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FDG6331L
Integrated Load Switch

General Description
This device is particularly suited for compact power management in portable electronic equipment where 2.5V to 8V input and 0.8A output current capability are needed. This load switch integrates a small N-Channel power MOSFET (Q1) that drives a large P-Channel power MOSFET (Q2) in one tiny SC70-6 package.

Applications
• Power management
• Load switch

Features
• –0.8 A, –8 V. \( R_{\text{DS(ON)}} = 260 \, \text{m}\Omega \) @ \( V_{GS} = –4.5 \, \text{V} \)
• \( R_{\text{DS(ON)}} = 330 \, \text{m}\Omega \) @ \( V_{GS} = –2.5 \, \text{V} \)
• \( R_{\text{DS(ON)}} = 450 \, \text{m}\Omega \) @ \( V_{GS} = –1.8 \, \text{V} \)
• Control MOSFET (Q1) includes Zener protection for ESD ruggedness (>6KV Human body model)
• High performance trench technology for extremely low \( R_{\text{DS(ON)}} \)
• Compact industry standard SC70-6 surface mount package

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{\text{IN}} )</td>
<td>Gate-Source Voltage (Q2)</td>
<td>± 8</td>
<td>V</td>
</tr>
<tr>
<td>( V_{\text{ON/OFF}} )</td>
<td>Gate-Source Voltage (Q1)</td>
<td>–0.5 to 8 V</td>
<td>V</td>
</tr>
<tr>
<td>( I_{\text{Load}} )</td>
<td>Load Current – Continuous</td>
<td>0.8</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Note 2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Load Current – Pulsed</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Note 2)</td>
<td></td>
</tr>
<tr>
<td>( P_{\text{D}} )</td>
<td>Maximum Power Dissipation</td>
<td>0.3</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Note 1)</td>
<td></td>
</tr>
<tr>
<td>( T_{J, T_{\text{STG}}} )</td>
<td>Operating and Storage Junction Temperature Range</td>
<td>–55 to +150 °C</td>
<td>–</td>
</tr>
<tr>
<td>( R_{\text{JA}} )</td>
<td>Thermal Resistance, Junction-to-Ambient</td>
<td>415 °C/W</td>
<td>–</td>
</tr>
</tbody>
</table>

Thermal Characteristics

Package Marking and Ordering Information

<table>
<thead>
<tr>
<th>Device Marking</th>
<th>Device</th>
<th>Reel Size</th>
<th>Tape width</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>.31</td>
<td>FDG6331L</td>
<td>7”</td>
<td>8mm</td>
<td>3000 units</td>
</tr>
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</table>
### Electrical Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>BV_{IN}</td>
<td>Vin Breakdown Voltage</td>
<td>( V_{ON/OFF} = 0 \text{ V}, I_D = -250 \mu\text{A} )</td>
<td>8</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>I_{LOAD}</td>
<td>Zero Gate Voltage Drain Current</td>
<td>( V_{IN} = -6.4 \text{ V}, V_{ON/OFF} = 0 \text{ V} )</td>
<td>–1</td>
<td></td>
<td></td>
<td>\mu\text{A}</td>
</tr>
<tr>
<td>I_{FL}</td>
<td>Leakage Current, Forward</td>
<td>( V_{ON/OFF} = 0 \text{ V}, V_N = 8 \text{ V} )</td>
<td>100</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>I_{RL}</td>
<td>Leakage Current, Reverse</td>
<td>( V_{ON/OFF} = 0 \text{ V}, V_N = -8 \text{ V} )</td>
<td>–100</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
</tbody>
</table>

#### Off Characteristics

#### On Characteristics (Note 2)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{ON/OFF} )</td>
<td>Gate Threshold Voltage</td>
<td>( V_{IN} = V_{ON/OFF}, I_D = -250 \mu\text{A} )</td>
<td>0.4</td>
<td>0.9</td>
<td>1.5</td>
<td>V</td>
</tr>
<tr>
<td>( R_{DS(on)} )</td>
<td>Static Drain–Source On–Resistance (Q2)</td>
<td></td>
<td>155</td>
<td></td>
<td>260</td>
<td>m\Omega</td>
</tr>
<tr>
<td></td>
<td>( V_{IN} = 4.5 \text{ V}, I_D = -0.8 \text{ A} )</td>
<td>193</td>
<td>330</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{IN} = 2.5 \text{ V}, I_D = -0.7 \text{ A} )</td>
<td>248</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>( V_{IN} = 1.8 \text{ V}, I_D = -0.6 \text{ A} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{DS(on)} )</td>
<td>Static Drain–Source On–Resistance (Q1)</td>
<td>( V_{IN} = 4.5 \text{ V}, I_D = 0.4 \text{ A} )</td>
<td>310</td>
<td>400</td>
<td></td>
<td>m\Omega</td>
</tr>
<tr>
<td></td>
<td>( V_{IN} = 2.7 \text{ V}, I_D = 0.2 \text{ A} )</td>
<td>380</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Drain–Source Diode Characteristics and Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{DS}</td>
<td>Maximum Continuous Drain–Source Diode Forward Current</td>
<td>( V_{ON/OFF} = 0 \text{ V}, I_S = -0.25 \text{ A} ) (Note 2)</td>
<td>–0.25</td>
<td>A</td>
</tr>
<tr>
<td>( V_{SD} )</td>
<td>Drain–Source Diode Forward Voltage</td>
<td>( V_{ON/OFF} = 0 \text{ V}, I_S = -0.25 \text{ A} ) (Note 2)</td>
<td>–1.2</td>
<td>V</td>
</tr>
</tbody>
</table>

#### Notes:

1. \( R_{JA} \) is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. \( R_{JC} \) is guaranteed by design while \( R_{JA} \) is determined by the user’s board design.

2. Pulse Test: Pulse Width < 300\text{us}, Duty Cycle < 2.0\%.

### FDG6331L Load Switch Application Circuit

**External Component Recommendation:**
For additional in-rush current control, R2 and C1 can be added. For more information, see application note AN1030.
Typical Characteristics

Figure 1. Conduction Voltage Drop Variation with Load Current.

Figure 2. Conduction Voltage Drop Variation with Load Current.

Figure 3. Conduction Voltage Drop Variation with Load Current.

Figure 4. On-Resistance Variation With Input Voltage
Dimensional Outline and Pad Layout

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<th>Definition</th>
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