Load Switch ICs Overview

Overview

The integrated Load Switch ICs incorporate cutting-edge technology that achieves industry-leading performance in ultra-low power consumption (low $I_{SS}$, $I_{SD}$, and $RDS(on)$) empowering designers to curtail parasitic leakage current, enhance system efficiency, and extend battery lifespan.

Benefits

Ultra Low Power Consumption

Improved system efficiency helps designers reduce parasitic leakage current, reducing the total energy consumption and prolonging battery life.

The Load Switch ICs industry-leading low $RDS(on)$ and low $IQ$ performance in operation mode ensures substantial power savings. (See Figure 2 below.)

![Figure 1. Function Block Diagram Example](image)

Reverse Current Blocking

Detects when there is a higher system output voltage than the system input voltage, blocking backward current flow through the system.

Quick Output Discharge

When the load switch IC turns off, it may be necessary for the output capacitor to discharge quickly to prevent unpredictable behavior of the downstream devices due to slow capacitor discharge.

![Figure 3. Illustration Diagrams](image)

Features

Slew Rate Control/Soft Start

The Load Switch ICs can control the output voltage slew rate that can limit the inrush current.

![Figure 2. Power Dissipation Equation](image)

\[ P_D = V_{IN} \times I_{SS} + I_{Load}^2 \times RDS(on) \]

Meanwhile, in standby mode, the superb low $ISD$ value affirms low current leakage and hence delivers significant low power loss.

Integration in the Miniaturized Packages

The Load Switch ICs provide integrated features such as soft start, reverse current blocking, and quick output discharge in tiny chip-scale packages.

Direct Drop-in Compatibility and Great Performance

The Load Switch ICs accelerate a new product's time to market by enabling quick pin-to-pin replacement across existing industry-popular solutions, easy assembly, and component savings during the design-in phase.

![Figure 4. Enable Simple Design With Integration](image)

Table 1. Discrete Solutions vs. Load Switch ICs By Features

<table>
<thead>
<tr>
<th>Features</th>
<th>Discrete Solutions</th>
<th>Load Switch ICs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Power Leakage ($I_{SS}/I_{SD}$)</td>
<td>$&gt;&gt; 1 \mu A$</td>
<td>nA Rating</td>
</tr>
<tr>
<td>Power Consumption $RDS(on)$</td>
<td>2-3x</td>
<td>Under 50 mΩ</td>
</tr>
<tr>
<td>Solution Size</td>
<td>$&gt; Several mm^2$ include FETs + Passive</td>
<td>Chip Scale Packages</td>
</tr>
<tr>
<td>Functional Integrations</td>
<td>Needs extra external components as FETs, OP, Passive, etc.</td>
<td>Slew Rate Control, Output Discharge, Reverse Current Blocking, Low $RDS(on)$</td>
</tr>
</tbody>
</table>

![Figure 4. Enable Simple Design With Integration](image)
Applications

The Load Switch ICs are ideal for battery-charged device power saving, power sequency control and power MUX (PMUX) application. Below is a list of the examples.

- Bluetooth Headset
- Computing Electronics
- Data Storage, SSD
- Doorbell
- Door Lock
- IoT (Internet of Things)
- Devices

Part System Classification

The easy-to-use part number system helps define the product’s specifications, such as operation voltage, current, package types, and key functions.

Available Parts

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Voltage Range Vmax (V)</th>
<th>Current Iq (A)</th>
<th>RDS(on) (mΩ)</th>
<th>Iq (nA)</th>
<th>Rise Time (Soft Start) (µs)</th>
<th>Reverse Current Blocking (RCB)</th>
<th>Control Active</th>
<th>Quick Output Discharge</th>
<th>Package</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>LQ05021QCS4</td>
<td>1.1-5.5</td>
<td>6</td>
<td>2</td>
<td>34</td>
<td>1 (520*)</td>
<td></td>
<td>No</td>
<td>High</td>
<td>CSP4 (0.77x0.77x0.48)</td>
<td></td>
</tr>
<tr>
<td>LQ05021RCS4</td>
<td>1.1-5.5</td>
<td>6</td>
<td>2</td>
<td>37</td>
<td>450</td>
<td></td>
<td>Yes</td>
<td>High</td>
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</tr>
<tr>
<td>LQ05022QCS4**</td>
<td>1.1-5.5</td>
<td>6</td>
<td>2</td>
<td>31</td>
<td>7 (570*)</td>
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<td>No</td>
<td>High</td>
<td>CSP4 (0.97x0.97x0.55)**</td>
<td></td>
</tr>
<tr>
<td>LQ05041QCS6</td>
<td>1.1-5.5</td>
<td>6</td>
<td>4</td>
<td>15</td>
<td>3 (540*)</td>
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<td>No</td>
<td>High</td>
<td>CSP6 (0.97x1.47x0.55)</td>
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</tr>
<tr>
<td>LQ05041RCS6</td>
<td>1.1-5.5</td>
<td>6</td>
<td>4</td>
<td>14</td>
<td>1300</td>
<td></td>
<td>Yes</td>
<td>High</td>
<td>CSP6 (0.97x1.47x0.55)</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
* This device includes the Enable pin leakage.
** This is an alternative version of CSP4 package.