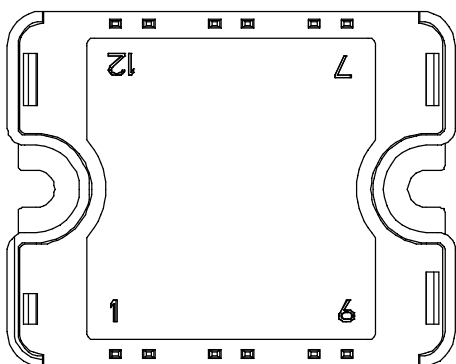
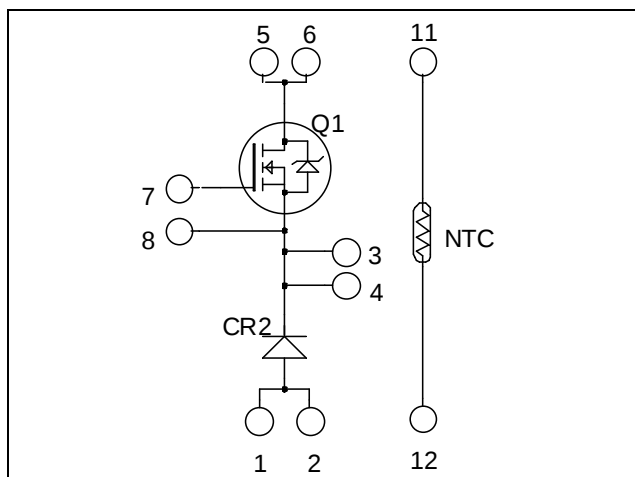


## Buck chopper MOSFET Power Module

$V_{DSS} = 1200V$

$R_{DSon} = 680m\Omega$  typ @  $T_j = 25^\circ C$

$I_D = 15A$  @  $T_c = 25^\circ C$



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

### Application

- AC and DC motor control
- Switched Mode Power Supplies

### Features

- Power MOS 8™ MOSFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Very rugged
- Very low stray inductance
- 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                  | 1200                      | V          |
| $I_D$      | Continuous Drain Current                          | $T_c = 25^\circ C$<br>15  | A          |
|            |                                                   | $T_c = 80^\circ C$<br>11  |            |
| $I_{DM}$   | Pulsed Drain current                              | 90                        |            |
| $V_{GS}$   | Gate - Source Voltage                             | $\pm 30$                  | V          |
| $R_{DSon}$ | Drain - Source ON Resistance                      | 816                       | m $\Omega$ |
| $P_D$      | Maximum Power Dissipation                         | $T_c = 25^\circ C$<br>357 | W          |
| $I_{AR}$   | Avalanche current (repetitive and non repetitive) | 12                        | A          |



**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://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 | $V_{DS} = 1200\text{V}$<br>$V_{GS} = 0\text{V}$ | $T_j = 25^\circ\text{C}$  |     | 100       | $\mu\text{A}$    |
|              |                                 |                                                 | $T_j = 125^\circ\text{C}$ |     | 500       |                  |
| $R_{DS(on)}$ | Drain – Source on Resistance    | $V_{GS} = 10\text{V}$ , $I_D = 12\text{A}$      |                           | 680 | 816       | $\text{m}\Omega$ |
| $V_{GS(th)}$ | Gate Threshold Voltage          | $V_{GS} = V_{DS}$ , $I_D = 2.5\text{mA}$        | 3                         | 4   | 5         | V                |
| $I_{GSS}$    | Gate – Source Leakage Current   | $V_{GS} = \pm 30\text{V}$                       |                           |     | $\pm 100$ | nA               |

### Dynamic Characteristics

| Symbol       | Characteristic               | Test Conditions                                                                                                                                           | Min | Typ  | Max | Unit |
|--------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|-----|------|
| $C_{iss}$    | Input Capacitance            | $V_{GS} = 0\text{V}$                                                                                                                                      |     | 6696 |     | pF   |
| $C_{oss}$    | Output Capacitance           | $V_{DS} = 25\text{V}$                                                                                                                                     |     | 615  |     |      |
| $C_{rss}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                                                                                                                         |     | 80   |     |      |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10\text{V}$                                                                                                                                     |     | 260  |     | nC   |
| $Q_{gs}$     | Gate – Source Charge         | $V_{Bus} = 600\text{V}$                                                                                                                                   |     | 42   |     |      |
| $Q_{gd}$     | Gate – Drain Charge          | $I_D = 12\text{A}$                                                                                                                                        |     | 120  |     |      |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Resistive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}$<br>$V_{Bus} = 800\text{V}$<br>$I_D = 12\text{A}$<br>$R_G = 2.2\Omega$ |     | 45   |     | ns   |
| $T_r$        | Rise Time                    |                                                                                                                                                           |     | 27   |     |      |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                                           |     | 145  |     |      |
| $T_f$        | Fall Time                    |                                                                                                                                                           |     | 42   |     |      |

### Chopper diode ratings and characteristics

| Symbol    | Characteristic                          | Test Conditions                                | Min                       | Typ  | Max | Unit          |
|-----------|-----------------------------------------|------------------------------------------------|---------------------------|------|-----|---------------|
| $V_{RRM}$ | Maximum Peak Repetitive Reverse Voltage |                                                | 1200                      |      |     | V             |
| $I_{RM}$  | Maximum Reverse Leakage Current         | $V_R = 1200\text{V}$                           | $T_j = 25^\circ\text{C}$  |      | 100 | $\mu\text{A}$ |
|           |                                         |                                                | $T_j = 125^\circ\text{C}$ |      | 500 |               |
| $I_F$     | DC Forward Current                      | $T_c = 80^\circ\text{C}$                       |                           | 30   |     | A             |
| $V_F$     | Diode Forward Voltage                   | $I_F = 30\text{A}$                             |                           | 2.6  | 3.1 | V             |
|           |                                         | $I_F = 60\text{A}$                             |                           | 3.2  |     |               |
|           |                                         | $I_F = 30\text{A}$ , $T_j = 125^\circ\text{C}$ |                           | 1.8  |     |               |
| $t_{rr}$  | Reverse Recovery Time                   | $I_F = 30\text{A}$                             | $T_j = 25^\circ\text{C}$  | 300  |     | ns            |
|           |                                         | $V_R = 800\text{V}$                            | $T_j = 125^\circ\text{C}$ | 380  |     |               |
| $Q_{rr}$  | Reverse Recovery Charge                 | $di/dt = 200\text{A}/\mu\text{s}$              | $T_j = 25^\circ\text{C}$  | 360  |     | nC            |
|           |                                         |                                                | $T_j = 125^\circ\text{C}$ | 1700 |     |               |

### Thermal and package characteristics

| Symbol            | Characteristic                                                            |             |            | Min  | Typ | Max  | Unit |
|-------------------|---------------------------------------------------------------------------|-------------|------------|------|-----|------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                       |             | Transistor |      |     | 0.35 | °C/W |
|                   |                                                                           |             | Diode      |      |     | 1.2  |      |
| V <sub>ISOL</sub> | RMS Isolation Voltage, any terminal to case t =1 min, I isol<1mA, 50/60Hz |             |            | 2500 |     |      | V    |
| T <sub>J</sub>    | Operating junction temperature range                                      |             |            | -40  |     | 150  | °C   |
| T <sub>STG</sub>  | Storage Temperature Range                                                 |             |            | -40  |     | 125  |      |
| T <sub>C</sub>    | Operating Case Temperature                                                |             |            | -40  |     | 100  |      |
| Torque            | Mounting torque                                                           | To heatsink | M4         | 2.5  |     | 4.7  | N.m  |
| Wt                | Package Weight                                                            |             |            |      |     | 80   | g    |

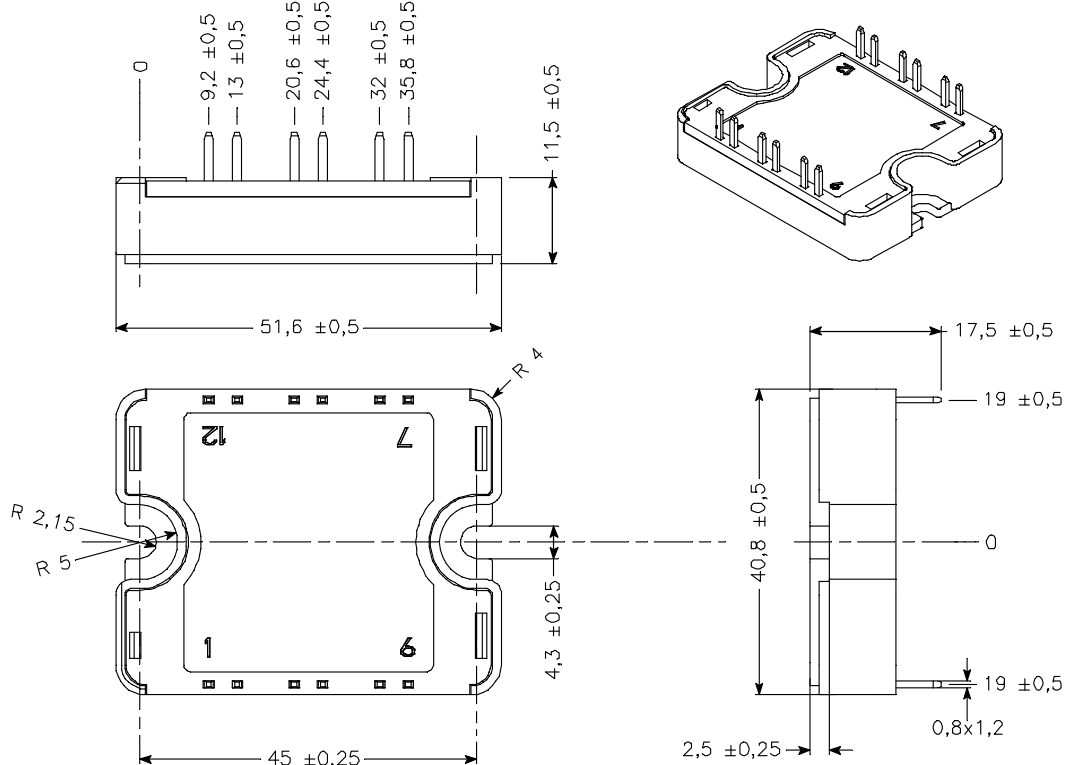
**Temperature sensor NTC** (see application note APT0406 on [www.microsemi.com](http://www.microsemi.com) for more information).

| Symbol             | Characteristic             | Min | Typ  | Max | Unit |
|--------------------|----------------------------|-----|------|-----|------|
| R <sub>25</sub>    | Resistance @ 25°C          |     | 50   |     | kΩ   |
| B <sub>25/85</sub> | T <sub>25</sub> = 298.15 K |     | 3952 |     | K    |

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

T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

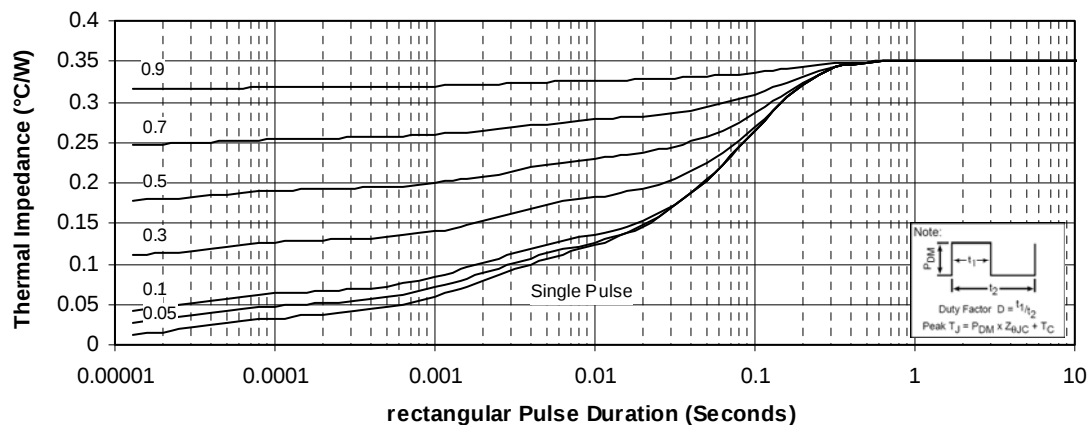
## SP1 Package outline (dimensions in mm)



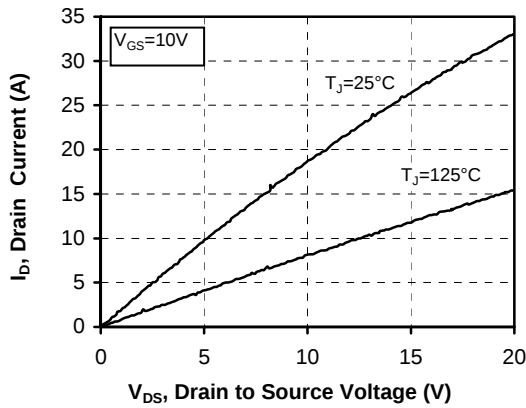
See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Mosfet Performance Curve

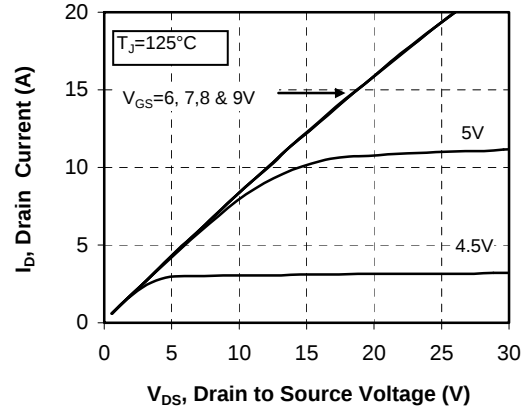
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



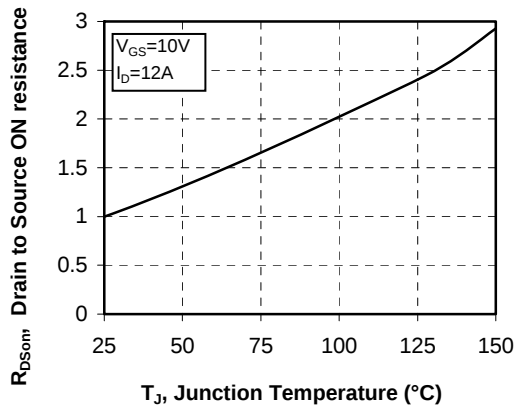
Low Voltage Output Characteristics



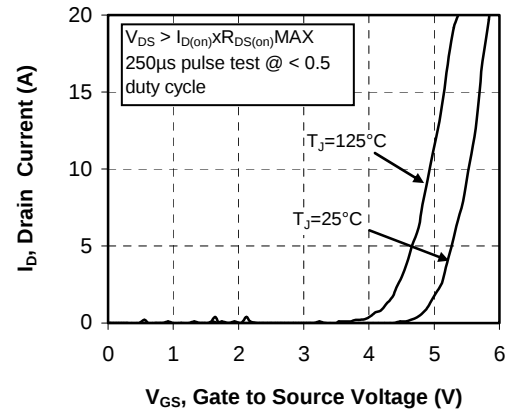
Low Voltage Output Characteristics



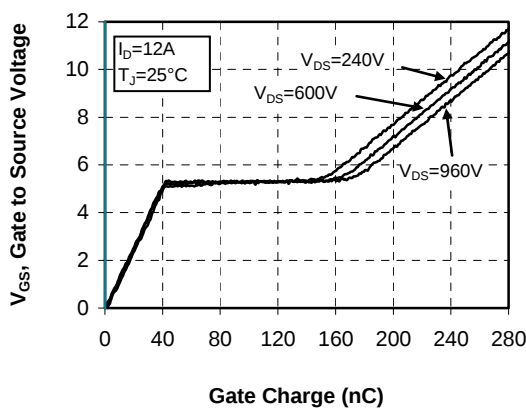
Normalized  $R_{DS(on)}$  vs. Temperature



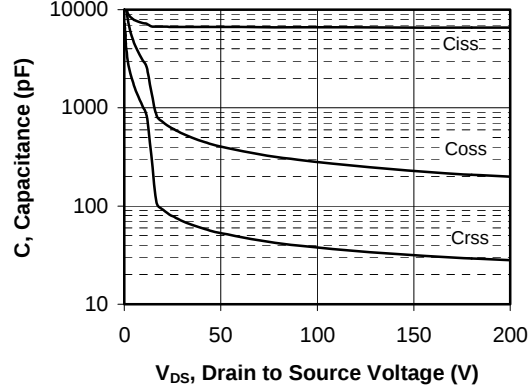
Transfer Characteristics



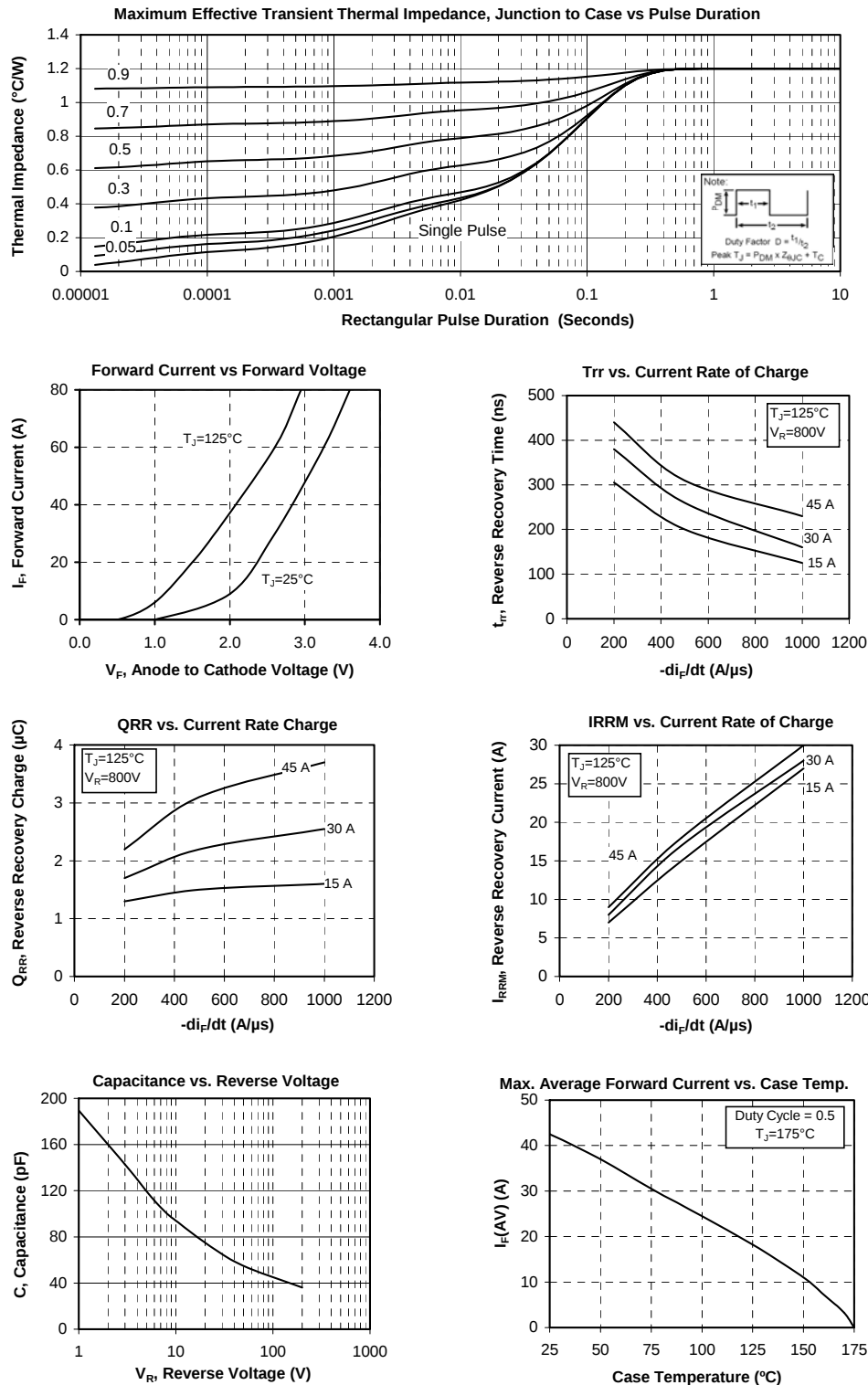
Gate Charge vs Gate to Source



Capacitance vs Drain to Source Voltage



## Typical Diode Performance Curve



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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.