

# 74AXP1T57

## Dual supply configurable multiple function gate

Rev. 5 — 3 July 2017

Product data sheet

## 1 General description

The 74AXP1T57 is a dual supply configurable multiple function gate with Schmitt-trigger inputs. It features three inputs (A, B and C), an output (Y) and dual supply pins ( $V_{CCI}$  and  $V_{CCO}$ ). The inputs are referenced to  $V_{CCI}$  and the output is referenced to  $V_{CCO}$ . All inputs can be connected directly to  $V_{CCI}$  or GND.  $V_{CCI}$  can be supplied at any voltage between 0.7 V and 2.75 V and  $V_{CCO}$  can be supplied at any voltage between 1.2 V and 5.5 V. This feature allows voltage level translation. The 74AXP1T57 can be configured as any of the following logic functions AND, OR, NAND, NOR, XNOR, inverter and buffer.

This device ensures very low static and dynamic power consumption across the entire supply range and 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:
  - $V_{CCI}$ : 0.7 V to 2.75 V
  - $V_{CCO}$ : 1.2 V to 5.5 V
- Low input capacitance;  $C_I = 0.6$  pF (typical)
- Low output capacitance;  $C_O = 1.8$  pF (typical)
- Low dynamic power consumption;  $C_{PD} = 0.6$  pF at  $V_{CCI} = 1.2$  V (typical)
- Low dynamic power consumption;  $C_{PD} = 7.1$  pF at  $V_{CCO} = 3.3$  V (typical)
- Low static power consumption;  $I_{CCI} = 0.5$   $\mu$ A (85 °C maximum)
- Low static power consumption;  $I_{CCO} = 1.8$   $\mu$ A (85 °C maximum)
- High noise immunity
- Complies with JEDEC standard:
  - JESD8-12A.01 (1.1 V to 1.3 V; A, B, C inputs)
  - 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)
  - JESD8-C (2.7 V to 3.6 V; Y output)
  - JESD12-6 (4.5 V to 5.5 V; Y output)
- 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 JESD78D Class II
- Inputs accept voltages up to 2.75 V
- Low noise overshoot and undershoot < 10 % of  $V_{CCO}$
- $I_{OFF}$  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  |
| 74AXP1T57DC | -40 °C to +85 °C  | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm                                      | SOT765-1 |
| 74AXP1T57GT | -40 °C to +85 °C  | XSON8  | plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm                     | SOT833-1 |
| 74AXP1T57GN | -40 °C to +85 °C  | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm                           | SOT1116  |
| 74AXP1T57GS | -40 °C to +85 °C  | XSON8  | extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm                          | SOT1203  |
| 74AXP1T57GX | -40 °C to +85 °C  | X2SON8 | plastic thermal enhanced extremely thin small outline package; no leads; 8 terminals; body 1.35 x 0.8 x 0.35 mm | SOT1233  |

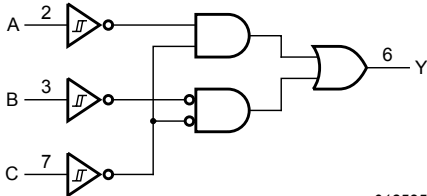
4 Marking

Table 2. Marking

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| 74AXP1T57DC | rD                          |
| 74AXP1T57GT | rD                          |
| 74AXP1T57GN | rD                          |
| 74AXP1T57GS | rD                          |
| 74AXP1T57GX | rD                          |

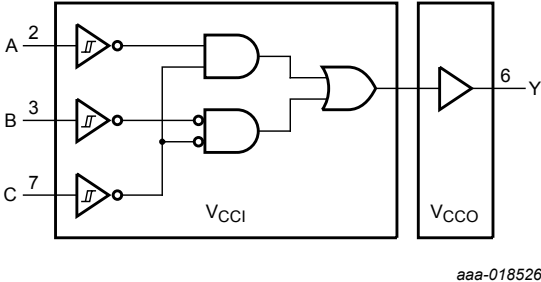
[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5 Functional diagram



aaa-018525

Figure 1. Logic symbol

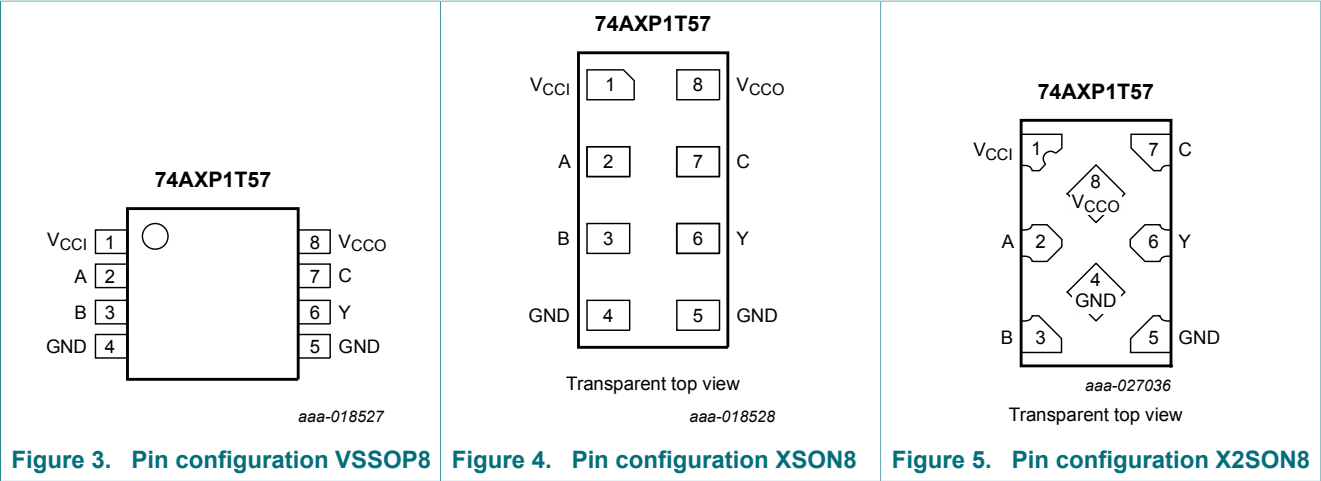


aaa-018526

Figure 2. Logic diagram

6 Pinning information

6.1 Pinning



6.2 Pin description

Table 3. Pin description

| Symbol             | Pin     | Description           |
|--------------------|---------|-----------------------|
| VCCI               | 1       | input supply voltage  |
| A, B, C            | 2, 3, 7 | data input            |
| GND <sup>[1]</sup> | 4, 5    | ground (0 V)          |
| Y                  | 6       | data output           |
| VCCO               | 8       | output supply voltage |

[1] All GND pins must be connected to ground (0 V).

## 7 Functional description

**Table 4. Function table**

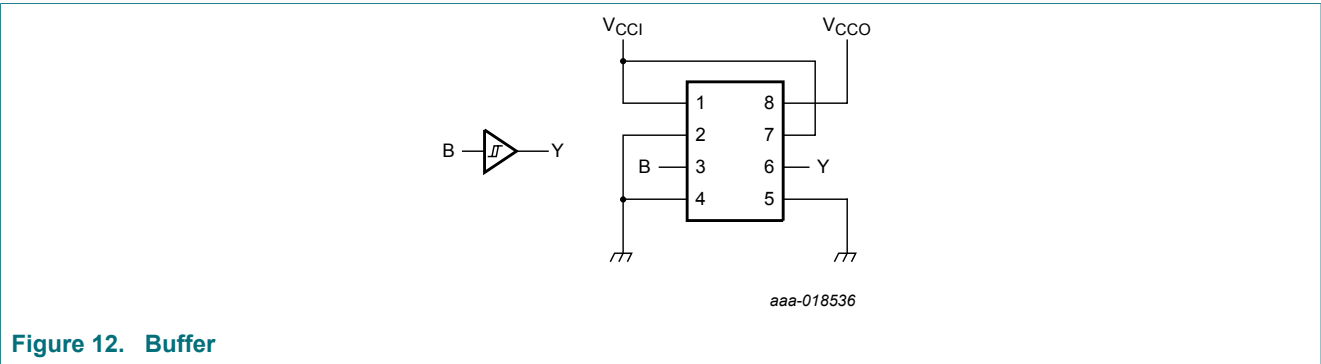
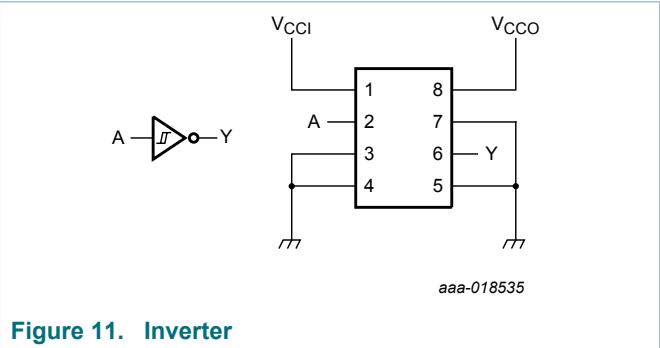
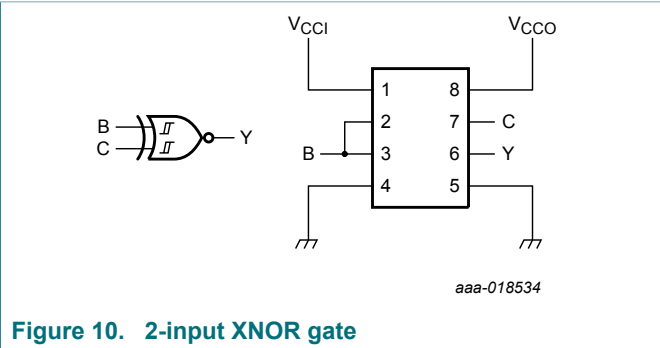
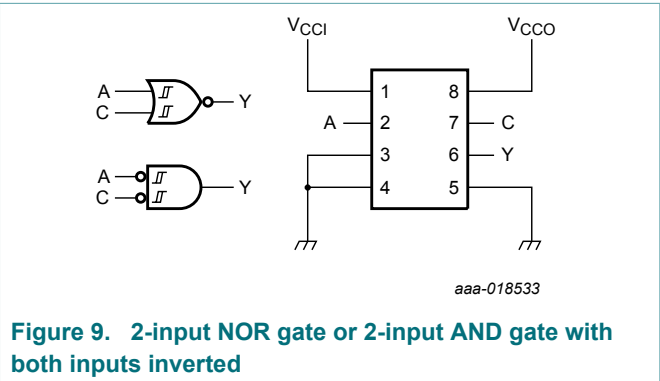
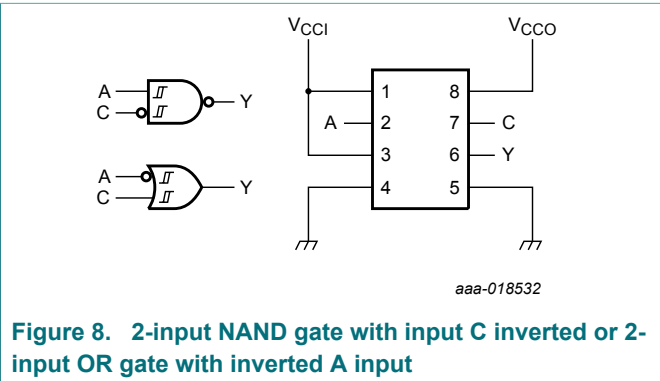
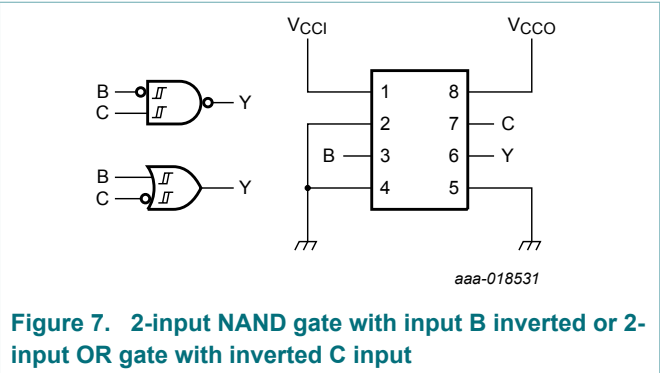
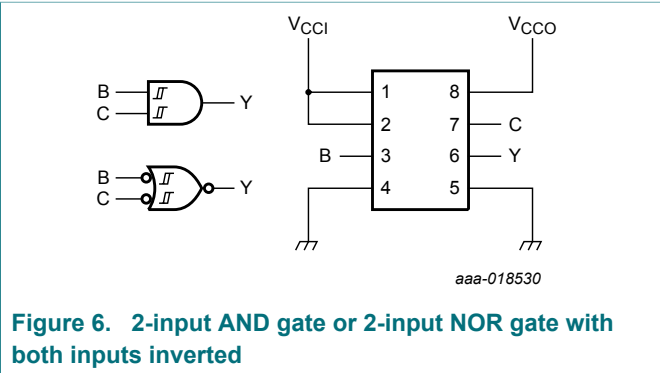
*H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.*

| Supply voltage   |                  | Input |   |   | Output |
|------------------|------------------|-------|---|---|--------|
| V <sub>CCI</sub> | V <sub>CCO</sub> | C     | B | A | Y      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | L     | L | L | H      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | L     | L | H | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | L     | H | L | H      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | L     | H | H | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | H     | L | L | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | H     | L | H | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | H     | H | L | H      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | H     | H | H | H      |
| GND              | 1.2 V to 5.5 V   | X     | X | X | Z      |
| 0.7 V to 2.75 V  | GND              | X     | X | X | Z      |
| GND              | GND              | X     | X | X | Z      |

### 7.1 Logic configurations

**Table 5. Function selection table**

| Logic function                        | Figure                                                    |
|---------------------------------------|-----------------------------------------------------------|
| 2-input AND                           | see <a href="#">Figure 6</a>                              |
| 2-input AND with both inputs inverted | see <a href="#">Figure 9</a>                              |
| 2-input NAND with inverted input      | see <a href="#">Figure 7</a> and <a href="#">Figure 8</a> |
| 2-input OR with inverted input        | see <a href="#">Figure 7</a> and <a href="#">Figure 8</a> |
| 2-input NOR                           | see <a href="#">Figure 9</a>                              |
| 2-input NOR with both inputs inverted | see <a href="#">Figure 6</a>                              |
| 2-input XNOR                          | see <a href="#">Figure 10</a>                             |
| Inverter                              | see <a href="#">Figure 11</a>                             |
| Buffer                                | see <a href="#">Figure 12</a>                             |



## 8 Limiting values

**Table 6. 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 |
|-----------|-------------------------|----------------------------------|------|-----------------|------|
| $V_{CCI}$ | input supply voltage    |                                  | -0.5 | +3.3            | V    |
| $V_{CCO}$ | output supply voltage   |                                  | -0.5 | +6.0            | 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          | Active mode [1] [2]              | -0.5 | $V_{CCO} + 0.5$ | V    |
|           |                         | Power-down or 3-state mode [1]   | -0.5 | +6.0            | V    |
| $I_O$     | output current          | $V_O = 0$ V to $V_{CCO}$         | -    | ±25             | mA   |
| $I_{CCI}$ | input supply current    |                                  | -    | 50              | mA   |
| $I_{CCO}$ | output 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 [3] | -    | 300             | mW   |

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2]  $V_{CCO} + 0.5$  V should not exceed 6.0 V.

[3] For SOT833-1 package: above 70 °C the value of  $P_{tot}$  derates linearly with 3.2 mW/K.  
For SOT1203 package: above 80 °C the value of  $P_{tot}$  derates linearly with 3.6 mW/K.

## 9 Recommended operating conditions

**Table 7. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

| Symbol    | Parameter             | Conditions                 | Min | Max       | Unit |
|-----------|-----------------------|----------------------------|-----|-----------|------|
| $V_{CCI}$ | input supply voltage  |                            | 0.7 | 2.75      | V    |
| $V_{CCO}$ | output supply voltage |                            | 1.2 | 5.5       | V    |
| $V_I$     | input voltage         |                            | 0   | 2.75      | V    |
| $V_O$     | output voltage        | Active mode                | 0   | $V_{CCO}$ | V    |
|           |                       | Power-down or 3-state mode | 0   | 5.5       | V    |
| $T_{amb}$ | ambient temperature   |                            | -40 | +85       | °C   |

## 10 Static characteristics

**Table 8. 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 13</a> and <a href="#">Figure 14</a>                        |                                     |           |                     |                     |      |
|                 |                                  | V <sub>CCI</sub> = 0.75 V to 0.85 V                                                | 0.3V <sub>CCI</sub>                 | -         | 0.8V <sub>CCI</sub> | 0.8V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</sub> = 1.1 V to 1.95 V                                                 | 0.4V <sub>CCI</sub>                 | -         | 0.7V <sub>CCI</sub> | 0.7V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</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 13</a> and <a href="#">Figure 14</a>                        |                                     |           |                     |                     |      |
|                 |                                  | V <sub>CCI</sub> = 0.75 V to 0.85 V                                                | 0.2V <sub>CCI</sub>                 | -         | 0.7V <sub>CCI</sub> | 0.7V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</sub> = 1.1 V to 1.95 V                                                 | 0.3V <sub>CCI</sub>                 | -         | 0.6V <sub>CCI</sub> | 0.6V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</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 13</a> and <a href="#">Figure 14</a>                        |                                     |           |                     |                     |      |
|                 |                                  | V <sub>CCI</sub> = 0.75 V to 0.85 V                                                | 0.06V <sub>CCI</sub>                | -         | 0.5V <sub>CCI</sub> | 0.5V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</sub> = 1.1 V to 1.95 V                                                 | 0.1V <sub>CCI</sub>                 | -         | 0.4V <sub>CCI</sub> | 0.4V <sub>CCI</sub> | V    |
|                 |                                  | V <sub>CCI</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> = -2 mA; V <sub>CCO</sub> = 1.2 V <sup>[1]</sup>                    | -                                   | 1.05      | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = -3 mA; V <sub>CCO</sub> = 1.4 V                                   | 1.05                                | -         | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = -4.5 mA; V <sub>CCO</sub> = 1.65 V                                | 1.2                                 | -         | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = -8 mA; V <sub>CCO</sub> = 2.3 V                                   | 1.7                                 | -         | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = -10 mA; V <sub>CCO</sub> = 3.0 V                                  | 2.2                                 | -         | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = -12 mA; V <sub>CCO</sub> = 4.5 V                                  | 3.7                                 | -         | -                   | -                   | V    |
| V <sub>OL</sub> | LOW-level output voltage         | I <sub>O</sub> = 2 mA; V <sub>CCO</sub> = 1.2 V <sup>[1]</sup>                     | -                                   | 0.18      | -                   | -                   | V    |
|                 |                                  | I <sub>O</sub> = 3 mA; V <sub>CCO</sub> = 1.4 V                                    | -                                   | -         | 0.35                | 0.35                | V    |
|                 |                                  | I <sub>O</sub> = 4.5 mA; V <sub>CCO</sub> = 1.65 V                                 | -                                   | -         | 0.45                | 0.45                | V    |
|                 |                                  | I <sub>O</sub> = 8 mA; V <sub>CCO</sub> = 2.3 V                                    | -                                   | -         | 0.7                 | 0.7                 | V    |
|                 |                                  | I <sub>O</sub> = 10 mA; V <sub>CCO</sub> = 3.0 V                                   | -                                   | -         | 0.8                 | 0.8                 | V    |
|                 |                                  | I <sub>O</sub> = 12 mA; V <sub>CCO</sub> = 4.5 V                                   | -                                   | -         | 0.8                 | 0.8                 | V    |
| I <sub>I</sub>  | input leakage current            | V <sub>I</sub> = 0 V to 2.75 V;<br>V <sub>CCI</sub> = 0 V to 2.75 V <sup>[1]</sup> | -                                   | ±0.001    | ±0.1                | ±0.5                | µA   |
| I <sub>OZ</sub> | OFF-state output current         | V <sub>O</sub> = 0 V to 5.5 V;<br>V <sub>CCO</sub> = 1.2 V to 5.5 V                | -                                   | ±0.001    | ±0.1                | ±0.5                | µA   |

| Symbol            | Parameter                            | Conditions                                                                                                                                        | T <sub>amb</sub> = -40 °C to +85 °C |           |           |           | Unit |    |
|-------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------|-----------|-----------|------|----|
|                   |                                      |                                                                                                                                                   | Min                                 | Typ 25 °C | Max 25 °C | Max 85 °C |      |    |
| I <sub>OFF</sub>  | power-off leakage current            | inputs; V <sub>I</sub> = 0 V to 2.75 V;<br>V <sub>CCI</sub> = 0 V; V <sub>CCO</sub> = 0 V to 5.5 V                                                | [1]                                 | -         | ±0.01     | ±0.1      | ±0.5 | µA |
|                   |                                      | output; V <sub>O</sub> = 0 V to 5.5 V;<br>V <sub>CCO</sub> = 0 V; V <sub>CCI</sub> = 0 V to 2.75 V;<br>V <sub>I</sub> = 0 V to 2.75 V             | [1]                                 | -         | ±0.01     | ±0.1      | ±0.5 | µA |
| ΔI <sub>OFF</sub> | additional power-off leakage current | inputs; V <sub>I</sub> = 0 V or 2.75 V;<br>V <sub>CCI</sub> = 0 V to 0.1 V;<br>V <sub>CCO</sub> = 0 V to 5.5 V                                    | [1]                                 | -         | ±0.02     | ±0.1      | ±0.5 | µA |
|                   |                                      | output; V <sub>O</sub> = 0 V or 5.5 V;<br>V <sub>CCO</sub> = 0 V to 0.1 V;<br>V <sub>CCI</sub> = 0 V to 2.75 V;<br>V <sub>I</sub> = 0 V or 2.75 V | [1]                                 | -         | ±0.02     | ±0.1      | ±0.5 | µA |

[1] Typical values are measured at V<sub>CCI</sub> = V<sub>CCO</sub> = 1.2 V unless otherwise specified.

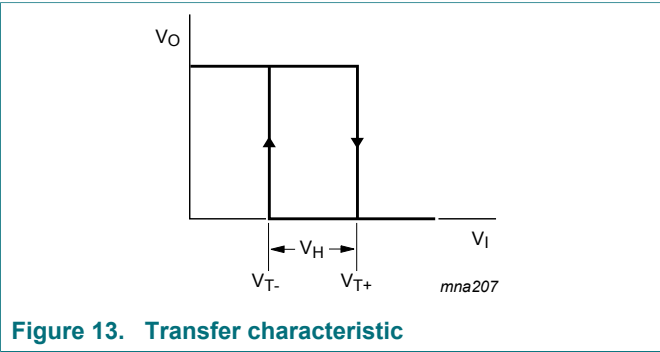


Figure 13. Transfer characteristic

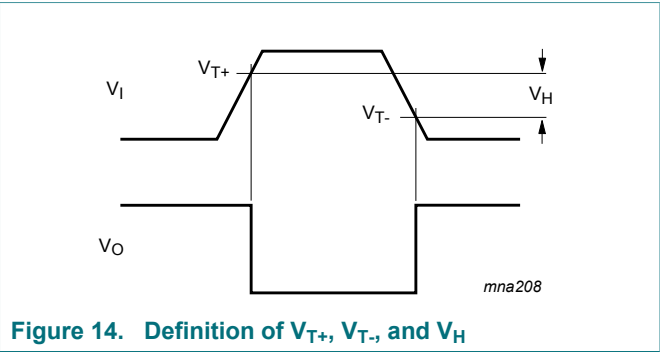


Figure 14. Definition of  $V_{T+}$ ,  $V_{T-}$ , and  $V_H$

**Table 9. Static characteristics supply current**

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 |
|-------------------|---------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------|-----------|-----------|-----------|------|
|                   |                                 |                                                                                                  | Typ 25 °C                           | Max 25 °C | Typ 85 °C | Max 85 °C |      |
| I <sub>CCI</sub>  | input supply current            | V <sub>I</sub> = 0 V or V <sub>CCI</sub> ;                                                       |                                     |           |           |           |      |
|                   |                                 | V <sub>CCI</sub> = 0.7 V to 1.3 V <sup>[1]</sup>                                                 | 1                                   | 100       | 10        | 300       | nA   |
|                   |                                 | V <sub>CCI</sub> = 1.3 V to 2.75 V <sup>[2]</sup>                                                | 1                                   | 100       | 20        | 500       | nA   |
|                   |                                 | V <sub>CCI</sub> = 2.75 V; V <sub>CCO</sub> = 0 V                                                | 1                                   | 100       | 20        | 500       | nA   |
|                   |                                 | V <sub>CCI</sub> = 0 V; V <sub>CCO</sub> = 5.5 V                                                 | 1                                   | 100       | 1         | 100       | nA   |
| I <sub>CCO</sub>  | output supply current           | V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; I <sub>O</sub> = 0 A;<br>see <a href="#">Table 10</a> |                                     |           |           |           |      |
|                   |                                 | V <sub>CCO</sub> = 1.2 V to 3.6 V <sup>[1]</sup>                                                 | 0.001                               | 1.0       | 0.01      | 1.2       | μA   |
|                   |                                 | V <sub>CCO</sub> = 3.6 V to 5.5 V <sup>[3]</sup>                                                 | 0.8                                 | 1.5       | 1.0       | 1.8       | μA   |
|                   |                                 | V <sub>CCI</sub> = 2.75 V; V <sub>CCO</sub> = 0 V                                                | 0.001                               | 0.1       | 0.003     | 0.2       | μA   |
|                   |                                 | V <sub>CCI</sub> = 0 V; V <sub>CCO</sub> = 3.6 V                                                 | 0.2                                 | 0.6       | 0.3       | 0.8       | μA   |
|                   |                                 | V <sub>CCI</sub> = 0 V; V <sub>CCO</sub> = 5.5 V                                                 | 0.4                                 | 0.8       | 0.5       | 1.0       | μA   |
| ΔI <sub>CCI</sub> | additional input supply current | V <sub>I</sub> = V <sub>CCI</sub> - 0.5 V; V <sub>CCI</sub> = 2.5 V                              | 2                                   | 100       | 14        | 150       | μA   |

[1] Typical values are measured at V<sub>CCI</sub> = V<sub>CCO</sub> = 1.2 V unless otherwise specified.

[2] Typical values are measured at V<sub>CCI</sub> = V<sub>CCO</sub> = 2.5 V.

[3] Typical values are measured at V<sub>CCI</sub> = 1.2 V and V<sub>CCO</sub> = 5.0 V.

**Table 10. Typical output supply current (I<sub>CCO</sub>)**

| V <sub>CCI</sub> | V <sub>CCO</sub> |       |       |       |       |       |       | Unit |
|------------------|------------------|-------|-------|-------|-------|-------|-------|------|
|                  | 0 V              | 1.2 V | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| 0 V              | 0                | 1     | 5     | 20    | 100   | 200   | 400   | nA   |
| 0.8 V            | 1                | 10    | 150   | 200   | 300   | 500   | 800   | nA   |
| 1.2 V            | 1                | 1     | 5     | 200   | 300   | 500   | 800   | nA   |
| 1.5 V            | 1                | 1     | 5     | 100   | 300   | 500   | 800   | nA   |
| 1.8 V            | 1                | 1     | 5     | 100   | 300   | 500   | 800   | nA   |
| 2.5 V            | 1                | 1     | 5     | 100   | 100   | 500   | 800   | nA   |

## 11 Dynamic characteristics

**Table 11. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 22](#); for waveform, see [Figure 15](#).

| Symbol                              | Parameter         | Conditions                                        | V <sub>CCO</sub>   |               |                    |      |                |                    |      | Unit |
|-------------------------------------|-------------------|---------------------------------------------------|--------------------|---------------|--------------------|------|----------------|--------------------|------|------|
|                                     |                   |                                                   | 1.2 V              | 1.5 V ± 0.1 V |                    |      | 1.8 V ± 0.15 V |                    |      |      |
|                                     |                   |                                                   | Typ <sup>[1]</sup> | Min           | Typ <sup>[1]</sup> | Max  | Min            | Typ <sup>[1]</sup> | Max  |      |
| T <sub>amb</sub> = 25 °C            |                   |                                                   |                    |               |                    |      |                |                    |      |      |
| t <sub>pd</sub>                     | propagation delay | A, B and C to Y <sup>[2]</sup>                    |                    |               |                    |      |                |                    |      |      |
|                                     |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 25                 | 4             | 20                 | 76   | 4              | 18                 | 72   | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 16.5               | 3.4           | 10.9               | 21.0 | 3.0            | 8.9                | 17.0 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 15.5               | 3.1           | 9.9                | 19.0 | 2.6            | 7.9                | 14.0 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 15.0               | 2.6           | 9.4                | 18.0 | 2.1            | 7.4                | 12.5 | ns   |
|                                     |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 14.5               | 2.7           | 8.9                | 17.5 | 2.2            | 6.9                | 11.7 | ns   |
| T <sub>amb</sub> = -40 °C to +85 °C |                   |                                                   |                    |               |                    |      |                |                    |      |      |
| t <sub>pd</sub>                     | propagation delay | A, B and C to Y <sup>[2]</sup>                    |                    |               |                    |      |                |                    |      |      |
|                                     |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 25                 | 3             | 20                 | 151  | 3              | 18                 | 148  | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 16.5               | 3.4           | 10.9               | 21.0 | 3.0            | 8.9                | 17.0 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 15.5               | 3.1           | 9.9                | 19.0 | 2.6            | 7.9                | 14.0 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 15.0               | 2.6           | 9.4                | 18.0 | 2.1            | 7.4                | 12.5 | ns   |
|                                     |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 14.5               | 2.7           | 8.9                | 17.5 | 2.2            | 6.9                | 11.7 | ns   |
| t <sub>t</sub>                      | transition time   | V <sub>CCI</sub> = 0.75 V to 2.7 V <sup>[3]</sup> | -                  | 1.0           | -                  | -    | 1.0            | -                  | -    | ns   |

[1] Typical values are measured at nominal supply voltages and  $T_{amb} = +25\text{ }^{\circ}\text{C}$ .

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

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

Table 12. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit, see Figure 22; for waveform, see Figure 15.

| Symbol                              | Parameter         | Conditions                                        | V <sub>CCO</sub> |                    |      |               |                    |      |               |                    |      | Unit |
|-------------------------------------|-------------------|---------------------------------------------------|------------------|--------------------|------|---------------|--------------------|------|---------------|--------------------|------|------|
|                                     |                   |                                                   | 2.5 V ± 0.2 V    |                    |      | 3.3 V ± 0.3 V |                    |      | 5.0 V ± 0.5 V |                    |      |      |
|                                     |                   |                                                   | Min              | Typ <sup>[1]</sup> | Max  | Min           | Typ <sup>[1]</sup> | Max  | Min           | Typ <sup>[1]</sup> | Max  |      |
| T <sub>amb</sub> = 25 °C            |                   |                                                   |                  |                    |      |               |                    |      |               |                    |      |      |
| t <sub>pd</sub>                     | propagation delay | A, B and C to Y <sup>[2]</sup>                    |                  |                    |      |               |                    |      |               |                    |      |      |
|                                     |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 3                | 16                 | 72   | 3             | 16                 | 80   | 3             | 17                 | 92   | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 2.6              | 7.3                | 12.0 | 2.5           | 6.7                | 10.7 | 2.4           | 6.4                | 10.2 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 2.3              | 6.2                | 9.9  | 2.1           | 5.6                | 9.0  | 2.1           | 5.3                | 8.5  | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 1.7              | 5.7                | 9.3  | 1.6           | 5.1                | 8.3  | 1.5           | 4.8                | 7.9  | ns   |
|                                     |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 1.9              | 5.2                | 8.7  | 1.8           | 4.6                | 7.7  | 1.7           | 4.3                | 7.2  | ns   |
| T <sub>amb</sub> = -40 °C to +85 °C |                   |                                                   |                  |                    |      |               |                    |      |               |                    |      |      |
| t <sub>pd</sub>                     | propagation delay | A, B and C to Y <sup>[2]</sup>                    |                  |                    |      |               |                    |      |               |                    |      |      |
|                                     |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 2                | 16                 | 167  | 2             | 16                 | 194  | 2             | 17                 | 225  | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 2.6              | 7.3                | 12.0 | 2.5           | 6.7                | 10.7 | 2.4           | 6.4                | 10.2 | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 2.3              | 6.2                | 9.9  | 2.1           | 5.6                | 9.0  | 2.1           | 5.3                | 8.5  | ns   |
|                                     |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 1.7              | 5.7                | 9.3  | 1.6           | 5.1                | 8.3  | 1.5           | 4.8                | 7.9  | ns   |
|                                     |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 1.9              | 5.2                | 8.7  | 1.8           | 4.6                | 7.7  | 1.7           | 4.3                | 7.2  | ns   |
| t <sub>t</sub>                      | transition time   | V <sub>CCI</sub> = 0.75 V to 2.7 V <sup>[3]</sup> | 1.0              | -                  | -    | 1.0           | -                  | -    | 1.0           | -                  | -    | ns   |

[1] Typical values are measured at nominal supply voltages and T<sub>amb</sub> = +25 °C.

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

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

**Table 13. Typical dynamic characteristics at  $T_{amb} = 25\text{ }^{\circ}\text{C}$** 

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 22](#); for waveform, see [Figure 15](#).

| Symbol   | Parameter                     | Conditions                                                                                           | $V_{CCO}$ |       |       |       |       |       | Unit |
|----------|-------------------------------|------------------------------------------------------------------------------------------------------|-----------|-------|-------|-------|-------|-------|------|
|          |                               |                                                                                                      | 1.2 V     | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| $C_{PD}$ | power dissipation capacitance | $f_i = 1\text{ MHz}$ ; $R_L = \infty\text{ }\Omega$ ; $V_I = 0\text{ V}$ to $V_{CCI}$ <sup>[1]</sup> |           |       |       |       |       |       |      |
|          |                               | input supply <sup>[2]</sup>                                                                          |           |       |       |       |       |       |      |
|          |                               | $V_{CCI} = 0.8\text{ V}$                                                                             | 0.5       | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | pF   |
|          |                               | $V_{CCI} = 1.2\text{ V}$                                                                             | 0.6       | 0.6   | 0.6   | 0.6   | 0.6   | 0.6   | pF   |
|          |                               | $V_{CCI} = 1.5\text{ V}$                                                                             | 0.7       | 0.7   | 0.7   | 0.7   | 0.7   | 0.7   | pF   |
|          |                               | $V_{CCI} = 1.8\text{ V}$                                                                             | 0.8       | 0.8   | 0.8   | 0.8   | 0.8   | 0.8   | pF   |
|          |                               | $V_{CCI} = 2.5\text{ V}$                                                                             | 1.0       | 1.0   | 1.0   | 1.0   | 1.0   | 1.0   | pF   |
|          |                               | output supply <sup>[3]</sup>                                                                         |           |       |       |       |       |       |      |
|          |                               | $V_{CCI} = 0.8\text{ V}$                                                                             | 6.7       | 6.8   | 6.8   | 6.9   | 7.5   | 9.5   | pF   |
|          |                               | $V_{CCI} = 1.2\text{ V}$                                                                             | 6.8       | 6.9   | 7.0   | 7.0   | 7.1   | 7.6   | pF   |
|          |                               | $V_{CCI} = 1.5\text{ V}$                                                                             | 6.9       | 6.9   | 6.9   | 7.0   | 7.1   | 7.6   | pF   |
|          |                               | $V_{CCI} = 1.8\text{ V}$                                                                             | 6.9       | 6.9   | 6.9   | 7.0   | 7.2   | 7.6   | pF   |
|          |                               | $V_{CCI} = 2.5\text{ V}$                                                                             | 6.9       | 7.0   | 7.0   | 7.0   | 7.2   | 7.6   | pF   |
| $C_I$    | input capacitance             | $V_I = 0\text{ V}$ or $V_{CCI}$ ; $V_{CCI} = 0\text{ V}$ to $2.7\text{ V}$                           | 0.6       | 0.6   | 0.6   | 0.6   | 0.6   | 0.6   | pF   |
| $C_O$    | output capacitance            | $V_O = 0\text{ V}$ ; $V_{CCO} = 0\text{ V}$                                                          | 1.8       | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | pF   |

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ).

[2] Power dissipated from input supply ( $V_{CCI}$ )

$P_D = C_{PD} \times V_{CCI}^2 \times f_i \times N$  where:

$C_{PD}$  = power dissipation capacitance of the input supply.

$V_{CCI}$  = input supply voltage in V;

$f_i$  = input frequency in MHz;

$N$  = number of inputs switching;

[3] Power dissipated from output supply ( $V_{CCO}$ )

$P_D = (C_L + C_{PD}) \times V_{CCO}^2 \times f_o$  where:

$C_L$  = load capacitance in pF;

$C_{PD}$  = power dissipation capacitance of the output supply.

$V_{CCO}$  = output supply voltage in V;

$f_o$  = output frequency in MHz;

11.1 Waveforms and graphs

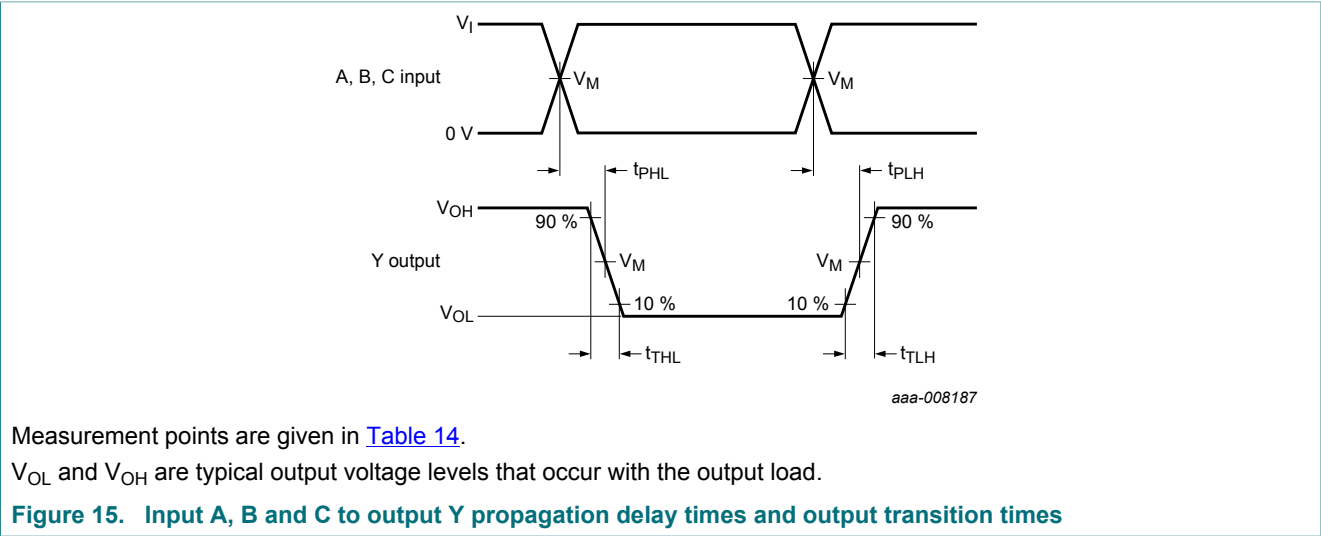
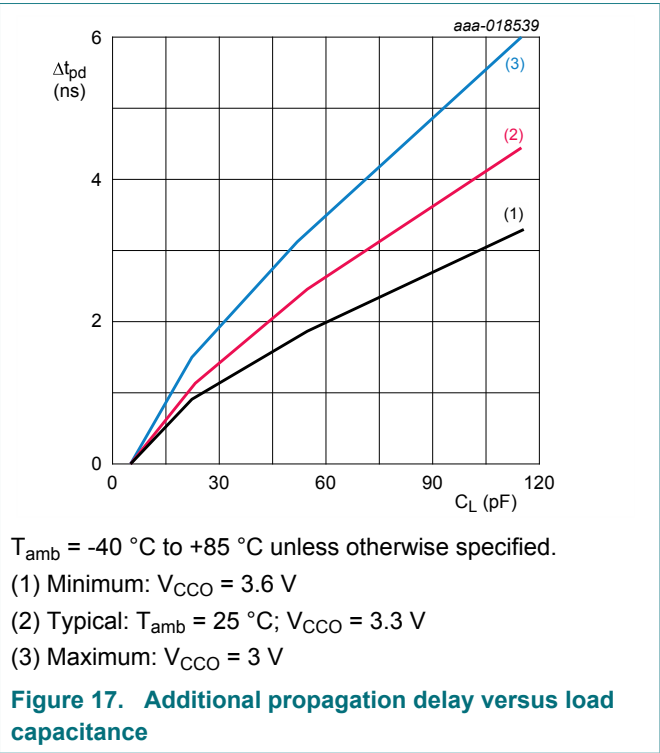
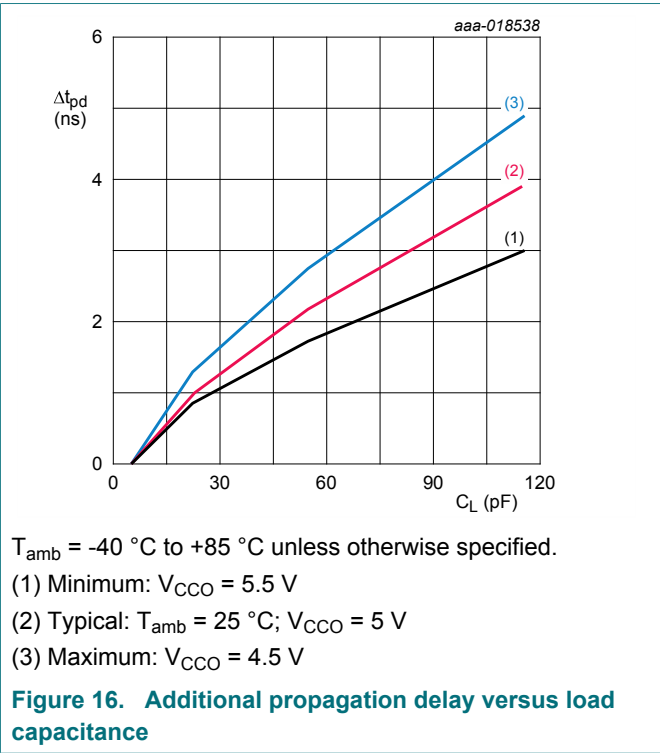
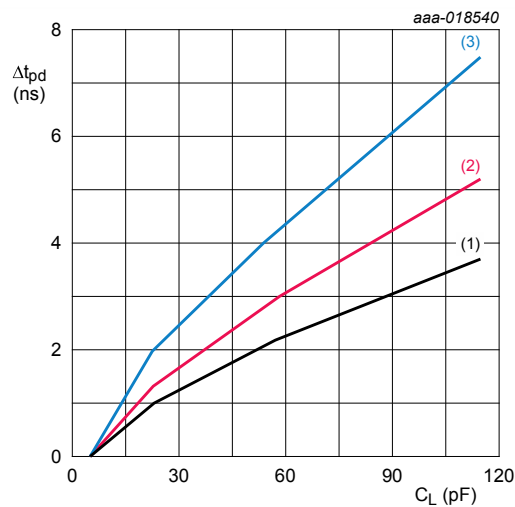


Table 14. Measurement points

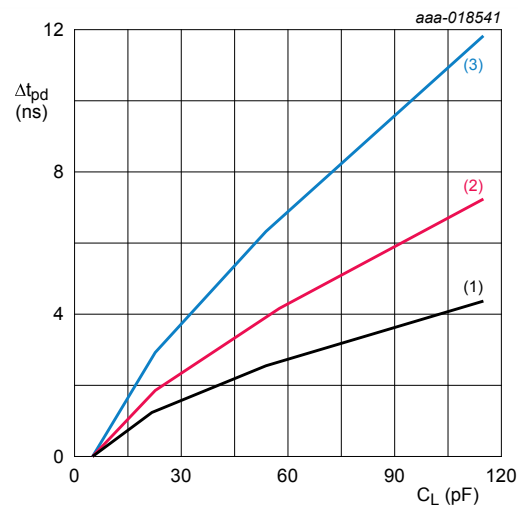
| Supply voltage  |                | Output       | Input        |           |
|-----------------|----------------|--------------|--------------|-----------|
| $V_{CCI}$       | $V_{CCO}$      | $V_M$        | $V_M$        | $V_I$     |
| 0.75 V to 2.7 V | 1.2 V to 5.5 V | $0.5V_{CCO}$ | $0.5V_{CCI}$ | $V_{CCI}$ |





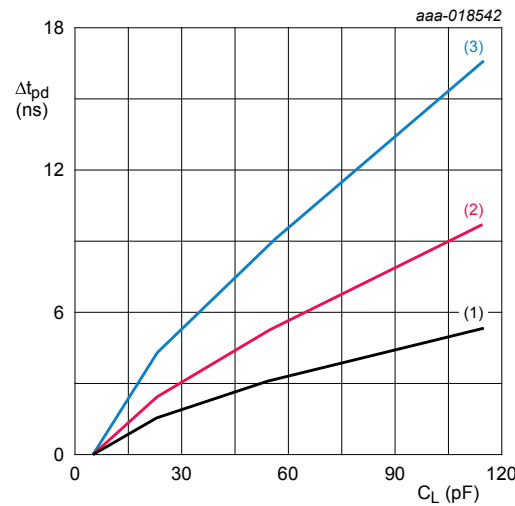
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
(1) Minimum:  $V_{CCO} = 2.7\text{ V}$   
(2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 2.5\text{ V}$   
(3) Maximum:  $V_{CCO} = 2.3\text{ V}$

Figure 18. Additional propagation delay versus load capacitance



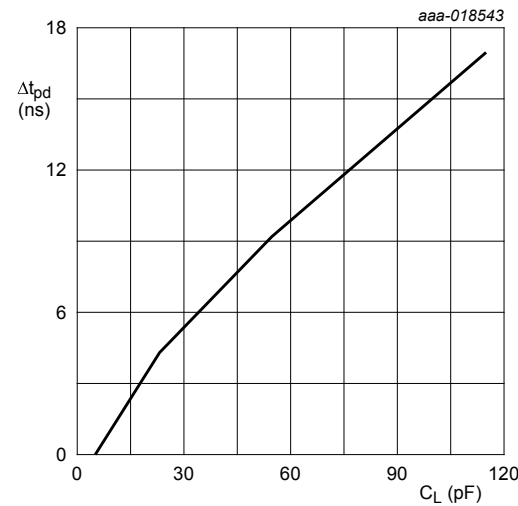
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
(1) Minimum:  $V_{CCO} = 1.95\text{ V}$   
(2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 1.8\text{ V}$   
(3) Maximum:  $V_{CCO} = 1.65\text{ V}$

Figure 19. Additional propagation delay versus load capacitance



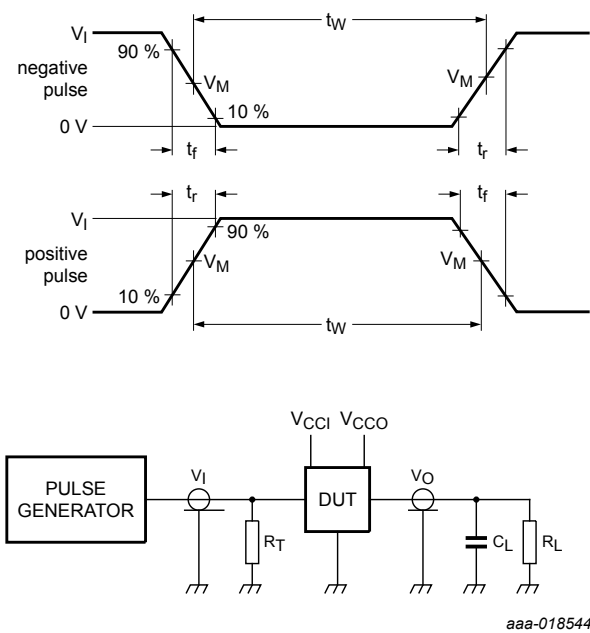
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
(1) Minimum:  $V_{CCO} = 1.6\text{ V}$   
(2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 1.5\text{ V}$   
(3) Maximum:  $V_{CCO} = 1.4\text{ V}$

Figure 20. Additional propagation delay versus load capacitance



$T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 1.2\text{ V}$ .

Figure 21. Additional propagation delay versus load capacitance



Test data is given in [Table 15](#).

Definitions test circuit:

$R_T$  = termination resistance should be equal to output impedance  $Z_o$  of the pulse generator.

$C_L$  = load capacitance including jig and probe capacitance.

$R_L$  = Load resistance.

**Figure 22. Test circuit for measuring switching times**

**Table 15. Test data**

| Supply voltage  |                | Load  |       | Input      |           |
|-----------------|----------------|-------|-------|------------|-----------|
| $V_{CCI}$       | $V_{CCO}$      | $C_L$ | $R_L$ | $t_r, t_f$ | $V_I$     |
| 0.75 V to 2.7 V | 1.2 V to 5.5 V | 5 pF  | 5 kΩ  | ≤3.0 ns    | $V_{CCI}$ |

12 Package outline

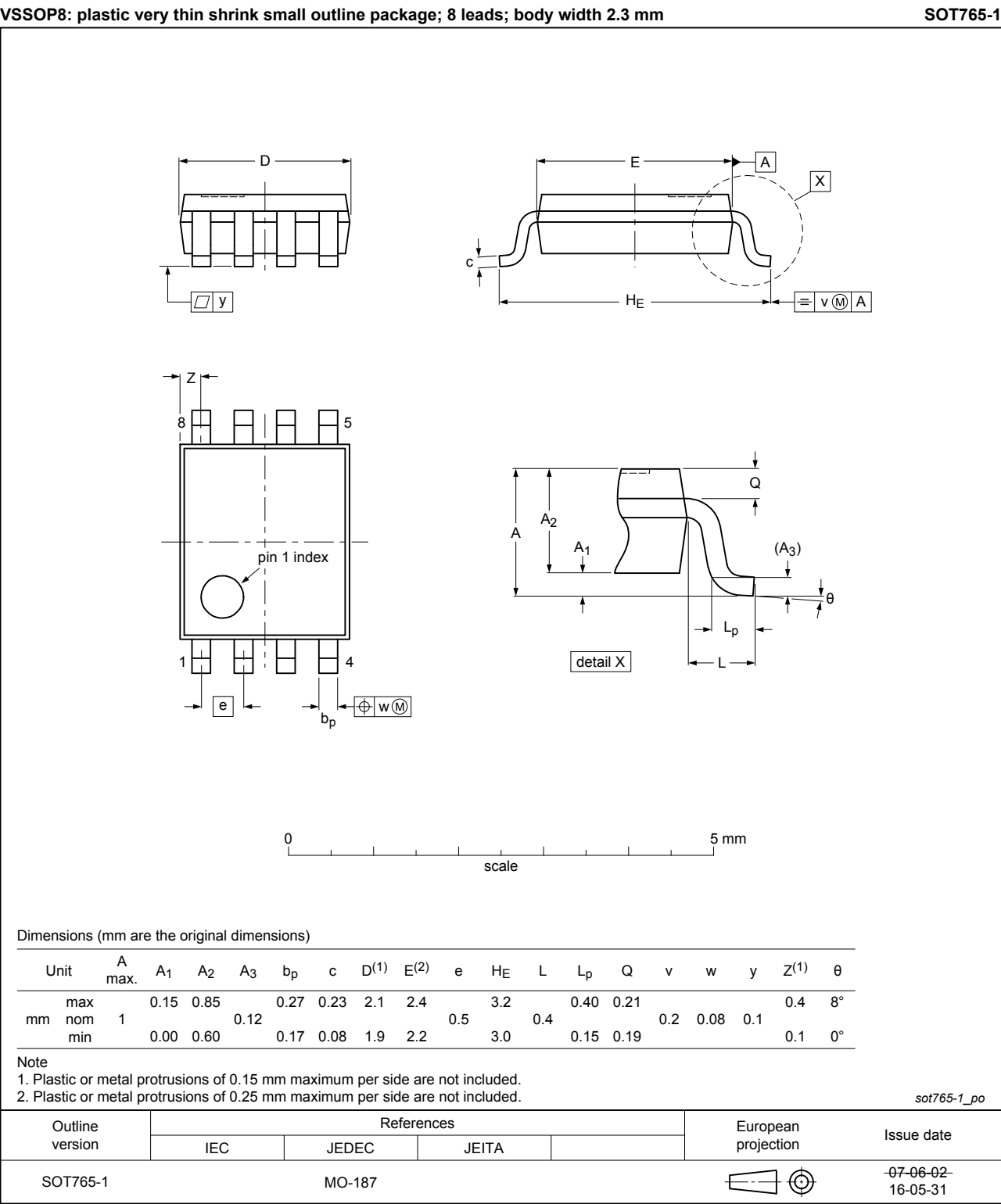
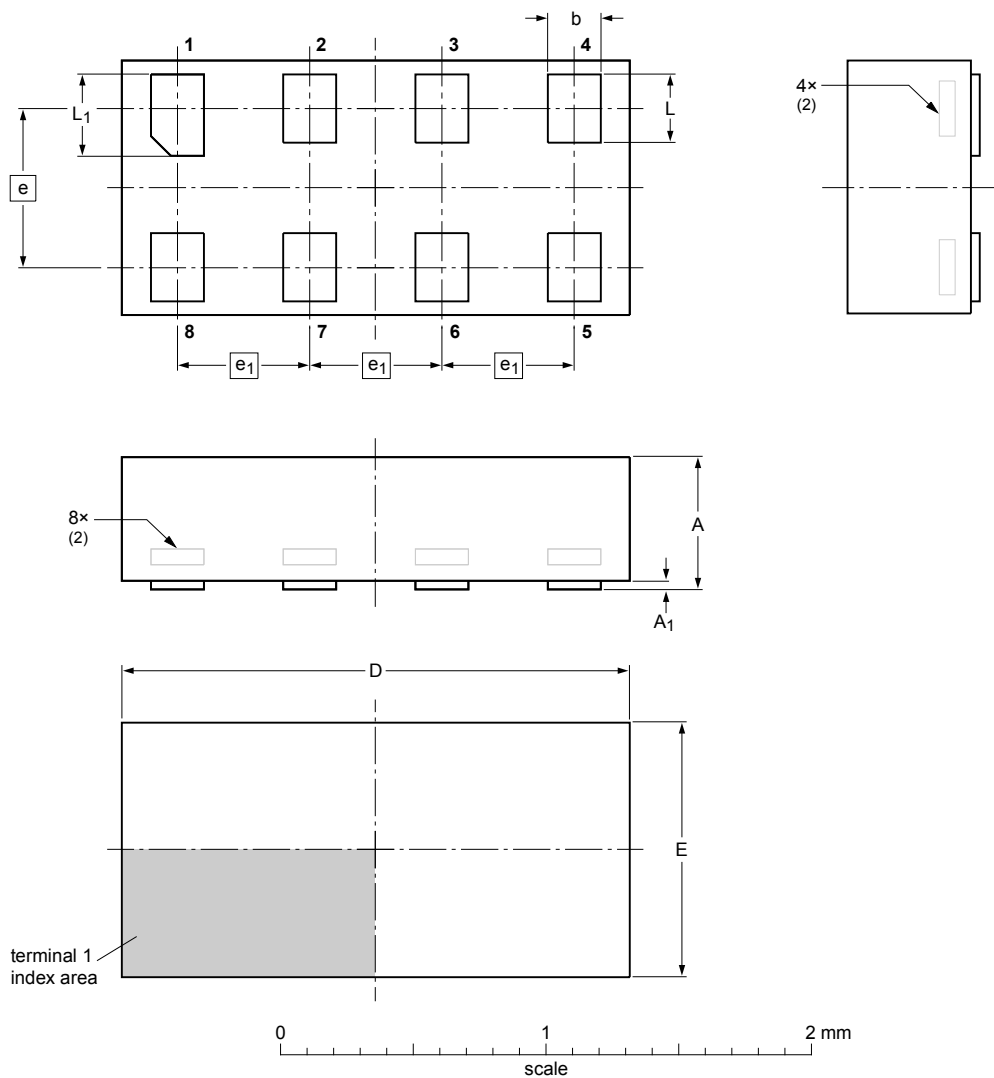


Figure 23. Package outline SOT765-1 (VSSOP8)

XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm SOT833-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A <sup>(1)</sup><br>max | A <sub>1</sub><br>max | b            | D          | E            | e   | e <sub>1</sub> | L            | L <sub>1</sub> |
|------|-------------------------|-----------------------|--------------|------------|--------------|-----|----------------|--------------|----------------|
| mm   | 0.5                     | 0.04                  | 0.25<br>0.17 | 2.0<br>1.9 | 1.05<br>0.95 | 0.6 | 0.5            | 0.35<br>0.27 | 0.40<br>0.32   |

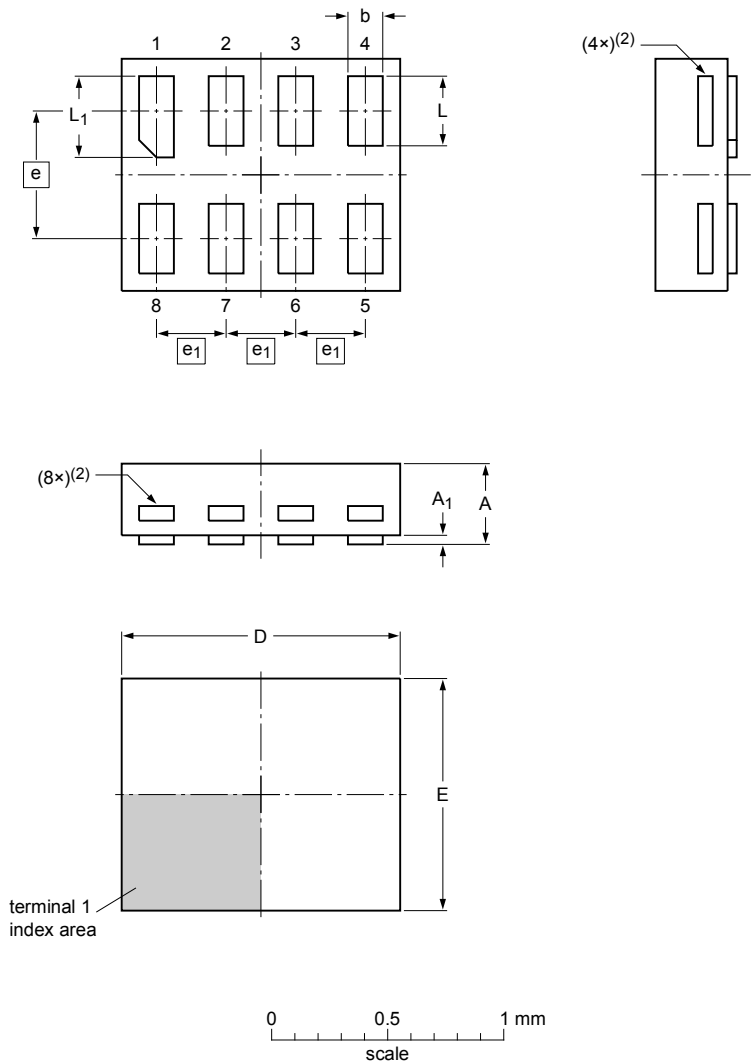
- Notes
- 1. Including plating thickness.
  - 2. Can be visible in some manufacturing processes.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE           |
|--------------------|------------|--------|-------|--|------------------------|----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                      |
| SOT833-1           | ---        | MO-252 | ---   |  |                        | 07-11-14<br>07-12-07 |

Figure 24. Package outline SOT833-1 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.2 x 1.0 x 0.35 mm

SOT1116



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm   | max              | 0.35           | 0.04 | 0.20 | 1.25 | 1.05 |                | 0.35 | 0.40           |
|      | nom              |                |      | 0.15 | 1.20 | 1.00 | 0.55           | 0.30 | 0.35           |
|      | min              |                |      | 0.12 | 1.15 | 0.95 |                | 0.27 | 0.32           |

Note

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

sot1116\_po

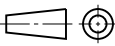
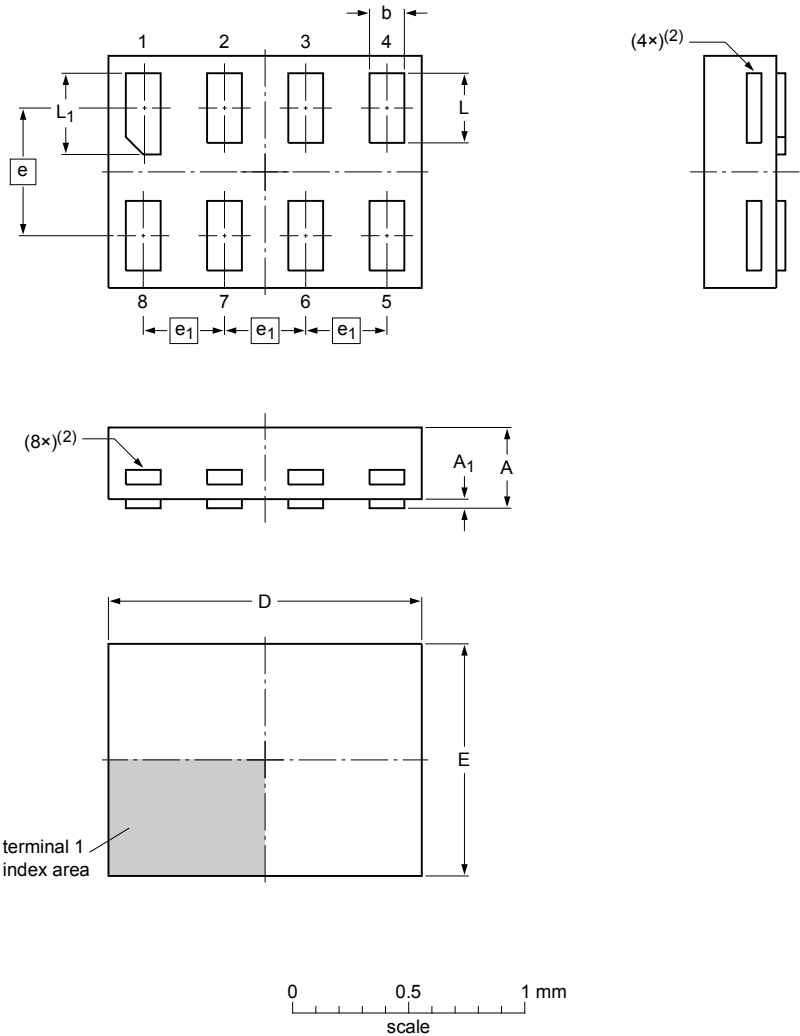
| Outline version | References |       |       |  | European projection                                                                   | Issue date            |
|-----------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|-----------------------|
|                 | IEC        | JEDEC | JEITA |  |                                                                                       |                       |
| SOT1116         |            |       |       |  |  | 10-04-02-<br>10-04-07 |

Figure 25. Package outline SOT1116 (XSON8)

XSON8: extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 1.0 x 0.35 mm

SOT1203



Dimensions

| Unit | A <sup>(1)</sup> | A <sub>1</sub> | b    | D    | E    | e    | e <sub>1</sub> | L    | L <sub>1</sub> |
|------|------------------|----------------|------|------|------|------|----------------|------|----------------|
| mm   | max              | 0.35           | 0.04 | 0.20 | 1.40 | 1.05 |                | 0.35 | 0.40           |
|      | nom              |                |      | 0.15 | 1.35 | 1.00 | 0.55           | 0.30 | 0.35           |
|      | min              |                |      | 0.12 | 1.30 | 0.95 |                | 0.27 | 0.32           |

Note

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

sot1203\_po

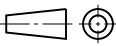
| Outline version | References |       |       |  | European projection                                                                   | Issue date           |
|-----------------|------------|-------|-------|--|---------------------------------------------------------------------------------------|----------------------|
|                 | IEC        | JEDEC | JEITA |  |                                                                                       |                      |
| SOT1203         |            |       |       |  |  | 10-04-02<br>10-04-06 |

Figure 26. Package outline SOT1203 (XSON8)

X2SON8: plastic thermal enhanced extremely thin small outline package; no leads;  
8 terminals; body 1.35 x 0.8 x 0.35 mm

SOT1233

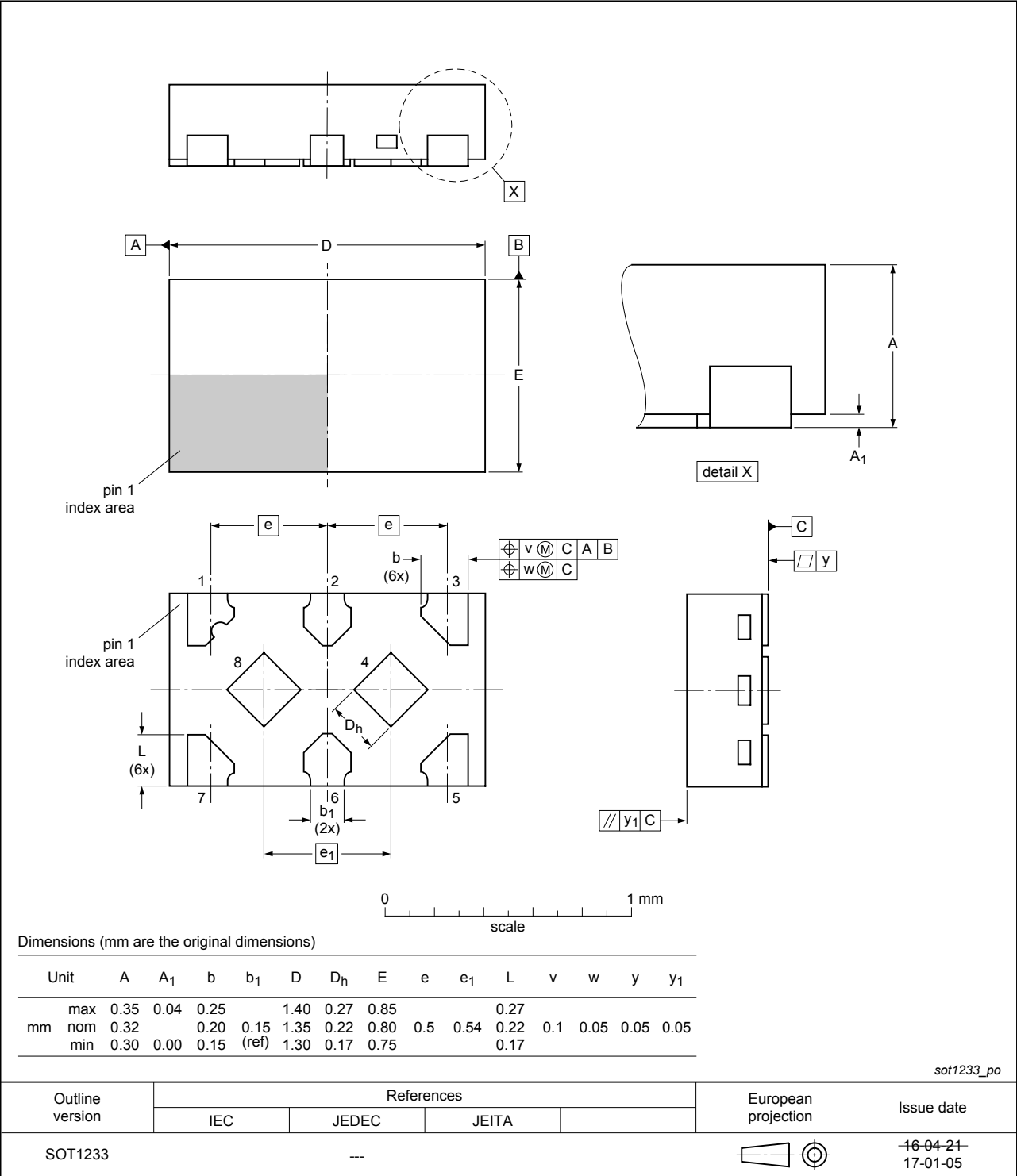


Figure 27. Package outline SOT1233 (X2SON8)

## 13 Abbreviations

Table 16. Abbreviations

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

## 14 Revision history

Table 17. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Data sheet status  | Change notice | Supersedes    |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------|
| 74AXP1T57 v.5  | 20170703                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Product data sheet | -             | 74AXP1T57 v.4 |
| Modifications: | <ul style="list-style-type: none"> <li>• <a href="#">Figure 27</a>: Package outline drawing for SOT1233 / X2SON8) has changed.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |               |               |
| 74AXP1T57 v.4  | 20161028                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Product data sheet | -             | 74AXP1T57 v.3 |
| Modifications: | <ul style="list-style-type: none"> <li>• Added type number 74AXP1T57GX (SOT1233/X2SON8)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |               |               |
| 74AXP1T57 v.3  | 20161007                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Product data sheet | -             | 74AXP1T57 v.2 |
| Modifications: | <ul style="list-style-type: none"> <li>• Type numbers 74AXP1T57DP and 74AXP1T57GD removed.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |               |               |
| 74AXP1T57 v.2  | 20151222                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Product data sheet | -             | 74AXP1T57 v.1 |
| Modifications: | <ul style="list-style-type: none"> <li>• <a href="#">Table 6</a>: Conditions <math>V_O</math> corrected (errata).</li> <li>• <a href="#">Table 6</a>: Derating values for packages added (errata).</li> <li>• <a href="#">Table 7</a>: Conditions <math>V_O</math> corrected (errata).</li> <li>• <a href="#">Table 8</a>: Conditions <math>I_{OZ}</math> corrected (errata).</li> <li>• <a href="#">Table 9</a>: Conditions <math>\Delta I_{CCI}</math> corrected (errata).</li> <li>• <a href="#">Table 11</a> and <a href="#">Table 12</a>: Conditions <math>t_r</math> corrected (errata).</li> <li>• <a href="#">Table 11</a>: Conditions <math>t_f</math> corrected (errata).</li> <li>• <a href="#">Table 13</a>: Removed "leadless packages" from conditions (errata).</li> </ul> |                    |               |               |
| 74AXP1T57 v.1  | 20150803                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Product data sheet | -             | -             |

## 15 Legal information

### 15.1 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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