

# 74HC251; 74HCT251

8-input multiplexer; 3-state

Rev. 7 — 14 March 2024

Product data sheet

## 1. General description

The 74HC251; 74HCT251 is an 8-bit multiplexer with eight binary inputs (I0 to I7), three select inputs (S0 to S2) and an output enable input ( $\overline{OE}$ ). The select inputs select one of the eight binary inputs and route it to the complementary outputs (Y and  $\overline{Y}$ ). A HIGH on  $\overline{OE}$  causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes that enable the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

## 2. Features and benefits

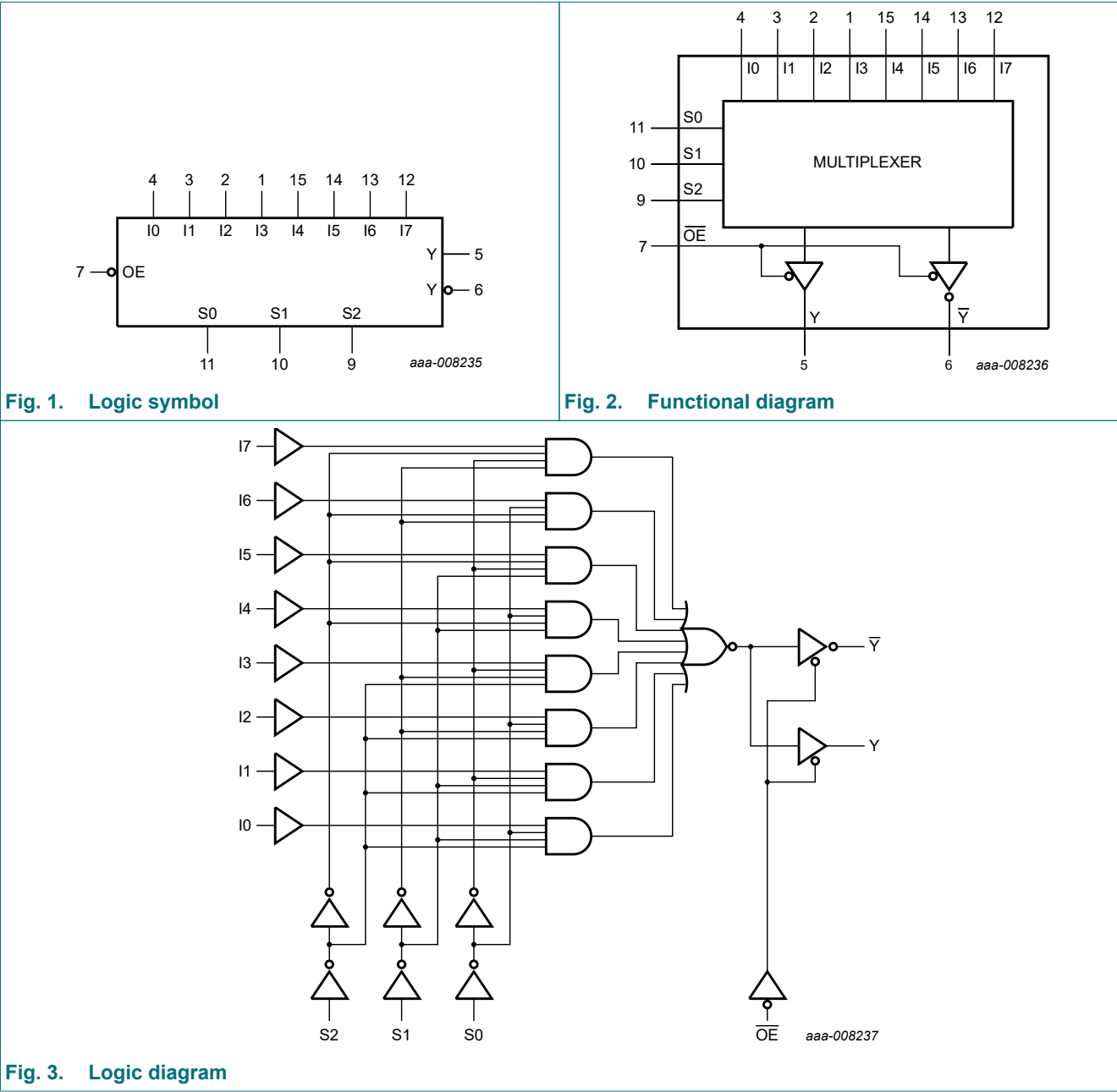
- Wide supply voltage range from 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- Input levels:
  - For 74HC251: CMOS level
  - For 74HCT251: TTL level
- Non-inverting data path
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

## 3. Ordering information

Table 1. Ordering information

| Type number                | Package           |         |  |                          |
|----------------------------|-------------------|---------|--|--------------------------|
|                            | Temperature range | Name    | Description  | Version                  |
| <a href="#">74HC251D</a>   | -40 °C to +125 °C | SO16    | plastic small outline package; 16 leads; body width 3.9 mm             | <a href="#">SOT109-1</a> |
| <a href="#">74HCT251D</a>  |                   |         |  |                          |
| <a href="#">74HC251PW</a>  | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | <a href="#">SOT403-1</a> |
| <a href="#">74HCT251PW</a> |                   |         |  |                          |

4. Functional diagram



5. Pinning information

5.1. Pinning

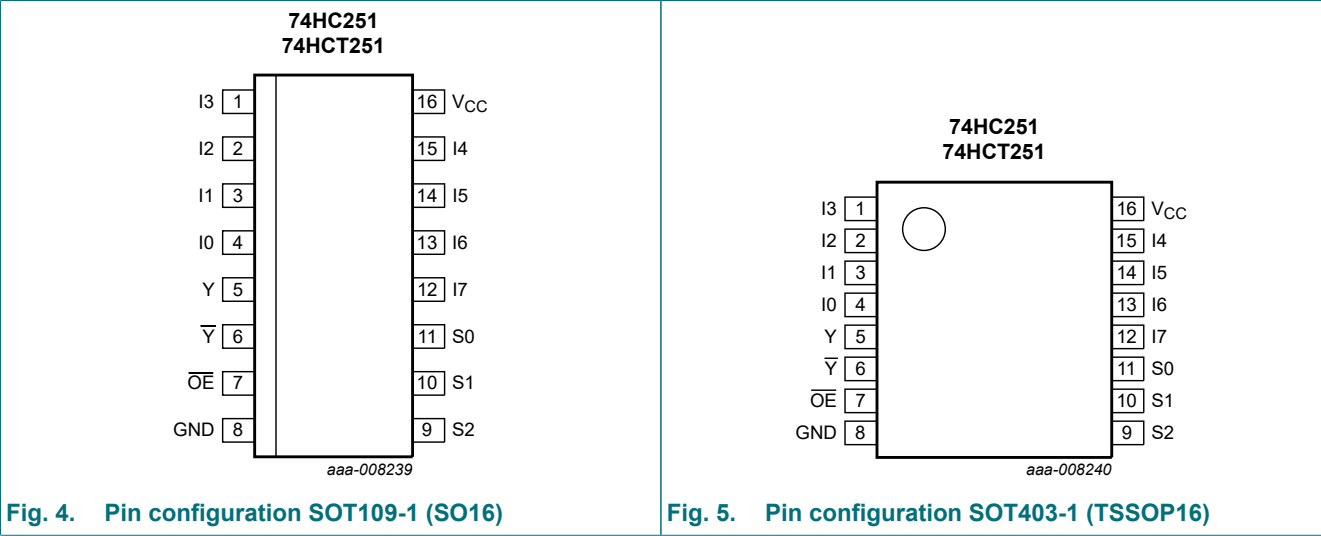


Fig. 4. Pin configuration SOT109-1 (SO16)

Fig. 5. Pin configuration SOT403-1 (TSSOP16)

5.2. Pin description

Table 2. Pin description

| Symbol                         | Pin                        | Description                      |
|--------------------------------|----------------------------|----------------------------------|
| I0, I1, I2, I3, I4, I5, I6, I7 | 4, 3, 2, 1, 15, 14, 13, 12 | data inputs                      |
| Y                              | 5                          | multiplexer output               |
| Y                              | 6                          | complementary multiplexer output |
| OE                             | 7                          | output enable input (active LOW) |
| GND                            | 8                          | ground (0 V)                     |
| S0, S1, S2                     | 11, 10, 9                  | common data select inputs        |
| V <sub>CC</sub>                | 16                         | supply voltage                   |

6. Functional description

Table 3. Function table

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

| Input |    |    |    |    |    |    |    |    |    |    |    | Output |   |
|-------|----|----|----|----|----|----|----|----|----|----|----|--------|---|
| OE    | S2 | S1 | S0 | I0 | I1 | I2 | I3 | I4 | I5 | I6 | I7 | Y      | Y |
| H     | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | X  | Z      | Z |
| L     | L  | L  | L  | L  | X  | X  | X  | X  | X  | X  | X  | H      | L |
| L     | L  | L  | L  | H  | X  | X  | X  | X  | X  | X  | X  | L      | H |
| L     | L  | L  | H  | X  | L  | X  | X  | X  | X  | X  | X  | H      | L |
| L     | L  | L  | H  | X  | H  | X  | X  | X  | X  | X  | X  | L      | H |
| L     | L  | H  | L  | X  | X  | L  | X  | X  | X  | X  | X  | H      | L |
| L     | L  | H  | L  | X  | X  | H  | X  | X  | X  | X  | X  | L      | H |
| L     | L  | H  | H  | X  | X  | X  | L  | X  | X  | X  | X  | H      | L |
| L     | L  | H  | H  | X  | X  | X  | H  | X  | X  | X  | X  | L      | H |
| L     | H  | L  | L  | X  | X  | X  | X  | L  | X  | X  | X  | H      | L |
| L     | H  | L  | L  | X  | X  | X  | X  | H  | X  | X  | X  | L      | H |
| L     | H  | L  | H  | X  | X  | X  | X  | X  | L  | X  | X  | H      | L |
| L     | H  | L  | H  | X  | X  | X  | X  | X  | H  | X  | X  | L      | H |
| L     | H  | H  | L  | X  | X  | X  | X  | X  | X  | L  | X  | H      | L |
| L     | H  | H  | L  | X  | X  | X  | X  | X  | X  | H  | X  | L      | H |
| L     | H  | H  | H  | X  | X  | X  | X  | X  | X  | X  | L  | H      | L |
| L     | H  | H  | H  | X  | X  | X  | X  | X  | X  | X  | H  | L      | H |

7. Limiting values

Table 4. 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 <sub>CC</sub>  | supply voltage          |   | -0.5 | +7   | V    |
| I <sub>IK</sub>  | input clamping current  | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | -    | ±20  | mA   |
| I <sub>OK</sub>  | output clamping current | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V | -    | ±20  | mA   |
| I <sub>O</sub>   | output current          | V <sub>O</sub> = -0.5 V to (V <sub>CC</sub> + 0.5 V)                | -    | ±25  | mA   |
| I <sub>CC</sub>  | supply current          |   | -    | +50  | mA   |
| I <sub>GND</sub> | ground current          |   | -50  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |   | -65  | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | T <sub>amb</sub> = -40 °C to +125 °C [1]                            | -    | 500  | mW   |

[1] For SOT109-1 (SO16) package: P<sub>tot</sub> derates linearly with 12.4 mW/K above 110 °C.  
For SOT403-1 (TSSOP16) package: P<sub>tot</sub> derates linearly with 8.5 mW/K above 91 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

| Symbol           | Parameter                           | Conditions              | 74HC251 |      |                 | 74HCT251 |      |                 | Unit |
|------------------|-------------------------------------|-------------------------|---------|------|-----------------|----------|------|-----------------|------|
|                  |                                     |                         | Min     | Typ  | Max             | Min      | Typ  | Max             |      |
| V <sub>CC</sub>  | supply voltage                      |                         | 2.0     | 5.0  | 6.0             | 4.5      | 5.0  | 5.5             | V    |
| V <sub>I</sub>   | input voltage                       |                         | 0       | -    | V <sub>CC</sub> | 0        | -    | V <sub>CC</sub> | V    |
| V <sub>O</sub>   | output voltage                      |                         | 0       | -    | V <sub>CC</sub> | 0        | -    | V <sub>CC</sub> | V    |
| T <sub>amb</sub> | ambient temperature                 |                         | -40     | +25  | +125            | -40      | +25  | +125            | °C   |
| Δt/ΔV            | input transition rise and fall rate | V <sub>CC</sub> = 2.0 V | -       | -    | 625             | -        | -    | -               | ns/V |
|                  |                                     | V <sub>CC</sub> = 4.5 V | -       | 1.67 | 139             | -        | 1.67 | 139             | ns/V |
|                  |                                     | V <sub>CC</sub> = 6.0 V | -       | -    | 83              | -        | -    | -               | ns/V |

9. Static characteristics

Table 6. Static characteristics

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol          | Parameter                 | Conditions  | 25 °C |      |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-----------------|---------------------------|---|-------|------|------|------------------|------|-------------------|------|------|
|                 |                           |   | Min   | Typ  | Max  | Min              | Max  | Min               | Max  |      |
| 74HC251         |                           |   |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage  | V <sub>CC</sub> = 2.0 V                             | 1.5   | 1.2  | -    | 1.5              | -    | 1.5               | -    | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                             | 3.15  | 2.4  | -    | 3.15             | -    | 3.15              | -    | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                             | 4.2   | 3.2  | -    | 4.2              | -    | 4.2               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage   | V <sub>CC</sub> = 2.0 V                             | -     | 0.8  | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                 |                           | V <sub>CC</sub> = 4.5 V                             | -     | 2.1  | 1.35 | -                | 1.35 | -                 | 1.35 | V    |
|                 |                           | V <sub>CC</sub> = 6.0 V                             | -     | 2.8  | 1.8  | -                | 1.8  | -                 | 1.8  | V    |
| V <sub>OH</sub> | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> |       |      |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V    | 1.9   | 2.0  | -    | 1.9              | -    | 1.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V    | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |                           | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V    | 5.9   | 6.0  | -    | 5.9              | -    | 5.9               | -    | V    |
|                 |                           | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 4.5 V   | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
|                 |                           | I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V   | 5.48  | 5.81 | -    | 5.34             | -    | 5.2               | -    | V    |
| V <sub>OL</sub> | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> |       |      |      |                  |      |                   |      |      |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V     | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V     | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V     | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |                           | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V    | -     | 0.15 | 0.26 | -                | 0.33 | -                 | 0.4  | V    |
|                 |                           | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V    | -     | 0.16 | 0.26 | -                | 0.33 | -                 | 0.4  | V    |

| Symbol           | Parameter                 | Conditions   | 25 °C |      |      | -40 °C to +85 °C |      | -40 °C to +125 °C |       | Unit |
|------------------|---------------------------|--|-------|------|------|------------------|------|-------------------|-------|------|
|                  |                           |  | Min   | Typ  | Max  | Min              | Max  | Min               | Max   |      |
| I <sub>I</sub>   | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V   | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0  | µA   |
| I <sub>OZ</sub>  | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                   | -     | -    | ±0.5 | -                | ±5.0 | -                 | ±10.0 | µA   |
| I <sub>CC</sub>  | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V   | -     | -    | 8.0  | -                | 80   | -                 | 160   | µA   |
| C <sub>I</sub>   | input capacitance         |  | -     | 3.5  | -    |                  |      |                   |       | pF   |
| 74HCT251         |                           |  |       |      |      |                  |      |                   |       |      |
| V <sub>IH</sub>  | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V   | 2.0   | 1.6  | -    | 2.0              | -    | 2.0               | -     | V    |
| V <sub>IL</sub>  | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V   | -     | 1.2  | 0.8  | -                | 0.8  | -                 | 0.8   | V    |
| V <sub>OH</sub>  | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |      |      |                  |      |                   |       |      |
|                  |                           | I <sub>O</sub> = -20 µA  | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -     | V    |
|                  |                           | I <sub>O</sub> = -4 mA   | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -     | V    |
| V <sub>OL</sub>  | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V  |       |      |      |                  |      |                   |       |      |
|                  |                           | I <sub>O</sub> = 20 µA   | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1   | V    |
|                  |                           | I <sub>O</sub> = 4.0 mA  | -     | 0.15 | 0.26 | -                | 0.33 | -                 | 0.4   | V    |
| I <sub>I</sub>   | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V   | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0  | µA   |
| I <sub>OZ</sub>  | OFF-state output current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V                   | -     | -    | ±0.5 | -                | ±5.0 | -                 | ±10   | µA   |
| I <sub>CC</sub>  | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V   | -     | -    | 8.0  | -                | 80   | -                 | 160   | µA   |
| ΔI <sub>CC</sub> | additional supply current | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A |       |      |      |                  |      |                   |       |      |
|                  |                           | per input pin; I <sub>n</sub> inputs   | -     | 100  | 360  | -                | 450  | -                 | 490   | µA   |
|                  |                           | per input pin; $\overline{OE}$ input   | -     | 150  | 540  | -                | 675  | -                 | 735   | µA   |
|                  |                           | per input pin; S <sub>n</sub> input  | -     | 150  | 540  | -                | 675  | -                 | 735   | µA   |
| C <sub>I</sub>   | input capacitance         |  | -     | 3.5  | -    |                  |      |                   |       | pF   |

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V);  $C_L = 50\text{ pF}$  unless otherwise specified; for test circuit, see Fig. 9.

| Symbol           | Parameter                     | Conditions   | 25 °C |     |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|--|-------|-----|-----|------------------|-----|-------------------|-----|------|
|                  |                               |  | Min   | Typ | Max | Min              | Max | Min               | Max |      |
| 74HC251          |                               |  |       |     |     |                  |     |                   |     |      |
| t <sub>pd</sub>  | propagation delay             | In to Y; see Fig. 6 [1]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 50  | 170 | -                | 215 | -                 | 255 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 18  | 34  | -                | 43  | -                 | 51  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                                  | -     | 15  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 14  | 29  | -                | 37  | -                 | 43  | ns   |
|                  |                               | In to $\bar{Y}$ ; see Fig. 6 [1]   |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 55  | 175 | -                | 220 | -                 | 265 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 20  | 35  | -                | 44  | -                 | 53  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                                  | -     | 17  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 16  | 30  | -                | 37  | -                 | 45  | ns   |
|                  |                               | Sn to Y; see Fig. 7 [1]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 66  | 205 | -                | 255 | -                 | 310 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 24  | 41  | -                | 51  | -                 | 62  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                                  | -     | 20  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 19  | 35  | -                | 43  | -                 | 53  | ns   |
|                  |                               | Sn to $\bar{Y}$ ; see Fig. 7 [1]   |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 69  | 205 | -                | 255 | -                 | 310 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 25  | 41  | -                | 51  | -                 | 62  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF                                  | -     | 21  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 20  | 35  | -                | 43  | -                 | 53  | ns   |
| t <sub>en</sub>  | enable time                   | $\overline{OE}$ to Y, $\bar{Y}$ ; see Fig. 8 [2]                               |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 36  | 140 | -                | 175 | -                 | 210 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 13  | 28  | -                | 35  | -                 | 42  | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 10  | 24  | -                | 30  | -                 | 36  | ns   |
| t <sub>dis</sub> | disable time                  | $\overline{OE}$ to Y, $\bar{Y}$ ; see Fig. 8 [3]                               |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 39  | 140 | -                | 170 | -                 | 210 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 14  | 28  | -                | 35  | -                 | 42  | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 11  | 24  | -                | 30  | -                 | 36  | ns   |
| t <sub>t</sub>   | transition time               | Y, $\bar{Y}$ ; see Fig. 6 [4]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 2.0 V  | -     | 19  | 75  | -                | 95  | -                 | 110 | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 7   | 15  | -                | 19  | -                 | 22  | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V  | -     | 6   | 13  | -                | 16  | -                 | 19  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [5] | -     | 44  | -   | -                | -   | -                 | -   | pF   |

| Symbol           | Parameter                     | Conditions   | 25 °C |     |     | -40 °C to +85 °C |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|--|-------|-----|-----|------------------|-----|-------------------|-----|------|
|                  |                               |  | Min   | Typ | Max | Min              | Max | Min               | Max |      |
| 74HCT251         |                               |  |       |     |     |                  |     |                   |     |      |
| t <sub>pd</sub>  | propagation delay             | In to Y; see <a href="#">Fig. 6</a> [1]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 22  | 35  | -                | 44  | -                 | 53  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 19  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | In to $\bar{Y}$ ; see <a href="#">Fig. 6</a> [1]                                       |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 22  | 35  | -                | 44  | -                 | 53  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 19  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | Sn to Y; see <a href="#">Fig. 7</a> [1]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 24  | 44  | -                | 55  | -                 | 66  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 20  | -   | -                | -   | -                 | -   | ns   |
|                  |                               | Sn to $\bar{Y}$ ; see <a href="#">Fig. 7</a> [1]                                       |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 25  | 44  | -                | 55  | -                 | 66  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 21  | -   | -                | -   | -                 | -   | ns   |
| t <sub>en</sub>  | enable time                   | $\overline{OE}$ to Y, $\bar{Y}$ ; see <a href="#">Fig. 8</a> [2]                       |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 13  | 28  | -                | 35  | -                 | 42  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 13  | -   | -                | -   | -                 | -   | ns   |
| t <sub>dis</sub> | disable time                  | $\overline{OE}$ to Y, $\bar{Y}$ ; see <a href="#">Fig. 8</a> [3]                       |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 14  | 28  | -                | 35  | -                 | 42  | ns   |
|                  |                               | V <sub>CC</sub> = 5 V; C <sub>L</sub> = 15 pF  | -     | 18  | -   | -                | -   | -                 | -   | ns   |
| t <sub>t</sub>   | transition time               | Y, $\bar{Y}$ ; see <a href="#">Fig. 6</a> [4]  |       |     |     |                  |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 4.5 V  | -     | 7   | 15  | -                | 19  | -                 | 22  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | C <sub>L</sub> = 50 pF; f = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> - 1.5 V [5] | -     | 46  | -   | -                | -   | -                 | -   | pF   |

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

[2] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.

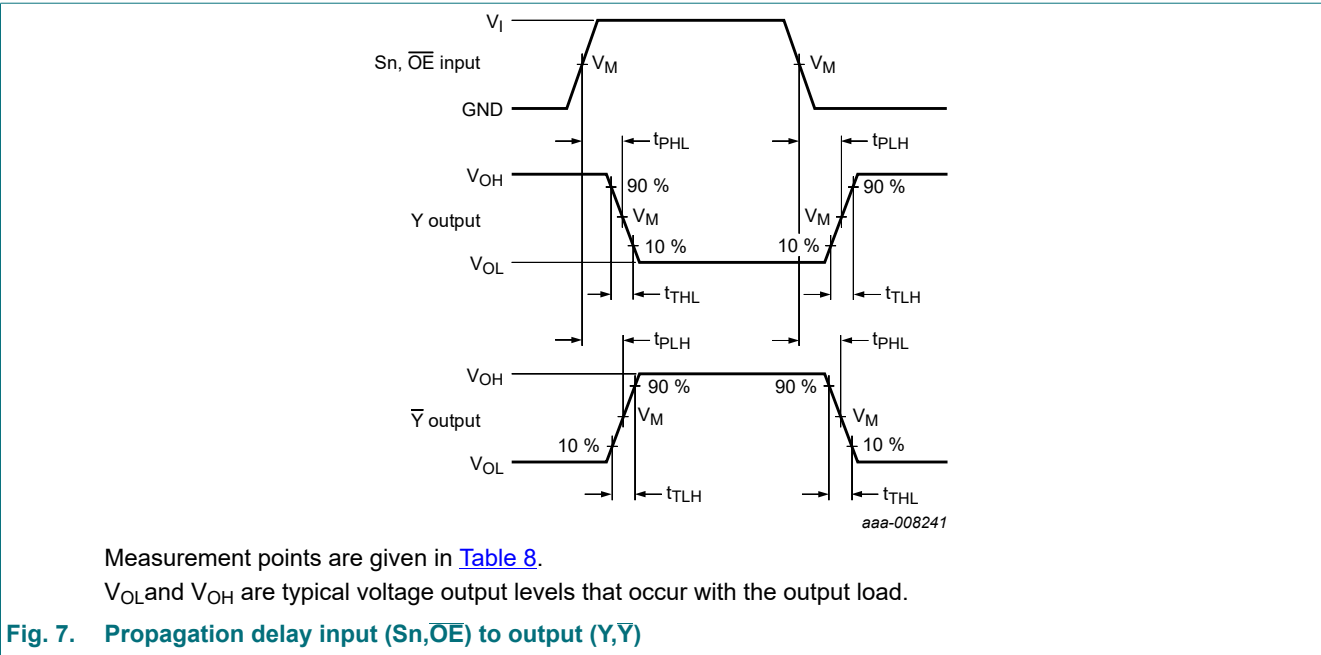
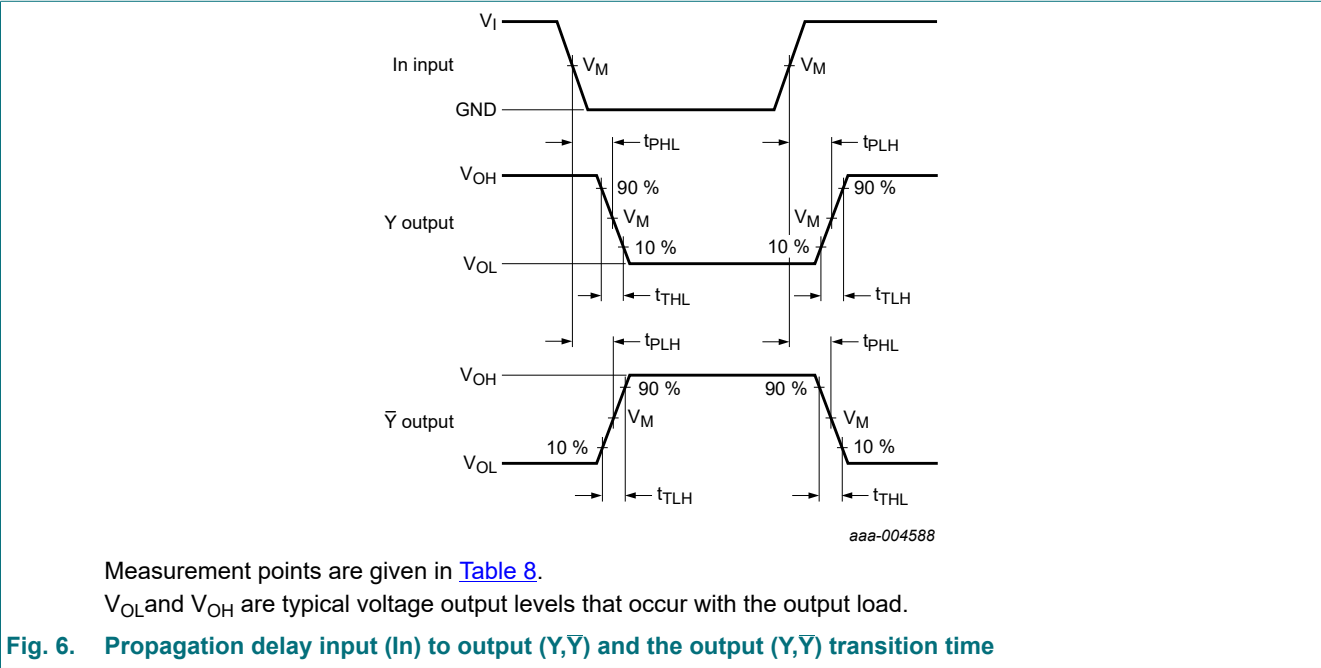
[3] t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

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

[5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
f<sub>i</sub> = input frequency in MHz;  
f<sub>o</sub> = output frequency in MHz;  
C<sub>L</sub> = output load capacitance in pF;  
V<sub>CC</sub> = supply voltage in V;  
N = number of inputs switching;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.



10.1. Waveforms and test circuit



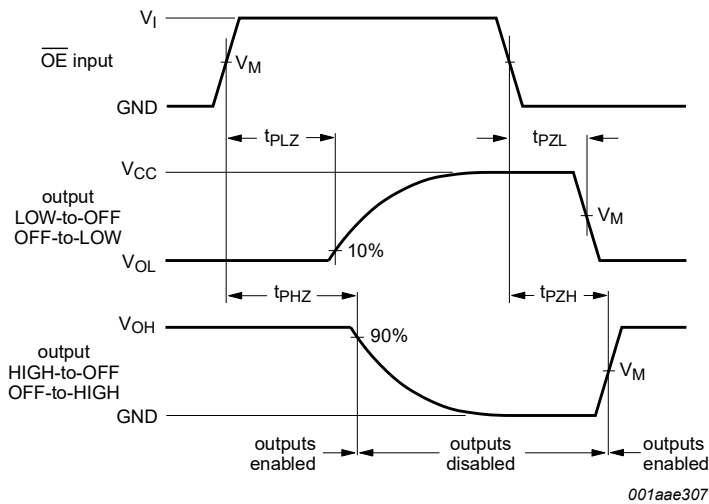


Fig. 8. Enable and disable times

Table 8. Measurement points

| Type     | Input       | Output      |
|----------|-------------|-------------|
|          | $V_M$       | $V_M$       |
| 74HC251  | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT251 | 1.3 V       | 1.3 V       |

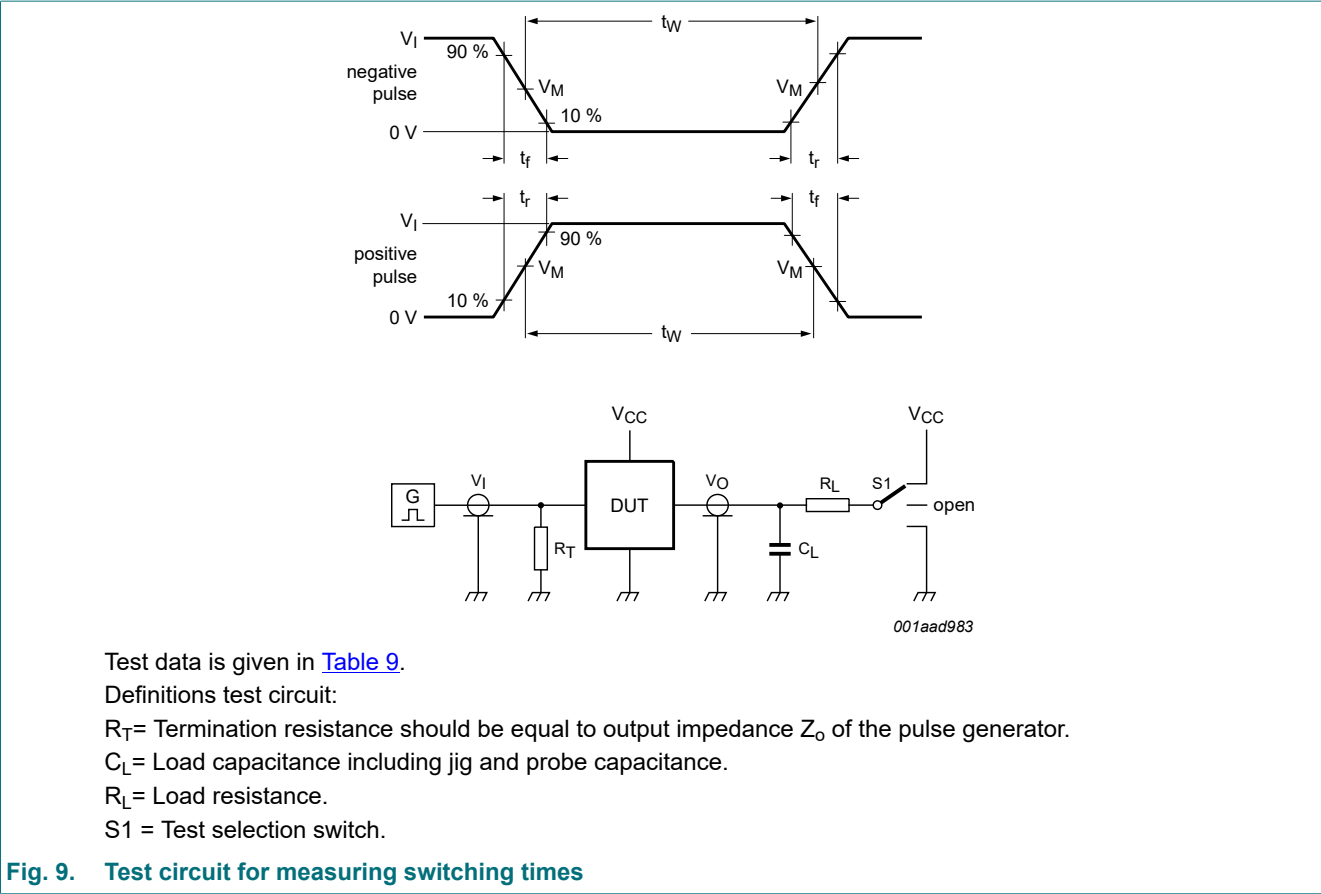


Table 9. Test data

| Type     | Input    |            | Load         |              | S1 position        |                    |                    |
|----------|----------|------------|--------------|--------------|--------------------|--------------------|--------------------|
|          | $V_I$    | $t_r, t_f$ | $C_L$        | $R_L$        | $t_{PHL}, t_{PLH}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 74HC251  | $V_{CC}$ | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |
| 74HCT251 | 3 V      | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |

11. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

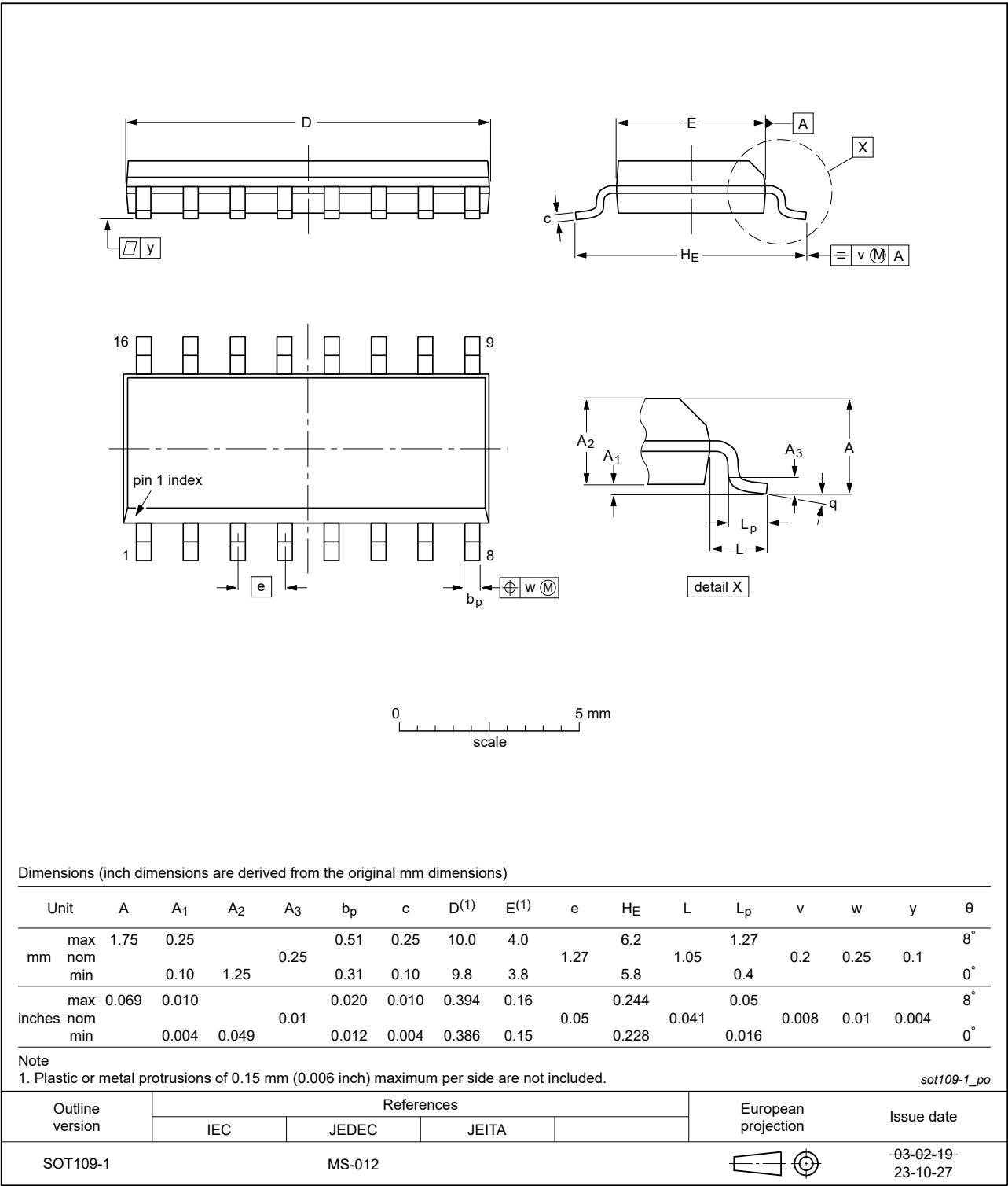


Fig. 10. Package outline SOT109-1 (SO16)

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

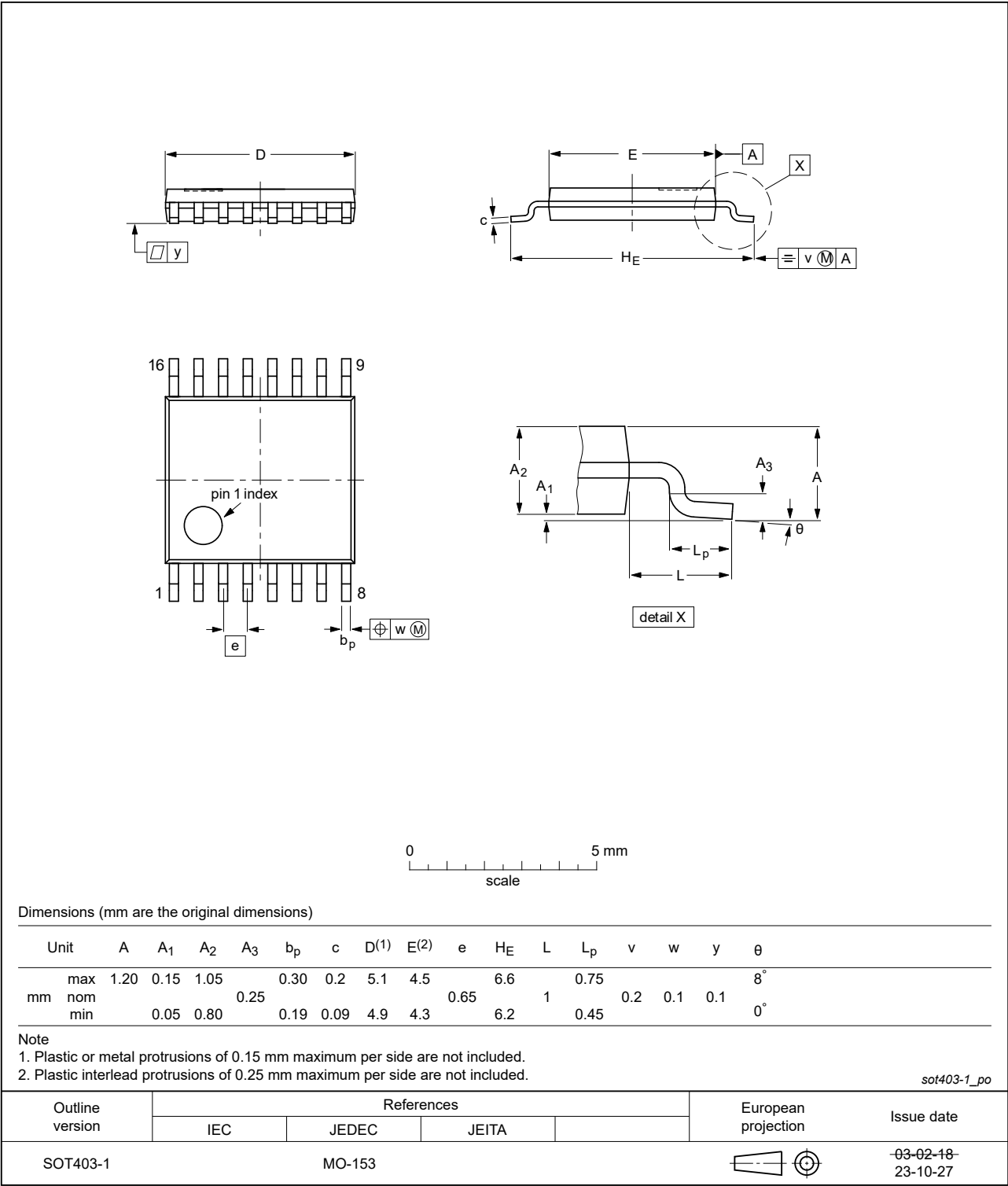


Fig. 11. Package outline SOT403-1 (TSSOP16)

12. Abbreviations

Table 10. Abbreviations

| Acronym | Description                             |
|---------|---|
| CDM     | Charged Device Model                    |
| CMOS    | Complementary Metal-Oxide Semiconductor |
| DUT     | Device Under Test                       |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| TTL     | Transistor-Transistor Logic             |

13. Revision history

Table 11. Revision history

| Document ID         | Release date  | Data sheet status     | Change notice | Supersedes          |
|---------------------|---|-----------------------|---------------|---------------------|
| 74HC_HCT251 v.7     | 20240314  | Product data sheet    | -             | 74HC_HCT251 v.6     |
| Modifications:      | <ul style="list-style-type: none"><li>• <a href="#">Fig. 10, Fig. 11</a>: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153.</li><li>• <a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li></ul>  |                       |               |                     |
| 74HC_HCT251 v.6     | 20210208  | Product data sheet    | -             | 74HC_HCT251 v.5     |
| Modifications:      | <ul style="list-style-type: none"><li>• <a href="#">Section 2</a> updated.</li><li>• Type numbers 74HC251DB and 74HCT251DB (SOT338-1 / SSOP16) removed.</li><li>• <a href="#">Table 7</a>: Conditions for C<sub>PD</sub> have changed for 74HCT251. (errata)</li></ul>  |                       |               |                     |
| 74HC_HCT251 v.5     | 20190715  | Product data sheet    | -             | 74HC_HCT251 v.4     |
| Modifications:      | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Table 4</a>: Derating values for P<sub>tot</sub> total power dissipation have changed.</li></ul> |                       |               |                     |
| 74HC_HCT251 v.4     | 20160201  | Product data sheet    | -             | 74HC_HCT251 v.3     |
| Modifications:      | <ul style="list-style-type: none"><li>• Type numbers 74HC251N and 74HCT251N (SOT38-4) removed.</li></ul>  |                       |               |                     |
| 74HC_HCT251 v.3     | 20130709  | Product data sheet    | -             | 74HC_HCT251_CNV v.2 |
| Modifications:      | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li></ul>  |                       |               |                     |
| 74HC_HCT251_CNV v.2 | 19970828  | Product specification | -             |                     |

## 14. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition  |
|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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