FCAB22420L

Gate resistor installed Dual N-channel MOS FET

For lithium-ion secondary battery protection circuits

■ Features
- Source-source On-state Resistance: RSS(on) typ. = 2.6 mΩ (VGS = 3.8 V)
- CSP (Chip Size Package)
- Halogen-free / RoHS compliant (EU RoHS / UL-94 V-0 / MSL: Level 1)

■ Marking Symbol: 97

■ Packaging
Embosed type (Thermo-compression sealing): 8,000 pcs/reel (standard)

■ Absolute Maximum Ratings Ta = 25 ºC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source-source Voltage</td>
<td>VSS</td>
<td>23</td>
<td>V</td>
</tr>
<tr>
<td>Gate-source Voltage</td>
<td>VGS</td>
<td>±12</td>
<td>V</td>
</tr>
<tr>
<td>Source Current</td>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Source Current</td>
<td>IS¹</td>
<td>13</td>
<td>A</td>
</tr>
<tr>
<td>Pulsed Source Current</td>
<td>ISp</td>
<td>130</td>
<td>A</td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>DC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC Total Power Dissipation</td>
<td>PD¹</td>
<td>0.59</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>PD²</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PD³</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>Tch</td>
<td>150</td>
<td>ºC</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>-55 to +150</td>
<td>ºC</td>
</tr>
</tbody>
</table>

■ Thermal Characteristics Ta = 25 ºC

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal Resistance (ch-a)</td>
<td>Rth¹</td>
<td>212</td>
<td>ºC/W</td>
</tr>
<tr>
<td></td>
<td>Rth²</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rth³</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Note
- *1 Mounted on FR4 board (25.4 mm × 25.4 mm × 1.0 mm).
- FR4 board partially covered with copper pad (42 mm² area, 36 µm thickness).
- *2 Mounted on FR4 board (25.4 mm × 25.4 mm × 1.0 mm).
- FR4 board fully covered with copper pad (605 mm² area, 36 µm thickness).
- *3 Mounted on Ceramic board (70 mm × 70 mm × 1.0 mm).
- *4 t = 10 µs, Duty Cycle ≤ 1 %
## Electrical Characteristics  \( Ta = 25 ^\circ C \pm 3 ^\circ C \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source-source Breakdown Voltage</td>
<td>VSSS</td>
<td>IS = 1 mA, VGS = 0 V</td>
<td>23</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Zero Gate Voltage Source Current</td>
<td>ISSS</td>
<td>VSS = 23 V, VGS = 0 V</td>
<td></td>
<td>1.0</td>
<td></td>
<td>( \mu A )</td>
</tr>
<tr>
<td>Gate-source Leakage Current</td>
<td>IGSS1</td>
<td>VGS = ( \pm 8 ) V, VSS = 0 V</td>
<td></td>
<td>( \pm 10 )</td>
<td></td>
<td>( \mu A )</td>
</tr>
<tr>
<td></td>
<td>IGSS2</td>
<td>VGS = ( \pm 5 ) V, VSS = 0 V</td>
<td></td>
<td>( \pm 1.0 )</td>
<td></td>
<td>( \mu A )</td>
</tr>
<tr>
<td>Gate-source Threshold Voltage</td>
<td>Vth</td>
<td>IS = 1.31 mA, VSS = 10 V</td>
<td>0.35</td>
<td>0.9</td>
<td>1.4</td>
<td>V</td>
</tr>
<tr>
<td>Source-source On-state Resistance</td>
<td>RSS(on)1</td>
<td>IS = 6.5 A, VGS = 4.5 V</td>
<td>1.75</td>
<td>2.4</td>
<td>3.15</td>
<td>m( \Omega )</td>
</tr>
<tr>
<td></td>
<td>RSS(on)2</td>
<td>IS = 6.5 A, VGS = 3.8 V</td>
<td>1.9</td>
<td>2.6</td>
<td>3.4</td>
<td>m( \Omega )</td>
</tr>
<tr>
<td></td>
<td>RSS(on)3</td>
<td>IS = 6.5 A, VGS = 3.1 V</td>
<td>2.05</td>
<td>3.0</td>
<td>4.95</td>
<td>m( \Omega )</td>
</tr>
<tr>
<td></td>
<td>RSS(on)4</td>
<td>IS = 6.5 A, VGS = 2.5 V</td>
<td>2.25</td>
<td>3.8</td>
<td>7.5</td>
<td>m( \Omega )</td>
</tr>
<tr>
<td>Body Diode Forward Voltage</td>
<td>VF(s-s)</td>
<td>IF = 6.5 A, VGS = 0 V</td>
<td>0.7</td>
<td>1.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Input Capacity (^1)</td>
<td>Ciss</td>
<td></td>
<td>4900</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance (^1)</td>
<td>Coss</td>
<td>VSS = 10 V, VGS = 0 V, f = 1 kHz</td>
<td></td>
<td>490</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance (^1)</td>
<td>Crss</td>
<td></td>
<td>450</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Turn-on Delay Time (^1,2)</td>
<td>td(on)</td>
<td>VDD = 10 V, VGS = 0 to 4 V</td>
<td>1.4</td>
<td></td>
<td></td>
<td>( \mu s )</td>
</tr>
<tr>
<td>Rise Time (^1,2)</td>
<td>tr</td>
<td>IS = 6.5 A</td>
<td>3.1</td>
<td></td>
<td></td>
<td>( \mu s )</td>
</tr>
<tr>
<td>Turn-off Delay Time (^1,2)</td>
<td>td(off)</td>
<td>VDD = 10 V, VGS = 4 to 0 V</td>
<td>7.2</td>
<td></td>
<td></td>
<td>( \mu s )</td>
</tr>
<tr>
<td>Fall Time (^1,2)</td>
<td>tf</td>
<td>IS = 6.5 A</td>
<td>4.8</td>
<td></td>
<td></td>
<td>( \mu s )</td>
</tr>
<tr>
<td>Total Gate Charge (^1)</td>
<td>Qg</td>
<td>VDD = 10 V</td>
<td>39</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate-source Charge (^1)</td>
<td>Qgs</td>
<td>VGS = 0 to 4 V</td>
<td>19</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate-drain Charge (^1)</td>
<td>Qgd</td>
<td>IS = 13 A</td>
<td>14</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
</tbody>
</table>

Note  
Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.  
*1 Guaranteed by design, not subject to production testing.  
*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time.
Technical Data (reference)

- **Source Current, IS (A)**
  - IS - VSS
    - Graph shows IS versus VSS with VGS values of 4.5 V, 3.8 V, 3.1 V, and 2.5 V.
    - Ta = 25 °C
  - RSS(on) - IS
    - Graph shows RSS(on) versus IS with VGS values of 4.5 V, 3.8 V, 3.1 V, and 2.5 V.
    - Ta = 25 °C

- **Gate-source Voltage, VGS (V)**
  - Graph for IS - VGS
    - Ta = 85 °C
  - Graph for RSS(on) - VGS
    - Ta = 85 °C
  - Graph for IF - VF(s-s)
    - Ta = 85 °C
  - Graph for IGS - VGS
    - Ta = 85 °C

- **Diode Forward Current, IF (A)**
  - Graph for IF - VF(s-s)
    - Ta = 85 °C
  - Graph for IGS - VGS
    - Ta = 85 °C

- **Body Diode Forward Voltage, VF(s-s) (V)**
  - Graph for IF - VF(s-s)
    - Ta = 85 °C
  - Graph for IGS - VGS
    - Ta = 85 °C

- **Source-source Voltage, VSS (V)**
  - Source Current, IS (A)
    - Graph shows IS versus VSS with VGS values of 4.5 V, 3.8 V, 3.1 V, and 2.5 V.
    - Ta = 25 °C
  - Source-source On-state Resistance, RSS(on) (mΩ)
    - Graph shows RSS(on) versus IS with VGS values of 4.5 V, 3.8 V, 3.1 V, and 2.5 V.
    - Ta = 25 °C

**Specifications**
- **VSS = 10 V**
- **IS = 6.5A**
- **Ta = 85 °C**
- **Ta = 25 °C**
- **Ta = 85 °C**
- **Ta = 25 °C**
- **Ta = -40 °C**
Technical Data (reference)

- **Zero Gate Voltage Source Current (ISS)**
- **Source Current (IS)**
- **Source-source Voltage (VSS)**
- **Gate-source Voltage (VGS)**
- **Dynamic Input / Output Characteristics**
- **Thermal Resistance (Rth)**
- **Normalized Effective Transient Thermal Impedance**
- **Safe Operating Area**

**Note**

1. Pulse measurement.
2. mounted on FR4 board (25.4 mm × 25.4 mm × 1.0 mm). FR4 board partially covered with copper pad (42 mm² area, 36 µm thickness).
3. mounted on FR4 board (25.4 mm × 25.4 mm × 1.0 mm). FR4 board fully covered with copper pad (605 mm² area, 36 µm thickness).
4. mounted on Ceramic board (70 mm × 70 mm × 1.0 mm).
Outline

(Top View)

(Front View)

(Bottom View)

Land Pattern (reference)

Stencil Pattern (reference)
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