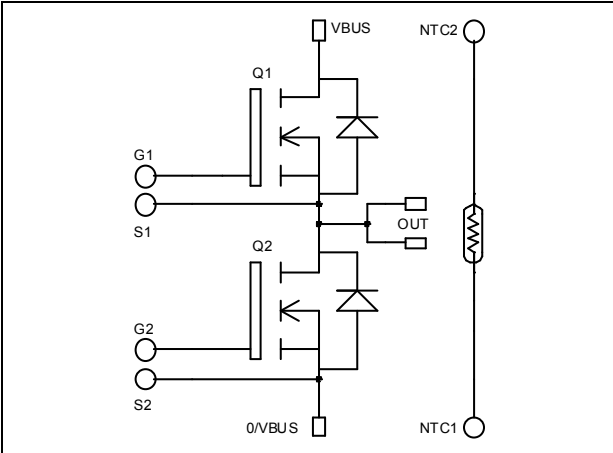


Phase leg  
MOSFET Power Module

**$V_{DSS} = 500V$**   
 **$R_{DSon} = 35m\Omega$  typ @  $T_j = 25^\circ C$**   
 **$I_D = 99A$  @  $T_c = 25^\circ C$**

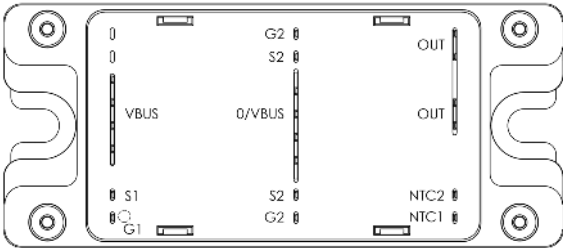


**Application**

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

**Features**

- Power MOS 7<sup>®</sup> FREDFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - Fast intrinsic reverse diode
  - Avalanche energy rated
  - Very rugged
- Kelvin source for easy drive
- Very low stray inductance
  - Symmetrical design
  - Lead frames for power connections
- 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	$T_c = 25^\circ C$	99
		$T_c = 80^\circ C$	74
$I_{DM}$	Pulsed Drain current	396	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	39	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	781
$I_{AR}$	Avalanche current (repetitive and non repetitive)	51	A
$E_{AR}$	Repetitive Avalanche Energy	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy	3000	

**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	$V_{GS} = 0V, V_{DS} = 500V$ $T_j = 25^\circ\text{C}$			200	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 400V$ $T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 49.5A$		35	39	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 5\text{mA}$	3		5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 150$	$\text{nA}$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		14		$\text{nF}$
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		2.8		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.2		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		280		$\text{nC}$
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 250V$		80		
$Q_{gd}$	Gate – Drain Charge	$I_D = 99A$		140		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 99A$ $R_G = 1\Omega$		21		$\text{ns}$
$T_r$	Rise Time			38		
$T_{d(off)}$	Turn-off Delay Time			75		
$T_f$	Fall Time			93		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 99A, R_G = 1\Omega$		2070		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			1690		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 99A, R_G = 1\Omega$		3112		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			2026		

**Source - Drain diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			99	A
		$T_c = 80^\circ\text{C}$			74	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0V, I_S = -99A$			1.3	V
$dv/dt$	Peak Diode Recovery ①				15	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -99A$ $V_R = 333V$	$T_j = 25^\circ\text{C}$		270	$\text{ns}$
			$T_j = 125^\circ\text{C}$		540	
$Q_{rr}$	Reverse Recovery Charge	$di_S/dt = 200A/\mu\text{s}$	$T_j = 25^\circ\text{C}$		5.2	$\mu\text{C}$
			$T_j = 125^\circ\text{C}$		19.2	

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

 $I_S \leq -99A$     $di/dt \leq 700A/\mu\text{s}$     $V_R \leq V_{DSS}$     $T_j \leq 150^\circ\text{C}$

## Thermal and package characteristics

Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance			0.16	°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	M5	2.5	4.7	N.m
Wt	Package Weight			160		g

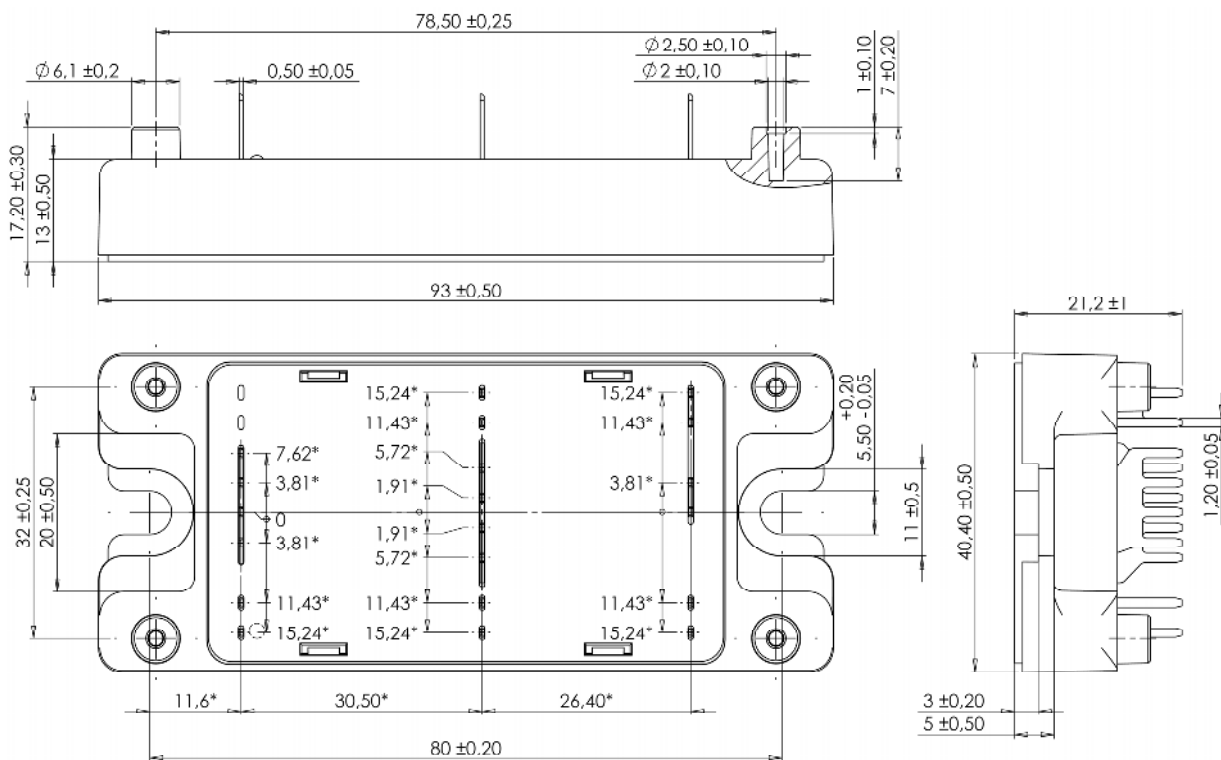
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

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

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

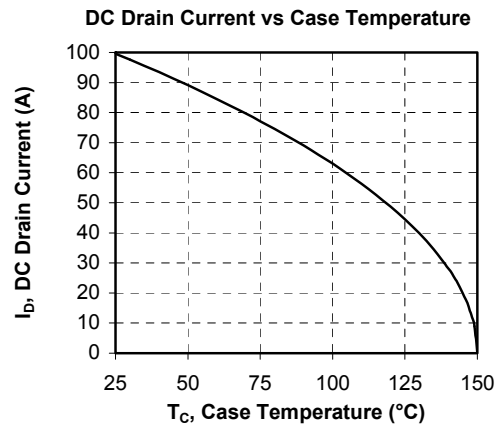
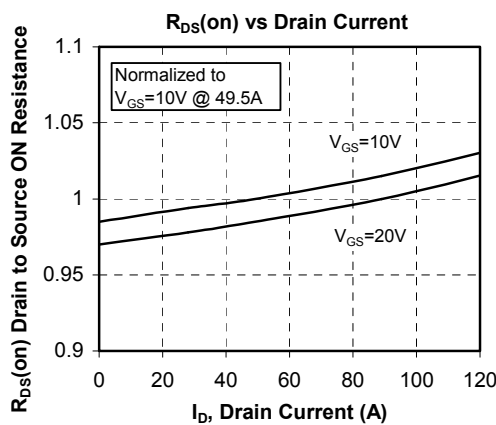
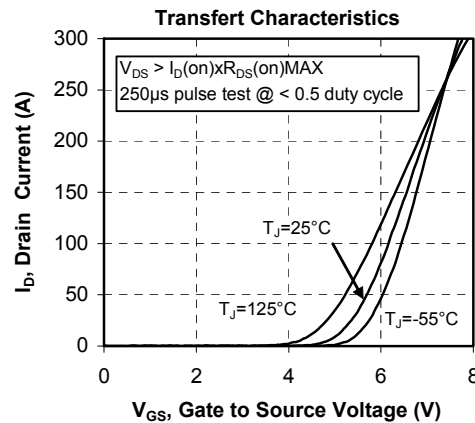
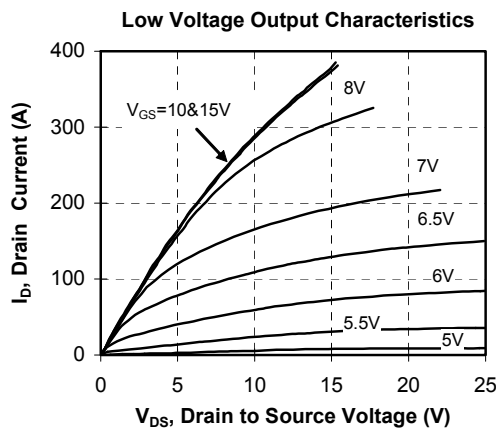
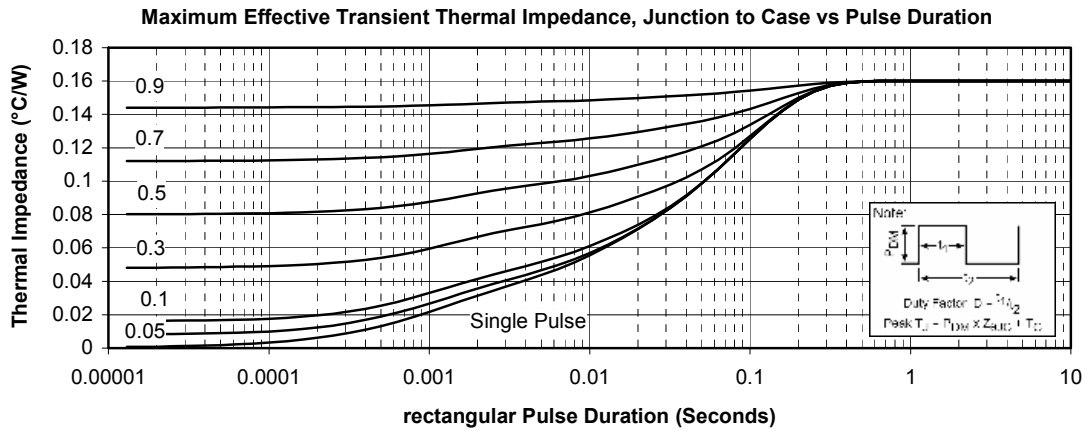
T: Thermistor temperature  
 R<sub>T</sub>: Thermistor value at T

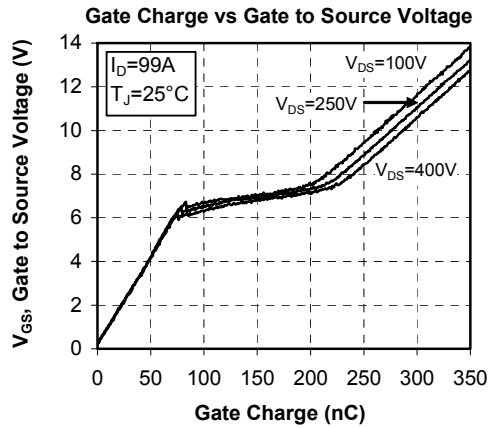
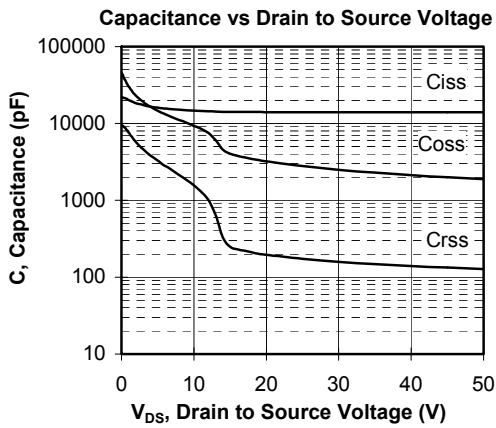
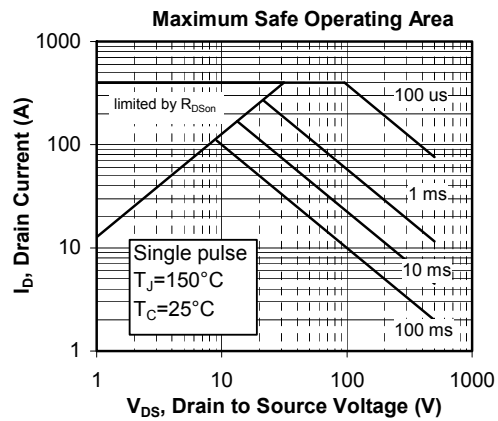
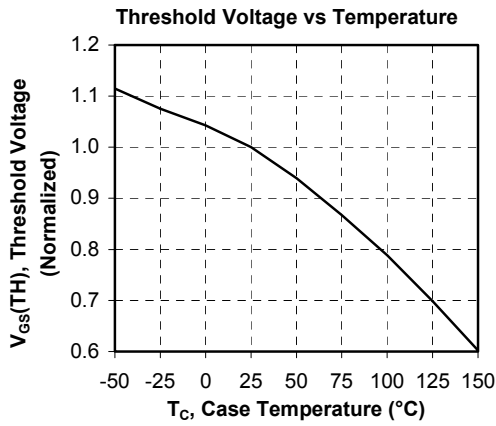
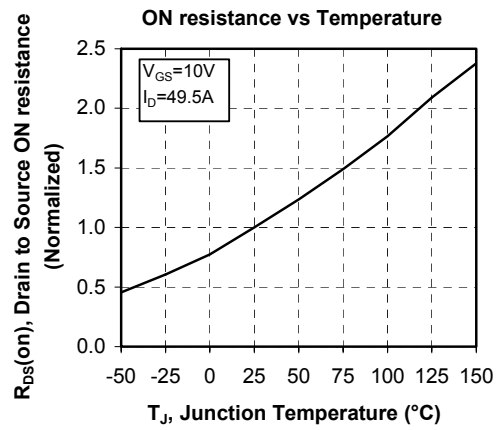
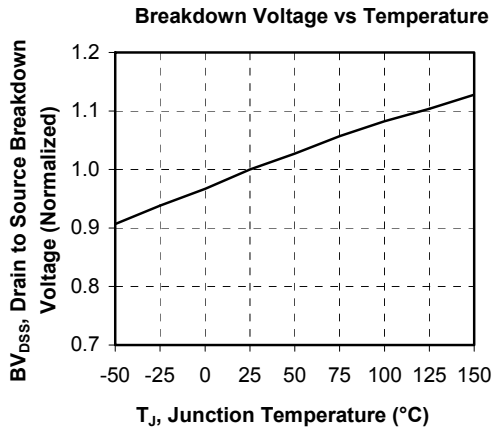
## SP4 Package outline (dimensions in mm)

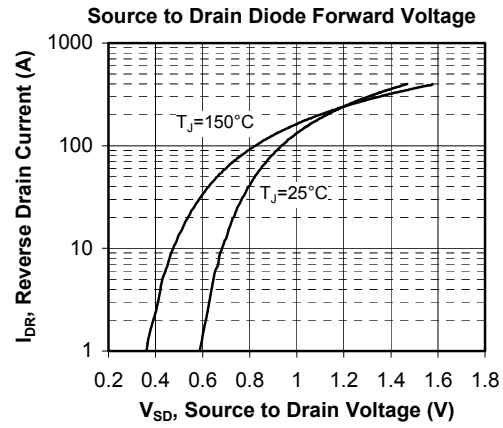
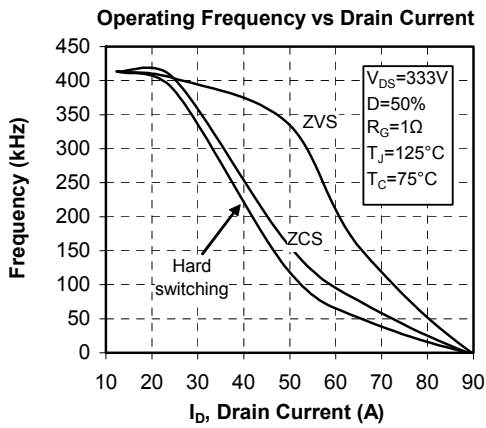
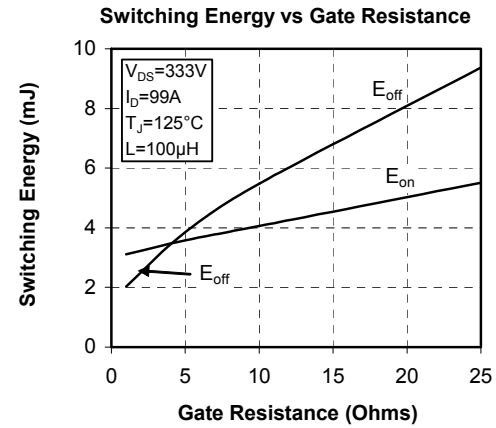
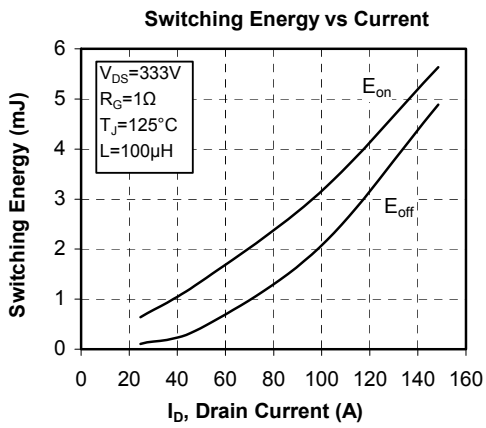
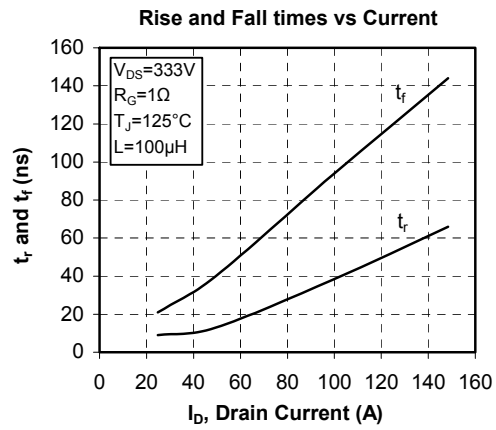
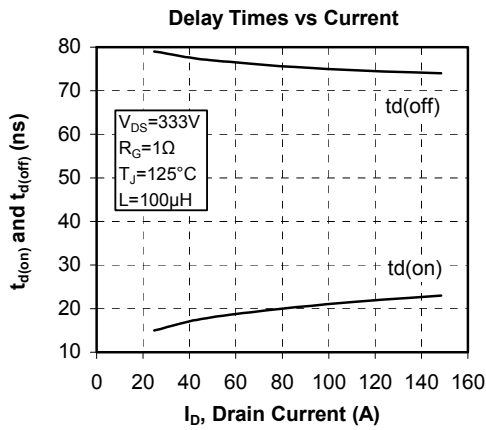


ALL DIMENSIONS MARKED "\*" ARE TOLERANCED AS:  $\pm \phi 1$

See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

**Typical Performance Curve**






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