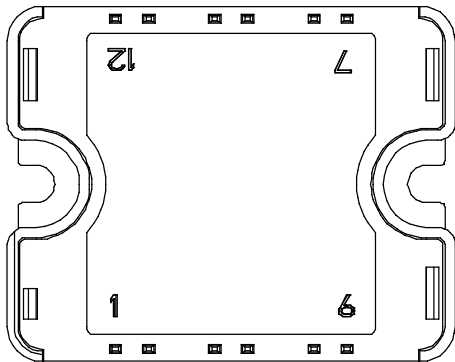
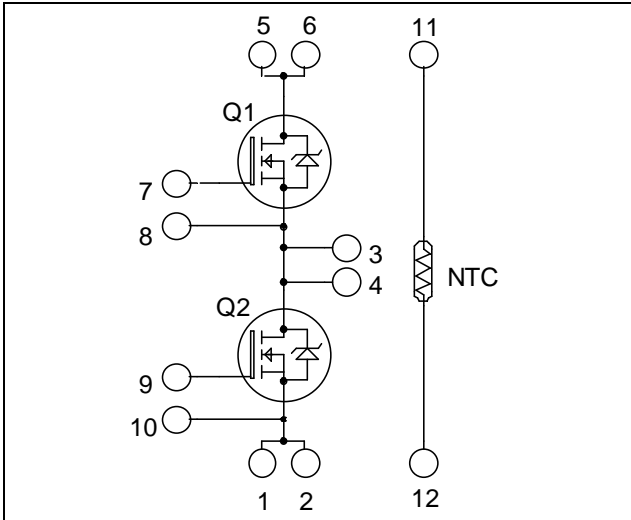


Phase leg MOSFET Power Module

$V_{DSS} = 500V$
 $R_{DSon} = 130m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 25A \text{ @ } T_c = 25^\circ C$



Pins 1/2 ; 3/4 ; 5/6 must be shorted together

Application

- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 8™ FREDFETs
 - Low R_{DSon}
 - Low input and Miller capacitance
 - Low gate charge
 - Fast intrinsic reverse diode
 - Avalanche energy rated
 - Very rugged
- Very low stray inductance
 - Symmetrical design
- Internal thermistor for temperature monitoring
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

Absolute maximum ratings

| Symbol | Parameter | Max ratings | Unit |
|------------|---------------------------------------------------|--------------------|-----------|
| V_{DSS} | Drain - Source Breakdown Voltage | 500 | V |
| I_D | Continuous Drain Current | $T_c = 25^\circ C$ | 25 |
| | | $T_c = 80^\circ C$ | 19 |
| I_{DM} | Pulsed Drain current | 156 | |
| V_{GS} | Gate - Source Voltage | ± 30 | V |
| R_{DSon} | Drain - Source ON Resistance | 180 | $m\Omega$ |
| P_D | Maximum Power Dissipation | $T_c = 25^\circ C$ | 208 |
| I_{AR} | Avalanche current (repetitive and non repetitive) | 21 | A |

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

All ratings @ $T_j = 25^\circ\text{C}$ unless otherwise specified

Electrical Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit | |
|--------------|---------------------------------|------------------------------------------------|---------------------------|-----|-----------|------------------|---------------|
| I_{DSS} | Zero Gate Voltage Drain Current | $V_{DS} = 500\text{V}$ $V_{GS} = 0\text{V}$ | $T_j = 25^\circ\text{C}$ | | | 250 | μA |
| | | | $T_j = 125^\circ\text{C}$ | | | 1000 | |
| $R_{DS(on)}$ | Drain – Source on Resistance | $V_{GS} = 10\text{V}, I_D = 21\text{A}$ | | 130 | 156 | $\text{m}\Omega$ | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS} = V_{DS}, I_D = 1\text{mA}$ | 3 | 4 | 5 | V | |
| I_{GSS} | Gate – Source Leakage Current | $V_{GS} = \pm 30\text{V}$ | | | ± 100 | nA | |

Dynamic Characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit |
|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|-------------|
| C_{iss} | Input Capacitance | $V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$ | | 5448 | | pF |
| C_{oss} | Output Capacitance | | | 735 | | |
| C_{rss} | Reverse Transfer Capacitance | | | 72 | | |
| Q_g | Total gate Charge | $V_{GS} = 10\text{V}$ $V_{Bus} = 250\text{V}$ $I_D = 21\text{A}$ | | 170 | | nC |
| Q_{gs} | Gate – Source Charge | | | 38 | | |
| Q_{gd} | Gate – Drain Charge | | | 80 | | |
| $T_{d(on)}$ | Turn-on Delay Time | Resistive switching @ 25°C $V_{GS} = 15\text{V}$ $V_{Bus} = 333\text{V}$ $I_D = 21\text{A}$ $R_G = 4.7\Omega$ | | 29 | | ns |
| T_r | Rise Time | | | 35 | | |
| $T_{d(off)}$ | Turn-off Delay Time | | | 80 | | |
| T_f | Fall Time | | | 26 | | |

Source - Drain diode ratings and characteristics

| Symbol | Characteristic | Test Conditions | Min | Typ | Max | Unit | |
|----------|-------------------------------------------|-----------------------------------------------------------------------------------|---------------------------|-----|------|------|---------------|
| I_S | Continuous Source current (Body diode) | | $T_c = 25^\circ\text{C}$ | | | 25 | A |
| | | | $T_c = 80^\circ\text{C}$ | | | 19 | |
| V_{SD} | Diode Forward Voltage | $V_{GS} = 0\text{V}, I_S = -21\text{A}$ | | | 1 | V | |
| dv/dt | Peak Diode Recovery ① | | | | 30 | V/ns | |
| t_{rr} | Reverse Recovery Time | $I_S = -21\text{A}$ $V_R = 100\text{V}$ $di_s/dt = 100\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$ | | | 215 | ns |
| | | | $T_j = 125^\circ\text{C}$ | | | 370 | |
| Q_{rr} | Reverse Recovery Charge | | $T_j = 25^\circ\text{C}$ | | 0.90 | | μC |
| | | | $T_j = 125^\circ\text{C}$ | | 2.6 | | |

 ① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

 $I_S \leq -21\text{A}$ $di/dt \leq 1000\text{A}/\mu\text{s}$ $V_{DD} \leq 333\text{V}$ $T_j \leq 125^\circ\text{C}$

Thermal and package characteristics

| Symbol | Characteristic | Min | Typ | Max | Unit | |
|-------------------|--------------------------------------------------------------------------------------|-------------|-----|-----|------|-----|
| R _{thJC} | Junction to Case Thermal Resistance | | | 0.6 | °C/W | |
| V _{ISOL} | RMS Isolation Voltage, any terminal to case t=1 min, I _{isol} <1mA, 50/60Hz | 4000 | | | V | |
| T _J | Operating junction temperature range | -40 | | 150 | °C | |
| T _{STG} | Storage Temperature Range | -40 | | 125 | | |
| T _C | Operating Case Temperature | -40 | | 100 | | |
| Torque | Mounting torque | To heatsink | M4 | 2.5 | 4.7 | N.m |
| Wt | Package Weight | | | | 80 | g |

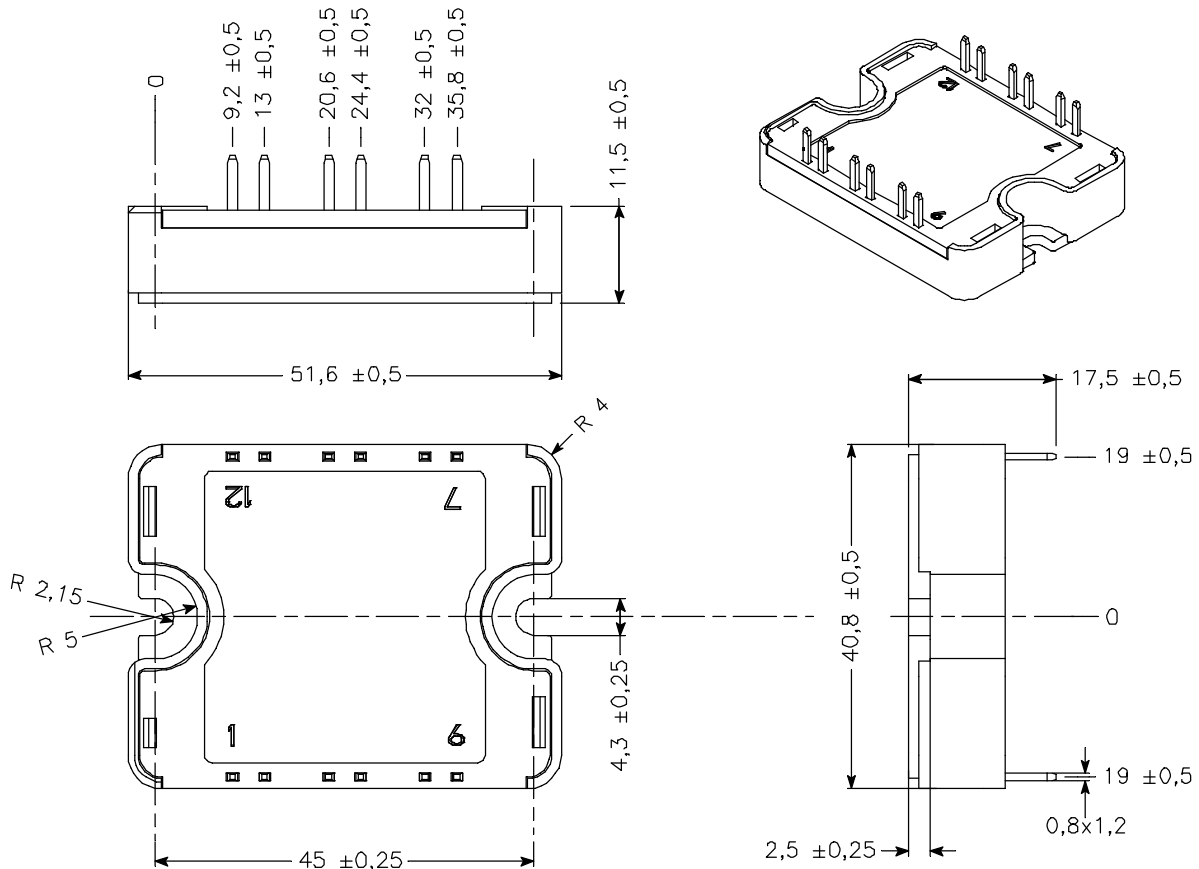
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

| Symbol | Characteristic | Min | Typ | Max | Unit |
|-----------------------------------|----------------------------|-----|------|-----|------|
| R ₂₅ | Resistance @ 25°C | | 50 | | kΩ |
| ΔR ₂₅ /R ₂₅ | | | 5 | | % |
| B _{25/85} | T ₂₅ = 298.15 K | | 3952 | | K |
| ΔB/B | T _C = 100°C | | 4 | | % |

$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

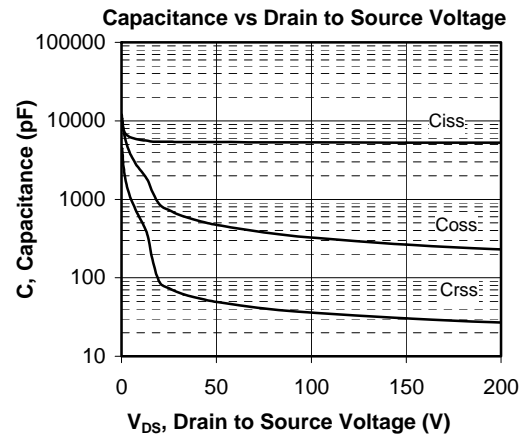
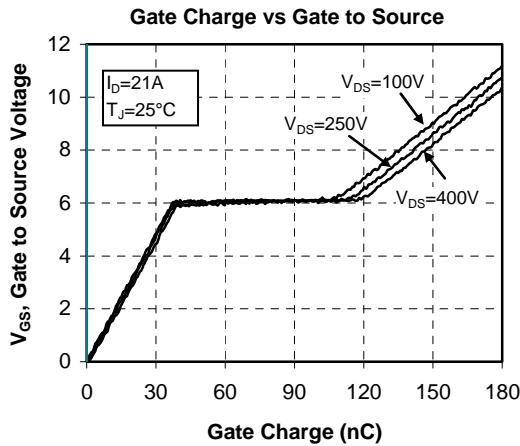
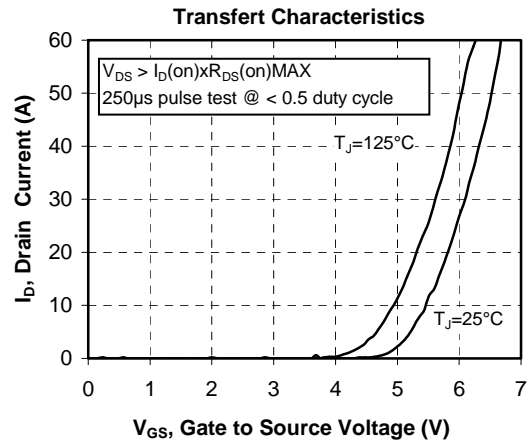
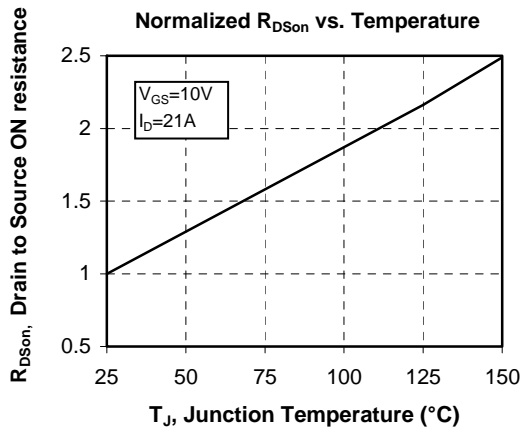
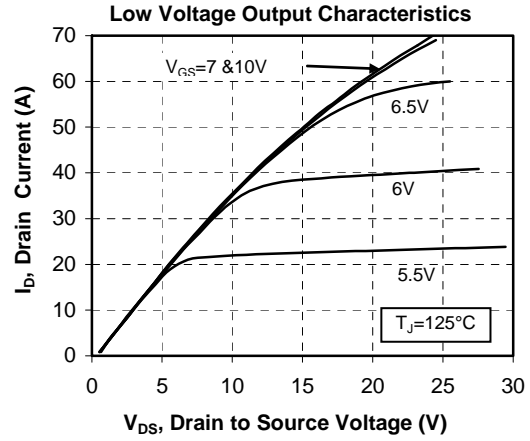
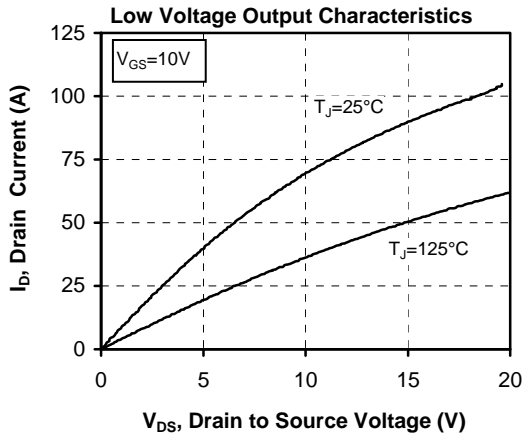
T: Thermistor temperature
 R_T: Thermistor value at T

SP1 Package outline (dimensions in mm)

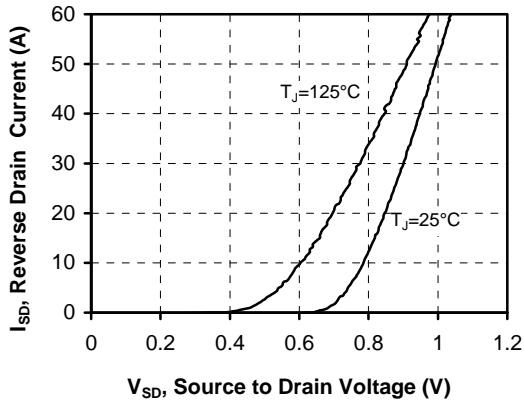


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

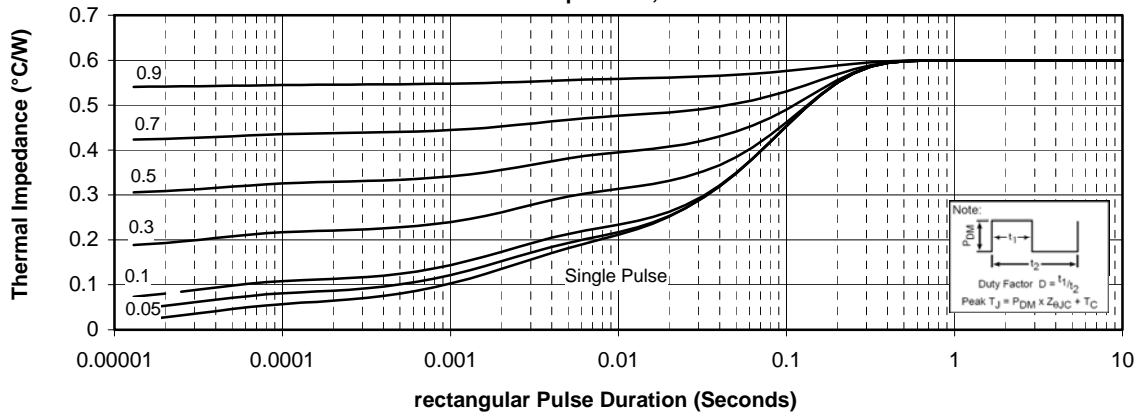
Typical Performance Curve



Drain Current vs Source to Drain Voltage



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



Microsemi reserves the right to change, without notice, the specifications and information contained herein

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.