

# 74AXP2T08-Q100

Dual supply, dual 2-input AND gate

Rev. 1 — 1 November 2016

Product data sheet

## 1. General description

The 74AXP2T08-Q100 is a dual supply, dual 2-input AND gate. It features four inputs (nA and nB), two outputs (nY) and dual supply pins ( $V_{CCI}$  and  $V_{CCO}$ ). The inputs are referenced to  $V_{CCI}$  and the outputs are 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.

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 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.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- 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;  $C_I = 0.6\text{ pF}$  (typical)
- Low output capacitance;  $C_O = 1.8\text{ pF}$  (typical)
- Low dynamic power consumption;  $C_{PD} = 0.5\text{ pF}$  at  $V_{CCI} = 1.2\text{ V}$  (typical)
- Low dynamic power consumption;  $C_{PD} = 7.1\text{ pF}$  at  $V_{CCO} = 3.3\text{ V}$  (typical)
- Low static power consumption;  $I_{CCI} = 0.5\text{ }\mu\text{A}$  ( $85\text{ }^{\circ}\text{C}$  maximum)
- Low static power consumption;  $I_{CCO} = 1.8\text{ }\mu\text{A}$  ( $85\text{ }^{\circ}\text{C}$  maximum)
- High noise immunity
- Complies with JEDEC standard:
  - ◆ JESD8-12A.01 (1.1 V to 1.3 V; nA, nB 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; nY outputs)
  - ◆ JESD12-6 (4.5 V to 5.5 V; nY outputs)



- ESD protection:
  - ◆ MIL-STD-883, method 3015 Class 2. Exceeds 2 kV
  - ◆ 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<sub>CCO</sub>
- I<sub>OFF</sub> circuitry provides partial power-down mode operation

### 3. Ordering information

Table 1. Ordering information

| Type number      | Package           |         |  | Version  |
|------------------|-------------------|---------|--|----------|
|                  | Temperature range | Name    | Description  |          |
| 74AXP2T08DP-Q100 | -40 °C to +125 °C | TSSOP10 | plastic thin shrink small outline package; 10 leads; body width 3 mm | SOT552-1 |

### 4. Marking

Table 2. Marking

| Type number      | Marking code <sup>[1]</sup> |
|------------------|-----------------------------|
| 74AXP2T08DP-Q100 | r8                          |

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

### 5. Functional diagram

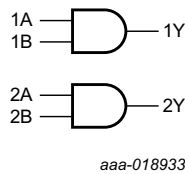


Fig 1. Logic symbol

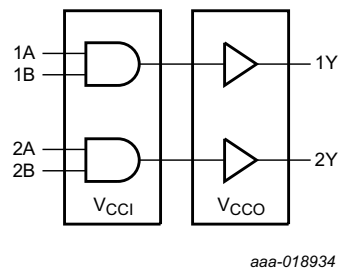


Fig 2. Logic diagram

## 6. Pinning information

### 6.1 Pinning

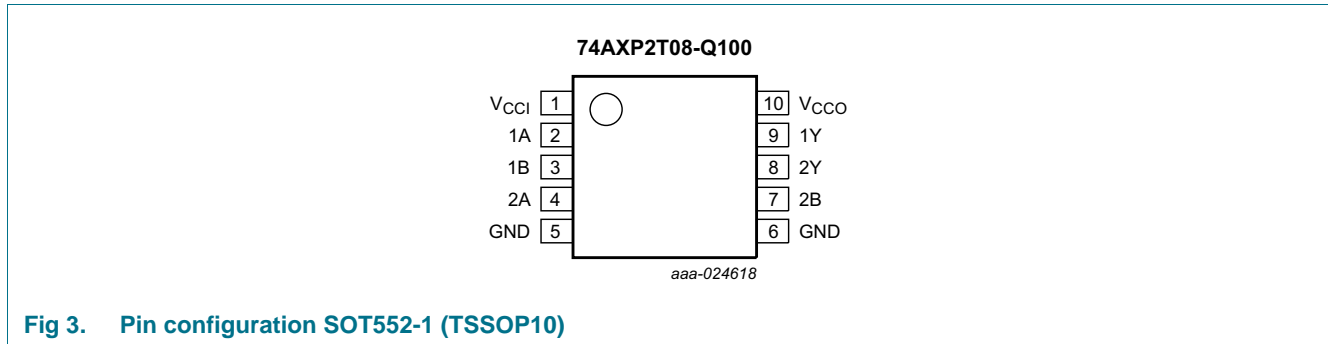


Fig 3. Pin configuration SOT552-1 (TSSOP10)

### 6.2 Pin description

Table 3. Pin description

| Symbol             | Pin  | Description           |
|--------------------|------|-----------------------|
| V <sub>CCI</sub>   | 1    | input supply voltage  |
| 1A, 2A             | 2, 4 | data input            |
| 1B, 2B             | 3, 7 | data input            |
| GND <sup>[1]</sup> | 5, 6 | ground (0 V)          |
| 1Y, 2Y             | 9, 8 | data output           |
| V <sub>CCO</sub>   | 10   | output supply voltage |

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

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

| Supply voltage   |                  | Input |    | Output |
|------------------|------------------|-------|----|--------|
| V <sub>CCI</sub> | V <sub>CCO</sub> | nA    | nB | nY     |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | L     | X  | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | X     | L  | L      |
| 0.7 V to 2.75 V  | 1.2 V to 5.5 V   | H     | H  | H      |
| GND              | 1.2 V to 5.5 V   | X     | X  | Z      |
| 0.7 V to 2.75 V  | GND              | X     | X  | Z      |
| GND              | GND              | X     | X  | Z      |

[1] H = HIGH voltage level; L = LOW voltage level; X = don't care.

## 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 |
|-----------|-------------------------|-------------------------------|-------------|-----------------|------|
| $V_{CCI}$ | 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 $V_{CCO}$      | -           | $\pm 25$        | 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 +125 °C | -           | 250             | 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.

## 9. Recommended operating conditions

**Table 6. 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 | +125      | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CCI} = 0.7$ 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  | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |             |               |               |               | Unit          |
|----------|---------------------------|---|---|-------------|---------------|---------------|---------------|---------------|
|          |                           |   | Min   | Typ 25 °C   | Max 25 °C     | Max 85 °C     | Max 125 °C    |               |
| $V_{IH}$ | HIGH-level input voltage  | $V_{CCI} = 0.75\text{ V to }0.85\text{ V}$  | $0.75V_{CCI}$                               | -           | -             | -             | -             | V             |
|          |                           | $V_{CCI} = 1.1\text{ V to }1.95\text{ V}$   | $0.65V_{CCI}$                               | -           | -             | -             | -             | V             |
|          |                           | $V_{CCI} = 2.3\text{ V to }2.7\text{ V}$  | 1.6   | -           | -             | -             | -             | V             |
| $V_{IL}$ | LOW-level input voltage   | $V_{CCI} = 0.75\text{ V to }0.85\text{ V}$  | -   | -           | $0.25V_{CCI}$ | $0.25V_{CCI}$ | $0.25V_{CCI}$ | V             |
|          |                           | $V_{CCI} = 1.1\text{ V to }1.95\text{ V}$   | -   | -           | $0.35V_{CCI}$ | $0.35V_{CCI}$ | $0.35V_{CCI}$ | V             |
|          |                           | $V_{CCI} = 2.3\text{ V to }2.7\text{ V}$  | -   | -           | 0.7           | 0.7           | 0.7           | V             |
| $V_{OH}$ | HIGH-level output voltage | $I_O = -2\text{ mA}; V_{CCO} = 1.2\text{ V}$ <sup>[1]</sup>                               | -   | 1.05        | -             | -             | -             | V             |
|          |                           | $I_O = -3\text{ mA}; V_{CCO} = 1.4\text{ V}$  | 1.05  | -           | -             | -             | -             | V             |
|          |                           | $I_O = -4.5\text{ mA}; V_{CCO} = 1.65\text{ V}$   | 1.2   | -           | -             | -             | -             | V             |
|          |                           | $I_O = -8\text{ mA}; V_{CCO} = 2.3\text{ V}$  | 1.7   | -           | -             | -             | -             | V             |
|          |                           | $I_O = -10\text{ mA}; V_{CCO} = 3.0\text{ V}$   | 2.2   | -           | -             | -             | -             | V             |
|          |                           | $I_O = -12\text{ mA}; V_{CCO} = 4.5\text{ V}$   | 3.7   | -           | -             | -             | -             | V             |
| $V_{OL}$ | LOW-level output voltage  | $I_O = 2\text{ mA}; V_{CCO} = 1.2\text{ V}$ <sup>[1]</sup>                                | -   | 0.18        | -             | -             | -             | V             |
|          |                           | $I_O = 3\text{ mA}; V_{CCO} = 1.4\text{ V}$   | -   | -           | 0.35          | 0.35          | 0.35          | V             |
|          |                           | $I_O = 4.5\text{ mA}; V_{CCO} = 1.65\text{ V}$  | -   | -           | 0.45          | 0.45          | 0.45          | V             |
|          |                           | $I_O = 8\text{ mA}; V_{CCO} = 2.3\text{ V}$   | -   | -           | 0.7           | 0.7           | 0.7           | V             |
|          |                           | $I_O = 10\text{ mA}; V_{CCO} = 3.0\text{ V}$  | -   | -           | 0.8           | 0.8           | 0.8           | V             |
|          |                           | $I_O = 12\text{ mA}; V_{CCO} = 4.5\text{ V}$  | -   | -           | 0.8           | 0.8           | 0.8           | V             |
| $I_I$    | input leakage current     | $V_I = 0\text{ V to }2.75\text{ V}; V_{CCI} = 0\text{ V to }2.75\text{ V}$ <sup>[1]</sup> | -   | $\pm 0.001$ | $\pm 0.1$     | $\pm 0.5$     | $\pm 1.0$     | $\mu\text{A}$ |
| $I_{OZ}$ | OFF-state output current  | $V_O = 0\text{ V to }5.5\text{ V}; V_{CCO} = 1.2\text{ V to }5.5\text{ V}$                | -   | $\pm 0.001$ | $\pm 0.1$     | $\pm 0.5$     | $\pm 2.0$     | $\mu\text{A}$ |

**Table 7. Static characteristics ...continued**

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 +125 °C |           |           |           |            | Unit |
|-------------------|--------------------------------------|---|--------------------------------------|-----------|-----------|-----------|------------|------|
|                   |                                      |   | Min                                  | Typ 25 °C | Max 25 °C | Max 85 °C | Max 125 °C |      |
| I <sub>OFF</sub>  | power-off leakage current            | inputs; V <sub>I</sub> = 0 V to 2.75 V; [1]<br>V <sub>CC1</sub> = 0 V;<br>V <sub>CC0</sub> = 0 V to 5.5 V   | -                                    | ±0.01     | ±0.1      | ±0.5      | ±2.0       | μA   |
|                   |                                      | output; V <sub>O</sub> = 0 V to 5.5 V; [1]<br>V <sub>CC0</sub> = 0 V;<br>V <sub>CC1</sub> = 0 V to 2.75 V;<br>V <sub>I</sub> = 0 V to 2.75 V          | -                                    | ±0.01     | ±0.1      | ±0.5      | ±2.0       | μA   |
| ΔI <sub>OFF</sub> | additional power-off leakage current | inputs; V <sub>I</sub> = 0 V or 2.75 V; [1]<br>V <sub>CC1</sub> = 0 V to 0.1 V;<br>V <sub>CC0</sub> = 0 V to 5.5 V                                    | -                                    | ±0.02     | ±0.1      | ±0.5      | ±2.0       | μA   |
|                   |                                      | output; V <sub>O</sub> = 0 V or 5.5 V; [1]<br>V <sub>CC0</sub> = 0 V to 0.1 V;<br>V <sub>CC1</sub> = 0 V to 2.75 V;<br>V <sub>I</sub> = 0 V or 2.75 V | -                                    | ±0.02     | ±0.1      | ±0.5      | ±2.0       | μA   |

[1] Typical values are measured at V<sub>CC1</sub> = V<sub>CC0</sub> = 1.2 V unless otherwise specified.

**Table 8. 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 +125 °C |           |           |           |            | Unit |
|-------------------|---------------------------------|---|--------------------------------------|-----------|-----------|-----------|------------|------|
|                   |                                 |   | Typ 25 °C                            | Max 25 °C | Typ 85 °C | Max 85 °C | Max 125 °C |      |
| I <sub>CC1</sub>  | input supply current            | V <sub>I</sub> = 0 V or V <sub>CC1</sub> ;                                      |                                      |           |           |           |            |      |
|                   |                                 | V <sub>CC1</sub> = 0.7 V to 1.3 V [1]   | 1                                    | 100       | 10        | 300       | 500        | nA   |
|                   |                                 | V <sub>CC1</sub> = 1.3 V to 2.75 V [2]  | 1                                    | 100       | 20        | 500       | 1000       | nA   |
|                   |                                 | V <sub>CC1</sub> = 2.75 V;<br>V <sub>CC0</sub> = 0 V                            | 1                                    | 100       | 20        | 500       | 1000       | nA   |
| I <sub>CC0</sub>  | output supply current           | V <sub>CC1</sub> = 0 V;<br>V <sub>CC0</sub> = 5.5 V                             | 1                                    | 100       | 1         | 100       | 500        | nA   |
|                   |                                 | V <sub>I</sub> = 0 V or V <sub>CC1</sub> ; I <sub>O</sub> = 0 A;<br>see Table 9 |                                      |           |           |           |            |      |
|                   |                                 | V <sub>CC0</sub> = 1.2 V to 3.6 V [1]   | 0.001                                | 1.0       | 0.01      | 1.2       | 1.3        | μA   |
|                   |                                 | V <sub>CC0</sub> = 3.6 V to 5.5 V [3]   | 0.8                                  | 1.5       | 1.0       | 1.8       | 2.0        | μA   |
|                   |                                 | V <sub>CC1</sub> = 2.75 V;<br>V <sub>CC0</sub> = 0 V                            | 0.001                                | 0.1       | 0.003     | 0.2       | 0.5        | μA   |
| ΔI <sub>CC1</sub> | additional input supply current | V <sub>CC1</sub> = 0 V;<br>V <sub>CC0</sub> = 3.6 V                             | 0.2                                  | 0.6       | 0.3       | 0.8       | 1.2        | μA   |
|                   |                                 | V <sub>CC1</sub> = 0 V;<br>V <sub>CC0</sub> = 5.5 V                             | 0.4                                  | 0.8       | 0.5       | 1.0       | 1.5        | μA   |
|                   |                                 | V <sub>I</sub> = V <sub>CC1</sub> - 0.5 V;<br>V <sub>CC1</sub> = 2.5 V          | 2                                    | 100       | 14        | 150       | 200        | μA   |

[1] Typical values are measured at V<sub>CC1</sub> = V<sub>CC0</sub> = 1.2 V.

[2] Typical values are measured at V<sub>CC1</sub> = V<sub>CC0</sub> = 2.5 V.

[3] Typical values are measured at V<sub>CC1</sub> = 1.2 V and V<sub>CC0</sub> = 5.0 V.

Table 9. Typical output supply current ( $I_{CCO}$ )

| $V_{CCI}$ | $V_{CCO}$ |       |       |       |       |       |       | 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 10. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V); for test circuit, see [Figure 11](#); for wave form, see [Figure 4](#).

| Symbol                                     | Parameter         | Conditions  | V <sub>CC0</sub> <sup>[1]</sup> |     |               |      |                |     |      |               |     |      |               |     |      |               |     | Unit |     |
|--|-------------------|---|---------------------------------|-----|---------------|------|----------------|-----|------|---------------|-----|------|---------------|-----|------|---------------|-----|------|-----|
|  |                   |   | 1.2 V                           |     | 1.5 V ± 0.1 V |      | 1.8 V ± 0.15 V |     |      | 2.5 V ± 0.2 V |     |      | 3.3 V ± 0.3 V |     |      | 5.0 V ± 0.5 V |     |      |     |
|  |                   |   | Typ                             | Min | Typ           | Max  | Min            | Typ | Max  | Min           | Typ | Max  | Min           | Typ | Max  | Min           | Typ |      | Max |
| <b>T<sub>amb</sub> = 25 °C</b>             |                   |   |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
| t <sub>pd</sub>                            | propagation delay | nA, nB to nY <sup>[2]</sup>                       |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
|  |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 23                              | 3   | 18            | 73   | 3              | 16  | 69   | 2             | 14  | 69   | 2             | 14  | 77   | 2             | 15  | 89   | ns  |
|  |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 16.9                            | 3.1 | 10.8          | 19.9 | 2.8            | 8.7 | 15.9 | 2.4           | 6.9 | 10.9 | 2.2           | 6.3 | 9.6  | 2.1           | 6.0 | 9.1  | ns  |
|  |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 16.0                            | 2.8 | 9.9           | 18.2 | 2.5            | 7.8 | 13.2 | 2.1           | 6.0 | 9.1  | 2.0           | 5.4 | 8.2  | 1.9           | 5.0 | 7.7  | ns  |
|  |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 15.6                            | 2.7 | 9.5           | 17.3 | 2.4            | 7.3 | 11.8 | 2.0           | 5.6 | 8.6  | 1.8           | 4.9 | 7.6  | 1.8           | 4.6 | 7.2  | ns  |
|  |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 15.2                            | 2.5 | 9.0           | 16.8 | 2.2            | 6.9 | 11.0 | 1.9           | 5.1 | 8.0  | 1.7           | 4.5 | 7.0  | 1.6           | 4.1 | 6.5  | ns  |
| <b>T<sub>amb</sub> = -40 °C to +85 °C</b>  |                   |   |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
| t <sub>pd</sub>                            | propagation delay | nA, nB to nY <sup>[2]</sup>                       |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
|  |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 23                              | 3   | 18            | 148  | 3              | 16  | 145  | 2             | 14  | 164  | 2             | 14  | 191  | 2             | 15  | 222  | ns  |
|  |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 16.9                            | 3.1 | 10.8          | 19.9 | 2.8            | 8.7 | 15.9 | 2.4           | 6.9 | 10.9 | 2.2           | 6.3 | 9.6  | 2.1           | 6.0 | 9.1  | ns  |
|  |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 16.0                            | 2.8 | 9.9           | 18.2 | 2.5            | 7.8 | 13.2 | 2.1           | 6.0 | 9.1  | 2.0           | 5.4 | 8.2  | 1.9           | 5.0 | 7.7  | ns  |
|  |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 15.6                            | 2.7 | 9.5           | 17.3 | 2.4            | 7.3 | 11.8 | 2.0           | 5.6 | 8.6  | 1.8           | 4.9 | 7.6  | 1.8           | 4.6 | 7.2  | ns  |
|  |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 15.2                            | 2.5 | 9.0           | 16.8 | 2.2            | 6.9 | 11.0 | 1.9           | 5.1 | 8.0  | 1.7           | 4.5 | 7.0  | 1.6           | 4.1 | 6.5  | ns  |
| <b>T<sub>amb</sub> = -40 °C to +125 °C</b> |                   |   |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
| t <sub>pd</sub>                            | propagation delay | nA, nB to nY <sup>[2]</sup>                       |                                 |     |               |      |                |     |      |               |     |      |               |     |      |               |     |      |     |
|  |                   | V <sub>CCI</sub> = 0.75 V to 0.85 V               | 23                              | 3   | 18            | 148  | 3              | 16  | 145  | 2             | 14  | 164  | 2             | 14  | 191  | 2             | 15  | 222  | ns  |
|  |                   | V <sub>CCI</sub> = 1.1 V to 1.3 V                 | 16.9                            | 3.1 | 10.8          | 20.2 | 2.8            | 8.7 | 16.7 | 2.4           | 6.9 | 14.2 | 2.2           | 6.3 | 12.2 | 2.1           | 6.0 | 11.2 | ns  |
|  |                   | V <sub>CCI</sub> = 1.4 V to 1.6 V                 | 16.0                            | 2.8 | 9.9           | 19.1 | 2.5            | 7.8 | 15.6 | 2.1           | 6.0 | 11.1 | 2.0           | 5.4 | 10.0 | 1.9           | 5.0 | 9.4  | ns  |
|  |                   | V <sub>CCI</sub> = 1.65 V to 1.95 V               | 15.6                            | 2.7 | 9.5           | 18.2 | 2.4            | 7.3 | 14.7 | 2.0           | 5.6 | 10.5 | 1.8           | 4.9 | 9.6  | 1.8           | 4.6 | 8.9  | ns  |
|  |                   | V <sub>CCI</sub> = 2.3 V to 2.7 V                 | 15.2                            | 2.5 | 9.0           | 17.2 | 2.2            | 6.9 | 13.7 | 1.9           | 5.1 | 9.8  | 1.7           | 4.5 | 8.8  | 1.6           | 4.1 | 8.1  | 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           | -   | -    | 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 11. Typical dynamic characteristics at T<sub>amb</sub> = 25 °C**

Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 11](#); for wave form see [Figure 4](#).

| Symbol                   | Parameter                     | Conditions   | V <sub>CCO</sub> |       |       |       |       |       | Unit |
|--------------------------|-------------------------------|--|------------------|-------|-------|-------|-------|-------|------|
|                          |                               |  | 1.2 V            | 1.5 V | 1.8 V | 2.5 V | 3.3 V | 5.0 V |      |
| C <sub>PD</sub>          | power dissipation capacitance | f <sub>i</sub> = 1 MHz; R <sub>L</sub> = ∞ Ω; V <sub>I</sub> = 0 V to V <sub>CCI</sub> <a href="#">[1]</a> |                  |       |       |       |       |       |      |
|                          |                               | input supply <a href="#">[2]</a>   |                  |       |       |       |       |       |      |
|                          |                               | V <sub>CCI</sub> = 0.8 V   | 0.4              | 0.4   | 0.4   | 0.4   | 0.4   | 0.4   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.2 V   | 0.5              | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.5 V   | 0.5              | 0.5   | 0.5   | 0.5   | 0.5   | 0.5   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.8 V   | 0.6              | 0.6   | 0.6   | 0.6   | 0.6   | 0.6   | pF   |
|                          |                               | V <sub>CCI</sub> = 2.5 V   | 0.8              | 0.8   | 0.8   | 0.8   | 0.8   | 0.8   | pF   |
|                          |                               | output supply <a href="#">[3]</a>  |                  |       |       |       |       |       |      |
|                          |                               | V <sub>CCI</sub> = 0.8 V   | 6.7              | 6.8   | 6.8   | 6.9   | 7.5   | 9.5   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.2 V   | 6.8              | 6.9   | 7.0   | 7.0   | 7.1   | 7.6   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.5 V   | 6.9              | 6.9   | 6.9   | 7.0   | 7.1   | 7.6   | pF   |
|                          |                               | V <sub>CCI</sub> = 1.8 V   | 6.9              | 6.9   | 6.9   | 7.0   | 7.2   | 7.6   | pF   |
| V <sub>CCI</sub> = 2.5 V | 6.9                           | 7.0  | 7.0              | 7.0   | 7.2   | 7.6   | pF    |       |      |
| C <sub>I</sub>           | input capacitance             | V <sub>I</sub> = 0 V or V <sub>CCI</sub> ; V <sub>CCI</sub> = 0 V to 2.7 V                                 | 0.6              | 0.6   | 0.6   | 0.6   | 0.6   | 0.6   | pF   |
| C <sub>O</sub>           | output capacitance            | V <sub>O</sub> = 0 V; V <sub>CCO</sub> = 0 V   | 1.8              | 1.8   | 1.8   | 1.8   | 1.8   | 1.8   | pF   |

[1] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

[2] Power dissipated from input supply (V<sub>CCI</sub>)

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

C<sub>PD</sub> = power dissipation capacitance of the input supply.

V<sub>CCI</sub> = input supply voltage in V;

f<sub>i</sub> = input frequency in MHz;

N = number of inputs switching;

[3] Power dissipated from output supply (V<sub>CCO</sub>)

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

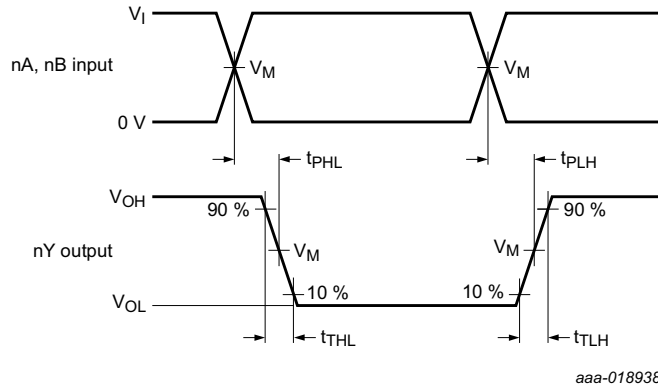
C<sub>L</sub> = load capacitance in pF;

C<sub>PD</sub> = power dissipation capacitance of the output supply.

V<sub>CCO</sub> = output supply voltage in V;

f<sub>o</sub> = output frequency in MHz;

11.1 Waveforms and graphs

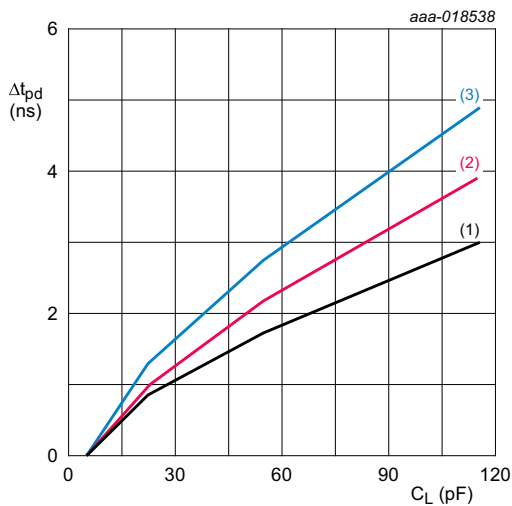


Measurement points are given in [Table 12](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

Fig 4. Input nA, nB to output nY propagation delay times and output transition times

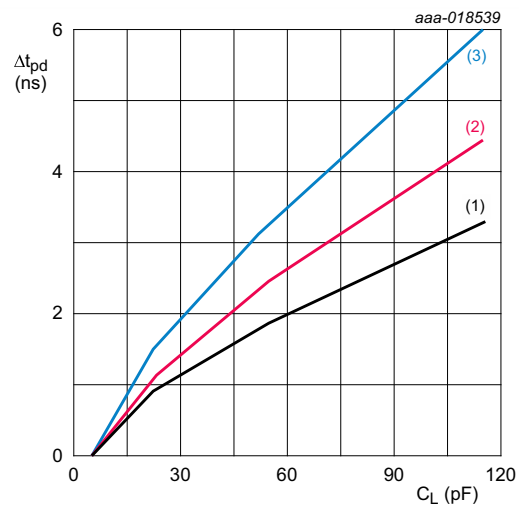
Table 12. Measurement points

| 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 | $0.5V_{CCO}$ | $0.5V_{CCI}$ | $V_{CCI}$ |



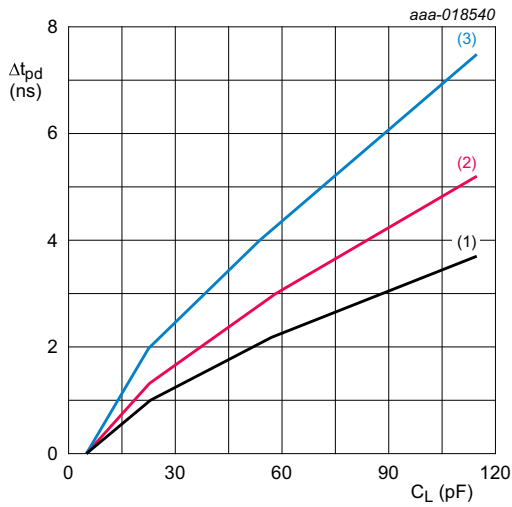
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
 (1) Minimum:  $V_{CCO} = 5.5\text{ V}$   
 (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 5\text{ V}$   
 (3) Maximum:  $V_{CCO} = 4.5\text{ V}$

Fig 5. Additional propagation delay versus load capacitance



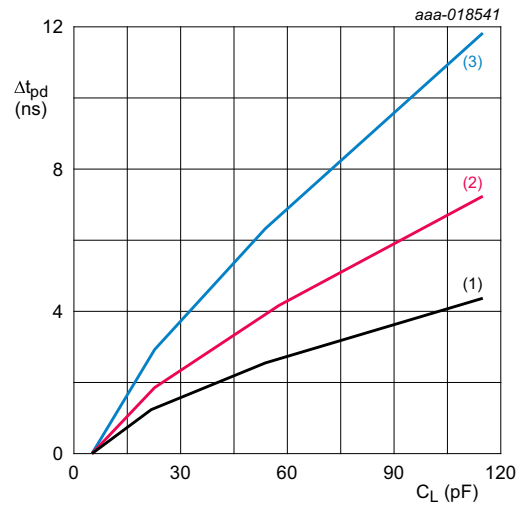
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
 (1) Minimum:  $V_{CCO} = 3.6\text{ V}$   
 (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 3.3\text{ V}$   
 (3) Maximum:  $V_{CCO} = 3\text{ V}$

Fig 6. Additional propagation delay versus load capacitance



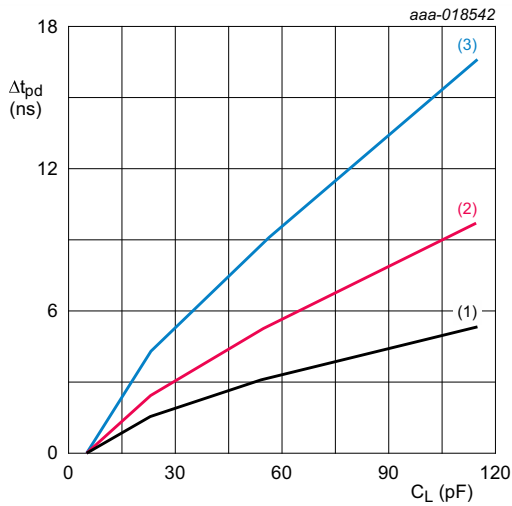
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
 (1) Minimum:  $V_{CCO} = 2.7\text{ V}$   
 (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 2.5\text{ V}$   
 (3) Maximum:  $V_{CCO} = 2.3\text{ V}$

**Fig 7. Additional propagation delay versus load capacitance**



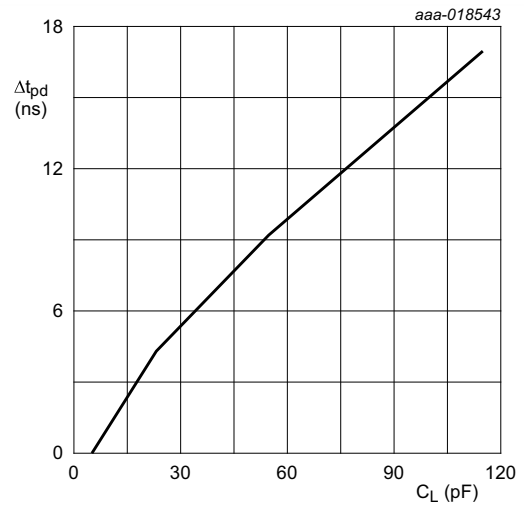
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
 (1) Minimum:  $V_{CCO} = 1.95\text{ V}$   
 (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 1.8\text{ V}$   
 (3) Maximum:  $V_{CCO} = 1.65\text{ V}$

**Fig 8. Additional propagation delay versus load capacitance**



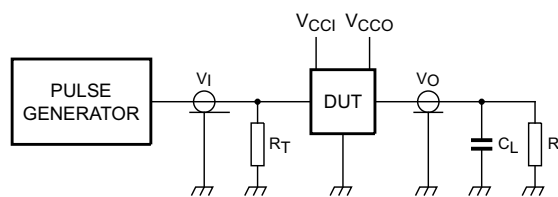
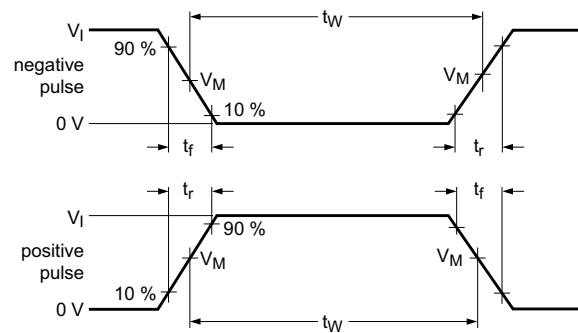
$T_{amb} = -40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  unless otherwise specified.  
 (1) Minimum:  $V_{CCO} = 1.6\text{ V}$   
 (2) Typical:  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{CCO} = 1.5\text{ V}$   
 (3) Maximum:  $V_{CCO} = 1.4\text{ V}$

**Fig 9. Additional propagation delay versus load capacitance**



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

**Fig 10. Additional propagation delay versus load capacitance**



aaa-018544

Test data is given in [Table 13](#).

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.

**Fig 11. Test circuit for measuring switching times**

**Table 13. 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 k $\Omega$ | $\leq 3.0$ ns | $V_{CCI}$ |

12. Package outline

TSSOP10: plastic thin shrink small outline package; 10 leads; body width 3 mm

SOT552-1

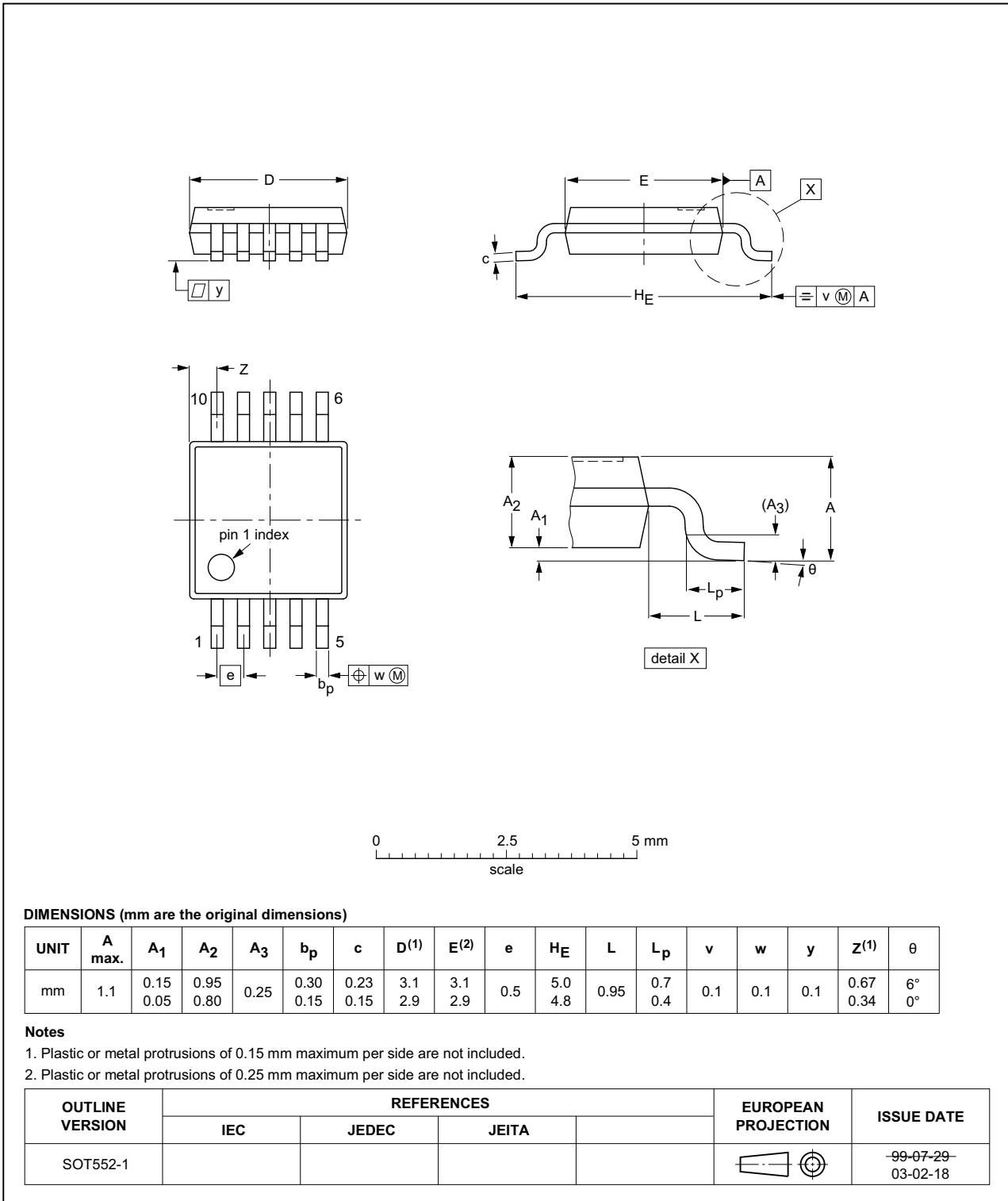


Fig 12. Package outline SOT552-1 (TSSOP10)

## 13. Abbreviations

Table 14. Abbreviations

| Acronym | Description             |
|---------|-------------------------|
| DUT     | Device Under Test       |
| ESD     | ElectroStatic Discharge |
| HBM     | Human Body Model        |
| MM      | Machine Model           |
| MIL     | Military                |

## 14. Revision history

Table 15. Revision history

| Document ID        | Release date | Data sheet status  | Change notice | Supersedes |
|--------------------|--------------|--------------------|---------------|------------|
| 74AXP2T08_Q100 v.1 | 20161101     | Product data sheet | -             | -          |

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| 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.                                     |

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

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