

74AXP2G17

Low-power dual Schmitt trigger

Rev. 1 — 12 November 2015

Product data sheet

1. General description

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

- 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; $I_{CC} = 0.6$ μ 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 | | | |
|-------------|-------------------|-------|---|---------|
| | Temperature range | Name | Description | Version |
| 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 ^[1] |
|-------------|-----------------------------|
| 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

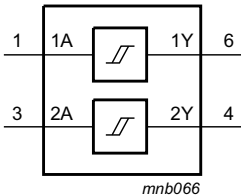


Fig 1. Logic symbol

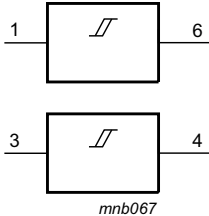


Fig 2. IEC logic symbol

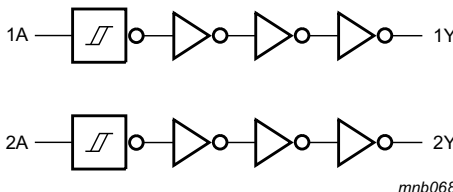
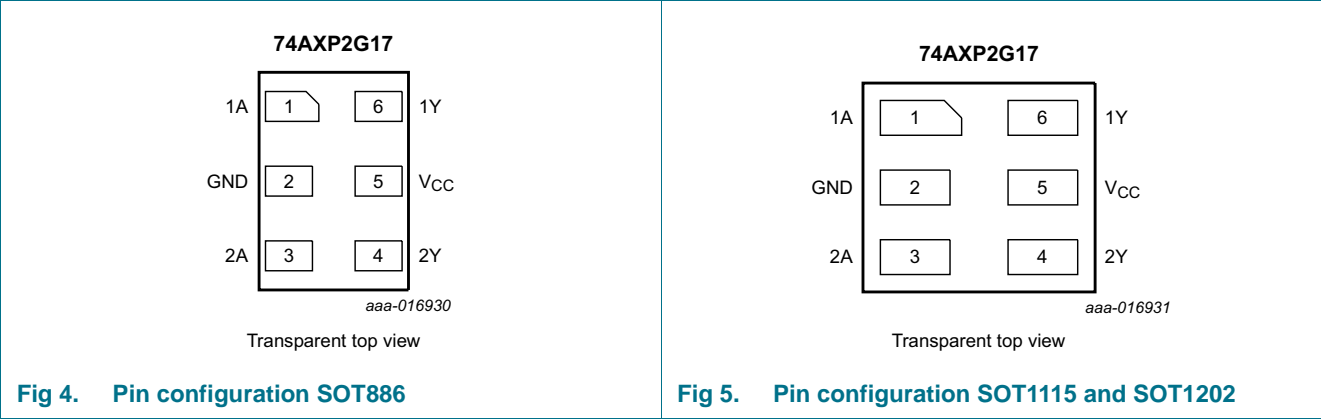


Fig 3. Logic diagram

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 _{CC} | 5 | supply voltage |
| 1Y | 6 | data output |

7. Functional description

Table 4. Function table^[1]

| 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 | [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 |
| 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

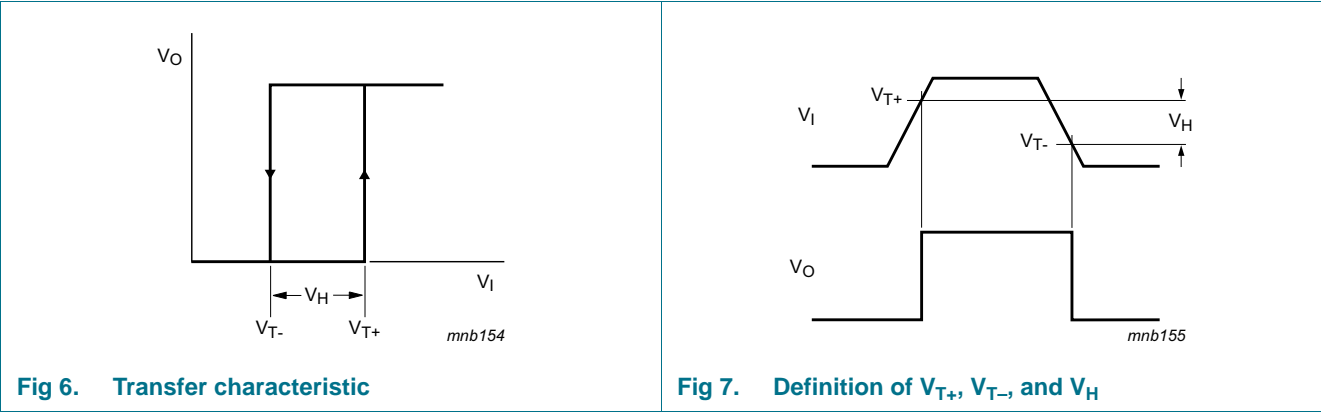
Table 7. Static characteristics

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 Figure 6 and Figure 7 | | | | | |
| | | 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 Figure 6 and Figure 7 | | | | | |
| | | 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 |
| V _H | hysteresis voltage | see Figure 6 and Figure 7 | | | | | |
| | | V _{CC} = 0.75 V to 0.85 V | 0.06V _{CC} | - | 0.5V _{CC} | 0.5V _{CC} | V |
| | | V _{CC} = 1.1 V to 1.95 V | 0.1V _{CC} | - | 0.4V _{CC} | 0.4V _{CC} | V |
| | | V _{CC} = 2.3 V to 2.7 V | 0.2 | - | 1.0 | 1.0 | V |
| V _{OH} | HIGH-level output voltage | I _O = -20 µA; V _{CC} = 0.7 V | - | 0.69 | - | - | V |
| | | 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 output voltage | I _O = 20 µA; V _{CC} = 0.7 V | - | 0.01 | - | - | V |
| | | 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 |
| I _I | input leakage current | V _I = 0 V to 2.75 V; V _{CC} = 0 V 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 _I or V _O = 0 V or 2.75 V; V _{CC} = 0 V to 0.1 V [1] | - | 0.02 | ±0.1 | ±0.5 | µA |
| I _{CC} | supply current | V _I = 0 V or V _{CC} ; I _O = 0 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] Typical values are measured at V_{CC} = 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 _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | Unit |
|-----------------|--------------------|--|--------------------------|--------------------|-----|-------------------------------------|-----|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| t _{pd} | propagation delay | nA to nY; see Figure 8 ^{[2][3]} | | | | | | |
| | | V _{CC} = 0.75 V to 0.85 V | 3 | 11 | 39 | 2 | 136 | ns |
| | | V _{CC} = 1.1 V to 1.3 V | 2.1 | 4.4 | 7.0 | 1.9 | 7.3 | ns |
| | | V _{CC} = 1.4 V to 1.6 V | 1.8 | 3.3 | 4.7 | 1.6 | 5.0 | ns |
| | | V _{CC} = 1.65 V to 1.95 V | 1.5 | 2.8 | 3.9 | 1.3 | 4.2 | ns |
| | | V _{CC} = 2.3 V to 2.7 V | 1.2 | 2.3 | 3.0 | 1.1 | 3.3 | ns |
| t _t | transition time | V _{CC} = 2.7 V; see Figure 8 ^[4] | - | - | - | 1.0 | - | ns |
| C _I | 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 | - | 1.0 | - | - | - | pF |

Table 8. Dynamic characteristics ...continued
Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 14.

| Symbol | Parameter | Conditions | T _{amb} = 25 °C | | | T _{amb} = -40 °C to +85 °C | | Unit |
|-----------------|-------------------------------|--|--------------------------|--------------------|-----|-------------------------------------|-----|------|
| | | | Min | Typ ^[1] | Max | Min | Max | |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; V _I = 0 V to V _{CC} ^[5] | | | | | | |
| | | V _{CC} = 0.75 V to 0.85 V | - | 2.3 | - | - | - | 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 | - | 2.7 | - | - | - | pF |
| | | V _{CC} = 2.3 V to 2.7 V | - | 3.1 | - | - | - | pF |

- [1] All typical values are measured at nominal V_{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 9 to Figure 13.
- [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 μW).
P_D = C_{PD} × V_{CC}² × f_i + C_L × V_{CC}² × 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;

12. Waveforms

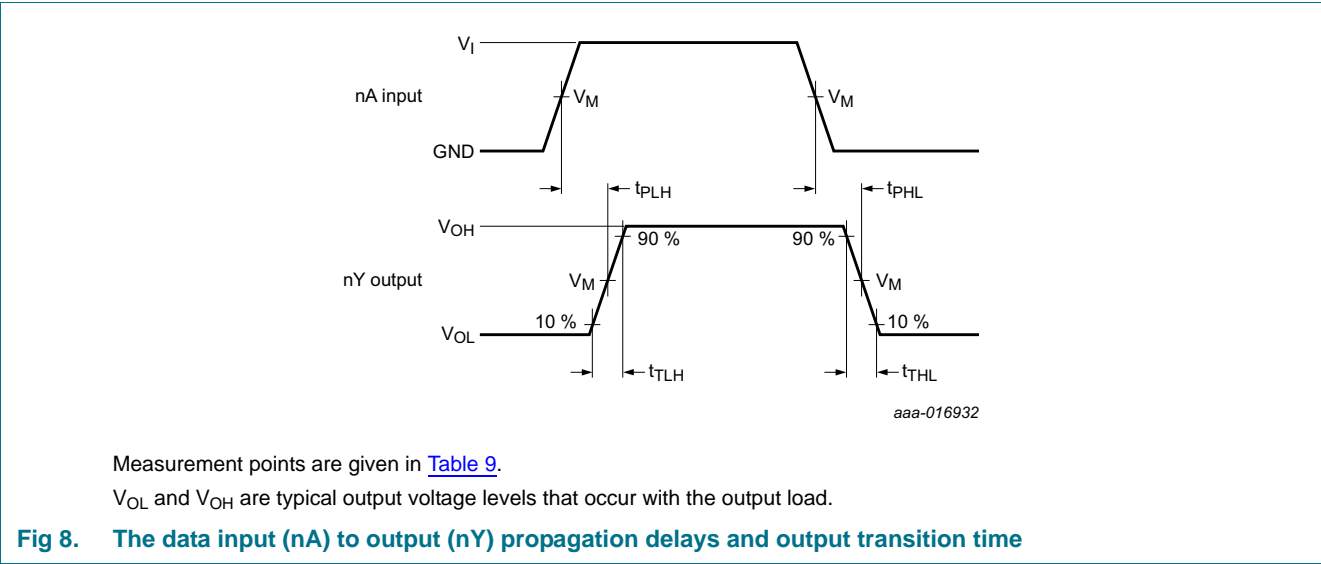
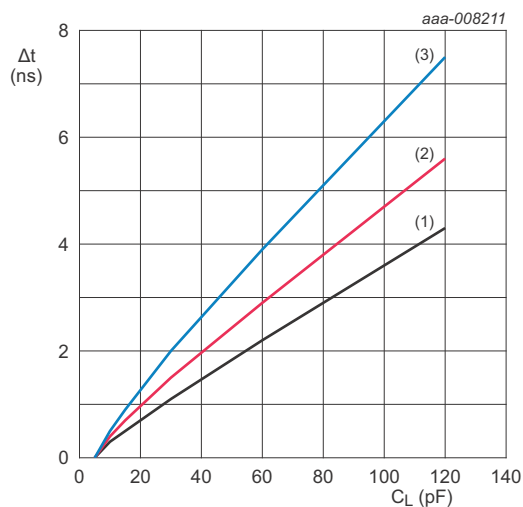


Table 9. Measurement points

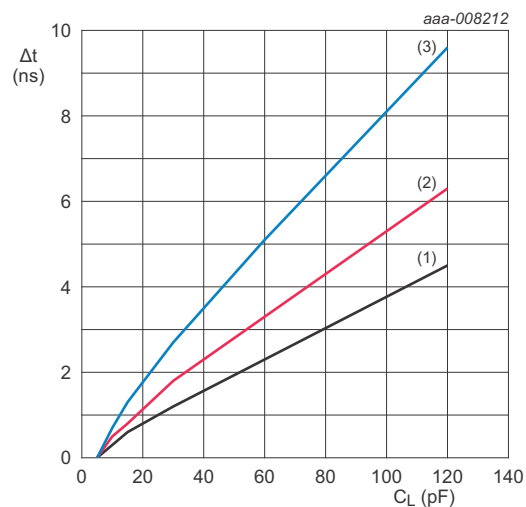
| Supply voltage | Input | | | Output |
|-----------------|--------------------|-----------------|---------------------------------|--------------------|
| V _{CC} | V _M | V _I | t _r = t _f | V _M |
| 0.75 V to 2.7 V | 0.5V _{CC} | V _{CC} | ≤ 3.0 ns | 0.5V _{CC} |



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

- (1) Minimum: $V_{CC} = 2.7\text{ V}$
- (2) Typical: $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 2.5\text{ V}$
- (3) Maximum: $V_{CC} = 2.3\text{ V}$

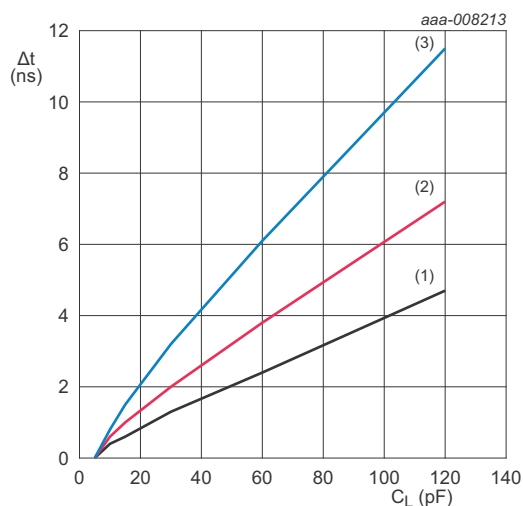
Fig 9. Additional t_{pd} versus load capacitance



$T_{amb} = -40\text{ }^{\circ}\text{C}$ 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: $V_{CC} = 1.65\text{ V}$

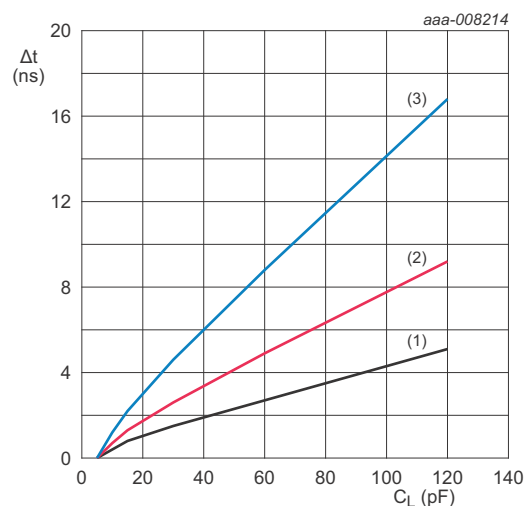
Fig 10. Additional t_{pd} versus load capacitance



$T_{amb} = -40\text{ }^{\circ}\text{C}$ 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: $V_{CC} = 1.4\text{ V}$

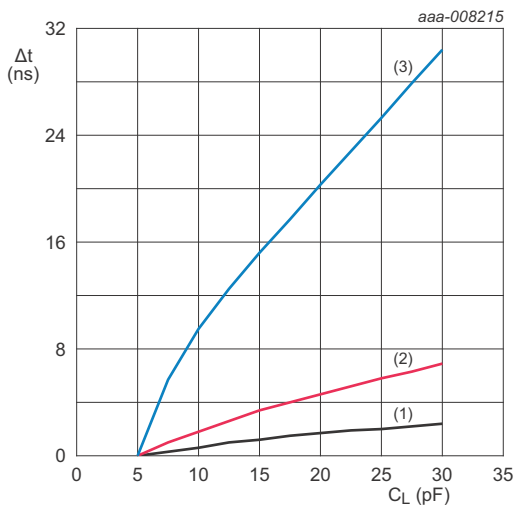
Fig 11. Additional t_{pd} versus load capacitance



$T_{amb} = -40\text{ }^{\circ}\text{C}$ 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: $V_{CC} = 1.1\text{ V}$

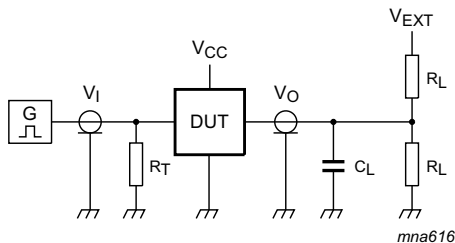
Fig 12. Additional t_{pd} versus load capacitance



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

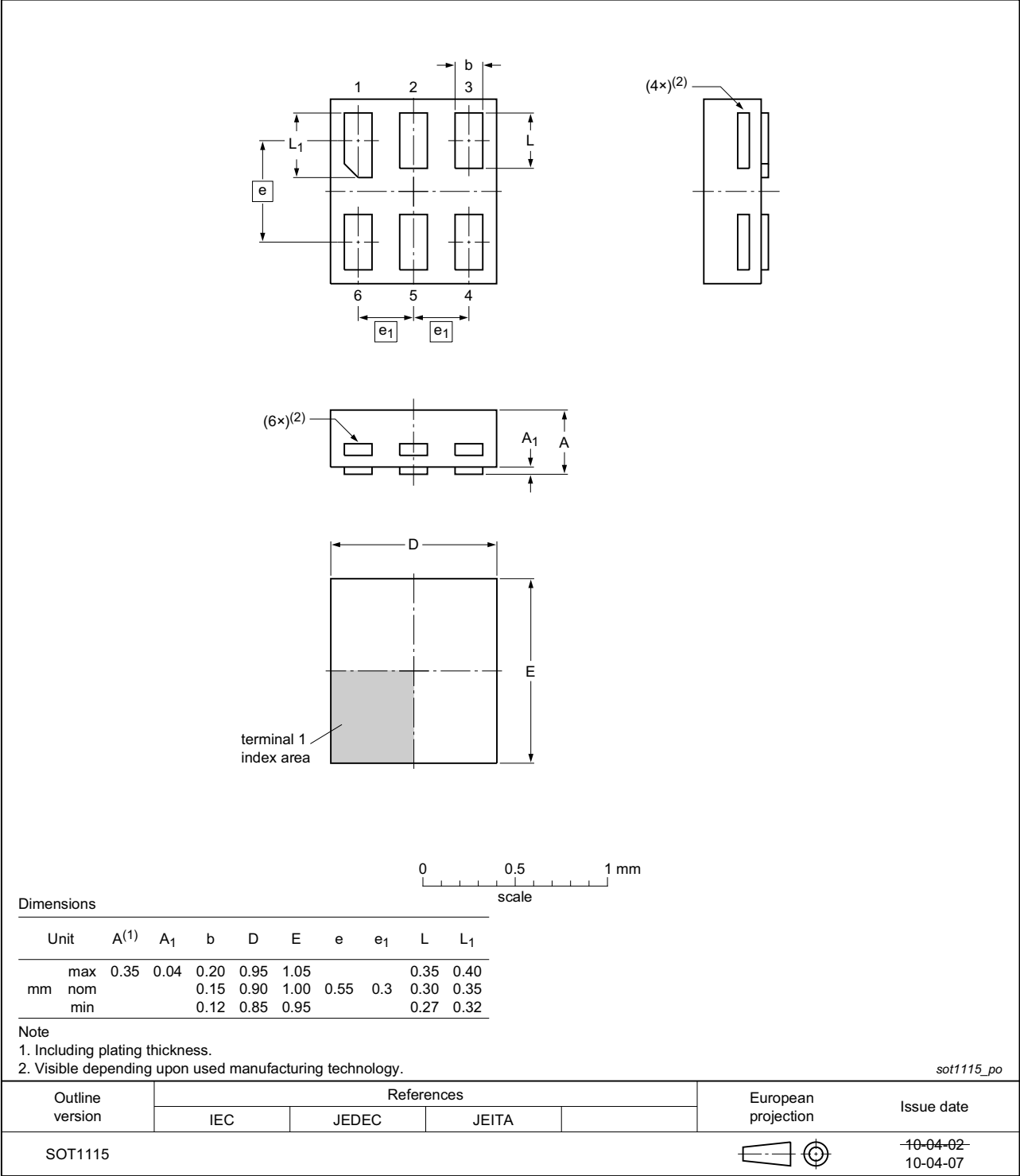


Fig 16. Package outline SOT1115 (XSON6)

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

SOT1202

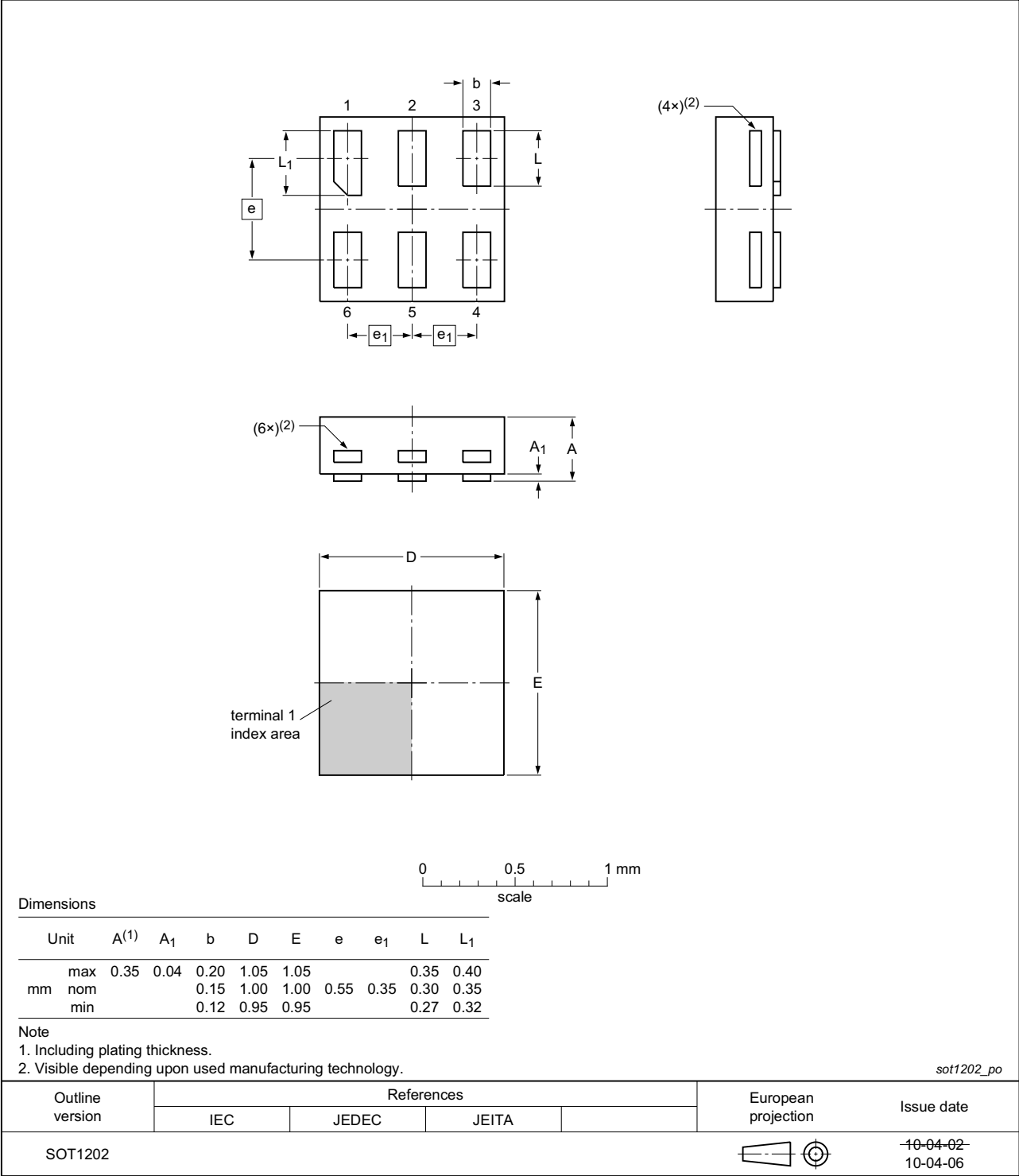


Fig 17. Package outline SOT1202 (XSON6)

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

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18. Contents

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