

# 74AXP2G14

## Low-power dual Schmitt trigger inverter

Rev. 2 — 17 September 2015

Product data sheet

### 1. General description

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The 74AXP2G14 is a dual inverter with Schmitt-trigger inputs. It transforms slowly changing input signals into sharply defined, jitter-free output signals.

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

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- 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;  $C_{PD} = 2.4$  pF at  $V_{CC} = 1.2$  V (typical)
- Low static power consumption;  $I_{CC} = 1.0$   $\mu$ A (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

### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AXP2G14GM	-40 °C to +85 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AXP2G14GN	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74AXP2G14GS	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202
74AXP2G14GX	-40 °C to +85 °C	X2SON6	plastic thermal extremely thin small outline package; no leads; 6 terminals; body 1 × 0.8 × 0.35 mm	SOT1255

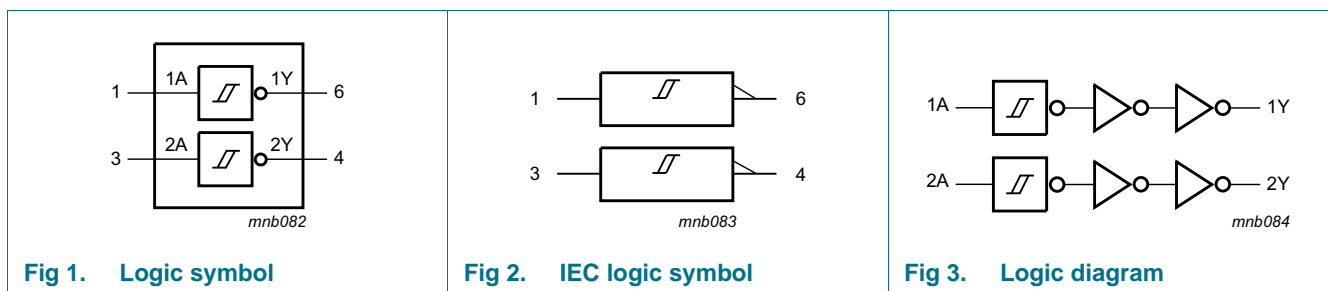
### 4. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AXP2G14GM	rK
74AXP2G14GN	rK
74AXP2G14GS	rK
74AXP2G14GX	rK

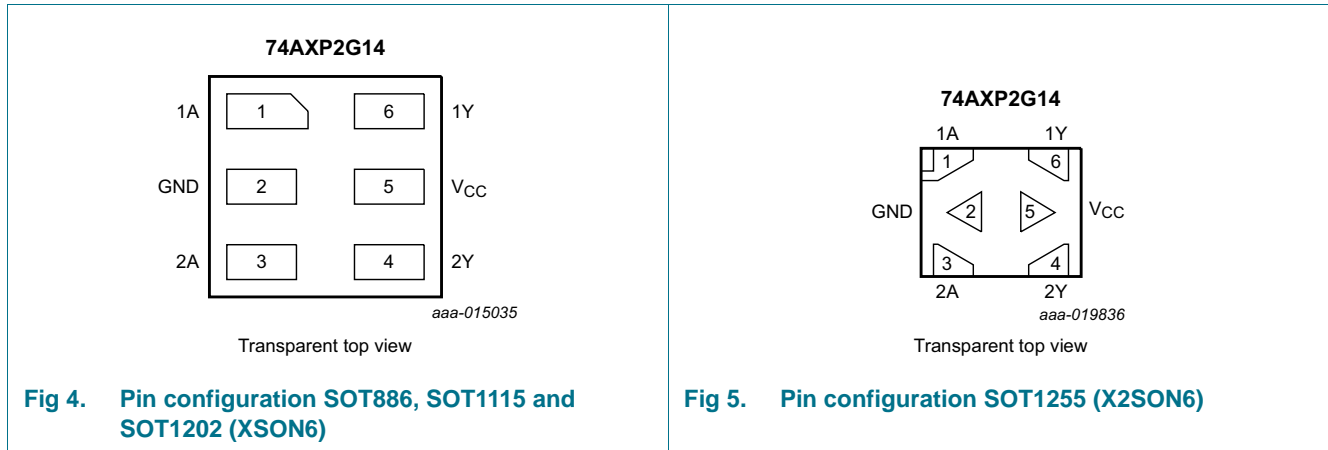
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

### 5. Functional diagram



## 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 <sub>CC</sub>	5	supply voltage
1Y	6	data output

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

Input	Output
nA	nY
L	H
H	L

[1] H = HIGH voltage level; L = LOW voltage level.

## 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	+3.3	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$V_I$	input voltage		[1]	+3.3	V
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$V_O$	output voltage		[1]	+3.3	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	$\pm 20$	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
$V_I$	input voltage		0	2.75	V
$V_O$	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

## 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				Unit
			Min	Typ 25 °C	Max 25 °C	Max 85 °C	
$V_{T+}$	positive-going threshold voltage	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>					
		$V_{CC} = 0.75$ V to 0.85 V	$0.3V_{CC}$	-	$0.8V_{CC}$	$0.8V_{CC}$	V
		$V_{CC} = 1.1$ V to 1.95 V	$0.4V_{CC}$	-	$0.7V_{CC}$	$0.7V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	0.9	-	1.7	1.7	V
$V_{T-}$	negative-going threshold voltage	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>					
		$V_{CC} = 0.75$ V to 0.85 V	$0.2V_{CC}$	-	$0.7V_{CC}$	$0.7V_{CC}$	V
		$V_{CC} = 1.1$ V to 1.95 V	$0.3V_{CC}$	-	$0.6V_{CC}$	$0.6V_{CC}$	V
		$V_{CC} = 2.3$ V to 2.7 V	0.7	-	1.5	1.5	V

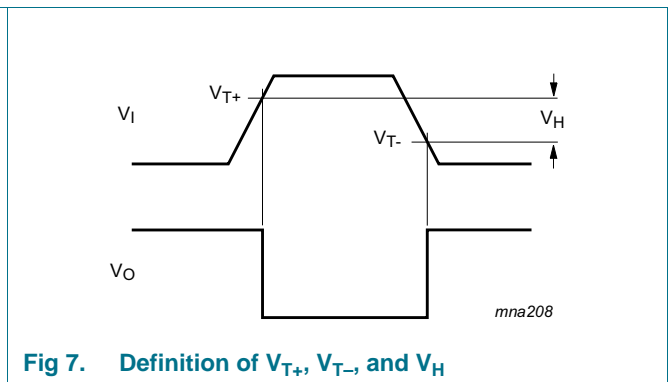
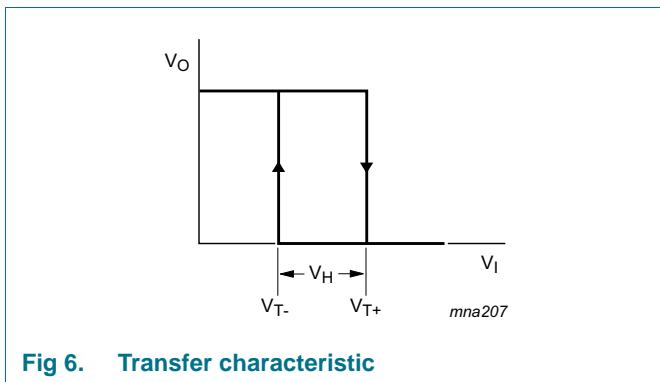
**Table 7. Static characteristics ...continued**

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

Symbol	Parameter	Conditions	T <sub>amb</sub> = -40 °C to +85 °C				Unit	
			Min	Typ 25 °C	Max 25 °C	Max 85 °C		
V <sub>H</sub>	hysteresis voltage	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>						
		V <sub>CC</sub> = 0.75 V to 0.85 V	0.06V <sub>CC</sub>	-	0.5V <sub>CC</sub>	0.5V <sub>CC</sub>	V	
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.1V <sub>CC</sub>	-	0.4V <sub>CC</sub>	0.4V <sub>CC</sub>	V	
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.2	-	1.0	1.0	V	
V <sub>OH</sub>	HIGH-level output voltage	I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.7 V	-	0.69	-	-	V	
		I <sub>O</sub> = -100 μA; V <sub>CC</sub> = 0.75 V	0.65	-	-	-	V	
		I <sub>O</sub> = -2 mA; V <sub>CC</sub> = 1.1 V	0.825	-	-	-	V	
		I <sub>O</sub> = -3 mA; V <sub>CC</sub> = 1.4 V	1.05	-	-	-	V	
		I <sub>O</sub> = -4.5 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	-	V	
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.7	-	-	-	V	
V <sub>OL</sub>	LOW-level output voltage	I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.7 V	-	0.01	-	-	V	
		I <sub>O</sub> = 100 μA; V <sub>CC</sub> = 0.75 V	-	-	0.1	0.1	V	
		I <sub>O</sub> = 2 mA; V <sub>CC</sub> = 1.1 V	-	-	0.275	0.275	V	
		I <sub>O</sub> = 3 mA; V <sub>CC</sub> = 1.4 V	-	-	0.35	0.35	V	
		I <sub>O</sub> = 4.5 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	0.45	V	
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.7	0.7	V	
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 0 V to 2.75 V; V <sub>CC</sub> = 0 V to 2.75 V	[1]	-	0.001	±0.1	±0.5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 2.75 V; V <sub>CC</sub> = 0 V	[1]	-	0.01	±0.1	±0.5	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V or 2.75 V; V <sub>CC</sub> = 0 V to 0.1 V	[1]	-	0.02	±0.1	±0.5	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = 0 V or V <sub>CC</sub> ; I <sub>O</sub> = 0 A	[1]	-	0.01	0.3	1.0	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.5 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 2.5 V		-	2	100	150	μA

[1] Typical values are measured at V<sub>CC</sub> = 1.2 V.

### 10.1 Waveform transfer characteristics



## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 14](#).

Symbol	Parameter	Conditions	T <sub>amb</sub> = 25 °C			T <sub>amb</sub> = -40 °C to +85 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	nA to nY; see <a href="#">Figure 8</a> <sup>[2][3]</sup>						
		V <sub>CC</sub> = 0.75 V to 0.85 V	3	12	38	2	126	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.0	4.6	7.4	1.8	7.7	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	1.6	3.5	5.0	1.4	5.4	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.4	2.9	4.2	1.2	4.6	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.2	2.3	3.2	1.0	3.5	ns
t <sub>t</sub>	transition time	V <sub>CC</sub> = 2.7 V; see <a href="#">Figure 8</a> <sup>[4]</sup>	-	-	-	1.0	-	ns
C <sub>I</sub>	input capacitance	V <sub>I</sub> = 0 V or V <sub>CC</sub> ; V <sub>CC</sub> = 0 V to 2.75 V	-	0.5	-	-	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = 0 V; V <sub>CC</sub> = 0 V	-	1.0	-	-	-	pF
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = 0 V to V <sub>CC</sub> <sup>[5]</sup>						
		V <sub>CC</sub> = 0.75 V to 0.85 V	-	2.3	-	-	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	2.4	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.5	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	2.6	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	2.9	-	-	-	pF

[1] All typical values are measured at nominal V<sub>CC</sub>.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[3] For additional propagation delay values at different load capacitances, see [Figure 9](#) to [Figure 13](#).

[4] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.

[5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

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

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

C<sub>L</sub> = output load capacitance in pF;

V<sub>CC</sub> = supply voltage in V;

N = number of inputs switching.

12. Waveforms

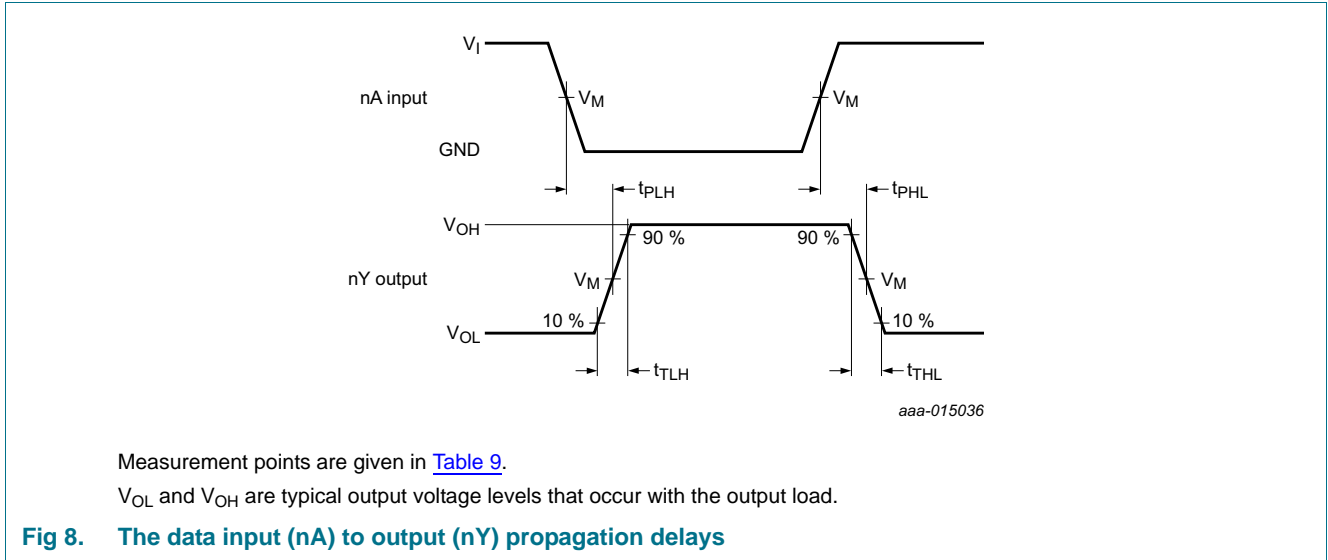
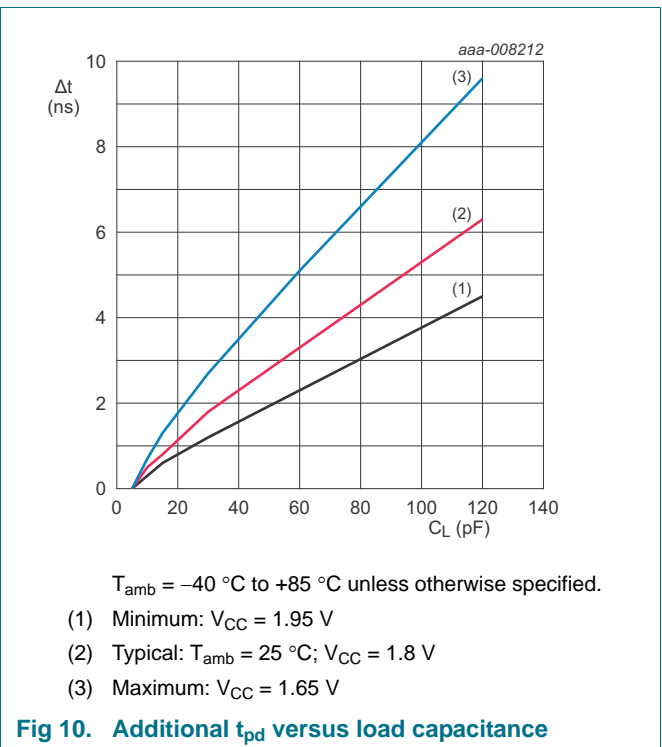
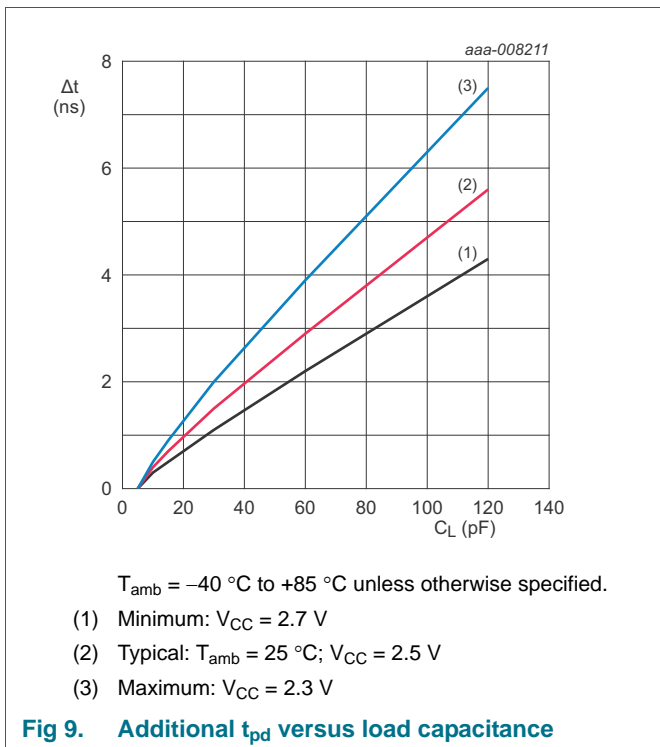
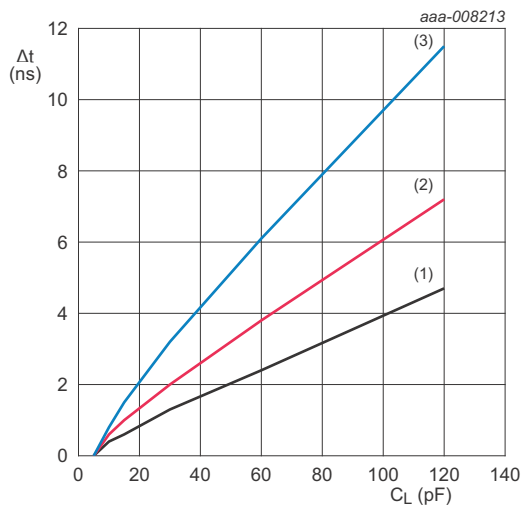


Table 9. Measurement points

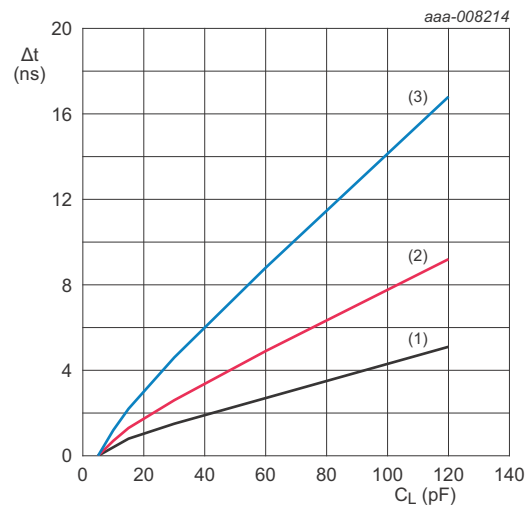
Supply voltage	Input			Output
$V_{CC}$	$V_M$	$V_I$	$t_r = t_f$	$V_M$
0.75 V to 2.7 V	$0.5V_{CC}$	$V_{CC}$	$\leq 3.0$ ns	$0.5V_{CC}$





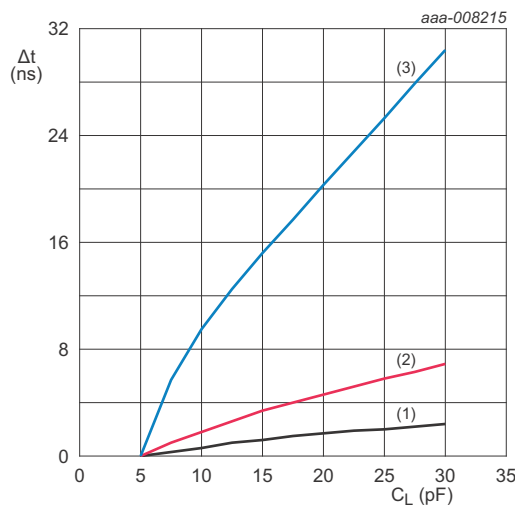
- $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.
- (1) Minimum:  $V_{CC} = 1.6\text{ V}$
  - (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 1.5\text{ V}$
  - (3) Maximum:  $V_{CC} = 1.4\text{ V}$

Fig 11. Additional  $t_{pd}$  versus load capacitance



- $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.
- (1) Minimum:  $V_{CC} = 1.3\text{ V}$
  - (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 1.2\text{ V}$
  - (3) Maximum:  $V_{CC} = 1.1\text{ V}$

Fig 12. Additional  $t_{pd}$  versus load capacitance



- $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.
- (1) Minimum:  $V_{CC} = 0.85\text{ V}$
  - (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 0.8\text{ V}$
  - (3) Maximum:  $V_{CC} = 0.75\text{ V}$

Fig 13. Additional  $t_{pd}$  versus load capacitance





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 14. Test circuit for measuring switching times**

**Table 10. Test data**

Supply voltage	Load		$V_{EXT}$		
$V_{CC}$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
0.75 V to 2.7 V	5 pF	10 k $\Omega$	0 V	0 V	$2 \times V_{CC}$

13. Package outline

XSON6: plastic extremely thin small outline package; no leads; 6 terminals; body 1 x 1.45 x 0.5 mm

SOT886



Fig 15. Package outline SOT886 (XSON6)

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

SOT1115

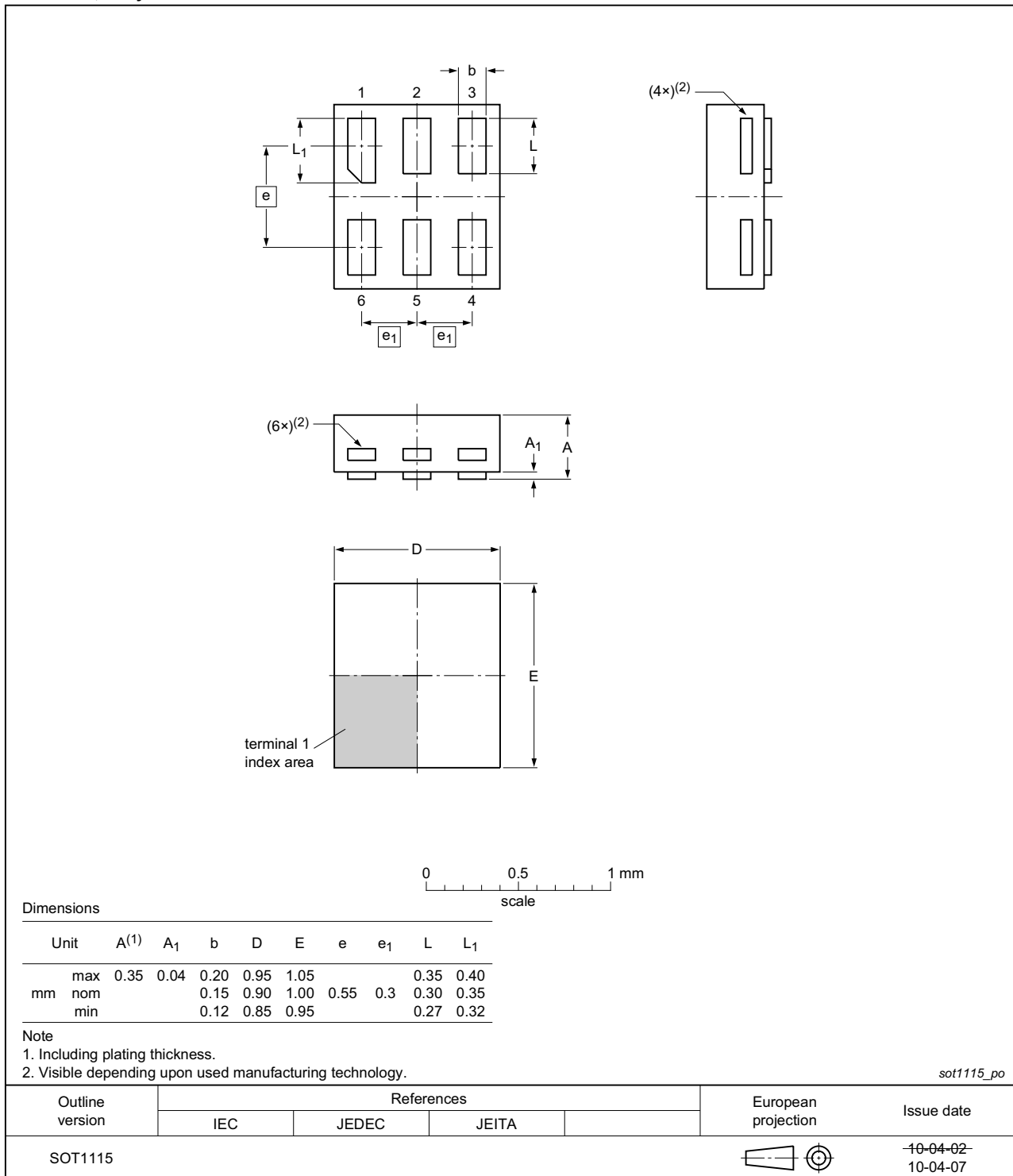


Fig 16. Package outline SOT1115 (XSON6)

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

SOT1202



Fig 17. Package outline SOT1202 (XSON6)

**X2SON6: plastic thermal enhanced extremely thin small outline package; no leads;  
6 terminals; body 1.0 x 0.8 x 0.35 mm**

SOT1255

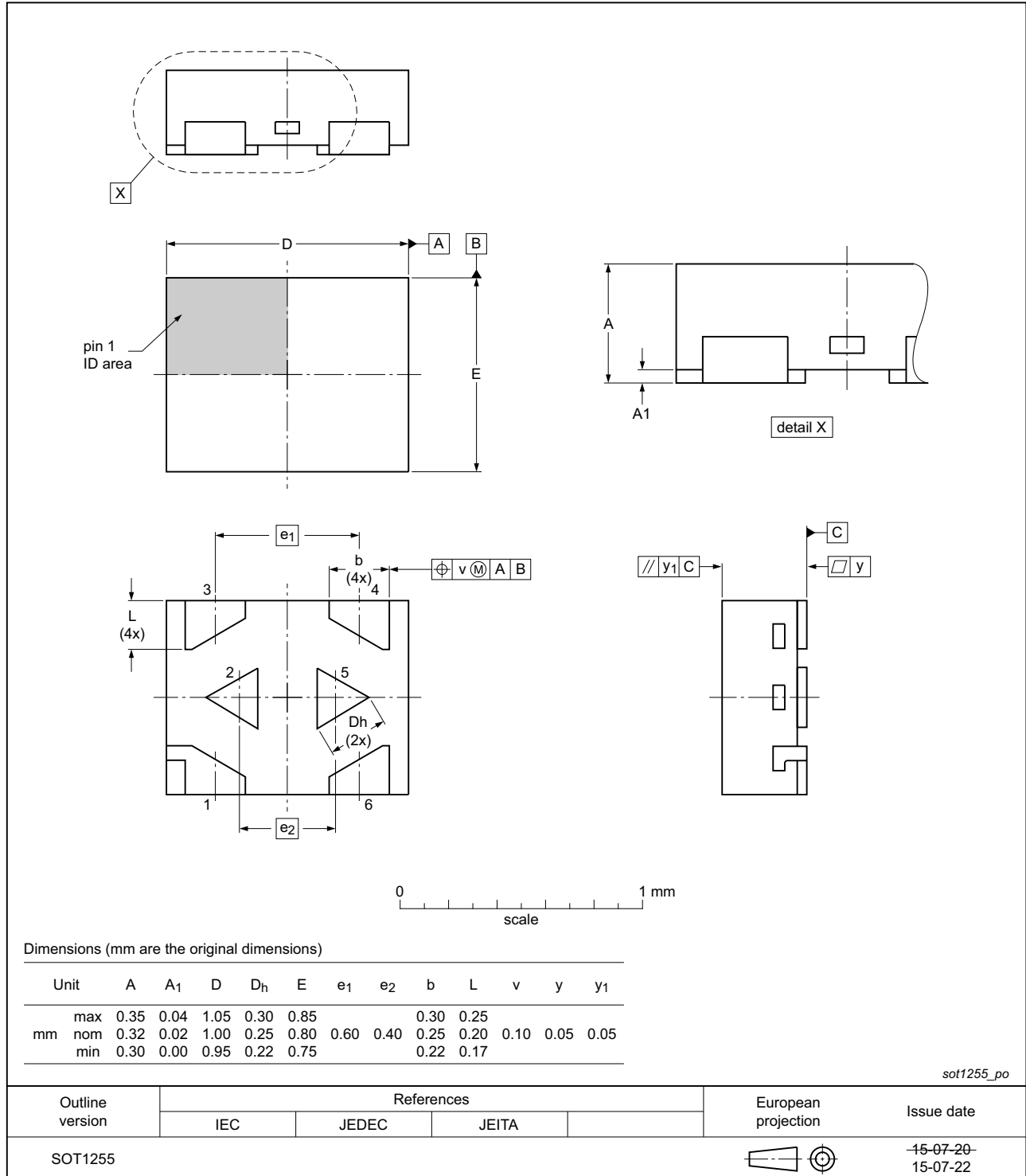


Fig 18. Package outline SOT1255 (X2SON6)

## 14. Abbreviations

Table 11. Abbreviations

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
74AXP2G14 v.2	20150917	Product data sheet	-	74AXP2G14 v.1
Modifications:	• Added type number 74AXP2G14GX (SOT1255/X2SON6).			
74AXP2G14 v.1	20141009	Product data sheet	-	-

## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.

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

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## 17. Contact information

For more information, please visit: <http://www.nexperia.com>

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## 18. Contents

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<b>1</b>	<b>General description</b> .....	<b>1</b>
<b>2</b>	<b>Features and benefits</b> .....	<b>1</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Marking</b> .....	<b>2</b>
<b>5</b>	<b>Functional diagram</b> .....	<b>2</b>
<b>6</b>	<b>Pinning information</b> .....	<b>3</b>
6.1	Pinning .....	3
6.2	Pin description .....	3
<b>7</b>	<b>Functional description</b> .....	<b>3</b>
<b>8</b>	<b>Limiting values</b> .....	<b>4</b>
<b>9</b>	<b>Recommended operating conditions</b> .....	<b>4</b>
<b>10</b>	<b>Static characteristics</b> .....	<b>4</b>
10.1	Waveform transfer characteristics .....	5
<b>11</b>	<b>Dynamic characteristics</b> .....	<b>6</b>
<b>12</b>	<b>Waveforms</b> .....	<b>7</b>
<b>13</b>	<b>Package outline</b> .....	<b>10</b>
<b>14</b>	<b>Abbreviations</b> .....	<b>14</b>
<b>15</b>	<b>Revision history</b> .....	<b>14</b>
<b>16</b>	<b>Legal information</b> .....	<b>15</b>
16.1	Data sheet status .....	15
16.2	Definitions .....	15
16.3	Disclaimers .....	15
16.4	Trademarks .....	16
<b>17</b>	<b>Contact information</b> .....	<b>16</b>
<b>18</b>	<b>Contents</b> .....	<b>17</b>

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## JONHON

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