

# 74LV4052-Q100

## Dual 4-channel analog multiplexer/demultiplexer

Rev. 5 — 29 March 2024

Product data sheet

### 1. General description

The 74LV4052-Q100 is a dual single-pole quad-throw analog switch suitable for use in 4:1 multiplexer/demultiplexer applications. Each switch features four independent inputs/outputs (nY0, nY1, nY2 and nY3) and a common input/output (nZ). A digital enable input (E) and two digital select inputs (S0, S1) are common to both switches. When E is HIGH, the switches are turned off. Digital inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess  $V_{CC}$ .

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  $+125\text{ }^{\circ}\text{C}$
- Wide supply voltage range from 1.0 to 6.0 V
- CMOS low power dissipation
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Optimized for low-voltage applications: 1.0 V to 6.0 V
- Accepts TTL input levels between  $V_{CC} = 2.7\text{ V}$  and  $V_{CC} = 3.6\text{ V}$
- Low ON resistance:
  - 145  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 2.0\text{ V}$
  - 90  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 3.0\text{ V}$
  - 60  $\Omega$  (typical) at  $V_{CC} - V_{EE} = 4.5\text{ V}$
- Logic level translation:
  - To enable 3 V logic to communicate with  $\pm 3\text{ V}$  analog signals
- Typical 'break before make' built in
- Complies with JEDEC standards:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

### 3. Ordering information

Table 1. Ordering information

| Type number                     | Package   |         |   |                          |
|---------------------------------|---|---------|---|--------------------------|
|                                 | Temperature range   | Name    | Description   | Version                  |
| <a href="#">74LV4052D-Q100</a>  | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO16    | plastic small outline package; 16 leads;<br>body width 3.9 mm             | <a href="#">SOT109-1</a> |
| <a href="#">74LV4052PW-Q100</a> | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP16 | plastic thin shrink small outline package; 16 leads;<br>body width 4.4 mm | <a href="#">SOT403-1</a> |

4. Functional diagram

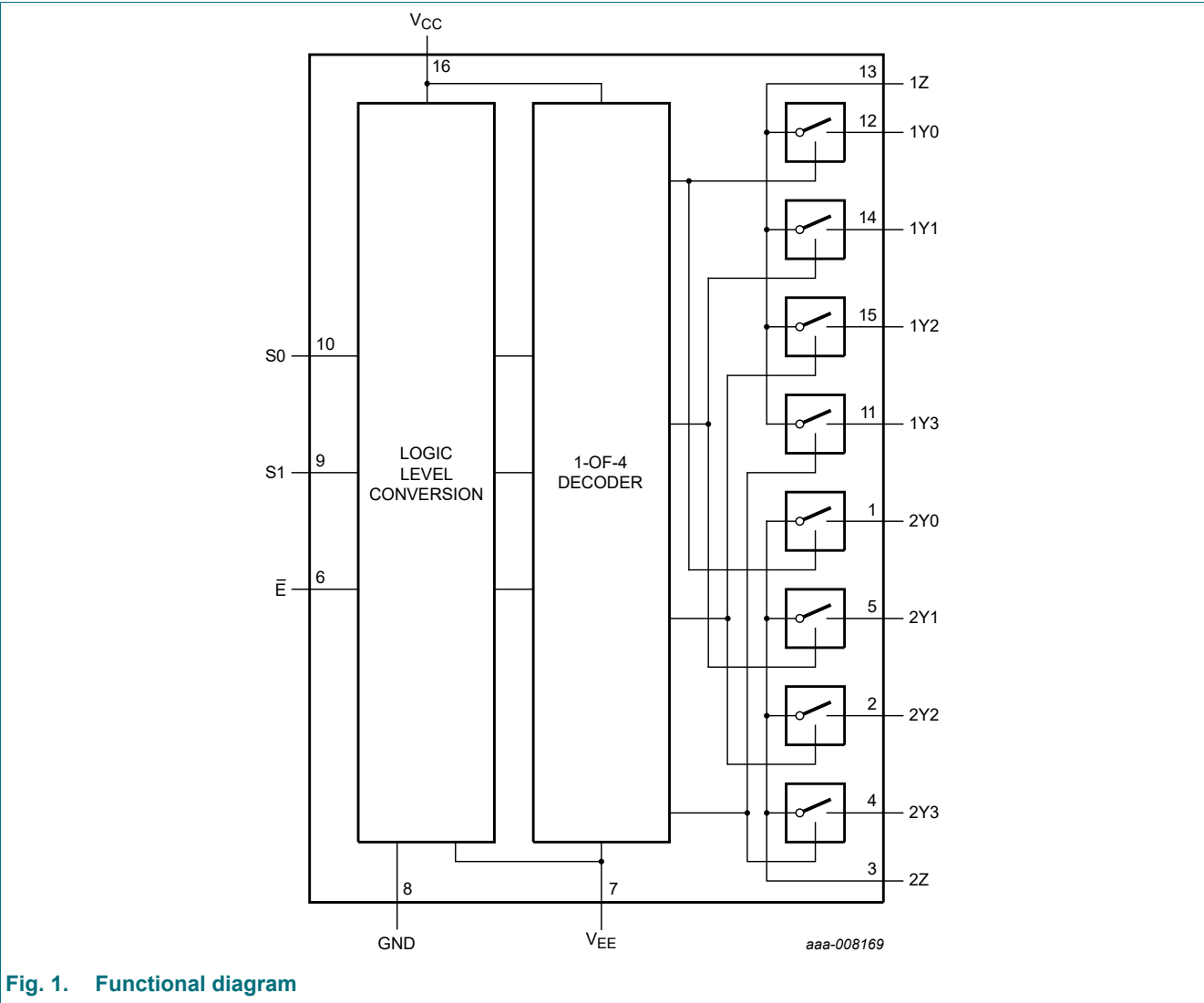


Fig. 1. Functional diagram

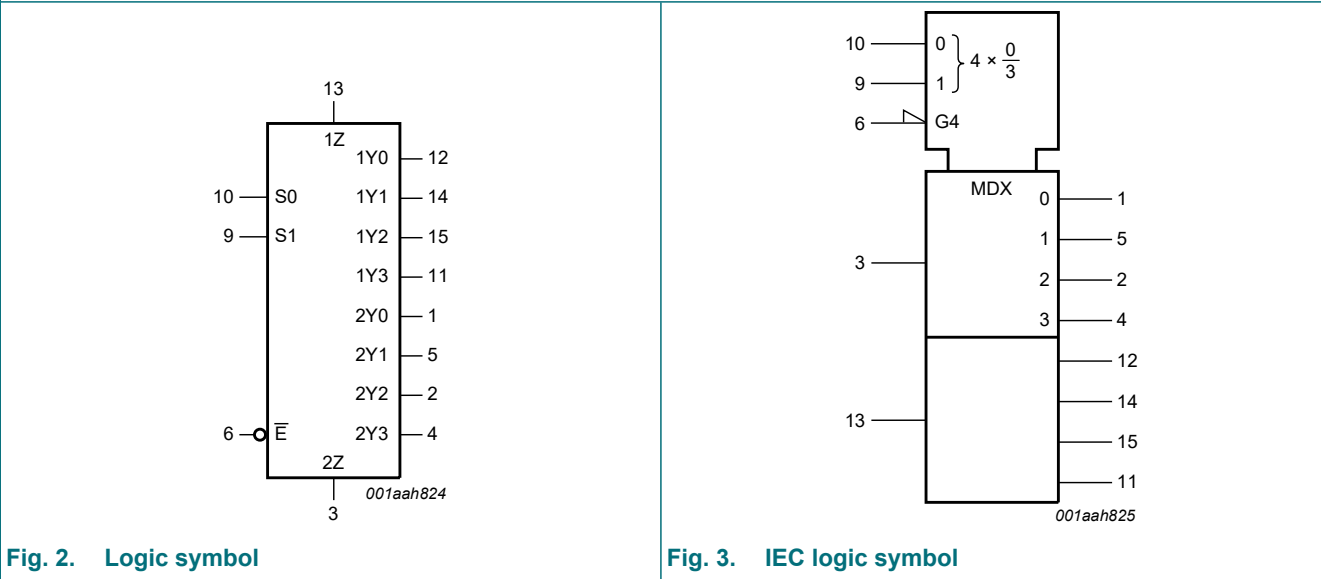
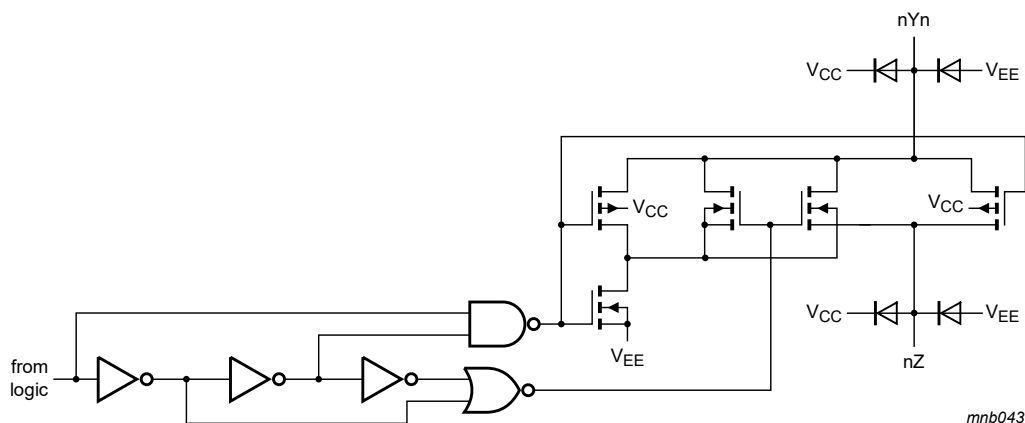


Fig. 2. Logic symbol

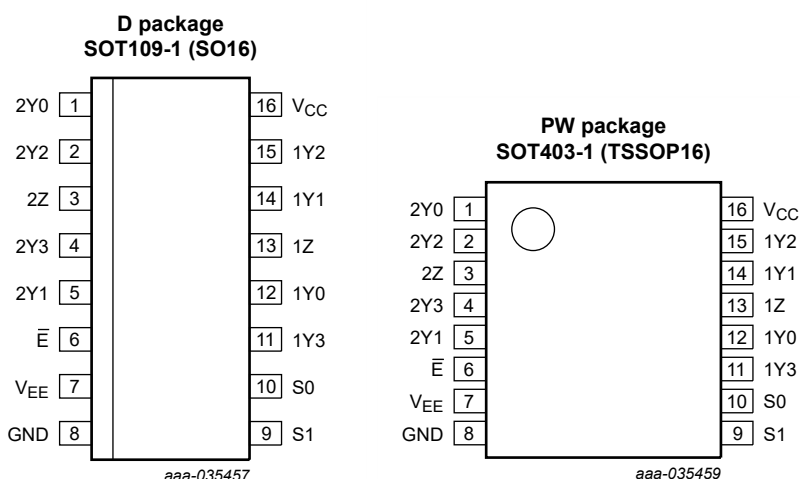
Fig. 3. IEC logic symbol



**Fig. 4. Schematic diagram (one switch)**

## 5. Pinning information

## 5.1. Pinning



## 5.2. Pin description

### Table 2. Pin description

| Symbol             | Pin            | Description                 |
|--------------------|----------------|-----------------------------|
| 2Y0, 2Y1, 2Y2, 2Y3 | 1, 5, 2, 4     | independent input or output |
| $\overline{E}$     | 6              | enable input (active LOW)   |
| $V_{EE}$           | 7              | negative supply voltage     |
| GND                | 8              | ground (0 V)                |
| S0, S1             | 10, 9          | select logic input          |
| 1Y0, 1Y1, 1Y2, 1Y3 | 12, 14, 15, 11 | independent input or output |
| 1Z, 2Z             | 13, 3          | common input or output      |
| $V_{CC}$           | 16             | positive supply voltage     |

6. Functional description

Table 3. Function table

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

| Input |    |    | Channel on |
|-------|----|----|------------|
| E     | S1 | S0 |            |
| L     | L  | L  | nY0 and nZ |
| L     | L  | H  | nY1 and nZ |
| L     | H  | L  | nY2 and nZ |
| L     | H  | H  | nY3 and nZ |
| H     | X  | X  | none       |

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to  $V_{SS} = 0\text{ V}$  (ground).

| Symbol    | Parameter               | Conditions  | Min  | Max      | Unit |
|-----------|-------------------------|---|------|----------|------|
| $V_{CC}$  | supply voltage          | [1]   | -0.5 | +7.0     | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$ [2]                                | -    | $\pm 20$ | mA   |
| $I_{SK}$  | switch clamping current | $V_{SW} < -0.5\text{ V}$ or $V_{SW} > V_{CC} + 0.5\text{ V}$ [2]                          | -    | $\pm 20$ | mA   |
| $I_{SW}$  | switch current          | $V_{SW} > -0.5\text{ V}$ or $V_{SW} < V_{CC} + 0.5\text{ V}$ ; source or sink current [2] | -    | $\pm 25$ | mA   |
| $T_{stg}$ | storage temperature     |   | -65  | +150     | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40\text{ °C}$ to $+125\text{ °C}$ [3]   | -    | 500      | mW   |

- [1] To avoid drawing  $V_{CC}$  current out of terminal nZ, when switch current flows into terminals nYn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal nZ, no  $V_{CC}$  current flows out of terminals nYn. In this case, there is no limit for the voltage drop across the switch, but the voltages at nYn and nZ may not exceed  $V_{CC}$  or  $V_{EE}$ .
- [2] The minimum input voltage rating may be exceeded if the input current rating is observed.
- [3] For SOT109-1 (SO16) package:  $P_{tot}$  derates linearly with 12.4 mW/K above 110 °C.  
For SOT403-1 (TSSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol              | Parameter                           | Conditions                                | Min | Typ | Max      | Unit |
|---------------------|-------------------------------------|---|-----|-----|----------|------|
| $V_{CC}$            | supply voltage                      | see Fig. 5 [1]                            | 1   | 3.3 | 6        | V    |
| $V_I$               | input voltage                       |   | 0   | -   | $V_{CC}$ | V    |
| $V_{SW}$            | switch voltage                      |   | 0   | -   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 | in free air                               | -40 | -   | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.0\text{ V}$ to $2.0\text{ V}$ | -   | -   | 500      | ns/V |
|                     |                                     | $V_{CC} = 2.0\text{ V}$ to $2.7\text{ V}$ | -   | -   | 200      | ns/V |
|                     |                                     | $V_{CC} = 2.7\text{ V}$ to $6.0\text{ V}$ | -   | -   | 100      | ns/V |

- [1] The static characteristics are guaranteed from  $V_{CC} = 1.2\text{ V}$  to  $6.0\text{ V}$ . However, LV devices are guaranteed to function down to  $V_{CC} = 1.0\text{ V}$  (with input levels GND or  $V_{CC}$ ).

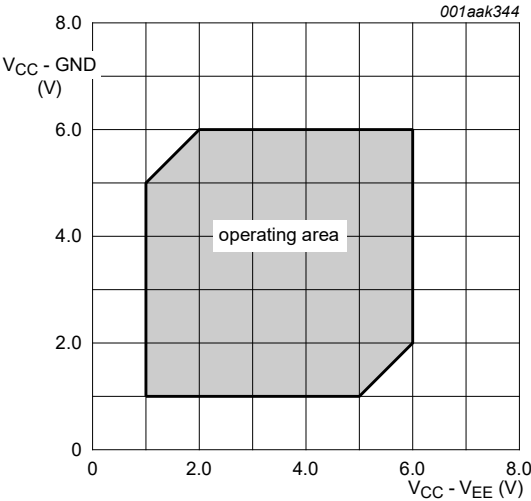


Fig. 5. Guaranteed operating area as a function of the supply voltages

9. Static characteristics

Table 6. Static characteristics

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

| Symbol              | Parameter                 | Conditions  | -40 °C to +85 °C |        |      | -40 °C to +125 °C |      | Unit |
|---------------------|---------------------------|---|------------------|--------|------|-------------------|------|------|
|                     |                           |   | Min              | Typ[1] | Max  | Min               | Max  |      |
| V <sub>IH</sub>     | HIGH-level input voltage  | V <sub>CC</sub> = 1.2 V   | 0.9              | -      | -    | 0.9               | -    | V    |
|                     |                           | V <sub>CC</sub> = 2.0 V   | 1.4              | -      | -    | 1.4               | -    | V    |
|                     |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | 2.0              | -      | -    | 2.0               | -    | V    |
|                     |                           | V <sub>CC</sub> = 4.5 V   | 3.15             | -      | -    | 3.15              | -    | V    |
|                     |                           | V <sub>CC</sub> = 6.0 V   | 4.20             | -      | -    | 4.20              | -    | V    |
| V <sub>IL</sub>     | LOW-level input voltage   | V <sub>CC</sub> = 1.2 V   | -                | -      | 0.3  | -                 | 0.3  | V    |
|                     |                           | V <sub>CC</sub> = 2.0 V   | -                | -      | 0.6  | -                 | 0.6  | V    |
|                     |                           | V <sub>CC</sub> = 2.7 V to 3.6 V  | -                | -      | 0.8  | -                 | 0.8  | V    |
|                     |                           | V <sub>CC</sub> = 4.5 V   | -                | -      | 1.35 | -                 | 1.35 | V    |
|                     |                           | V <sub>CC</sub> = 6.0 V   | -                | -      | 1.80 | -                 | 1.80 | V    |
| I <sub>I</sub>      | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND   |                  |        |      |                   |      |      |
|                     |                           | V <sub>CC</sub> = 3.6 V   | -                | -      | 1.0  | -                 | 1.0  | μA   |
|                     |                           | V <sub>CC</sub> = 6.0 V   | -                | -      | 2.0  | -                 | 2.0  | μA   |
| I <sub>S(OFF)</sub> | OFF-state leakage current | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; see Fig. 6                      |                  |        |      |                   |      |      |
|                     |                           | V <sub>CC</sub> = 3.6 V   | -                | -      | 1.0  | -                 | 1.0  | μA   |
|                     |                           | V <sub>CC</sub> = 6.0 V   | -                | -      | 2.0  | -                 | 2.0  | μA   |
| I <sub>S(ON)</sub>  | ON-state leakage current  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; see Fig. 7                      |                  |        |      |                   |      |      |
|                     |                           | V <sub>CC</sub> = 3.6 V   | -                | -      | 1.0  | -                 | 1.0  | μA   |
|                     |                           | V <sub>CC</sub> = 6.0 V   | -                | -      | 2.0  | -                 | 2.0  | 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> = 3.6 V   | -                | -      | 20   | -                 | 40   | μA   |
|                     |                           | V <sub>CC</sub> = 6.0 V   | -                | -      | 40   | -                 | 80   | μA   |
| ΔI <sub>CC</sub>    | additional supply current | per input; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; V <sub>CC</sub> = 2.7 V to 3.6 V | -                | -      | 500  | -                 | 850  | μA   |

| Symbol          | Parameter          | Conditions           | -40 °C to +85 °C |        |     | -40 °C to +125 °C |     | Unit |
|-----------------|--------------------|----------------------|------------------|--------|-----|-------------------|-----|------|
|                 |                    |                      | Min              | Typ[1] | Max | Min               | Max |      |
| C <sub>I</sub>  | input capacitance  |                      | -                | 3.5    | -   | -                 | -   | pF   |
| C <sub>sw</sub> | switch capacitance | independent pins nYn | -                | 5      | -   | -                 | -   | pF   |
|                 |                    | common pins nZ       | -                | 12     | -   | -                 | -   | pF   |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

9.1. Test circuits

aaa-008172

**Fig. 6. Test circuit for measuring OFF-state leakage current**

aaa-008173

**Fig. 7. Test circuit for measuring ON-state leakage current**

9.2. ON resistance

**Table 7. ON resistance**  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit and graph see [Fig. 8](#) and [Fig. 9](#).

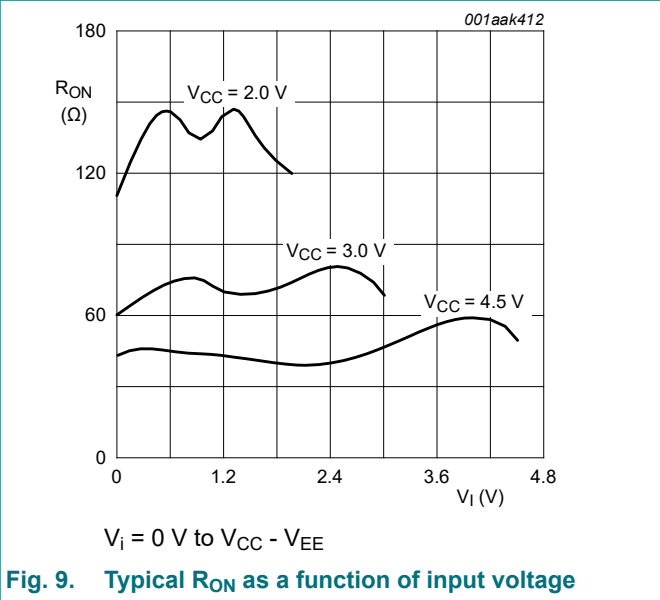
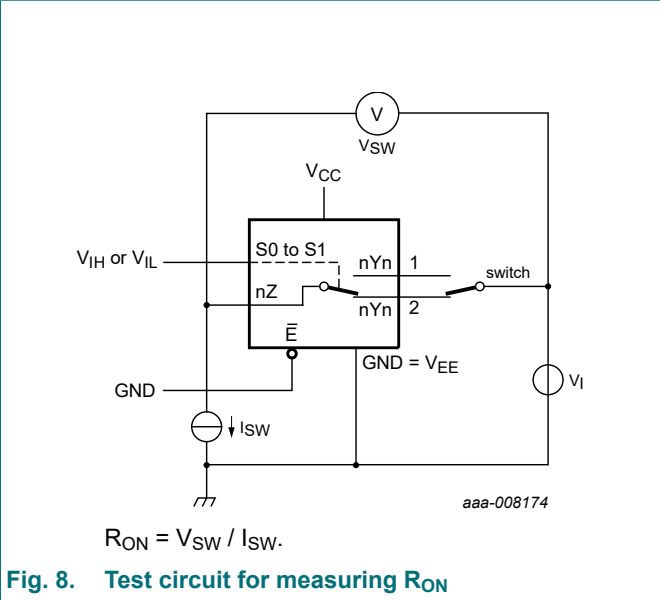
| Symbol                | Parameter                               | Conditions  | -40 °C to +85 °C |        |     | -40 °C to +125 °C |     | Unit |
|-----------------------|---|---|------------------|--------|-----|-------------------|-----|------|
|                       |   |   | Min              | Typ[1] | Max | Min               | Max |      |
| R <sub>ON(peak)</sub> | ON resistance (peak)                    | V <sub>I</sub> = 0 V to V <sub>CC</sub> - V <sub>EE</sub>   |                  |        |     |                   |     |      |
|                       |   | V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 µA [2]       | -                | -      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 µA          | -                | 145    | 325 | -                 | 375 | Ω    |
|                       |   | V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 µA          | -                | 90     | 200 | -                 | 235 | Ω    |
|                       |   | V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>SW</sub> = 1000 µA | -                | 80     | 180 | -                 | 210 | Ω    |
|                       |   | V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 µA          | -                | 60     | 135 | -                 | 160 | Ω    |
|                       |   | V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 µA          | -                | 55     | 125 | -                 | 145 | Ω    |
| ΔR <sub>ON</sub>      | ON resistance mismatch between channels | V <sub>I</sub> = 0 V to V <sub>CC</sub> - V <sub>EE</sub>   |                  |        |     |                   |     |      |
|                       |   | V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 µA [2]       | -                | -      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 µA          | -                | 5      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 µA          | -                | 4      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 3.0 V to 3.6 V; I <sub>SW</sub> = 1000 µA | -                | 4      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 µA          | -                | 3      | -   | -                 | -   | Ω    |
|                       |   | V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 µA          | -                | 2      | -   | -                 | -   | Ω    |

| Symbol                | Parameter            | Conditions   | -40 °C to +85 °C |        |     | -40 °C to +125 °C |     | Unit |
|-----------------------|----------------------|--|------------------|--------|-----|-------------------|-----|------|
|                       |                      |  | Min              | Typ[1] | Max | Min               | Max |      |
| R <sub>ON(rail)</sub> | ON resistance (rail) | V <sub>I</sub> = GND   |                  |        |     |                   |     |      |
|                       |                      | V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 µA [2]          | -                | 225    | -   | -                 | -   | Ω    |
|                       |                      | V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 µA             | -                | 110    | 235 | -                 | 270 | Ω    |
|                       |                      | V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 µA             | -                | 70     | 145 | -                 | 165 | Ω    |
|                       |                      | V <sub>CC</sub> = 3.0 V to 3.6 V;<br>I <sub>SW</sub> = 1000 µA | -                | 60     | 130 | -                 | 150 | Ω    |
|                       |                      | V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 µA             | -                | 45     | 100 | -                 | 115 | Ω    |
|                       |                      | V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 µA             | -                | 40     | 85  | -                 | 100 | Ω    |
| R <sub>ON(rail)</sub> | ON resistance (rail) | V <sub>I</sub> = V <sub>CC</sub> - V <sub>EE</sub>             |                  |        |     |                   |     |      |
|                       |                      | V <sub>CC</sub> = 1.2 V; I <sub>SW</sub> = 100 µA [2]          | -                | 250    | -   | -                 | -   | Ω    |
|                       |                      | V <sub>CC</sub> = 2.0 V; I <sub>SW</sub> = 1000 µA             | -                | 120    | 320 | -                 | 370 | Ω    |
|                       |                      | V <sub>CC</sub> = 2.7 V; I <sub>SW</sub> = 1000 µA             | -                | 75     | 195 | -                 | 225 | Ω    |
|                       |                      | V <sub>CC</sub> = 3.0 V to 3.6 V;<br>I <sub>SW</sub> = 1000 µA | -                | 70     | 175 | -                 | 205 | Ω    |
|                       |                      | V <sub>CC</sub> = 4.5 V; I <sub>SW</sub> = 1000 µA             | -                | 50     | 130 | -                 | 150 | Ω    |
|                       |                      | V <sub>CC</sub> = 6.0 V; I <sub>SW</sub> = 1000 µA             | -                | 45     | 120 | -                 | 135 | Ω    |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C.

[2] When supply voltages (V<sub>CC</sub> - V<sub>EE</sub>) near 1.2 V the analog switch ON resistance becomes extremely non-linear. When using a supply of 1.2 V, only use these devices for transmitting digital signals.

9.3. On resistance test circuit and graph



10. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V). For test circuit, see Fig. 12.

| Symbol           | Parameter                     | Conditions   | -40 °C to +85 °C |        |     | -40 °C to +125 °C |     | Unit |
|------------------|-------------------------------|--|------------------|--------|-----|-------------------|-----|------|
|                  |                               |  | Min              | Typ[1] | Max | Min               | Max |      |
| t <sub>pd</sub>  | propagation delay             | nYn to nZ, nZ to nYn; see Fig. 10 [2]                        |                  |        |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.2 V                                      | -                | 25     | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.0 V                                      | -                | 9      | 17  | -                 | 20  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                      | -                | 6      | 13  | -                 | 15  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V [3]                         | -                | 5      | 10  | -                 | 12  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                      | -                | 4      | 9   | -                 | 10  | ns   |
|                  |                               | V <sub>CC</sub> = 6.0 V                                      | -                | 3      | 7   | -                 | 8   | ns   |
| t <sub>en</sub>  | enable time                   | $\bar{E}$ , Sn to nYn, nZ; see Fig. 11 [2]                   |                  |        |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.2 V                                      | -                | 190    | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.0 V                                      | -                | 65     | 121 | -                 | 146 | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                      | -                | 48     | 89  | -                 | 108 | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF [3] | -                | 30     | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V [3]                         | -                | 36     | 71  | -                 | 86  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                      | -                | 32     | 60  | -                 | 73  | ns   |
| t <sub>dis</sub> | disable time                  | $\bar{E}$ , Sn to nYn, nZ; see Fig. 11 [2]                   |                  |        |     |                   |     |      |
|                  |                               | V <sub>CC</sub> = 1.2 V                                      | -                | 125    | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 2.0 V                                      | -                | 43     | 80  | -                 | 95  | ns   |
|                  |                               | V <sub>CC</sub> = 2.7 V                                      | -                | 33     | 59  | -                 | 71  | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V; C <sub>L</sub> = 15 pF [3] | -                | 22     | -   | -                 | -   | ns   |
|                  |                               | V <sub>CC</sub> = 3.0 V to 3.6 V [3]                         | -                | 26     | 48  | -                 | 57  | ns   |
|                  |                               | V <sub>CC</sub> = 4.5 V                                      | -                | 23     | 41  | -                 | 49  | ns   |
| C <sub>PD</sub>  | power dissipation capacitance | C <sub>L</sub> = 50 pF; f <sub>i</sub> = 1 MHz; [4]          | -                | 57     | -   | -                 | -   | pF   |
|                  |                               | V <sub>I</sub> = GND to V <sub>CC</sub>                      |                  |        |     |                   |     |      |

[1] All typical values are measured at T<sub>amb</sub> = 25 °C.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.  
t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.

[3] Typical values are measured at nominal supply voltage (V<sub>CC</sub> = 3.3 V).

[4] 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> + C<sub>sw</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  
C<sub>sw</sub> = maximum switch capacitance in pF;  
V<sub>CC</sub> = supply voltage in Volts  
N = number of inputs switching  
Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

10.1. Waveforms and test circuit

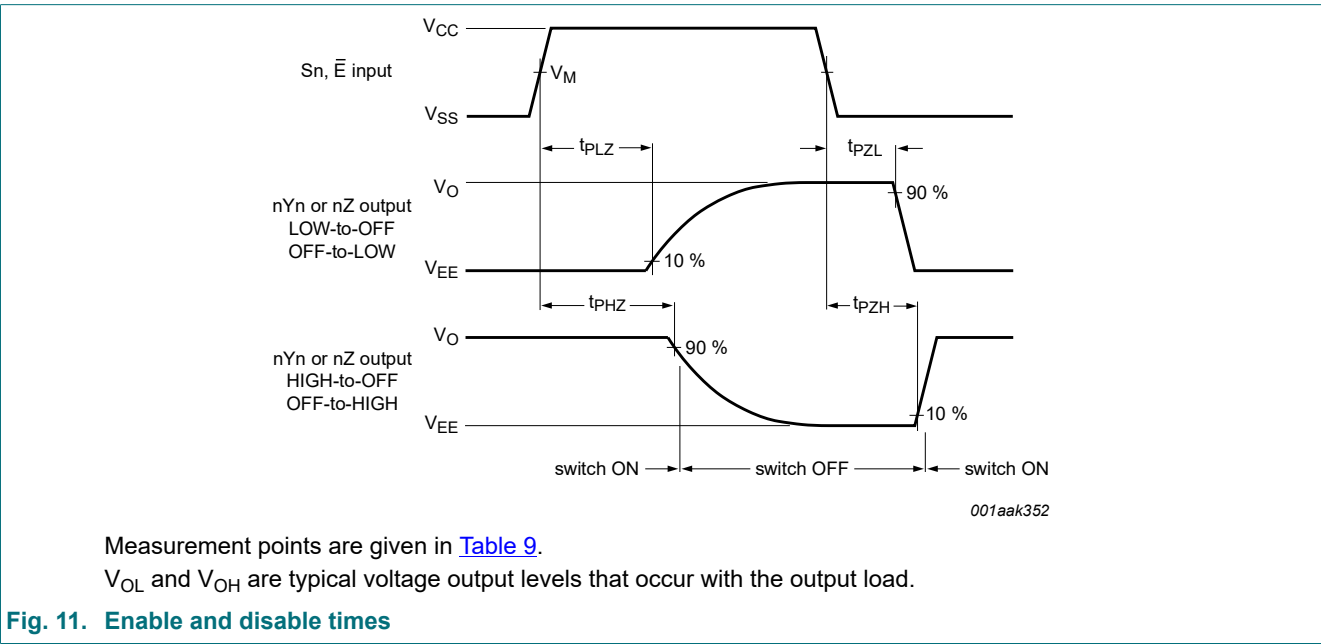
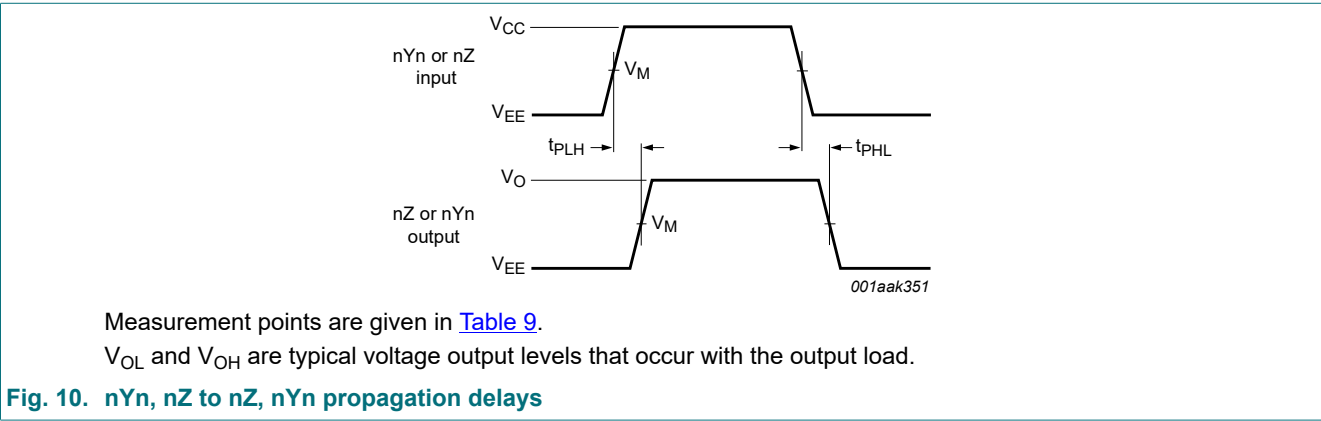


Table 9. Measurement points

| Supply voltage | Input       | Output      |
|----------------|-------------|-------------|
| $V_{CC}$       | $V_M$       | $V_M$       |
| < 2.7 V        | $0.5V_{CC}$ | $0.5V_{CC}$ |
| 2.7 V to 3.6 V | 1.5 V       | 1.5 V       |
| > 3.6 V        | $0.5V_{CC}$ | $0.5V_{CC}$ |

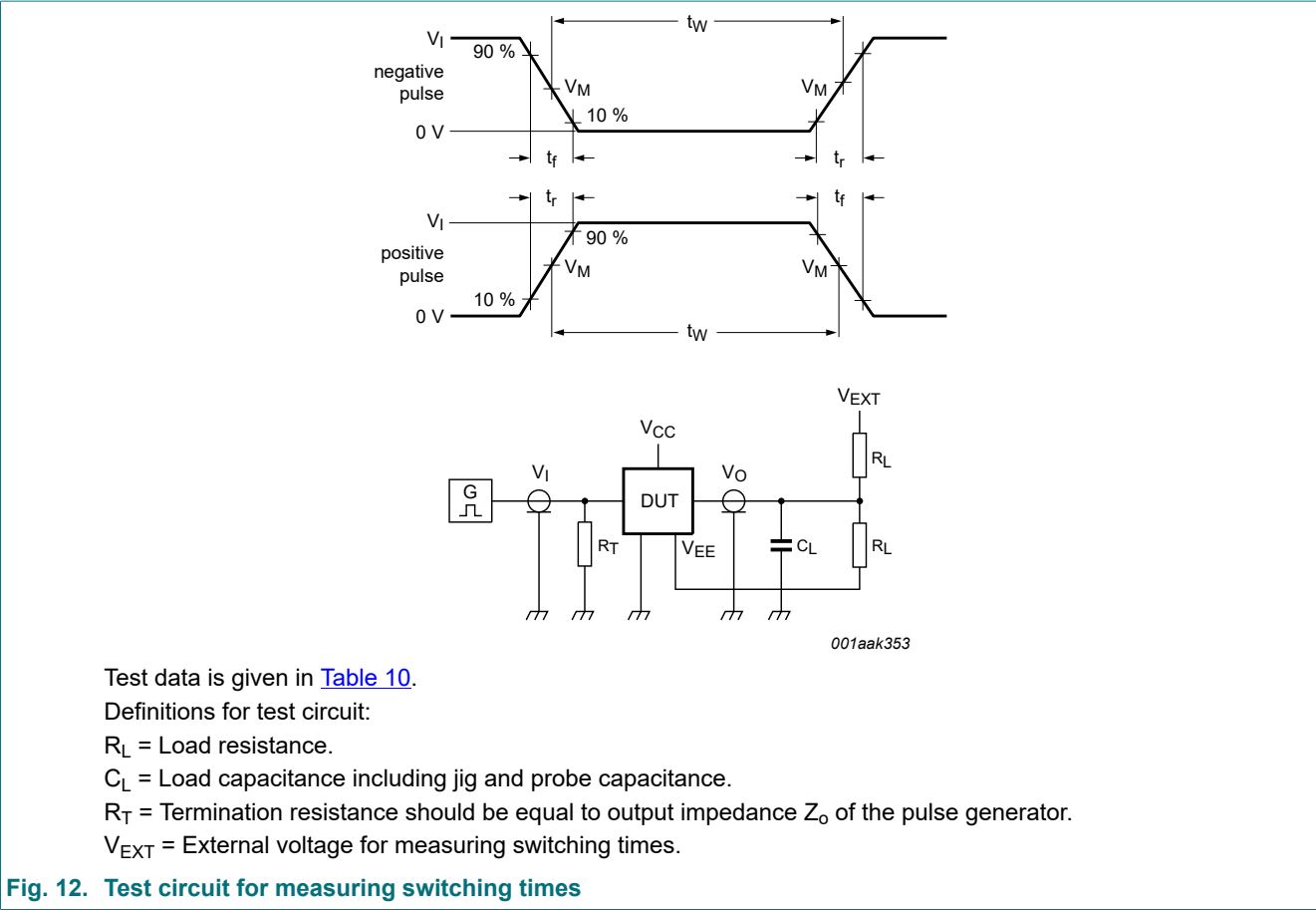


Table 10. Test data

| Supply voltage | Input    |             | Load         |              | $V_{EXT}$          |                    |                    |
|----------------|----------|-------------|--------------|--------------|--------------------|--------------------|--------------------|
| $V_{CC}$       | $V_I$    | $t_r, t_f$  | $C_L$        | $R_L$        | $t_{PHL}, t_{PLH}$ | $t_{PZH}, t_{PHZ}$ | $t_{PZL}, t_{PLZ}$ |
| < 2.7 V        | $V_{CC}$ | $\leq 6$ ns | 50 pF        | 1 k $\Omega$ | open               | $V_{EE}$           | $2V_{CC}$          |
| 2.7 V to 3.6 V | 2.7 V    | $\leq 6$ ns | 15 pF, 50 pF | 1 k $\Omega$ | open               | $V_{EE}$           | $2V_{CC}$          |
| > 3.6 V        | $V_{CC}$ | $\leq 6$ ns | 50 pF        | 1 k $\Omega$ | open               | $V_{EE}$           | $2V_{CC}$          |

10.2. Additional dynamic parameters

Table 11. Additional dynamic characteristics

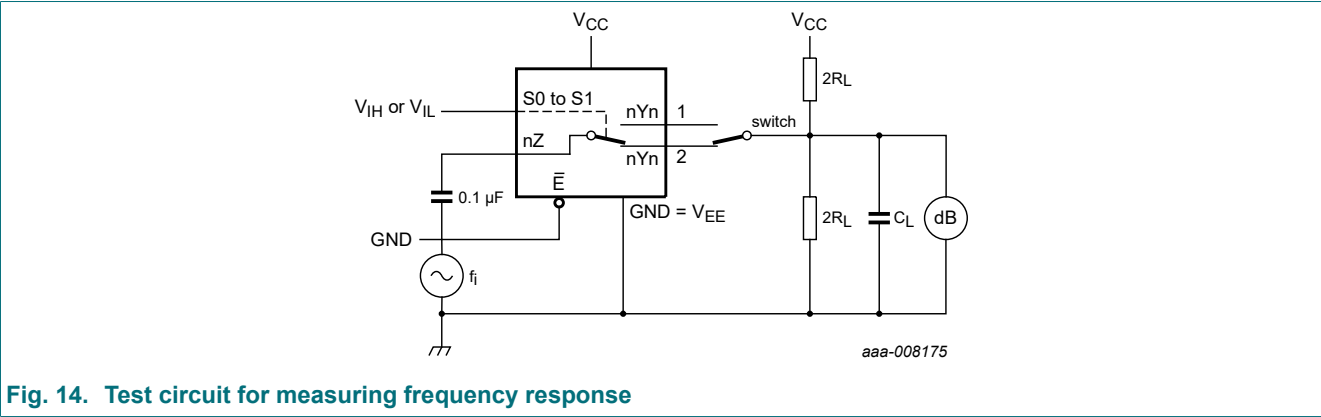
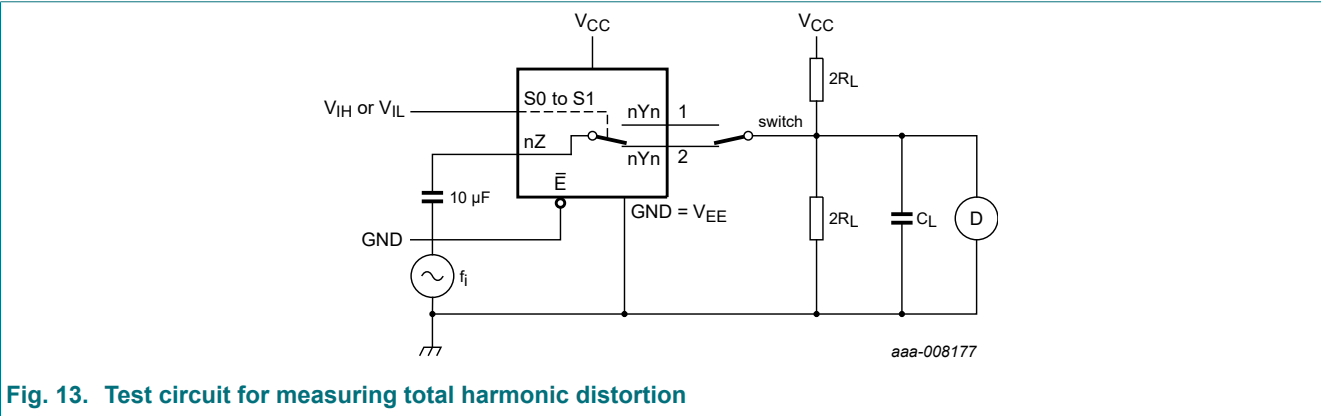
At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  $V_I$  = GND or  $V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 6.0$  ns;  $T_{amb} = 25$  °C.

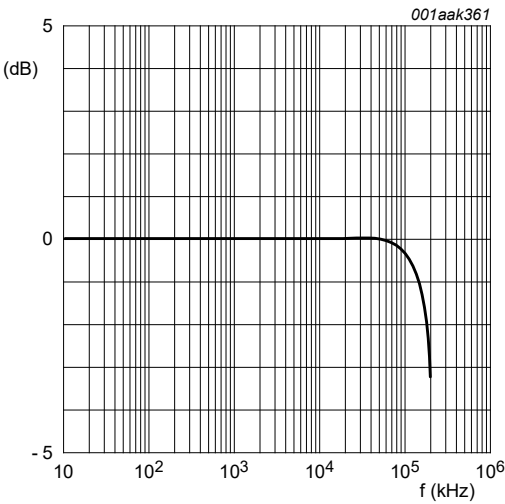
| Symbol       | Parameter                 | Conditions   | Min | Typ | Max | Unit |
|--------------|---------------------------|--|-----|-----|-----|------|
| THD          | total harmonic distortion | $f_i = 1$ kHz; $C_L = 50$ pF; $R_L = 10$ k $\Omega$ ; see <a href="#">Fig. 13</a>                |     |     |     |      |
|              |                           | $V_{CC} = 3.0$ V; $V_I = 2.75$ V (p-p)   | -   | 0.8 | -   | %    |
|              |                           | $V_{CC} = 6.0$ V; $V_I = 5.5$ V (p-p)  | -   | 0.4 | -   | %    |
|              |                           | $f_i = 10$ kHz; $C_L = 50$ pF; $R_L = 10$ k $\Omega$ ; see <a href="#">Fig. 13</a>               |     |     |     |      |
|              |                           | $V_{CC} = 3.0$ V; $V_I = 2.75$ V (p-p)   | -   | 2.4 | -   | %    |
|              |                           | $V_{CC} = 6.0$ V; $V_I = 5.5$ V (p-p)  | -   | 1.2 | -   | %    |
| $f_{(-3dB)}$ | -3 dB frequency response  | $C_L = 50$ pF; $R_L = 50$ $\Omega$ ; see <a href="#">Fig. 14</a> and <a href="#">Fig. 15</a> [1] |     |     |     |      |
|              |                           | $V_{CC} = 3.0$ V   | -   | 180 | -   | MHz  |
|              |                           | $V_{CC} = 6.0$ V   | -   | 200 | -   | MHz  |

| Symbol         | Parameter             | Conditions   | Min | Typ  | Max | Unit |
|----------------|-----------------------|--|-----|------|-----|------|
| $\alpha_{iso}$ | isolation (OFF-state) | $f_i = 1\text{ MHz}$ ; $C_L = 50\text{ pF}$ ; $R_L = 600\text{ }\Omega$ ; see Fig. 16 and Fig. 17                        |     |      |     |      |
|                |                       | $V_{CC} = 3.0\text{ V}$  | -   | -50  | -   | dB   |
|                |                       | $V_{CC} = 6.0\text{ V}$  | -   | -50  | -   | dB   |
| $V_{ct}$       | crosstalk voltage     | between digital inputs and switch; $f_i = 1\text{ MHz}$ ; $C_L = 50\text{ pF}$ ; $R_L = 600\text{ }\Omega$ ; see Fig. 18 |     |      |     |      |
|                |                       | $V_{CC} = 3.0\text{ V}$  | -   | 0.11 | -   | V    |
|                |                       | $V_{CC} = 6.0\text{ V}$  | -   | 0.12 | -   | V    |
| Xtalk          | crosstalk             | between switches; $f_i = 1\text{ MHz}$ ; $C_L = 50\text{ pF}$ ; $R_L = 600\text{ }\Omega$ ; [2] see Fig. 19              |     |      |     |      |
|                |                       | $V_{CC} = 3.0\text{ V}$  | -   | -60  | -   | dB   |
|                |                       | $V_{CC} = 6.0\text{ V}$  | -   | -60  | -   | dB   |

- [1] To obtain 0 dBm level at output for 1 MHz (0 dBm = 1 mW into 50  $\Omega$ ), adjust  $f_i$  voltage.
- [2] To obtain 0 dBm level at output for 1 MHz (0 dBm = 1 mW into 600  $\Omega$ ), adjust  $f_i$  voltage.

10.2.1. Test circuits





$V_{CC} = 3.0\text{ V}$ ;  $GND = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$ ;  $R_L = 50\text{ }\Omega$ ;  $R_{SOURCE} = 1\text{ k}\Omega$ .

Fig. 15. Typical frequency response

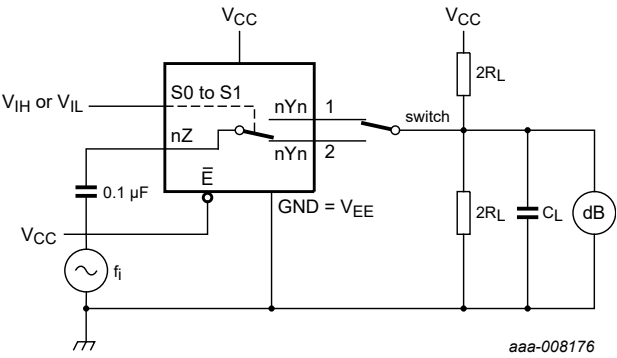
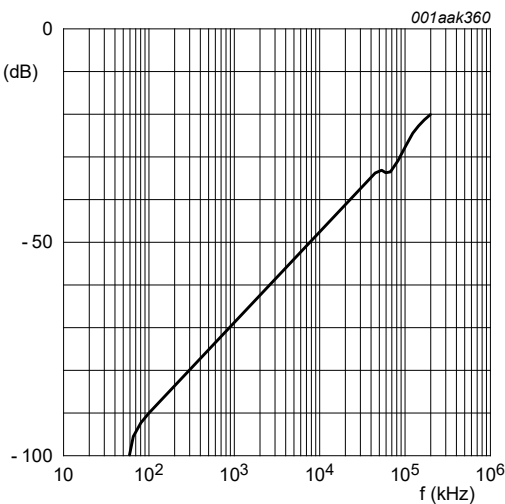
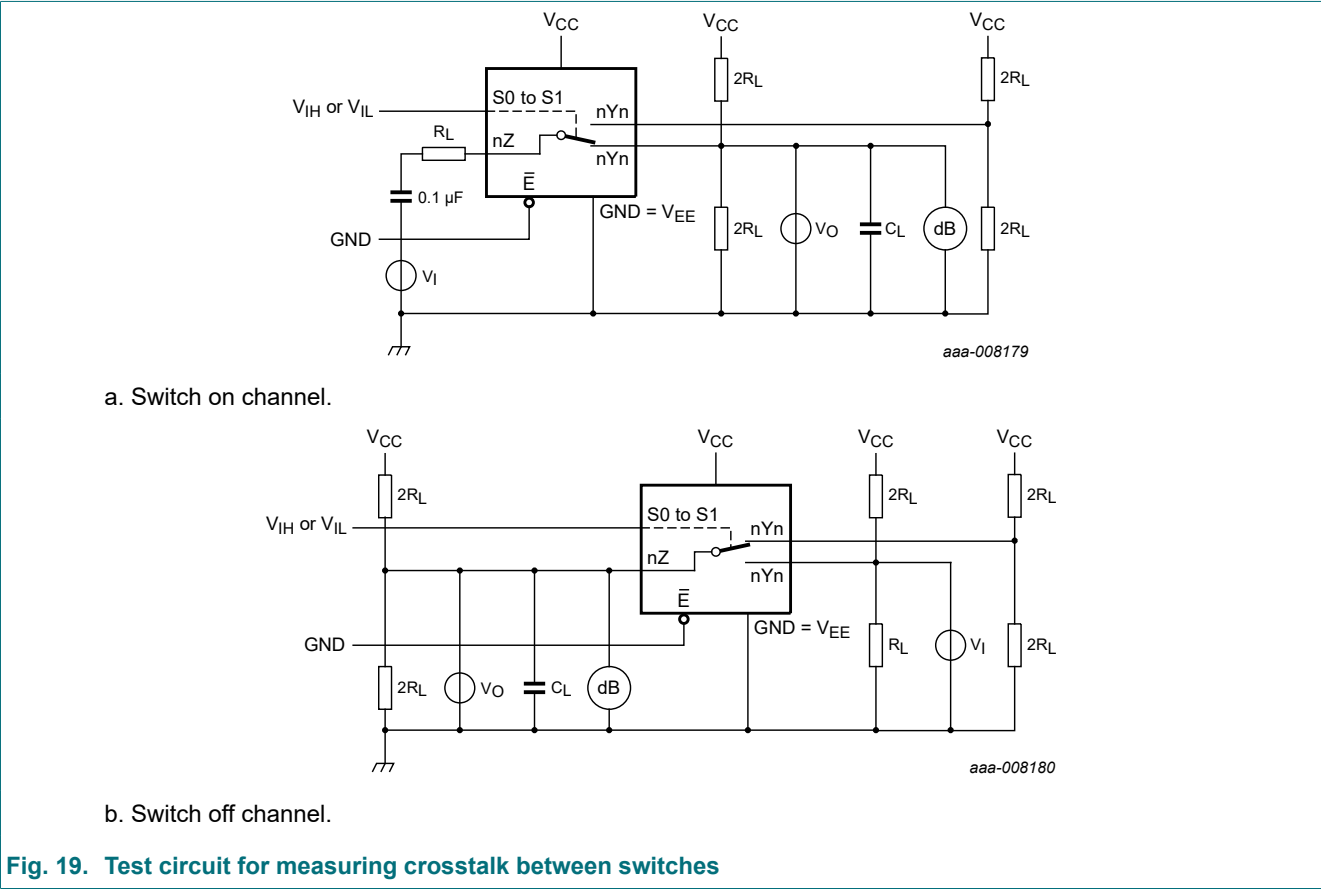
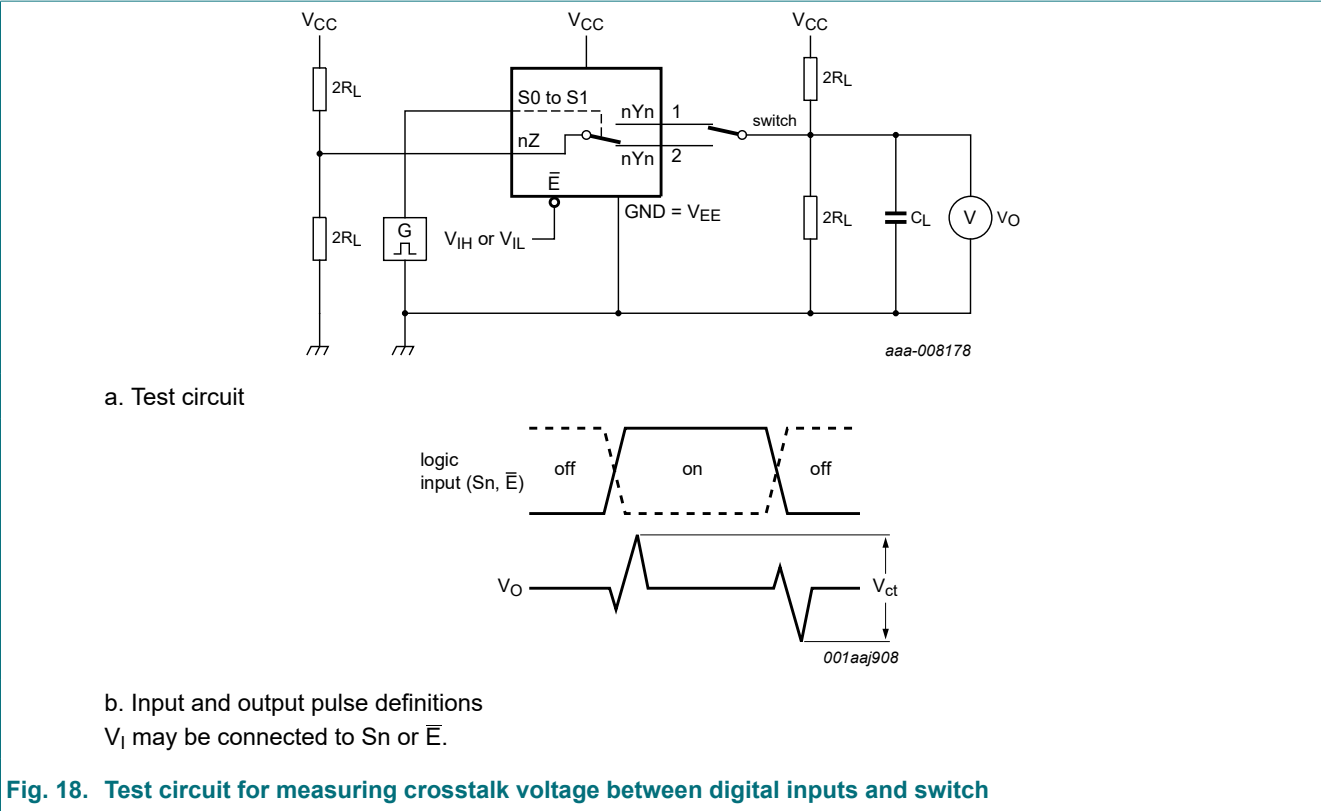


Fig. 16. Test circuit for measuring isolation (OFF-state)



$V_{CC} = 3.0\text{ V}$ ;  $GND = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V}$ ;  $R_L = 50\text{ }\Omega$ ;  $R_{SOURCE} = 1\text{ k}\Omega$ .

Fig. 17. Typical isolation (OFF-state) as function of frequency



11. Package outline

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

SOT109-1

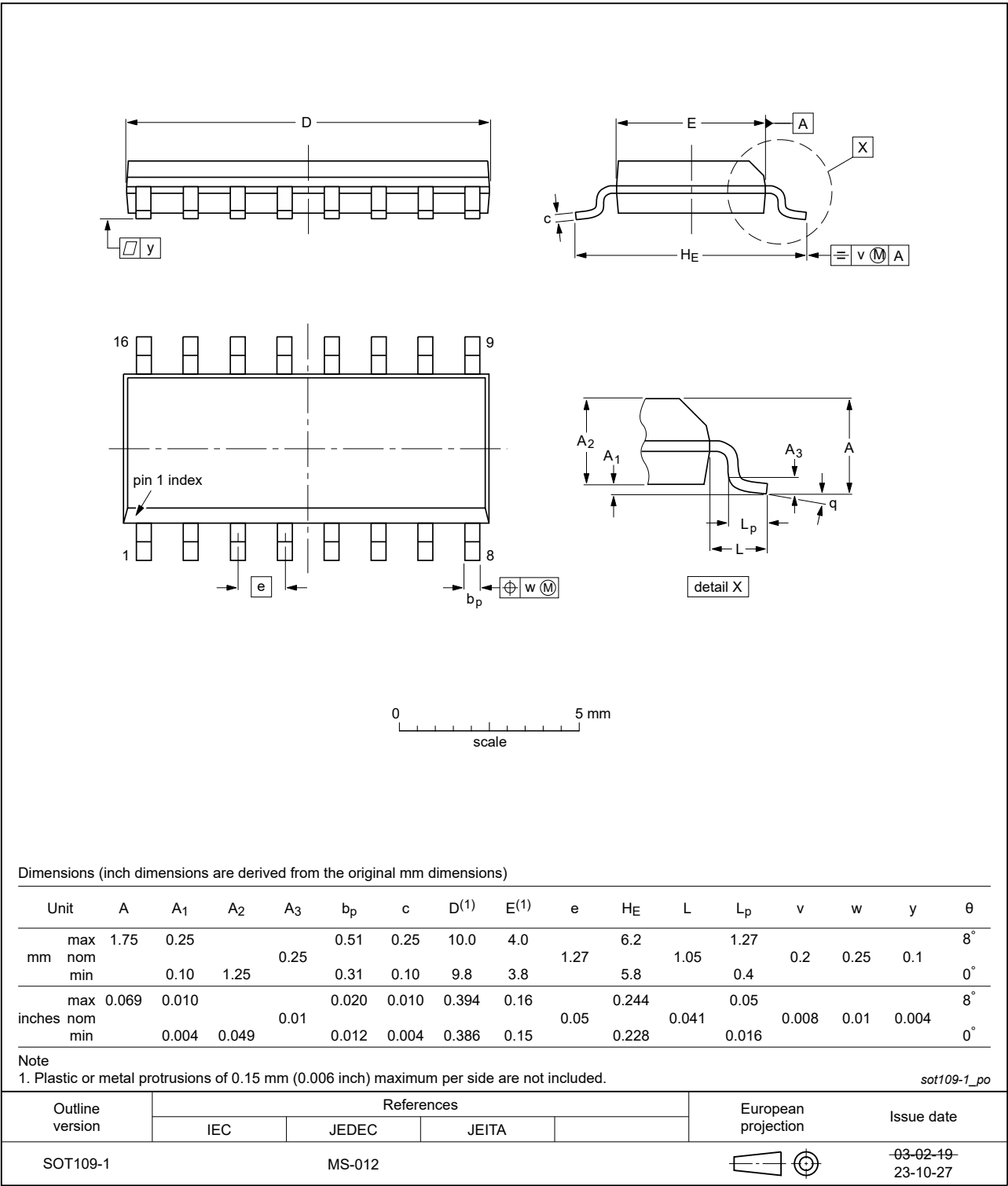


Fig. 20. Package outline SOT109-1 (SO16)

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

SOT403-1

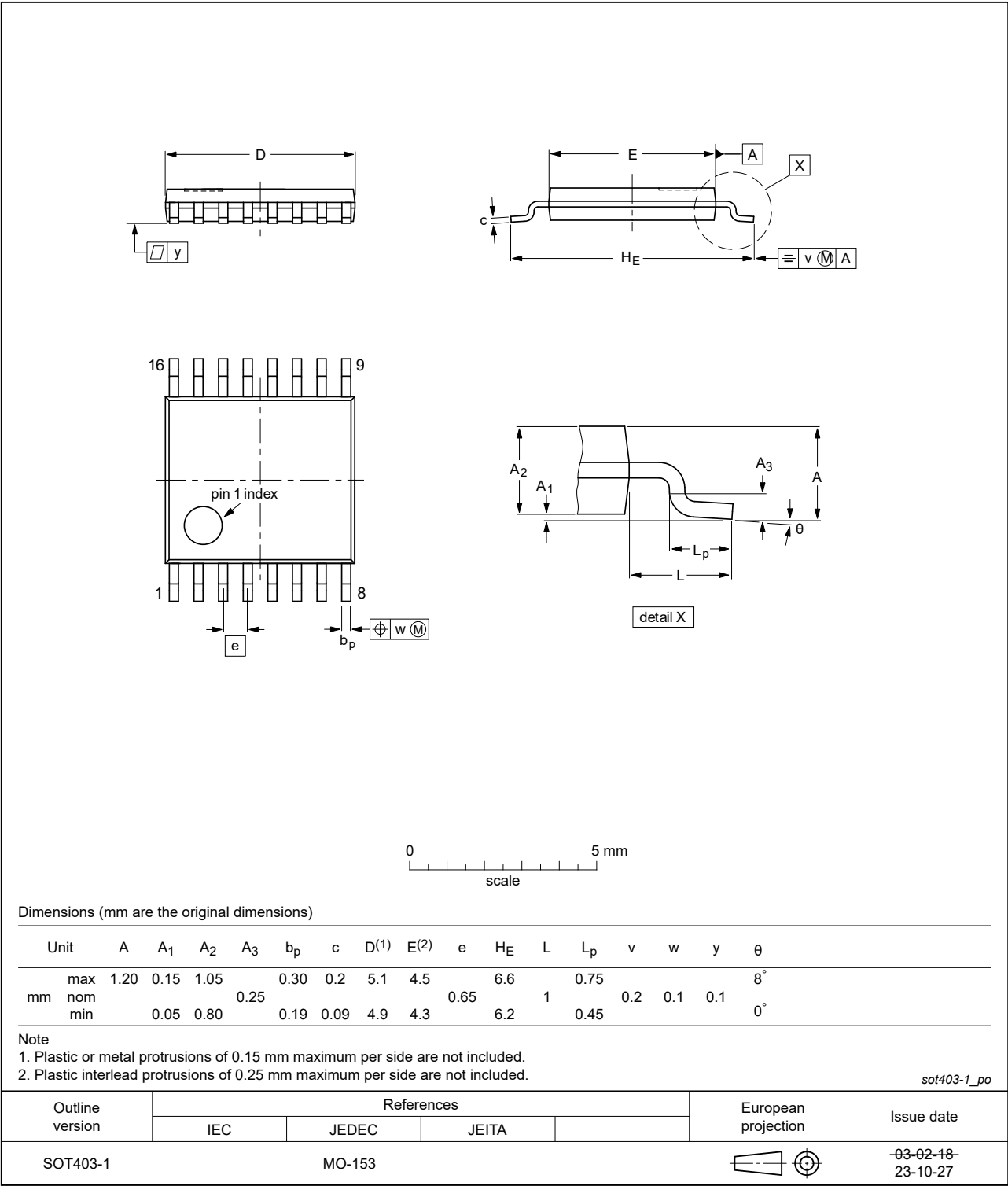


Fig. 21. Package outline SOT403-1 (TSSOP16)

12. Abbreviations

Table 12. Abbreviations

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

13. Revision history

Table 13. Revision history

| Document ID       | Release date  | Data sheet status  | Change notice | Supersedes        |
|-------------------|---|--------------------|---------------|-------------------|
| 74LV4052_Q100 v.5 | 20240329  | Product data sheet | -             | 74LV4052_Q100 v.4 |
| Modifications:    | <ul style="list-style-type: none"><li>Section 2: ESD specification updated according to the latest JEDEC standard.</li><li>Fig. 20 and Fig. 21: Aligned SO and TSSOP package outline drawings to JEDEC MS-012 and MO-153.</li></ul>   |                    |               |                   |
| 74LV4052_Q100 v.4 | 20210924  | Product data sheet | -             | 74LV4052_Q100 v.3 |
| Modifications:    | <ul style="list-style-type: none"><li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>Legal texts have been adapted to the new company name where appropriate.</li><li>Section 1 and Section 2 updated.</li><li>Section 7: Derating values for P<sub>tot</sub> total power dissipation updated.</li></ul> |                    |               |                   |
| 74LV4052_Q100 v.3 | 20151022  | Product data sheet | -             | 74LV4052_Q100 v.2 |
| Modifications:    | <ul style="list-style-type: none"><li>Descriptive title corrected (errata)</li></ul>  |                    |               |                   |
| 74LV4052_Q100 v.2 | 20140915  | Product data sheet | -             | 74LV4052_Q100 v.1 |
| Modifications:    | <ul style="list-style-type: none"><li>Section 2: ESD protection: MIL-STD-833 changed to MIL-STD883</li><li>Table 1: Typo in type number corrected.</li></ul>  |                    |               |                   |
| 74LV4052_Q100 v.1 | 20130722  | Product data sheet | -             | -                 |

## 14. Legal information

### Data sheet status

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

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
- [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 <https://www.nexperia.com>.

### 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.

### 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 an 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.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

**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.

### Trademarks

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

Contents

1. General description..... 1

2. Features and benefits..... 1

3. Ordering information..... 1

4. Functional diagram..... 2

5. Pinning information..... 3

5.1. Pinning..... 3

5.2. Pin description..... 3

6. Functional description..... 4

7. Limiting values..... 4

8. Recommended operating conditions..... 4

9. Static characteristics..... 5

9.1. Test circuits..... 6

9.2. ON resistance..... 6

9.3. On resistance test circuit and graph..... 7

10. Dynamic characteristics..... 8

10.1. Waveforms and test circuit..... 9

10.2. Additional dynamic parameters..... 10

10.2.1. Test circuits..... 11

11. Package outline..... 14

12. Abbreviations..... 16

13. Revision history..... 16

14. Legal information..... 17

© Nexperia B.V. 2024. All rights reserved

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)

Date of release: 29 March 2024