

# XS3A4052

## Low-ohmic dual-pole quad-throw analog switch

Rev. 1 — 11 February 2022

Product data sheet

### 1. General description

---

The XS3A4052 is a low-ohmic dual-pole quad-throw analog switch (DP4T), suitable for use as an analog or digital multiplexer/demultiplexer. 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 and S1) are common to both switches. When E is HIGH, the switches are turned off.

Schmitt trigger action at the digital inputs makes the circuit tolerant to slower input rise and fall times. Low threshold digital inputs allows this device to be driven by 1.8 V logic levels in 3.3 V applications without significant increase in supply current  $I_{CC}$ . This makes it possible for the XS3A4052 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation. The XS3A4052 allows signals with amplitude up to  $V_{CC}$  to be transmitted from  $nZ$  to  $nYn$  or from  $nYn$  to  $nZ$ . Its low ON resistance ( $0.5\ \Omega$ ) and flatness ( $0.13\ \Omega$ ) ensures minimal attenuation and distortion of transmitted signals.

### 2. Features and benefits

---

- Wide supply voltage range from 1.4 V to 4.3 V
- Very low ON resistance (peak):
  - $1.6\ \Omega$  (typical) at  $V_{CC} = 1.4\text{ V}$
  - $1.0\ \Omega$  (typical) at  $V_{CC} = 1.65\text{ V}$
  - $0.55\ \Omega$  (typical) at  $V_{CC} = 2.3\text{ V}$
  - $0.50\ \Omega$  (typical) at  $V_{CC} = 2.7\text{ V}$
  - $0.50\ \Omega$  (typical) at  $V_{CC} = 4.3\text{ V}$
- Break-before-make switching
- High noise immunity
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 exceeds 6000 V
  - CDM ANSI/ESDA/JEDEC JS-002 exceeds 1000 V
  - IEC61000-4-2 contact discharge exceeds 8000 V for switch ports
- CMOS low-power consumption
- Latch-up performance exceeds 100 mA per JESD78 Class II Level A
- Low-switching threshold levels
- Control input accepts voltages above supply voltage
- Very low supply current, even when input is below  $V_{CC}$
- High current handling capability (350 mA continuous current under 3.3 V supply)
- 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. Applications

---

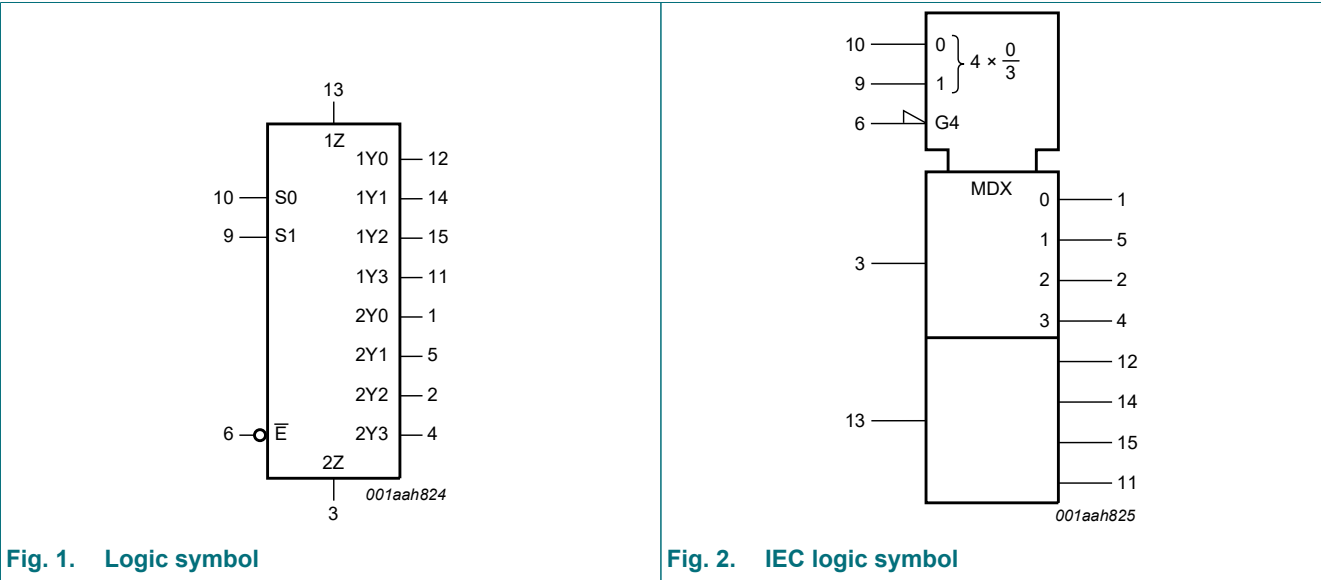
- Appliances
- Communication Systems
- Medical Equipment
- Analog Sensor Monitoring
- Audio Routing/Switching
- Test and Measurement

4. Ordering information

Table 1. Ordering information

| Type number | Package           |         |                                                                        |          |
|-------------|-------------------|---------|------------------------------------------------------------------------|----------|
|             | Temperature range | Name    | Description                                                            | Version  |
| XS3A4052PW  | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

5. Functional diagram



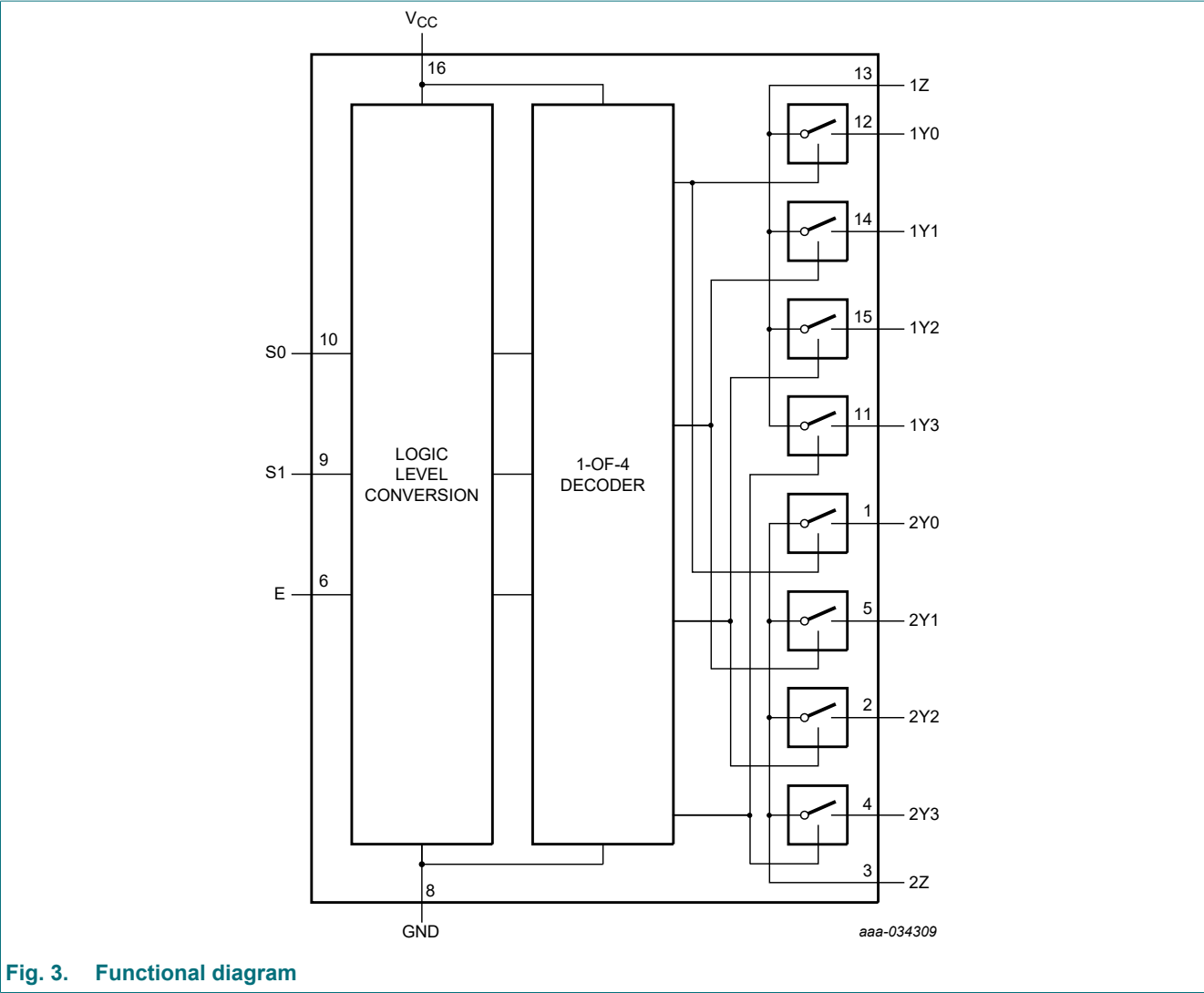
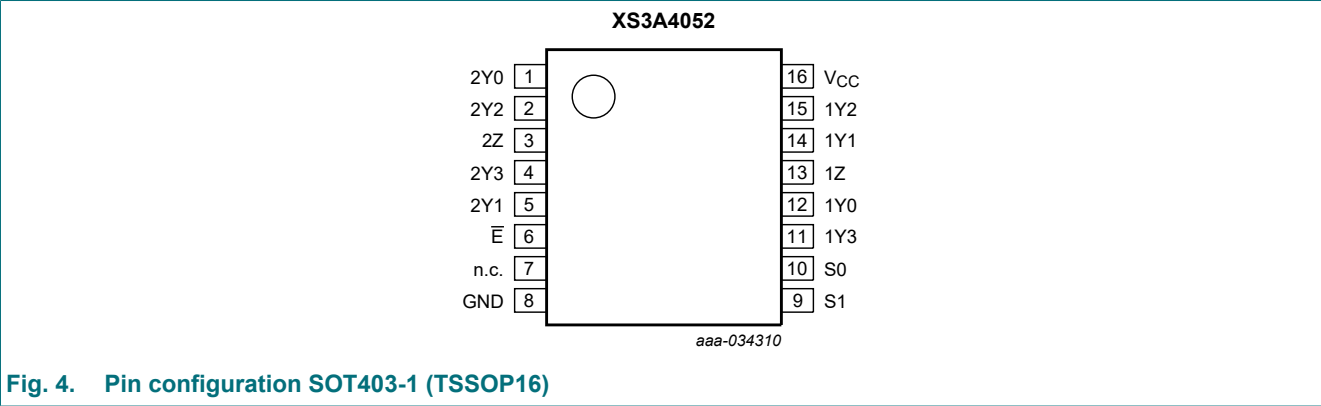


Fig. 3. Functional diagram

6. Pinning information

6.1. Pinning



6.2. Pin description

Table 2. Pin description

| Symbol             | Pin            | Description                 |
|--------------------|----------------|-----------------------------|
| 2Y0, 2Y1, 2Y2, 2Y3 | 1, 5, 2, 4     | independent input or output |
| 1Z, 2Z             | 13, 3          | common output or input      |
| $\overline{E}$     | 6              | enable input (active LOW)   |
| n.c.               | 7              | not connected               |
| GND                | 8              | ground supply voltage       |
| S0, S1             | 10, 9          | select input                |
| 1Y0, 1Y1, 1Y2, 1Y3 | 12, 14, 15, 11 | independent input or output |
| V <sub>CC</sub>    | 16             | supply voltage              |

## 7. 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 to nZ    |
| L     | L  | H  | nY1 to nZ    |
| L     | H  | L  | nY2 to nZ    |
| L     | H  | H  | nY3 to nZ    |
| H     | X  | X  | switches off |

## 8. 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 | +4.6           | V    |
| $V_I$     | input voltage           | $S_n$ and $\bar{E}$ inputs [1]                                                                                 | -0.5 | +4.6           | V    |
| $V_{SW}$  | switch voltage          | [2]                                                                                                            | -0.5 | $V_{CC} + 0.5$ | V    |
| $I_{IK}$  | input clamping current  | $V_I < -0.5$ V                                                                                                 | -50  | -              | mA   |
| $I_{SK}$  | switch clamping current | $V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V                                                                       | -    | $\pm 50$       | mA   |
| $I_{SW}$  | switch current          | $V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V;<br>source or sink current                                      | -    | $\pm 350$      | mA   |
|           |                         | $V_{SW} > -0.5$ V or $V_{SW} < V_{CC} + 0.5$ V;<br>pulsed at 1 ms duration, < 10 % duty cycle;<br>peak current | -    | $\pm 500$      | mA   |
| $T_{stg}$ | storage temperature     |                                                                                                                | -65  | +150           | °C   |
| $P_{tot}$ | total power dissipation | $T_{amb} = -40$ °C to +125 °C [3]                                                                              | -    | 500            | mW   |

[1] The minimum input voltage rating may be exceeded if the input current rating is observed.

[2] The minimum and maximum switch voltage ratings may be exceeded if the switch clamping current rating is observed but may not exceed 4.6 V.

[3] For SOT403-1 (TSSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.

## 9. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol              | Parameter                           | Conditions                                             | Min | Max      | Unit |
|---------------------|-------------------------------------|--------------------------------------------------------|-----|----------|------|
| $V_{CC}$            | supply voltage                      |                                                        | 1.4 | 4.3      | V    |
| $V_I$               | input voltage                       | Sn and $\bar{E}$ inputs                                | 0   | 4.3      | V    |
| $V_{SW}$            | switch voltage                      | [1]                                                    | 0   | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |                                                        | -40 | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | Sn and $\bar{E}$ inputs; $V_{CC} = 1.4$ V to 4.3 V [2] | -   | 200      | ns/V |

- [1] To avoid sinking GND current from terminal Z when switch current flows in terminal Yn, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no GND current will flow from terminal Yn. In this case, there is no limit for the voltage drop across the switch.
- [2] Applies to control signal levels.

## 10. Static characteristics

Table 6. Static characteristics

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

| Symbol       | Parameter                 | Conditions                                                                                     | $T_{amb} = 25\text{ °C}$ |     |          | $T_{amb} = -40\text{ °C to }+85\text{ °C}$ |           | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |            | Unit          |
|--------------|---------------------------|------------------------------------------------------------------------------------------------|--------------------------|-----|----------|--------------------------------------------|-----------|---------------------------------------------|------------|---------------|
|              |                           |                                                                                                | Min                      | Typ | Max      | Min                                        | Max       | Min                                         | Max        |               |
| $V_{IH}$     | HIGH-level input voltage  | $V_{CC} = 1.4$ V to 1.6 V                                                                      | 0.9                      | -   | -        | 0.9                                        | -         | 0.9                                         | -          | V             |
|              |                           | $V_{CC} = 1.65$ V to 1.95 V                                                                    | 0.9                      | -   | -        | 0.9                                        | -         | 0.9                                         | -          | V             |
|              |                           | $V_{CC} = 2.3$ V to 2.7 V                                                                      | 1.1                      | -   | -        | 1.1                                        | -         | 1.1                                         | -          | V             |
|              |                           | $V_{CC} = 2.7$ V to 3.6 V                                                                      | 1.3                      | -   | -        | 1.3                                        | -         | 1.3                                         | -          | V             |
|              |                           | $V_{CC} = 3.6$ V to 4.3 V                                                                      | 1.4                      | -   | -        | 1.4                                        | -         | 1.4                                         | -          | V             |
| $V_{IL}$     | LOW-level input voltage   | $V_{CC} = 1.4$ V to 1.6 V                                                                      | -                        | -   | 0.3      | -                                          | 0.3       | -                                           | 0.3        | V             |
|              |                           | $V_{CC} = 1.65$ V to 1.95 V                                                                    | -                        | -   | 0.4      | -                                          | 0.4       | -                                           | 0.3        | V             |
|              |                           | $V_{CC} = 2.3$ V to 2.7 V                                                                      | -                        | -   | 0.4      | -                                          | 0.4       | -                                           | 0.4        | V             |
|              |                           | $V_{CC} = 2.7$ V to 3.6 V                                                                      | -                        | -   | 0.5      | -                                          | 0.5       | -                                           | 0.5        | V             |
|              |                           | $V_{CC} = 3.6$ V to 4.3 V                                                                      | -                        | -   | 0.6      | -                                          | 0.6       | -                                           | 0.6        | V             |
| $I_I$        | input leakage current     | Sn and $\bar{E}$ inputs;<br>$V_I = \text{GND to } 4.3\text{ V}$ ;<br>$V_{CC} = 1.4$ V to 4.3 V | -                        | -   | -        | -                                          | $\pm 0.5$ | -                                           | $\pm 1$    | $\mu\text{A}$ |
| $I_{S(OFF)}$ | OFF-state leakage current | nYn port; see Fig. 5                                                                           |                          |     |          |                                            |           |                                             |            |               |
|              |                           | $V_{CC} = 1.4$ V to 3.6 V                                                                      | -                        | -   | $\pm 5$  | -                                          | $\pm 50$  | -                                           | $\pm 500$  | nA            |
|              |                           | $V_{CC} = 3.6$ V to 4.3 V                                                                      | -                        | -   | $\pm 10$ | -                                          | $\pm 50$  | -                                           | $\pm 500$  | nA            |
| $I_{S(ON)}$  | ON-state leakage current  | nZ port; see Fig. 6                                                                            |                          |     |          |                                            |           |                                             |            |               |
|              |                           | $V_{CC} = 1.4$ V to 3.6 V                                                                      | -                        | -   | $\pm 15$ | -                                          | $\pm 150$ | -                                           | $\pm 1500$ | nA            |
|              |                           | $V_{CC} = 3.6$ V to 4.3 V                                                                      | -                        | -   | $\pm 20$ | -                                          | $\pm 150$ | -                                           | $\pm 1500$ | nA            |
| $I_{CC}$     | supply current            | $V_I = V_{CC}$ or GND;<br>$V_{SW} = \text{GND or } V_{CC}$                                     |                          |     |          |                                            |           |                                             |            |               |
|              |                           | $V_{CC} = 3.6$ V                                                                               | -                        | -   | 100      | -                                          | 690       | -                                           | 6000       | nA            |
|              |                           | $V_{CC} = 4.3$ V                                                                               | -                        | -   | 150      | -                                          | 800       | -                                           | 7000       | nA            |

| 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 |      |
| $\Delta I_{CC}$     | additional supply current | V <sub>SW</sub> = GND or V <sub>CC</sub>        |                          |      |      |                                     |     |                                      |     |      |
|                     |                           | V <sub>I</sub> = 2.6 V; V <sub>CC</sub> = 4.3 V | -                        | 2.0  | 4.0  | -                                   | 7   | -                                    | 7   | μA   |
|                     |                           | V <sub>I</sub> = 2.6 V; V <sub>CC</sub> = 3.6 V | -                        | 0.35 | 0.7  | -                                   | 1   | -                                    | 1   | μA   |
|                     |                           | V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 4.3 V | -                        | 7.0  | 10.0 | -                                   | 15  | -                                    | 15  | μA   |
|                     |                           | V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 3.6 V | -                        | 2.5  | 4.0  | -                                   | 5   | -                                    | 5   | μA   |
|                     |                           | V <sub>I</sub> = 1.8 V; V <sub>CC</sub> = 2.5 V | -                        | 50   | 200  | -                                   | 300 | -                                    | 500 | nA   |
| C <sub>I</sub>      | input capacitance         | Sn and $\bar{E}$ inputs                         | -                        | 1.0  | -    | -                                   | -   | -                                    | -   | pF   |
| C <sub>S(OFF)</sub> | OFF-state capacitance     |                                                 | -                        | 35   | -    | -                                   | -   | -                                    | -   | pF   |
| C <sub>S(ON)</sub>  | ON-state capacitance      |                                                 | -                        | tbd  | -    | -                                   | -   | -                                    | -   | pF   |

Table 7. ON resistance

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Fig. 8 to Fig. 14.

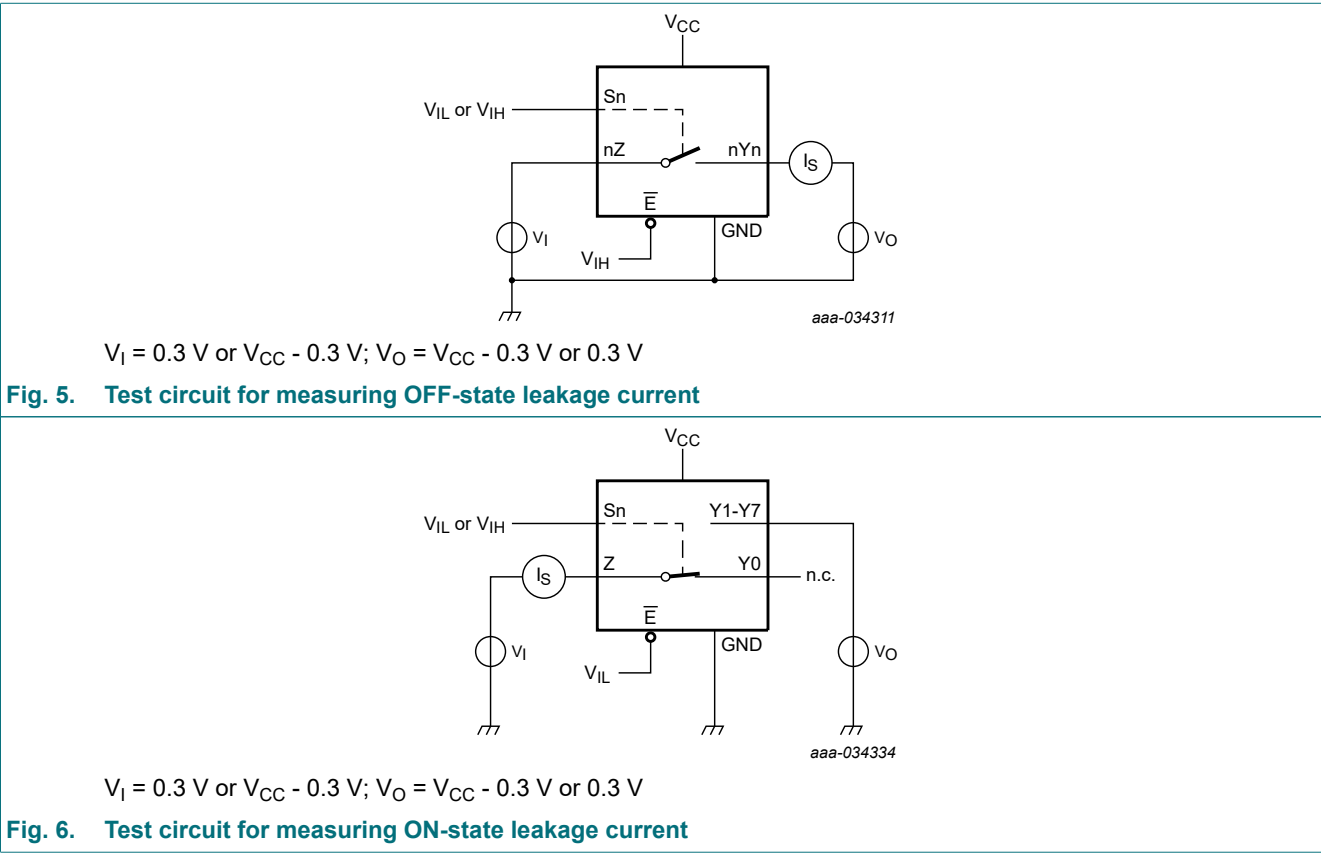
| Symbol                | Parameter                               | Conditions                                                                     | T <sub>amb</sub> = -40 °C to +85 °C |        |      | T <sub>amb</sub> = -40 °C to +125 °C |      | Unit |
|-----------------------|-----------------------------------------|--------------------------------------------------------------------------------|-------------------------------------|--------|------|--------------------------------------|------|------|
|                       |                                         |                                                                                | Min                                 | Typ[1] | Max  | Min                                  | Max  |      |
| R <sub>ON(peak)</sub> | ON resistance (peak)                    | V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA; see Fig. 7 |                                     |        |      |                                      |      |      |
|                       |                                         | V <sub>CC</sub> = 1.4 V                                                        | -                                   | 1.6    | 3.7  | -                                    | 4.1  | Ω    |
|                       |                                         | V <sub>CC</sub> = 1.65 V                                                       | -                                   | 1.0    | 1.6  | -                                    | 1.7  | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.3 V                                                        | -                                   | 0.55   | 0.8  | -                                    | 0.9  | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.7 V                                                        | -                                   | 0.5    | 0.75 | -                                    | 0.9  | Ω    |
|                       |                                         | V <sub>CC</sub> = 4.3 V                                                        | -                                   | 0.5    | 0.75 | -                                    | 0.9  | Ω    |
| ΔR <sub>ON</sub>      | ON resistance mismatch between channels | V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA [2]         |                                     |        |      |                                      |      |      |
|                       |                                         | V <sub>CC</sub> = 1.4 V; V <sub>SW</sub> = 0.4 V                               | -                                   | 0.07   | 0.3  | -                                    | 0.3  | Ω    |
|                       |                                         | V <sub>CC</sub> = 1.65 V; V <sub>SW</sub> = 0.5 V                              | -                                   | 0.06   | 0.2  | -                                    | 0.3  | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.3 V; V <sub>SW</sub> = 0.7 V                               | -                                   | 0.06   | 0.10 | -                                    | 0.13 | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.7 V; V <sub>SW</sub> = 0.8 V                               | -                                   | 0.06   | 0.10 | -                                    | 0.13 | Ω    |
|                       |                                         | V <sub>CC</sub> = 4.3 V; V <sub>SW</sub> = 0.8 V                               | -                                   | 0.06   | 0.10 | -                                    | 0.13 | Ω    |
| R <sub>ON(flat)</sub> | ON resistance (flatness)                | V <sub>I</sub> = GND to V <sub>CC</sub> ; I <sub>SW</sub> = 100 mA [3]         |                                     |        |      |                                      |      |      |
|                       |                                         | V <sub>CC</sub> = 1.4 V                                                        | -                                   | 1.0    | 3.3  | -                                    | 3.6  | Ω    |
|                       |                                         | V <sub>CC</sub> = 1.65 V                                                       | -                                   | 0.5    | 1.2  | -                                    | 1.3  | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.3 V                                                        | -                                   | 0.15   | 0.3  | -                                    | 0.35 | Ω    |
|                       |                                         | V <sub>CC</sub> = 2.7 V                                                        | -                                   | 0.13   | 0.3  | -                                    | 0.35 | Ω    |
|                       |                                         | V <sub>CC</sub> = 4.3 V                                                        | -                                   | 0.2    | 0.4  | -                                    | 0.45 | Ω    |

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

[2] Measured at identical V<sub>CC</sub>, temperature and input voltage.

[3] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V<sub>CC</sub> and temperature.

10.1. Test circuits and graphs



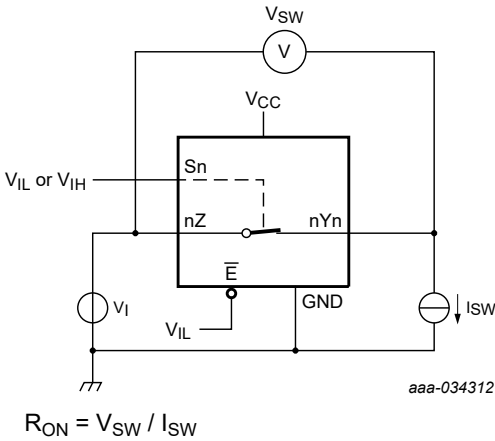


Fig. 7. Test circuit for measuring ON resistance

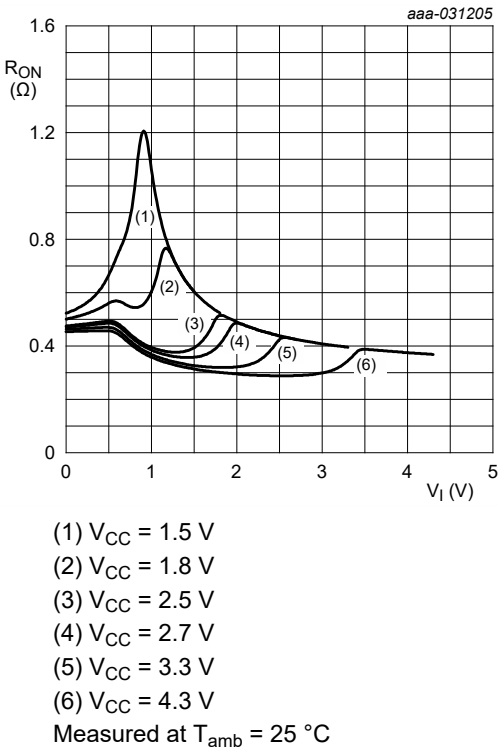


Fig. 8. Typical ON resistance as a function of input voltage

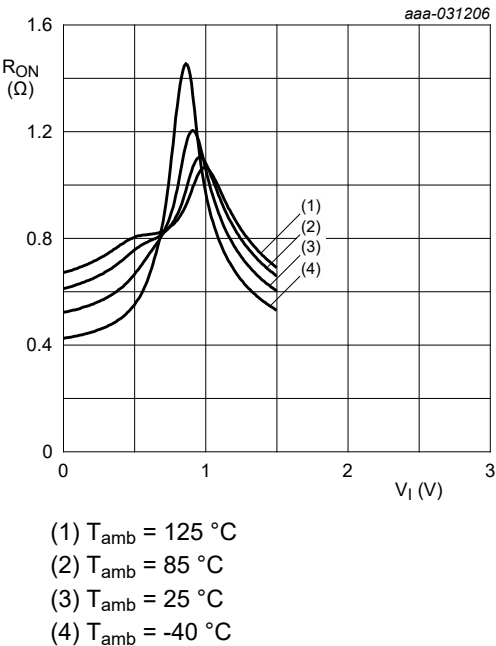


Fig. 9. ON resistance as a function of input voltage;  $V_{CC} = 1.5\text{ V}$

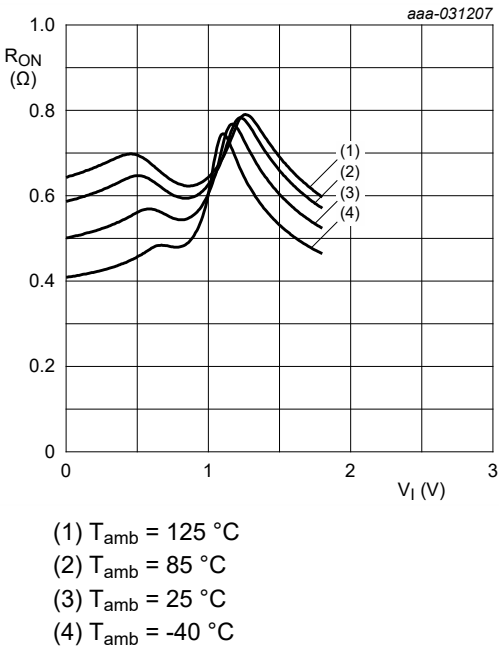


Fig. 10. ON resistance as a function of input voltage;  $V_{CC} = 1.8\text{ V}$

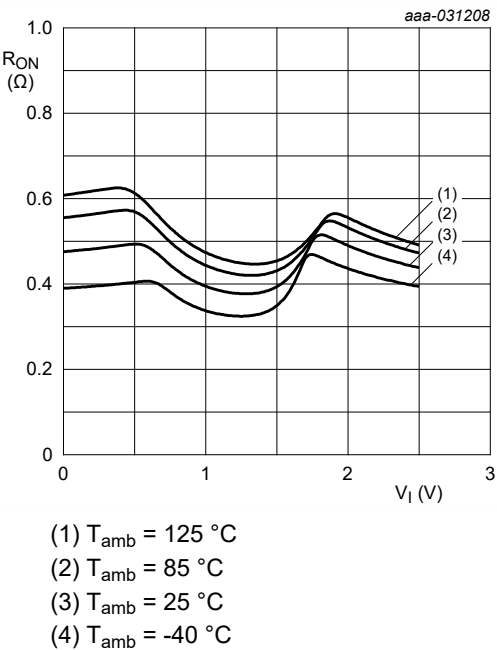


Fig. 11. ON resistance as a function of input voltage;  
 $V_{CC} = 2.5\text{ V}$

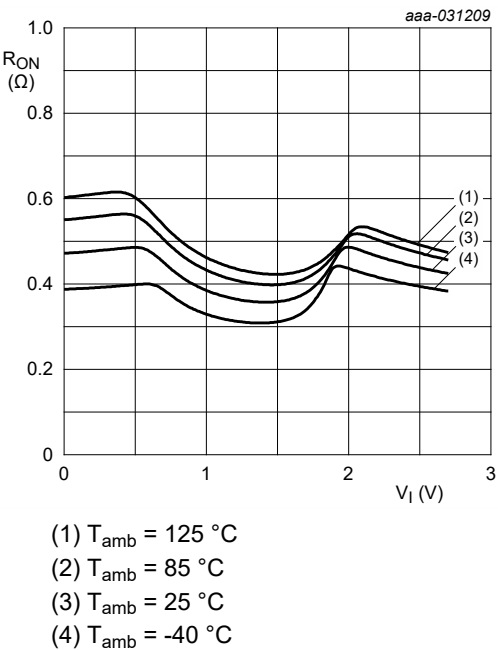


Fig. 12. ON resistance as a function of input voltage;  
 $V_{CC} = 2.7\text{ V}$

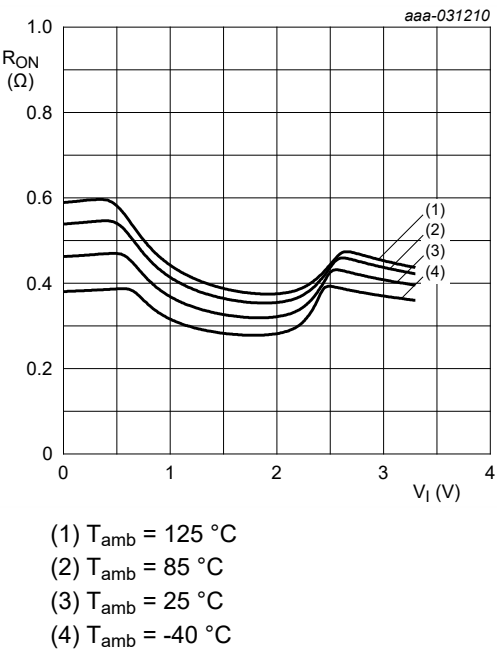


Fig. 13. ON resistance as a function of input voltage;  
 $V_{CC} = 3.3\text{ V}$

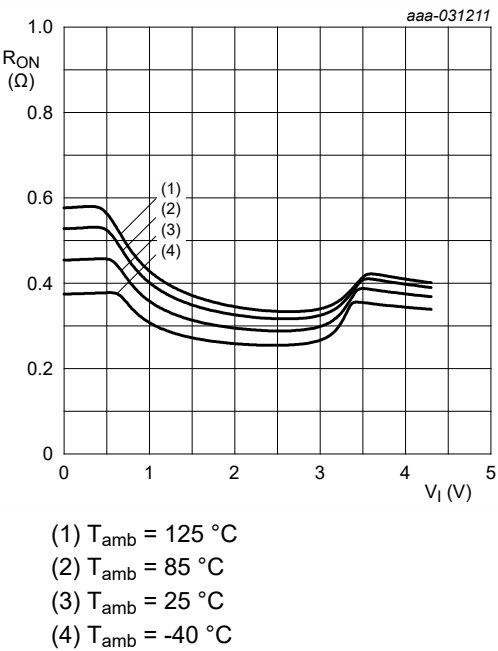


Fig. 14. ON resistance as a function of input voltage;  
 $V_{CC} = 4.3\text{ V}$

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

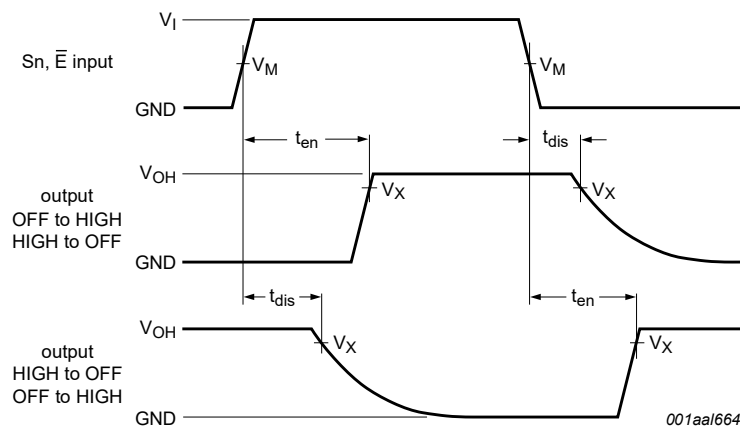
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 17.

| 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[1] | Max | Min                                 | Max | Min                                  | Max |      |
| t <sub>en</sub>  | enable time            | $\bar{E}$ , Sn to nZ or nYn; see Fig. 15 |                          |        |     |                                     |     |                                      |     |      |
|                  |                        | V <sub>CC</sub> = 1.4 V to 1.6 V         | -                        | 50     | 110 | -                                   | 120 | -                                    | 120 | ns   |
|                  |                        | V <sub>CC</sub> = 1.65 V to 1.95 V       | -                        | 36     | 70  | -                                   | 80  | -                                    | 90  | ns   |
|                  |                        | V <sub>CC</sub> = 2.3 V to 2.7 V         | -                        | 24     | 45  | -                                   | 50  | -                                    | 55  | ns   |
|                  |                        | V <sub>CC</sub> = 2.7 V to 3.6 V         | -                        | 22     | 40  | -                                   | 45  | -                                    | 50  | ns   |
|                  |                        | V <sub>CC</sub> = 3.6 V to 4.3 V         | -                        | 22     | 40  | -                                   | 45  | -                                    | 50  | ns   |
| t <sub>dis</sub> | disable time           | $\bar{E}$ , Sn to nZ or nYn; see Fig. 15 |                          |        |     |                                     |     |                                      |     |      |
|                  |                        | V <sub>CC</sub> = 1.4 V to 1.6 V         | -                        | 32     | 90  | -                                   | 90  | -                                    | 90  | ns   |
|                  |                        | V <sub>CC</sub> = 1.65 V to 1.95 V       | -                        | 20     | 55  | -                                   | 60  | -                                    | 65  | ns   |
|                  |                        | V <sub>CC</sub> = 2.3 V to 2.7 V         | -                        | 12     | 25  | -                                   | 30  | -                                    | 35  | ns   |
|                  |                        | V <sub>CC</sub> = 2.7 V to 3.6 V         | -                        | 10     | 20  | -                                   | 25  | -                                    | 30  | ns   |
|                  |                        | V <sub>CC</sub> = 3.6 V to 4.3 V         | -                        | 10     | 20  | -                                   | 25  | -                                    | 30  | ns   |
| t <sub>b-m</sub> | break-before-make time | see Fig. 16 [2]                          |                          |        |     |                                     |     |                                      |     |      |
|                  |                        | V <sub>CC</sub> = 1.4 V to 1.6 V         | -                        | 19     | -   | 9                                   | -   | 9                                    | -   | ns   |
|                  |                        | V <sub>CC</sub> = 1.65 V to 1.95 V       | -                        | 17     | -   | 7                                   | -   | 7                                    | -   | ns   |
|                  |                        | V <sub>CC</sub> = 2.3 V to 2.7 V         | -                        | 13     | -   | 4                                   | -   | 4                                    | -   | ns   |
|                  |                        | V <sub>CC</sub> = 2.7 V to 3.6 V         | -                        | 10     | -   | 3                                   | -   | 3                                    | -   | ns   |
|                  |                        | V <sub>CC</sub> = 3.6 V to 4.3 V         | -                        | 10     | -   | 2                                   | -   | 2                                    | -   | ns   |

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.5 V, 1.8 V, 2.5 V, 3.3 V and 4.3 V respectively.

[2] Break-before-make guaranteed by design.

### 11.1. Waveforms and test circuit



Measurement points are given in Table 9.

Logic level: V<sub>OH</sub> is typical output voltage level that occurs with the output load.

**Fig. 15. Enable and disable times**

Table 9. Measurement points

| Supply voltage | Input       | Output      |
|----------------|-------------|-------------|
| $V_{CC}$       | $V_M$       | $V_X$       |
| 1.4 V to 4.3 V | $0.5V_{CC}$ | $0.9V_{OH}$ |

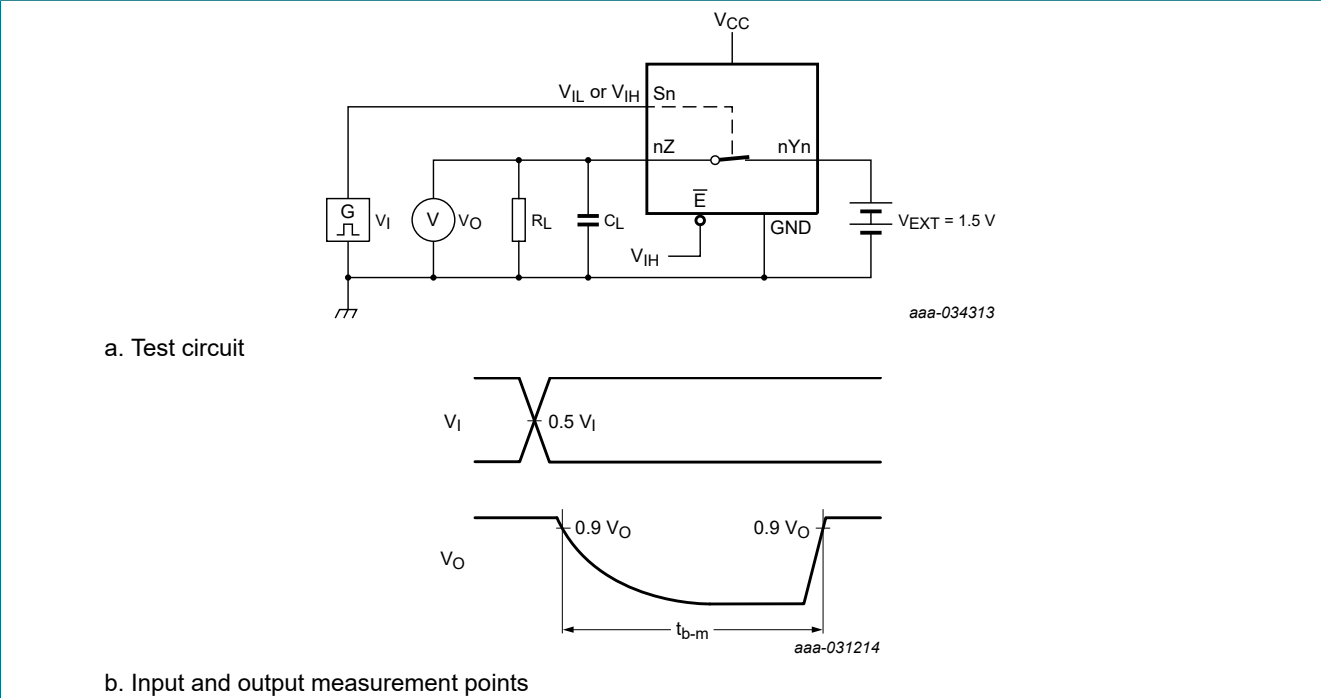


Fig. 16. Test circuit for measuring break-before-make times

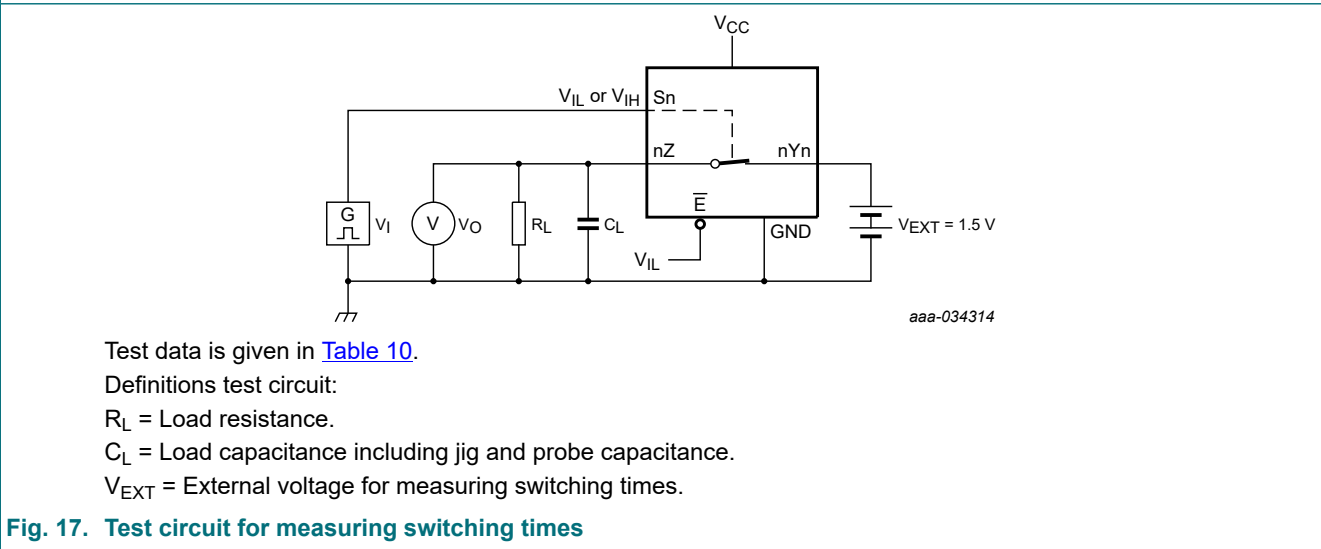


Fig. 17. Test circuit for measuring switching times

Table 10. Test data

| Supply voltage | Input    |                       | Load  |             |
|----------------|----------|-----------------------|-------|-------------|
| $V_{CC}$       | $V_I$    | $t_r, t_f$            | $C_L$ | $R_L$       |
| 1.4 V to 4.3 V | $V_{CC}$ | $\leq 2.5 \text{ ns}$ | 35 pF | 50 $\Omega$ |

## 11.2. Additional dynamic characteristics

**Table 11. Additional dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V);  
 $V_I = \text{GND}$  or  $V_{CC}$  (unless otherwise specified);  $t_r = t_f \leq 2.5 \text{ ns}$ .

| Symbol                | Parameter                 | Conditions                                                                                                                                                           | $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$ |      |     | Unit |
|-----------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|------|-----|------|
|                       |                           |                                                                                                                                                                      | Min                                            | Typ  | Max |      |
| THD                   | total harmonic distortion | $f_i = 20 \text{ Hz to } 20 \text{ kHz}$ ; $R_L = 32 \text{ } \Omega$ ; see Fig. 18 [1]                                                                              |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V}$ ; $V_I = 1 \text{ V (p-p)}$                                                                                                                 | -                                              | 0.17 | -   | %    |
|                       |                           | $V_{CC} = 1.65 \text{ V}$ ; $V_I = 1.2 \text{ V (p-p)}$                                                                                                              | -                                              | 0.10 | -   | %    |
|                       |                           | $V_{CC} = 2.3 \text{ V}$ ; $V_I = 1.5 \text{ V (p-p)}$                                                                                                               | -                                              | 0.05 | -   | %    |
|                       |                           | $V_{CC} = 2.7 \text{ V}$ ; $V_I = 2 \text{ V (p-p)}$                                                                                                                 | -                                              | 0.04 | -   | %    |
|                       |                           | $V_{CC} = 4.3 \text{ V}$ ; $V_I = 2 \text{ V (p-p)}$                                                                                                                 | -                                              | 0.01 | -   | %    |
| $f_{(-3\text{dB})}$   | -3 dB frequency response  | $R_L = 50 \text{ } \Omega$ ; see Fig. 19 [1]                                                                                                                         |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$                                                                                                                           | -                                              | 25   | -   | MHz  |
| $\alpha_{\text{iso}}$ | isolation (OFF-state)     | $f_i = 100 \text{ kHz}$ ; $R_L = 50 \text{ } \Omega$ ; see Fig. 20 [1]                                                                                               |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$                                                                                                                           | -                                              | -90  | -   | dB   |
| $V_{\text{ct}}$       | crosstalk voltage         | between digital inputs and switch; $f_i = 1 \text{ MHz}$ ; $C_L = 50 \text{ pF}$ ; $R_L = 50 \text{ } \Omega$ ; see Fig. 21 [1]                                      |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$                                                                                                                           | -                                              | 0.2  | -   | V    |
|                       |                           | $V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$                                                                                                                           | -                                              | 0.4  | -   | V    |
| Xtalk                 | crosstalk                 | between switches; $f_i = 100 \text{ kHz}$ ; $R_L = 50 \text{ } \Omega$ ; see Fig. 22 [1]                                                                             |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$                                                                                                                           | -                                              | -90  | -   | dB   |
| $Q_{\text{inj}}$      | charge injection          | $f_i = 1 \text{ MHz}$ ; $C_L = 0.1 \text{ nF}$ ; $R_L = 1 \text{ M}\Omega$ ; $V_{\text{gen}} = 0 \text{ V}$ ; $R_{\text{gen}} = 0 \text{ } \Omega$ ; see Fig. 23 [1] |                                                |      |     |      |
|                       |                           | $V_{CC} = 1.5 \text{ V}$                                                                                                                                             | -                                              | 3    | -   | pC   |
|                       |                           | $V_{CC} = 1.8 \text{ V}$                                                                                                                                             | -                                              | 4    | -   | pC   |
|                       |                           | $V_{CC} = 2.5 \text{ V}$                                                                                                                                             | -                                              | 6    | -   | pC   |
|                       |                           | $V_{CC} = 3.3 \text{ V}$                                                                                                                                             | -                                              | 9    | -   | pC   |
|                       |                           | $V_{CC} = 4.3 \text{ V}$                                                                                                                                             | -                                              | 15   | -   | pC   |

[1]  $f_i$  is biased at  $0.5V_{CC}$ .

11.3. Additional test circuits

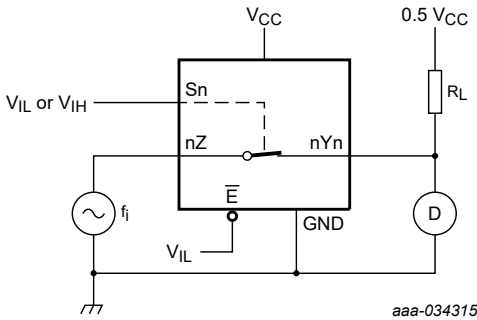
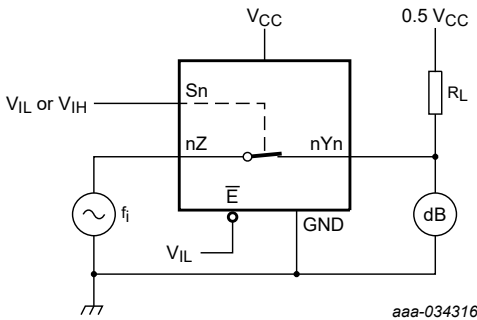
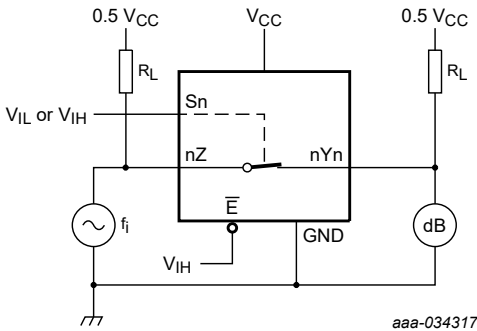


Fig. 18. Test circuit for measuring total harmonic distortion



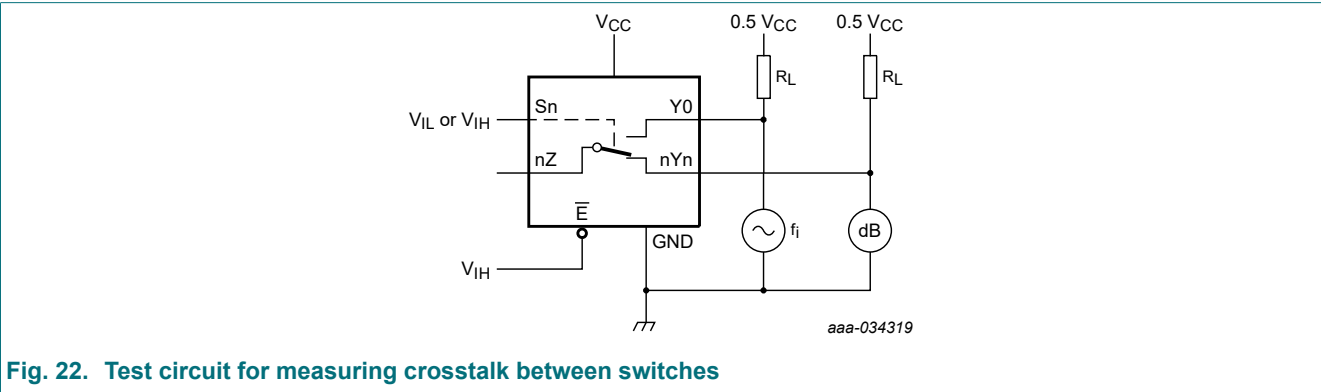
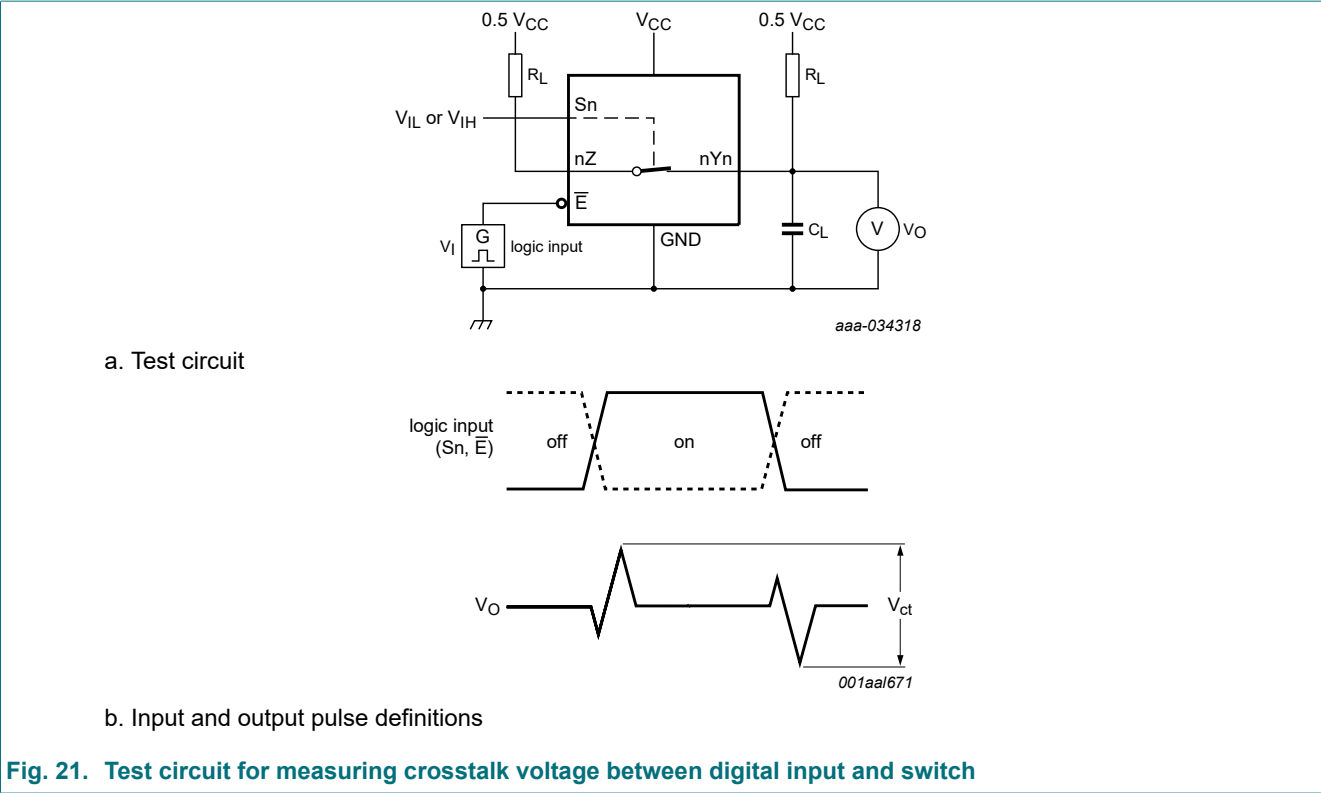
Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.  
 $R_S = R_L = 50 \, \Omega$  (standard 50  $\Omega$  system).

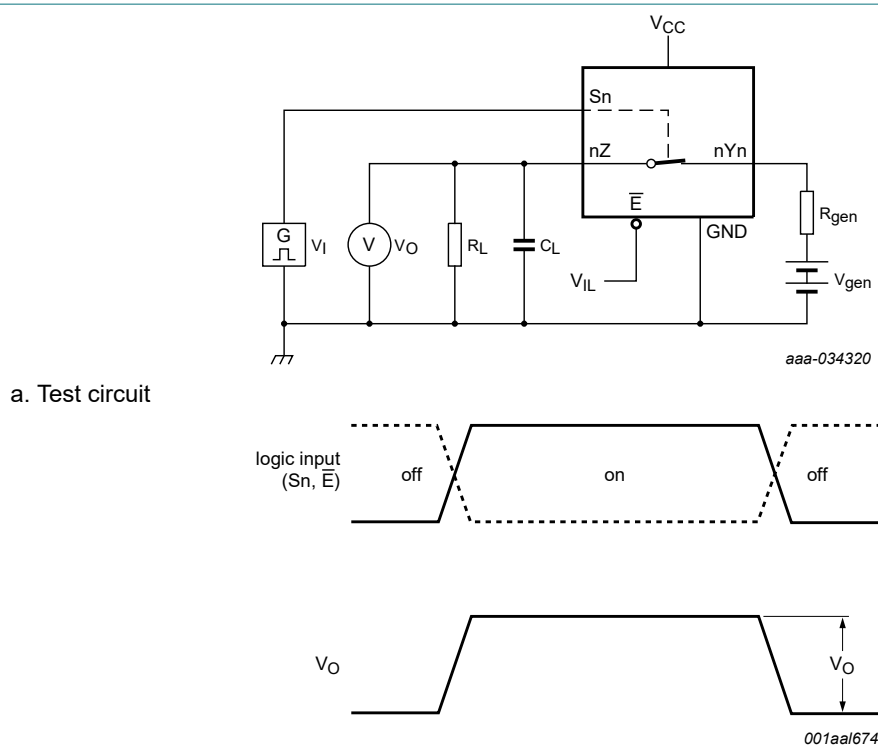
Fig. 19. Test circuit for measuring the frequency response when channel is in ON-state



Adjust  $f_i$  voltage to obtain 0 dBm level at input.

Fig. 20. Test circuit for measuring isolation (OFF-state)





b. Input and output pulse definitions

$$Q_{inj} = \Delta V_O \times C_L.$$

$\Delta V_O$  = output voltage variation.

$R_{gen}$  = generator resistance.

$V_{gen}$  = generator voltage.

**Fig. 23. Test circuit for measuring charge injection**

12. Package outline

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

SOT403-1

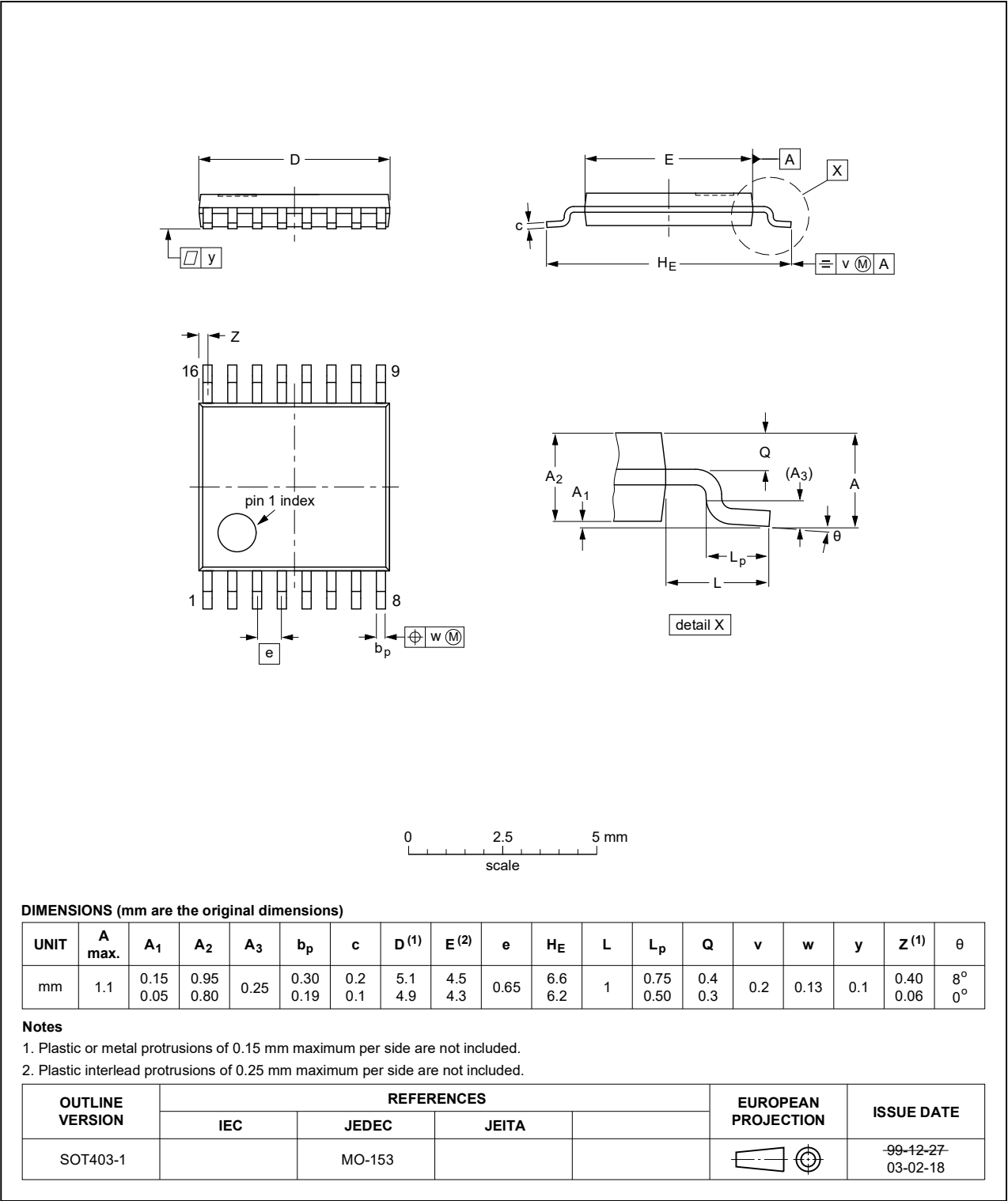


Fig. 24. Package outline SOT403-1 (TSSOP16)

## 13. Abbreviations

Table 12. Abbreviations

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

## 14. Revision history

Table 13. Revision history

| Document ID  | Release date | Data sheet status  | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| XS3A4052 v.1 | 20220211     | Product data sheet | -             | -          |

## 15. 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** — Nexperia products are 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.

**Non-automotive qualified products** — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

**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

|                                                 |           |
|-------------------------------------------------|-----------|
| <b>1. General description.....</b>              | <b>1</b>  |
| <b>2. Features and benefits.....</b>            | <b>1</b>  |
| <b>3. Applications.....</b>                     | <b>1</b>  |
| <b>4. Ordering information.....</b>             | <b>2</b>  |
| <b>5. Functional diagram.....</b>               | <b>2</b>  |
| <b>6. Pinning information.....</b>              | <b>4</b>  |
| 6.1. Pinning.....                               | 4         |
| 6.2. Pin description.....                       | 4         |
| <b>7. Functional description.....</b>           | <b>5</b>  |
| <b>8. Limiting values.....</b>                  | <b>5</b>  |
| <b>9. Recommended operating conditions.....</b> | <b>6</b>  |
| <b>10. Static characteristics.....</b>          | <b>6</b>  |
| 10.1. Test circuits and graphs.....             | 8         |
| <b>11. Dynamic characteristics.....</b>         | <b>11</b> |
| 11.1. Waveforms and test circuit.....           | 11        |
| 11.2. Additional dynamic characteristics.....   | 13        |
| 11.3. Additional test circuits.....             | 14        |
| <b>12. Package outline.....</b>                 | <b>17</b> |
| <b>13. Abbreviations.....</b>                   | <b>18</b> |
| <b>14. Revision history.....</b>                | <b>18</b> |
| <b>15. Legal information.....</b>               | <b>19</b> |

© Nexperia B.V. 2022. 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: 11 February 2022