

74AXP1G125

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; $I_{CC} = 0.6$ 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 | | | Version |
|--------------|-------------------|--------|--|---------|
| | Temperature range | Name | Description | |
| 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 |

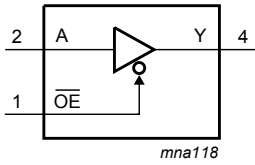
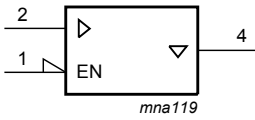
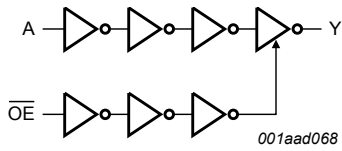
4 Marking

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.

5 Functional diagram

| | | |
|--|--|---|
|  <p>Figure 1. Logic symbol</p> |  <p>Figure 2. IEC logic symbol</p> |  <p>Figure 3. Logic diagram</p> |
|--|--|---|

6 Pinning information

6.1 Pinning

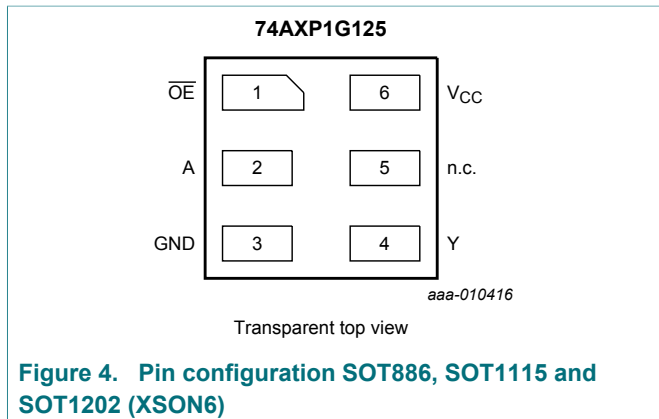


Figure 4. Pin configuration SOT886, SOT1115 and SOT1202 (XSON6)

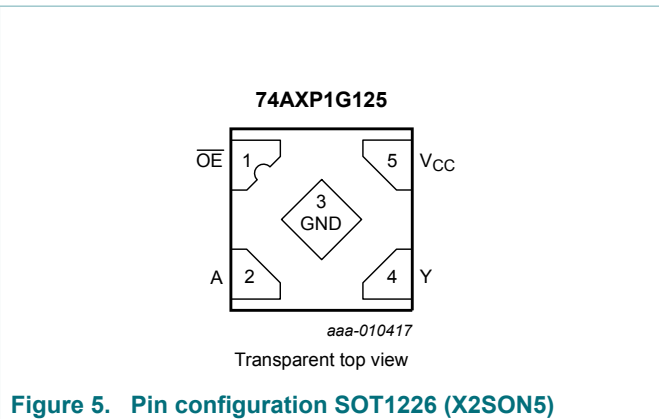


Figure 5. Pin configuration SOT1226 (X2SON5)

6.2 Pin description

Table 3. Pin description

| Symbol | Pin | | Description |
|-----------------|--------|-------|---------------------|
| | X2SON5 | XSON6 | |
| OE | 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 | A | Y |
| L | L | L |
| L | H | H |
| H | 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 | 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} | - | ± 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 |
| $\Delta t/\Delta V$ | 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 | $T_{amb} = -40\text{ °C to }+85\text{ °C}$ | | | | Unit |
|------------------|--------------------------------------|---|--|-----------|--------------|--------------|---------------|
| | | | Min | Typ 25 °C | Max 25 °C | Max 85 °C | |
| V_{IH} | HIGH-level input voltage | $V_{CC} = 0.75\text{ V to }0.85\text{ V}$ | $0.75V_{CC}$ | - | - | - | V |
| | | $V_{CC} = 1.1\text{ V to }1.95\text{ V}$ | $0.65V_{CC}$ | - | - | - | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | 1.6 | - | - | - | V |
| V_{IL} | LOW-level input voltage | $V_{CC} = 0.75\text{ V to }0.85\text{ V}$ | - | - | $0.25V_{CC}$ | $0.25V_{CC}$ | V |
| | | $V_{CC} = 1.1\text{ V to }1.95\text{ V}$ | - | - | $0.35V_{CC}$ | $0.35V_{CC}$ | V |
| | | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$ | - | - | 0.7 | 0.7 | V |
| V_{OH} | HIGH-level output voltage | $I_O = -20\text{ }\mu\text{A}; V_{CC} = 0.7\text{ V}$ | - | 0.69 | - | - | V |
| | | $I_O = -100\text{ }\mu\text{A}; V_{CC} = 0.75\text{ V}$ | 0.65 | - | - | - | V |
| | | $I_O = -2\text{ mA}; V_{CC} = 1.1\text{ V}$ | 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} | LOW-level output voltage | $I_O = 20\text{ }\mu\text{A}; V_{CC} = 0.7\text{ V}$ | - | 0.01 | - | - | V |
| | | $I_O = 100\text{ }\mu\text{A}; V_{CC} = 0.75\text{ V}$ | - | - | 0.1 | 0.1 | V |
| | | $I_O = 2\text{ mA}; V_{CC} = 1.1\text{ V}$ | - | - | 0.275 | 0.275 | V |
| | | $I_O = 3\text{ mA}; V_{CC} = 1.4\text{ V}$ | - | - | 0.35 | 0.35 | V |
| | | $I_O = 4.5\text{ mA}; V_{CC} = 1.65\text{ V}$ | - | - | 0.45 | 0.45 | V |
| | | $I_O = 8\text{ mA}; V_{CC} = 2.3\text{ V}$ | - | - | 0.7 | 0.7 | V |
| I_I | input leakage current | $V_I = 0\text{ V to }2.75\text{ V};$ $V_{CC} = 0\text{ V to }2.75\text{ V}$ | - | 0.001 | ± 0.1 | ± 0.5 | μA |
| I_{OZ} | OFF-state output current | $V_I = V_{IH}\text{ or }V_{IL}; V_O = 0\text{ V to }2.75\text{ V}$ | - | 0.02 | ± 0.1 | ± 0.5 | μA |
| I_{OFF} | power-off leakage current | $V_I\text{ or }V_O = 0\text{ V to }2.75\text{ V};$ $V_{CC} = 0\text{ V}$ | - | 0.01 | ± 0.1 | ± 0.5 | μA |
| ΔI_{OFF} | additional power-off leakage current | $V_I\text{ or }V_O = 0\text{ V or }2.75\text{ V};$ $V_{CC} = 0\text{ V to }0.1\text{ V}$ | - | 0.02 | ± 0.1 | ± 0.5 | μA |
| I_{CC} | supply current | $V_I = 0\text{ V or }V_{CC}; I_O = 0\text{ A}$ | - | 0.01 | 0.3 | 0.6 | μA |
| ΔI_{CC} | additional supply current | $V_I = V_{CC} - 0.5\text{ V}; I_O = 0\text{ A};$ $V_{CC} = 2.5\text{ V}$ | - | 2 | 100 | 150 | μA |

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

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 | Max | |
| t _{pd} | propagation delay | A to Y; see Figure 6 ^{[2] [3]} | | | | | | |
| | | 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 | \overline{OE} to Y; see Figure 7 ^{[2] [3]} | | | | | | |
| | | V _{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 | \overline{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 Figure 6 ^[2] | - | - | - | 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 | - | - | - | pF |
| C _{PD} | power dissipation capacitance | f _i = 1 MHz; V _I = 0 V to V _{CC} ^[4] | | | | | | |
| | | V _{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}.

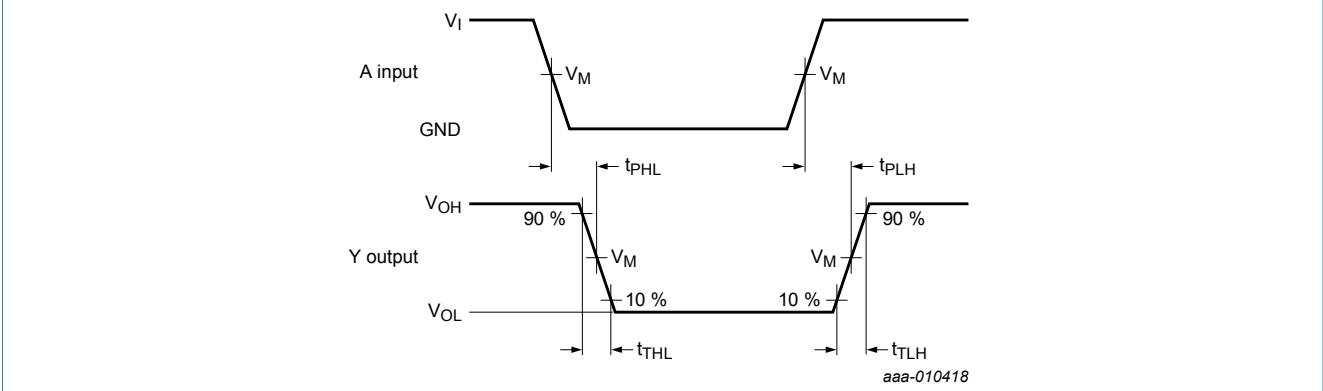
[3] For additional propagation delays and enable times values at different load capacitances see [Figure 8](#) to [Figure 12](#).

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

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

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.

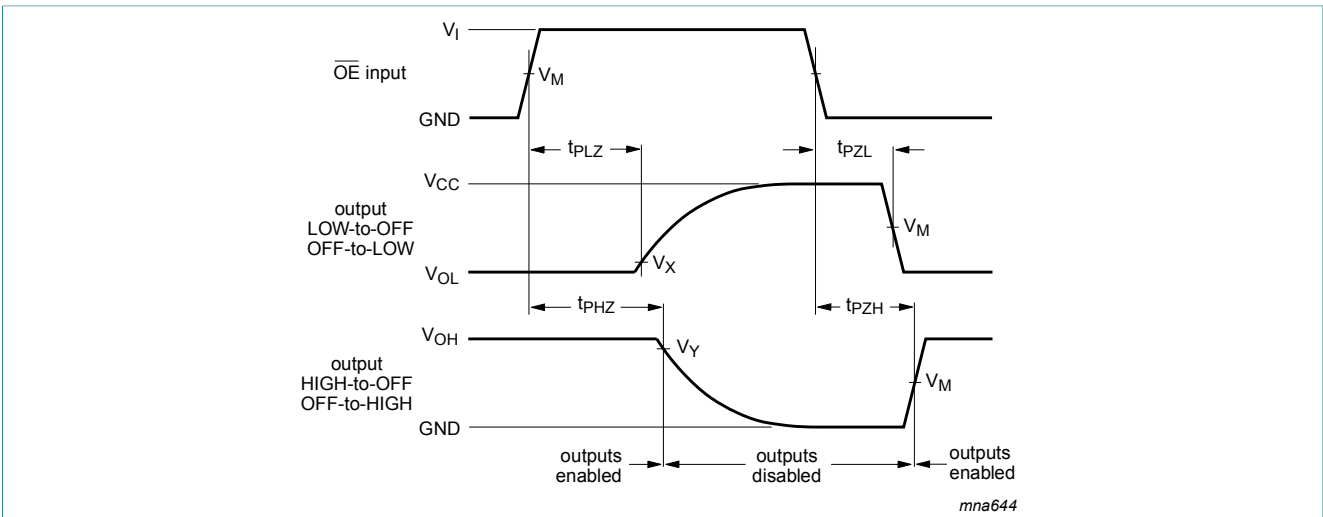
11.1 Waveforms and test circuit



Measurement points are given in [Table 9](#).

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



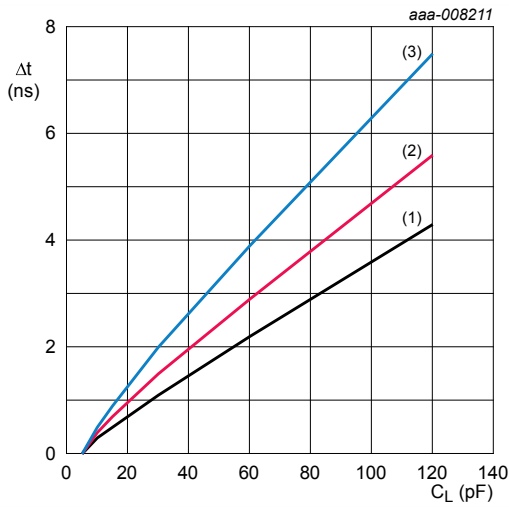
Measurement points are given in [Table 9](#).

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

Figure 7. Enable and disable times

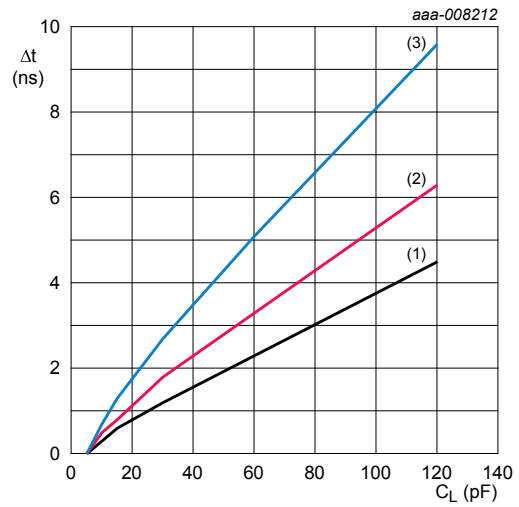
Table 9. Measurement points

| Supply voltage | Input | | | Output | | |
|-----------------|-------------|----------|---------------|-------------|-------------------|-------------------|
| V_{CC} | V_M | V_I | $t_r = t_f$ | V_M | V_X | 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 |



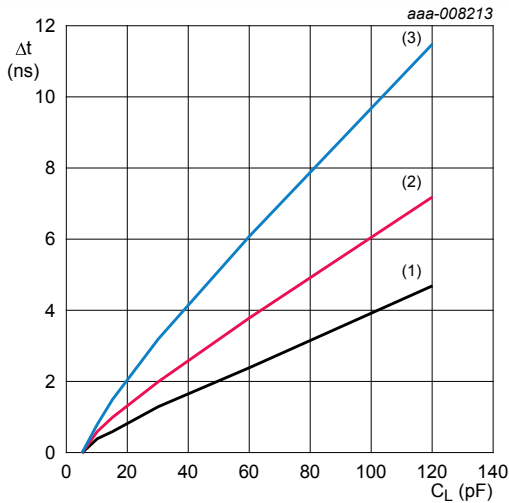
$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified.
 (1) Minimum: $V_{CC} = 2.7\text{ V}$
 (2) Typical: $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 2.5\text{ V}$
 (3) Maximum: $V_{CC} = 2.3\text{ V}$

Figure 8. Additional t_{pd} and t_{en} versus load capacitance



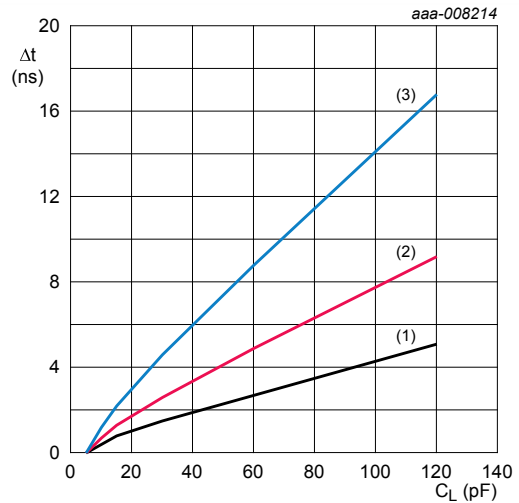
$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified.
 (1) Minimum: $V_{CC} = 1.95\text{ V}$
 (2) Typical: $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 1.8\text{ V}$
 (3) Maximum: $V_{CC} = 1.65\text{ V}$

Figure 9. Additional t_{pd} and t_{en} versus load capacitance



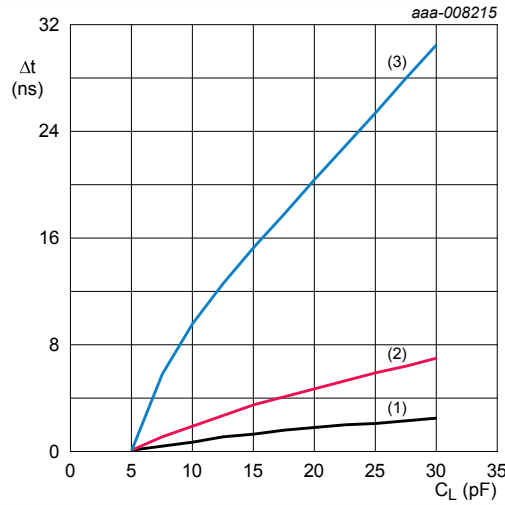
$T_{amb} = -40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ unless otherwise specified.
 (1) Minimum: $V_{CC} = 1.6\text{ V}$
 (2) Typical: $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{CC} = 1.5\text{ V}$
 (3) Maximum: $V_{CC} = 1.4\text{ V}$

Figure 10. Additional t_{pd} and t_{en} 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: $V_{CC} = 1.1\text{ V}$

Figure 11. Additional t_{pd} and t_{en} versus load capacitance



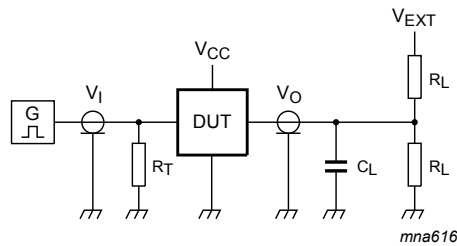
T_{amb} = -40 °C to +85 °C unless otherwise specified.

(1) Minimum: V_{CC} = 0.85 V

(2) Typical: T_{amb} = 25 °C; V_{CC} = 0.8 V

(3) Maximum: V_{CC} = 0.75 V

Figure 12. Additional t_{pd} and t_{en} 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.

Figure 13. 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 | 2 x V _{CC} |

12 Package outline

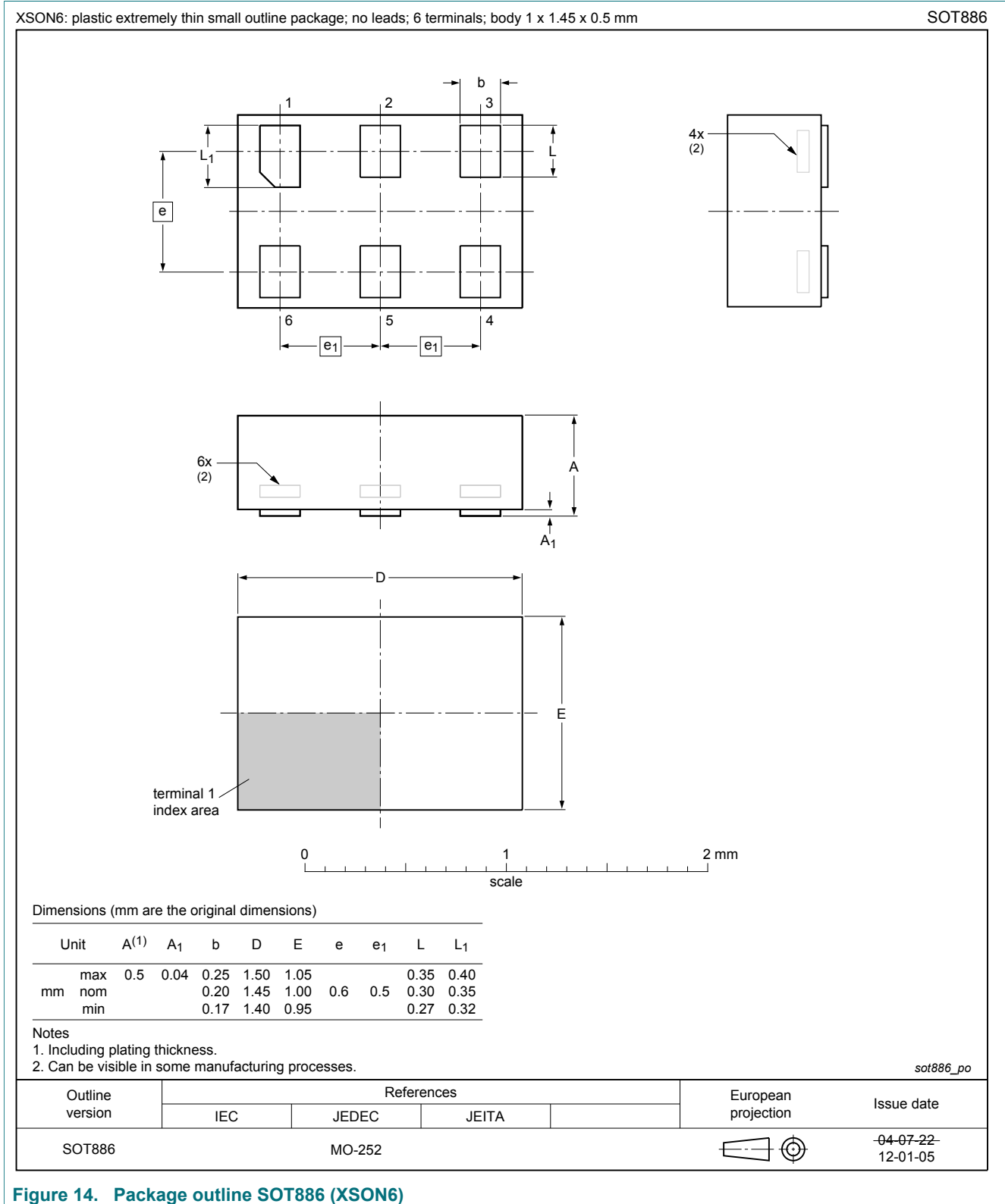
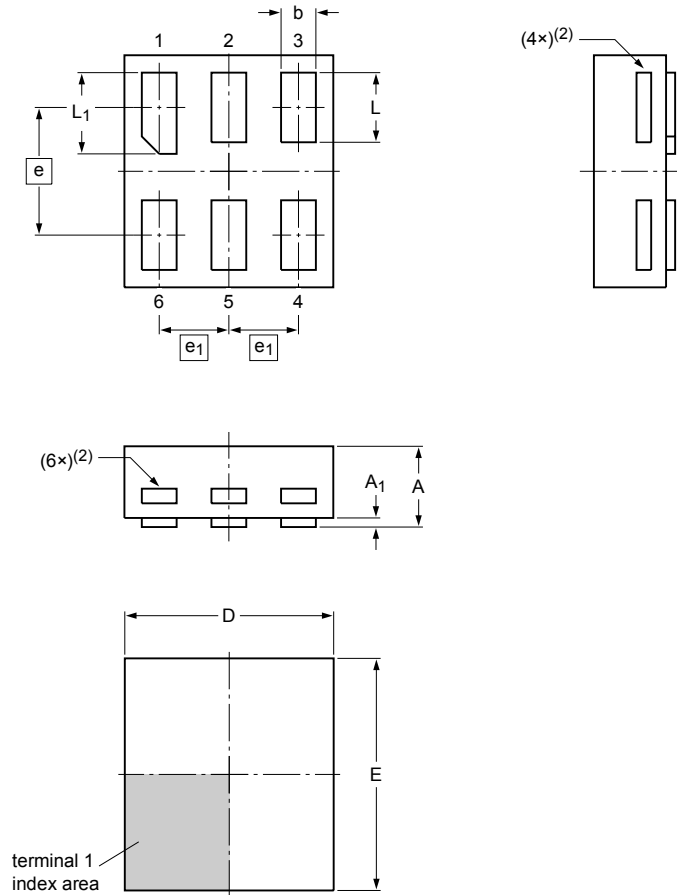


Figure 14. Package outline SOT886 (XSON6)

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

SOT1115



Dimensions

| Unit | A ⁽¹⁾ | A ₁ | b | D | E | e | e ₁ | L | L ₁ |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm | max 0.35 | 0.04 | 0.20 | 0.95 | 1.05 | 0.35 | 0.30 | 0.35 | 0.40 |
| | nom | | 0.15 | 0.90 | 1.00 | 0.55 | 0.3 | 0.30 | 0.35 |
| | min | | 0.12 | 0.85 | 0.95 | | | 0.27 | 0.32 |

Note

- Including plating thickness.
- Visible depending upon used manufacturing technology.

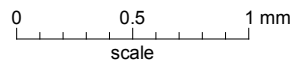
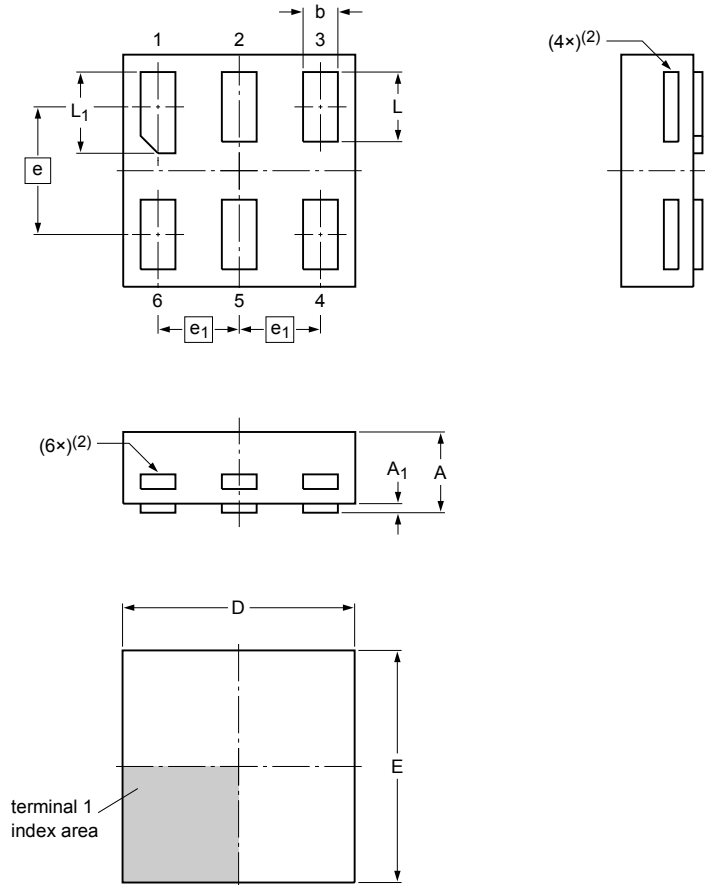
sot1115_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT1115 | | | | | | -10-04-02- 10-04-07 |

Figure 15. 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



Dimensions

| Unit | A ⁽¹⁾ | A ₁ | b | D | E | e | e ₁ | L | L ₁ |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| max | 0.35 | 0.04 | 0.20 | 1.05 | 1.05 | | | 0.35 | 0.40 |
| nom | | | 0.15 | 1.00 | 1.00 | 0.55 | 0.35 | 0.30 | 0.35 |
| min | | | 0.12 | 0.95 | 0.95 | | | 0.27 | 0.32 |

Note

- Including plating thickness.
- Visible depending upon used manufacturing technology.

sot1202_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|-------|-------|--|---------------------|------------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT1202 | | | | | | -10-04-02- 10-04-06 |

Figure 16. Package outline SOT1202 (XSON6)

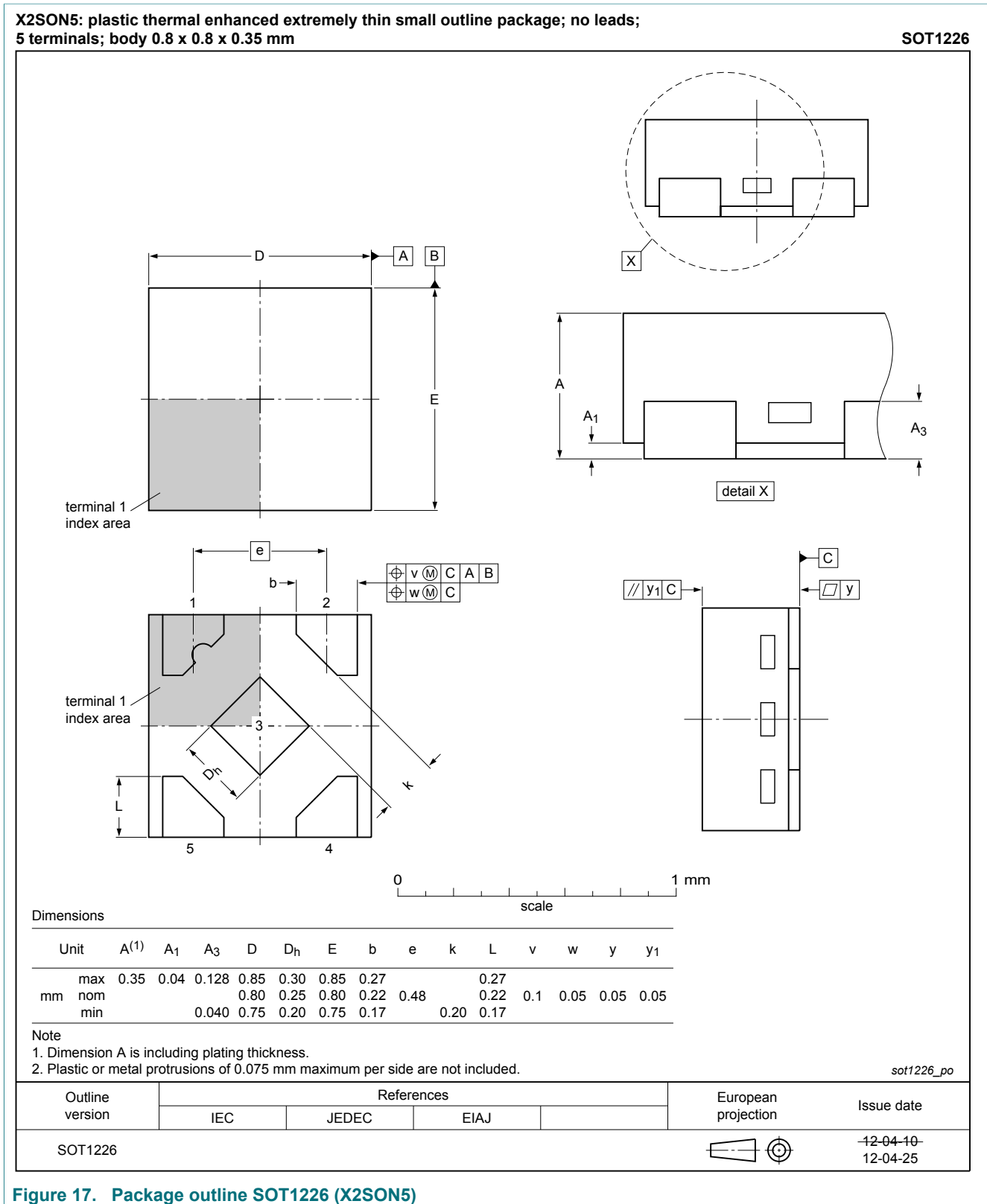


Figure 17. Package outline SOT1226 (X2SON5)

13 Abbreviations

Table 11. Abbreviations

| Acronym | Description |
|---------|-------------------------|
| CDM | Charged Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |

14 Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--|--------------------|---------------|----------------|
| 74AXP1G125 v.2 | 20180418 | Product data sheet | - | 74AXP1G125 v.1 |
| Modifications: | <ul style="list-style-type: none">• 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 | - | - |

15 Legal information

15.1 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. |
| 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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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 |
| 11 | Dynamic characteristics | 6 |
| 11.1 | Waveforms and test circuit | 7 |
| 12 | Package outline | 10 |
| 13 | Abbreviations | 14 |
| 14 | Revision history | 14 |
| 15 | Legal information | 15 |

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Date of release: 18 April 2018
Document identifier: 74AXP1G125

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