

# 74HC257-Q100; 74HCT257-Q100

Quad 2-input multiplexer; 3-state

Rev. 1 — 27 July 2015

Product data sheet

## 1. General description

The 74HC257-Q100; 74HCT257-Q100 is a quad 2-input multiplexer with 3-state outputs. Inputs include clamp diodes. It enables 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

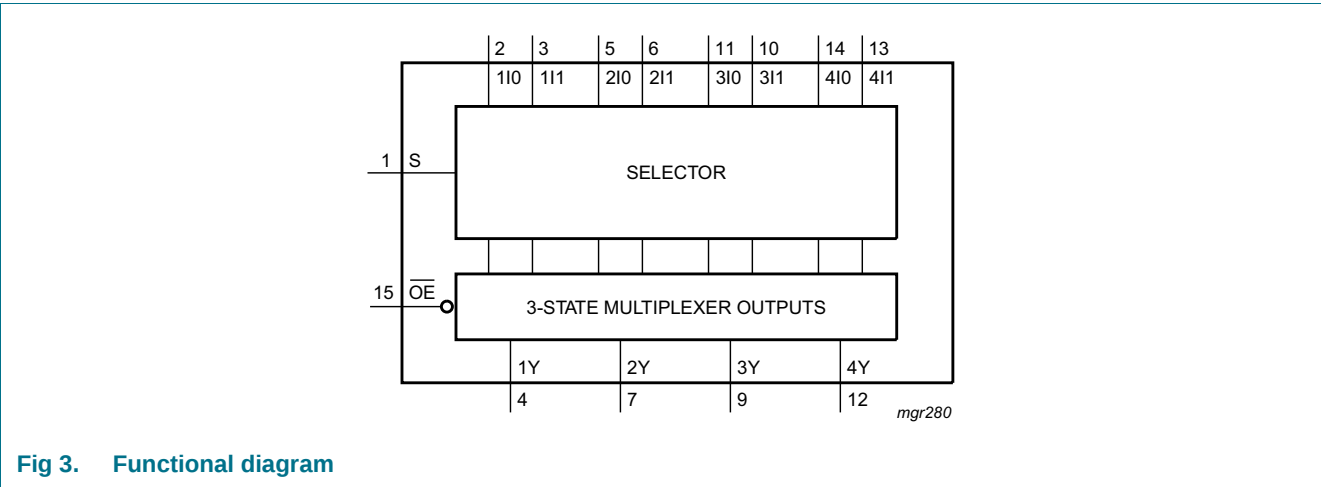
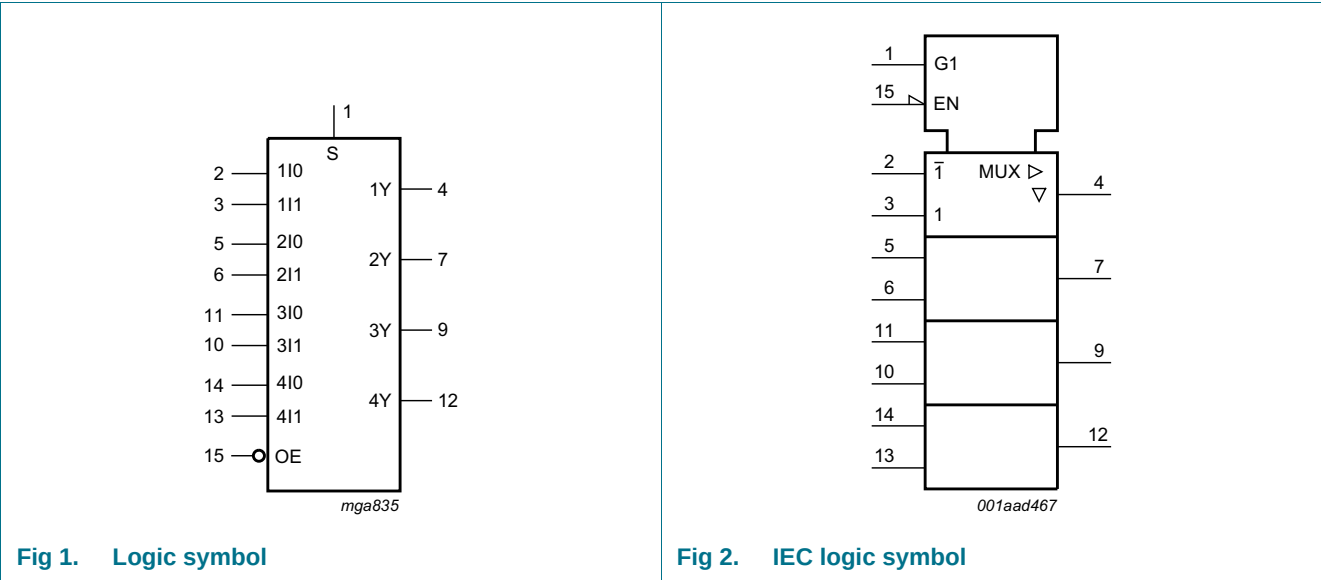
- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - ◆ Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- Non-inverting data path
- 3-state outputs interface directly with system bus
- Complies with JEDEC standard no. 7A
- Input levels:
  - ◆ For 74HC257: CMOS level
  - ◆ For 74HCT257: TTL level
- ESD protection:
  - ◆ MIL-STD-883, method 3015 exceeds 2000 V
  - ◆ HBM JESD22-A114F exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

## 3. Ordering information

Table 1. Ordering information

| Type number     | Package                                                         |         |                                                                           |          |
|-----------------|-----------------------------------------------------------------|---------|---------------------------------------------------------------------------|----------|
|                 | Temperature range                                               | Name    | Description                                                               | Version  |
| 74HC257D-Q100   | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO16    | plastic small outline package; 16 leads;<br>body width 3.9 mm             | SOT109-1 |
| 74HCT257D-Q100  |                                                                 |         |                                                                           |          |
| 74HC257PW-Q100  | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP16 | plastic thin shrink small outline package; 16 leads;<br>body width 4.4 mm | SOT403-1 |
| 74HCT257PW-Q100 |                                                                 |         |                                                                           |          |

4. Functional diagram



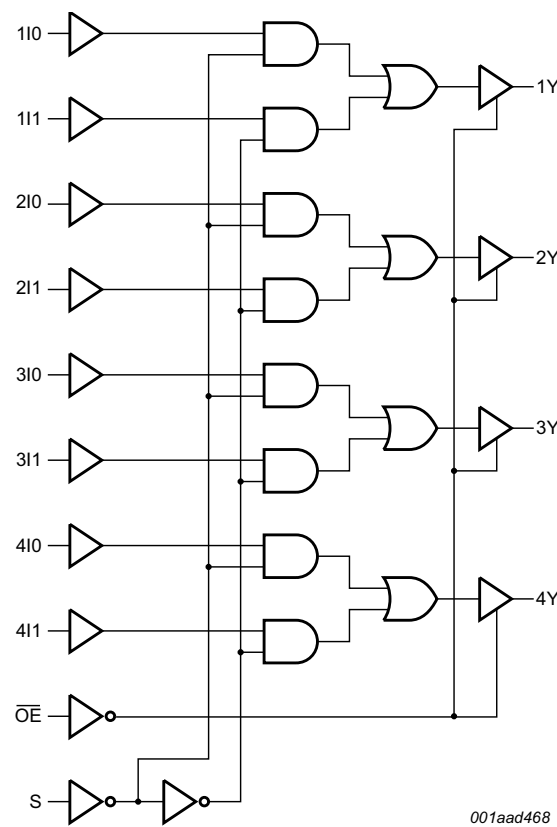


Fig 4. Logic diagram

5. Pinning information

5.1 Pinning

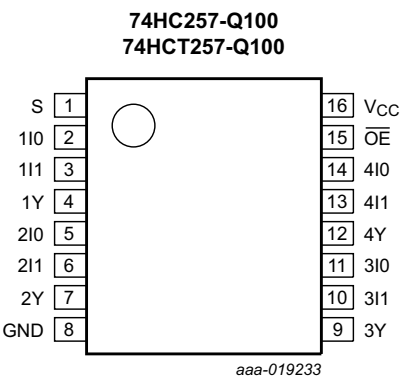


Fig 5. Pin configuration SO16 and TSSOP16

## 5.2 Pin description

Table 2. Pin description

| Symbol                 | Pin          | Description                              |
|------------------------|--------------|------------------------------------------|
| S                      | 1            | common data select input                 |
| 1I0 to 4I0             | 2, 5, 11, 14 | data input from source 0                 |
| 1I1 to 4I1             | 3, 6, 10, 13 | data input from source 1                 |
| 1Y to 4Y               | 4, 7, 9, 12  | 3-state multiplexer output               |
| GND                    | 8            | ground (0 V)                             |
| $\overline{\text{OE}}$ | 15           | 3-state output enable input (active LOW) |
| V <sub>CC</sub>        | 16           | supply voltage                           |

## 6. Functional description

### 6.1 Function table

Table 3. Function table<sup>[1]</sup>

| Control                |   | Input |     | Output |
|------------------------|---|-------|-----|--------|
| $\overline{\text{OE}}$ | S | nI0   | nI1 | nY     |
| H                      | X | X     | X   | Z      |
| L                      | H | X     | L   | L      |
| L                      | H | X     | H   | H      |
| L                      | L | L     | X   | L      |
| L                      | L | H     | X   | 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 <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 <sup>[1]</sup> | -    | ±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 <sup>[1]</sup> | -    | ±20  | mA   |
| I <sub>O</sub>   | output current          | V <sub>O</sub> = −0.5 V to V <sub>CC</sub> + 0.5 V                                 | -    | ±35  | mA   |
| I <sub>CC</sub>  | supply current          |                                                                                    | -    | +70  | mA   |
| I <sub>GND</sub> | ground current          |                                                                                    | −70  | -    | mA   |
| T <sub>stg</sub> | storage temperature     |                                                                                    | −65  | +150 | °C   |
| P <sub>tot</sub> | total power dissipation | SO16 package <sup>[2]</sup>                                                        | -    | 500  | mW   |
|                  |                         | TSSOP16 package <sup>[3]</sup>                                                     | -    | 500  | mW   |

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

[2] For SO16 packages: above 70 °C, P<sub>tot</sub> derates linearly with 8 mW/K.

[3] For TSSOP16 packages: above 60 °C, P<sub>tot</sub> derates linearly with 5.5 mW/K.

## 8. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol               | Parameter                            | Conditions              | Min | Typ  | Max      | Unit |
|----------------------|--------------------------------------|-------------------------|-----|------|----------|------|
| <b>74HC257-Q100</b>  |                                      |                         |     |      |          |      |
| $V_{CC}$             | supply voltage                       |                         | 2.0 | 5.0  | 6.0      | V    |
| $V_I$                | input voltage                        |                         | 0   | -    | $V_{CC}$ | V    |
| $V_O$                | output voltage                       |                         | 0   | -    | $V_{CC}$ | V    |
| $\Delta t/\Delta V$  | input transition rise and fall rates | $V_{CC} = 2.0\text{ V}$ | -   | -    | 625      | ns   |
|                      |                                      | $V_{CC} = 4.5\text{ V}$ | -   | 1.67 | 139      | ns   |
|                      |                                      | $V_{CC} = 6.0\text{ V}$ | -   | -    | 83       | ns   |
| $T_{amb}$            | ambient temperature                  |                         | -40 | -    | +125     | °C   |
| <b>74HCT257-Q100</b> |                                      |                         |     |      |          |      |
| $V_{CC}$             | supply voltage                       |                         | 4.5 | 5.0  | 5.5      | V    |
| $V_I$                | input voltage                        |                         | 0   | -    | $V_{CC}$ | V    |
| $V_O$                | output voltage                       |                         | 0   | -    | $V_{CC}$ | V    |
| $\Delta t/\Delta V$  | input transition rise and fall rates | $V_{CC} = 4.5\text{ V}$ | -   | 1.67 | 139      | ns   |
| $T_{amb}$            | ambient temperature                  |                         | -40 | -    | +125     | °C   |

## 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  |      |
| 74HC257-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> = −6.0 mA; V <sub>CC</sub> = 4.5 V   | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
|                 |                           | I <sub>O</sub> = −7.8 mA; V <sub>CC</sub> = 6.0 V   | 5.48  | 5.81 | -    | 5.34             | -    | 5.2               | -    | V    |

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

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   |      |
| 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> = 6.0 mA; V <sub>CC</sub> = 4.5 V                                                                                                                                                   | -     | 0.15 | 0.26 | -                | 0.33 | -                 | 0.4   | V    |
|                      |                           | I <sub>O</sub> = 7.8 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   |
| <b>74HCT257-Q100</b> |                           |                                                                                                                                                                                                    |       |      |      |                  |      |                   |       |      |
| 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> = –6 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  | -                | 0.33 | -                 | 0.4   | V    |
|                      |                           | I <sub>O</sub> = 6.0 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; nI0, nI1 inputs                                                                                                                                                                     | -     | 40   | 144  | -                | 180  | -                 | 196   | µA   |
|                      |                           | per input pin; $\overline{\text{OE}}$ input                                                                                                                                                        | -     | 135  | 486  | -                | 608  | -                 | 662   | µA   |
|                      |                           | per input pin; S input                                                                                                                                                                             | -     | 70   | 252  | -                | 315  | -                 | 343   | 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); For test circuit, see [Figure 8](#).

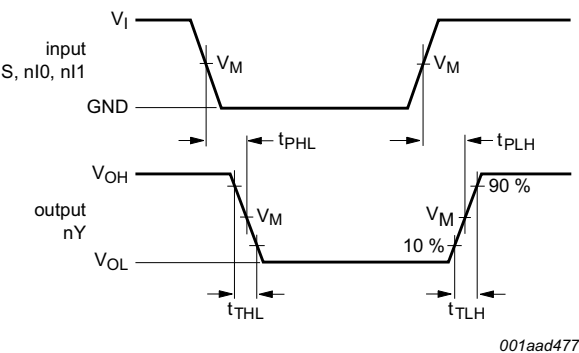
| Symbol           | Parameter                     | Conditions                                                                                  | 25 °C |     | −40 °C to +85 °C | −40 °C to +125 °C | Unit |
|------------------|-------------------------------|---------------------------------------------------------------------------------------------|-------|-----|------------------|-------------------|------|
|                  |                               |                                                                                             | Typ   | Max | Max              | Max               |      |
| 74HC257-Q100     |                               |                                                                                             |       |     |                  |                   |      |
| t <sub>pd</sub>  | propagation delay             | nl0 to nY or nl1 to nY; see <a href="#">Figure 6</a> <sup>[1]</sup>                         |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 2.0 V                                                                     | 36    | 110 | 140              | 165               | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 13    | 22  | 28               | 33                | ns   |
|                  |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                             | 11    | -   | -                | -                 | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                                                     | 10    | 19  | 24               | 28                | ns   |
|                  |                               | S to nY; see <a href="#">Figure 6</a>                                                       |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 2.0 V                                                                     | 47    | 150 | 190              | 225               | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 17    | 30  | 38               | 45                | ns   |
|                  |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                             | 14    | -   | -                | -                 | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                                                     | 14    | 26  | 33               | 38                | ns   |
| t <sub>en</sub>  | enable time                   | $\overline{OE}$ to nY; see <a href="#">Figure 7</a> <sup>[2]</sup>                          |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 2.0 V                                                                     | 33    | 150 | 190              | 225               | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 12    | 30  | 38               | 45                | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                                                     | 10    | 26  | 33               | 38                | ns   |
| t <sub>dis</sub> | disable time                  | $\overline{OE}$ to nY; see <a href="#">Figure 7</a> <sup>[3]</sup>                          |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 2.0 V                                                                     | 41    | 150 | 190              | 225               | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 15    | 30  | 38               | 45                | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                                                     | 12    | 26  | 33               | 38                | ns   |
| t <sub>t</sub>   | transition time               | see <a href="#">Figure 6</a> <sup>[4]</sup>                                                 |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 2.0 V                                                                     | 14    | 60  | 75               | 90                | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 5     | 12  | 15               | 18                | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                                                     | 4     | 10  | 13               | 15                | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | per multiplexer; V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[5]</sup>                     | 45    | -   | -                | -                 | pF   |
| 74HCT257-Q100    |                               |                                                                                             |       |     |                  |                   |      |
| t <sub>pd</sub>  | propagation delay             | nl0 to nY or nl1 to nY; see <a href="#">Figure 6</a> <sup>[1]</sup>                         |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 16    | 30  | 38               | 45                | ns   |
|                  |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                             | 13    | -   | -                | -                 | ns   |
|                  |                               | S to nY; see <a href="#">Figure 6</a>                                                       |       |     |                  |                   |      |
|                  |                               | V <sub>CC</sub> = 4.5 V                                                                     | 20    | 35  | 44               | 53                | ns   |
|                  |                               | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                                             | 17    | -   | -                | -                 | ns   |
| t <sub>en</sub>  | enable time                   | $\overline{OE}$ to nY; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a> <sup>[2]</sup> | 15    | 30  | 38               | 45                | ns   |
| t <sub>dis</sub> | disable time                  | $\overline{OE}$ to nY; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a> <sup>[3]</sup> | 16    | 30  | 38               | 45                | ns   |
| t <sub>t</sub>   | transition time               | V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a> <sup>[4]</sup>                        | 5     | 12  | 15               | 18                | ns   |

Table 7. Dynamic characteristics ...continued  
Voltages are referenced to GND (ground = 0 V); For test circuit, see Figure 8.

| Symbol          | Parameter                     | Conditions                                                           | 25 °C |     | -40 °C to +85 °C | -40 °C to +125 °C | Unit |
|-----------------|-------------------------------|----------------------------------------------------------------------|-------|-----|------------------|-------------------|------|
|                 |                               |                                                                      | Typ   | Max | Max              | Max               |      |
| C <sub>PD</sub> | power dissipation capacitance | per multiplexer; V <sub>I</sub> = GND to V <sub>CC</sub> – 1.5 V [5] | 45    | -   | -                | -                 | pF   |

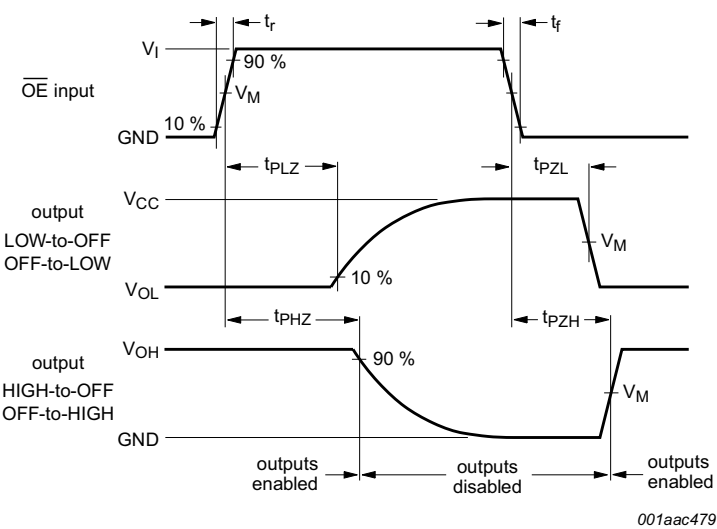
- [1] t<sub>pd</sub> is the same as t<sub>PHL</sub>, t<sub>PLH</sub>.  
[2] t<sub>en</sub> is the same as t<sub>PZH</sub>, t<sub>PZL</sub>.  
[3] t<sub>dis</sub> is the same as t<sub>PHZ</sub>, t<sub>PLZ</sub>.  
[4] t<sub>i</sub> is the same as t<sub>THL</sub>, t<sub>TLH</sub>.  
[5] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
P<sub>D</sub> = C<sub>PD</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>i</sub> × N + Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) 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;  
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of outputs.

11. Waveforms



Measurement points are given in Table 8.  
VOL and VOH are typical voltage output levels that occur with the output load.

Fig 6. Propagation delays input (S, nI0, nI1) to output (nY) and output (nY) transition times



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. 3-state output enable and disable times

Table 8. Measurement points

| Type          | Input       | Output      |
|---------------|-------------|-------------|
|               | $V_M$       | $V_M$       |
| 74HC257-Q100  | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 74HCT257-Q100 | 1.3 V       | 1.3 V       |

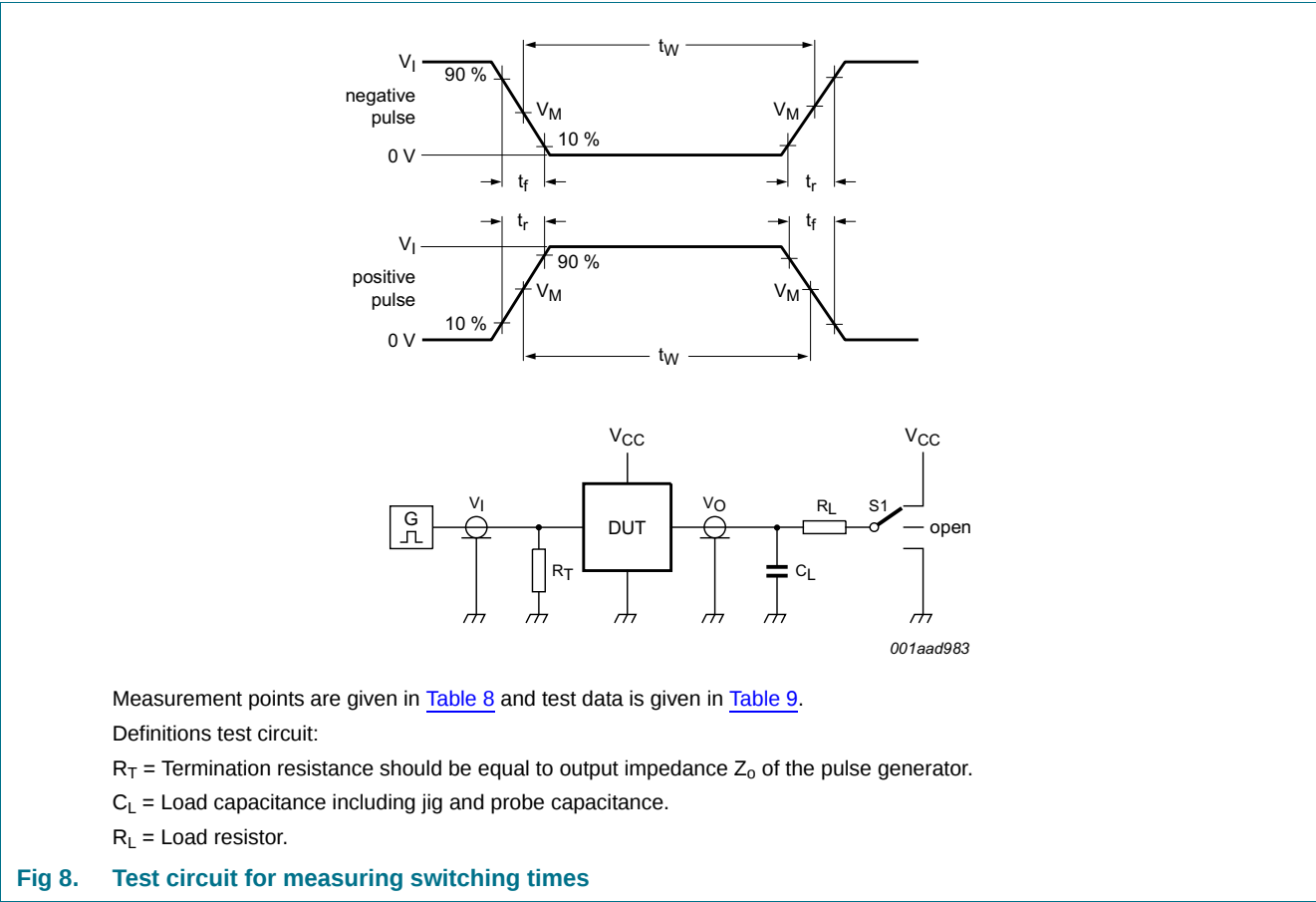


Table 9. Test data

| Type          | Input    |            | Load  |              | Switch position    |                    |                    |
|---------------|----------|------------|-------|--------------|--------------------|--------------------|--------------------|
|               | $V_I$    | $t_r, t_f$ | $C_L$ | $R_L$        | $t_{PHL}, t_{PLH}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| 74HC257-Q100  | $V_{CC}$ | 6 ns       | 50 pF | 1 k $\Omega$ | open               | GND                | $V_{CC}$           |
| 74HCT257-Q100 | 3 V      | 6 ns       | 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

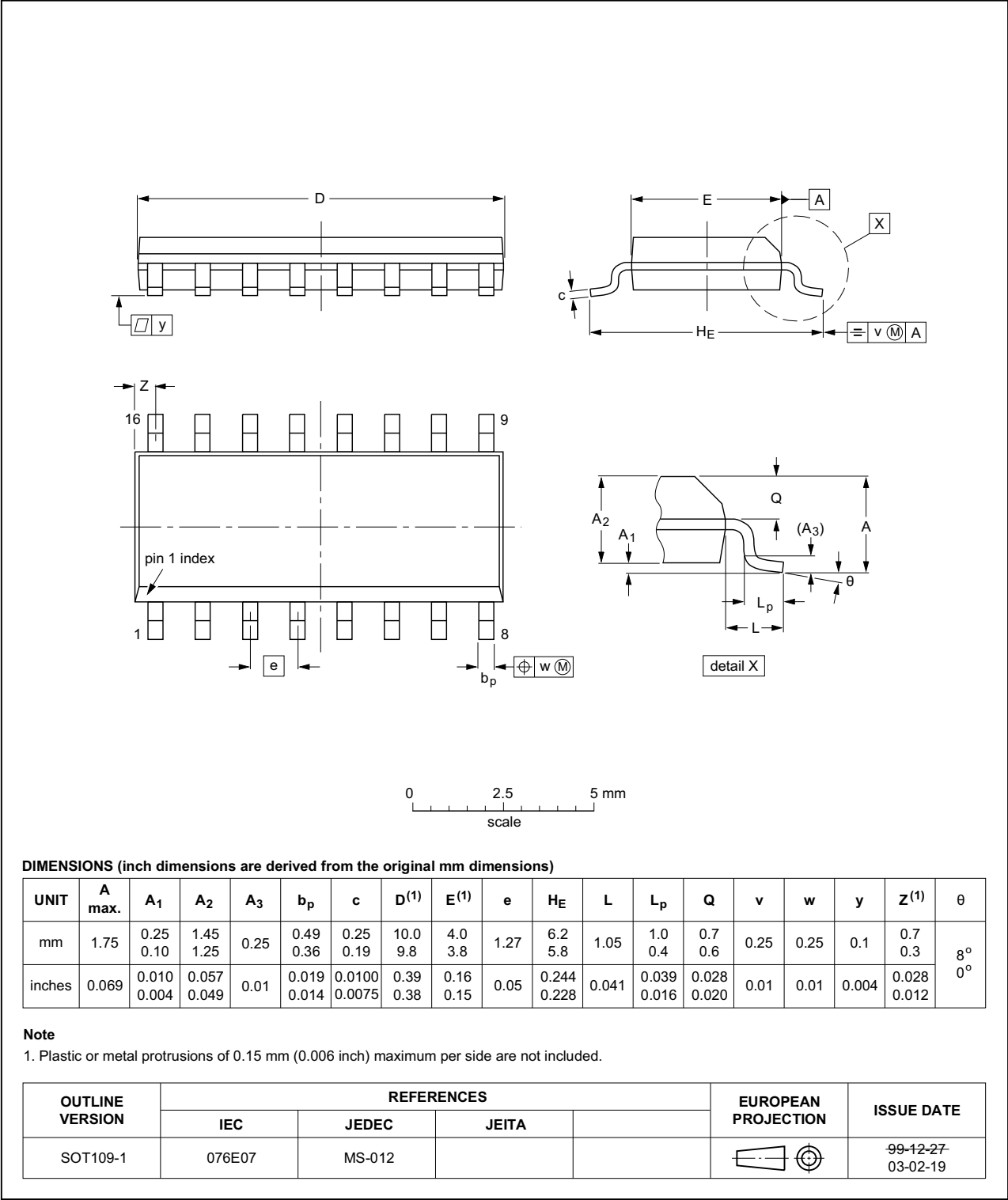
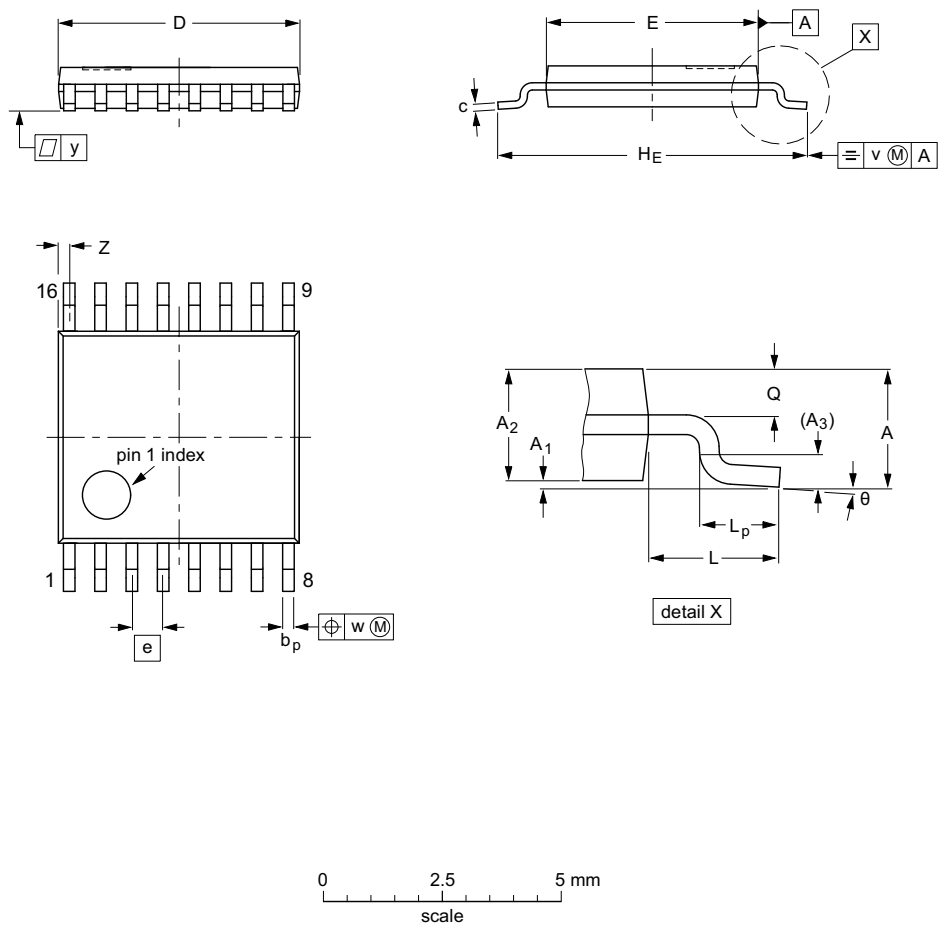


Fig 9. Package outline SOT109-1 (SO16)

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

SOT403-1



DIMENSIONS (mm are the original dimensions)

| UNIT | A<br>max. | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> | b <sub>p</sub> | c          | D <sup>(1)</sup> | E <sup>(2)</sup> | e    | H <sub>E</sub> | L | L <sub>p</sub> | Q          | v   | w    | y   | Z <sup>(1)</sup> | θ        |
|------|-----------|----------------|----------------|----------------|----------------|------------|------------------|------------------|------|----------------|---|----------------|------------|-----|------|-----|------------------|----------|
| mm   | 1.1       | 0.15<br>0.05   | 0.95<br>0.80   | 0.25           | 0.30<br>0.19   | 0.2<br>0.1 | 5.1<br>4.9       | 4.5<br>4.3       | 0.65 | 6.6<br>6.2     | 1 | 0.75<br>0.50   | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.40<br>0.06     | 8°<br>0° |

Notes

- 1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
- 2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE<br>VERSION | REFERENCES |        |       |  | EUROPEAN<br>PROJECTION | ISSUE DATE            |
|--------------------|------------|--------|-------|--|------------------------|-----------------------|
|                    | IEC        | JEDEC  | JEITA |  |                        |                       |
| SOT403-1           |            | MO-153 |       |  |                        | -99-12-27<br>03-02-18 |

Fig 10. 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                           |
| TTL     | Transistor-Transistor Logic             |
| MIL     | Military                                |

## 14. Revision history

Table 11. Revision history

| Document ID          | Release date | Data sheet status  | Change notice | Supersedes |
|----------------------|--------------|--------------------|---------------|------------|
| 74HC_HCT257_Q100 v.1 | 20150727     | Product data sheet | -             | -          |

## 15. Legal information

### 15.1 Data sheet status

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

[1] Please consult the most recently issued document before initiating or completing a design.

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

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

### 15.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

**Product specification** — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

### 15.3 Disclaimers

**Limited warranty and liability** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Nexperia.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use in automotive applications** — This Nexperia product has been qualified for use in automotive applications. Unless otherwise agreed in writing, the product is not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

**Terms and conditions of commercial sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

**Translations** — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

## 15.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 16. Contact information

---

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

## 17. Contents

---

|           |                                               |           |
|-----------|-----------------------------------------------|-----------|
| <b>1</b>  | <b>General description</b> .....              | <b>1</b>  |
| <b>2</b>  | <b>Features and benefits</b> .....            | <b>1</b>  |
| <b>3</b>  | <b>Ordering information</b> .....             | <b>1</b>  |
| <b>4</b>  | <b>Functional diagram</b> .....               | <b>2</b>  |
| <b>5</b>  | <b>Pinning information</b> .....              | <b>3</b>  |
| 5.1       | Pinning .....                                 | 3         |
| 5.2       | Pin description .....                         | 4         |
| <b>6</b>  | <b>Functional description</b> .....           | <b>4</b>  |
| 6.1       | Function table .....                          | 4         |
| <b>7</b>  | <b>Limiting values</b> .....                  | <b>4</b>  |
| <b>8</b>  | <b>Recommended operating conditions</b> ..... | <b>5</b>  |
| <b>9</b>  | <b>Static characteristics</b> .....           | <b>5</b>  |
| <b>10</b> | <b>Dynamic characteristics</b> .....          | <b>7</b>  |
| <b>11</b> | <b>Waveforms</b> .....                        | <b>8</b>  |
| <b>12</b> | <b>Package outline</b> .....                  | <b>11</b> |
| <b>13</b> | <b>Abbreviations</b> .....                    | <b>13</b> |
| <b>14</b> | <b>Revision history</b> .....                 | <b>13</b> |
| <b>15</b> | <b>Legal information</b> .....                | <b>14</b> |
| 15.1      | Data sheet status .....                       | 14        |
| 15.2      | Definitions .....                             | 14        |
| 15.3      | Disclaimers .....                             | 14        |
| 15.4      | Trademarks .....                              | 15        |
| <b>16</b> | <b>Contact information</b> .....              | <b>15</b> |
| <b>17</b> | <b>Contents</b> .....                         | <b>16</b> |