Introduction to Load Switch ICs

TOSHIBA Load Switch ICs Contribute to Shorter Design Periods and Higher Equipment Performance

A load switch is a switch (= high-side switch) connected in series between the power supply and the load. It is used to set the power sequence for reliable operation of complex systems in the equipment and to disconnect circuits that are not required for operation for the purpose of reducing power consumption.

The load switch IC is an IC that incorporates a wealth of functions into this load switch. It is compact [Note] compared to a load switch in a discrete configuration, allowing a more reliable system to be constructed. [Note] Comparison with our products

Lineup of compact products with a variety of additional functions and space-saving capabilities

The load switch IC has a variety of additional functions, such as inrush current reduction, reverse current prevention, overcurrent protection, thermal shutdown, and automatic output discharge, which become complicated in conventional circuit configurations composed of discrete components, in a single chip IC. High performance system is easily realized with small area and low cost.

The lineup of packages is centered on small products of 1mm in size, and we offer products that are ideal for mobile, wearable, IoT equipment, and other applications that require particularly small space.
Low Input Voltage Operation/Low On-Resistance Characteristics
The low on-resistance (low $R_{ON}$) type load switch IC realizes low-voltage operation at 0.75V (TCK20x series) and ultra-low $R_{ON}$ of 8mΩ (TCK11x series) in a compact package by incorporating a charge pump circuit (step-up circuit) inside. In addition, it has low on-resistance characteristics that are flat against output current and input voltage. Therefore, it is possible to maintain low loss because of low $R_{ON}$ at all times regardless of changes in operating conditions.

Low Current Consumption Characteristics
TCK10xAG series is a popular series featuring 110nA (normal) and very low current dissipation.

The input voltage of this series can be operated from 1.1V to 5.5V. This low current consumption and wide voltage range covers all major power lines for mobile and wearable equipment.

Overcurrent protection function
The overcurrent protection function of the load switch IC limits the output current $I_{OUT}$ by controlling the gate voltage of MOSFET inside the load switch when the output current reaches the internal overcurrent limit. This function is also called the current limit (Current Limit) or OCP (Over Current Protection).

Our load switch ICs use a foldback type of protection circuit (called the "foe" characteristic) control method.

The overcurrent limit value is fixed for each product. The product lineup ranges from a small current value of several hundred mA to a 1.0A or higher.
### Load switch IC selection table

<table>
<thead>
<tr>
<th>Product name</th>
<th>Package</th>
<th>Size (mm)</th>
<th>Structure</th>
<th>Vin /V (Min)</th>
<th>Vin /V (Max)</th>
<th>Iout /A (DC)</th>
<th>RON /mΩ (typ) @1.2V</th>
<th>RON /mΩ (typ) @ 5.0V</th>
<th>Iq /µA (typ)</th>
<th>Slew Rate /µs (typ)</th>
<th>Control Active</th>
<th>Control Connection</th>
<th>OAD</th>
<th>RCB</th>
<th>OVP</th>
<th>OCP</th>
<th>TSD</th>
<th>Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCSP4D</td>
<td></td>
<td>0.8x1.2</td>
<td>PMOS</td>
<td>1.1</td>
<td>5.5</td>
<td>&gt;2</td>
<td>104</td>
<td>25</td>
<td>1.7</td>
<td>4.5</td>
<td>High</td>
<td>Pull down</td>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>WCSP4C</td>
<td></td>
<td>0.9x0.9</td>
<td>SMV</td>
<td>(SOT-25)</td>
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<tr>
<td>SMV (SOT-25)</td>
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<tr>
<td>WCSP6C</td>
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<td>2.9x2.8</td>
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<tr>
<td>WCSP6E</td>
<td></td>
<td>1.5x1.0</td>
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<tr>
<td>DFN4A</td>
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<td>1.2x1.2</td>
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</table>

**Electrical Characteristics/Switching Characteristics**

**Additional function**

<table>
<thead>
<tr>
<th>OAD</th>
<th>RCB</th>
<th>OVP</th>
<th>OCP</th>
<th>TSD</th>
<th>Purchase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
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</tbody>
</table>

**OAD**: Output auto-discharge, Y (On/Off); "True backflow prevention function", RCB: Reverse flow prevention, OVP: Overvoltage protection (shutdown), OCP: Overcurrent protection (shutdown), TSD: Heat protection

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**Related LINK**

- [Introduction to Load Switch IC Products](#)
- [Application note](#)
- [Frequently Asked Queries for Load Switch ICs (FAQ)](#)
- [Online distributor purchase, inventory search page](#)
- [Cross-reference search](#)

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