# NX3L4051

## Single low-ohmic 8-channel analog switch

Rev. 5.1 — 30 September 2020 Product data sheet

## 1 General description

The NX3L4051 is a low-ohmic 8-channel analog switch, suitable for use as an analog or digital multiplexer/demultiplexer. The NX3L4051 has three digital select inputs (S1 to S3), eight independent inputs/outputs (Y0 to Y7) and a common input/output (Z). All eight switches share an enable input ($\overline{E}$). A HIGH on $\overline{E}$ causes all switches into the high impedance OFF-state, independent of Sn.

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 NX3L4051 to switch 4.3 V signals with a 1.8 V digital controller, eliminating the need for logic level translation.The NX3L4051 allows signals with amplitude up to $V_{CC}$ to be transmitted from Z to Yn or from Yn to Z. Its low ON resistance (0.5 Ω) and flatness (0.13 Ω) 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):
  - 1.7 Ω (typical) at $V_{CC}$ = 1.4 V
  - 1.0 Ω (typical) at $V_{CC}$ = 1.65 V
  - 0.6 Ω (typical) at $V_{CC}$ = 2.3 V
  - 0.5 Ω (typical) at $V_{CC}$ = 2.7 V
    0.5 Ω (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 8000 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
- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

## 4 Ordering information

**Table 1. Ordering information**

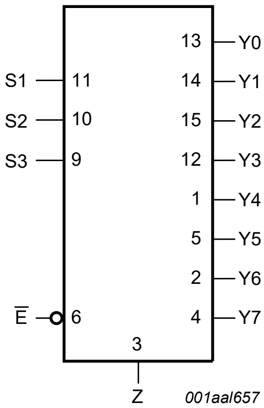
| Type number | Topside mark | Package | | | |
|---|---|---|---|---|---|
| | | Temperature range | Name | Description | Version |
| NX3L4051HR | M41 | -40 °C to +125 °C | HXQFN16 | plastic thermal enhanced extremely thin quad flat package; no leads; 16 terminals; body 3 × 3 × 0.5 mm | SOT1039-2 |
| NX3L4051PW | X3L4051 | -40 °C to +125 °C | TSSOP16 | plastic thin shrink small outline package; 16 leads; body width 4.4 mm | SOT403-1 |

### 4.1 Ordering options

**Table 2. Ordering options**

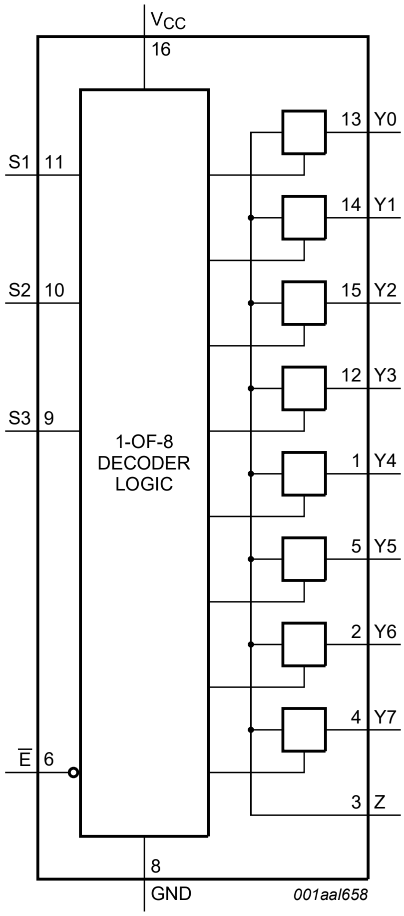
| Type number | Orderable part number | Package | Packing method | Minimum order quantity | Temperature |
|---|---|---|---|---|---|
| NX3L4051HR | NX3L4051HRZ | HXQFN16 | REEL 7" Q1 NDP SSB | 1500 | $T_{amb}$ = -40 °C to 125 °C |
| NX3L4051PW | NX3L4051PW,118 | TSSOP16 | REEL 13" Q1 NDP | 2500 | $T_{amb}$ = -40 °C to 125 °C |

## 5 Functional diagram




Pin numbers are shown for TSSOP16 package only.

**Figure 1. Logic symbol**




Pin numbers are shown for TSSOP16 package only.

**Figure 2. Functional diagram**

# 6 Pinning information

## 6.1 Pinning

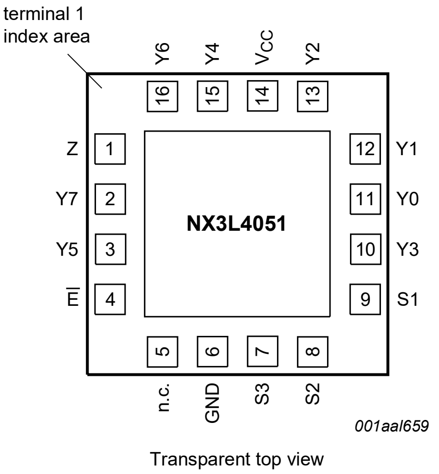



**Figure 3. Pin configuration SOT1039-2 (HXQFN16)**

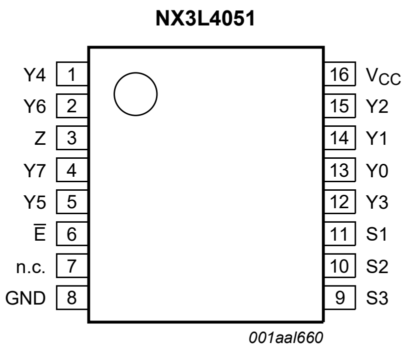



**Figure 4. Pin configuration SOT403-1 (TSSOP16)**

## 6.2 Pin description

**Table 3. Pin description**

| Symbol | Pin | | Description |
|---|---|---|---|
| | SOT1039-2 | SOT403-1 | |
| Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7 | 11, 12, 13, 10, 15, 3, 16, 2 | 13, 14, 15, 12, 1, 5, 2, 4 | independent input or output |
| Z | 1 | 3 | independent output or input |
| $\overline{E}$ | 4 | 6 | enable input (active LOW) |
| n.c. | 5 | 7 | not connected |
| GND | 6 | 8 | ground (0 V) |
| S1, S2, S3 | 9, 8, 7 | 11, 10, 9 | select input |
| $V_{CC}$ | 14 | 16 | supply voltage |

# 7 Functional description

**Table 4. Function table[1]**

| Input | | | | Channel ON |
|---|---|---|---|---|
| $\overline{E}$ | S3 | S2 | S1 | |
| L | L | L | L | Y0 = Z |
| L | L | L | H | Y1 = Z |
| L | L | H | L | Y2 = Z |
| L | L | H | H | Y3 = Z |
| L | H | L | L | Y4 = Z |
| L | H | L | H | Y5 = Z |

| Input | | | | Channel ON |
|---|---|---|---|---|
| $\overline{E}$ | S3 | S2 | S1 | |
| L | H | H | L | Y6 = Z |
| L | H | H | H | Y7 = Z |
| H | X | X | X | switches off |

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

# 8 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 | Sn and $\overline{E}$ | [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 | | - | ±50 | mA |
| $I_{SW}$ | switch current | $V_{SW}$ > -0.5 V or $V_{SW}$ < $V_{CC}$ + 0.5 V; source or sink current | | - | ±350 | mA |
| | | $V_{SW}$ > -0.5 V or $V_{SW}$ < $V_{CC}$ + 0.5 V; pulsed at 1 ms duration, < 10 % duty cycle; peak current | | - | ±500 | mA |
| $T_{stg}$ | storage temperature | | | -65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = -40 °C to +125 °C | | | | |
| | | HXQFN16 | [3] | - | 250 | mW |
| | | TSSOP16 | [4] | - | 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 HXQFN16 package: above 135 °C the value of $P_{tot}$ derates linearly with 16.9 mW/K.
[4] For TSSOP16 package: above 60 °C the value of $P_{tot}$ derates linearly with 5.5 mW/K above.

# 9 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 | Sn and $\overline{E}$ | | 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 $\overline{E}$; $V_{CC}$ = 1.4 V to 4.3 V | | - | 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.

# 10 Static characteristics

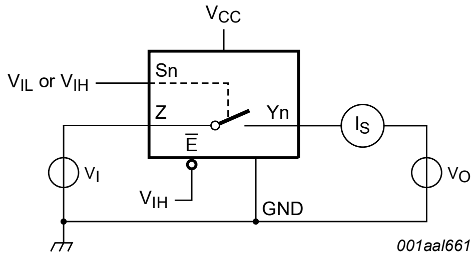
**Table 7. Static characteristics**

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

| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +125 °C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max (85 °C) | Max (125 °C) | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 1.4 V to 1.6 V | 0.9 | - | - | 0.9 | - | - | V |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 0.9 | - | - | 0.9 | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.1 | - | - | 1.1 | - | - | V |
| | | $V_{CC}$ = 2.7 V to 3.6 V | 1.3 | - | - | 1.3 | - | - | V |
| | | $V_{CC}$ = 3.6 V to 4.3 V | 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 $\overline{E}$; $V_I$ = GND to 4.3 V; $V_{CC}$ = 1.4 V to 4.3 V | - | - | - | - | ±0.5 | ±1 | μA |
| $I_{S(OFF)}$ | OFF-state leakage current | Yn ports; see Figure 5 | | | | | | | |
| | | $V_{CC}$ = 1.4 V to 3.6 V | - | - | ±5 | - | ±50 | ±500 | nA |
| | | $V_{CC}$ = 3.6 V to 4.3 V | - | - | ±10 | - | ±50 | ±500 | nA |
| $I_{S(ON)}$ | ON-state leakage current | Z port; $V_{CC}$ = 1.4 V to 3.6 V; see Figure 6 | | | | | | | |
| | | $V_{CC}$ = 1.4 V to 3.6 V | - | - | ±20 | - | ±200 | ±2000 | nA |
| | | $V_{CC}$ = 3.6 V to 4.3 V | - | - | ±40 | - | ±200 | ±2000 | nA |
| $I_{CC}$ | supply current | $V_I$ = $V_{CC}$ or GND; $V_{SW}$ = GND or $V_{CC}$ | | | | | | | |
| | | $V_{CC}$ = 3.6 V | - | - | 100 | - | 500 | 5000 | nA |
| | | $V_{CC}$ = 4.3 V | - | - | 150 | - | 800 | 6000 | nA |
| $\Delta I_{CC}$ | additional supply current | $V_{SW}$ = GND or $V_{CC}$ | | | | | | | |
| | | $V_I$ = 2.6 V; $V_{CC}$ = 4.3 V | - | 2.0 | 4.0 | - | 7 | 7 | μA |
| | | $V_I$ = 2.6 V; $V_{CC}$ = 3.6 V | - | 0.35 | 0.7 | - | 1 | 1 | μA |
| | | $V_I$ = 1.8 V; $V_{CC}$ = 4.3 V | - | 7.0 | 10.0 | - | 15 | 15 | μA |
| | | $V_I$ = 1.8 V; $V_{CC}$ = 3.6 V | - | 2.5 | 4.0 | - | 5 | 5 | μA |
| | | $V_I$ = 1.8 V; $V_{CC}$ = 2.5 V | - | 50 | 200 | - | 300 | 500 | nA |
| $C_I$ | input capacitance | Sn and $\overline{E}$ | - | 1.0 | - | - | - | - | pF |
| $C_{S(OFF)}$ | OFF-state capacitance | | - | 35 | - | - | - | - | pF |

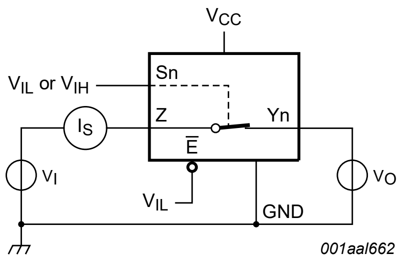
| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +125 °C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Max (85 °C) | Max (125 °C) | |
| $C_{S(ON)}$ | ON-state capacitance | | - | 350 | - | - | - | - | pF |

## 10.1 Test circuits




$V_I$ = 0.3 V or $V_{CC}$ - 0.3 V; $V_O$ = $V_{CC}$ - 0.3 V or 0.3 V.

**Figure 5. Test circuit for measuring OFF-state leakage current**




$V_I$ = 0.3 V or $V_{CC}$ - 0.3 V; $V_O$ = $V_{CC}$ - 0.3 V or 0.3 V.

**Figure 6. Test circuit for measuring ON-state leakage current**

## 10.2 ON resistance

**Table 8. ON resistance[1]**

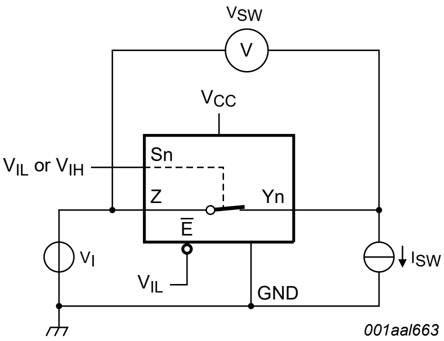
*At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for graphs see Figure 8 to Figure 14.*

| Symbol | Parameter | Conditions | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[2] | Max | Min | Max | |
| $R_{ON(peak)}$ | ON resistance (peak) | $V_I$ = GND to $V_{CC}$; $I_{SW}$ = 100 mA; see Figure 7 | | | | | | |
| | | $V_{CC}$ = 1.4 V | - | 1.7 | 3.7 | - | 4.1 | Ω |
| | | $V_{CC}$ = 1.65 V | - | 1.0 | 1.6 | - | 1.7 | Ω |
| | | $V_{CC}$ = 2.3 V | - | 0.6 | 0.8 | - | 0.9 | Ω |
| | | $V_{CC}$ = 2.7 V | - | 0.5 | 0.75 | - | 0.9 | Ω |
| | | $V_{CC}$ = 4.3 V | - | 0.5 | 0.75 | - | 0.9 | Ω |

| Symbol | Parameter | Conditions | | $T_{amb}$ = -40 °C to +85 °C | | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[2] | Max | Min | Max | |
| $\Delta R_{ON}$ | ON resistance mismatch between channels | $V_I$ = GND to $V_{CC}$; $I_{SW}$ = 100 mA | [3] | | | | | | |
| | | $V_{CC}$ = 1.4 V; $V_{SW}$ = 0.4 V | | - | 0.18 | 0.30 | - | 0.30 | Ω |
| | | $V_{CC}$ = 1.65 V; $V_{SW}$ = 0.5 V | | - | 0.18 | 0.20 | - | 0.30 | Ω |
| | | $V_{CC}$ = 2.3 V; $V_{SW}$ = 0.7 V | | - | 0.07 | 0.10 | - | 0.13 | Ω |
| | | $V_{CC}$ = 2.7 V; $V_{SW}$ = 0.8 V | | - | 0.07 | 0.10 | - | 0.13 | Ω |
| | | $V_{CC}$ = 4.3 V; $V_{SW}$ = 0.8 V | | - | 0.07 | 0.10 | - | 0.13 | Ω |
| $R_{ON(flat)}$ | ON resistance (flatness) | $V_I$ = GND to $V_{CC}$; $I_{SW}$ = 100 mA | [4] | | | | | | |
| | | $V_{CC}$ = 1.4 V | | - | 1.0 | 3.3 | - | 3.6 | Ω |
| | | $V_{CC}$ = 1.65 V | | - | 0.5 | 1.2 | - | 1.3 | Ω |
| | | $V_{CC}$ = 2.3 V | | - | 0.15 | 0.3 | - | 0.35 | Ω |
| | | $V_{CC}$ = 2.7 V | | - | 0.13 | 0.3 | - | 0.35 | Ω |
| | | $V_{CC}$ = 4.3 V | | - | 0.2 | 0.4 | - | 0.45 | Ω |

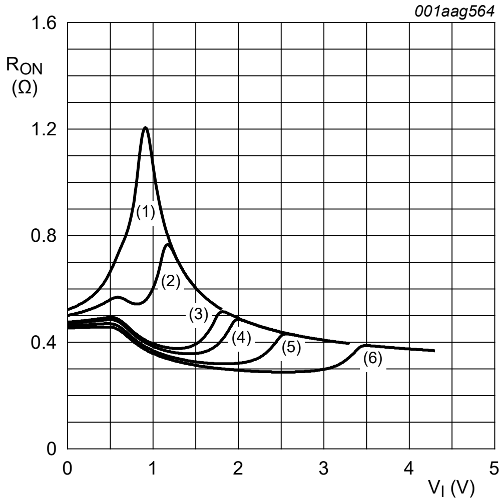
[1] For NX3L4051PW (TSSOP16 package), all ON resistance values are up to 0.05 Ω higher.
[2] Typical values are measured at $T_{amb}$ = 25 °C.
[3] Measured at identical $V_{CC}$, temperature and input voltage.
[4] Flatness is defined as the difference between the maximum and minimum value of ON resistance measured at identical $V_{CC}$ and temperature.

## 10.3 ON resistance test circuit and graphs




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

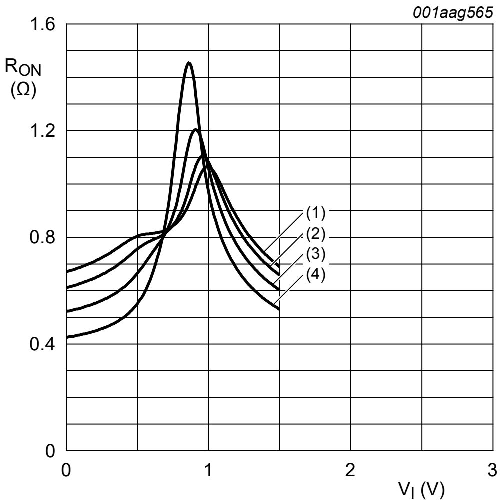
**Figure 7. Test circuit for measuring ON resistance**




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

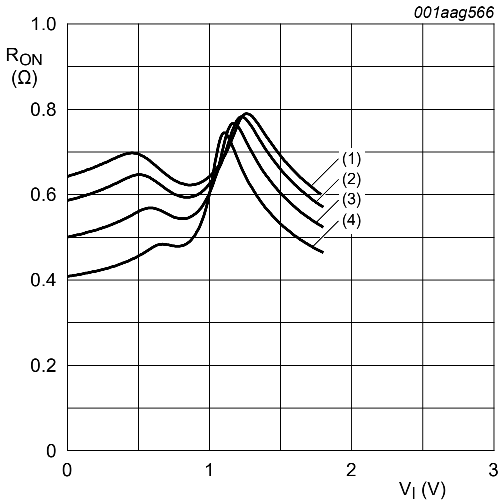
Measured at $T_{amb}$ = 25 °C.

**Figure 8. Typical ON resistance as a function of input voltage**



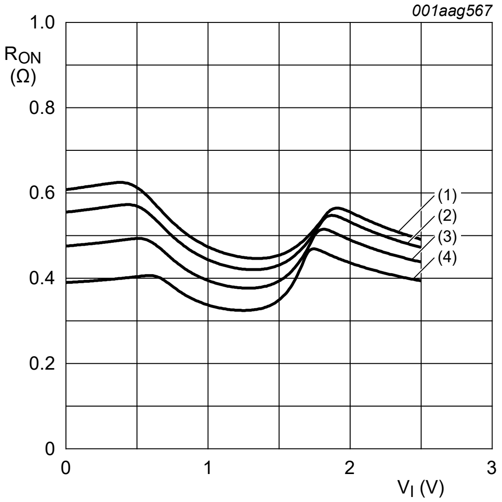

1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 9. ON resistance as a function of input voltage; $V_{CC}$ = 1.5 V**



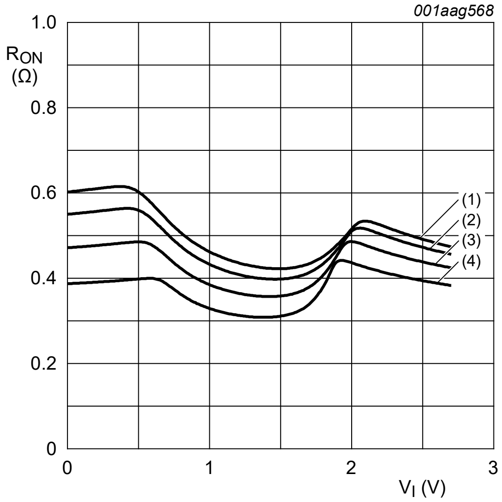

1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 10. ON resistance as a function of input voltage; $V_{CC}$ = 1.8 V**



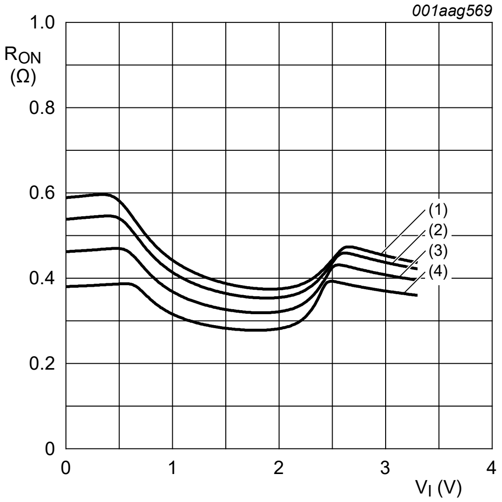

1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 11. ON resistance as a function of input voltage; $V_{CC}$ = 2.5 V**



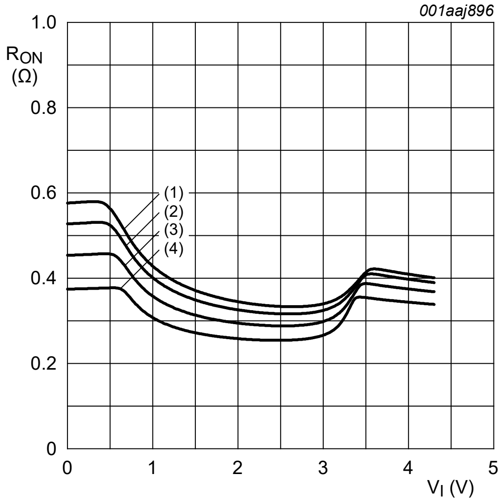

1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 12. ON resistance as a function of input voltage; $V_{CC}$ = 2.7 V**




1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 13. ON resistance as a function of input voltage; $V_{CC}$ = 3.3 V**




1. $T_{amb}$ = 125 °C.
2. $T_{amb}$ = 85 °C.
3. $T_{amb}$ = 25 °C.
4. $T_{amb}$ = -40 °C.

**Figure 14. ON resistance as a function of input voltage; $V_{CC}$ = 4.3 V**

# 11 Dynamic characteristics

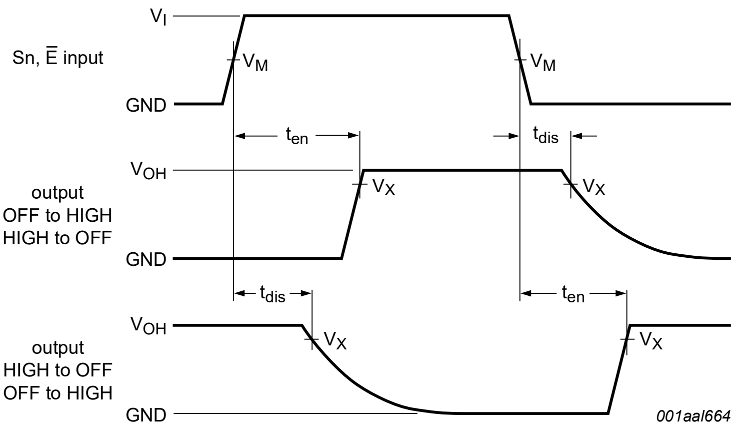
**Table 9. Dynamic characteristics**

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

| Symbol | Parameter | Conditions | | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +125 °C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ[1] | Max | Min | Max (85 °C) | Max (125 °C) | |
| $t_{en}$ | enable time | $\overline{E}$, Sn to Z or Yn; see Figure 15 | | | | | | | | |
| | | $V_{CC}$ = 1.4 V to 1.6 V | | - | 45 | 100 | - | 120 | 125 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | - | 32 | 75 | - | 85 | 95 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | - | 21 | 50 | - | 55 | 60 | ns |
| | | $V_{CC}$ = 2.7 V to 3.6 V | | - | 19 | 45 | - | 45 | 50 | ns |
| | | $V_{CC}$ = 3.6 V to 4.3 V | | - | 19 | 45 | - | 45 | 50 | ns |
| $t_{dis}$ | disable time | $\overline{E}$, Sn to Z or Yn; see Figure 15 | | | | | | | | |
| | | $V_{CC}$ = 1.4 V to 1.6 V | | - | 25 | 80 | - | 90 | 105 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | - | 15 | 65 | - | 70 | 75 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | - | 9 | 30 | - | 35 | 40 | ns |
| | | $V_{CC}$ = 2.7 V to 3.6 V | | - | 8 | 25 | - | 30 | 35 | ns |
| | | $V_{CC}$ = 3.6 V to 4.3 V | | - | 8 | 25 | - | 30 | 35 | ns |
| $t_{b-m}$ | break-before-make time | see Figure 16 | [2] | | | | | | | |
| | | $V_{CC}$ = 1.4 V to 1.6 V | | - | 19 | - | 9 | - | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | | - | 17 | - | 7 | - | - | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | - | 12 | - | 4 | - | - | ns |
| | | $V_{CC}$ = 2.7 V to 3.6 V | | - | 10 | - | 3 | - | - | ns |
| | | $V_{CC}$ = 3.6 V to 4.3 V | | - | 9 | - | 2 | - | - | ns |

[1] Typical values are measured at $T_{amb}$ = 25 °C and $V_{CC}$ = 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 Waveform and test circuits



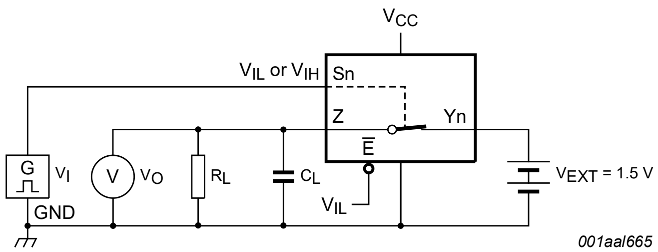

Measurement points are given in Table 10.

Logic level: $V_{OH}$ is typical output voltage level that occurs with the output load.

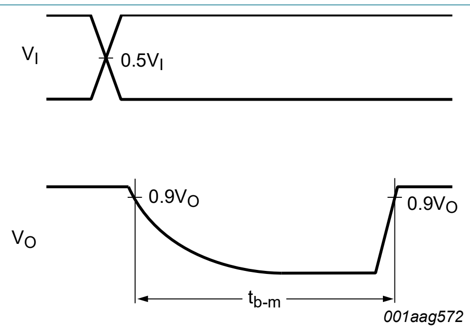
**Figure 15. Enable and disable times**

**Table 10. Measurement points**

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

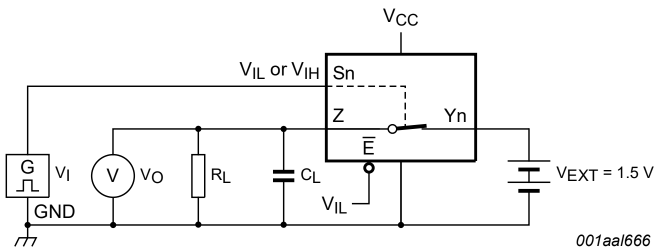



a. Test circuit




b. Input and output measurement points

**Figure 16. Test circuit for measuring break-before-make timing**




Test data is given in Table 11.

Definitions test circuit:

$R_L$ = Load resistance.

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

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

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

**Figure 17. Test circuit for measuring 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 | $V_{CC}$ | ≤ 2.5 ns | 35 pF | 50 Ω |

## 11.2 Additional dynamic characteristics

**Table 12. Additional dynamic characteristics**

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V); $V_I$ = GND or $V_{CC}$ (unless otherwise specified); $t_r = t_f \leq 2.5$ ns; $T_{amb}$ = 25 °C.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| THD | total harmonic distortion | $f_i$ = 20 Hz to 20 kHz; $R_L$ = 32 Ω; see Figure 18 | [1] | | | | |
| | | $V_{CC}$ = 1.4 V; $V_I$ = 1 V (p-p) | | - | 0.15 | - | % |
| | | $V_{CC}$ = 1.65 V; $V_I$ = 1.2 V (p-p) | | - | 0.10 | - | % |
| | | $V_{CC}$ = 2.3 V; $V_I$ = 1.5 V (p-p) | | - | 0.02 | - | % |
| | | $V_{CC}$ = 2.7 V; $V_I$ = 2 V (p-p) | | - | 0.02 | - | % |
| | | $V_{CC}$ = 4.3 V; $V_I$ = 2 V (p-p) | | - | 0.02 | - | % |
| $f_{(-3dB)}$ | -3 dB frequency response | $R_L$ = 50 Ω; see Figure 19 | [1] | | | | |
| | | $V_{CC}$ = 1.4 V to 4.3 V | | - | 15 | - | MHz |
| $\alpha_{iso}$ | isolation (OFF-state) | $f_i$ = 100 kHz; $R_L$ = 50 Ω; see Figure 20 | [1] | | | | |
| | | $V_{CC}$ = 1.4 V to 4.3 V | | - | -90 | - | dB |
| $V_{ct}$ | crosstalk voltage | between digital inputs and switch; $f_i$ = 1 MHz; $C_L$ = 50 pF; $R_L$ = 50 Ω; see Figure 21 | | | | | |
| | | $V_{CC}$ = 1.4 V to 3.6 V | | - | 0.2 | - | V |
| | | $V_{CC}$ = 3.6 V to 4.3 V | | - | 0.3 | - | V |
| Xtalk | crosstalk | between switches; $f_i$ = 100 kHz; $R_L$ = 50 Ω; see Figure 22 | [1] | | | | |

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ = 1.4 V to 4.3 V | | - | -90 | - | dB |
| $Q_{inj}$ | charge injection | $f_i$ = 1 MHz; $C_L$ = 0.1 nF; $R_L$ = 1 MΩ; $V_{gen}$ = 0 V; $R_{gen}$ = 0 Ω; see Figure 23 | | | | | |
| | | $V_{CC}$ = 1.5 V | | - | 3 | - | pC |
| | | $V_{CC}$ = 1.8 V | | - | 4 | - | pC |
| | | $V_{CC}$ = 2.5 V | | - | 6 | - | pC |
| | | $V_{CC}$ = 3.3 V | | - | 9 | - | pC |
| | | $V_{CC}$ = 4.3 V | | - | 15 | - | pC |

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

## 11.3 Test circuits

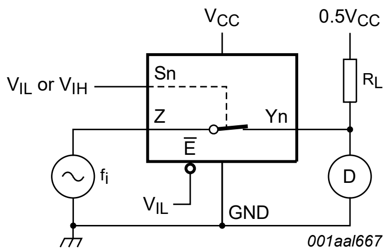
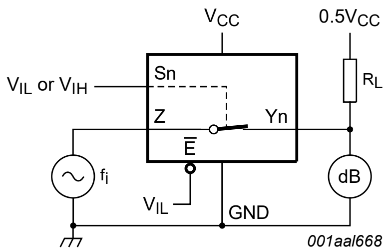
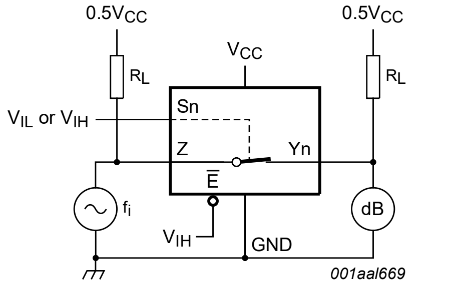



Figure 18. Test circuit for measuring total harmonic distortion



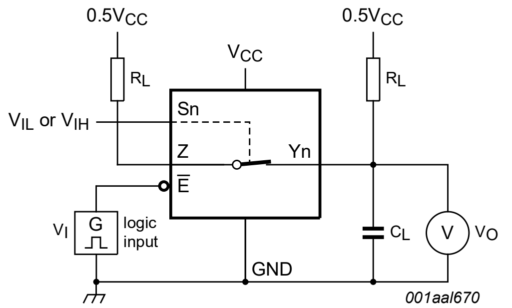

Adjust $f_i$ voltage to obtain 0 dBm level at output. Increase $f_i$ frequency until dB meter reads -3 dB.

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

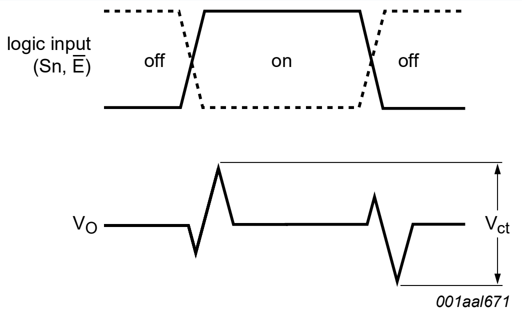



Adjust $f_i$ voltage to obtain 0 dBm level at input.

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




a. Test circuit




b. Input and output pulse definitions

**Figure 21. Test circuit for measuring crosstalk voltage between digital inputs and switch**

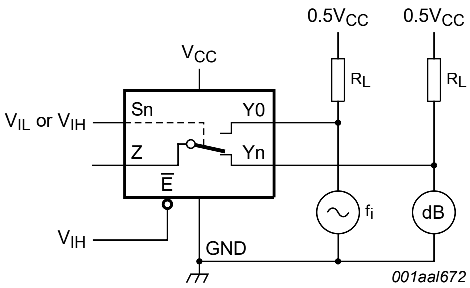
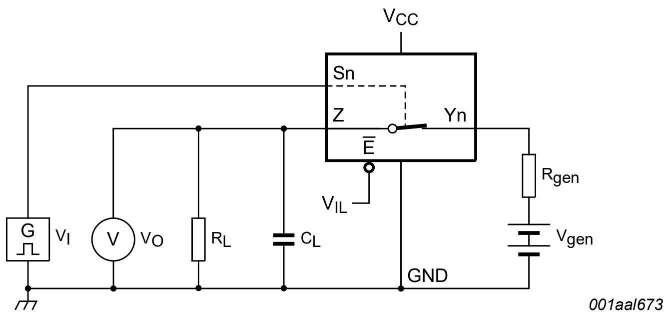
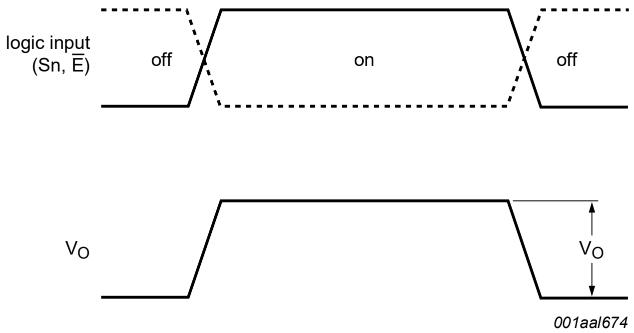



**Figure 22. Test circuit for measuring crosstalk between switches**




a. Test circuit




b. Input and output pulse definitions

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

$\Delta V_O$ = output voltage variation.

$R_{gen}$ = generator resistance.

$V_{gen}$ = generator voltage.

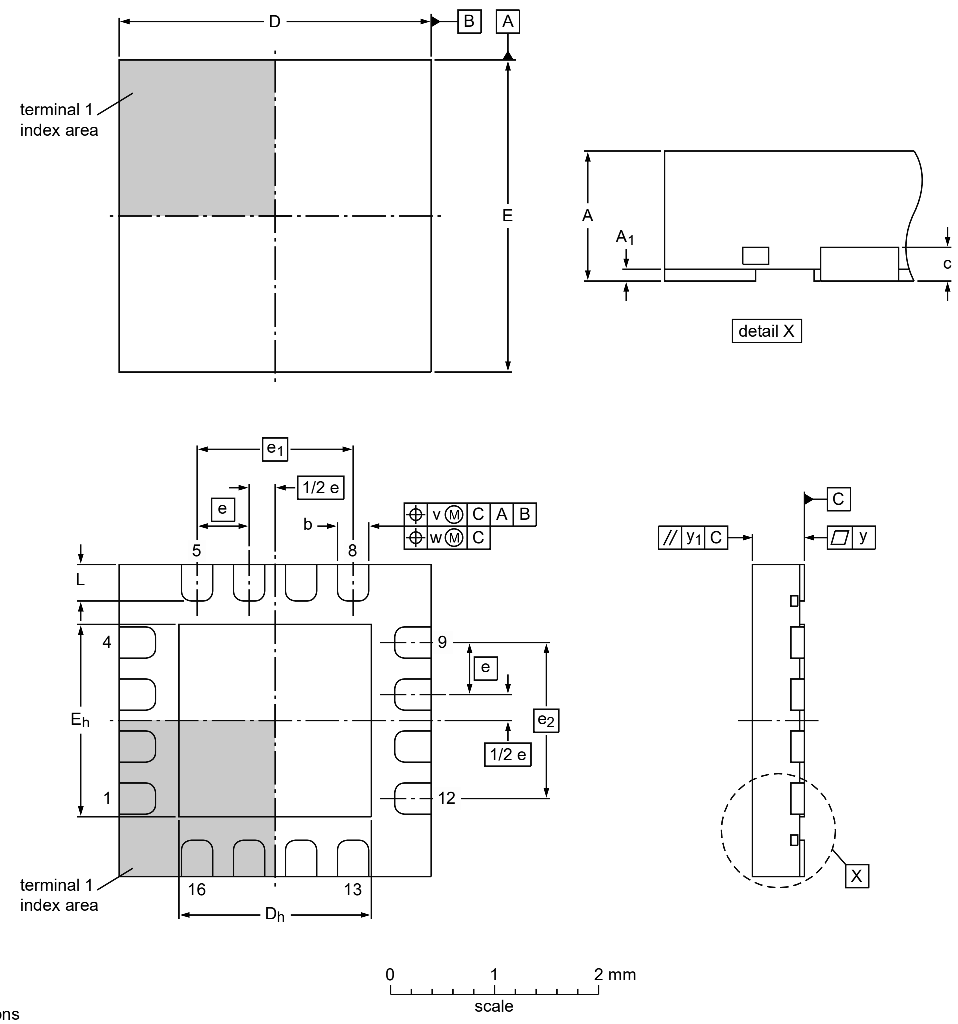
$V_I$ may be connected to Sn or $\overline{E}$.

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

## 12 Package outline

HXQFN16 (U): plastic thermal enhanced extremely thin quad flat package; no leads; 16 terminals; body 3 x 3 x 0.5 mm

SOT1039-2




Dimensions

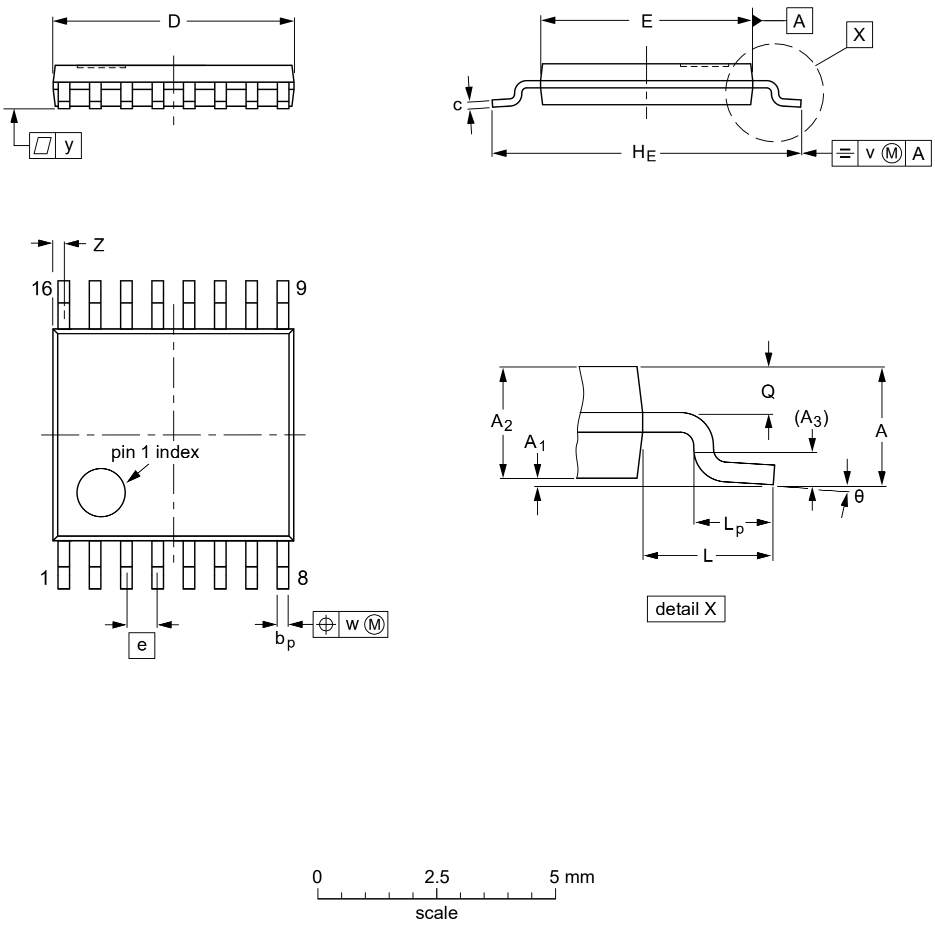
| Unit | | A | $A_1$ | b | c | D | $D_h$ | E | $E_h$ | e | $e_1$ | $e_2$ | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | max | 0.5 | 0.05 | 0.35 | | 3.1 | 1.95 | 3.1 | 1.95 | | | | 0.40 | | | | |
| mm | nom | | | 0.30 | 0.127 | 3.0 | 1.85 | 3.0 | 1.85 | 0.5 | 1.5 | 1.5 | 0.35 | 0.1 | 0.05 | 0.05 | 0.1 |
| | min | | 0.00 | 0.25 | | 2.9 | 1.75 | 2.9 | 1.75 | | | | 0.30 | | | | |

*sot1039-2_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1039-2 | - - - | | - - - | | | ~~11-03-30~~ 17-10-31 |

**Figure 24. Package outline SOT1039-2 (HXQFN16)**

**TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm** **SOT403-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (2) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1 | 0.15<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 5.1<br>4.9 | 4.5<br>4.3 | 0.65 | 6.6<br>6.2 | 1 | 0.75<br>0.50 | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.40<br>0.06 | 8°<br>0° |

**Notes**

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

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

**Figure 25. Package outline SOT403-1 (TSSOP16)**

# 13 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 |
| PDA | Personal Digital Assistant |

# 14 Revision history

**Table 14. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| NX3L4051 v.5.1 | 20200930 | Product data sheet | - | NX3L4051 v.5 |
| Modifications: | • Section 4: Added Section 4.1; NX3L4051HR,115 replaced with NX3L4051HRZ | | | |
| NX3L4051 v.5 | 20120703 | Product data sheet | - | NX3L4051 v.4 |
| Modifications: | • For type number NX3L4051HR the sot code has changed to SOT1039-2. | | | |
| NX3L4051 v.4 | 20111107 | Product data sheet | - | NX3L4051 v.3 |
| Modifications: | • Legal pages updated. | | | |
| NX3L4051 v.3 | 20101222 | Product data sheet | - | NX3L4051 v.2 |
| NX3L4051 v.2 | 20100812 | Product data sheet | - | NX3L4051 v.1 |
| NX3L4051 v.1 | 20100415 | Product data sheet | - | - |

# 15 Legal information

## 15.1 Data sheet status

| Document status[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 URL http://www.nxp.com.

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## Tables



## Figures

## Contents





**Date of release: 30 September 2020**
**Document identifier: NX3L4051**