1. General description

The 74LVC1G175-Q100 is a low-power, low-voltage single positive edge triggered D-type flip-flop with individual data (D) input, clock (CP) input, master reset (MR) input, and Q output. The master reset (MR) is an asynchronous active LOW input and operates independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up time prior to the LOW-to-HIGH clock transition for predictable operation. The inputs can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment. This device is fully specified for partial power-down applications using $I_{OFF}$. The $I_{OFF}$ circuitry disables the output, preventing the damaging backflow current through the device when it is powered down. Schmitt trigger action at all inputs makes the circuit highly tolerant of slower input rise and fall times.

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
- Overvoltage tolerant inputs to 5.5 V
- ±24 mA output drive ($V_{CC} = 3.0$ V)
- CMOS low power dissipation
- Direct interface with TTL levels
- $I_{OFF}$ circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standard:
  - JESD8-7 (1.65 V to 1.95 V)
  - JESD8-5 (2.3 V to 2.7 V)
  - JESD8C (2.7 V to 3.6 V)
  - JESD36 (4.5 V to 5.5 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

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>74LVC1G175GW-Q100</td>
<td>TSSOP6</td>
<td>-40 °C to +125 °C</td>
<td>plastic thin shrink small outline package; 6 leads; body width 1.25 mm</td>
<td>SOT363-2</td>
<td></td>
</tr>
<tr>
<td>74LVC1G175GV-Q100</td>
<td>TSOP6</td>
<td>-40 °C to +125 °C</td>
<td>SC-74; TSOP6</td>
<td>plastic surface-mounted package; 6 leads</td>
<td>SOT457</td>
</tr>
</tbody>
</table>
4. Marking

Table 2. Marking

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code [1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>74LVC1G175GW-Q100</td>
<td>YT</td>
</tr>
<tr>
<td>74LVC1G175GV-Q100</td>
<td>V75</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 SOT363-2 (TSSOP6) and SOT457 (SC-74; TSOP6)
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>CP</td>
<td>1</td>
<td>clock input (LOW-to-HIGH, edge-triggered)</td>
</tr>
<tr>
<td>GND</td>
<td>2</td>
<td>ground (0 V)</td>
</tr>
<tr>
<td>D</td>
<td>3</td>
<td>data input</td>
</tr>
<tr>
<td>Q</td>
<td>4</td>
<td>output Q</td>
</tr>
<tr>
<td>VCC</td>
<td>5</td>
<td>supply voltage</td>
</tr>
<tr>
<td>MR</td>
<td>6</td>
<td>master reset input (active LOW)</td>
</tr>
</tbody>
</table>

7. Functional description

Table 4. Function table

\[ H = \text{HIGH voltage level}; h = \text{HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition}; \]
\[ L = \text{LOW voltage level}; l = \text{LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition}; \]
\[ \uparrow = \text{LOW-to-HIGH CP transition}; X = \text{don't care}. \]

<table>
<thead>
<tr>
<th>Operating mode</th>
<th>Input</th>
<th>CP</th>
<th>D</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reset (clear)</td>
<td>L</td>
<td>X</td>
<td>X</td>
<td>L</td>
</tr>
<tr>
<td>Load ‘1’</td>
<td>H</td>
<td>↑</td>
<td>h</td>
<td>H</td>
</tr>
<tr>
<td>Load ‘0’</td>
<td>H</td>
<td>↑</td>
<td>l</td>
<td>L</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>IᵢK</td>
<td>input clamping</td>
<td>( Vᵢ &lt; 0 ) V</td>
<td>-50</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Vᵢ</td>
<td>input voltage</td>
<td>[1]</td>
<td>-0.5</td>
<td>+6.5</td>
<td>V</td>
</tr>
<tr>
<td>I₀K</td>
<td>output clamping</td>
<td>( V₀ &gt; V_{CC} ) or ( V₀ &lt; 0 ) V</td>
<td>-</td>
<td>±50</td>
<td>mA</td>
</tr>
<tr>
<td>V₀</td>
<td>output voltage</td>
<td>Active mode</td>
<td>[1]</td>
<td>V₀ + 0.5 V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power-down mode; ( V_{CC} = 0 ) V</td>
<td>[1]</td>
<td>-0.5</td>
<td>+6.5</td>
<td>V</td>
</tr>
<tr>
<td>I₀</td>
<td>output current</td>
<td>( V₀ = 0 ) V to ( V_{CC} )</td>
<td>-</td>
<td>±50</td>
<td>mA</td>
</tr>
<tr>
<td>IᵢCC</td>
<td>supply current</td>
<td></td>
<td>-</td>
<td>100</td>
<td>mA</td>
</tr>
<tr>
<td>IᵢGND</td>
<td>ground current</td>
<td></td>
<td>-100</td>
<td>-</td>
<td>mA</td>
</tr>
<tr>
<td>Pₜot</td>
<td>total power</td>
<td>( T_{amb} = -40 ) °C to +125 °C</td>
<td>[2]</td>
<td>-</td>
<td>250 mW</td>
</tr>
<tr>
<td>Tₜstg</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>+150</td>
<td>°C</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 SOT363-2 (TSSOP6) package: \( Pₜot \) derates linearly with 3.7 mW/K above 83 °C.
For SOT457 (SC-74; TSOP6) package: \( Pₜot \) derates linearly with 4.1 mW/K above 89 °C.
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>VCC</td>
<td>supply voltage</td>
<td></td>
<td>1.65</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>VI</td>
<td>input voltage</td>
<td></td>
<td>0</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>VO</td>
<td>output voltage</td>
<td>Active mode</td>
<td>0</td>
<td>-</td>
<td>VCC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power-down mode; VCC = 0 V</td>
<td>0</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>Tamb</td>
<td>ambient temperature</td>
<td></td>
<td>-40</td>
<td>-</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>ΔI/ΔV</td>
<td>input transition rise and fall rate</td>
<td>VCC = 1.65 V to 2.7 V</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>ns/V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 2.7 V to 5.5 V</td>
<td>-</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</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>supply voltage</td>
<td>VCC = 1.65 V to 1.95 V</td>
<td>0.65</td>
<td>× VCC</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 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>VCC = 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>VCC = 4.5 V to 5.5 V</td>
<td>0.7</td>
<td>× VCC</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>VI</td>
<td>HIGH-level input voltage</td>
<td>VCC = 1.65 V to 1.95 V</td>
<td>-</td>
<td>-</td>
<td>0.35 × VCC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 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>VCC = 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>VCC = 4.5 V to 5.5 V</td>
<td>-</td>
<td>-</td>
<td>0.3  × VCC</td>
<td>V</td>
</tr>
<tr>
<td>VIL</td>
<td>LOW-level input voltage</td>
<td>VCC = 1.65 V to 1.95 V</td>
<td>-</td>
<td>-</td>
<td>0.1</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 2.3 V to 2.7 V</td>
<td>1.2</td>
<td>1.54</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 2.7 V to 3.6 V</td>
<td>1.9</td>
<td>2.15</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VCC = 4.5 V to 5.5 V</td>
<td>2.2</td>
<td>2.50</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -24 mA; VCC = 3.0 V</td>
<td>2.3</td>
<td>2.62</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -32 mA; VCC = 4.5 V</td>
<td>3.8</td>
<td>4.11</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>VOH</td>
<td>HIGH-level output voltage</td>
<td>VI = VIH or VIL</td>
<td>VCC</td>
<td>0.1</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -100 μA; VCC = 1.65 V</td>
<td>1.2</td>
<td>1.54</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -4 mA; VCC = 1.65 V</td>
<td>1.9</td>
<td>2.15</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -8 mA; VCC = 2.3 V</td>
<td>2.2</td>
<td>2.50</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -12 mA; VCC = 2.7 V</td>
<td>2.3</td>
<td>2.62</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -24 mA; VCC = 3.0 V</td>
<td>3.8</td>
<td>4.11</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>VOL</td>
<td>LOW-level output voltage</td>
<td>VI = VIH or VIL</td>
<td>VCC</td>
<td>0.1</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -100 μA; VCC = 1.65 V</td>
<td>-</td>
<td>-</td>
<td>0.10</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -4 mA; VCC = 1.65 V</td>
<td>-</td>
<td>0.07</td>
<td>0.45</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -8 mA; VCC = 2.3 V</td>
<td>-</td>
<td>0.12</td>
<td>0.30</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -12 mA; VCC = 2.7 V</td>
<td>-</td>
<td>0.17</td>
<td>0.40</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -24 mA; VCC = 3.0 V</td>
<td>-</td>
<td>0.33</td>
<td>0.55</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IIL = -32 mA; VCC = 4.5 V</td>
<td>-</td>
<td>0.39</td>
<td>0.55</td>
<td>V</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&lt;sub&gt;I&lt;/sub&gt;</td>
<td>input leakage current</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 0 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND [2]</td>
<td></td>
<td>±0.1</td>
<td>±1</td>
<td>μA</td>
</tr>
<tr>
<td>I&lt;sub&gt;OFF&lt;/sub&gt;</td>
<td>power-off leakage</td>
<td>current V&lt;sub&gt;CC&lt;/sub&gt; = 0 V; V&lt;sub&gt;O&lt;/sub&gt; or V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V</td>
<td></td>
<td>±0.1</td>
<td>±2</td>
<td>μA</td>
</tr>
<tr>
<td>I&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>supply current</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; I&lt;sub&gt;O&lt;/sub&gt; = 0 A;</td>
<td></td>
<td>0.1</td>
<td>4</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;CC&lt;/sub&gt; - 0.6 V;</td>
<td></td>
<td>5</td>
<td>500</td>
<td>μA</td>
</tr>
<tr>
<td>ΔI&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>additional supply</td>
<td>current V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; I&lt;sub&gt;O&lt;/sub&gt; = 0 A;</td>
<td></td>
<td>0.1</td>
<td>4</td>
<td>μA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;CC&lt;/sub&gt; - 0.6 V;</td>
<td></td>
<td>5</td>
<td>500</td>
<td>μA</td>
</tr>
<tr>
<td>C&lt;sub&gt;I&lt;/sub&gt;</td>
<td>input capacitance</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 3.3 V; V&lt;sub&gt;I&lt;/sub&gt; = GND to V&lt;sub&gt;CC&lt;/sub&gt;</td>
<td></td>
<td>2.5</td>
<td>-</td>
<td>pF</td>
</tr>
</tbody>
</table>

**T<sub>Tamb</sub> = -40 °C to +125 °C**

<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</td>
<td>-V</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>-V</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>-V</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</td>
<td>-V</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>0.35 ×</td>
<td>V</td>
<td></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>-V</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></td>
<td>0.8</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></td>
<td>0.3 ×</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>V&lt;sub&gt;OH&lt;/sub&gt;</td>
<td>HIGH-level output</td>
<td>voltage 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></td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></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 V&lt;sub&gt;CC&lt;/sub&gt; = 0.1</td>
<td></td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<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>0.95</td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
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<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>1.7</td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<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>1.9</td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<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>2.0</td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
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<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>3.4</td>
<td>-V</td>
<td>-</td>
<td>V</td>
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<tr>
<td>V&lt;sub&gt;OL&lt;/sub&gt;</td>
<td>LOW-level output</td>
<td>voltage 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></td>
<td>-V</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></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>0.10</td>
<td>-</td>
<td>V</td>
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<td>0.70</td>
<td>-</td>
<td>V</td>
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<td>0.45</td>
<td>-</td>
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<td>0.60</td>
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<td>V</td>
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<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>0.80</td>
<td>-</td>
<td>V</td>
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<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>0.80</td>
<td>-</td>
<td>V</td>
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<tr>
<td>I&lt;sub&gt;I&lt;/sub&gt;</td>
<td>input leakage current</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 0 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND</td>
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<td>±1</td>
<td>±2</td>
<td>μA</td>
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<tr>
<td>I&lt;sub&gt;OFF&lt;/sub&gt;</td>
<td>power-off leakage</td>
<td>current V&lt;sub&gt;CC&lt;/sub&gt; = 0 V; V&lt;sub&gt;O&lt;/sub&gt; or V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V</td>
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<td>0.1</td>
<td>-</td>
<td>μA</td>
</tr>
<tr>
<td>I&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>supply current</td>
<td>V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; I&lt;sub&gt;O&lt;/sub&gt; = 0 A;</td>
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<td>0.1</td>
<td>4</td>
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<td></td>
<td>V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;CC&lt;/sub&gt; - 0.6 V;</td>
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<td>5</td>
<td>500</td>
<td>μA</td>
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<tr>
<td>ΔI&lt;sub&gt;CC&lt;/sub&gt;</td>
<td>additional supply</td>
<td>current V&lt;sub&gt;CC&lt;/sub&gt; = 1.65 V to 5.5 V; I&lt;sub&gt;O&lt;/sub&gt; = 0 A;</td>
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<td>0.1</td>
<td>4</td>
<td>μA</td>
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<td>V&lt;sub&gt;I&lt;/sub&gt; = 5.5 V or GND V&lt;sub&gt;CC&lt;/sub&gt; = 2.3 V to 5.5 V; V&lt;sub&gt;I&lt;/sub&gt; = V&lt;sub&gt;CC&lt;/sub&gt; - 0.6 V;</td>
<td></td>
<td>5</td>
<td>500</td>
<td>μA</td>
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[1] All typical values are measured at T<sub>Tamb</sub> = 25 °C.
[2] These typical values are measured at V<sub>CC</sub> = 3.3 V.
## 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>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ [1]</td>
<td>Max</td>
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<tr>
<td>( t_{pd} )</td>
<td>propagation delay</td>
<td>CP to Q; see Fig. 5 [2]</td>
<td>( V_{CC} ) = 1.65 V to 1.95 V</td>
<td>1.5</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.3 V to 2.7 V</td>
<td>1.0</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.7 V</td>
<td>1.0</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 3.0 V to 3.6 V</td>
<td>1.0</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 4.5 V to 5.5 V</td>
<td>1.0</td>
<td>2.2</td>
</tr>
<tr>
<td>( t_{W} )</td>
<td>pulse width</td>
<td>CP HIGH or LOW; see Fig. 5</td>
<td>( V_{CC} ) = 1.65 V to 1.95 V</td>
<td>2.7</td>
<td>-</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.3 V to 2.7 V</td>
<td>2.7</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.7 V</td>
<td>2.7</td>
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<tr>
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<td></td>
<td></td>
<td>( V_{CC} ) = 3.0 V to 3.6 V</td>
<td>2.7</td>
<td>1.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 4.5 V to 5.5 V</td>
<td>2.0</td>
<td>-</td>
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<tr>
<td>( t_{rec} )</td>
<td>recovery time</td>
<td>MR; see Fig. 6</td>
<td>( V_{CC} ) = 1.65 V to 1.95 V</td>
<td>1.9</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.3 V to 2.7 V</td>
<td>1.4</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.7 V</td>
<td>1.3</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 3.0 V to 3.6 V</td>
<td>1.2</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 4.5 V to 5.5 V</td>
<td>1.0</td>
<td>-</td>
</tr>
<tr>
<td>( t_{su} )</td>
<td>set-up time</td>
<td>D to CP; see Fig. 6</td>
<td>( V_{CC} ) = 1.65 V to 1.95 V</td>
<td>2.9</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 2.3 V to 2.7 V</td>
<td>1.7</td>
<td>-</td>
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<tr>
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<td></td>
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<td>( V_{CC} ) = 2.7 V</td>
<td>1.7</td>
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<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 3.0 V to 3.6 V</td>
<td>1.3</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>( V_{CC} ) = 4.5 V to 5.5 V</td>
<td>1.1</td>
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Single D-type flip-flop with reset; positive-edge trigger

### Parameters and Conditions

<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>Min</td>
<td>Typ [1]</td>
<td>Max</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Typ [1]</td>
<td>Max</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
<td></td>
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<tr>
<td>(I_h)</td>
<td>hold time</td>
<td>D to CP; see Fig. 5</td>
<td>0.0</td>
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<td>0.0</td>
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<td>-</td>
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<td>0.5</td>
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<tr>
<td>(f_{\text{max}})</td>
<td>maximum frequency</td>
<td>CP; see Fig. 5</td>
<td>80</td>
<td>125</td>
<td>80</td>
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<td>200</td>
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<td>200</td>
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<tr>
<td>(C_{\text{PD}})</td>
<td>power dissipation capacitance</td>
<td>(V_i = \text{GND} ) to (V_{\text{CC}}; V_{\text{CC}} = 3.3 \text{~V}) [3]</td>
<td>-</td>
<td>14</td>
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[1] Typical values are measured at \(T_{\text{amb}} = 25 \text{~°C}\) and \(V_{\text{CC}} = 1.8 \text{~V, 2.5 \text{~V, 2.7 \text{~V, 3.3 \text{~V and 5.0 \text{~V}}}}\) respectively.

[2] \(t_{\text{pd}}\) is the same as \(t_{\text{PLH}}\) and \(t_{\text{PHL}}\).

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

\[
P_D = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i \times N + \Sigma(C_L \times V_{\text{CC}}^2 \times f_o) \]  

where:

- \(f_i\) = input frequency in MHz;
- \(f_o\) = output frequency in MHz;
- \(C_{\text{L}}\) = output load capacitance in pF;
- \(V_{\text{CC}}\) = supply voltage in Volts;
- \(N\) = number of inputs switching;
- \(\Sigma(C_L \times V_{\text{CC}}^2 \times f_o)\) = sum of the outputs.

#### 11.1. Waveforms and test circuit

Measurement points are given in Table 9.

The shaded areas indicate when the input is permitted to change for predictable output performance.

\(V_{\text{OL}}\) and \(V_{\text{OH}}\) are typical output voltage levels that occur with the output load.

**Fig. 5.** The clock input (CP) to output (Q) propagation delays, the clock pulse width, the D to CP set-up, the CP to D hold times, and the maximum clock pulse frequency
Measurement points are given in Table 9. 
$V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig. 6.** The master reset (MR) input to output (Q) propagation delays, the master reset pulse width, and the MR to CP recovery time

### Table 9. Measurement points

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input $V_M$</th>
<th>Output $V_M$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CC}$</td>
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<td></td>
</tr>
<tr>
<td>1.65 V to 1.95 V</td>
<td>$0.5 \times V_{CC}$</td>
<td>$0.5 \times V_{CC}$</td>
</tr>
<tr>
<td>2.3 V to 2.7 V</td>
<td>$0.5 \times V_{CC}$</td>
<td>$0.5 \times V_{CC}$</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>$0.5 \times V_{CC}$</td>
<td>$0.5 \times V_{CC}$</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. 7.** Test circuit for measuring switching times

### Table 10. Test data

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>Input $V_I$</th>
<th>$t_f = t_r$</th>
<th>Load $C_L$</th>
<th>Load $R_L$</th>
<th>$V_{EXT}$</th>
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<tr>
<td>$V_{CC}$</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<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>
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<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>
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<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>
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12. Package information

12.1. SOT363-2 (TSSOP6) package

TSSOP6: plastic thin shrink small outline package; 6 leads; body width 1.25 mm

```
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<th>Unit</th>
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<th>A2</th>
<th>A3</th>
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<th>c</th>
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<th>E(1)</th>
<th>e</th>
<th>e1</th>
<th>H E</th>
<th>L p</th>
<th>V</th>
<th>W</th>
<th>Y</th>
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<td>0°</td>
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Note: Plastic or metal protrusions of 0.2 mm maximum per side are not included.

Fig. 8. Package outline SOT363-2 (TSSOP6)
12.2. SOT457 (SC-74; TSOP6) package

Plastic, surface-mounted package (SC-74; TSOP6); 6 leads

Fig. 9. Package outline SOT457 (SC-74; TSOP6)
13. Abbreviations

Table 11. 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>
</tr>
<tr>
<td>ESD</td>
<td>ElectroStatic Discharge</td>
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<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

Table 12. Revision history

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<th>Change notice</th>
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<td>• Section 2:</td>
<td>ESD specification updated according to the latest JEDEC standard.</td>
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<td>• Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6).</td>
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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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<td></td>
<td>• Table 5: Derating values for $P_{\text{tot}}$ total power dissipation updated.</td>
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<td>• Package outline drawing SOT457 (SC-74) updated.</td>
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<td>• Table 7: The maximum limits for leakage current and supply current have changed.</td>
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15. Legal information

Data sheet status

<table>
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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>[1][2]</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
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<tr>
<td>Preliminary [short] data sheet</td>
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<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
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[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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