

# 74HC251-Q100; 74HCT251-Q100

8-input multiplexer; 3-state

Rev. 1 — 12 August 2013

Product data sheet

## 1. General description

The 74HC251-Q100; 74HCT251-Q100 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  $V_{CC}$ .

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  $+125\text{ }^{\circ}\text{C}$
- Input levels:
  - ◆ For 74HC251-Q100: CMOS level
  - ◆ For 74HCT251-Q100: TTL level
- Low-power dissipation
- Non-inverting data path
- Specified in compliance with JEDEC standard no. 7A
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- Multiple package options

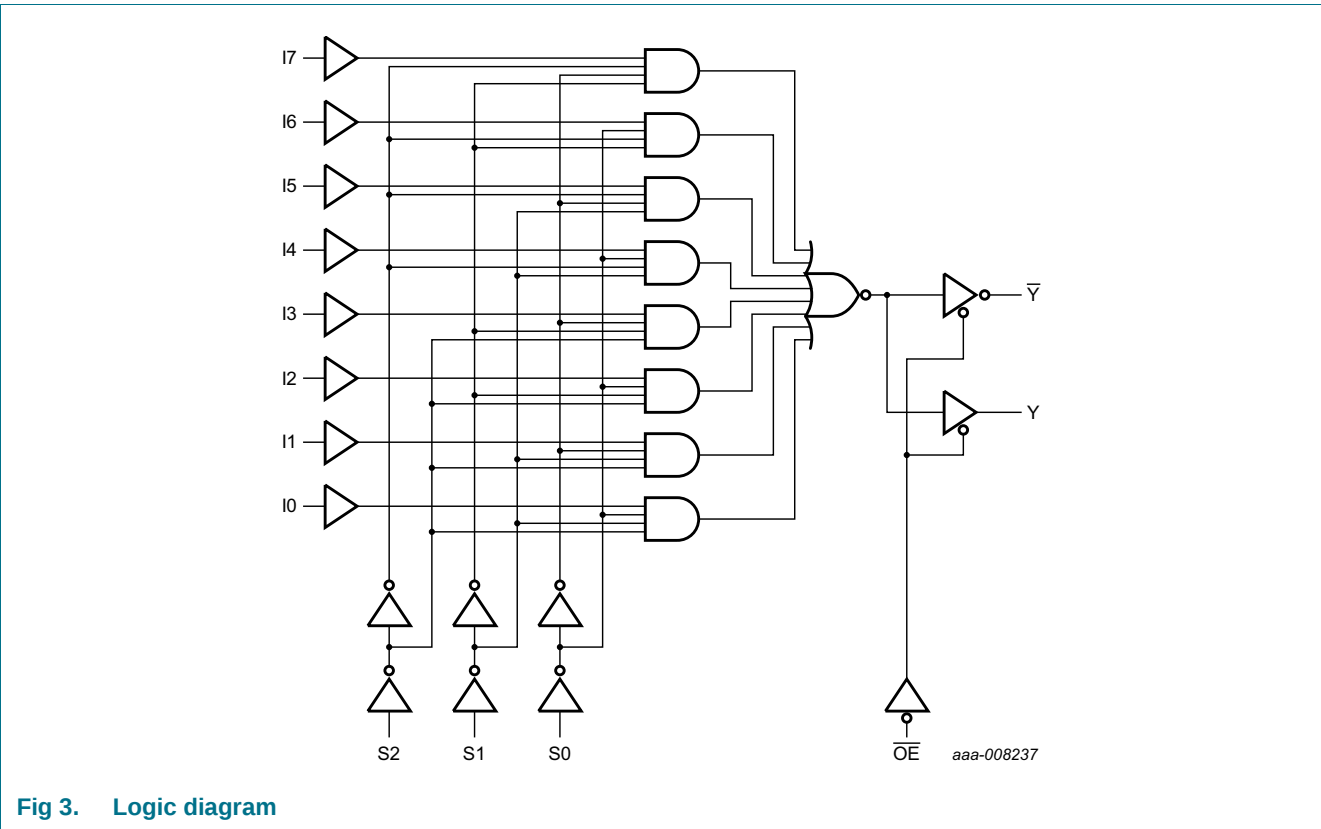
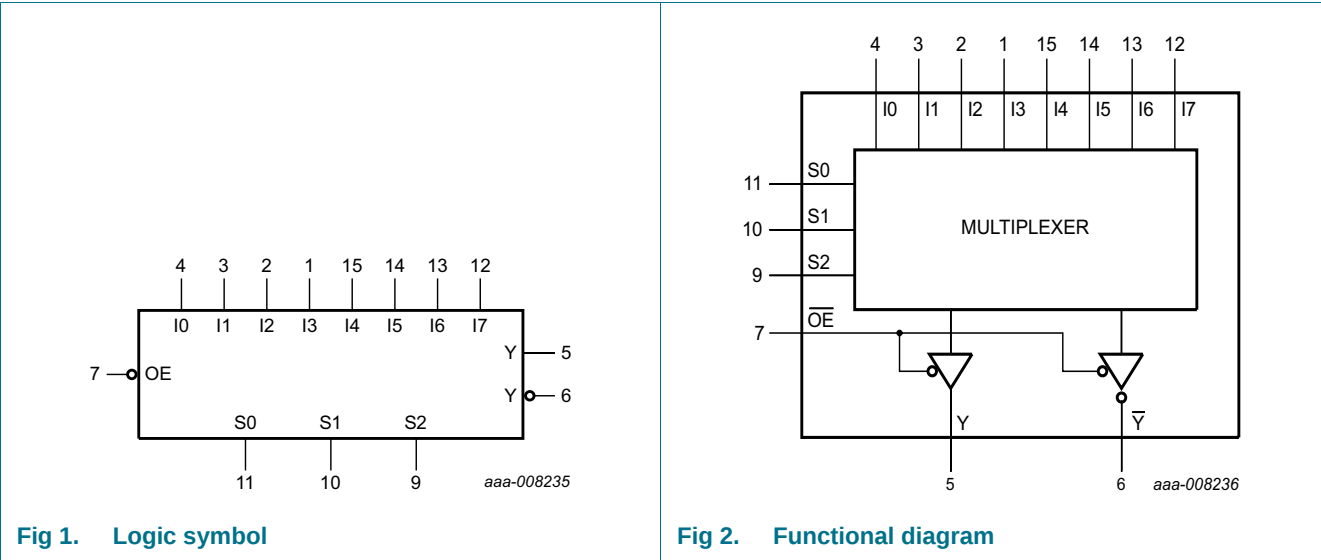
## 3. Ordering information

Table 1. Ordering information

| Type number                       | Package                                                         |         |                                                                        |          |
|-----------------------------------|-----------------------------------------------------------------|---------|------------------------------------------------------------------------|----------|
|                                   | Temperature range                                               | Name    | Description                                                            | Version  |
| 74HC251D-Q100<br>74HCT251D-Q100   | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO16    | plastic small outline package; 16 leads; body width 3.9 mm             | SOT109-1 |
| 74HC251PW-Q100<br>74HCT251PW-Q100 | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

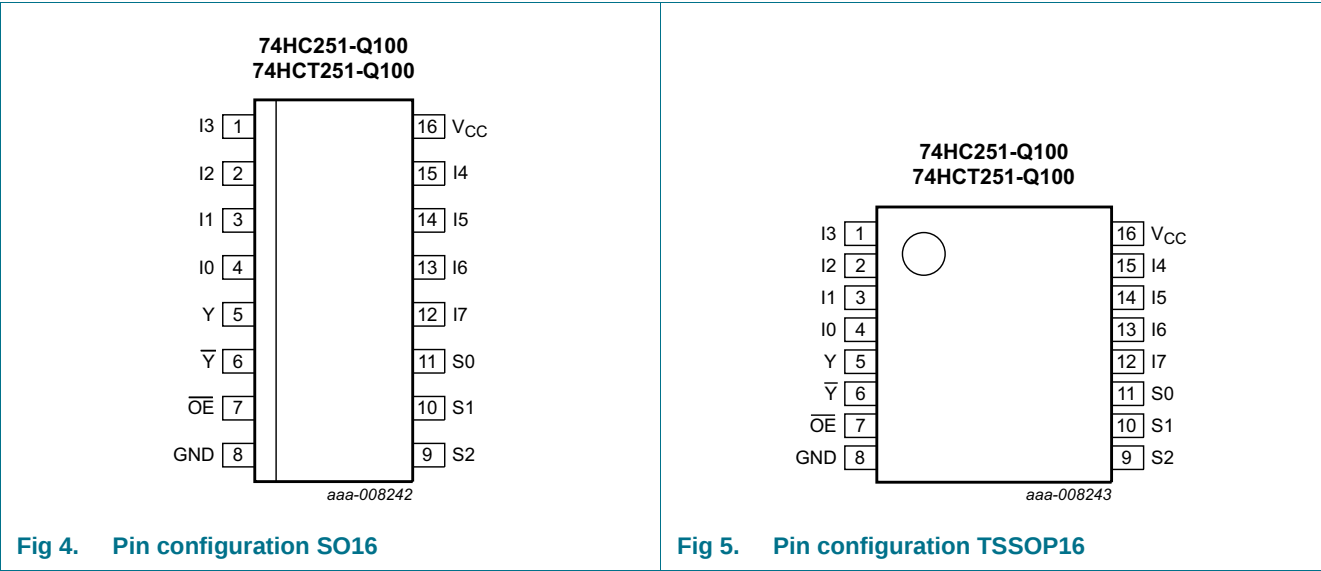


4. Functional diagram



5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

| Symbol          | Pin                        | Description                      |
|-----------------|----------------------------|----------------------------------|
| I0 to I7        | 4, 3, 2, 1, 15, 14, 13, 12 | data inputs                      |
| Y               | 5                          | multiplexer output               |
| $\overline{Y}$  | 6                          | complementary multiplexer output |
| $\overline{OE}$ | 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<sup>[1]</sup>

| Input                  |    |    |    |    |    |    |    |    |    |    |    | Output                |   |
|------------------------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|---|
| $\overline{\text{OE}}$ | S2 | S1 | S0 | I0 | I1 | I2 | I3 | I4 | I5 | I6 | I7 | $\overline{\text{Y}}$ | 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 |

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

## 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 |
|-----------|-------------------------|--------------------------------------------------------|-----------------------------------------|----------|------|
| $V_{CC}$  | supply voltage          |                                                        | -0.5                                    | +7       | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ | -                                       | $\pm 20$ | mA   |
| $I_{OK}$  | output clamping current | $V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$ | -                                       | $\pm 20$ | mA   |
| $I_O$     | output current          | $V_O = -0.5\text{ V}$ to $(V_{CC} + 0.5\text{ V})$     | -                                       | $\pm 25$ | mA   |
| $I_{CC}$  | supply current          |                                                        | -                                       | +50      | mA   |
| $I_{GND}$ | ground current          |                                                        | -50                                     | -        | mA   |
| $T_{stg}$ | storage temperature     |                                                        | -65                                     | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$          | <a href="#">[1]</a> <a href="#">[2]</a> | 500      | mW   |

[1] For SO16 package:  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

[2] For TSSOP16 package:  $P_{tot}$  derates linearly with 5.5 mW/K above 60 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V)

| Symbol              | Parameter                           | Conditions              | 74HC251-Q100 |      |          | 74HCT251-Q100 |      |          | Unit |
|---------------------|-------------------------------------|-------------------------|--------------|------|----------|---------------|------|----------|------|
|                     |                                     |                         | Min          | Typ  | Max      | Min           | Typ  | Max      |      |
| $V_{CC}$            | supply voltage                      |                         | 2.0          | 5.0  | 6.0      | 4.5           | 5.0  | 5.5      | V    |
| $V_I$               | input voltage                       |                         | 0            | -    | $V_{CC}$ | 0             | -    | $V_{CC}$ | V    |
| $V_O$               | output voltage                      |                         | 0            | -    | $V_{CC}$ | 0             | -    | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                         | -40          | +25  | +125     | -40           | +25  | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 2.0\text{ V}$ | -            | -    | 625      | -             | -    | -        | ns/V |
|                     |                                     | $V_{CC} = 4.5\text{ V}$ | -            | 1.67 | 139      | -             | 1.67 | 139      | ns/V |
|                     |                                     | $V_{CC} = 6.0\text{ V}$ | -            | -    | 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                                                                                                             | T <sub>amb</sub> = 25 °C |      |      | T <sub>amb</sub> = –40 °C to +85 °C |      | T <sub>amb</sub> = –40 °C to +125 °C |       | Unit |
|-----------------|---------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|-------------------------------------|------|--------------------------------------|-------|------|
|                 |                           |                                                                                                                        | Min                      | Typ  | Max  | Min                                 | Max  | Min                                  | Max   |      |
| 74HC251-Q100    |                           |                                                                                                                        |                          |      |      |                                     |      |                                      |       |      |
| 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    |
| 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   |

**Table 6.** Static characteristics ...continued

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

| Symbol           | Parameter                 | Conditions                                                                                                                                                                                         | T <sub>amb</sub> = 25 °C |      |      | T <sub>amb</sub> = –40 °C to +85 °C |      | T <sub>amb</sub> = –40 °C to +125 °C |      | Unit |
|------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------|------|-------------------------------------|------|--------------------------------------|------|------|
|                  |                           |                                                                                                                                                                                                    | Min                      | Typ  | Max  | Min                                 | Max  | Min                                  | Max  |      |
| 74HCT251-Q100    |                           |                                                                                                                                                                                                    |                          |      |      |                                     |      |                                      |      |      |
| 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>CC</sub> = 5.5 V; V <sub>O</sub> = V <sub>CC</sub> or GND per input pin; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A | -                        | -    | ±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; In inputs                                                                                                                                                                           | -                        | 100  | 360  | -                                   | 450  | -                                    | 490  | µA   |
|                  |                           | per input pin; $\overline{\text{OE}}$ input                                                                                                                                                        | -                        | 150  | 540  | -                                   | 675  | -                                    | 735  | µA   |
|                  |                           | per input pin; Sn 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);  $C_L = 50$  pF unless otherwise specified; for test circuit, see [Figure 9](#).

| Symbol                                        | Parameter                     | Conditions                                                                                | T <sub>amb</sub> = 25 °C |     |     | T <sub>amb</sub> = −40 °C<br>to +85 °C |     | T <sub>amb</sub> = −40 °C<br>to +125 °C |     | Unit |
|-----------------------------------------------|-------------------------------|-------------------------------------------------------------------------------------------|--------------------------|-----|-----|----------------------------------------|-----|-----------------------------------------|-----|------|
|                                               |                               |                                                                                           | Min                      | Typ | Max | Min                                    | Max | Min                                     | Max |      |
| 74HC251-Q100                                  |                               |                                                                                           |                          |     |     |                                        |     |                                         |     |      |
| t <sub>pd</sub>                               | propagation delay             | In to Y; see <a href="#">Figure 6</a> <sup>[1]</sup>                                      |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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 <a href="#">Figure 6</a> <sup>[1]</sup>                             |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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 <a href="#">Figure 7</a> <sup>[1]</sup>                                      |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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 <a href="#">Figure 7</a> <sup>[1]</sup>                             |                          |     |     |                                        |     |                                         |     |      |
| 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 <a href="#">Figure 7</a> <sup>[2]</sup>             |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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 <a href="#">Figure 7</a> <sup>[3]</sup>             |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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 <a href="#">Figure 6</a> <sup>[4]</sup>                                |                          |     |     |                                        |     |                                         |     |      |
|                                               |                               | 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> <sup>[5]</sup> | -                        | 44  | -   | -                                      | -   | -                                       | pF  |      |

**Table 7. Dynamic characteristics ...continued**

Voltages are referenced to GND (ground = 0 V);  $C_L = 50$  pF unless otherwise specified; for test circuit, see [Figure 9](#).

| Symbol           | Parameter                     | Conditions                                                                                        | T <sub>amb</sub> = 25 °C |     |     | T <sub>amb</sub> = −40 °C<br>to +85 °C |     | T <sub>amb</sub> = −40 °C<br>to +125 °C |     | Unit |
|------------------|-------------------------------|---------------------------------------------------------------------------------------------------|--------------------------|-----|-----|----------------------------------------|-----|-----------------------------------------|-----|------|
|                  |                               |                                                                                                   | Min                      | Typ | Max | Min                                    | Max | Min                                     | Max |      |
| 74HCT251-Q100    |                               |                                                                                                   |                          |     |     |                                        |     |                                         |     |      |
| t <sub>pd</sub>  | propagation delay             | In to Y; see <a href="#">Figure 6</a> <a href="#">[1]</a>                                         |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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 $\overline{Y}$ ; see <a href="#">Figure 6</a> <a href="#">[1]</a>                           |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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="#">Figure 7</a> <a href="#">[1]</a>                                         |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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 $\overline{Y}$ ; see <a href="#">Figure 7</a> <a href="#">[1]</a>                           |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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, $\overline{Y}$ ; see <a href="#">Figure 7</a> <a href="#">[2]</a>           |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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, $\overline{Y}$ ; see <a href="#">Figure 7</a> <a href="#">[3]</a>           |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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, $\overline{Y}$ ; see <a href="#">Figure 6</a> <a href="#">[4]</a>                              |                          |     |     |                                        |     |                                         |     |      |
|                  |                               | 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;<br>V <sub>I</sub> = GND to V <sub>CC</sub> <a href="#">[5]</a> | -                        | 46  | -   | -                                      | -   | -                                       | -   | pF   |

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

[2]  $t_{en}$  is the same as  $t_{PZH}$  and  $t_{PZL}$ .

[3]  $t_{dis}$  is the same as  $t_{PLZ}$  and  $t_{PHZ}$ .

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

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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

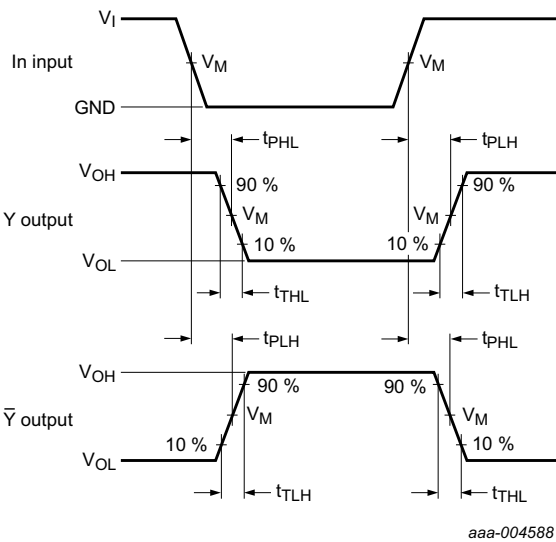
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

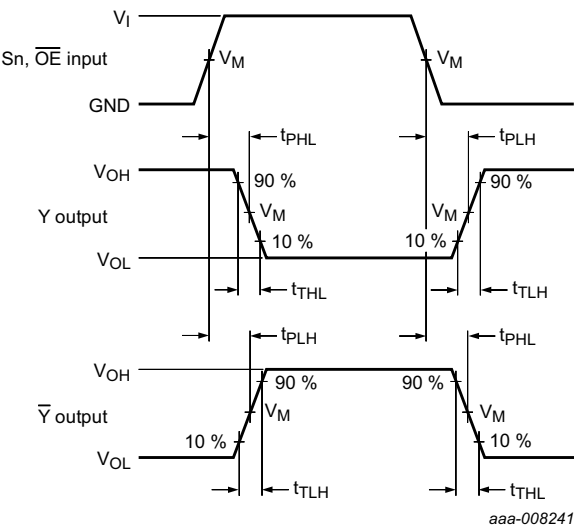
$N$  = number of inputs switching;

$\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

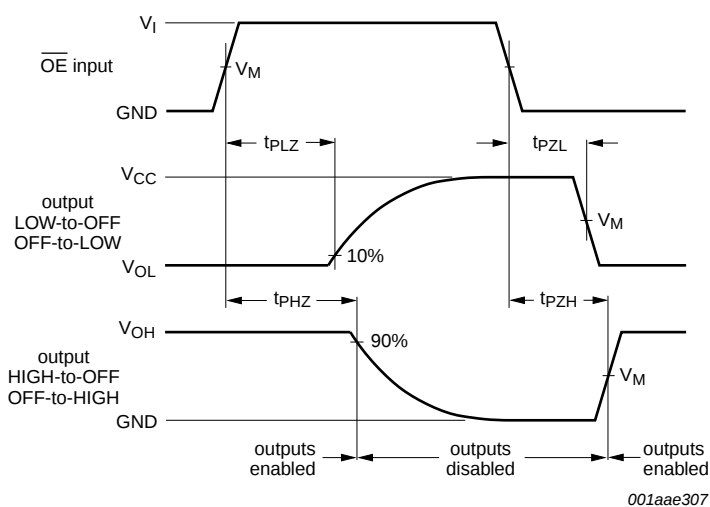
11. Waveforms



Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.  
**Fig 6. Propagation delay input (In) to output (Y,  $\bar{Y}$ ) and the output (Y,  $\bar{Y}$ ) transition time**



Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical voltage output levels that occur with the output load.  
**Fig 7. Propagation delay input ( $S_n, \overline{OE}$ ) to output (Y,  $\bar{Y}$ )**



Measurement points are given in [Table 8](#).

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

**Fig 8. Enable and disable times**

### Table 8. Measurement points

| Type          | Input       | Output      |
|---------------|-------------|-------------|
|               | $V_M$       | $V_M$       |
| 74HC251-Q100  | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT251-Q100 | 1.3 V       | 1.3 V       |

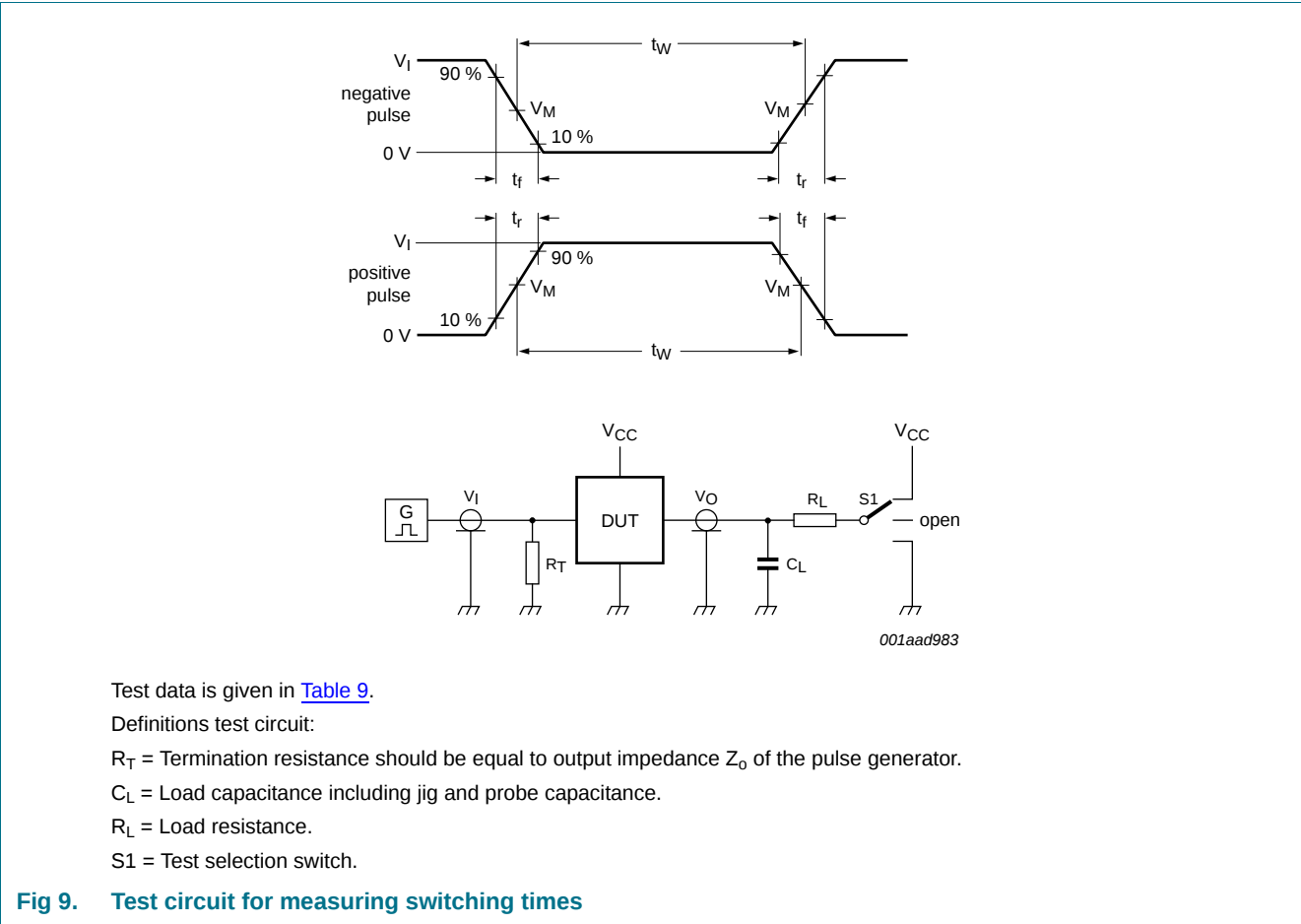


Table 9. Test data

| 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-Q100  | $V_{CC}$ | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |
| 74HCT251-Q100 | 3 V      | 6 ns       | 15 pF, 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm SOT109-1

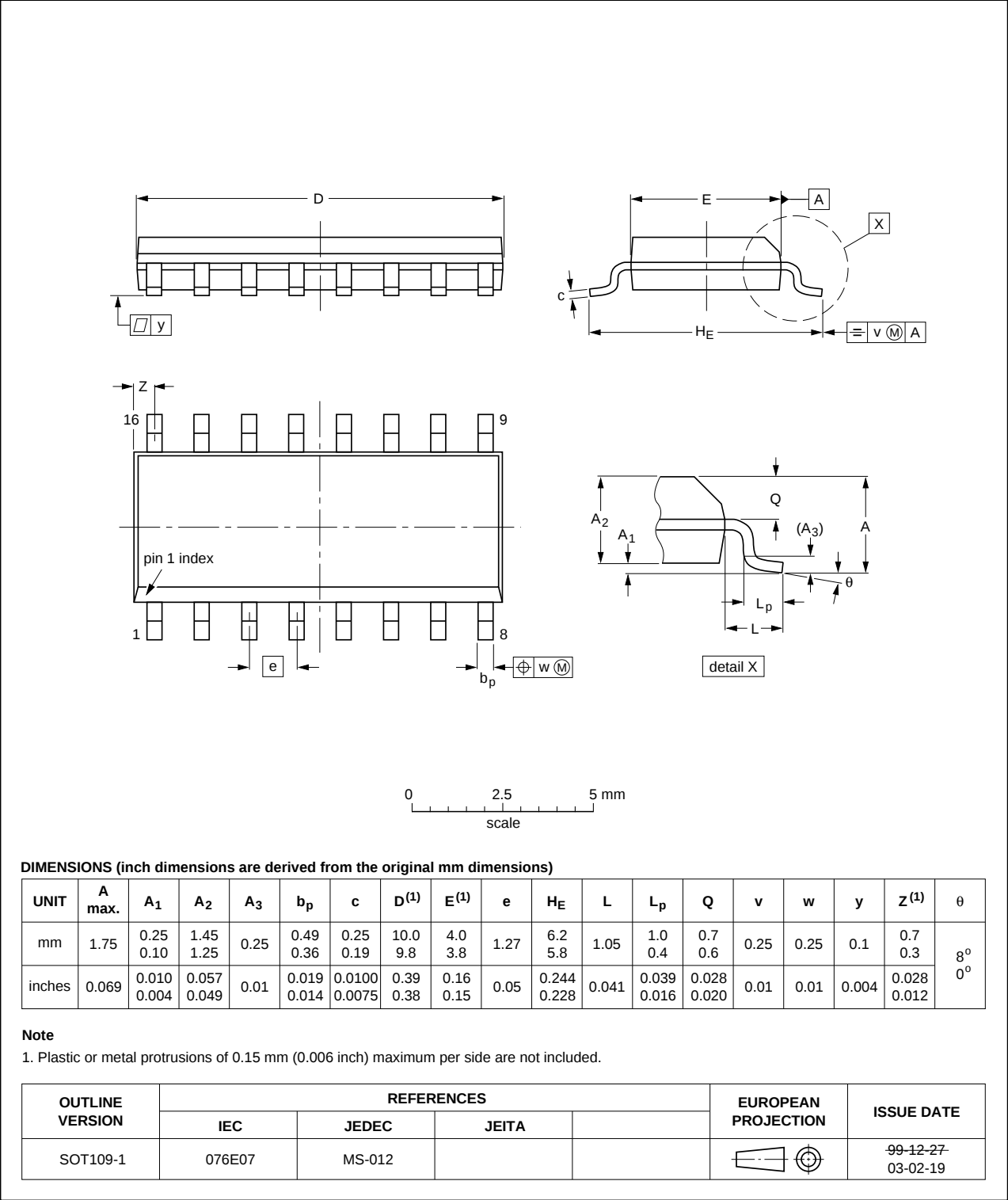


Fig 10. Package outline SOT109-1 (SO16)

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

SOT403-1

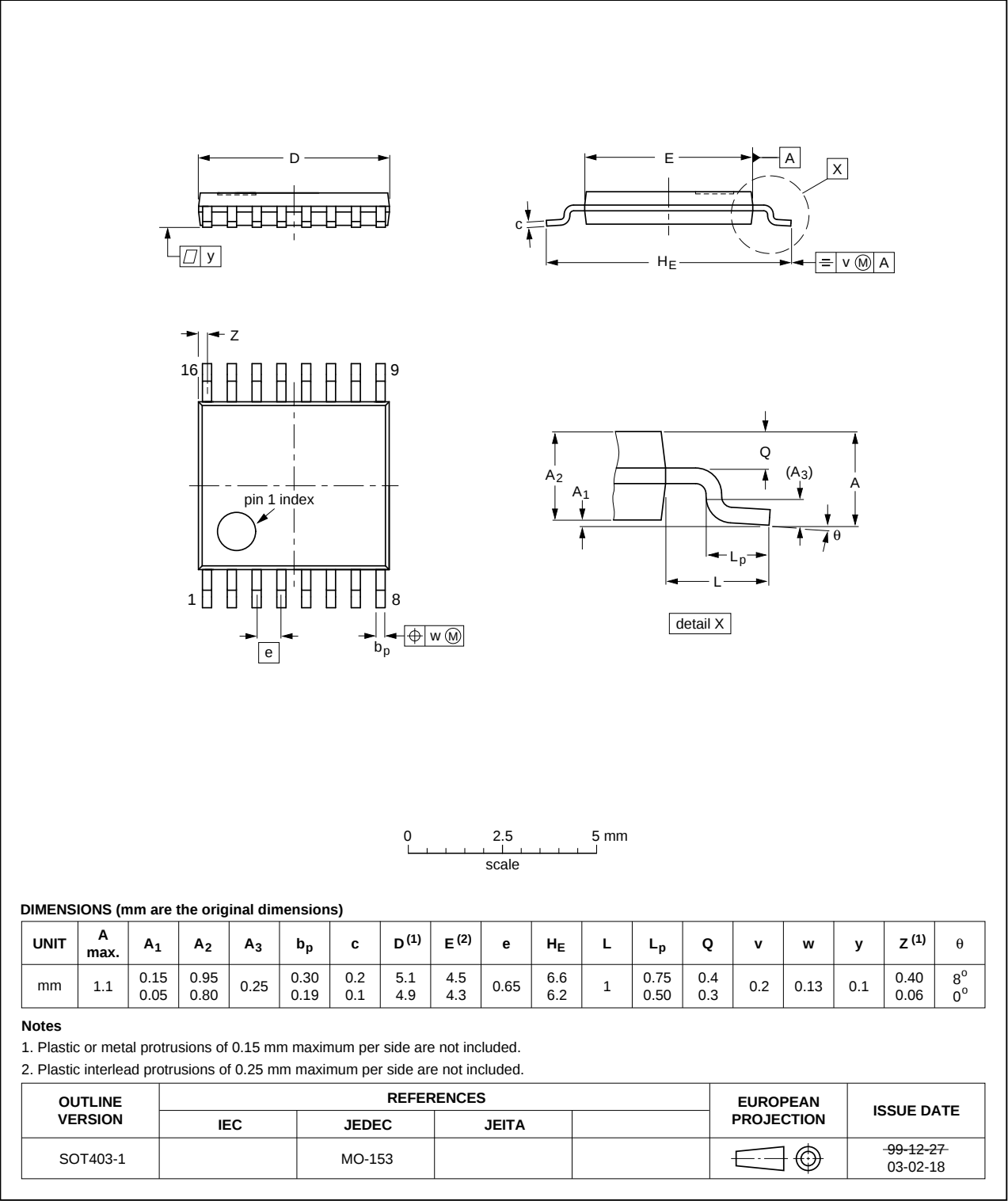


Fig 11. Package outline SOT403-1 (TSSOP16)

## 13. Abbreviations

Table 10. Abbreviations

| Acronym | Description                             |
|---------|-----------------------------------------|
| CMOS    | Complementary Metal Oxide Semiconductor |
| DUT     | Device Under Test                       |
| ESD     | ElectroStatic Discharge                 |
| HBM     | Human Body Model                        |
| MM      | Machine Model                           |
| MIL     | Military                                |
| TTL     | Transistor-Transistor Logic             |
| MIL     | Military                                |

## 14. Revision history

Table 11. Revision history

| Document ID          | Release date | Data sheet status  | Change notice | Supersedes |
|----------------------|--------------|--------------------|---------------|------------|
| 74HC_HCT251_Q100 v.1 | 20130812     | 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".

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