}	V _{OL} + 0.15 V
3.0 V to 3.6 V	0.5 × V _{CC}	V _{CC}	≤ 3.0 ns	0.5 × 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. 9. Test circuit for measuring 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 kΩ or 1 MΩ	open	GND	2 × 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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Low-power dual buffer with open-drain output

12. Package outline

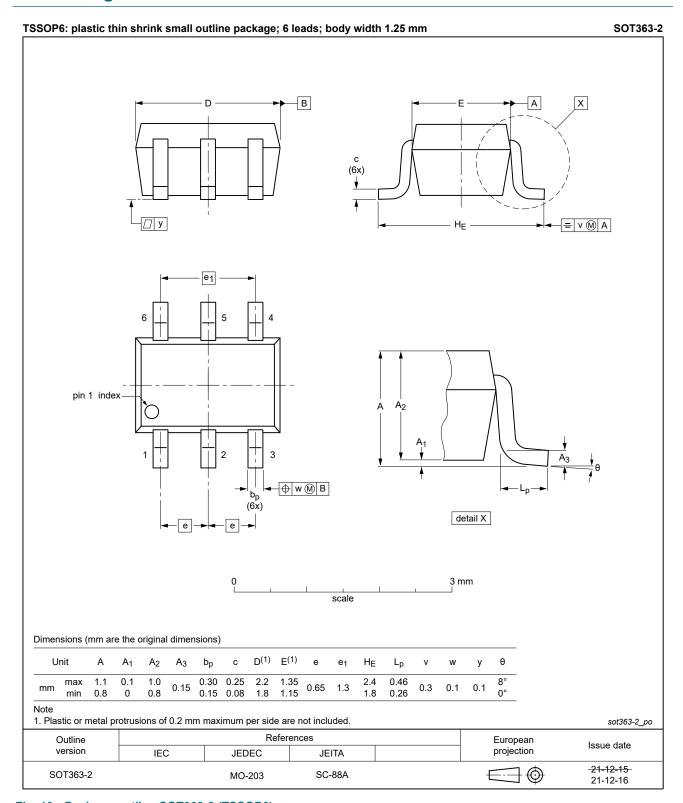


Fig. 10. Package outline SOT363-2 (TSSOP6)

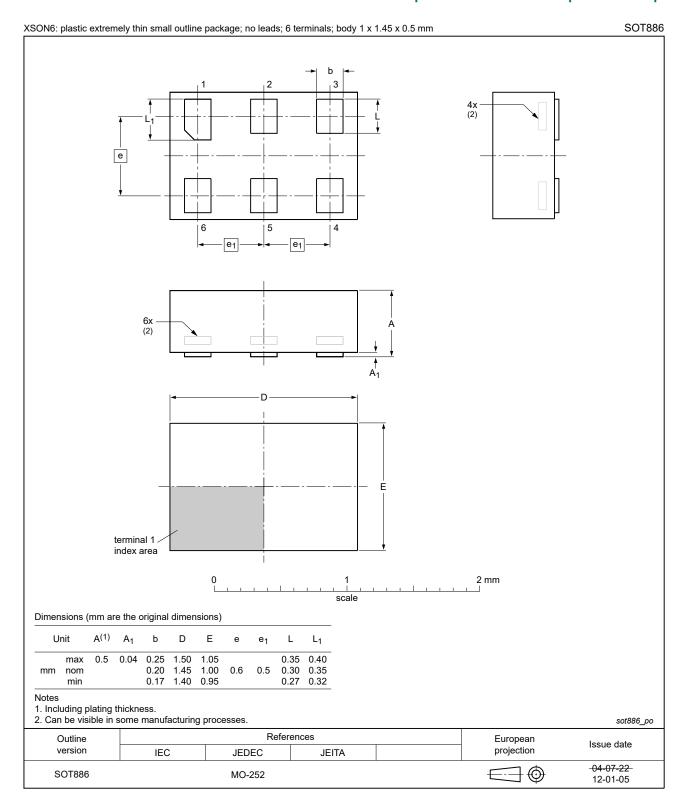


Fig. 11. Package outline SOT886 (XSON6)

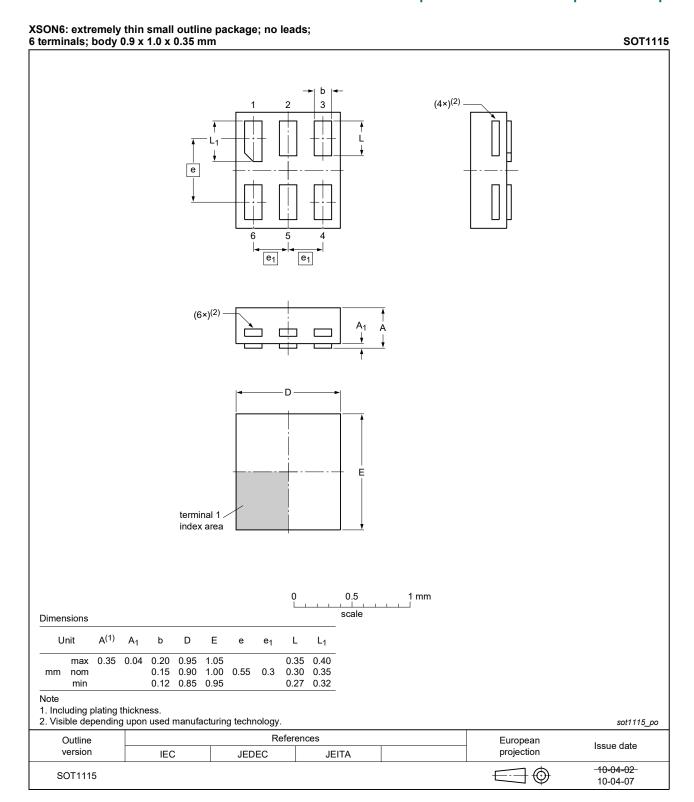


Fig. 12. Package outline SOT1115 (XSON6)

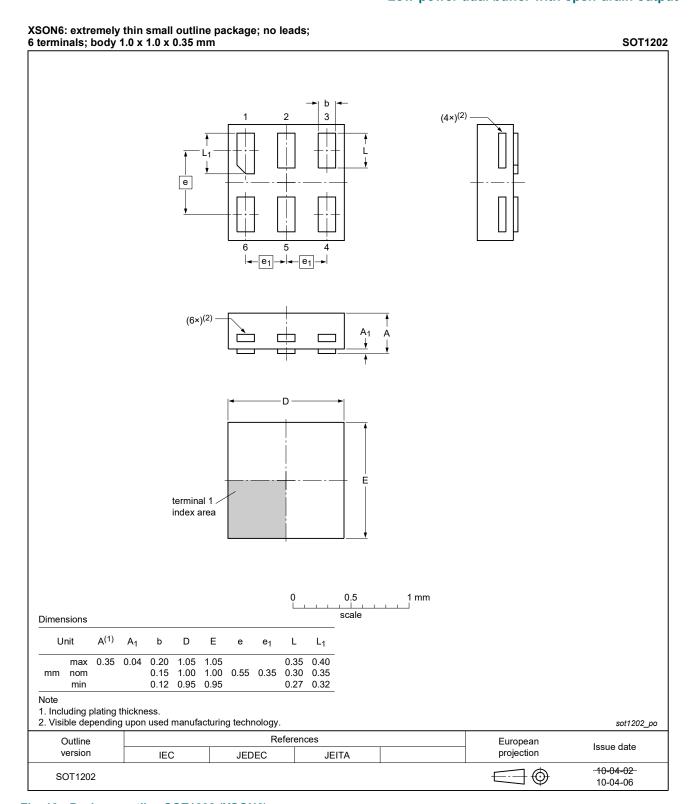


Fig. 13. Package outline SOT1202 (XSON6)

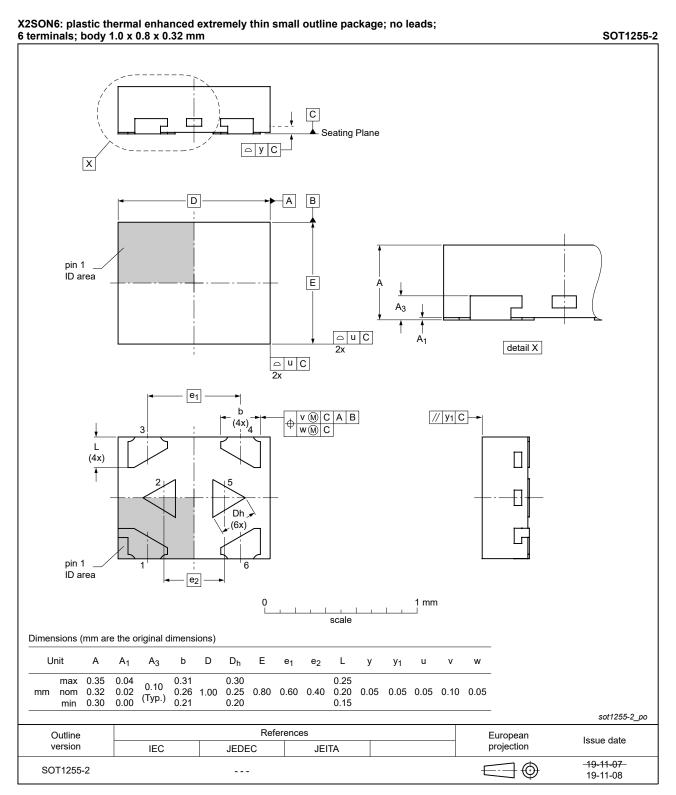


Fig. 14. Package outline SOT1255-2 (X2SON6)

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13. Abbreviations

Table 11. Abbreviations

Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
НВМ	Human Body Model

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes	
74AUP2G07 v.11	20230726	Product data sheet	-	74AUP2G07 v.10	
Modifications:	<u>Section 2</u> : ESD specification updated according to the latest JEDEC standard.				
74AUP2G07 v.10	20220131	Product data sheet	-	74AUP2G07 v.9	
Modifications:	Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6).				
74AUP2G07 v.9	20211103	Product data sheet	-	74AUP2G07 v.8	
Modifications:	 The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Section 1 and Section 2 updated. Type number 74AUP2G07GF (SOT891/XSON6) removed. SOT1255 (X2SON6) package changed to SOT1255-2 (X2SON6) package. Table 5: Derating values for P_{tot} total power dissipation updated. 				
74AUP2G07 v.8	20150917	Product data sheet	-	74AUP2G07 v.7	
Modifications:	Added type	Added type number 74AUP2G07GX (SOT1255/X2SON6).			
74AUP2G07 v.7	20121129	Product data sheet	-	74AUP2G07 v.6	
Modifications:	Package outline drawing of SOT886 (Fig. 11) modified.				
74AUP2G07 v.6	20111202	Product data sheet	-	74AUP2G07 v.5	
74AUP2G07 v.5	20100909	Product data sheet	-	74AUP2G07 v.4	
74AUP2G07 v.4	20090611	Product data sheet	-	74AUP2G07 v.3	
74AUP2G07 v.3	20071016	Product data sheet	-	74AUP2G07 v.2	
74AUP2G07 v.2	20070612	Product data sheet	-	74AUP2G07 v.1	
74AUP2G07 v.1	20061121	Product data sheet	-	-	

15. Legal information

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.
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