Low-power buffer/line driver; 3-state Rev. 2 — 18 April 2018

Product data sheet

1 General description

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.

2 Features and benefits

- Wide supply voltage range from 0.7 V to 2.75 V
- Low input capacitance; C_I = 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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Ordering information 3

Type number	Package	kage							
	Temperature range	Name	Description	Version					
74AXP1G125GM	-40 °C to +85 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm	SOT886					
74AXP1G125GN	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 x 1.0 x 0.35 mm	SOT1115					
74AXP1G125GS	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm	SOT1202					
74AXP1G125GX	-40 °C to +85 °C	X2SON5	plastic thermal enhanced extremely thin small outline package; no leads; 5 terminals; body 0.8 x 0.8 x 0.35 mm	SOT1226					

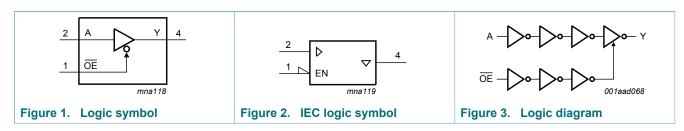
Marking 4

Table 2.	Marking

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

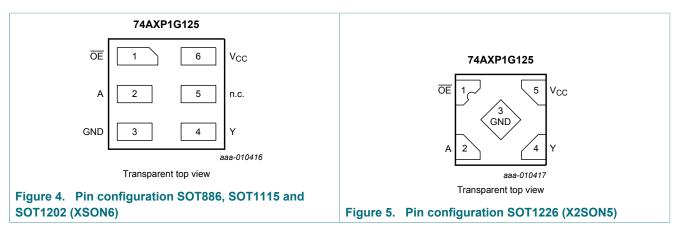
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

Functional diagram 5



6 Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description					
Symbol	Pin	Description			
	X2SON5	XSON6			
ŌĒ	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

H = HIGH voltage level; L = LOW voltage level; X = Don't care; Z = high-impedance OFF-state.

Input		Output
OE	Α	Y
L	L	L
L	Н	Н
Н	X	Z

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	Мах	Unit
V _{CC}	supply voltage		-0.5	+3.3	V
I _{IK}	input clamping current	V _I < 0 V	-50	-	mA
VI	input voltage	[1]	-0.5	+3.3	V
I _{OK}	output clamping current	V _O < 0 V	-50	-	mA
V _O	output voltage	[1]	-0.5	+3.3	V
I _O	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).

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
Δt/ΔV	input transition rise and fall rate	V_{CC} = 0.7 V to 2.75 V	0	200	ns/V

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 °C to +85 °C				
			Min	Typ 25 °C	Max 25 °C	Max 85 °C	
VIH	HIGH-level input	V_{CC} = 0.75 V to 0.85 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 V to 1.95 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 µA; V_{CC} = 0.7 V	-	0.69	-	-	V
	output voltage	I _O = -100 μA; V _{CC} = 0.75 V	0.65	-	-	-	V
		I _O = -2 mA; V _{CC} = 1.1 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 μA; V _{CC} = 0.75 V	-	-	0.1	0.1	V
		I _O = 2 mA; V _{CC} = 1.1 V	-	-	0.275	0.275	V
		I _O = 3 mA; V _{CC} = 1.4 V	-	-	0.35	0.35	V
		I _O = 4.5 mA; V _{CC} = 1.65 V	-	-	0.45	0.45	V
		I _O = 8 mA; V _{CC} = 2.3 V	-	-	0.7	0.7	V
lı	input leakage current	V _I = 0 V to 2.75 V; V _{CC} = 0 V to 2.75 V	_	0.001	±0.1	±0.5	μA
I _{OZ}	OFF-state output current	$V_{I} = V_{IH} \text{ or } V_{IL}; V_{O} = 0 \text{ V to } 2.75 \text{ V}^{[1]}$	-	0.02	±0.1	±0.5	μA
I _{OFF}	power-off leakage current	$V_{I} \text{ or } V_{O} = 0 \text{ V to } 2.75 \text{ V};$ [1] $V_{CC} = 0 \text{ V}$	-	0.01	±0.1	±0.5	μA
ΔI _{OFF}	additional power-off leakage current	$V_{I} \text{ or } V_{O} = 0 \text{ V or } 2.75 \text{ V};$ $V_{CC} = 0 \text{ V to } 0.1 \text{ V}$ [1]	-	0.02	±0.1	±0.5	μA
I _{CC}	supply current	$V_{\rm I} = 0 \text{ V or } V_{\rm CC}; I_{\rm O} = 0 \text{ A}$ [1]	-	0.01	0.3	0.6	μA
ΔI _{CC}	additional supply current	$V_{I} = V_{CC} - 0.5 V; I_{O} = 0 A;$ $V_{CC} = 2.5 V$	-	2	100	150	μA

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

11 Dynamic characteristics

Table 8. Dynamic characteristics

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

Symbol	Parameter	Conditions		T _{amb} = 25		°C	T _{amb} = -40 °C to +85 °C		Unit
				Min	Typ ^[1]	Max	Min	Мах	
t _{pd}	propagation	A to Y; see <u>Figure 6</u>	[2] [3]						
	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	[2] [3]						
		$V_{\rm CC}$ = 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	[2]						
		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
t _t	transition time	V _{CC} = 2.7 V; see <u>Figure 6</u>	[2]	-	-	-	1.0	-	ns
CI	input capacitance	V_{I} = 0 V or V_{CC} ; V_{CC} = 0 V to 2.75 V		-	0.5	-	-	-	pF
C _O	output capacitance	$V_{O} = 0 V; V_{CC} = 0 V$		-	1	-	-	-	pF
C _{PD}		$f_i = 1 \text{ MHz}; V_i = 0 \text{ V to } V_{CC}$	[4]						
	capacitance	$V_{\rm CC}$ = 0.75 V to 0.85 V		-	2.4	-	-	-	pF
		V _{CC} = 1.1 V to 1.3 V		-	2.5	-	-	-	pF
		V _{CC} = 1.4 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

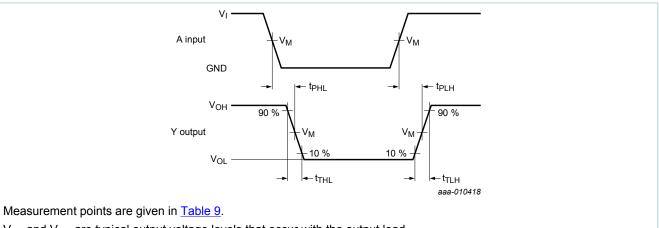
[1] All typical values are measured at nominal V_{CC}. [2] t_{pd} is the same as t_{PLH} and t_{PHL} ; t_{en} is the same as t_{PZH} and t_{PZL} ; t_{dis} is the same as t_{PHZ} and t_{PLZ} ; t_t is the same as t_{THL} and t_{TLH} . [3] For additional propagation delays and enable times values at different load capacitances see Figure 8 to Figure 12.

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

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

fi = input frequency in MHz; fo = output frequency in MHz; CL = output load capacitance in pF; VCC = supply voltage in V; N = number of inputs switching.

11.1 Waveforms and test circuit



 V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Figure 6. The data input (A) to output (Y) propagation delays

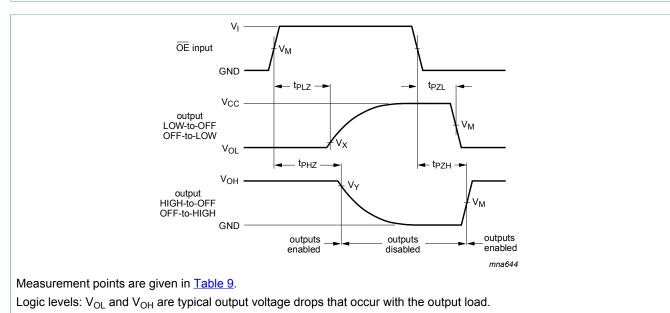


Figure 7. Enable and disable times

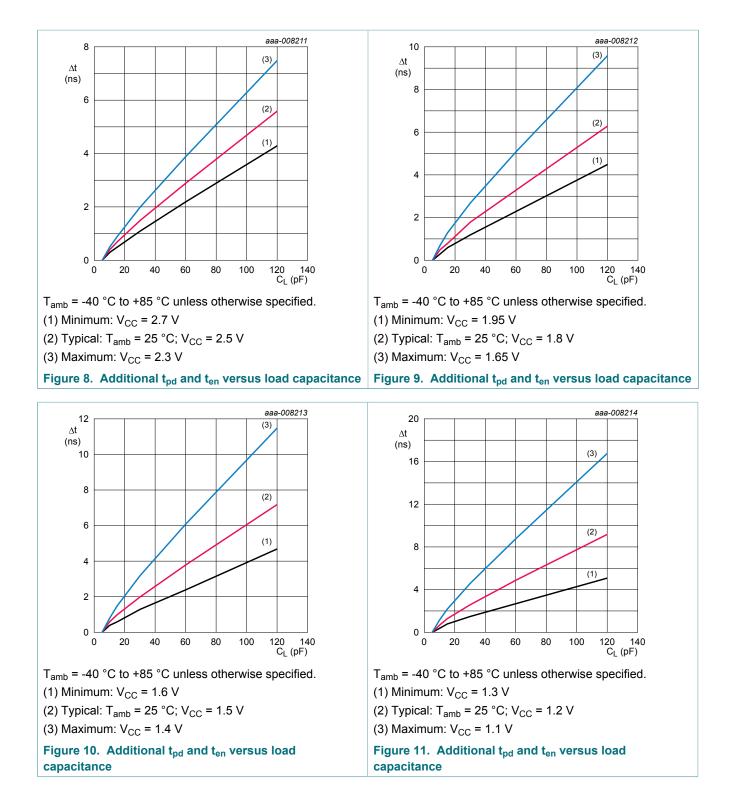
Table 9. Measurement points

Supply voltage	Input			Output		
V _{cc}	V _M	VI	$t_r = t_f$	V _M	Vx	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}	≤ 3.0 ns	0.5V _{CC}	V _{OL} + 0.15 V	V _{OH} - 0.15 V

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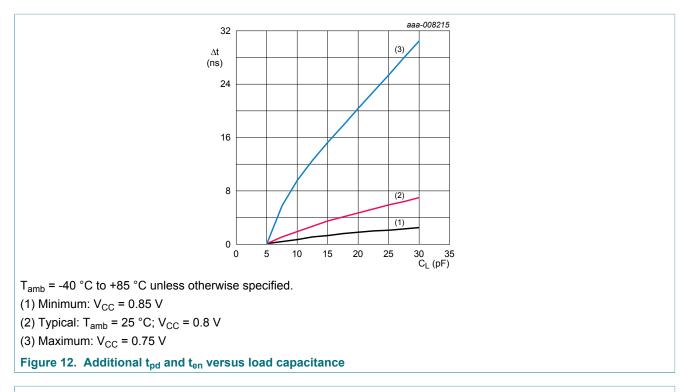
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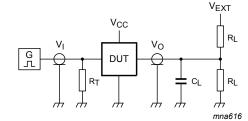


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Test data is given in <u>Table 10</u>.

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.

Figure 13. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Load		V _{EXT}			
Vcc	CL	RL	t _{PLH} , t _{PHL} t _{PZH} , t _{PHZ} t _{PZL} , t			
0.75 V to 2.7 V	5 pF	10 kΩ	0 V	0 V	2 x V _{CC}	

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12 Package outline

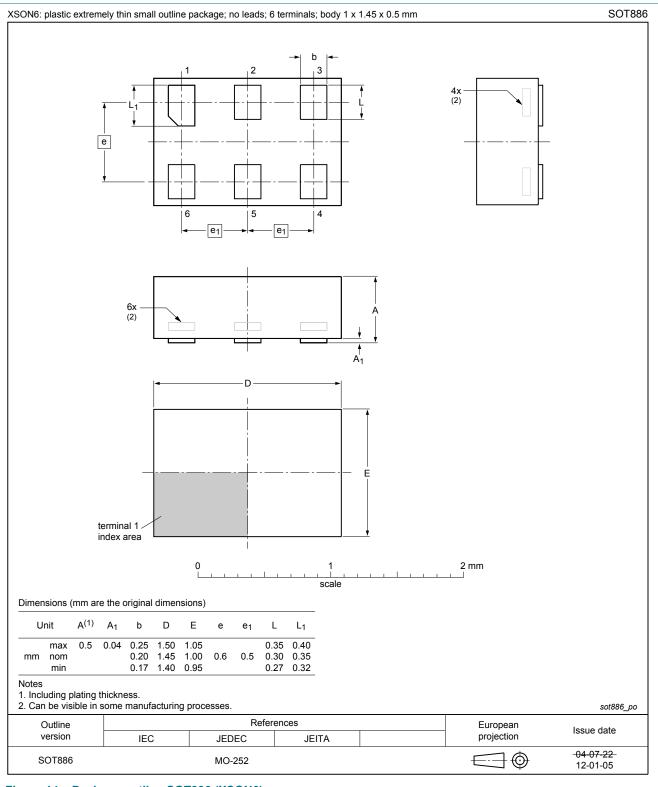
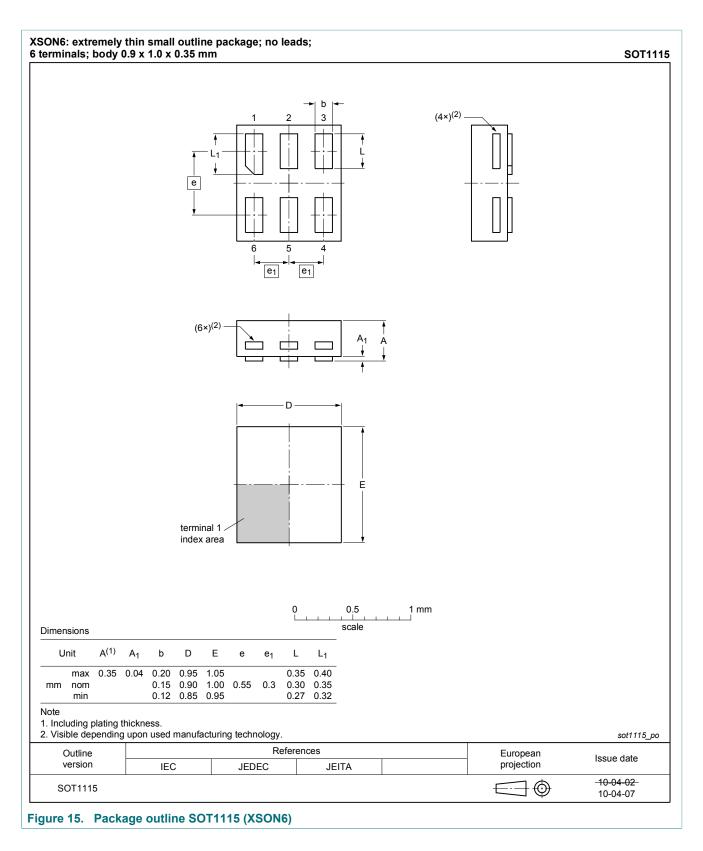


Figure 14. Package outline SOT886 (XSON6)

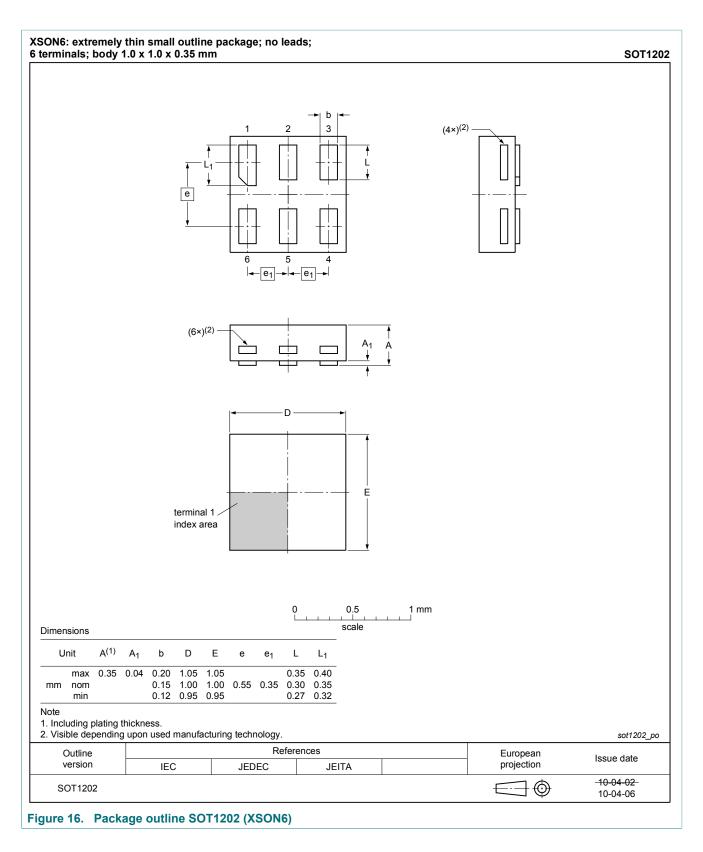
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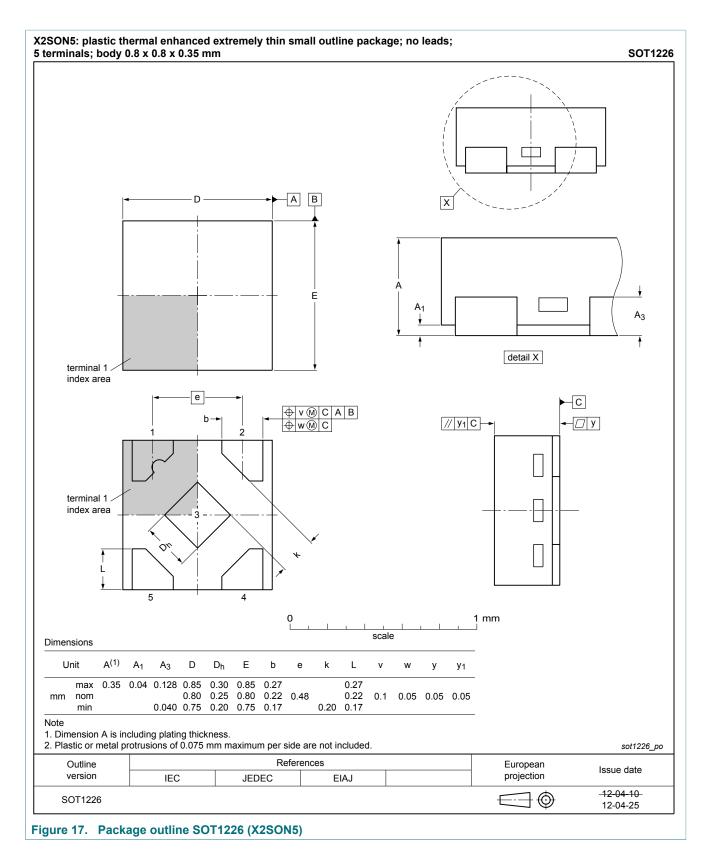
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13 Abbreviations

Table 11. Abbreviations				
Acronym	Description			
CDM	Charged Device Model			
DUT	Device Under Test			
ESD	ElectroStatic Discharge			
НВМ	Human Body Model			

14 Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes		
74AXP1G125 v.2	20180418	Product data sheet	-	74AXP1G125 v.1		
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. 					
74AXP1G125 v.1	20140116	Product data sheet	-	-		

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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.

Please consult the most recently issued document before initiating or completing a design. [1]

The term 'short data sheet' is explained in section "Definitions".

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