

# 74AXP2G17

## Low-power dual Schmitt trigger

Rev. 1 — 12 November 2015

Product data sheet

## 1. General description

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The 74AXP2G17 is a dual Schmitt trigger buffer. It can transform 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;  $C_{PD} = 2.5$  pF at  $V_{CC} = 1.2$  V (typical)
- Low static power consumption;  $I_{CC} = 0.6$   $\mu$ 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	
74AXP2G17GM	-40 °C to +85 °C	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886
74AXP2G17GN	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 0.9 × 1.0 × 0.35 mm	SOT1115
74AXP2G17GS	-40 °C to +85 °C	XSON6	extremely thin small outline package; no leads; 6 terminals; body 1.0 × 1.0 × 0.35 mm	SOT1202

### 4. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
74AXP2G17GM	rV
74AXP2G17GN	rV
74AXP2G17GS	rV

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

### 5. Functional diagram

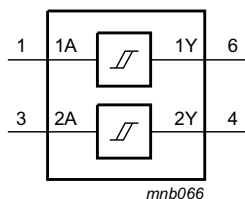


Fig 1. Logic symbol

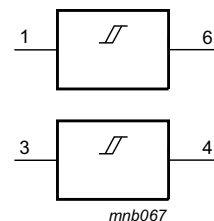


Fig 2. IEC logic symbol

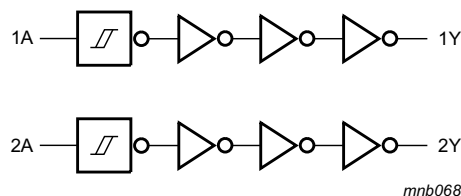
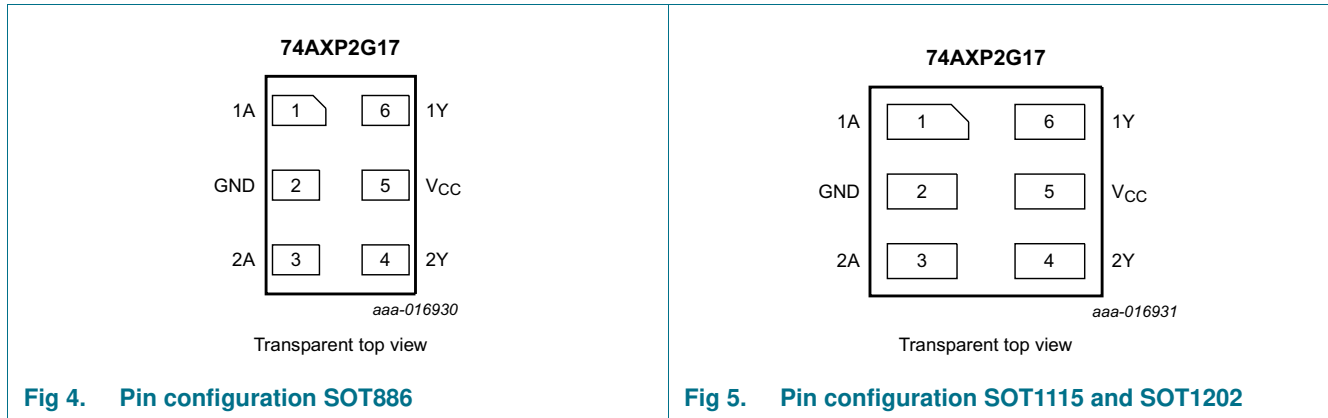


Fig 3. Logic diagram

## 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	L
H	H

[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		-0.5	+3.3	V
$I_{OK}$	output clamping current	$V_O < 0$ V	-50	-	mA
$V_O$	output voltage		-0.5	+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 <sub>amb</sub> = -40 °C to +85 °C				Unit	
			Min	Typ 25 °C	Max 25 °C	Max 85 °C		
V <sub>T+</sub>	positive-going threshold voltage	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>						
		V <sub>CC</sub> = 0.75 V to 0.85 V	0.3V <sub>CC</sub>	-	0.8V <sub>CC</sub>	0.8V <sub>CC</sub>	V	
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.4V <sub>CC</sub>	-	0.7V <sub>CC</sub>	0.7V <sub>CC</sub>	V	
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.9	-	1.7	1.7	V	
V <sub>T-</sub>	negative-going threshold voltage	see <a href="#">Figure 6</a> and <a href="#">Figure 7</a>						
		V <sub>CC</sub> = 0.75 V to 0.85 V	0.2V <sub>CC</sub>	-	0.7V <sub>CC</sub>	0.7V <sub>CC</sub>	V	
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.3V <sub>CC</sub>	-	0.6V <sub>CC</sub>	0.6V <sub>CC</sub>	V	
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7	-	1.5	1.5	V	
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	0.6	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

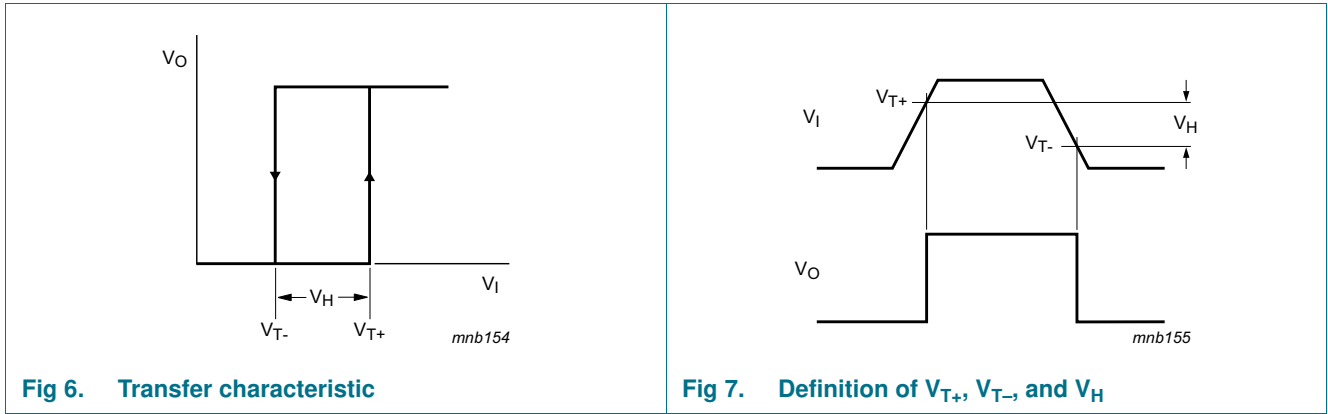


Fig 6. Transfer characteristic

Fig 7. Definition of  $V_{T+}$ ,  $V_{T-}$ , and  $V_H$

11. Dynamic characteristics

Table 8. Dynamic characteristics

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

Symbol	Parameter	Conditions	$T_{amb} = 25\text{ °C}$			$T_{amb} = -40\text{ °C to }+85\text{ °C}$		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$t_{pd}$	propagation delay	nA to nY; see Figure 8 <sup>[2][3]</sup>						
		$V_{CC} = 0.75\text{ V to }0.85\text{ V}$	3	11	39	2	136	ns
		$V_{CC} = 1.1\text{ V to }1.3\text{ V}$	2.1	4.4	7.0	1.9	7.3	ns
		$V_{CC} = 1.4\text{ V to }1.6\text{ V}$	1.8	3.3	4.7	1.6	5.0	ns
		$V_{CC} = 1.65\text{ V to }1.95\text{ V}$	1.5	2.8	3.9	1.3	4.2	ns
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	1.2	2.3	3.0	1.1	3.3	ns
$t_t$	transition time	$V_{CC} = 2.7\text{ V}$ ; see Figure 8 <sup>[4]</sup>	-	-	-	1.0	-	ns
$C_I$	input capacitance	$V_I = 0\text{ V or }V_{CC}$ ; $V_{CC} = 0\text{ V to }2.75\text{ V}$	-	0.5	-	-	-	pF
$C_O$	output capacitance	$V_O = 0\text{ V}; V_{CC} = 0\text{ V}$	-	1.0	-	-	-	pF

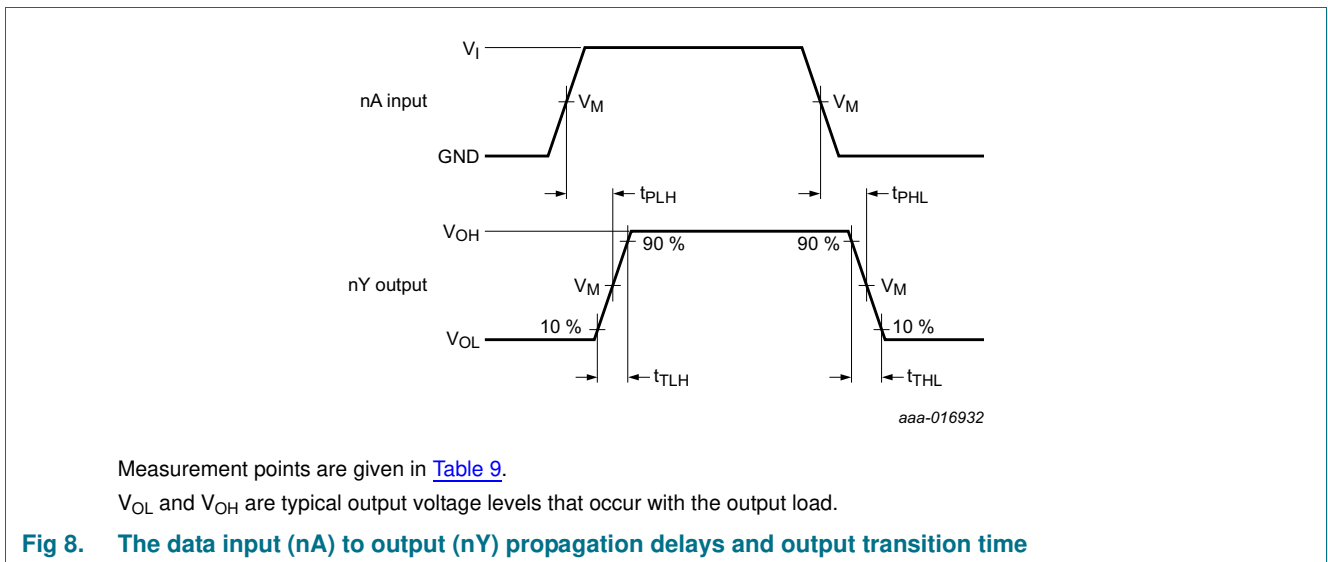
**Table 8. Dynamic characteristics ...continued**

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	
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = 0 V to V <sub>CC</sub> <a href="#">[5]</a>						
		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	-	2.5	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	2.6	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	2.7	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	3.1	-	-	-	pF

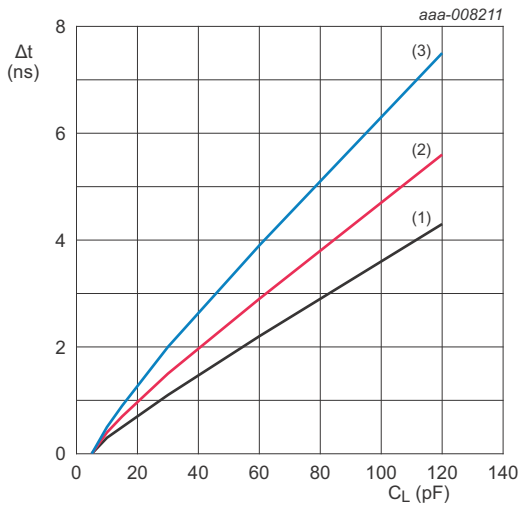
- [1] All typical values are measured at nominal V<sub>CC</sub>.
- [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- [3] For additional propagation delay values at different load capacitances, see [Figure 9](#) to [Figure 13](#).
- [4] t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.
- [5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + C_L \times V_{CC}^2 \times f_o$  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;

## 12. Waveforms



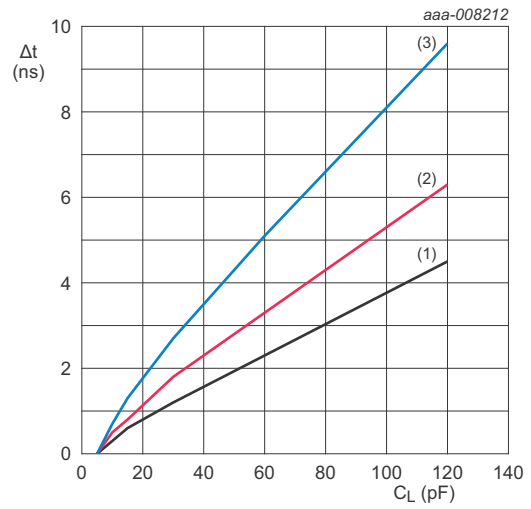
**Table 9. Measurement points**

Supply voltage	Input			Output
V <sub>CC</sub>	V <sub>M</sub>	V <sub>I</sub>	t <sub>r</sub> = t <sub>f</sub>	V <sub>M</sub>
0.75 V to 2.7 V	0.5V <sub>CC</sub>	V <sub>CC</sub>	≤ 3.0 ns	0.5V <sub>CC</sub>



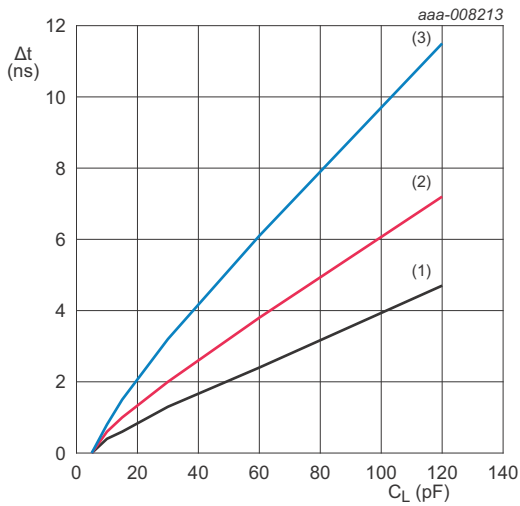
- $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.
- (1) Minimum:  $V_{CC} = 2.7\text{ V}$
  - (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 2.5\text{ V}$
  - (3) Maximum:  $V_{CC} = 2.3\text{ V}$

Fig 9. Additional  $t_{pd}$  versus load capacitance



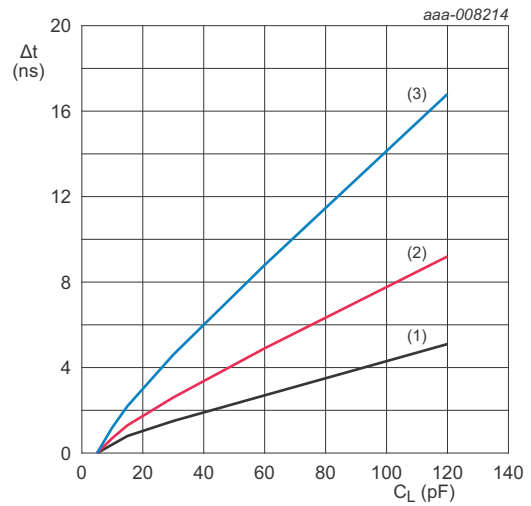
- $T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.
- (1) Minimum:  $V_{CC} = 1.95\text{ V}$
  - (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CC} = 1.8\text{ V}$
  - (3) Maximum:  $V_{CC} = 1.65\text{ V}$

Fig 10. Additional  $t_{pd}$  versus load capacitance



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

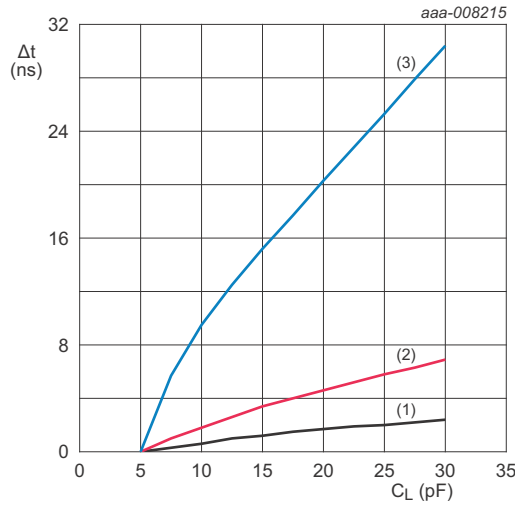
Fig 11. Additional  $t_{pd}$  versus load capacitance



- $T_{amb} = -40\text{ }^{\circ}\text{C}$  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

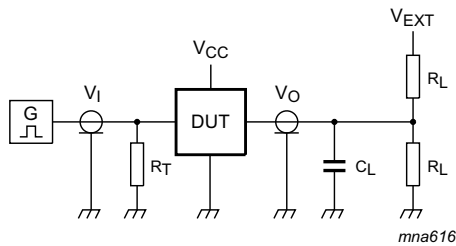




$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.

- (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 kΩ	0 V	0 V	$2V_{CC}$

13. Package outline

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

SOT886

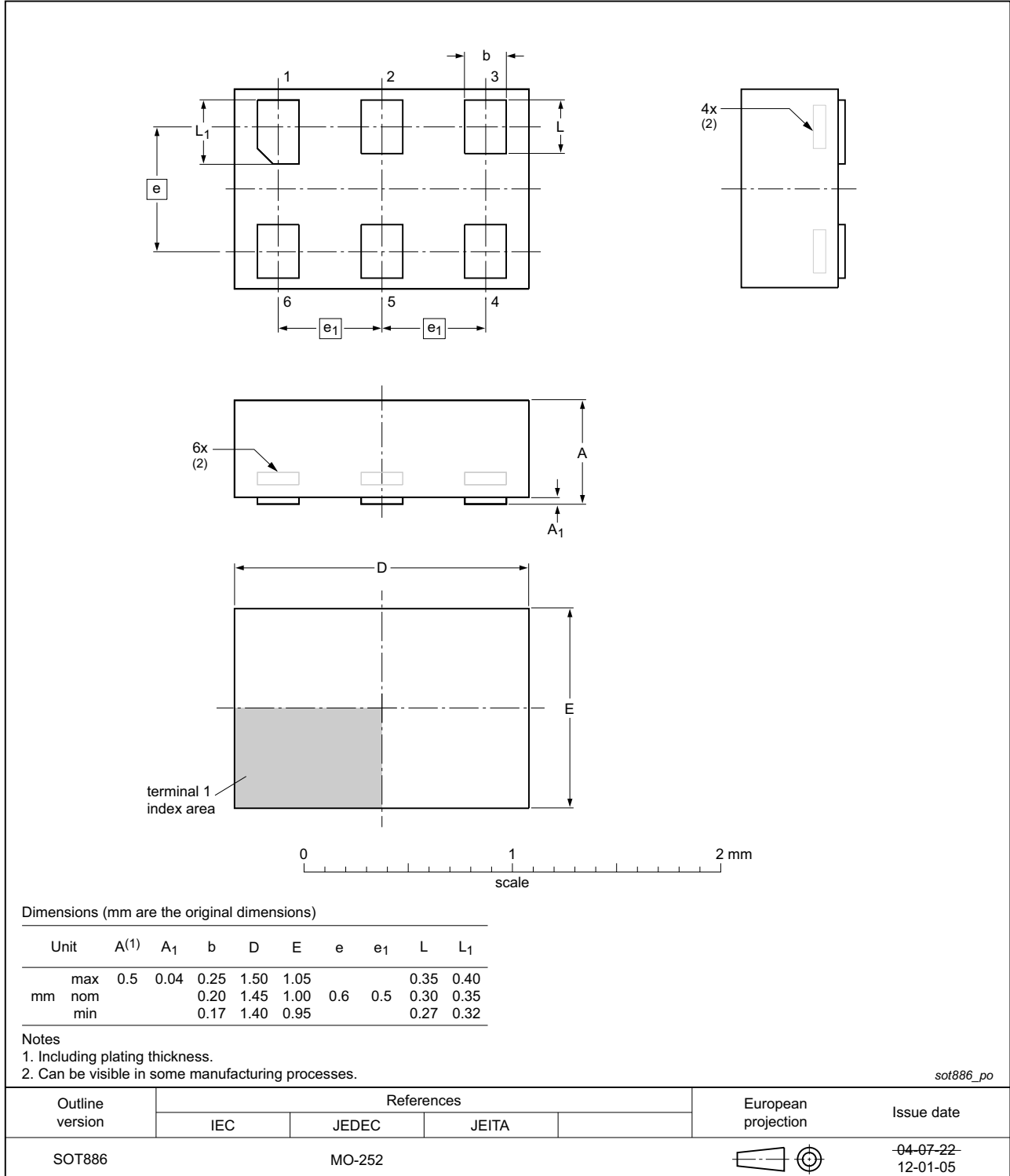


Fig 15. Package outline SOT886 (XSON6)

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

SOT1115

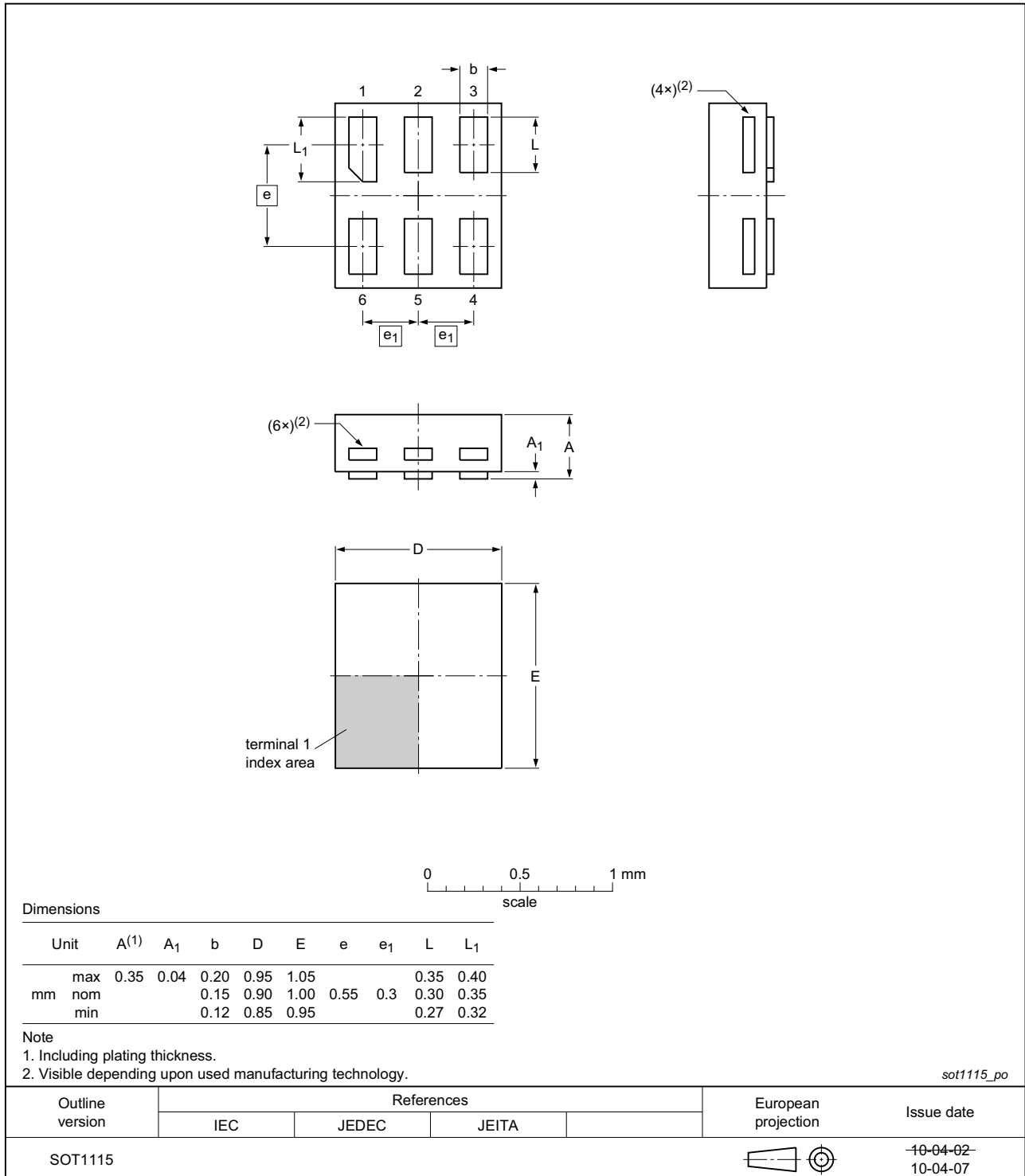


Fig 16. Package outline SOT1115 (XSON6)

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

SOT1202

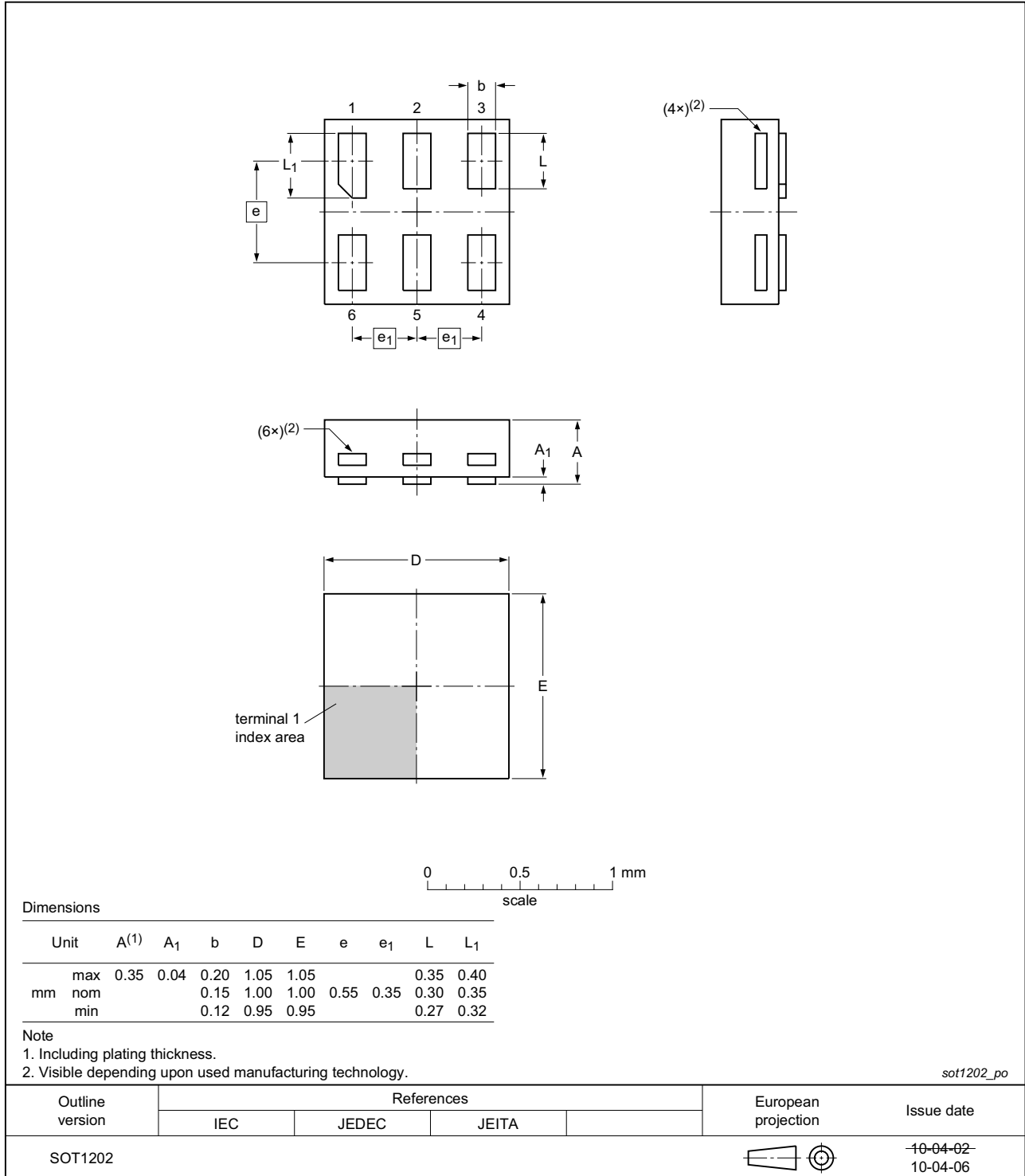


Fig 17. Package outline SOT1202 (XSON6)

## 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
74AXP2G17 v.1	20151112	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.

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

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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## 17. Contact information

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

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

## 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>5</b>
10.1	Waveform transfer characteristics .....	6
<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>13</b>
<b>15</b>	<b>Revision history</b> .....	<b>13</b>
<b>16</b>	<b>Legal information</b> .....	<b>14</b>
16.1	Data sheet status .....	14
16.2	Definitions .....	14
16.3	Disclaimers .....	14
16.4	Trademarks .....	15
<b>17</b>	<b>Contact information</b> .....	<b>15</b>
<b>18</b>	<b>Contents</b> .....	<b>16</b>