

# NX3L4357

## Low-ohmic single-pole triple-throw analog switch with enable input

Rev. 4 — 7 November 2011

Product data sheet

### 1. General description

The NX3L4357 is a low-ohmic single-pole triple-throw analog switch suitable for use as an analog or digital 3:1 multiplexer/demultiplexer. It has two digital select inputs (S0 and S1), one digital enable input ( $\bar{E}$ ), three independent inputs/outputs (Y0, Y1 and Y2) and a common input/output (Z). The device features a broadcast mode, when S0 and S1 are both high the signal applied to pin Z is passed to Y0, Y1 and Y2.

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 NX3L4357 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation. The NX3L4357 allows signals with amplitude up to  $V_{CC}$  to be transmitted from Z to Yn or Yn to Z. 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):
  - ◆ 1.65  $\Omega$  (typical) at  $V_{CC} = 1.4$  V
  - ◆ 0.95  $\Omega$  (typical) at  $V_{CC} = 1.65$  V
  - ◆ 0.55  $\Omega$  (typical) at  $V_{CC} = 2.3$  V
  - ◆ 0.50  $\Omega$  (typical) at  $V_{CC} = 2.7$  V
  - ◆ 0.50  $\Omega$  (typical) at  $V_{CC} = 4.3$  V
- Break-before-make switching
- High noise immunity
- ESD protection:
  - ◆ HBM JESD22-A114F Class 3A exceeds 7500 V
  - ◆ MM JESD22-A115-A exceeds 200 V
  - ◆ CDM AEC-Q100-011 revision B exceeds 1000 V
  - ◆ IEC61000-4-2 contact discharge exceeds 6000 V for switch ports
- CMOS low-power consumption
- Latch-up performance exceeds 100 mA per JESD 78B Class II Level A
- 1.8 V control logic at  $V_{CC} = 3.6$  V
- 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  $-40$  °C to  $+85$  °C and from  $-40$  °C to  $+125$  °C



### 3. Applications

- Cell phone
- PDA
- Portable media player

### 4. Ordering information

Table 1. Ordering information

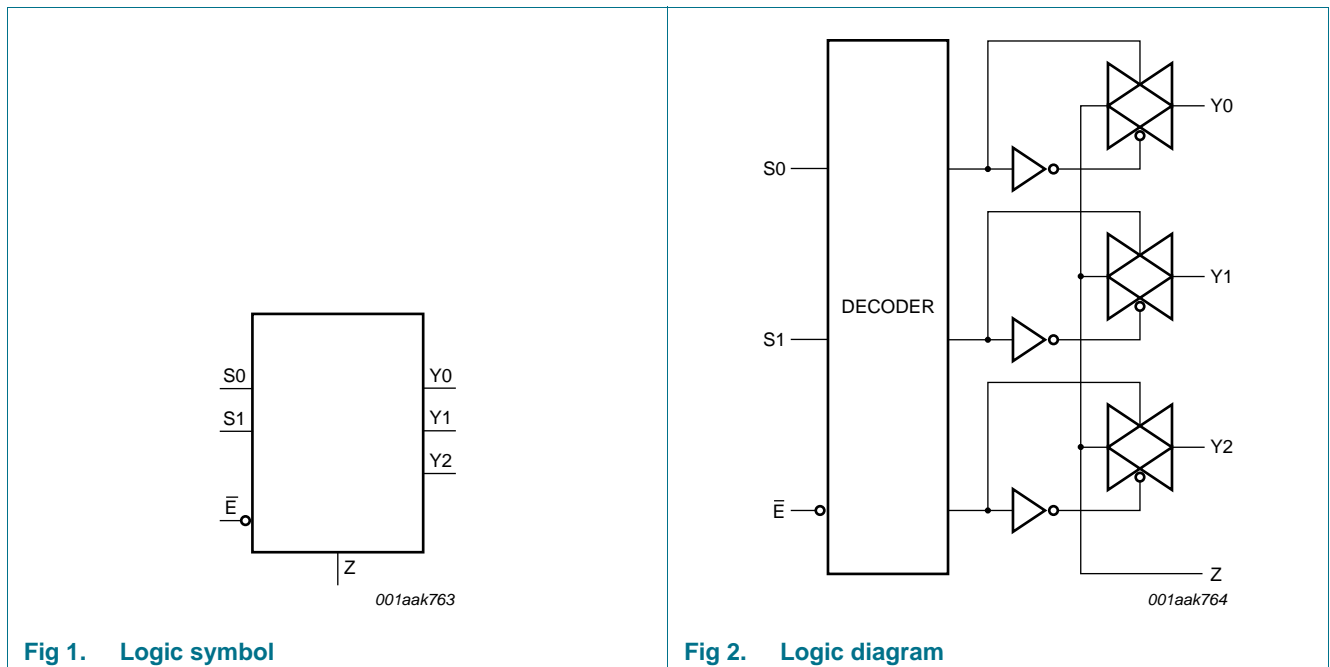
| Type number | Package           |         |  | Version   |
|-------------|-------------------|---------|--|-----------|
|             | Temperature range | Name    | Description  |           |
| NX3L4357GM  | -40 °C to +125 °C | XQFN10U | plastic extremely thin quad flat package; no leads; 10 terminals; UTLP based; body 2 × 1.55 × 0.5 mm | SOT1049-2 |

### 5. Marking

Table 2. Marking

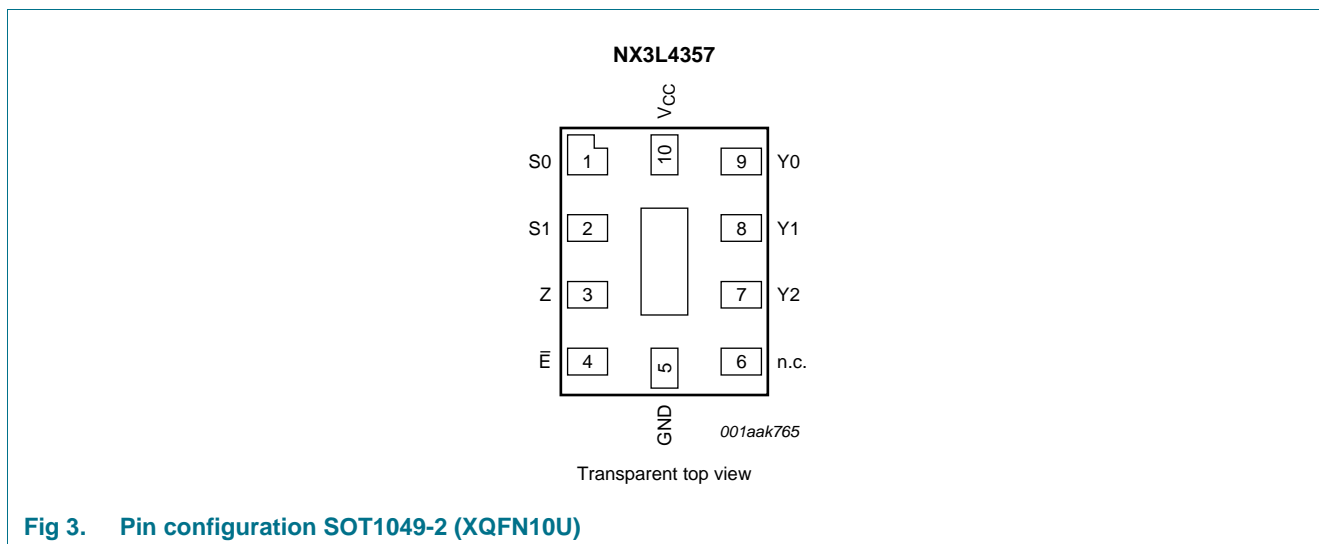
| Type number | Marking code |
|-------------|--------------|
| NX3L4357GM  | D43          |

### 6. Functional diagram



## 7. Pinning information

### 7.1 Pinning



### 7.2 Pin description

**Table 3. Pin description**

| Symbol          | Pin | Description                 |
|-----------------|-----|-----------------------------|
| S0              | 1   | select input                |
| S1              | 2   | select input                |
| Z               | 3   | common output or input      |
| E̅              | 4   | enable input (active LOW)   |
| GND             | 5   | ground (0 V)                |
| n.c.            | 6   | not connected               |
| Y2              | 7   | independent input or output |
| Y1              | 8   | independent input or output |
| Y0              | 9   | independent input or output |
| V <sub>CC</sub> | 10  | supply voltage              |

## 8. Functional description

Table 4. Function table<sup>[1]</sup>

| $\bar{E}$ | S1 | S0 | Channel on                      |
|-----------|----|----|---------------------------------|
| L         | L  | L  | Y0 = Z                          |
| L         | L  | H  | Y1 = Z                          |
| L         | H  | L  | Y2 = Z                          |
| L         | H  | H  | Y0, Y1, Y2 = Z (broadcast mode) |
| H         | X  | X  | switches off                    |

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

## 9. Limiting values

Table 5. 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           | select input S0, S1 and $\bar{E}$  | <sup>[1]</sup> -0.5 | +4.6           | V    |
| $V_{SW}$  | switch voltage          |  | <sup>[2]</sup> -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  | <sup>[3]</sup> -    | 250            | 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 XQFN10U packages: above 132 °C the value of  $P_{tot}$  derates linearly with 14.1 mW/K.

## 10. Recommended operating conditions

**Table 6. Recommended operating conditions**

| Symbol              | Parameter                           | Conditions                              | Min   | Max      | Unit |
|---------------------|-------------------------------------|---|-------|----------|------|
| $V_{CC}$            | supply voltage                      |   | 1.4   | 4.3      | V    |
| $V_I$               | input voltage                       | select input S0, S1 and $\bar{E}$       | 0     | 4.3      | V    |
| $V_{SW}$            | switch voltage                      | switch input Y0, Y1 and Y2              | [1] 0 | $V_{CC}$ | V    |
| $T_{amb}$           | ambient temperature                 |   | -40   | +125     | °C   |
| $\Delta t/\Delta V$ | input transition rise and fall rate | $V_{CC} = 1.4\text{ V to }4.3\text{ V}$ | [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 select input Sn signal levels.

## 11. Static characteristics

**Table 7. Static characteristics**

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

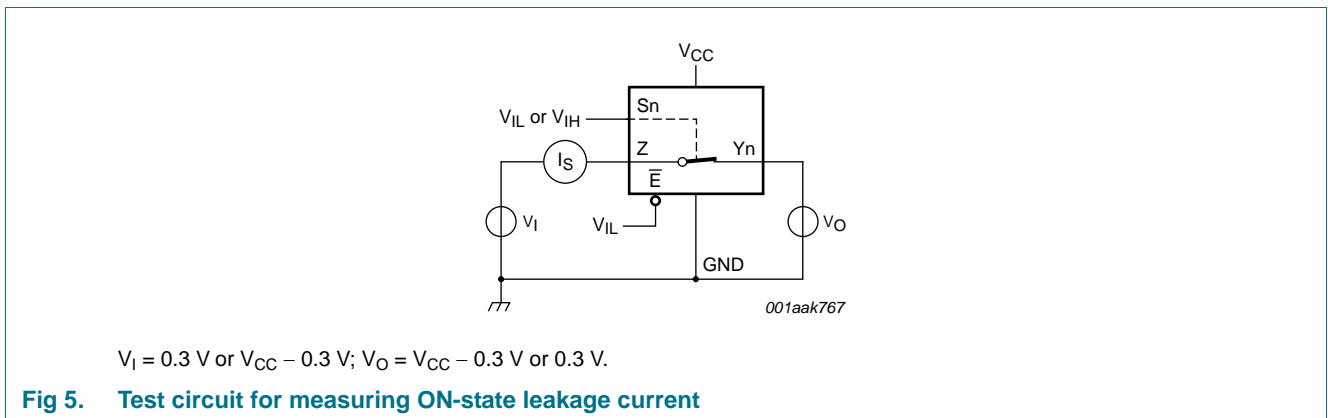
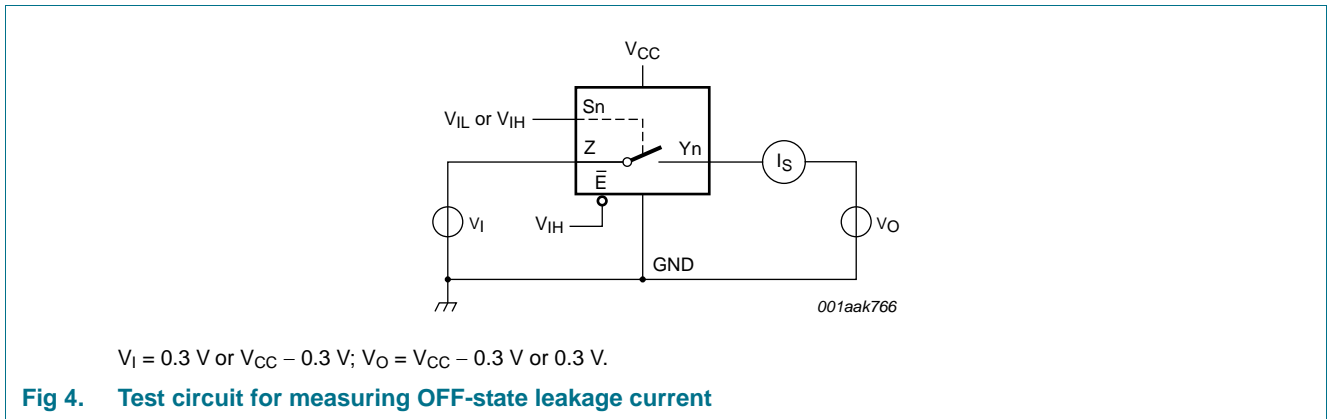
| Symbol       | Parameter                 | Conditions   | $T_{amb} = 25\text{ °C}$ |     |          | $T_{amb} = -40\text{ °C to }+125\text{ °C}$ |             |              | Unit          |
|--------------|---------------------------|--|--------------------------|-----|----------|---|-------------|--------------|---------------|
|              |                           |  | Min                      | Typ | Max      | Min   | Max (85 °C) | Max (125 °C) |               |
| $V_{IH}$     | HIGH-level input voltage  | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$  | 0.9                      | -   | -        | 0.9   | -           | -            | V             |
|              |                           | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$  | 0.9                      | -   | -        | 0.9   | -           | -            | V             |
|              |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$  | 1.1                      | -   | -        | 1.1   | -           | -            | V             |
|              |                           | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$  | 1.3                      | -   | -        | 1.3   | -           | -            | V             |
|              |                           | $V_{CC} = 3.6\text{ V to }4.3\text{ V}$  | 1.4                      | -   | -        | 1.4   | -           | -            | V             |
| $V_{IL}$     | LOW-level input voltage   | $V_{CC} = 1.4\text{ V to }1.6\text{ V}$  | -                        | -   | 0.3      | -   | 0.3         | 0.3          | V             |
|              |                           | $V_{CC} = 1.65\text{ V to }1.95\text{ V}$  | -                        | -   | 0.4      | -   | 0.4         | 0.3          | V             |
|              |                           | $V_{CC} = 2.3\text{ V to }2.7\text{ V}$  | -                        | -   | 0.5      | -   | 0.5         | 0.4          | V             |
|              |                           | $V_{CC} = 2.7\text{ V to }3.6\text{ V}$  | -                        | -   | 0.5      | -   | 0.5         | 0.5          | V             |
|              |                           | $V_{CC} = 3.6\text{ V to }4.3\text{ V}$  | -                        | -   | 0.6      | -   | 0.6         | 0.6          | V             |
| $I_I$        | input leakage current     | select input S0, S1 and $\bar{E}$ ;<br>$V_I = \text{GND to }4.3\text{ V}$ ;<br>$V_{CC} = 1.4\text{ V to }4.3\text{ V}$ | -                        | -   | -        | -   | $\pm 0.5$   | $\pm 1$      | $\mu\text{A}$ |
| $I_{S(OFF)}$ | OFF-state leakage current | port Y0, Y1 and Y2;<br>see <a href="#">Figure 4</a>  |                          |     |          |   |             |              |               |
|              |                           | $V_{CC} = 1.4\text{ V to }3.6\text{ V}$  | -                        | -   | $\pm 5$  | -   | $\pm 10$    | $\pm 100$    | nA            |
|              |                           | $V_{CC} = 3.6\text{ V to }4.3\text{ V}$  | -                        | -   | $\pm 10$ | -   | $\pm 50$    | $\pm 200$    | nA            |
| $I_{S(ON)}$  | ON-state leakage current  | Z port; see <a href="#">Figure 5</a>   |                          |     |          |   |             |              |               |
|              |                           | $V_{CC} = 1.4\text{ V to }3.6\text{ V}$  | -                        | -   | $\pm 5$  | -   | $\pm 20$    | $\pm 200$    | nA            |
|              |                           | $V_{CC} = 3.6\text{ V to }4.3\text{ V}$  | -                        | -   | $\pm 10$ | -   | $\pm 50$    | $\pm 400$    | nA            |
| $I_{CC}$     | supply current            | $V_I = V_{CC}$ or GND;<br>$V_{SW} = \text{GND or }V_{CC}$  |                          |     |          |   |             |              |               |
|              |                           | $V_{CC} = 3.6\text{ V}$  | -                        | -   | 100      | -   | 300         | 3000         | nA            |
|              |                           | $V_{CC} = 4.3\text{ V}$  | -                        | -   | 150      | -   | 500         | 5000         | nA            |

**Table 7. Static characteristics ...continued**

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

| Symbol              | Parameter                 | Conditions                                      | T <sub>amb</sub> = 25 °C |      |      | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |
|---------------------|---------------------------|---|--------------------------|------|------|--------------------------------------|-------------|--------------|------|
|                     |                           |   | Min                      | Typ  | Max  | Min                                  | Max (85 °C) | Max (125 °C) |      |
| ΔI <sub>CC</sub>    | 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         |   | -                        | 1.0  | -    | -                                    | -           | -            | pF   |
| C <sub>S(OFF)</sub> | OFF-state capacitance     | port Y0, Y1 and Y2                              | -                        | 35   | -    | -                                    | -           | -            | pF   |
| C <sub>S(ON)</sub>  | ON-state capacitance      | port Z; broadcast mode                          | -                        | 330  | -    | -                                    | -           | -            | pF   |
|                     |                           | port Y0, Y1 and Y2                              | -                        | 170  | -    | -                                    | -           | -            | pF   |

**11.1 Test circuits**



## 11.2 ON resistance

**Table 8. ON resistance**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see [Figure 7](#) to [Figure 13](#).

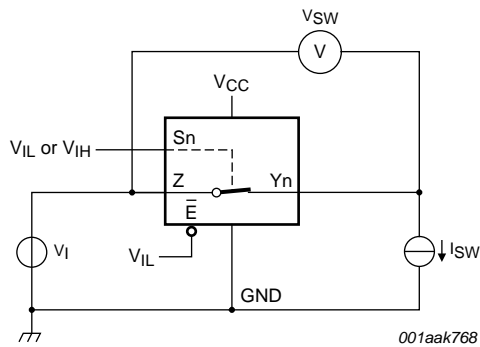
| Symbol                | Parameter                               | Conditions  | T <sub>amb</sub> = -40 °C to +85 °C |                    |      | T <sub>amb</sub> = -40 °C to +125 °C |     | Unit |   |
|-----------------------|---|---|-------------------------------------|--------------------|------|--------------------------------------|-----|------|---|
|                       |   |   | Min                                 | Typ <sup>[1]</sup> | Max  | Min                                  | Max |      |   |
| R <sub>ON(peak)</sub> | ON resistance (peak)                    | port Y0, Y1 and Y2;<br>V <sub>I</sub> = GND to V <sub>CC</sub> ;<br>I <sub>SW</sub> = 100 mA;<br>see <a href="#">Figure 6</a> | 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> ;<br>I <sub>SW</sub> = 100 mA   |                                     |                    |      |                                      |     |      |   |
|                       |   |   | V <sub>CC</sub> = 1.4 V             | -                  | 0.20 | 0.35                                 | -   | 0.35 | Ω |
|                       |   |   | V <sub>CC</sub> = 1.65 V            | -                  | 0.20 | 0.25                                 | -   | 0.30 | Ω |
|                       |   |   | V <sub>CC</sub> = 2.3 V             | -                  | 0.09 | 0.13                                 | -   | 0.15 | Ω |
|                       |   |   | V <sub>CC</sub> = 2.7 V             | -                  | 0.09 | 0.13                                 | -   | 0.15 | Ω |
|                       |   |   | V <sub>CC</sub> = 4.3 V             | -                  | 0.09 | 0.13                                 | -   | 0.15 | Ω |
| R <sub>ON(flat)</sub> | ON resistance (flatness)                | port Y0, Y1 and Y2; <a href="#">[3]</a><br>V <sub>I</sub> = GND to V <sub>CC</sub> ;<br>I <sub>SW</sub> = 100 mA              | V <sub>CC</sub> = 1.4 V             | -                  | 1.05 | 3.35                                 | -   | 3.65 | Ω |
|                       |   |   | V <sub>CC</sub> = 1.65 V            | -                  | 0.55 | 1.25                                 | -   | 1.35 | Ω |
|                       |   |   | V <sub>CC</sub> = 2.3 V             | -                  | 0.20 | 0.35                                 | -   | 0.40 | Ω |
|                       |   |   | V <sub>CC</sub> = 2.7 V             | -                  | 0.18 | 0.35                                 | -   | 0.40 | Ω |
|                       |   |   | V <sub>CC</sub> = 4.3 V             | -                  | 0.23 | 0.40                                 | -   | 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.

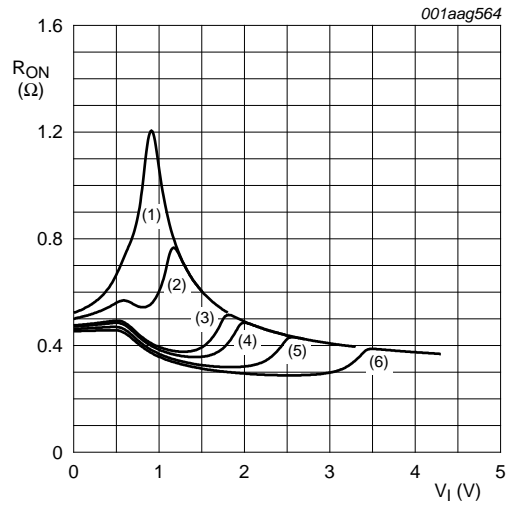
[3] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical V<sub>CC</sub> and temperature.

11.3 ON resistance test circuit and graphs



$R_{ON} = V_{SW} / I_{SW}$ .

Fig 6. Test circuit for measuring ON resistance

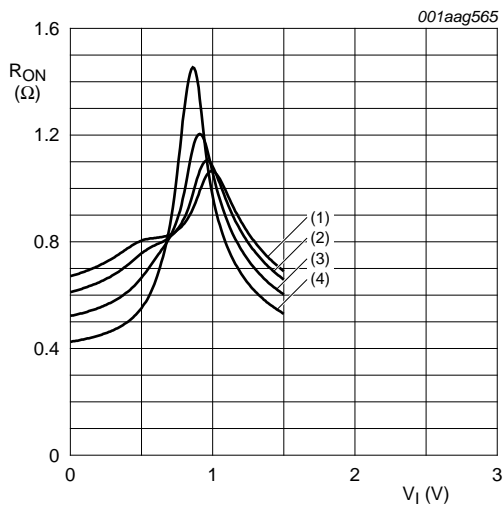


- (1)  $V_{CC} = 1.5\text{ V}$ .
- (2)  $V_{CC} = 1.8\text{ V}$ .
- (3)  $V_{CC} = 2.5\text{ V}$ .
- (4)  $V_{CC} = 2.7\text{ V}$ .
- (5)  $V_{CC} = 3.3\text{ V}$ .
- (6)  $V_{CC} = 4.3\text{ V}$ .

Measured at  $T_{amb} = 25\text{ }^{\circ}\text{C}$ .

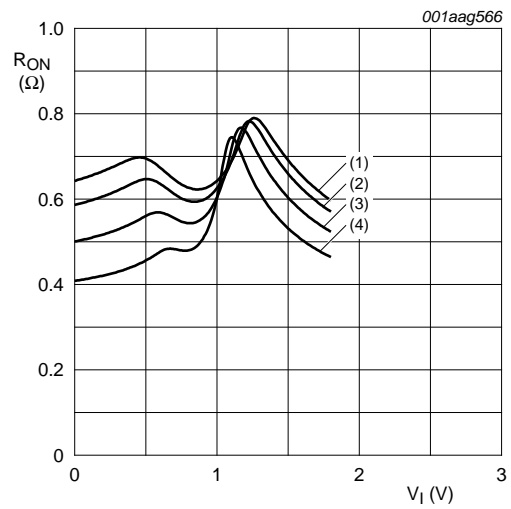
Fig 7. Typical ON resistance as a function of input voltage (Yn port)





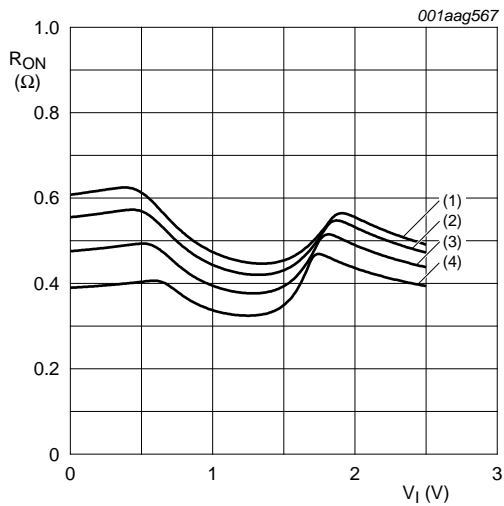
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig 8. ON resistance as a function of input voltage;  $V_{CC} = 1.5\text{ V}$  (Yn port)**



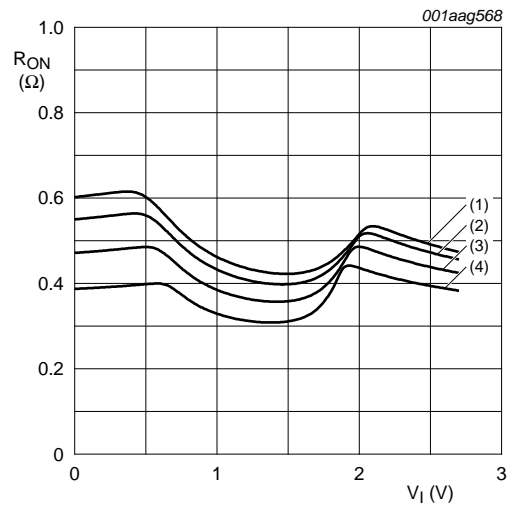
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig 9. ON resistance as a function of input voltage;  $V_{CC} = 1.8\text{ V}$  (Yn port)**



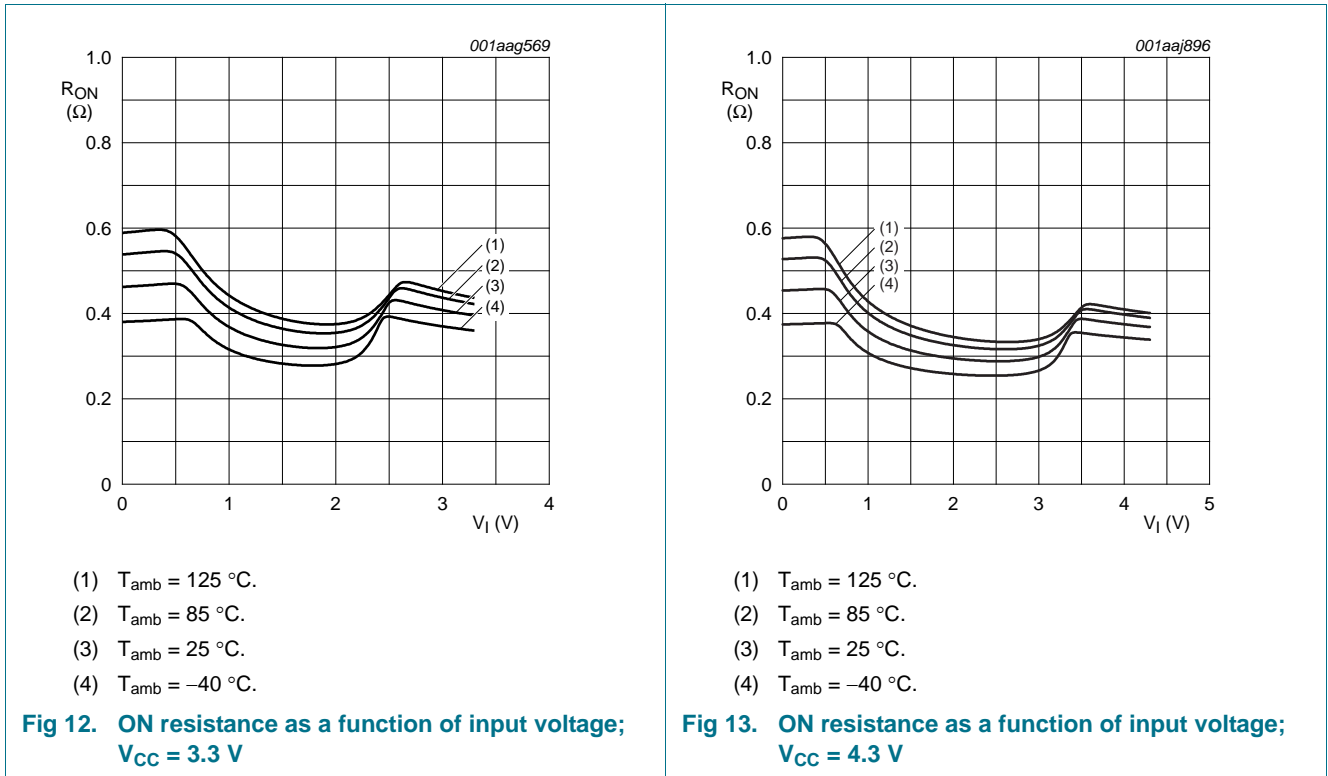
- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig 10. ON resistance as a function of input voltage;  $V_{CC} = 2.5\text{ V}$  (Yn port)**



- (1)  $T_{amb} = 125\text{ }^{\circ}\text{C}.$
- (2)  $T_{amb} = 85\text{ }^{\circ}\text{C}.$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}.$
- (4)  $T_{amb} = -40\text{ }^{\circ}\text{C}.$

**Fig 11. ON resistance as a function of input voltage;  $V_{CC} = 2.7\text{ V}$  (Yn port)**



## 12. Dynamic characteristics

**Table 9. Dynamic characteristics**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 16](#).

| Symbol           | Parameter    | Conditions  | T <sub>amb</sub> = 25 °C           |                    |     | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |    |
|------------------|--------------|---|------------------------------------|--------------------|-----|--------------------------------------|-------------|--------------|------|----|
|                  |              |   | Min                                | Typ <sup>[1]</sup> | Max | Min                                  | Max (85 °C) | Max (125 °C) |      |    |
| t <sub>en</sub>  | enable time  | $\bar{E}$ , Sn to Z or Yn;<br>see <a href="#">Figure 14</a> | V <sub>CC</sub> = 1.4 V to 1.6 V   | -                  | 50  | 100                                  | -           | 120          | 125  | ns |
|                  |              |   | V <sub>CC</sub> = 1.65 V to 1.95 V | -                  | 36  | 75                                   | -           | 85           | 95   | ns |
|                  |              |   | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                  | 24  | 50                                   | -           | 55           | 60   | ns |
|                  |              |   | V <sub>CC</sub> = 2.7 V to 3.6 V   | -                  | 22  | 45                                   | -           | 45           | 50   | ns |
|                  |              |   | V <sub>CC</sub> = 3.6 V to 4.3 V   | -                  | 22  | 45                                   | -           | 45           | 50   | ns |
| t <sub>dis</sub> | disable time | $\bar{E}$ , Sn to Z or Yn;<br>see <a href="#">Figure 14</a> | V <sub>CC</sub> = 1.4 V to 1.6 V   | -                  | 32  | 80                                   | -           | 90           | 105  | ns |
|                  |              |   | V <sub>CC</sub> = 1.65 V to 1.95 V | -                  | 20  | 65                                   | -           | 70           | 75   | ns |
|                  |              |   | V <sub>CC</sub> = 2.3 V to 2.7 V   | -                  | 12  | 30                                   | -           | 35           | 40   | ns |
|                  |              |   | V <sub>CC</sub> = 2.7 V to 3.6 V   | -                  | 10  | 25                                   | -           | 30           | 35   | ns |
|                  |              |   | V <sub>CC</sub> = 3.6 V to 4.3 V   | -                  | 10  | 25                                   | -           | 30           | 35   | ns |

**Table 9. Dynamic characteristics ...continued**

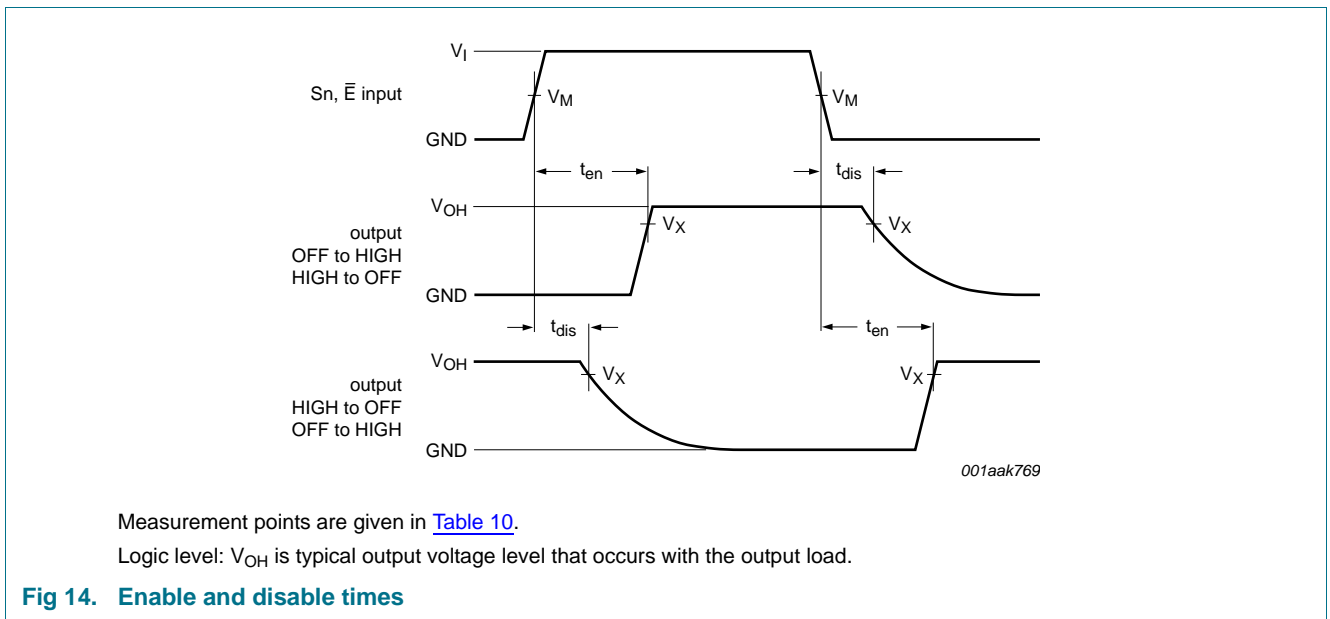
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 16](#).

| Symbol           | Parameter              | Conditions                                   | T <sub>amb</sub> = 25 °C |                    |     | T <sub>amb</sub> = -40 °C to +125 °C |             |              | Unit |
|------------------|------------------------|--|--------------------------|--------------------|-----|--------------------------------------|-------------|--------------|------|
|                  |                        |  | Min                      | Typ <sup>[1]</sup> | Max | Min                                  | Max (85 °C) | Max (125 °C) |      |
| t <sub>b-m</sub> | break-before-make time | see <a href="#">Figure 15</a> <sup>[2]</sup> |                          |                    |     |                                      |             |              |      |
|                  |                        | V <sub>CC</sub> = 1.4 V to 1.6 V             | -                        | 19                 | -   | 9                                    | -           | -            | ns   |
|                  |                        | V <sub>CC</sub> = 1.65 V to 1.95 V           | -                        | 17                 | -   | 7                                    | -           | -            | ns   |
|                  |                        | V <sub>CC</sub> = 2.3 V to 2.7 V             | -                        | 13                 | -   | 4                                    | -           | -            | ns   |
|                  |                        | V <sub>CC</sub> = 2.7 V to 3.6 V             | -                        | 10                 | -   | 3                                    | -           | -            | ns   |
|                  |                        | V <sub>CC</sub> = 3.6 V to 4.3 V             | -                        | 10                 | -   | 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.

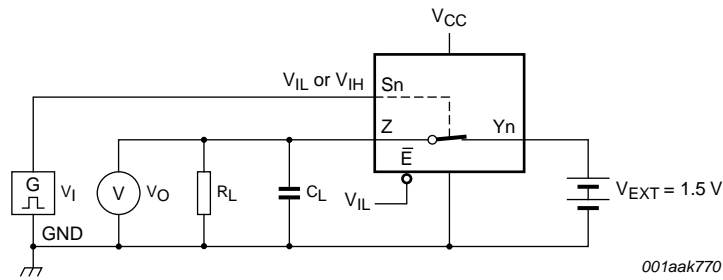
[2] Break-before-make guaranteed by design.

### 12.1 Waveforms and test circuits

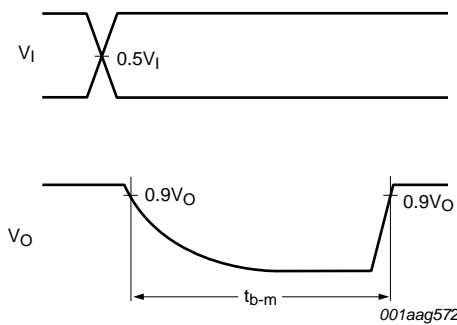


**Table 10. Measurement points**

| Supply voltage  | Input              | Output             |
|-----------------|--------------------|--------------------|
| V <sub>CC</sub> | V <sub>M</sub>     | V <sub>X</sub>     |
| 1.4 V to 4.3 V  | 0.5V <sub>CC</sub> | 0.9V <sub>OH</sub> |



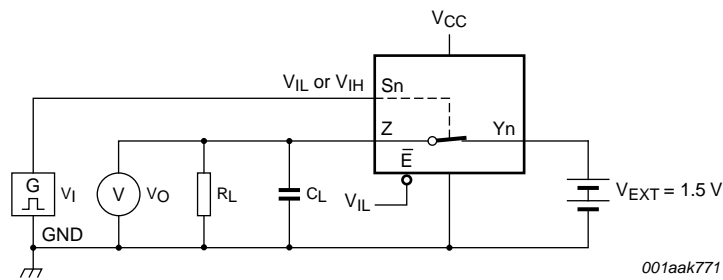
a. Test circuit



b. Input and output measurement points

$V_I$  may be connected to S0 or S1.

**Fig 15. Test circuit for measuring break-before-make timing**



Test data is given in [Table 11](#).

$V_I$  may be connected to Sn or  $\bar{E}$ .

Definitions test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

$V_{EXT}$  = External voltage for measuring switching times.

**Fig 16. Load circuit for switching times**

**Table 11. 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 | $V_{CC}$ | $\leq 2.5$ ns | 35 pF | 50 $\Omega$ |

## 12.2 Additional dynamic characteristics

**Table 12. 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 <sub>amb</sub> = 25 °C |      |     | Unit |
|-----------------------|---------------------------|--|--------------------------|------|-----|------|
|                       |                           |  | Min                      | Typ  | Max |      |
| THD                   | total harmonic distortion | $f_i = 20 \text{ Hz to } 20 \text{ kHz}; R_L = 32 \text{ } \Omega$ ; see <a href="#">Figure 17</a> [1]   |                          |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V}; V_I = 1 \text{ V (p-p)}$  | -                        | 0.15 | -   | %    |
|                       |                           | $V_{CC} = 1.65 \text{ V}; V_I = 1.2 \text{ V (p-p)}$   | -                        | 0.10 | -   | %    |
|                       |                           | $V_{CC} = 2.3 \text{ V}; V_I = 1.5 \text{ V (p-p)}$  | -                        | 0.02 | -   | %    |
|                       |                           | $V_{CC} = 2.7 \text{ V}; V_I = 2 \text{ V (p-p)}$  | -                        | 0.02 | -   | %    |
|                       |                           | $V_{CC} = 4.3 \text{ V}; V_I = 2 \text{ V (p-p)}$  | -                        | 0.02 | -   | %    |
| $f_{(-3\text{dB})}$   | -3 dB frequency response  | $R_L = 50 \text{ } \Omega$ ; see <a href="#">Figure 18</a> [1]   |                          |      |     |      |
|                       |                           | port Y0, Y1 or Y2; $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$  | -                        | 30   | -   | MHz  |
|                       |                           | port Y0, Y1 and Y2; $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$   | -                        | 20   | -   | MHz  |
| $\alpha_{\text{iso}}$ | isolation (OFF-state)     | $f_i = 100 \text{ kHz}; R_L = 50 \text{ } \Omega$ ; see <a href="#">Figure 19</a> [1]  |                          |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 4.3 \text{ V}$   | -                        | -90  | -   | dB   |
| $V_{\text{ct}}$       | crosstalk voltage         | between digital inputs and switch;<br>$f_i = 1 \text{ MHz}; C_L = 50 \text{ pF}; R_L = 50 \text{ } \Omega$ ; see <a href="#">Figure 20</a>                             |                          |      |     |      |
|                       |                           | $V_{CC} = 1.4 \text{ V to } 3.6 \text{ V}$   | -                        | 0.21 | -   | V    |
|                       |                           | $V_{CC} = 3.6 \text{ V to } 4.3 \text{ V}$   | -                        | 0.30 | -   | V    |
| Xtalk                 | crosstalk                 | between switches; <a href="#">Figure 21</a> [1]  |                          |      |     |      |
|                       |                           | $f_i = 100 \text{ kHz}; R_L = 50 \text{ } \Omega$ ; see <a href="#">Figure 21</a>  |                          |      |     |      |
| $Q_{\text{inj}}$      | 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 <a href="#">Figure 22</a> |                          |      |     |      |
|                       |                           | $V_{CC} = 1.5 \text{ V}$   | -                        | 10   | -   | pC   |
|                       |                           | $V_{CC} = 1.8 \text{ V}$   | -                        | 15   | -   | pC   |
|                       |                           | $V_{CC} = 2.5 \text{ V}$   | -                        | 26   | -   | pC   |
|                       |                           | $V_{CC} = 3.3 \text{ V}$   | -                        | 36   | -   | pC   |
|                       |                           | $V_{CC} = 4.3 \text{ V}$   | -                        | 50   | -   | pC   |

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

12.3 Test circuits

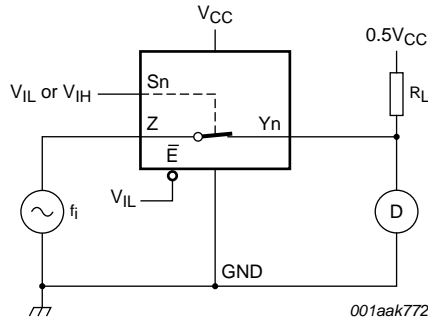
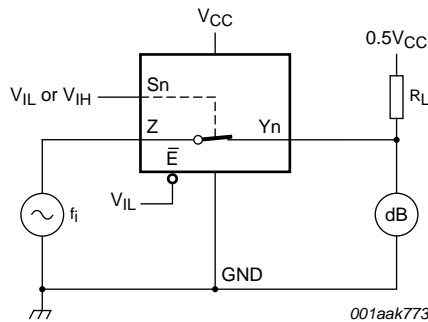
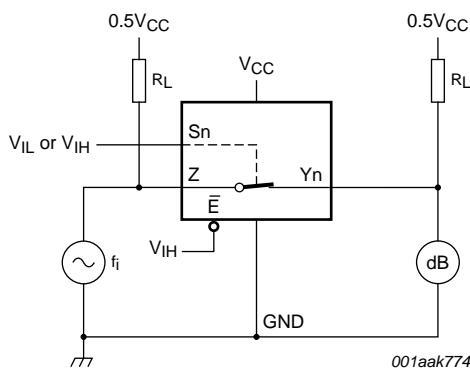


Fig 17. Test circuit for measuring total harmonic distortion



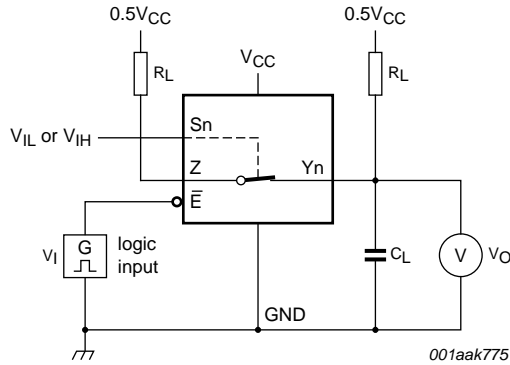
Adjust  $f_i$  voltage to obtain 0 dBm level at output. Increase  $f_i$  frequency until dB meter reads -3 dB.

Fig 18. Test circuit for measuring the frequency response when channel is in ON-state

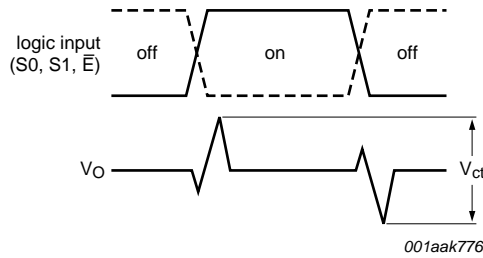


Adjust  $f_i$  voltage to obtain 0 dBm level at input.

Fig 19. Test circuit for measuring isolation (OFF-state)

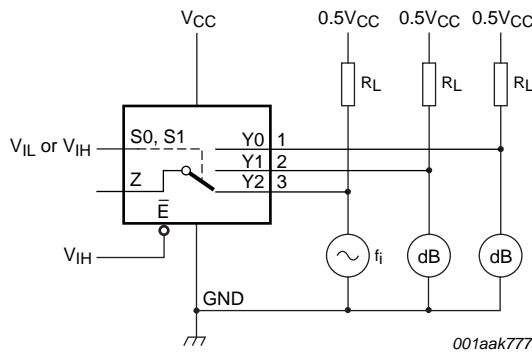


a. Test circuit



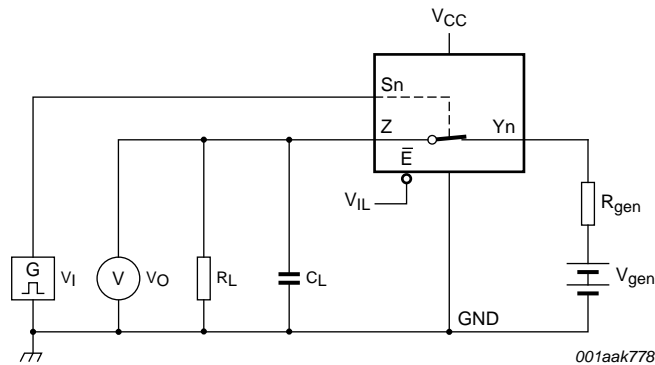
b. Input and output pulse definitions  
 $V_I$  may be connected to  $S_n$  or  $\bar{E}$ .

**Fig 20. Test circuit for measuring crosstalk voltage between digital inputs and switch**

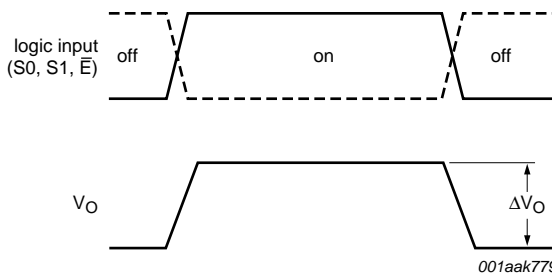


$f_i$  may be connected to  $Y_0$ ,  $Y_1$  or  $Y_2$ .

**Fig 21. Test circuit for measuring crosstalk between switches**



a. Test circuit



b. Input and output pulse definitions

$V_I$  may be connected to  $S_n$  or  $\bar{E}$ .

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

$\Delta V_O$  = output voltage variation.

$R_{gen}$  = generator resistance.

$V_{gen}$  = generator voltage.

**Fig 22. Test circuit for measuring charge injection**



13. Package outline

XQFN10U: plastic extremely thin quad flat package; no leads; 10 terminals; UTLP based; body 2 x 1.55 x 0.5 mm

SOT1049-2

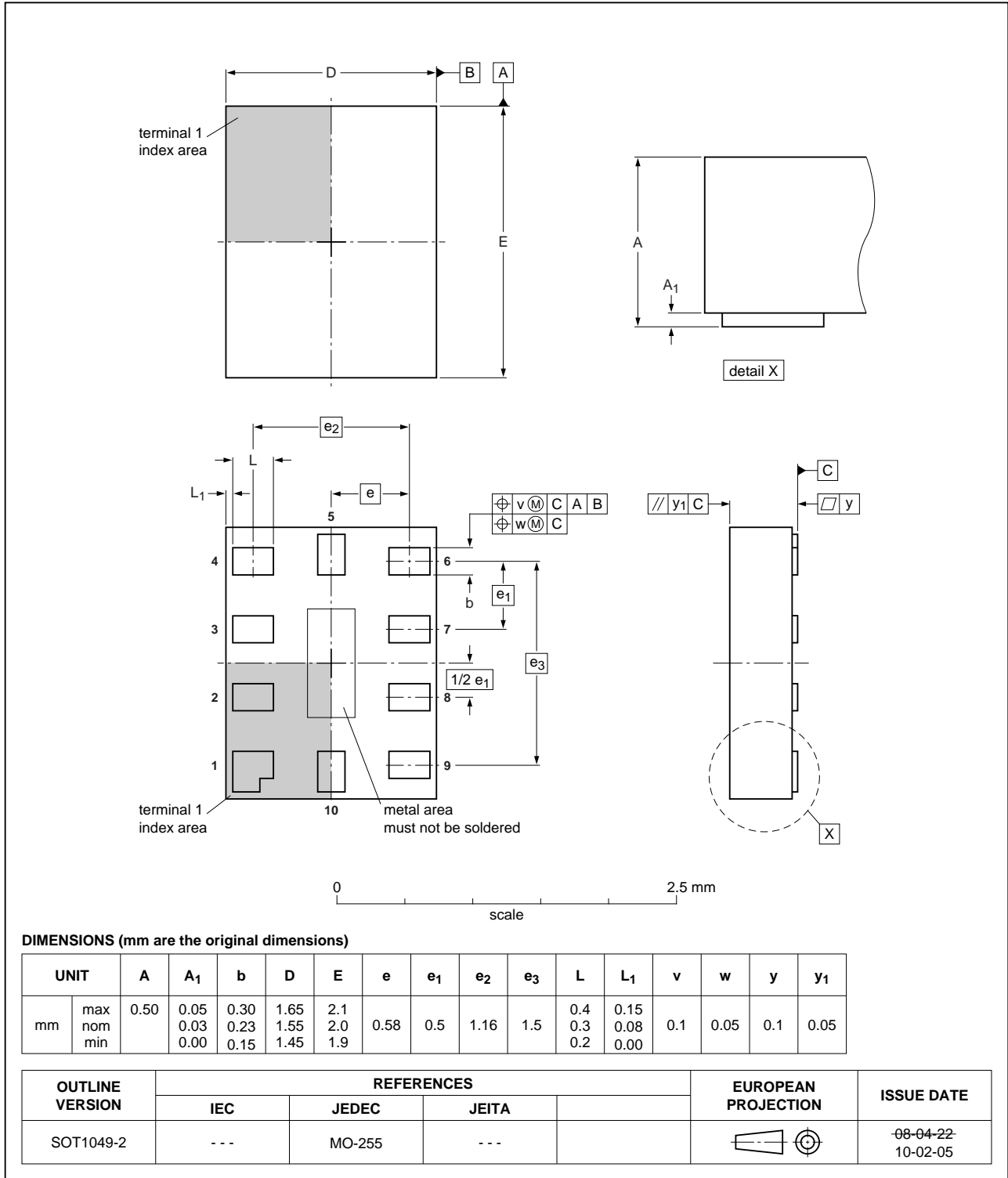


Fig 23. Package outline SOT1049-2 (XQFN10U)

## 14. Abbreviations

Table 13. Abbreviations

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

## 15. Revision history

Table 14. Revision history

| Document ID    | Release date           | Data sheet status  | Change notice | Supersedes   |
|----------------|------------------------|--------------------|---------------|--------------|
| NX3L4357 v.4   | 20111107               | Product data sheet | -             | NX3L4357 v.3 |
| Modifications: | • Legal pages updated. |                    |               |              |
| NX3L4357 v.3   | 20101228               | Product data sheet | -             | NX3L4357 v.2 |
| NX3L4357 v.2   | 20100428               | Product data sheet | -             | NX3L4357 v.1 |
| NX3L4357 v.1   | 20091019               | Product data sheet | -             | -            |

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### 16.1 Data sheet status

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

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

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

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

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Date of release: 7 November 2011

Document identifier: NX3L4357