Product data sheet



1. General description

The 74AXP1G04 is a single inverting buffer.

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; C₁ = 0.5 pF (typical)
- Low output capacitance; C_O = 1.0 pF (typical)
- Low dynamic power consumption; C_{PD} = 2.3 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. Ordering information

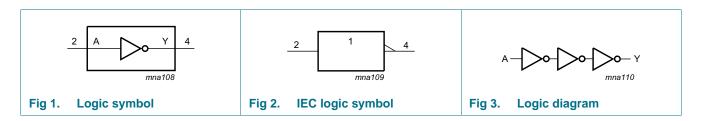
Type number	Package						
	Temperature range	Name	Description	Version			
74AXP1G04GM	–40 °C to +85 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 \times 1.45 \times 0.5 mm	SOT886			
74AXP1G04GN	–40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body $0.9 \times 1.0 \times 0.35$ mm	SOT1115			
74AXP1G04GS	–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			
74AXP1G04GX	–40 °C to +85 °C	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]				
74AXP1G04GM	rC				
74AXP1G04GN	rC				
74AXP1G04GS	rC				
74AXP1G04GX	rC				

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

5. Functional diagram

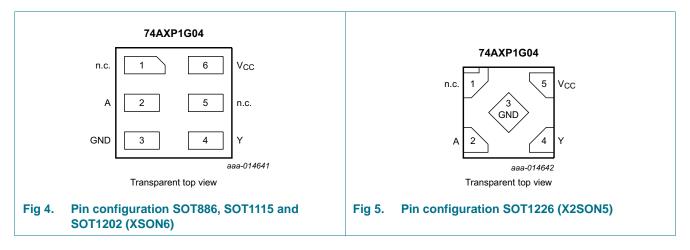


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6. Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description									
Pin		Description							
X2SON5	XSON6								
1	1	not connected							
2	2	data input							
3	3	ground (0 V)							
4	4	data output							
-	5	not connected							
5	6	supply voltage							
	Pin X2SON5 1 2 3 4 -	Pin X2SON5 XSON6 1 1 2 2 3 3 4 4 - 5							

7. Functional description

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Table 4. Function table^[1]

Input	Output
A	Y
L	Н
Н	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	Mir	n	Max	Unit
V _{CC}	supply voltage		-0.	.5	+3.3	V
I _{IK}	input clamping current	V _I < 0 V	-50	0	-	mA
VI	input voltage		[1] -0.	.5	+3.3	V
I _{ОК}	output clamping current	V _O < 0 V	-50	0	-	mA
Vo	output voltage		[1] -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	0	-	mA
T _{stg}	storage temperature		-65	5	+150	°C
P _{tot}	total power dissipation	$T_{amb} = -40 \ ^{\circ}C \ to \ +85 \ ^{\circ}C$	-		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.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
$\Delta t / \Delta V$	input transition rise and fall rate	$V_{CC} = 0.7 \text{ V} \text{ to } 2.75 \text{ V}$	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	;	Unit
				Min	Typ 25 °C	Max 25 °C	Max 85 °C	
V _{IH}	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
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		1.6	-	-	-	V
V _{IL}	LOW-level input	$V_{CC} = 0.75 \text{ V} \text{ to } 0.85 \text{ V}$		-	-	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	$I_0 = -20 \ \mu A; \ V_{CC} = 0.7 \ V$		-	0.69	-	-	V
	output voltage	$I_{O} = -100 \ \mu A; \ V_{CC} = 0.75 \ V$		0.65	-	-	-	V
		$I_0 = -2 \text{ mA}; V_{CC} = 1.1 \text{ V}$		0.825	-	-	-	V
		$I_{O} = -3 \text{ mA}; V_{CC} = 1.4 \text{ V}$		1.05	-	-	-	V
		$I_{O} = -4.5 \text{ mA}; V_{CC} = 1.65 \text{ V}$		1.2	-	-	-	V
		$I_{O} = -8 \text{ mA}; V_{CC} = 2.3 \text{ V}$		1.7	-	-	-	V
V _{OL}	DL 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 _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
		$I_0 = 8 \text{ mA}; V_{CC} = 2.3 \text{ V}$		-	-	0.7	0.7	V
I _I	input leakage current	$V_{I} = 0 V \text{ to } 2.75 V;$ $V_{CC} = 0 V \text{ to } 2.75 V$	[1]	-	0.001	±0.1	±0.5	μA
I _{OFF}	power-off leakage current	V_{I} or $V_{O} = 0$ V to 2.75 V; $V_{CC} = 0$ V	[1]	-	0.01	±0.1	±0.5	μA
ΔI_{OFF}	additional power-off leakage current	$V_1 \text{ or } V_0 = 0 \text{ V or } 2.75 \text{ V};$ [1] $V_{CC} = 0 \text{ V to } 0.1 \text{ V}$		-	0.02	±0.1	±0.5	μA
I _{CC}	supply current	$V_{I} = 0 V \text{ or } V_{CC}; I_{O} = 0 A$	<u>[1]</u>	-	0.01	0.3	0.6	μA
ΔI_{CC}	additional supply current			-	2	100	150	μA

[1] 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 <u>Figure 12</u>.

Symbol	Parameter	Conditions	T,	T _{amb} = 25 °C		T _{amb} = -4	0 °C to +85 °C	Unit
			Min	Typ[1]	Max	Min	Max	
t _{pd}	propagation	A to Y; see Figure 6 [2][3]						
	delay	$V_{CC} = 0.75 \text{ V} \text{ to } 0.85 \text{ V}$	3	11	33	2	100	ns
		V _{CC} = 1.1 V to 1.3 V	1.8	4.3	7.0	1.7	7.3	ns
		V _{CC} = 1.4 V to 1.6 V	1.5	3.1	4.7	1.3	5.1	ns
		V _{CC} = 1.65 V to 1.95 V	1.2	2.6	3.8	1.1	4.1	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.0	2.0	2.8	0.9	3.1	ns
t _t	transition time	V _{CC} = 2.7 V; see <u>Figure 6</u> [4]	-	-	-	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	$V_{O} = 0 V; V_{CC} = 0 V$	-	1.0	-	-	-	pF
C _{PD}	power dissipation	$f_i = 1 \text{ MHz}; V_1 = 0 \text{ V to } V_{CC}$ [5]						
	capacitance	$V_{CC} = 0.75 \text{ V} \text{ to } 0.85 \text{ V}$	-	2.3	-	-	-	pF
		V _{CC} = 1.1 V to 1.3 V	-	2.3	-	-	-	pF
		V _{CC} = 1.4 V to 1.6 V	-	2.4	-	-	-	pF
		V _{CC} = 1.65 V to 1.95 V	-	2.4	-	-	-	pF
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	-	2.7	-	-	-	pF

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

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

[3] For additional propagation delay values at different load capacitances, see Figure 7 to Figure 11.

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

[5] 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:

 f_i = input frequency in MHz;

 $f_o = output frequency in MHz;$

 C_L = output load capacitance in pF;

 V_{CC} = supply voltage in V;

N = number of inputs switching.

12. Waveforms

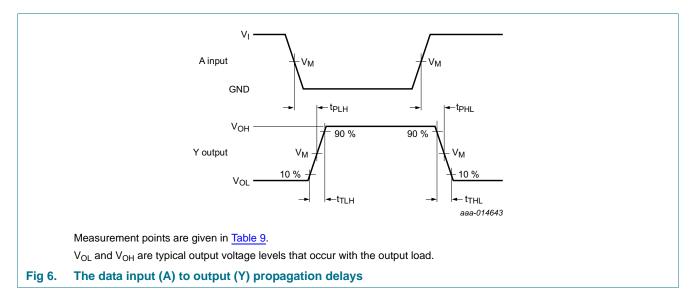
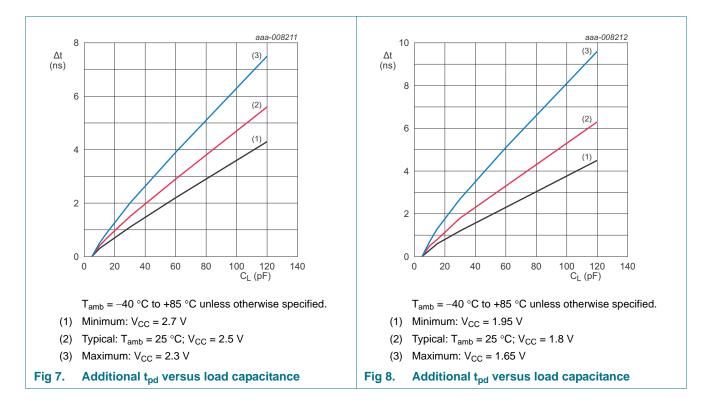


Table 9.Measurement points

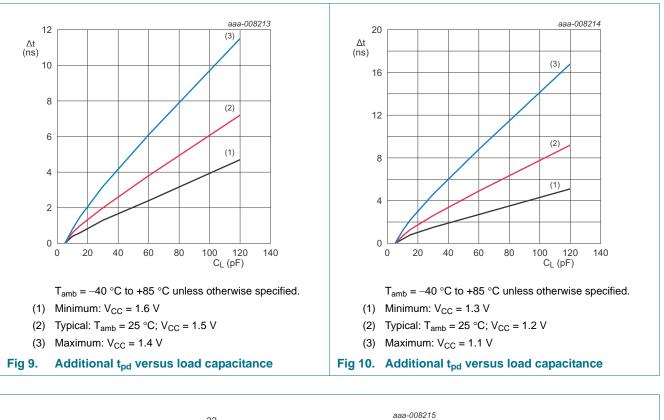
Supply voltage	Input	Output		
V _{cc}	V _M	VI	$t_r = t_f$	V _M
0.75 V to 2.7 V	0.5V _{CC}	V _{CC}	≤ 3.0 ns	0.5V _{CC}

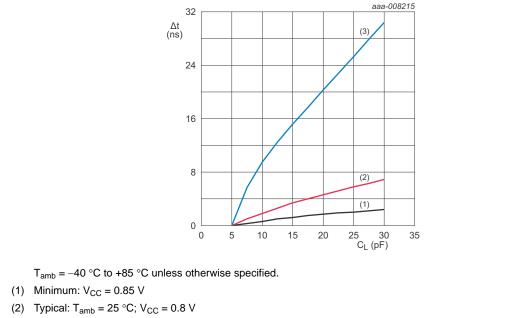


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- (3) Maximum: $V_{CC} = 0.75 V$
- Fig 11. Additional t_{pd} versus load capacitance

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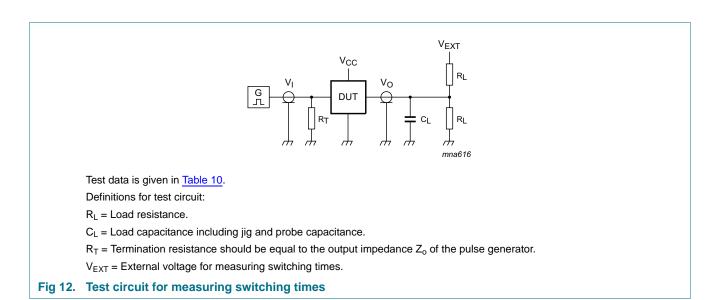


Table 10. Test data

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

13. Package outline

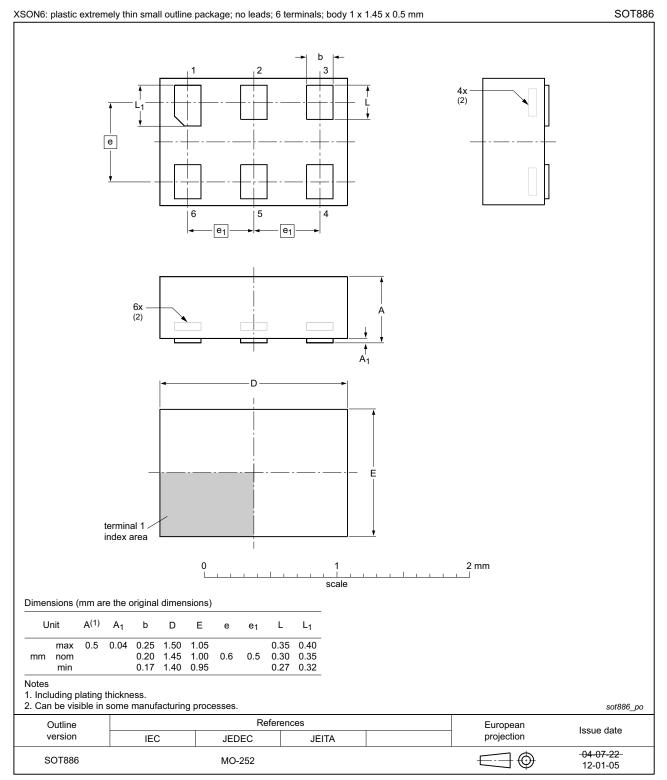
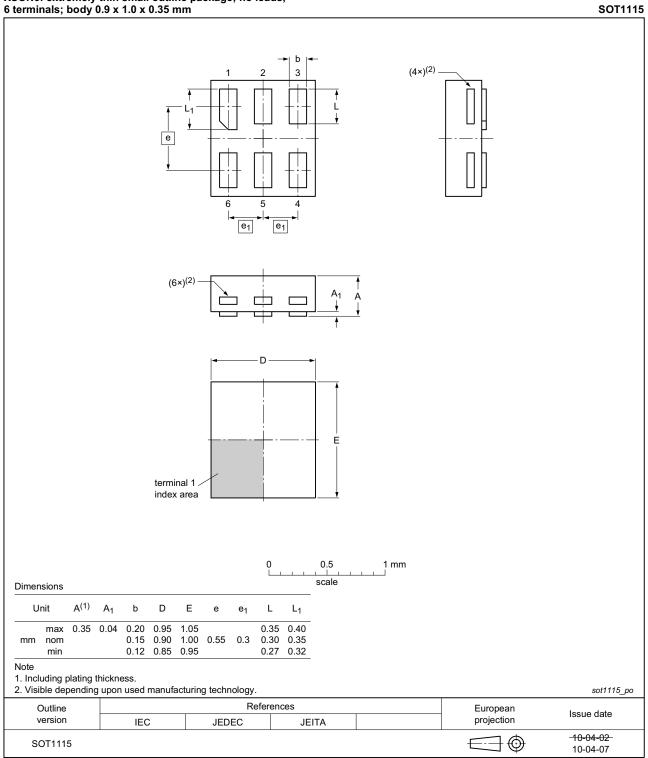


Fig 13. Package outline SOT886 (XSON6)

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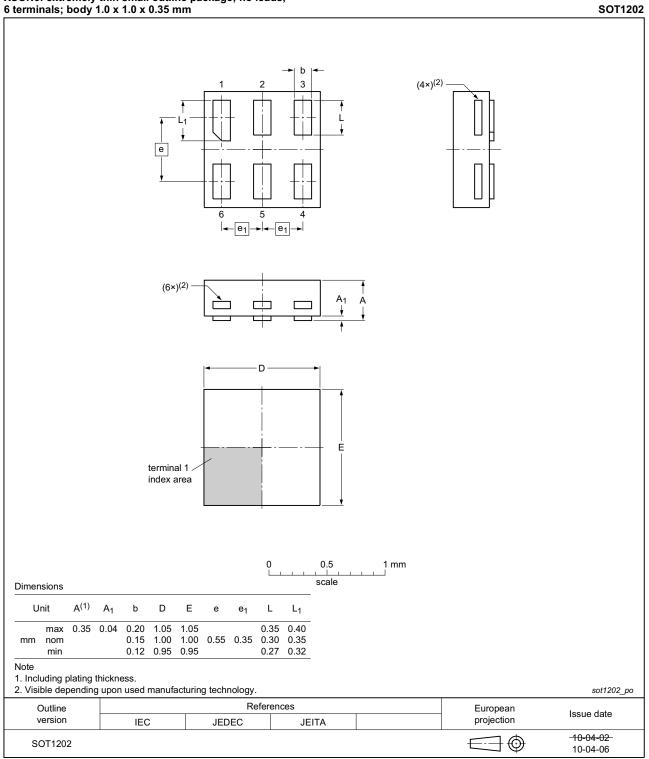
74AXP1G04



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

Fig 14. Package outline SOT1115 (XSON6)

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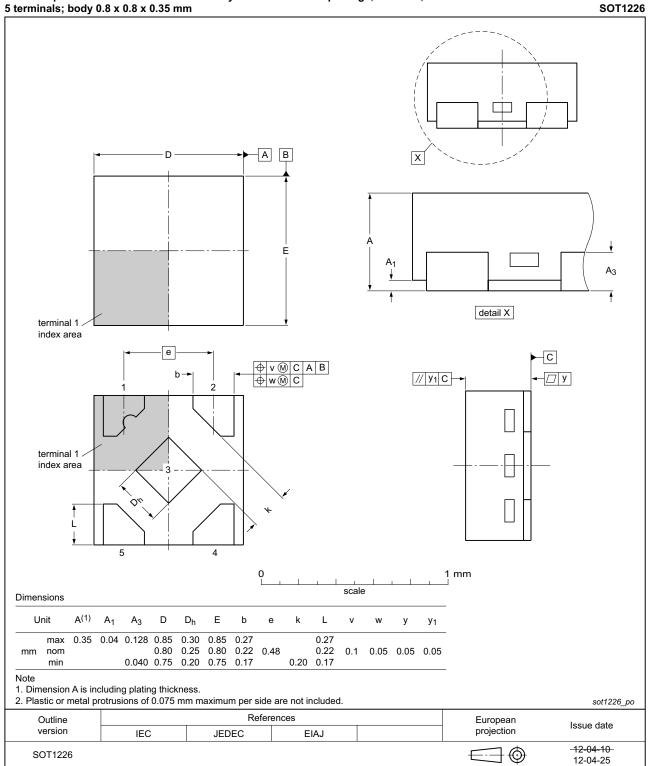


XSON6: extremely thin small outline package; no leads; 6 terminals; body 1.0 x 1.0 x 0.35 mm

Fig 15. 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 16. Package outline SOT1226 (X2SON5)

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14. Abbreviations

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

15. Revision history

Table 12.Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AXP1G04 v.1	20140825	Product data sheet	-	-

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status ^[3]	Definition
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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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