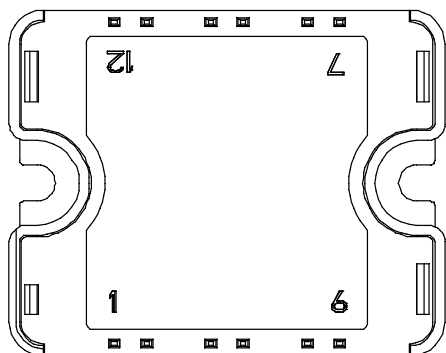
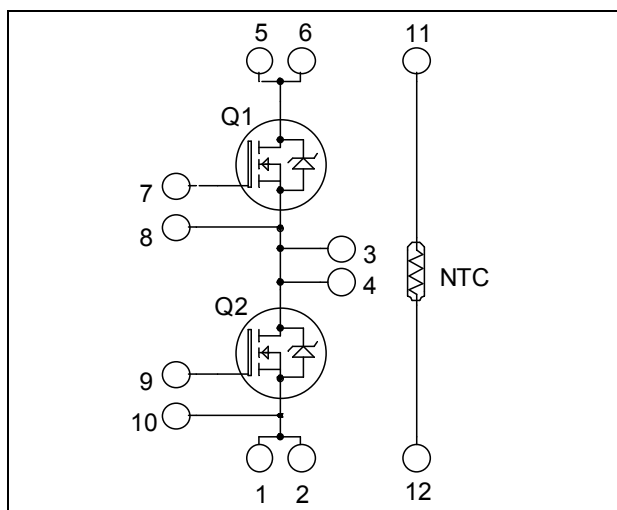


## Phase leg MOSFET Power Module

$$V_{DSS} = 600V$$

$$R_{DSon} = 90m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 40A \text{ @ } T_c = 25^\circ C$$



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	600	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$ 40 $T_c = 80^\circ C$ 30	A
$I_{DM}$	Pulsed Drain current	245	
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	110	m $\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$ 390	W
$I_{AR}$	Avalanche current (repetitive and non repetitive)	33	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	$V_{DS} = 600\text{V}$ $V_{GS} = 0\text{V}$	$T_j = 25^\circ\text{C}$		100	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 33\text{A}$		90	110	$\text{m}\Omega$
$V_{GS(th)}$	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	$V_{GS} = 0\text{V}$		10552		pF
$C_{oss}$	Output Capacitance	$V_{DS} = 25\text{V}$		1210		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		108		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$		330		nC
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 300\text{V}$		70		
$Q_{gd}$	Gate – Drain Charge	$I_D = 33\text{A}$		140		
$T_{d(on)}$	Turn-on Delay Time	<b>Resistive switching @ <math>25^\circ\text{C}</math></b>		75		ns
$T_r$	Rise Time	$V_{GS} = 15\text{V}$		85		
$T_{d(off)}$	Turn-off Delay Time	$V_{Bus} = 400\text{V}$		225		
$T_f$	Fall Time	$I_D = 33\text{A}$ $R_G = 2.2\Omega$		70		

### Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			40	A
		$T_c = 80^\circ\text{C}$			30	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -33\text{A}$			1	V
$dv/dt$	Peak Diode Recovery ❶				30	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -33\text{A}$ $V_R = 100\text{V}$	$T_j = 25^\circ\text{C}$		250	ns
			$T_j = 125^\circ\text{C}$		460	
$Q_{rr}$	Reverse Recovery Charge	$di/dt = 100\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	1.27		$\mu\text{C}$
			$T_j = 125^\circ\text{C}$	3.32		

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

$I_S \leq -33\text{A}$     $di/dt \leq 1000\text{A}/\mu\text{s}$     $V_{DD} \leq 400\text{V}$     $T_j \leq 125^\circ\text{C}$

## 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, 50/60Hz			4000			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		3	N.m
Wt	Package Weight					80	g

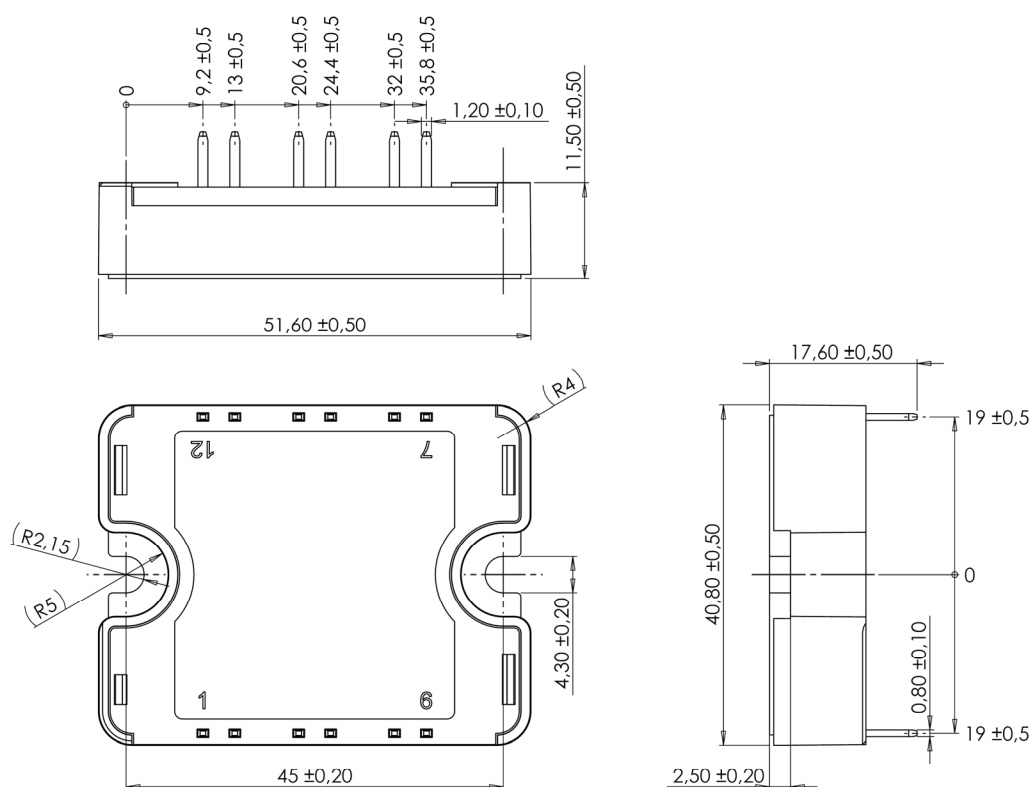
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

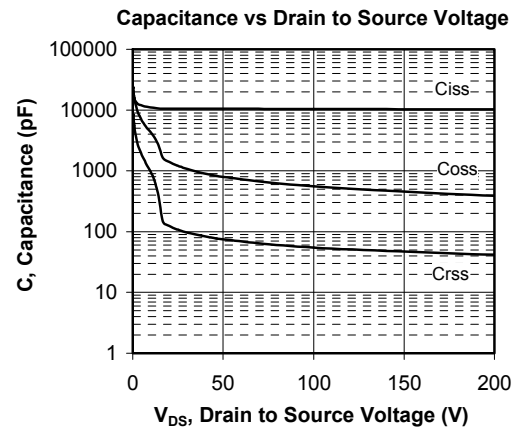
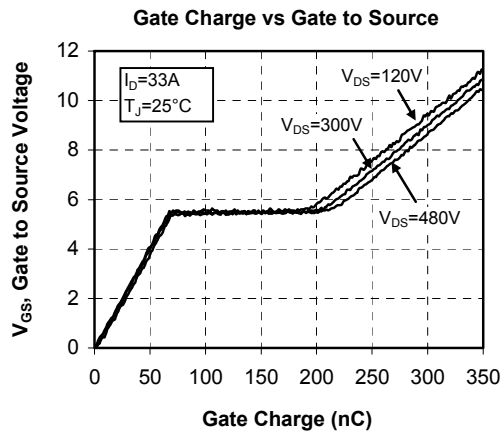
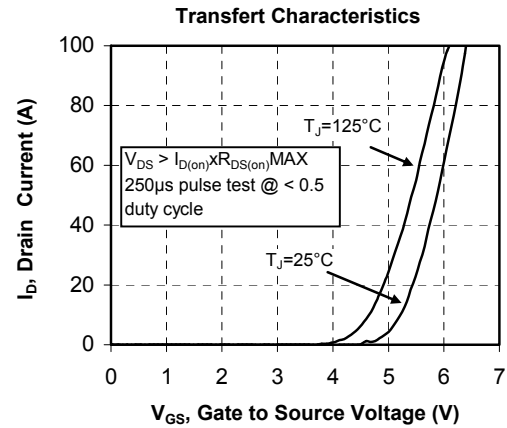
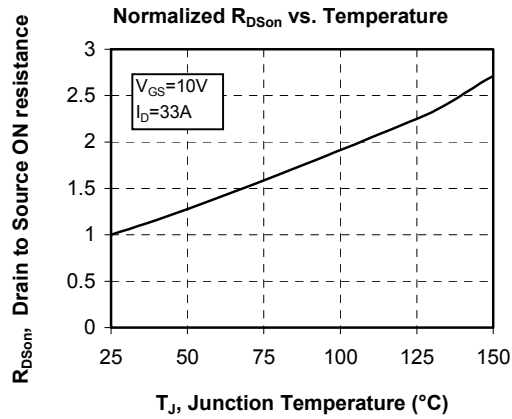
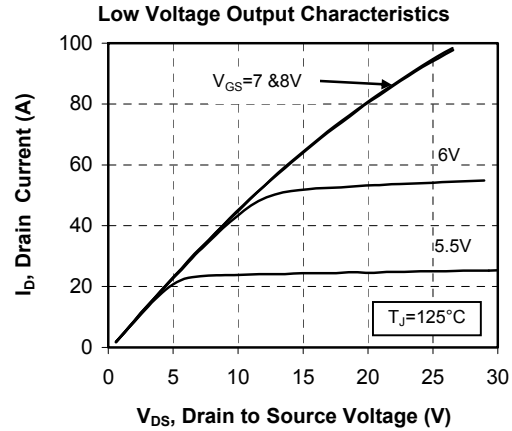
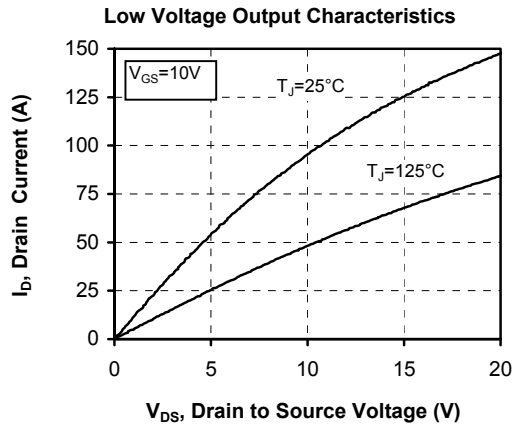
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

## SP1 Package outline (dimensions in mm)

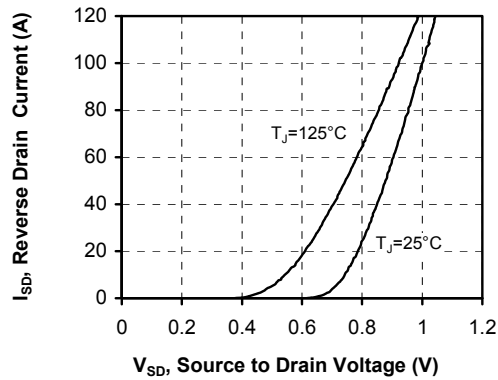


See application note 1904 - Mounting Instructions for SP1 Power Modules on [www.microsemi.com](http://www.microsemi.com)

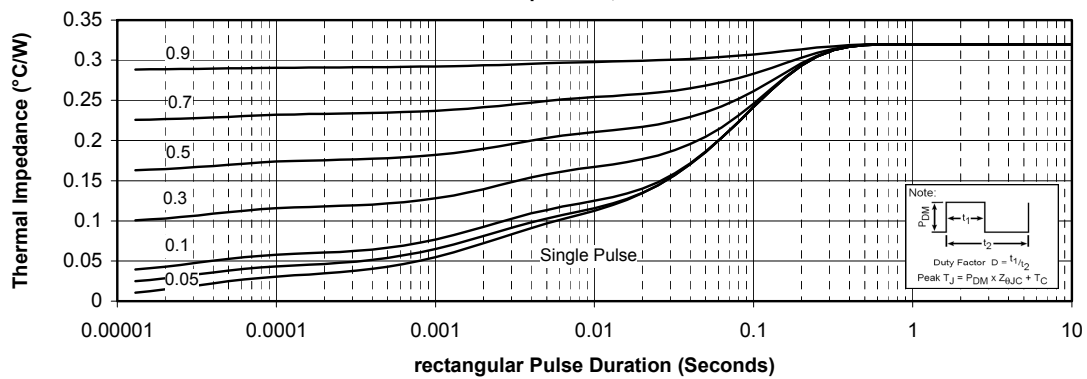
## Typical Performance Curve



Drain Current vs Source to Drain Voltage



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



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