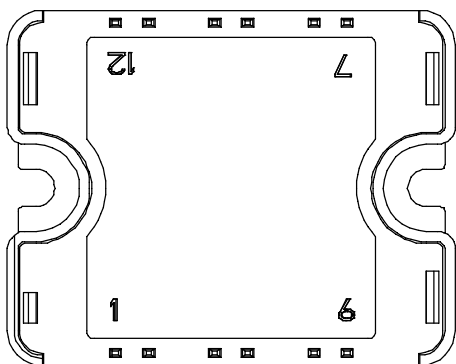
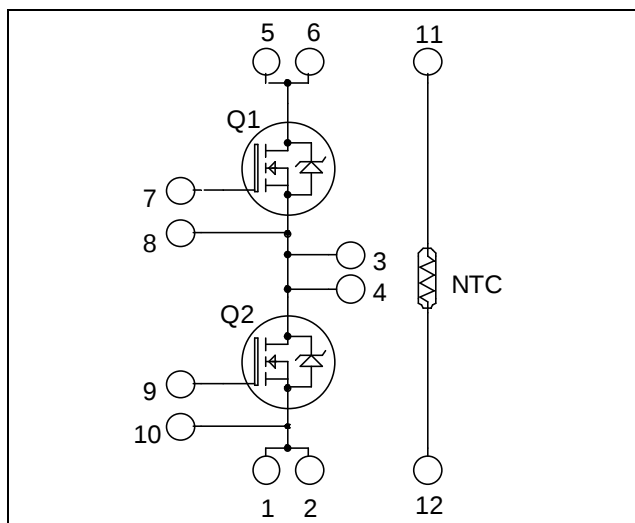


## Phase leg MOSFET Power Module

$V_{DS} = 500V$

$R_{DS(on)} = 70m\Omega \text{ typ @ } T_j = 25^\circ C$

$I_D = 50A \text{ @ } T_c = 25^\circ C$



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™ Ultrafast FREDFETs
  - Low  $R_{DS(on)}$
  - Low input and Miller capacitance
  - Low gate charge
  - Ultrafast 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       |
|--------------|---------------------------------------------------|--------------------|------------|
| $V_{DS}$     | Drain - Source Breakdown Voltage                  | 500                | V          |
| $I_D$        | Continuous Drain Current                          | $T_c = 25^\circ C$ | A          |
|              |                                                   | $T_c = 80^\circ C$ |            |
| $I_{DM}$     | Pulsed Drain current                              | 270                |            |
| $V_{GS}$     | Gate - Source Voltage                             | $\pm 30$           | V          |
| $R_{DS(on)}$ | Drain - Source ON Resistance                      | 84                 | m $\Omega$ |
| $P_D$        | Maximum Power Dissipation                         | $T_c = 25^\circ C$ | 390        |
| $I_{AR}$     | Avalanche current (repetitive and non repetitive) | 42                 | 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 | $V_{DS} = 500\text{V}$<br>$V_{GS} = 0\text{V}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |     | 250<br>1000 | $\mu\text{A}$    |
| $R_{DS(on)}$ | Drain – Source on Resistance    | $V_{GS} = 10\text{V}$ , $I_D = 42\text{A}$     |                                                       | 70  | 84          | $\text{m}\Omega$ |
| $V_{GS(th)}$ | 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            | $V_{GS} = 0\text{V}$                                                                                                                                      |     | 10800 |     | $\text{pF}$ |
| $C_{oss}$    | Output Capacitance           | $V_{DS} = 25\text{V}$                                                                                                                                     |     | 1455  |     |             |
| $C_{rss}$    | Reverse Transfer Capacitance | $f = 1\text{MHz}$                                                                                                                                         |     | 148   |     |             |
| $Q_g$        | Total gate Charge            | $V_{GS} = 10\text{V}$                                                                                                                                     |     | 340   |     | nC          |
| $Q_{gs}$     | Gate – Source Charge         | $V_{Bus} = 250\text{V}$                                                                                                                                   |     | 75    |     |             |
| $Q_{gd}$     | Gate – Drain Charge          | $I_D = 42\text{A}$                                                                                                                                        |     | 155   |     |             |
| $T_{d(on)}$  | Turn-on Delay Time           | <b>Resistive switching @ <math>25^\circ\text{C}</math></b><br>$V_{GS} = 15\text{V}$<br>$V_{Bus} = 333\text{V}$<br>$I_D = 42\text{A}$<br>$R_G = 2.2\Omega$ |     | 60    |     | ns          |
| $T_r$        | Rise Time                    |                                                                                                                                                           |     | 70    |     |             |
| $T_{d(off)}$ | Turn-off Delay Time          |                                                                                                                                                           |     | 155   |     |             |
| $T_f$        | Fall Time                    |                                                                                                                                                           |     | 50    |     |             |

### Source - Drain diode ratings and characteristics

| Symbol   | Characteristic                         | Test Conditions                                                                   | Min                                                   | Typ         | Max        | Unit |
|----------|----------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------|-------------|------------|------|
| $I_S$    | Continuous Source current (Body diode) | $T_c = 25^\circ\text{C}$<br>$T_c = 80^\circ\text{C}$                              |                                                       |             | 50<br>37   | A    |
| $V_{SD}$ | Diode Forward Voltage                  | $V_{GS} = 0\text{V}$ , $I_S = -42\text{A}$                                        |                                                       |             | 1          | V    |
| $dv/dt$  | Peak Diode Recovery ❶                  |                                                                                   |                                                       |             | 30         | V/ns |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S = -42\text{A}$<br>$V_R = 100\text{V}$<br>$di_s/dt = 100\text{A}/\mu\text{s}$ | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ |             | 260<br>480 | ns   |
| $Q_{rr}$ | Reverse Recovery Charge                |                                                                                   | $T_j = 25^\circ\text{C}$<br>$T_j = 125^\circ\text{C}$ | 1.5<br>3.93 |            |      |

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

$I_S \leq -42\text{A}$     $di/dt \leq 1000\text{A}/\mu\text{s}$     $V_{DD} \leq 333\text{V}$     $T_j \leq 125^\circ\text{C}$

## Thermal and package characteristics

| Symbol            | Characteristic                                                            |             |    | Min  | Typ | Max  | Unit |
|-------------------|---------------------------------------------------------------------------|-------------|----|------|-----|------|------|
| R <sub>thJC</sub> | Junction to Case Thermal Resistance                                       |             |    |      |     | 0.32 | °C/W |
| 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    |

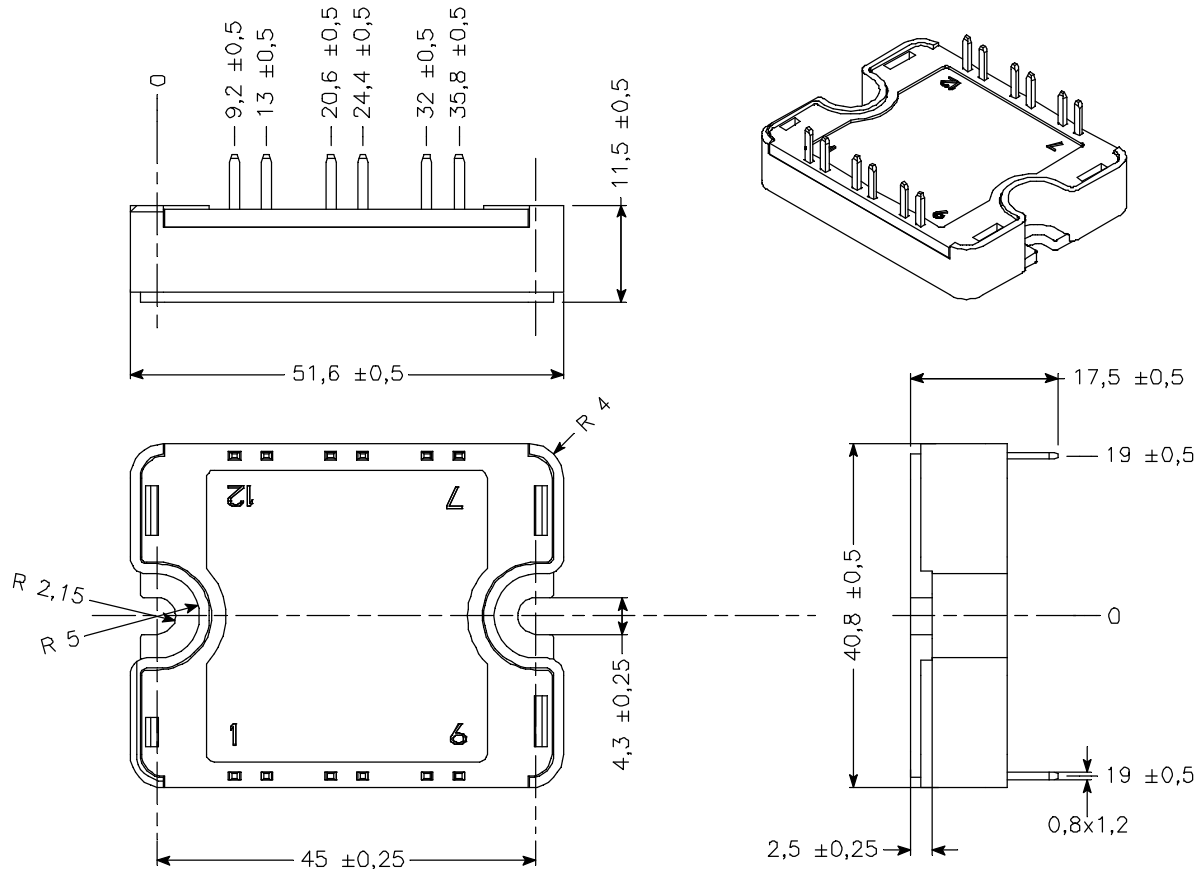
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

| 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    |

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

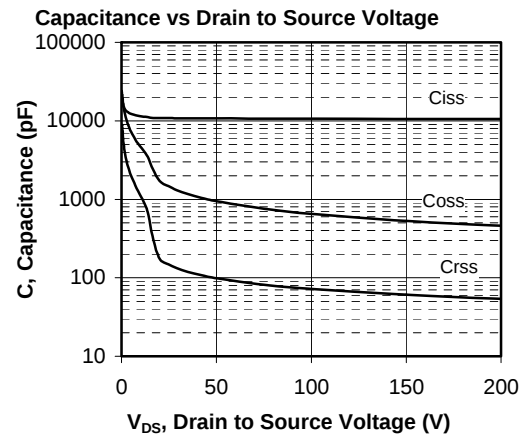
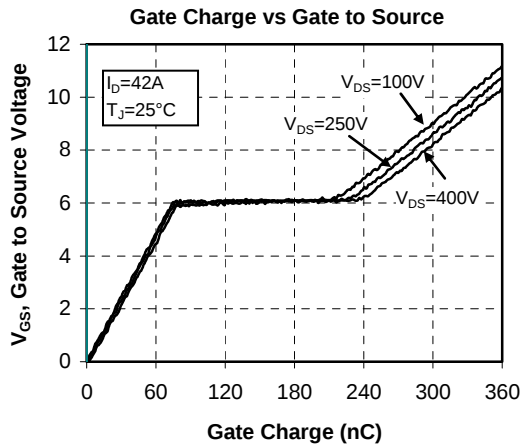
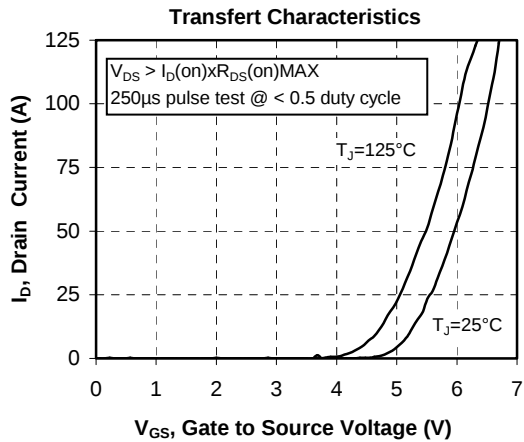
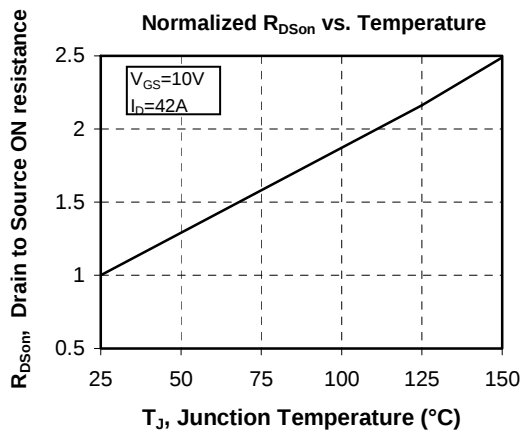
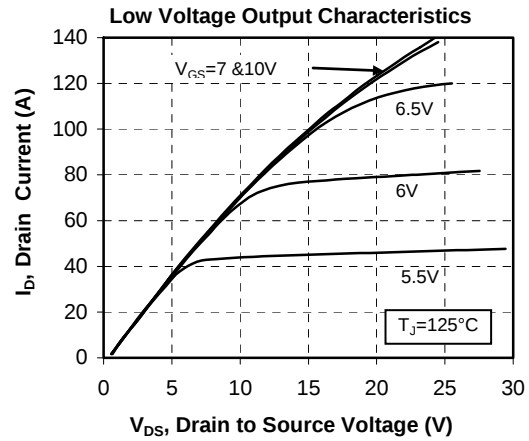
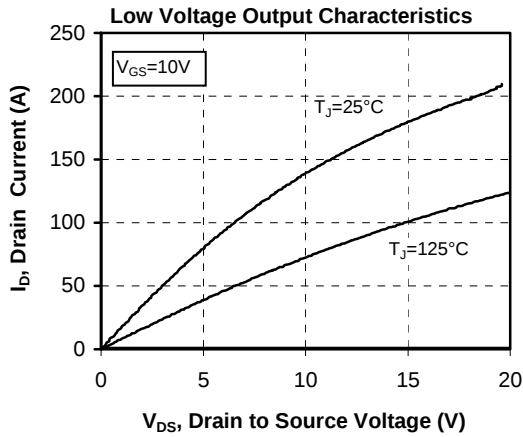
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

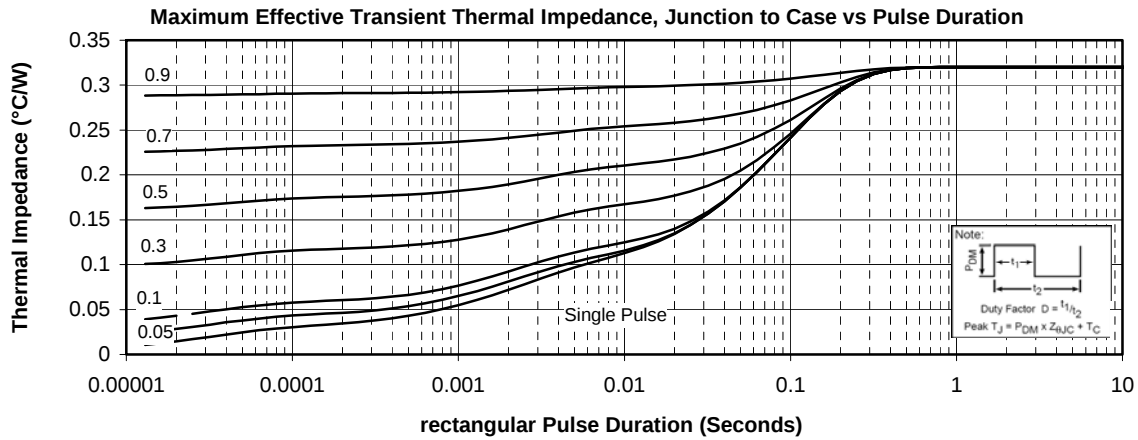
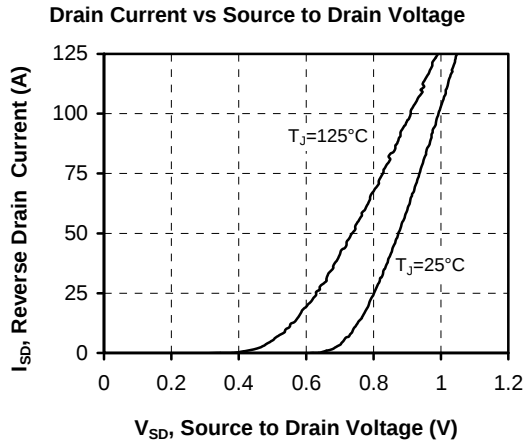
## SP1 Package outline (dimensions in mm)



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

## Typical Performance Curve





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