Boost chopper
MOSFET Power Module

\[ V_{DSS} = 100V \]
\[ R_{DSon} = 2.25\text{m}\Omega \text{ typ at } T_j = 25^\circ C \]
\[ I_D = 495A \text{ at } T_c = 25^\circ C \]

Application
- AC and DC motor control
- Switched Mode Power Supplies
- Power Factor Correction

Features
- Power MOS V® MOSFETs
  - Low \( R_{DSon} \)
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - M5 power connectors
- High level of integration

Benefits
- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Low profile
- RoHS Compliant

Absolute maximum ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Max ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{DSS} )</td>
<td>Drain - Source Breakdown Voltage</td>
<td>100</td>
<td>V</td>
</tr>
<tr>
<td>( I_D )</td>
<td>Continuous Drain Current</td>
<td>495</td>
<td>A</td>
</tr>
<tr>
<td>( T_c = 25^\circ C )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{DM} )</td>
<td>Pulsed Drain current</td>
<td>1900</td>
<td>A</td>
</tr>
<tr>
<td>( V_{GS} )</td>
<td>Gate - Source Voltage</td>
<td>±30</td>
<td>V</td>
</tr>
<tr>
<td>( R_{DSon} )</td>
<td>Drain - Source ON Resistance</td>
<td>2.5</td>
<td>m\Omega</td>
</tr>
<tr>
<td>( P_D )</td>
<td>Maximum Power Dissipation</td>
<td>1250</td>
<td>W</td>
</tr>
<tr>
<td>( T_c = 25^\circ C )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_{AR} )</td>
<td>Avalanche current (repetitive and non repetitive)</td>
<td>100</td>
<td>A</td>
</tr>
<tr>
<td>( E_{AR} )</td>
<td>Repetitive Avalanche Energy</td>
<td>50</td>
<td>mJ</td>
</tr>
<tr>
<td>( E_{AS} )</td>
<td>Single Pulse Avalanche Energy</td>
<td>3000</td>
<td>mJ</td>
</tr>
</tbody>
</table>

\( \text{CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com} \)
All ratings @ Tj = 25°C unless otherwise specified

### Electrical Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDSS</td>
<td>Zero Gate Voltage Drain Current</td>
<td>VGS = 0V, VDS = 100V, Tj = 25°C</td>
<td>400</td>
<td></td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VGS = 0V, VDS = 80V, Tj = 125°C</td>
<td>2000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RDS(on)</td>
<td>Drain – Source on Resistance</td>
<td>VGS = 10V, ID = 200A</td>
<td>2.25</td>
<td>2.5</td>
<td></td>
<td>mΩ</td>
</tr>
<tr>
<td>VGsth</td>
<td>Gate Threshold Voltage</td>
<td>VGS = VDS, ID = 10mA</td>
<td>2</td>
<td>4</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>IGSS</td>
<td>Gate – Source Leakage Current</td>
<td>VGS = ±30 V, VDS = 0V</td>
<td>±400</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
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</table>

### Dynamic Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciss</td>
<td>Input Capacitance</td>
<td>VGS = 0V</td>
<td>40</td>
<td></td>
<td></td>
<td>nF</td>
</tr>
<tr>
<td>Coss</td>
<td>Output Capacitance</td>
<td>VDS = 25V</td>
<td>15.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crss</td>
<td>Reverse Transfer Capacitance</td>
<td>f = 1MHz</td>
<td>5.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qg</td>
<td>Total gate Charge</td>
<td>VGS = 10V, Vbus = 50V, ID = 400A</td>
<td>1360</td>
<td></td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td>Qgs</td>
<td>Gate – Source Charge</td>
<td>VGS = ±30V</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Qgd</td>
<td>Gate – Drain Charge</td>
<td>ID = 400A</td>
<td>720</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TD(on)</td>
<td>Turn-on Delay Time</td>
<td>Inductive switching @ 125°C</td>
<td>160</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>TR</td>
<td>Rise Time</td>
<td>VGS = 15V, Vbus = 66V, ID = 400A, RG = 1.25Ω</td>
<td>240</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TD(off)</td>
<td>Turn-off Delay Time</td>
<td>Inductive switching @ 125°C</td>
<td>500</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TF</td>
<td>Fall Time</td>
<td>Rg = 1.25Ω</td>
<td>160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eon</td>
<td>Turn-on Switching Energy</td>
<td>Inductive switching @ 125°C</td>
<td>2.2</td>
<td></td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>Eoff</td>
<td>Turn-off Switching Energy</td>
<td>Inductive switching @ 125°C</td>
<td>2.41</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Eon</td>
<td>Turn-on Switching Energy</td>
<td>Inductive switching @ 25°C</td>
<td>2.43</td>
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<tr>
<td>Eoff</td>
<td>Turn-off Switching Energy</td>
<td>Inductive switching @ 25°C</td>
<td>2.56</td>
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</tbody>
</table>

### Chopper diode ratings and characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VRRM</td>
<td>Maximum Peak Repetitive Reverse Voltage</td>
<td>V = 200V</td>
<td>200</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>IRM</td>
<td>Maximum Reverse Leakage Current</td>
<td>V = 200V</td>
<td>750</td>
<td>1000</td>
<td></td>
<td>µA</td>
</tr>
<tr>
<td>IF</td>
<td>DC Forward Current</td>
<td>Tc = 80°C</td>
<td>400</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>VF</td>
<td>Diode Forward Voltage</td>
<td>IF = 400A</td>
<td>1</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IF = 800A</td>
<td>1.4</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IF = 400A</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tr</td>
<td>Reverse Recovery Time</td>
<td>IF = 400A, VR = 133V, di/dt = 800A/µs</td>
<td>60</td>
<td></td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Qrr</td>
<td>Reverse Recovery Charge</td>
<td>IF = 400A</td>
<td>Tj = 25°C</td>
<td>800</td>
<td></td>
<td>nC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tj = 125°C</td>
<td>3360</td>
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</tbody>
</table>
### Thermal and package characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Characteristic</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{thJC}$</td>
<td>Junction to Case Thermal Resistance</td>
<td>Transistor Diode</td>
<td>0.1</td>
<td>0.14</td>
<td>°C/W</td>
</tr>
<tr>
<td>$V_{isol}$</td>
<td>RMS Isolation Voltage, any terminal to case t =1 min, I Isol&lt;1mA, 50/60Hz</td>
<td>2500</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$T_J$</td>
<td>Operating junction temperature range</td>
<td>-40</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$T_{STG}$</td>
<td>Storage Temperature Range</td>
<td>-40</td>
<td>125</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$T_C$</td>
<td>Operating Case Temperature</td>
<td>-40</td>
<td>100</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Torque</td>
<td>Mounting torque</td>
<td>To heatsink</td>
<td>M6</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For terminals</td>
<td>M5</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>Wt</td>
<td>Package Weight</td>
<td></td>
<td>280</td>
<td>g</td>
<td></td>
</tr>
</tbody>
</table>

### SP6 Package outline (dimensions in mm)

![SP6 Package outline](image)

See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com
Typical Performance Curve

Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

- Thermal Impedance (°C/W)
- Pulse Duration (Seconds)
- Single Pulse

Low Voltage Output Characteristics

- Drain to Source Voltage (V)
- Drain Current (A)
- VGS=15V, 10V & 9V

LTP > ID(on)xRDS(on)MAX
- 250µs pulse test @ < 0.5 duty cycle

Transistor Characteristics

- Gate to Source Voltage (V)
- Drain Current (A)
- VGS=10V
- VGS=20V

Normalized to
- VGS=10V @ 200A

RDS(on) vs Drain Current

- Drain to Source ON Resistance
- Drain Current (A)
- Normalized to VGS=10V @ 200A

DC Drain Current vs Case Temperature

- Drain Current (A)
- Case Temperature (°C)
Breakdown Voltage vs Temperature

ON resistance vs Temperature

Threshold Voltage vs Temperature

Maximum Safe Operating Area

Capacitance vs Drain to Source Voltage

Gate Charge vs Gate to Source Voltage
Delay Times vs Current

Rise and Fall times vs Current

Switching Energy vs Current

Switching Energy vs Gate Resistance

Operating Frequency vs Drain Current

Source to Drain Diode Forward Voltage

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