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 (E). A HIGH on 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 \( (0.5 \, \Omega) \) 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):
  - 1.7 \( \Omega \) (typical) at \( V_{CC} = 1.4 \, V \)
  - 1.0 \( \Omega \) (typical) at \( V_{CC} = 1.65 \, V \)
  - 0.6 \( \Omega \) (typical) at \( V_{CC} = 2.3 \, V \)
  - 0.5 \( \Omega \) (typical) at \( V_{CC} = 2.7 \, V \)
  - 0.5 \( \Omega \) (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 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 \(-40 \, ^\circ C\) to \(+85 \, ^\circ C\) and from \(-40 \, ^\circ C\) to \(+125 \, ^\circ C\)
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

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Temperature range</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX3L4051HR</td>
<td>HXQFN16</td>
<td>-40 °C to +125 °C</td>
<td>plastic thermal enhanced extremely thin quad flat package; no leads; 16 terminals; body 3 × 3 × 0.5 mm</td>
<td>SOT1039-2</td>
<td></td>
</tr>
<tr>
<td>NX3L4051PW</td>
<td>TSSOP16</td>
<td>-40 °C to +125 °C</td>
<td>plastic thin shrink small outline package; 16 leads; body width 4.4 mm</td>
<td>SOT403-1</td>
<td></td>
</tr>
</tbody>
</table>

5. Marking

Table 2. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX3L4051HR</td>
<td>M41</td>
</tr>
<tr>
<td>NX3L4051PW</td>
<td>X3L4051</td>
</tr>
</tbody>
</table>
6. Functional diagram

Fig 1. Logic symbol

Fig 2. Functional diagram

Pin numbers are shown for TSSOP16 package only.
7. Pinning information

7.1 Pinning

![Pin configuration SOT1039-2 (HXQFN16)](image1)

![Pin configuration SOT403-1 (TSSOP16)](image2)

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

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

7.2 Pin description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pin</th>
<th>SOT1039-2</th>
<th>SOT403-1</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7</td>
<td>11, 12, 13, 10, 15, 3, 16, 2</td>
<td>13, 14, 15, 12, 1, 5, 2, 4</td>
<td>independent input or output</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>1</td>
<td>3</td>
<td>independent output or input</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>4</td>
<td>6</td>
<td>enable input (active LOW)</td>
<td></td>
</tr>
<tr>
<td>n.c.</td>
<td>5</td>
<td>7</td>
<td>not connected</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>6</td>
<td>8</td>
<td>ground (0 V)</td>
<td></td>
</tr>
<tr>
<td>S1, S2, S3</td>
<td>9, 8, 7</td>
<td>11, 10, 9</td>
<td>select input</td>
<td></td>
</tr>
<tr>
<td>VCC</td>
<td>14</td>
<td>16</td>
<td>supply voltage</td>
<td></td>
</tr>
</tbody>
</table>
8. Functional description

Table 4. Function table

<table>
<thead>
<tr>
<th>Input</th>
<th>Channel ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>S3</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
</tr>
</tbody>
</table>

[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).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>supply voltage</td>
<td></td>
<td>$-0.5$</td>
<td>$+4.6$</td>
<td>V</td>
</tr>
<tr>
<td>$V_I$</td>
<td>input voltage Sn and $\overline{E}$</td>
<td></td>
<td>$[1] -0.5$</td>
<td>$+4.6$</td>
<td>V</td>
</tr>
<tr>
<td>$V_{SW}$</td>
<td>switch voltage</td>
<td></td>
<td>$[2] -0.5$</td>
<td>$V_{CC} + 0.5$</td>
<td>V</td>
</tr>
<tr>
<td>$I_{IK}$</td>
<td>input clamping current</td>
<td>$V_I &lt; -0.5$ V</td>
<td>$-50$</td>
<td>$-$</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{SK}$</td>
<td>switch clamping current</td>
<td>$V_I &lt; -0.5$ V or $V_I &gt; V_{CC} + 0.5$ V</td>
<td>$-$</td>
<td>$\pm 50$</td>
<td>mA</td>
</tr>
<tr>
<td>$I_{SW}$</td>
<td>switch current</td>
<td>$V_{SW} &gt; -0.5$ V or $V_{SW} &lt; V_{CC} + 0.5$ V; source or sink current</td>
<td>$-$</td>
<td>$\pm 350$</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{SW} &gt; -0.5$ V or $V_{SW} &lt; V_{CC} + 0.5$ V; pulsed at 1 ms duration, &lt; 10 % duty cycle; peak current</td>
<td>$-$</td>
<td>$\pm 500$</td>
<td>mA</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td></td>
<td>$-65$</td>
<td>$+150$</td>
<td>°C</td>
</tr>
<tr>
<td>$P_{tot}$</td>
<td>total power dissipation</td>
<td>$T_{amb} = -40$ °C to $+125$ °C</td>
<td>$[3]$</td>
<td>$250$</td>
<td>mW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$HXQFN16$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$TSSOP16$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[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.
10. Recommended operating conditions

Table 6. Recommended operating conditions

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
<td>supply voltage</td>
<td></td>
<td>1.4</td>
<td>4.3</td>
<td>V</td>
</tr>
<tr>
<td>$V_I$</td>
<td>input voltage Sn and $\bar{E}$</td>
<td>$V_{CC} = 1.4$ V to 4.3 V</td>
<td>0</td>
<td>4.3</td>
<td>V</td>
</tr>
<tr>
<td>$V_{SW}$</td>
<td>switch voltage</td>
<td>$V_{CC}$</td>
<td>0</td>
<td>4.3</td>
<td>V</td>
</tr>
<tr>
<td>$T_{amb}$</td>
<td>ambient temperature</td>
<td>$-40$ to $+125$ °C</td>
<td>-</td>
<td>200</td>
<td>ns/V</td>
</tr>
<tr>
<td>$\Delta t/\Delta V$</td>
<td>input transition rise and fall rate Sn and $\bar{E}$; $V_{CC} = 1.4$ V to 4.3 V</td>
<td>-</td>
<td>200</td>
<td>ns/V</td>
<td></td>
</tr>
</tbody>
</table>

[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.

11. Static characteristics

Table 7. Static characteristics

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>$T_{amb} = 25$ °C</th>
<th>$T_{amb} = -40$ °C to $+125$ °C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{IH}$</td>
<td>HIGH-level input voltage</td>
<td>$V_{CC} = 1.4$ V to 1.6 V</td>
<td>0.9</td>
<td>0.9</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 1.65$ V to 1.95 V</td>
<td>0.9</td>
<td>0.9</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.3$ V to 2.7 V</td>
<td>1.1</td>
<td>1.1</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.7$ V to 3.6 V</td>
<td>1.3</td>
<td>1.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 3.6$ V to 4.3 V</td>
<td>1.4</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>$V_{IL}$</td>
<td>LOW-level input voltage</td>
<td>$V_{CC} = 1.4$ V to 1.6 V</td>
<td>-</td>
<td>0.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 1.65$ V to 1.95 V</td>
<td>-</td>
<td>0.4</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.3$ V to 2.7 V</td>
<td>-</td>
<td>0.4</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.7$ V to 3.6 V</td>
<td>-</td>
<td>0.5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 3.6$ V to 4.3 V</td>
<td>-</td>
<td>0.6</td>
<td>V</td>
</tr>
<tr>
<td>$I_I$</td>
<td>input leakage current</td>
<td>Sn and $\bar{E}$; $V_I = GND$ to 4.3 V; $V_{CC} = 1.4$ V to 4.3 V</td>
<td>-</td>
<td>-0.5</td>
<td>±1  μA</td>
</tr>
<tr>
<td>$I_{S(OFF)}$</td>
<td>OFF-state leakage current</td>
<td>Yn ports; see Figure 5</td>
<td>-</td>
<td>±5</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 1.4$ V to 3.6 V</td>
<td>-</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>$I_{S(ON)}$</td>
<td>ON-state leakage current</td>
<td>Z port; see Figure 6</td>
<td>$V_{CC} = 1.4$ V to 3.6 V</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 3.6$ V to 4.3 V</td>
<td>-</td>
<td>40</td>
<td>-</td>
</tr>
<tr>
<td>$I_{CC}$</td>
<td>supply current</td>
<td>$V_I = V_{CC}$ or GND; $V_{SW} = GND$ or $V_{CC}$</td>
<td>$V_{CC} = 3.6$ V</td>
<td>-</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 4.3$ V</td>
<td>-</td>
<td>150</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 7. Static characteristics …continued
At recommended operating conditions; voltages are referenced to GND (ground 0 V).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>$T_{amb}$ = 25 °C</th>
<th>$T_{amb}$ = –40 °C to +125 °C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta I_{CC}$</td>
<td>additional supply current</td>
<td>$V_{SW} = \text{GND or } V_{CC}$</td>
<td>Min</td>
<td>Typ</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 2.6 \text{ V}; V_{CC} = 4.3 \text{ V}$</td>
<td>-</td>
<td>2.0</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 2.6 \text{ V}; V_{CC} = 3.6 \text{ V}$</td>
<td>-</td>
<td>0.35</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 1.8 \text{ V}; V_{CC} = 4.3 \text{ V}$</td>
<td>-</td>
<td>7.0</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 1.8 \text{ V}; V_{CC} = 3.6 \text{ V}$</td>
<td>-</td>
<td>2.5</td>
<td>4.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 1.8 \text{ V}; V_{CC} = 2.5 \text{ V}$</td>
<td>-</td>
<td>50</td>
<td>200</td>
</tr>
<tr>
<td>$C_I$</td>
<td>input capacitance</td>
<td>$S_n$ and $\bar{E}$</td>
<td>-</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>$C_{S(OFF)}$</td>
<td>OFF-state capacitance</td>
<td>-</td>
<td>35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$C_{S(ON)}$</td>
<td>ON-state capacitance</td>
<td>-</td>
<td>350</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

11.1 Test circuits

Fig 5. Test circuit for measuring OFF-state leakage current

$V_I = 0.3 \text{ V or } V_{CC} – 0.3 \text{ V}; V_O = V_{CC} – 0.3 \text{ V or } 0.3 \text{ V}.$

Fig 6. Test circuit for measuring ON-state leakage current

$V_I = 0.3 \text{ V or } V_{CC} – 0.3 \text{ V}; V_O = V_{CC} – 0.3 \text{ V or } 0.3 \text{ V}.$
11.2 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.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>(T_{\text{amb}} = -40 , ^\circ \text{C} \text{ to } +85 , ^\circ \text{C})</th>
<th>(T_{\text{amb}} = -40 , ^\circ \text{C} \text{ to } +125 , ^\circ \text{C})</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>(R_{\text{ON(peak)}})</td>
<td>ON resistance (peak)</td>
<td>(V_i = \text{GND to } V_{\text{CC}}; ) (I_{\text{SW}} = 100 , \text{mA}); see Figure 7</td>
<td>Min</td>
<td>Typ[2]</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.4 , \text{V})</td>
<td>-</td>
<td>1.7</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.65 , \text{V})</td>
<td>-</td>
<td>1.0</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.3 , \text{V})</td>
<td>-</td>
<td>0.6</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.7 , \text{V})</td>
<td>-</td>
<td>0.5</td>
<td>0.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 4.3 , \text{V})</td>
<td>-</td>
<td>0.5</td>
<td>0.75</td>
</tr>
<tr>
<td>(\Delta R_{\text{ON}})</td>
<td>ON resistance mismatch between channels</td>
<td>(V_i = \text{GND to } V_{\text{CC}}; ) (I_{\text{SW}} = 100 , \text{mA})</td>
<td>Min</td>
<td></td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.4 , \text{V}; ) (V_{\text{SW}} = 0.4 , \text{V})</td>
<td>-</td>
<td>0.18</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.65 , \text{V}; ) (V_{\text{SW}} = 0.5 , \text{V})</td>
<td>-</td>
<td>0.18</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.3 , \text{V}; ) (V_{\text{SW}} = 0.7 , \text{V})</td>
<td>-</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.7 , \text{V}; ) (V_{\text{SW}} = 0.8 , \text{V})</td>
<td>-</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 4.3 , \text{V}; ) (V_{\text{SW}} = 0.8 , \text{V})</td>
<td>-</td>
<td>0.07</td>
<td>0.10</td>
</tr>
<tr>
<td>(R_{\text{ON(flat)}})</td>
<td>ON resistance (flatness)</td>
<td>(V_i = \text{GND to } V_{\text{CC}}; ) (I_{\text{SW}} = 100 , \text{mA})</td>
<td>Min</td>
<td></td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.4 , \text{V})</td>
<td>-</td>
<td>1.0</td>
<td>3.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 1.65 , \text{V})</td>
<td>-</td>
<td>0.5</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.3 , \text{V})</td>
<td>-</td>
<td>0.15</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 2.7 , \text{V})</td>
<td>-</td>
<td>0.13</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(V_{\text{CC}} = 4.3 , \text{V})</td>
<td>-</td>
<td>0.2</td>
<td>0.4</td>
</tr>
</tbody>
</table>

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

Fig 7. Test circuit for measuring ON resistance

\[ R_{ON} = \frac{V_{SW}}{I_{SW}}. \]

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

(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.
Single low-ohmic 8-channel analog switch

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

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

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

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

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

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

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

(1) $T_{amb} = 125 \degree C$.
(2) $T_{amb} = 85 \degree C$.
(3) $T_{amb} = 25 \degree C$.
(4) $T_{amb} = -40 \degree C$. 
12. Dynamic characteristics

Table 9. Dynamic characteristics
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see Figure 17.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>$T_{\text{amb}} = 25$ °C</th>
<th>$T_{\text{amb}} = -40$ °C to +125 °C</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$t_{\text{en}}$</td>
<td>enable time</td>
<td>$E$, $\text{Sn to Z or Yn}$; see Figure 15</td>
<td>$V_{\text{CC}} = 1.4$ V to 1.6 V</td>
<td>$-45$</td>
<td>$100$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 1.65$ V to 1.95 V</td>
<td>$-32$</td>
<td>$75$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 2.3$ V to 2.7 V</td>
<td>$-21$</td>
<td>$50$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 2.7$ V to 3.6 V</td>
<td>$-19$</td>
<td>$45$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 3.6$ V to 4.3 V</td>
<td>$-19$</td>
<td>$45$</td>
</tr>
<tr>
<td>$t_{\text{dis}}$</td>
<td>disable time</td>
<td>$E$, $\text{Sn to Z or Yn}$; see Figure 15</td>
<td>$V_{\text{CC}} = 1.4$ V to 1.6 V</td>
<td>$-25$</td>
<td>$80$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 1.65$ V to 1.95 V</td>
<td>$-15$</td>
<td>$65$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 2.3$ V to 2.7 V</td>
<td>$-9$</td>
<td>$30$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 2.7$ V to 3.6 V</td>
<td>$-8$</td>
<td>$25$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$V_{\text{CC}} = 3.6$ V to 4.3 V</td>
<td>$-8$</td>
<td>$25$</td>
</tr>
</tbody>
</table>
Table 9. Dynamic characteristics ...continued
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); for load circuit see Figure 17.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>( T_{\text{amb}} = 25 , ^\circ\text{C} )</th>
<th>( T_{\text{amb}} = -40 \to +125 , ^\circ\text{C} )</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t\text{-bm} )</td>
<td>break-before-make time</td>
<td>see Figure 16</td>
<td>[2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{\text{CC}} = 1.4 , \text{V to 1.6 , V} )</td>
<td>- 19 - 9 - -</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{\text{CC}} = 1.65 , \text{V to 1.95 , V} )</td>
<td>- 17 - 7 - -</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{\text{CC}} = 2.3 , \text{V to 2.7 , V} )</td>
<td>- 12 - 4 - -</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{\text{CC}} = 2.7 , \text{V to 3.6 , V} )</td>
<td>- 10 - 3 - -</td>
<td>ns</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{\text{CC}} = 3.6 , \text{V to 4.3 , V} )</td>
<td>- 9 - 2 - -</td>
<td>ns</td>
<td></td>
</tr>
</tbody>
</table>

[1] Typical values are measured at \( T_{\text{amb}} = 25 \, ^\circ\text{C} \) and \( V_{\text{CC}} = 1.5 \, \text{V, 1.8 \, V, 2.5 \, V, 3.3 \, V and 4.3 \, V} \) respectively.


12.1 Waveform and test circuits

Fig 15. Enable and disable times

Measurement points are given in Table 10.

Logic level: \( V_{\text{OH}} \) is typical output voltage level that occurs with the output load.

Table 10. Measurement points

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{\text{CC}} )</td>
<td>( V_{\text{M}} )</td>
<td>( V_{\text{X}} )</td>
</tr>
<tr>
<td>1.4 V to 4.3 V</td>
<td>0.5( V_{\text{CC}} )</td>
<td>0.9( V_{\text{OH}} )</td>
</tr>
</tbody>
</table>
Fig 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 \( S_n \) or \( E \).

Fig 17. Test circuit for measuring switching times

Table 11. Test data

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input</th>
<th>( t_r, t_f )</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{CC} )</td>
<td>( V_I )</td>
<td>( \leq 2.5 \text{ ns} )</td>
<td>( C_L )</td>
</tr>
<tr>
<td>1.4 V to 4.3 V</td>
<td>( V_{CC} )</td>
<td></td>
<td>35 pF</td>
</tr>
</tbody>
</table>
12.2 Additional dynamic characteristics

Table 12. Additional dynamic characteristics
At recommended operating conditions; voltages are referenced to GND (ground = 0 V); Vf = GND or VCC (unless otherwise specified); tᵣ = tᵢ ≤ 2.5 ns; T_amb = 25 °C.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>THD</td>
<td>total harmonic distortion</td>
<td>fᵢ = 20 Hz to 20 kHz; Rₓ = 32 Ω; see Figure 18 [1]</td>
<td>0.15</td>
<td>0.01</td>
<td>0.10</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.4 V; Vᵦ = 1 V (p-p)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.65 V; Vᵦ = 1.2 V (p-p)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 2.3 V; Vᵦ = 1.5 V (p-p)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 2.7 V; Vᵦ = 2 V (p-p)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 4.3 V; Vᵦ = 2 V (p-p)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fᵢ(-3dB)</td>
<td>-3 dB frequency response</td>
<td>RL = 50 Ω; see Figure 19 [1]</td>
<td></td>
<td>15</td>
<td></td>
<td>MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.4 V to 4.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>α_iso</td>
<td>isolation (OFF-state)</td>
<td>fᵢ = 100 kHz; RL = 50 Ω; see Figure 20 [1]</td>
<td></td>
<td>-90</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.4 V to 4.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vᵦct</td>
<td>crosstalk voltage</td>
<td>between digital inputs and switch; fᵢ = 1 MHz; Cᵦ = 50 pF; RL = 50 Ω; see Figure 21</td>
<td>0.2</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.4 V to 3.6 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 3.6 V to 4.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Xtalk</td>
<td>crosstalk</td>
<td>between switches; fᵢ = 100 kHz; RL = 50 Ω; see Figure 22 [1]</td>
<td></td>
<td>-90</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.4 V to 4.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qᵦᵣᵢ</td>
<td>charge injection</td>
<td>fᵢ = 1 MHz; Cᵦ = 0.1 nF; RL = 1 MΩ; Vᵦgen = 0 V; Rᵦgen = 0 Ω; see Figure 23 [1]</td>
<td>3</td>
<td></td>
<td>4</td>
<td>pC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.5 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 1.8 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 2.5 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 3.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VᵦC = 4.3 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[1\] fᵢ is biased at 0.5VᵦC.

12.3 Test circuits

Fig 18. Test circuit for measuring total harmonic distortion
Adjust f, voltage to obtain 0 dBm level at output. Increase f, frequency until dB meter reads −3 dB.

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

Adjust f, voltage to obtain 0 dBm level at input.

**Fig 20. Test circuit for measuring isolation (OFF-state)**
Fig 21. Test circuit for measuring crosstalk voltage between digital inputs and switch

Fig 22. Test circuit for measuring crosstalk between switches
a. Test circuit

![Test circuit for measuring charge injection](image)

b. Input and output pulse definitions

Definition: \[ Q_{in} = \Delta V_O \times C_L. \]

\( \Delta V_O \) = output voltage variation.

\( R_{gen} \) = generator resistance.

\( V_{gen} \) = generator voltage.

\( V_i \) may be connected to \( S_n \) or \( E \).

**Fig 23.** Test circuit for measuring charge injection
13. Package outline

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

SOT1039-2

Fig 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)

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<thead>
<tr>
<th>UNIT</th>
<th>A max.</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>b p</th>
<th>c</th>
<th>D (1)</th>
<th>E (2)</th>
<th>e</th>
<th>H E</th>
<th>L</th>
<th>L p</th>
<th>Q</th>
<th>v</th>
<th>w</th>
<th>y</th>
<th>Z (3)</th>
<th>θ</th>
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<tbody>
<tr>
<td>mm</td>
<td>1.1</td>
<td>0.15</td>
<td>0.95</td>
<td>0.25</td>
<td>0.30</td>
<td>0.2</td>
<td>0.1</td>
<td>4.5</td>
<td>4.9</td>
<td>0.65</td>
<td>6.6</td>
<td>1</td>
<td>0.75</td>
<td>0.2</td>
<td>0.13</td>
<td>6.6</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.05</td>
<td>0.80</td>
<td>0.19</td>
<td>0.1</td>
<td>0.30</td>
<td>0.1</td>
<td>0.2</td>
<td>4.3</td>
<td>4.9</td>
<td>0.65</td>
<td>6.2</td>
<td>1</td>
<td>0.75</td>
<td>0.3</td>
<td>0.2</td>
<td>6.2</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

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

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<th>VERSION</th>
<th>REFERENCES</th>
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<tr>
<td>IEC</td>
<td>MO-153</td>
</tr>
</tbody>
</table>

Fig 25. Package outline SOT403-1 (TSSOP16)
14. Abbreviations

Table 13. Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>CDM</td>
<td>Charged Device Model</td>
</tr>
<tr>
<td>CMOS</td>
<td>Complementary Metal-Oxide Semiconductor</td>
</tr>
<tr>
<td>ESD</td>
<td>ElectroStatic Discharge</td>
</tr>
<tr>
<td>HBM</td>
<td>Human Body Model</td>
</tr>
<tr>
<td>MM</td>
<td>Machine Model</td>
</tr>
<tr>
<td>PDA</td>
<td>Personal Digital Assistant</td>
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15. Revision history

Table 14. Revision history

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<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>Product data sheet</td>
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NXP Semiconductors

NX3L4051

Single low-ohmic 8-channel analog switch

16. Legal information

16.1 Data sheet status

<table>
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<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[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".

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17. Contact information

For more information, please visit: [http://www.nxp.com](http://www.nxp.com)

For sales office addresses, please send an email to: salesaddresses@nxp.com
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