1. General description

The 74LVC1G00-Q100 provides the single 2-input NAND function. Input can be driven from either 3.3 V or 5 V devices. These features allow the use of these devices in a mixed 3.3 V and 5 V environment.

Schmitt trigger action at all inputs makes the circuit tolerant for slower input rise and fall time.

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

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 1.65 V to 5.5 V
- High noise immunity
- 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)
- ±24 mA output drive ($V_{\text{CC}} = 3.0$ V)
- CMOS low power consumption
- Latch-up performance exceeds 250 mA
- Direct interface with TTL levels
- Inputs accept voltages up to 5 V
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V ($C = 200 \, \text{pF}, \, R = 0 \, \Omega$)

3. 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>74LVC1G00GW-Q100</td>
<td>TSSOP5</td>
<td>-40 °C to +125 °C</td>
<td>plastic thin shrink small outline package; 5 leads; body width 1.25 mm</td>
<td>SOT353-1</td>
<td></td>
</tr>
<tr>
<td>74LVC1G00GV-Q100</td>
<td>SC-74A</td>
<td>-40 °C to +125 °C</td>
<td>plastic surface-mounted package; 5 leads</td>
<td>SOT753</td>
<td></td>
</tr>
</tbody>
</table>
4. Marking

Table 2. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>74LVC1G00GW-Q100</td>
<td>VA</td>
</tr>
<tr>
<td>74LVC1G00GV-Q100</td>
<td>V00</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

Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning

Fig. 4. Pin configuration SOT353-1 and SOT753

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>B</td>
<td>1</td>
<td>data input</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>data input</td>
</tr>
<tr>
<td>GND</td>
<td>3</td>
<td>ground (0 V)</td>
</tr>
<tr>
<td>Y</td>
<td>4</td>
<td>data output</td>
</tr>
<tr>
<td>VCC</td>
<td>5</td>
<td>supply voltage</td>
</tr>
</tbody>
</table>
7. Functional description

Table 4. Function table
H = HIGH voltage level; L = LOW voltage level.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>H</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>V_{CC}</td>
<td>supply voltage</td>
<td>-0.5 to +6.5 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I_{IK}</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>[1] -0.5 to +6.5 V</td>
<td></td>
<td></td>
<td></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>Active mode [1][2] -0.5 to V_{CC} + 0.5 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power-down mode [1][2] -0.5 to +6.5 V</td>
<td></td>
<td></td>
<td></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>+100</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>I_{GND}</td>
<td>ground current</td>
<td>-100</td>
<td>-</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>total power dissipation</td>
<td>T_{amb} = -40 °C to +125 °C [3]</td>
<td>-</td>
<td>250</td>
<td>mW</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td>-65 to +150 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] When V_{CC} = 0 V (Power-down mode), the output voltage can be 5.5 V in normal operation.
[3] For TSSOP5 and SC-74A packages: above 87.5 °C the value of P_{tot} derates linearly with 4.0 mW/K.

9. Recommended operating conditions

Table 6. Recommended operating conditions

<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>V_{CC}</td>
<td>supply voltage</td>
<td>1.65 to 5.5 V</td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>V_{I}</td>
<td>input voltage</td>
<td>Active mode 0 to 5.5 V</td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>V_{O}</td>
<td>output voltage</td>
<td>V_{CC} = 0 V; Power-down mode 0 to 5.5 V</td>
<td></td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td>-40 to +125 °C</td>
<td></td>
<td></td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Δt/ΔV</td>
<td>input transition rise and fall rate</td>
<td>V_{CC} = 1.65 V to 2.7 V</td>
<td>-</td>
<td>-</td>
<td>20 ns/V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{CC} = 2.7 V to 5.5 V</td>
<td>-</td>
<td>-</td>
<td>10 ns/V</td>
<td></td>
</tr>
</tbody>
</table>
## 10. Static characteristics

### Table 7. Static characteristics

<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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ[1]</td>
<td>Max</td>
</tr>
<tr>
<td>V_{IH}</td>
<td>HIGH-level input voltage</td>
<td>$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$</td>
<td>0.65$V_{CC}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$</td>
<td>1.7</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$</td>
<td>2.0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$</td>
<td>0.7$V_{CC}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>V_{IL}</td>
<td>LOW-level input voltage</td>
<td>$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.35$V_{CC}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.3$V_{CC}$</td>
</tr>
<tr>
<td>V_{OH}</td>
<td>HIGH-level output voltage</td>
<td>$V_{I} = V_{IH}$ or $V_{IL}$</td>
<td>$V_{CC} = 0.1$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = -100 \mu A$; $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = -4 \text{ mA}$; $V_{CC} = 1.65 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = -8 \text{ mA}$; $V_{CC} = 2.3 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = -12 \text{ mA}$; $V_{CC} = 2.7 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>2.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = -32 \text{ mA}$; $V_{CC} = 4.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>3.8</td>
</tr>
<tr>
<td>V_{OL}</td>
<td>LOW-level output voltage</td>
<td>$V_{I} = V_{IH}$ or $V_{IL}$</td>
<td>$V_{CC}$</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = 100 \mu A$; $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = 8 \text{ mA}$; $V_{CC} = 2.3 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = 12 \text{ mA}$; $V_{CC} = 2.7 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = 24 \text{ mA}$; $V_{CC} = 3.0 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{O} = 32 \text{ mA}$; $V_{CC} = 4.5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>0.55</td>
</tr>
<tr>
<td>I_{I}</td>
<td>input leakage current</td>
<td>$V_{I} = 5.5 \text{ V}$ or GND; $V_{CC} = 0 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>±0.1</td>
<td>±1</td>
</tr>
<tr>
<td>I_{OFF}</td>
<td>power-off leakage current</td>
<td>$V_{CC} = 0 \text{ V}$ or $V_{O} = 5.5 \text{ V}$</td>
<td>-</td>
<td>±0.1</td>
<td>±2</td>
</tr>
<tr>
<td>I_{CC}</td>
<td>supply current</td>
<td>$V_{I} = 5.5 \text{ V}$ or GND; $I_{O} = 0 \text{ A}$; $V_{CC} = 1.65 \text{ V to } 5.5 \text{ V}$</td>
<td>-</td>
<td>0.1</td>
<td>4</td>
</tr>
<tr>
<td>ΔI_{CC}</td>
<td>additional supply current</td>
<td>$V_{CC} = 2.3 \text{ V to } 5.5 \text{ V}$; $V_{I} = V_{CC} - 0.6 \text{ V}$; $I_{O} = 0 \text{ A}$; per pin</td>
<td>-</td>
<td>5</td>
<td>500</td>
</tr>
<tr>
<td>C_{I}</td>
<td>input capacitance</td>
<td>$V_{CC} = 3.3 \text{ V}$; $V_{I} = \text{GND}$ to $V_{CC}$</td>
<td>-</td>
<td>5</td>
<td>-</td>
</tr>
</tbody>
</table>

[1] All typical values are measured at $V_{CC} = 3.3 \text{ V}$ and $T_{amb} = 25 \degree \text{C}$. 
11. Dynamic characteristics

Table 8. Dynamic characteristics
Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 6.

<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>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ[1]</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A, B to Y; see Fig. 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 1.65 \text{ V} \text{ to } 1.95 \text{ V}$</td>
<td>1.0</td>
<td>3.3</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.3 \text{ V} \text{ to } 2.7 \text{ V}$</td>
<td>0.5</td>
<td>2.2</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 2.7 \text{ V}$</td>
<td>0.5</td>
<td>2.6</td>
<td>5.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 3.0 \text{ V} \text{ to } 3.6 \text{ V}$</td>
<td>0.5</td>
<td>2.2</td>
<td>4.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_{CC} = 4.5 \text{ V} \text{ to } 5.5 \text{ V}$</td>
<td>0.5</td>
<td>1.8</td>
<td>4.0</td>
</tr>
<tr>
<td>$C_{PD}$</td>
<td>power dissipation capacitance</td>
<td>$V_I = \text{GND to } V_{CC}; V_{CC} = 3.3 \text{ V}$</td>
<td>-</td>
<td>14</td>
<td>-</td>
</tr>
</tbody>
</table>

[1] Typical values are measured at $T_{\text{amb}} = 25 \degree C$ and $V_{CC} = 1.8 \text{ V}, 2.5 \text{ V}, 2.7 \text{ V}, 3.3 \text{ V}$ and $5.0 \text{ V}$ respectively.
[2] $t_{\text{pd}}$ is the same as $t_{\text{PLH}}$ and $t_{\text{PHL}}$.
[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in $\mu$W).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$$

where:
- $f_i$ = input frequency in MHz;
- $f_o$ = output frequency in MHz;
- $C_L$ = output load capacitance in pF;
- $V_{CC}$ = supply voltage in V;
- $N$ = number of inputs switching;
- $\sum(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

11.1. Waveform and test circuit

![Waveform and test circuit diagram]

Fig. 5. The input (A and B) to output (Y) propagation delay times

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>$0.5V_{CC}$</td>
<td>$0.5V_{CC}$</td>
</tr>
<tr>
<td>2.3 V to 2.7 V</td>
<td>$0.5V_{CC}$</td>
<td>$0.5V_{CC}$</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>$0.5V_{CC}$</td>
<td>$0.5V_{CC}$</td>
</tr>
</tbody>
</table>
Test data is given in Table 10.
Definitions for test circuit:

- $R_L$ = Load resistance.
- $C_L$ = Load capacitance including jig and probe capacitance.
- $R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator.
- $V_{EXT}$ = External voltage for measuring switching times.

Fig. 6. Test circuit for measuring switching times

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input</th>
<th>$t_r = t_f$</th>
<th>$C_L$</th>
<th>$R_L$</th>
<th>$t_{PLH}, t_{PHL}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.65 V to 1.95 V</td>
<td>$V_{CC}$</td>
<td>$\leq 2.0$ ns</td>
<td>30 pF</td>
<td>1 kΩ</td>
<td>open</td>
</tr>
<tr>
<td>2.3 V to 2.7 V</td>
<td>$V_{CC}$</td>
<td>$\leq 2.0$ ns</td>
<td>30 pF</td>
<td>500 Ω</td>
<td>open</td>
</tr>
<tr>
<td>2.7 V</td>
<td>2.7 V</td>
<td>$\leq 2.5$ ns</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
</tr>
<tr>
<td>3.0 V to 3.6 V</td>
<td>2.7 V</td>
<td>$\leq 2.5$ ns</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
</tr>
<tr>
<td>4.5 V to 5.5 V</td>
<td>$V_{CC}$</td>
<td>$\leq 2.5$ ns</td>
<td>50 pF</td>
<td>500 Ω</td>
<td>open</td>
</tr>
</tbody>
</table>
12. Package outline

TSSOP5: plastic thin shrink small outline package; 5 leads; body width 1.25 mm

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

<table>
<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(1)</th>
<th>e</th>
<th>e(1)</th>
<th>H_E</th>
<th>L</th>
<th>L_p</th>
<th>v</th>
<th>w</th>
<th>y</th>
<th>Z(1)</th>
<th>θ</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.1</td>
<td>0.1</td>
<td>1.0</td>
<td>0.15</td>
<td>0.30</td>
<td>0.15</td>
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<td>1.35</td>
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<td>0.21</td>
<td>0.3</td>
<td>0.1</td>
<td>0.1</td>
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Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

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<tr>
<th>OUTLINE VERSION</th>
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<th>EUROPEAN PROJECTION</th>
<th>ISSUE DATE</th>
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<td>SOT353-1</td>
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Fig. 7. Package outline SOT353-1 (TSSOP5)
Fig. 8. Package outline SOT753 (SC-74A)
13. Abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>CMOS</td>
<td>Complementary Metal Oxide Semiconductor</td>
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<tr>
<td>DUT</td>
<td>Device Under Test</td>
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<tr>
<td>ESD</td>
<td>ElectroStatic Discharge</td>
</tr>
<tr>
<td>HBM</td>
<td>Human Body Model</td>
</tr>
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<td>MIL</td>
<td>Military</td>
</tr>
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<td>MM</td>
<td>Machine Model</td>
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<td>TTL</td>
<td>Transistor-Transistor Logic</td>
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14. Revision history

Table 12. Revision history

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<th>Change notice</th>
<th>Supersedes</th>
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<td>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</td>
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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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<th>Document status</th>
<th>Product status</th>
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<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short]</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short]</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”.
[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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