1. General description

The 74LVC2G241 is a dual non-inverting buffer/line driver with 3-state outputs. The 3-state outputs are controlled by the output enable inputs 1OE and 2OE:

- A HIGH level at pin 1OE causes output 1Y to assume a high-impedance OFF-state.
- A LOW level at pin 2OE causes output 2Y to assume a high-impedance OFF-state.

Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

Inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of the 74LVC2G241 as a translator in a mixed 3.3 V and 5 V environment.

This device is fully specified for partial power-down applications using $I_{	ext{OFF}}$. The $I_{	ext{OFF}}$ circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 5.5 V
- 5 V tolerant input/output for interfacing with 5 V logic
- High noise immunity
- $\pm24$ mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8-B/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and -40 °C to +125 °C
3. 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>74LVC2G241DP</td>
<td>TSSOP8</td>
<td>-40 °C to +125 °C</td>
<td>plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LVC2G241DC</td>
<td>VSSOP8</td>
<td>-40 °C to +125 °C</td>
<td>plastic very thin shrink small outline package; 8 leads; body width 2.3 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LVC2G241GT</td>
<td>XSON8</td>
<td>-40 °C to +125 °C</td>
<td>plastic extremely thin small outline package; no leads; 8 terminals; body 1 × 1.95 × 0.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LVC2G241GF</td>
<td>XSON8</td>
<td>-40 °C to +125 °C</td>
<td>extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1 × 0.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LVC2G241GN</td>
<td>XSON8</td>
<td>-40 °C to +125 °C</td>
<td>extremely thin small outline package; no leads; 8 terminals; body 1.2 × 1.0 × 0.35 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>74LVC2G241GS</td>
<td>XSON8</td>
<td>-40 °C to +125 °C</td>
<td>extremely thin small outline package; no leads; 8 terminals; body 1.35 × 1.0 × 0.35 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Marking

Table 2. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>74LVC2G241DP</td>
<td>V241</td>
</tr>
<tr>
<td>74LVC2G241DC</td>
<td>V41</td>
</tr>
<tr>
<td>74LVC2G241GT</td>
<td>V41</td>
</tr>
<tr>
<td>74LVC2G241GF</td>
<td>V1</td>
</tr>
<tr>
<td>74LVC2G241GN</td>
<td>V1</td>
</tr>
<tr>
<td>74LVC2G241GS</td>
<td>V1</td>
</tr>
</tbody>
</table>

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

5. Functional diagram

Fig. 1. Logic symbol

Fig. 2. IEC logic symbol
6. Pinning information

6.1. Pinning

Fig. 3. Pin configuration SOT1089 (XSON8)

DP package SOT505-2 (TSSOP8)

DC package SOT765-1 (VSSOP8)

GT package SOT833-1 (XSON8)

GN package SOT1116 (XSON8)

GS package SOT1203 (XSON8)
6.2. Pin description

Table 3. Pin description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Pin</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1OE</td>
<td>1</td>
<td>output enable input (active LOW)</td>
</tr>
<tr>
<td>1A, 2A</td>
<td>2, 5</td>
<td>data input</td>
</tr>
<tr>
<td>GND</td>
<td>4</td>
<td>ground (0 V)</td>
</tr>
<tr>
<td>1Y, 2Y</td>
<td>6, 3</td>
<td>data output</td>
</tr>
<tr>
<td>2OE</td>
<td>7</td>
<td>output enable input (active HIGH)</td>
</tr>
<tr>
<td>VCC</td>
<td>8</td>
<td>supply voltage</td>
</tr>
</tbody>
</table>

7. Functional description

Table 4. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

<table>
<thead>
<tr>
<th>Input</th>
<th>1OE</th>
<th>1A</th>
<th>2OE</th>
<th>2A</th>
<th>1Y</th>
<th>2Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>X</td>
<td>L</td>
<td>X</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
</tr>
</tbody>
</table>

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).

<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>VCC</td>
<td>supply voltage</td>
<td></td>
<td>-0.5</td>
<td>+6.5</td>
<td>V</td>
</tr>
<tr>
<td>I_K</td>
<td>input clamping current</td>
<td>V_i &lt; 0 V</td>
<td>-50</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>V_i</td>
<td>input voltage</td>
<td></td>
<td>-0.5</td>
<td>+6.5</td>
<td>V</td>
</tr>
<tr>
<td>I_OK</td>
<td>output clamping current</td>
<td>V_o &gt; V_CC or V_o &lt; 0 V</td>
<td>-</td>
<td>±50</td>
<td>mA</td>
</tr>
<tr>
<td>V_o</td>
<td>output voltage</td>
<td>enable mode</td>
<td>[1]</td>
<td>-0.5</td>
<td>V_CC + 0.5 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>disable mode</td>
<td>[1]</td>
<td>-0.5</td>
<td>+6.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_CC = 0 V; Power-down mode</td>
<td>[1]</td>
<td>-0.5</td>
<td>+6.5</td>
</tr>
<tr>
<td>I_O</td>
<td>output current</td>
<td>V_o = 0 V to V_CC</td>
<td>-</td>
<td>±50</td>
<td>mA</td>
</tr>
<tr>
<td>I_CC</td>
<td>supply current</td>
<td></td>
<td>-</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>I_GND</td>
<td>ground current</td>
<td></td>
<td>-100</td>
<td>-</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_tout</td>
<td>total power dissipation</td>
<td>T_amb = -40 °C to +125 °C</td>
<td>[2]</td>
<td>-</td>
<td>250</td>
</tr>
</tbody>
</table>

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For SOT505-2 (TSSOP8) package: P_tout derates linearly with 4.6 mW/K above 96 °C.
For SOT765-1 (VSSOP8) package: P_tout derates linearly with 4.9 mW/K above 99 °C.
For SOT833-1 (XSON8) package: P_tout derates linearly with 3.1 mW/K above 68 °C.
For SOT1089 (XSON8) package: P_tout derates linearly with 4.0 mW/K above 88 °C.
For SOT1116 (XSON8) package: P_tout derates linearly with 4.2 mW/K above 90 °C.
For SOT1203 (XSON8) package: P_tout derates linearly with 3.6 mW/K above 81 °C.
9. Recommended operating conditions

Table 6. 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&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>supply voltage</td>
<td></td>
<td>1.65</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>V&lt;sub&gt;I&lt;/sub&gt;</td>
<td>input voltage</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; enable mode</td>
<td>0</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; disable mode</td>
<td>0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 0 V; Power-down mode</td>
<td>0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>V&lt;sub&gt;O&lt;/sub&gt;</td>
<td>output voltage</td>
<td></td>
<td>0</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt;</td>
<td>ambient temperature</td>
<td></td>
<td>-40</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>Δt/ΔV</td>
<td>input transition rise and fall rate</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 2.7 V</td>
<td>-</td>
<td>20</td>
<td>ns/V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 2.7 V to 5.5 V</td>
<td>-</td>
<td>10</td>
<td>ns/V</td>
</tr>
</tbody>
</table>

10. 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>Min</th>
<th>Typ[1]</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V&lt;sub&gt;IH&lt;/sub&gt;</td>
<td>HIGH-level input voltage</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 1.95 V</td>
<td>0.65 × V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 2.7 V</td>
<td>1.7</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 2.7 V to 3.6 V</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 4.5 V to 5.5 V</td>
<td>0.7 × V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>LOW-level input voltage</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 1.95 V</td>
<td>-</td>
<td>-</td>
<td>0.35 × V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 2.7 V</td>
<td>-</td>
<td>-</td>
<td>0.7</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 2.7 V to 3.6 V</td>
<td>-</td>
<td>-</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 4.5 V to 5.5 V</td>
<td>-</td>
<td>-</td>
<td>0.3 × V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>V</td>
</tr>
<tr>
<td>V&lt;sub&gt;OL&lt;/sub&gt;</td>
<td>LOW-level output voltage</td>
<td>V&lt;sub&gt;O&lt;/sub&gt; = V&lt;sub&gt;IH&lt;/sub&gt; or V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 100 μA; V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 4 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V</td>
<td>-</td>
<td>-</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 8 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 12 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 2.7 V</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 24 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 3.0 V</td>
<td>-</td>
<td>-</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = 32 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 4.5 V</td>
<td>-</td>
<td>-</td>
<td>0.55</td>
</tr>
<tr>
<td>V&lt;sub&gt;OH&lt;/sub&gt;</td>
<td>HIGH-level output voltage</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;IH&lt;/sub&gt; or V&lt;sub&gt;IL&lt;/sub&gt;</td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -100 μA; V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; - 0.1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -4 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -8 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V</td>
<td>1.9</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -12 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 2.7 V</td>
<td>2.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -24 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 3.0 V</td>
<td>2.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>I&lt;sub&gt;O&lt;/sub&gt; = -32 mA; V&lt;sub&gt;CC&lt;/sub&gt; = 4.5 V</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>I&lt;sub&gt;I&lt;/sub&gt;</td>
<td>input leakage current</td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND; V&lt;sub&gt;CC&lt;/sub&gt; = 0 V to 5.5 V</td>
<td>-</td>
<td>±0.1</td>
<td>±1</td>
<td>μA</td>
</tr>
<tr>
<td>I&lt;sub&gt;0Z&lt;/sub&gt;</td>
<td>OFF-state output current</td>
<td>V&lt;sub&gt;O&lt;/sub&gt; = V&lt;sub&gt;IH&lt;/sub&gt; or V&lt;sub&gt;IL&lt;/sub&gt;; V&lt;sub&gt;CC&lt;/sub&gt; = 5.5 V or GND; V&lt;sub&gt;CC&lt;/sub&gt; = 3.6 V</td>
<td>-</td>
<td>±0.1</td>
<td>±2</td>
<td>μA</td>
</tr>
<tr>
<td>I&lt;sub&gt;OFF&lt;/sub&gt;</td>
<td>power-off leakage current</td>
<td>V&lt;sub&gt;O&lt;/sub&gt; = 5.5 V; V&lt;sub&gt;CC&lt;/sub&gt; = 0 V</td>
<td>-</td>
<td>±0.1</td>
<td>±2</td>
<td>μA</td>
</tr>
<tr>
<td>Symbol</td>
<td>Parameter</td>
<td>Conditions</td>
<td>Min</td>
<td>Typ[1]</td>
<td>Max</td>
<td>Unit</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
<td>--------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>$I_{CC}$</td>
<td>supply current</td>
<td>$V_I = 5.5,\text{V or GND; } I_O = 0,\text{A;}$</td>
<td>-</td>
<td>0.1</td>
<td>4</td>
<td>μA</td>
</tr>
<tr>
<td>$V_{CC}$</td>
<td></td>
<td>$V_{CC} = 1.65,\text{V to 5.5,V}$</td>
<td>-</td>
<td>0.1</td>
<td>4</td>
<td>μA</td>
</tr>
<tr>
<td>$\Delta I_{CC}$</td>
<td>additional supply current</td>
<td>per pin; $V_I = V_{CC} - 0.6,\text{V;} I_O = 0,\text{A;}$</td>
<td>-</td>
<td>5</td>
<td>500</td>
<td>μA</td>
</tr>
<tr>
<td>$C_I$</td>
<td>input capacitance</td>
<td></td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

$T_{amb} = -40\,^\circ\text{C to } +125\,^\circ\text{C}$

| $V_{IH}$ | HIGH-level input voltage     | $V_{CC} = 1.65\,\text{V to 1.95\,V}$                                      | 0.65×$V_{CC}$ | -    | -    | V    |
|         |                               | $V_{CC} = 2.3\,\text{V to 2.7\,V}$                                       | -    | 1.7    | -    | V    |
|         |                               | $V_{CC} = 2.7\,\text{V to 3.6\,V}$                                       | -    | 2.0    | -    | V    |
|         |                               | $V_{CC} = 4.5\,\text{V to 5.5\,V}$                                       | -    | 0.7×$V_{CC}$ | -    | V    |

| $V_{IL}$ | LOW-level input voltage      | $V_{CC} = 1.65\,\text{V to 1.95\,V}$                                      | -    | -      | 0.35×$V_{CC}$ | V    |
|         |                               | $V_{CC} = 2.3\,\text{V to 2.7\,V}$                                       | -    | -      | 0.7      | V    |
|         |                               | $V_{CC} = 2.7\,\text{V to 3.6\,V}$                                       | -    | -      | 0.8      | V    |
|         |                               | $V_{CC} = 4.5\,\text{V to 5.5\,V}$                                       | -    | -      | 0.3×$V_{CC}$ | V    |

| $V_{OL}$ | LOW-level output voltage     | $V_I = V_{IH}$ or $V_{IL}$                                               | $I_O = 100\,\mu\text{A;} V_{CC} = 1.65\,\text{V to 5.5\,V}$ | -    | -      | 0.1    | V    |
|         |                               | $I_O = 4\,\text{mA;} V_{CC} = 1.65\,\text{V}$                              | -    | -      | 0.70    | V    |
|         |                               | $I_O = 8\,\text{mA;} V_{CC} = 2.3\,\text{V}$                              | -    | -      | 0.45    | V    |
|         |                               | $I_O = 12\,\text{mA;} V_{CC} = 2.7\,\text{V}$                              | -    | -      | 0.60    | V    |
|         |                               | $I_O = 24\,\text{mA;} V_{CC} = 3.0\,\text{V}$                              | -    | -      | 0.80    | V    |
|         |                               | $I_O = 32\,\text{mA;} V_{CC} = 4.5\,\text{V}$                              | -    | -      | 0.80    | V    |

| $V_{OH}$ | HIGH-level output voltage    | $V_I = V_{IH}$ or $V_{IL}$                                               | $I_O = -100\,\mu\text{A;} V_{CC} = 1.65\,\text{V to 5.5\,V}$ | $V_{CC} - 0.1$ | -    | -    | V    |
|         |                               | $I_O = -4\,\text{mA;} V_{CC} = 1.65\,\text{V}$                              | 0.95 | -      | -    | V    |
|         |                               | $I_O = -8\,\text{mA;} V_{CC} = 2.3\,\text{V}$                              | 1.7  | -      | -    | V    |
|         |                               | $I_O = -12\,\text{mA;} V_{CC} = 2.7\,\text{V}$                             | 1.9  | -      | -    | V    |
|         |                               | $I_O = -24\,\text{mA;} V_{CC} = 3.0\,\text{V}$                             | 2.0  | -      | -    | V    |
|         |                               | $I_O = -32\,\text{mA;} V_{CC} = 4.5\,\text{V}$                             | 3.4  | -      | -    | V    |
| $I_I$   | input leakage current        | $V_I = 5.5\,\text{V or GND;} V_{CC} = 0\,\text{V to 5.5\,V}$              | -    | -      | ±1    | μA   |
| $I_{OZ}$ | OFF-state output current     | $V_I = V_{IH}$ or $V_{IL}$; $V_O = 5.5\,\text{V or GND;} V_{CC} = 3.8\,\text{V}$ | -    | -      | ±2    | μA   |
| $I_{OFF}$ | power-off leakage current   | $V_I$ or $V_O = 5.5\,\text{V;} V_{CC} = 0\,\text{V}$                       | -    | -      | ±2    | μA   |
| $I_{CC}$ | supply current              | $V_I = 5.5\,\text{V or GND;} I_O = 0\,\text{A;} V_{CC} = 1.65\,\text{V to 5.5\,V}$ | -    | -      | 4    | μA   |
| $\Delta I_{CC}$ | additional supply current | per pin; $V_I = V_{CC} - 0.6\,\text{V;} I_O = 0\,\text{A;} V_{CC} = 2.3\,\text{V to 5.5\,V}$ | -    | -      | 500   | μA   |

[1] Typical values are measured at $V_{CC} = 3.3\,\text{V}$ and $T_{amb} = 25\,^\circ\text{C}$.
# 11. Dynamic characteristics

Table 8. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>-40 °C to +85 °C</th>
<th>-40 °C to +125 °C</th>
<th>Unit</th>
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<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ[1]</td>
<td>Max</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td></td>
<td>Max</td>
</tr>
<tr>
<td>( t_{pd} )</td>
<td>propagation delay</td>
<td>nA to nY; see Fig. 4</td>
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<td></td>
<td></td>
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<tr>
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<td></td>
<td>( V_{CC} = 1.65 \text{ V} ) to 1.95 \text{ V}</td>
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<td>4.5</td>
<td>8.8</td>
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<td>( V_{CC} = 2.3 \text{ V} ) to 2.7 \text{ V}</td>
<td>0.5</td>
<td>2.8</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.7 \text{ V} )</td>
<td>1.0</td>
<td>2.8</td>
<td>4.7</td>
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<td>( V_{CC} = 4.5 \text{ V} ) to 5.5 \text{ V}</td>
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<td>2.1</td>
<td>3.7</td>
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<tr>
<td>( t_{en} )</td>
<td>enable time</td>
<td>( \uparrow \text{OE to } 1\text{Y}; ) see Fig. 5</td>
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<td>( V_{CC} = 1.65 \text{ V} ) to 1.95 \text{ V}</td>
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<td></td>
<td>( V_{CC} = 2.3 \text{ V} ) to 2.7 \text{ V}</td>
<td>1.0</td>
<td>3.1</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.7 \text{ V} )</td>
<td>1.5</td>
<td>3.2</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 3.0 \text{ V} ) to 3.6 \text{ V}</td>
<td>0.5</td>
<td>2.7</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 4.5 \text{ V} ) to 5.5 \text{ V}</td>
<td>0.5</td>
<td>2.0</td>
<td>3.8</td>
</tr>
<tr>
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<td></td>
<td>( 2\text{OE to } 2\text{Y}; ) see Fig. 6</td>
<td>[2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 1.65 \text{ V} ) to 1.95 \text{ V}</td>
<td>1.0</td>
<td>4.3</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.3 \text{ V} ) to 2.7 \text{ V}</td>
<td>1.0</td>
<td>2.7</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.7 \text{ V} )</td>
<td>1.0</td>
<td>2.7</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 3.0 \text{ V} ) to 3.6 \text{ V}</td>
<td>1.0</td>
<td>2.5</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 4.5 \text{ V} ) to 5.5 \text{ V}</td>
<td>0.5</td>
<td>1.9</td>
<td>3.3</td>
</tr>
<tr>
<td>( t_{ds} )</td>
<td>disable time</td>
<td>( \uparrow \text{OE to } 1\text{Y}; ) see Fig. 5</td>
<td>[2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 1.65 \text{ V} ) to 1.95 \text{ V}</td>
<td>1.0</td>
<td>3.2</td>
<td>11.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.3 \text{ V} ) to 2.7 \text{ V}</td>
<td>0.5</td>
<td>2.2</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.7 \text{ V} )</td>
<td>1.0</td>
<td>2.8</td>
<td>4.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 3.0 \text{ V} ) to 3.6 \text{ V}</td>
<td>1.0</td>
<td>2.6</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 4.5 \text{ V} ) to 5.5 \text{ V}</td>
<td>0.5</td>
<td>2.0</td>
<td>3.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( 2\text{OE to } 2\text{Y}; ) see Fig. 6</td>
<td>[2]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 1.65 \text{ V} ) to 1.95 \text{ V}</td>
<td>1.0</td>
<td>3.6</td>
<td>12.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.3 \text{ V} ) to 2.7 \text{ V}</td>
<td>0.5</td>
<td>2.0</td>
<td>5.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 2.7 \text{ V} )</td>
<td>1.5</td>
<td>3.2</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 3.0 \text{ V} ) to 3.6 \text{ V}</td>
<td>1.0</td>
<td>2.8</td>
<td>4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_{CC} = 4.5 \text{ V} ) to 5.5 \text{ V}</td>
<td>0.5</td>
<td>2.0</td>
<td>3.3</td>
</tr>
<tr>
<td>( C_{PD} )</td>
<td>power dissipation capacitance</td>
<td>per buffer; ( V_{I} = \text{GND to } V_{CC} )</td>
<td>[3]</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>output enabled</td>
<td>-</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>output disabled</td>
<td>-</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

[1] Typical values are measured at nominal \( V_{CC} \) and at \( T_{SSK} = 25 \text{ °C} \).

[2] \( t_{pd} \) is the same as \( t_{PLH} \) and \( t_{PLH} \); \( t_{en} \) is the same as \( t_{PZL} \) and \( t_{PZL} \); \( t_{ds} \) is the same as \( t_{PLZ} \) and \( t_{PLZ} \).

[3] \( C_{PD} \) is used to determine the dynamic power dissipation (\( P_{D} \) in \( \mu \text{W} \)).

\[ P_{D} = C_{PD} \times V_{CC}^{2} \times f_{I} \times N + \Sigma(C_{L} \times V_{CC}^{2} \times f_{D}) \]

where:

- \( f_{I} \) is input frequency in \( \text{MHz} \);
- \( f_{D} \) is output frequency in \( \text{MHz} \);
- \( C_{L} \) is output load capacitance in \( \text{pF} \);
- \( V_{CC} \) is supply voltage in \( \text{V} \);
- \( N \) is number of inputs switching;
- \( \Sigma(C_{L} \times V_{CC}^{2} \times f_{D}) \) is sum of outputs.
11.1. Waveforms and test circuit

Measurement points are given in Table 9.
Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

**Fig. 4.** The data input (nA) to output (nY) propagation delays

**Table 9. Measurement points**

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{CC}</td>
<td>V_{M}</td>
<td>V_{M}</td>
</tr>
<tr>
<td>1.65 V to 1.95 V</td>
<td>0.5 × V_{CC}</td>
<td>0.5 × V_{CC}</td>
</tr>
<tr>
<td>2.3 V to 2.7 V</td>
<td>0.5 × V_{CC}</td>
<td>0.5 × V_{CC}</td>
</tr>
<tr>
<td>2.7 V</td>
<td>1.5 V</td>
<td>1.5 V</td>
</tr>
<tr>
<td>3.0 V to 3.6 V</td>
<td>1.5 V</td>
<td>1.5 V</td>
</tr>
<tr>
<td>4.5 V to 5.5 V</td>
<td>0.5 × V_{CC}</td>
<td>0.5 × V_{CC}</td>
</tr>
</tbody>
</table>

Measurement points are given in Table 9.
Logic levels: V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

**Fig. 5.** Enable and disable times for input 1OE
Measurement points are given in Table 9.
Logic levels: $V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

Fig. 6. Enable and disable times for input 2OE

Test data is given in Table 10.
Definitions for test circuit:
$R_T =$ Termination resistance should be equal to output impedance $Z_o$ of the pulse generator;
$C_L =$ Load capacitance including jig and probe capacitance; $R_L =$ Load resistance.

Fig. 7. Test circuit for measuring switching times

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input $V_i$</th>
<th>Load $C_L$</th>
<th>$R_L$</th>
<th>$t_{PLH}$, $t_{PHL}$</th>
<th>$t_{PZH}$, $t_{PHZ}$</th>
<th>$t_{PZL}$, $t_{PLZ}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.65 V to 1.95 V</td>
<td>$V_{CC}$</td>
<td>30 pF</td>
<td>1 kΩ</td>
<td>open</td>
<td>GND</td>
<td>$2 \times V_{CC}$</td>
</tr>
<tr>
<td>2.3 V to 2.7 V</td>
<td>$V_{CC}$</td>
<td>30 pF</td>
<td>500 Ω</td>
<td>open</td>
<td>GND</td>
<td>$2 \times V_{CC}$</td>
</tr>
<tr>
<td>2.7 V</td>
<td>2.7 V</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
<td>GND</td>
<td>6 V</td>
</tr>
<tr>
<td>3.0 V to 3.6 V</td>
<td>2.7 V</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
<td>GND</td>
<td>6 V</td>
</tr>
<tr>
<td>4.5 V to 5.5 V</td>
<td>$V_{CC}$</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
<td>GND</td>
<td>$2 \times V_{CC}$</td>
</tr>
</tbody>
</table>
12. Package outline

TSSOP8: plastic thin shrink small outline package; 8 leads; body width 3 mm; lead length 0.5 mm  SOT505-2

---

Fig. 8. Package outline SOT505-2 (TSSOP8)
Fig. 9. Package outline SOT765-1 (VSSOP8)
XSON8: plastic extremely thin small outline package; no leads; 8 terminals; body 1 x 1.95 x 0.5 mm

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

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<th>A max</th>
<th>A1 max</th>
<th>b</th>
<th>D</th>
<th>E</th>
<th>e1</th>
<th>L</th>
<th>L1</th>
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<td>0.25</td>
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<td>1.05</td>
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<td>0.35</td>
<td>0.40</td>
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<td>0.17</td>
<td>1.9</td>
<td>0.95</td>
<td>0.5</td>
<td>0.27</td>
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**Notes**
1. Including plating thickness.
2. Can be visible in some manufacturing processes.

**Fig. 10. Package outline SOT833-1 (XSON8)**
XSON8: extremely thin small outline package; no leads;
8 terminals; body 1.35 x 1 x 0.5 mm

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Unit</th>
<th>A&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>A&lt;sub&gt;1&lt;/sub&gt;</th>
<th>b</th>
<th>D</th>
<th>E</th>
<th>e</th>
<th>L</th>
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<td>0.40</td>
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<tr>
<td></td>
<td>nom</td>
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<td>1.35</td>
<td>1.00</td>
<td>0.55</td>
<td>0.36</td>
<td>0.30</td>
<td>0.35</td>
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</tr>
<tr>
<td></td>
<td>min</td>
<td>0.12</td>
<td>1.30</td>
<td>0.95</td>
<td></td>
<td>0.27</td>
<td>0.32</td>
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Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

Fig. 11. Package outline SOT1089 (XSON8)
XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.2 x 1.0 x 0.35 mm

Dimensions

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<thead>
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<th>A₁</th>
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<th>D</th>
<th>E</th>
<th>e₁</th>
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<th>L₁</th>
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<tr>
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<td>1.00</td>
<td>0.55</td>
<td>0.30</td>
<td>0.35</td>
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<tr>
<td>min</td>
<td>0.12</td>
<td>1.15</td>
<td>0.95</td>
<td>0.27</td>
<td>0.32</td>
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</table>

Note
1. Including plating thickness.
2. Visible depending upon used manufacturing technology.

Fig. 12. Package outline SOT1116 (XSON8)
XSON8: extremely thin small outline package; no leads; 8 terminals; body 1.35 x 1.0 x 0.35 mm

Fig. 13. Package outline SOT1203 (XSON8)
13. Abbreviations

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<td>Complementary Metal-Oxide Semiconductor</td>
</tr>
<tr>
<td>DUT</td>
<td>Device Under Test</td>
</tr>
<tr>
<td>ESD</td>
<td>ElectroStatic Discharge</td>
</tr>
<tr>
<td>HBM</td>
<td>Human Body Model</td>
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<td>TTL</td>
<td>Transistor-Transistor Logic</td>
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14. Revision history

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<td>• Legal texts have been adapted to the new company name where appropriate.</td>
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15. Legal information

Data sheet status

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[1] Please consult the most recently issued document before starting or completing a design. [2] The term "short data sheet" is explained in section "Definitions". [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com

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