FC8V36120L
Dual N-channel MOS FET

For lithium-ion secondary battery protection circuits
For load switching

**Features**
- Low drain-source ON resistance: \( R_{DS(on)} \) typ. = 50 m\( \Omega \) (\( VGS = 4.5 \) V)
- Low drive voltage: 2.5 V drive
- RoHS compliant (EU RoHS / UL-94 V-0 / MSL : Level 1 compliant)

**Marking Symbol:** M5

**Packaging**
Embossed type (Thermo-compression sealing) : 3 000 pcs / reel (standard)

**Absolute Maximum Ratings \( Ta = 25 \) °C**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>VDS</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>Drain Current</td>
<td>ID1</td>
<td>6.0</td>
<td>A</td>
</tr>
<tr>
<td>( Ta = 25 ) °C, t = 10sec</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain Current</td>
<td>ID2</td>
<td>5.7</td>
<td>A</td>
</tr>
<tr>
<td>( Ta = 25 ) °C, DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulsed, ( Tch &lt; 150 ) °C</td>
<td>IDP</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Total Power Dissipation</td>
<td>PD</td>
<td>1.4</td>
<td>W</td>
</tr>
<tr>
<td>Junction to Ambient R( \theta )ja</td>
<td></td>
<td>90</td>
<td>°C / W</td>
</tr>
<tr>
<td>Avalanche Current (Single pulse) ( ^*4 )</td>
<td>IAR</td>
<td>1.5</td>
<td>A</td>
</tr>
<tr>
<td>Avalance Energy (Single pulse) ( ^*4 )</td>
<td>EAR</td>
<td>9</td>
<td>mJ</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>Tch</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>-55 to +150</td>
<td></td>
</tr>
</tbody>
</table>

Note
*1 Mounted on FR-4 glass epoxy board, 25.4mm x 25.4mm x t 1.0mm coated with copper foil > 500 mm².
*2 Mounted on Ceramic substrate, 70.0mm x 70.0mm x t 1.0mm
*3 Mounted on FR-4 glass epoxy board, 25.4mm x 25.4mm x t 1.0mm
*4 \( VDD = 30 \) V, \( VGS = 4.5 \) to 0 V, \( L = 5 \) mH, \( Tch = 25 \) °C(initial)
Electrical Characteristics  $T_a = 25\, ^\circ C \pm 3\, ^\circ C$

<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>Drain-source Breakdown Voltage</td>
<td>$V_{DSS}$</td>
<td>$I_D = 1, mA, V_GS = 0, V$</td>
<td>60</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>$I_{DSS}$</td>
<td>$V_D = 60, V, V_GS = 0, V$</td>
<td></td>
<td>10</td>
<td></td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Gate-source Leakage Current</td>
<td>$I_{GSS}$</td>
<td>$V_GS = \pm 20, V, V_D = 0, V$</td>
<td></td>
<td>$\pm 10$</td>
<td></td>
<td>$\mu A$</td>
</tr>
<tr>
<td>Gate-source Threshold Voltage</td>
<td>$V_{th}$</td>
<td>$I_D = 0.48, mA, V_D = 10, V$</td>
<td>0.6</td>
<td>2.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Drain-source On-state Resistance</td>
<td>$R_{DS(on)}1$</td>
<td>$I_D = 2.0, A, V_GS = 4.5, V$</td>
<td></td>
<td>50</td>
<td>70</td>
<td>$m\Omega$</td>
</tr>
<tr>
<td></td>
<td>$R_{DS(on)}2$</td>
<td>$I_D = 2.0, A, V_GS = 2.5, V$</td>
<td></td>
<td>60</td>
<td>110</td>
<td>$m\Omega$</td>
</tr>
<tr>
<td>Input Capacitance $^*$</td>
<td>$C_{iss}$</td>
<td></td>
<td></td>
<td></td>
<td>400</td>
<td>pF</td>
</tr>
<tr>
<td>Output Capacitance $^*$</td>
<td>$C_{oss}$</td>
<td>$V_D = 30, V, V_GS = 0, V, f = 1, MHz$</td>
<td></td>
<td></td>
<td>30</td>
<td>pF</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance $^*$</td>
<td>$C_{rss}$</td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>pF</td>
</tr>
<tr>
<td>Turn-on delay Time $^*,^2$</td>
<td>$t_{d(on)}$</td>
<td>$V_D = 30, V, V_GS = 0, V, f = 1, MHz$</td>
<td>10</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Rise Time $^*,^2$</td>
<td>$t_{r}$</td>
<td>$I_D = 2.0, A$</td>
<td>15</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Turn-off delay Time $^*,^2$</td>
<td>$t_{d(off)}$</td>
<td>$V_D = 30, V, V_GS = 10, V, f = 1, MHz$</td>
<td>45</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Fall Time $^*,^2$</td>
<td>$t_{f}$</td>
<td>$I_D = 2.0, A$</td>
<td>40</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Total Gate Charge $^*$</td>
<td>$Q_g$</td>
<td>$V_D = 30, V$</td>
<td>10</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate-source Charge $^*$</td>
<td>$Q_{gs}$</td>
<td>$V_GS = 0, V$</td>
<td>1.0</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Gate-drain Charge $^*$</td>
<td>$Q_{gd}$</td>
<td>$I_D = 4.5, A$</td>
<td>1.5</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Body Diode Forward Voltage</td>
<td>$V_{SD}$</td>
<td>$I_F = 2.0, A, V_GS = 0, V$</td>
<td>0.8</td>
<td>1.2</td>
<td></td>
<td>V</td>
</tr>
</tbody>
</table>

Note: Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 Measuring methods for transistors.

*1 Assured by design
*2 Measurement circuit for Turn-on Delay Time / Rise Time / Turn-off Delay Time / Fall Time
*2  Measurement circuit for Turn-on delay time / Rise time / Turn-off delay time / Fall time
**Product Standards**

**MOS FET FC8V36120L**

**Technical Data (reference)**

**ID - VDS**

![Graph showing the relationship between Drain Current (ID) and Drain-source Voltage (VDS).]

**ID - VGS**

![Graph showing the relationship between Drain Current (ID) and Gate-source Voltage (VGS).]

**RDS(on) - VGS**

![Graph showing the relationship between Drain-source ON-state Resistance (RDS(on)) and Gate-source Voltage (VGS).]

**RDS(on) - ID**

![Graph showing the relationship between Drain-source ON-state Resistance (RDS(on)) and Drain Current (ID).]

**Capacitance - VDS**

![Graph showing the relationship between Capacitance (Ciss, Coss, Crss) and Drain-source Voltage (VDS).]

**Dynamic Input/Output Characteristics**

![Graph showing the relationship between Gate-source Voltage and Gate Charge (Qg).]
**Technical Data (reference)**

**Vth - Ta**

Gate-source Threshold Voltage $V_{th}$ vs. Temperature $T_a$ ($^\circ$C)

- $ID = 0.48 \text{ mA}$

**RDS(on) - Ta**

Drain-source ON-state Resistance $R_{DS(on)}$ vs. Temperature $T_a$ ($^\circ$C)

- $ID = 2.0 \text{ A}$

- $2.5V$

- $V_{GS} = 4.5V$

**PD - Ta**

Total Power Dissipation $PD$ vs. Temperature $T_a$ ($^\circ$C)

- $0$ to $2.0$

**Rth - tsw**

Thermal Resistance $R_{th}$ vs. Pulse Width $t_{sw}$ (s)

- $0.001$ to $100$

**Safe Operating Area**

Drain Current $ID$ vs. Drain-source Voltage $V_{DS}$ (V)

- $0.001$ to $10$

- $0.01$ to $100$

- $0.1$ to $1000$

Operation in this area is limited by $R_{DS(on)}$ (2.5V)

- $1 \text{ ms}$

- $10 \text{ ms}$

- $100 \text{ ms}$

- $1 \text{ s}$

- DC

Ta=25°C, Mounted on FR4 board (25.4 $\times$ 25.4 $\times$ 1.0mm) coated with copper foil which has more than 300mm².
## Product Standards

**MOS FET**

**FC8V36120L**

**Unit:** mm

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**WMini8-F1**

**Unit:** mm

- **2.9 ± 0.1**
- **2.4 ± 0.1**
- **2.8 ± 0.1**
- **2.4 ± 0.1**
- **0.8 ± 0.05**
- **0.80 ± 0.05**
- **0.30 ± 0.05**
- **0.16 ± 0.05**
- **0.16 ± 0.10**
- **0.16 ± 0.10**
- **0.65**
- **0.65**
- **0.65**
- **0.65**

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**Land Pattern (Reference) (Unit: mm)**

- **0.65**
- **0.65**
- **0.65**
- **0.65**
- **2.4**
- **0.4**
- **0.65**
- **0.65**

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**Revised:** ####-##-##
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