Low-power buffer/line driver; 3-state Rev. 1 — 16 January 2014

Product data sheet

General description 1.

The 74AXP1G125 is a single buffer/line driver with 3-state output.

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 0.7 V to 2.75 V. It 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.

Features and benefits 2.

- Wide supply voltage range from 0.7 V to 2.75 V
- Low input capacitance; C₁ = 0.5 pF (typical)
- Low output capacitance; C_O = 1.0 pF (typical)
- Low dynamic power consumption; C_{PD} = 2.5 pF at V_{CC} = 1.2 V (typical)
- Low static power consumption; I_{CC} = 0.6 μA (85 °C maximum)
- High noise immunity
- Complies with JEDEC standard:
 - JESD8-12A.01 (1.1 V to 1.3 V)
 - JESD8-11A.01 (1.4 V to 1.6 V)
 - JESD8-7A (1.65 V to 1.95 V)
 - JESD8-5A.01 (2.3 V to 2.7 V)
- ESD protection:
 - HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 2 kV
 - CDM JESD22-C101E exceeds 1000 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 2.75 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



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3. Ordering information

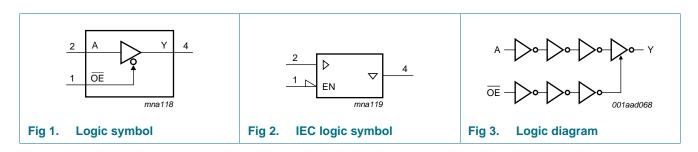
Table 1. Orderin	g information									
Type number	Package	Package								
	Temperature range	Name	Description	Version						
74AXP1G125GM	–40 °C to +85 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886						
74AXP1G125GN	–40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115						
74AXP1G125GS	–40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $1.0 \times 1.0 \times 0.35$ mm	SOT1202						
74AXP1G125GX	–40 °C to +85 °C	X2SON5	X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body $0.8 \times 0.8 \times 0.35$ mm	SOT1226						

4. Marking

Table 2. Marking	
Type number	Marking code ^[1]
74AXP1G125GM	rM
74AXP1G125GN	rM
74AXP1G125GS	rM
74AXP1G125GX	rM

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

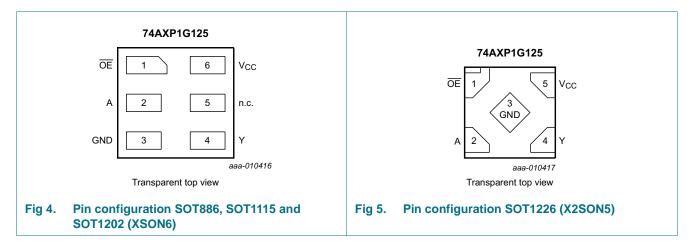
5. Functional diagram



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6. Pinning information

6.1 Pinning



6.2 Pin description

Symbol	/mbol Pin X2SON5 XSON6		Description	
OE	1	1	output enable input	
A	2	2	data input	
GND	3	3	ground (0 V)	
Y	4	4	data output	
n.c.	-	5	not connected	
V _{CC}	5	6	supply voltage	

7. Functional description

Table 4. Function table^[1]

Input OE		Output
OE	A	Y
L	L	L
L	Н	Н
Н	Х	Z

[1] H = HIGH voltage level;

L = LOW voltage level;

X = Don't care;

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).

			0	.0	,
Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	+3.3	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
VI	input voltage		<u>[1]</u> –0.5	+3.3	V
I _{OK}	output clamping current	V _O < 0 V	-50	-	mA
Vo	output voltage		<u>[1]</u> –0.5	+3.3	V
lo	output current	$V_{O} = 0 V$ 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 °C to +85 °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

Voltages are referenced to GND (ground = 0 V).

0	10 /				
Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		0.7	2.75	V
VI	input voltage		0	2.75	V
Vo	output voltage	Active mode	0	V _{CC}	V
		Power-down mode; $V_{CC} = 0 V$	0	2.75	V
T _{amb}	ambient temperature		-40	+85	°C
$\Delta t / \Delta V$	input transition rise and fall rate	V_{CC} = 0.7 V to 2.75 V	0	200	ns/V

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10. Static characteristics

Table 7. Static characteristics

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

Symbol Parameter		Conditions		$T_{amb} = -40 \ ^{\circ}C \ to \ +85 \ ^{\circ}C$				
				Min	Тур 25 °С	Max 25 °C	Max 85 °C	
VIH	HIGH-level input	$V_{CC} = 0.75 \text{ V} \text{ to } 0.85 \text{ V}$		0.75V _{CC}	-	-	-	V
	voltage	V _{CC} = 1.1 V to 1.95 V		0.65V _{CC}	-	-	-	V
		V_{CC} = 2.3 V to 2.7 V		1.6	-	-	-	V
V _{IL}	LOW-level input	V_{CC} = 0.75 V to 0.85 V		-	-	$0.25V_{CC}$	$0.25V_{CC}$	V
	voltage	$V_{CC} = 1.1 \text{ V to } 1.95 \text{ V}$		-	-	$0.35V_{CC}$	$0.35V_{CC}$	V
		V_{CC} = 2.3 V to 2.7 V		-	-	0.7	0.7	V
V _{OH}	HIGH-level	I_O = –20 $\mu A;V_{CC}$ = 0.7 V		-	0.69	-	-	V
	output voltage	I_O = $-100~\mu\text{A};~V_{CC}$ = 0.75 V		0.65	-	-	-	V
		$I_O = -2 \text{ mA}; V_{CC} = 1.1 \text{ V}$		0.825	-	-	-	V
		$I_O = -3$ mA; $V_{CC} = 1.4$ V		1.05	-	-	-	V
		I_{O} = –4.5 mA; V_{CC} = 1.65 V		1.2	-	-	-	V
		I_{O} = –8 mA; V_{CC} = 2.3 V		1.7	-	-	-	V
V _{OL}	LOW-level	$I_0 = 20 \ \mu A; \ V_{CC} = 0.7 \ V$		-	0.01	-	-	V
	output voltage	$I_{O} = 100 \ \mu A; \ V_{CC} = 0.75 \ V$		-	-	0.1	0.1	V
		$I_0 = 2 \text{ mA}; V_{CC} = 1.1 \text{ V}$		-	-	0.275	0.275	V
		$I_{O} = 3 \text{ mA}; V_{CC} = 1.4 \text{ V}$		-	-	0.35	0.35	V
		I_{O} = 4.5 mA; V_{CC} = 1.65 V		-	-	0.45	0.45	V
		$I_{O} = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$		-	-	0.7	0.7	V
l _l	input leakage current	$V_{I} = 0 V \text{ to } 2.75 V;$ $V_{CC} = 0 V \text{ to } 2.75 V$	<u>[1]</u>	-	0.001	±0.1	±0.5	μΑ
I _{OZ}	OFF-state output current	V_{I} = V_{IH} or $V_{\text{IL}};$ V_{O} = 0 V to 2.75 V	<u>[1]</u>	-	0.02	±0.1	±0.5	μΑ
I _{OFF}	power-off leakage current	$V_1 \text{ or } V_0 = 0 \text{ V to } 2.75 \text{ V};$ $V_{CC} = 0 \text{ V}$	<u>[1]</u>	-	0.01	±0.1	±0.5	μΑ
∆l _{OFF}	additional power-off leakage current	$V_{I} \text{ or } V_{O} = 0 \text{ V or } 2.75 \text{ V};$ $V_{CC} = 0 \text{ V to } 0.1 \text{ V}$	<u>[1]</u>	-	0.02	±0.1	±0.5	μA
l _{cc}	supply current	$V_I = 0 \text{ V or } V_{CC}; I_O = 0 \text{ A}$	[1]	-	0.01	0.3	0.6	μΑ
ΔI_{CC}	additional supply current			-	2	100	150	μA

[1] All typical values are measured at V_{CC} = 1.2 V.

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11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 13.

Symbol	Parameter	Conditions		Ta	_{mb} = 25	°C	T _{amb} = -40	Unit	
				Min	Typ <mark>[1]</mark>	Max	Min	Max	
t _{pd}	propagation	A to Y; see Figure 6	[2][5]						
	delay	V_{CC} = 0.75 V to 0.85 V		3	11	38	2	132	ns
		V_{CC} = 1.1 V to 1.3 V		2.0	4.3	7.0	1.8	7.3	ns
		V_{CC} = 1.4 V to 1.6 V		1.6	3.2	4.7	1.5	5.0	ns
		V_{CC} = 1.65 V to 1.95 V		1.4	2.7	3.8	1.2	4.1	ns
		V_{CC} = 2.3 V to 2.7 V		1.1	2.1	2.8	1.0	3.1	ns
t _{en}	enable time	OE to Y; see Figure 7	[3][5]						
		V_{CC} = 0.75 V to 0.85 V		5	15	45	4	160	ns
		V_{CC} = 1.1 V to 1.3 V		2.7	5.6	8.7	2.5	9.1	ns
		V_{CC} = 1.4 V to 1.6 V		2.1	4.1	5.8	1.9	6.2	ns
		V_{CC} = 1.65 V to 1.95 V		1.7	3.4	4.8	1.5	5.2	ns
		V_{CC} = 2.3 V to 2.7 V		1.4	2.6	3.6	1.2	3.9	ns
t _{dis}	disable time	OE to Y; see Figure 7	[4]						
		V_{CC} = 0.75 V to 0.85 V		4	14	42	1	152	ns
		V_{CC} = 1.1 V to 1.3 V		2.9	5.9	9.5	2.7	9.9	ns
		V_{CC} = 1.4 V to 1.6 V		2.3	4.4	6.6	2.0	7.1	ns
		V_{CC} = 1.65 V to 1.95 V		2.4	4.5	6.6	2.1	7.1	ns
		V_{CC} = 2.3 V to 2.7 V		1.7	3.3	4.7	1.5	5.1	ns
tt	transition time	$V_{CC} = 2.7 \text{ V}; \text{ see } \frac{\text{Figure 6}}{1000}$	[6]	-	-	-	1.0	-	ns
CI	input capacitance	$V_{I} = 0 V \text{ or } V_{CC};$ $V_{CC} = 0 V \text{ to } 2.75 V$		-	0.5	-	-	-	pF
Co	output capacitance	$V_{O} = 0 V; V_{CC} = 0 V$		-	1	-	-	-	pF

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Symbol	Parameter	Conditions		amb = 25 °	D ^o	T _{amb} = −40 °C to +85 °C		Unit
			Min	Typ <mark>[1]</mark>	Max	Min	Max	
C _{PD}		$f_i = 1 \text{ MHz}; V_i = 0 \text{ V to } V_{CC}$ [7]						
	capacitance	$V_{CC} = 0.75 \text{ V} \text{ to } 0.85 \text{ V}$	-	2.4	-	-	-	pF
		$V_{CC} = 1.1 \text{ V to } 1.3 \text{ V}$	-	2.5	-	-	-	pF
		$V_{CC} = 1.4 \text{ V}$ to 1.6 V	-	2.6	-	-	-	pF
		V_{CC} = 1.65 V to 1.95 V	-	2.6	-	-	-	pF
		V_{CC} = 2.3 V to 2.7 V	-	3.0	-	-	-	pF

Table 8. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 13.

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

[2] t_{pd} is the same as t_{PLH} and t_{PHL} .

[3] t_{en} is the same as t_{PZH} and t_{PZL} .

[5] For additional propagation delays and enable times values at different load capacitances see Figure 8 to Figure 12.

[6] t_t is the same as t_{THL} and t_{TLH} .

[7] C_{PD} is used to determine the dynamic power dissipation (P_D in μ W).

 $P_{D} = C_{PD} \times V_{CC}^{2} \times f_{i} \times N + C_{L} \times V_{CC}^{2} \times f_{o} \text{ where:}$ $f_{i} = \text{input frequency in MHz;}$

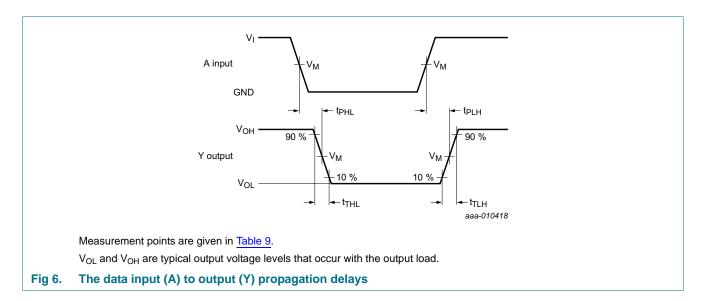
 f_0 = output frequency in MHz;

 C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching.

12. Waveforms



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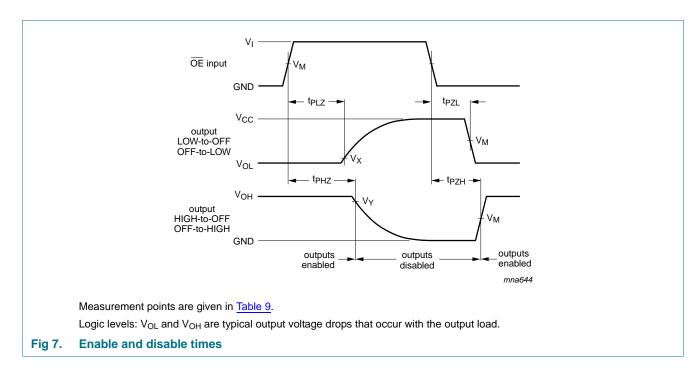
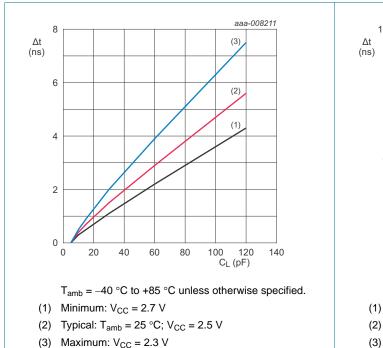
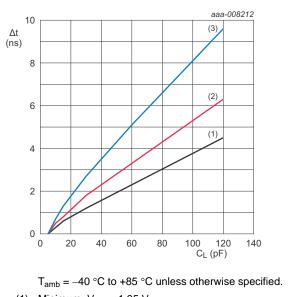


Table 9. Measurement points

Supply voltage	Input C		Output			
V _{cc}	V _M	VI	$t_r = t_f$	V _M	V _X	V _Y
0.75 V to 1.6 V	0.5V _{CC}	V _{CC}	≤ 3.0 ns	$0.5V_{CC}$	$V_{OL} + 0.1 V$	V _{OH} – 0.1 V
1.65 V to 2.7 V	0.5V _{CC}	V _{CC}	\leq 3.0 ns	$0.5V_{CC}$	V_{OL} + 0.15 V	$V_{OH} - 0.15 \ V$



Additional tpd and ten versus load capacitance



- (1) Minimum: $V_{CC} = 1.95 V$
- (2) Typical: $T_{amb} = 25 \text{ °C}$; $V_{CC} = 1.8 \text{ V}$
- (3) Maximum: $V_{CC} = 1.65 V$

Fig 9. Additional t_{pd} and t_{en} versus load capacitance

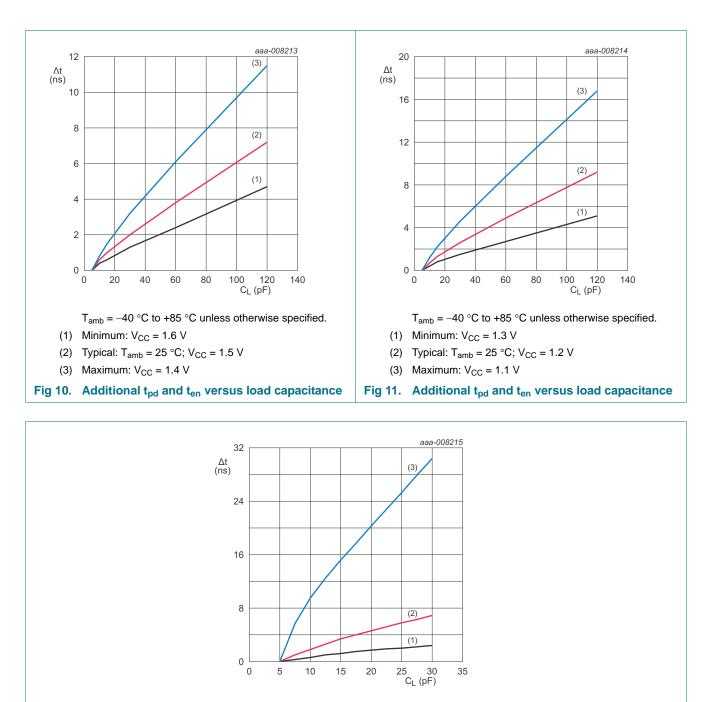
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Fig 8.

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 T_{amb} = -40 °C to +85 °C unless otherwise specified.

- (1) Minimum: $V_{CC} = 0.85 V$
- (2) Typical: $T_{amb} = 25 \text{ °C}$; $V_{CC} = 0.8 \text{ V}$
- (3) Maximum: $V_{CC} = 0.75 V$
- Fig 12. Additional t_{pd} and t_{en} versus load capacitance

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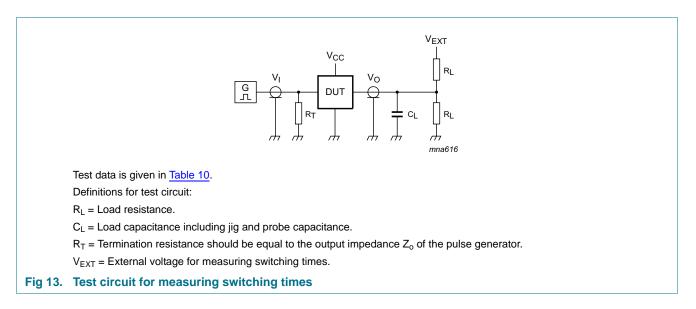


Table 10. Test data

Supply voltage	Load		V _{EXT}			
V _{CC}	CL	RL	t _{PLH} , t _{PHL}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}	
0.75 V to 2.7 V	5 pF	10 kΩ	0 V	0 V	$2 \times V_{CC}$	

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13. Package outline

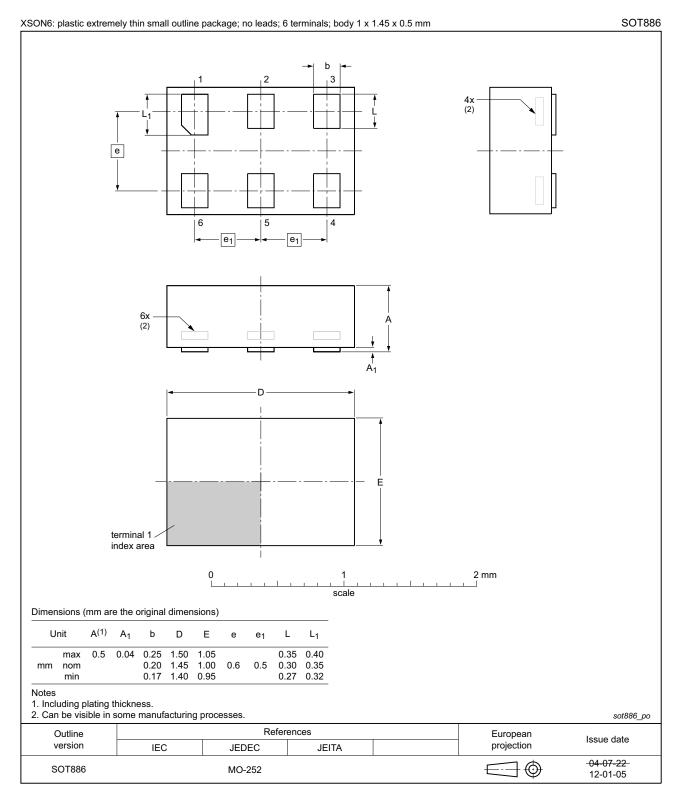
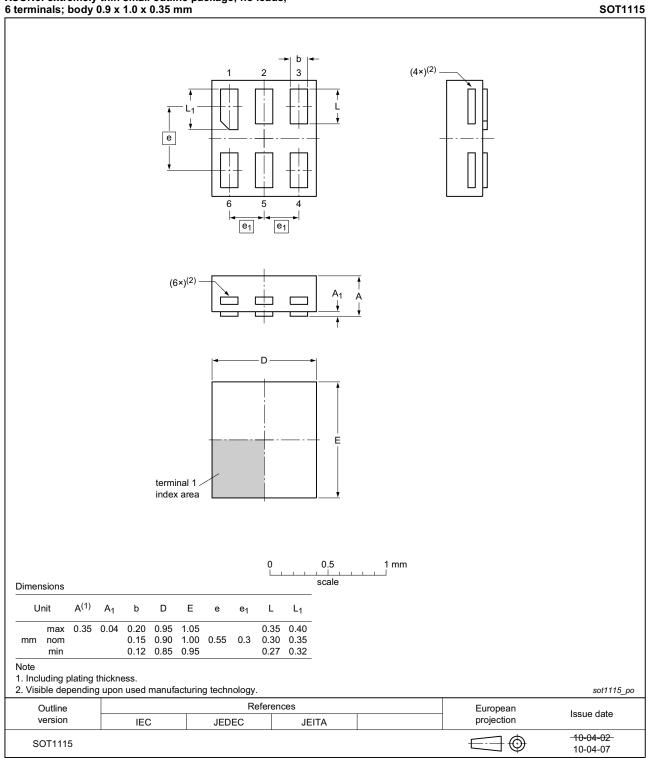


Fig 14. Package outline SOT886 (XSON6)

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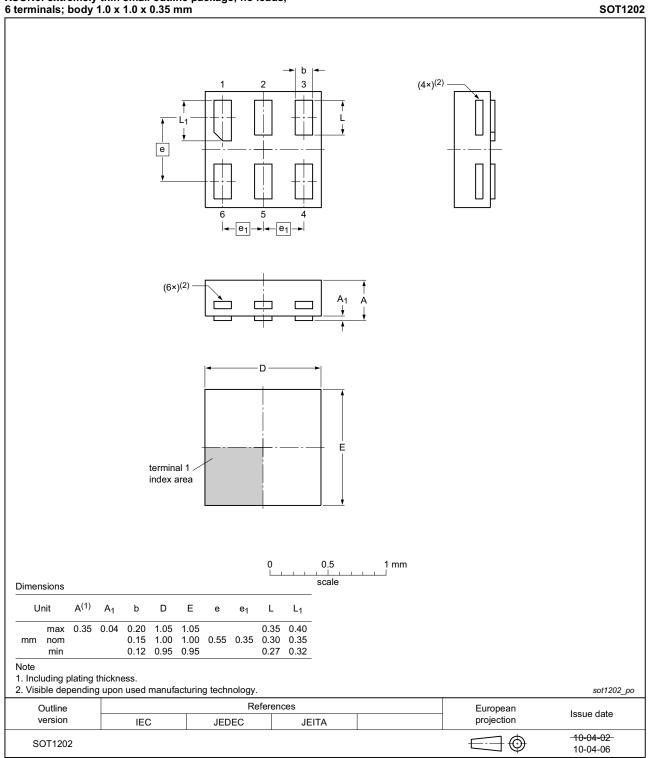


XSON6: extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm

Fig 15. Package outline SOT1115 (XSON6)

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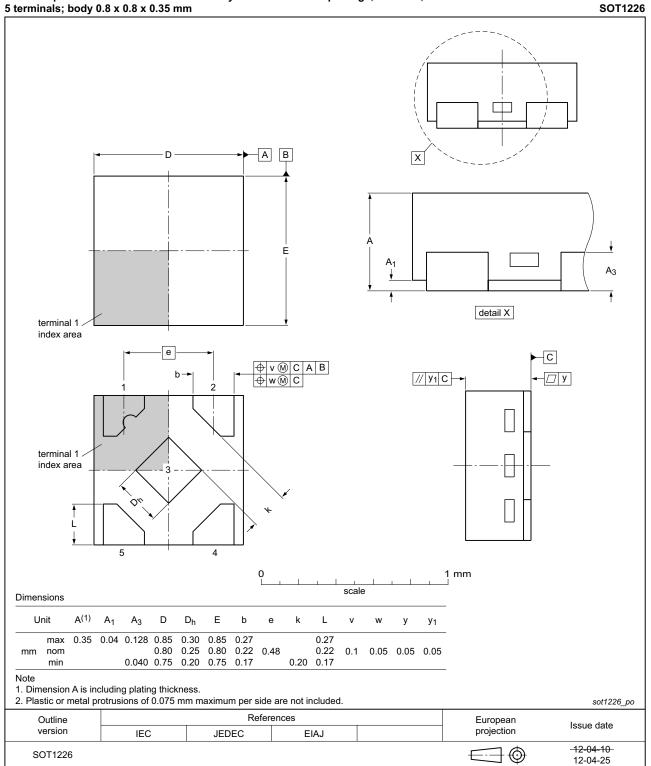


XSON6: extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm

Fig 16. Package outline SOT1202 (XSON6)

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X2SON5: plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals: body 0.8 x 0.8 x 0.35 mm

Fig 17. Package outline SOT1226 (X2SON5)

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14. Abbreviations

Table 11. A	breviations
Acronym	Description
CDM	Charged Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

15. Revision history

Table 12. Revision history						
Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AXP1G125 v.1	20140116	Product data sheet	-	-		

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.
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Product [short] data sheet	Production	This document contains the product specification.

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Low-power buffer/line driver; 3-state

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