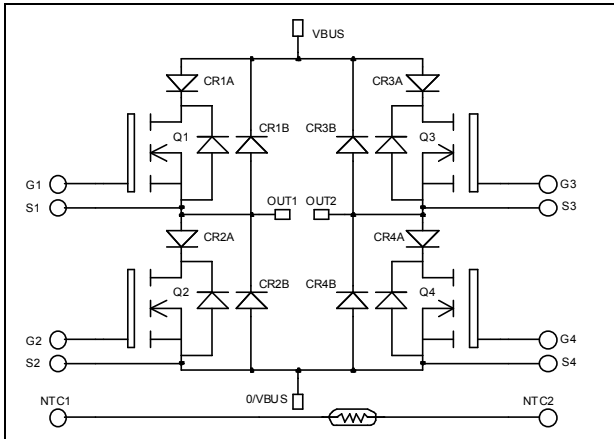


**Full bridge  
Series & parallel diodes  
MOSFET Power Module**

**$V_{DSS} = 500V$**   
 **$R_{DSon} = 75m\Omega \text{ typ @ } T_j = 25^\circ C$**   
 **$I_D = 46A \text{ @ } T_c = 25^\circ C$**

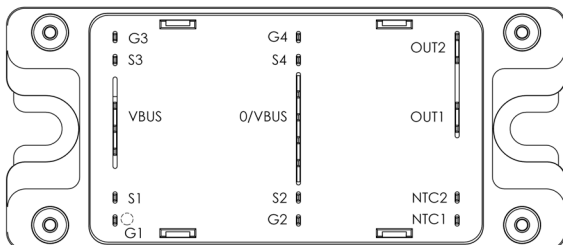


### Application

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

### Features

- Power MOS 7<sup>®</sup> MOSFETs
  - Low  $R_{DSon}$
  - Low input and Miller capacitance
  - Low gate charge
  - 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

**All ratings @  $T_j = 25^\circ C$  unless otherwise specified**

### Absolute maximum ratings

Symbol	Parameter	Max ratings	Unit
$V_{DSS}$	Drain - Source Breakdown Voltage	500	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	46
		$T_c = 80^\circ C$	34
$I_{DM}$	Pulsed Drain current	184	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	90	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	357
$I_{AR}$	Avalanche current (repetitive and non repetitive)	46	A
$E_{AR}$	Repetitive Avalanche Energy	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy	2500	

**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)

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>GS</sub> = 0V, V <sub>DS</sub> = 500V			100	μA
		T <sub>j</sub> = 25°C				
		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 400V			500	
R <sub>DS(on)</sub>	Drain – Source on Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 23A		75	90	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 2.5mA	3		5	V
I <sub>GSS</sub>	Gate – Source Leakage Current	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0V			±100	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C <sub>iss</sub>	Input Capacitance	V <sub>GS</sub> = 0V		5600		pF
C <sub>oss</sub>	Output Capacitance	V <sub>DS</sub> = 25V		1200		
C <sub>rss</sub>	Reverse Transfer Capacitance	f = 1MHz		90		
Q <sub>g</sub>	Total gate Charge	V <sub>GS</sub> = 10V		123		nC
Q <sub>gs</sub>	Gate – Source Charge	V <sub>Bus</sub> = 250V		33		
Q <sub>gd</sub>	Gate – Drain Charge	I <sub>D</sub> = 46A		65		
T <sub>d(on)</sub>	Turn-on Delay Time	<b>Inductive switching @ 125°C</b>		18		ns
T <sub>r</sub>	Rise Time	V <sub>GS</sub> = 15V		35		
T <sub>d(off)</sub>	Turn-off Delay Time	V <sub>Bus</sub> = 333V		87		
T <sub>f</sub>	Fall Time	I <sub>D</sub> = 46A R <sub>G</sub> = 5Ω		77		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 25°C</b>		755		μJ
E <sub>off</sub>	Turn-off Switching Energy	V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 333V I <sub>D</sub> = 46A, R <sub>G</sub> = 5Ω		726		
E <sub>on</sub>	Turn-on Switching Energy	<b>Inductive switching @ 125°C</b>		1241		μJ
E <sub>off</sub>	Turn-off Switching Energy	V <sub>GS</sub> = 15V, V <sub>Bus</sub> = 333V I <sub>D</sub> = 46A, R <sub>G</sub> = 5Ω		846		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				0.35	°C/W

**Series diode ratings and characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage		600			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> = 600V			250	μA
I <sub>F</sub>	DC Forward Current	T <sub>c</sub> = 70°C		30		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 30A		1.6	1.8	V
		I <sub>F</sub> = 60A		1.9		
		I <sub>F</sub> = 30A	T <sub>j</sub> = 125°C	1.4		
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> = 25°C		85		ns
		T <sub>j</sub> = 125°C		160		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 30A V <sub>R</sub> = 400V di/dt = 200A/μs	T <sub>j</sub> = 25°C	130		nC
		T <sub>j</sub> = 125°C		700		
R <sub>thJC</sub>	Junction to Case Thermal Resistance				1.2	°C/W

## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V <sub>RRM</sub>	Maximum Peak Repetitive Reverse Voltage			600			V
I <sub>RM</sub>	Maximum Reverse Leakage Current	V <sub>R</sub> = 600V				250	μA
I <sub>F</sub>	DC Forward Current		T <sub>c</sub> = 70°C		30		A
V <sub>F</sub>	Diode Forward Voltage	I <sub>F</sub> = 30A			1.6	1.8	V
		I <sub>F</sub> = 60A			1.9		
		I <sub>F</sub> = 30A	T <sub>j</sub> = 125°C		1.4		
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 30A V <sub>R</sub> = 400V di/dt = 200A/μs	T <sub>j</sub> = 25°C		85		ns
			T <sub>j</sub> = 125°C		160		
Q <sub>rr</sub>	Reverse Recovery Charge	I <sub>F</sub> = 30A V <sub>R</sub> = 400V di/dt = 200A/μs	T <sub>j</sub> = 25°C		130		nC
			T <sub>j</sub> = 125°C		700		
R <sub>thJC</sub>	Junction to Case Thermal Resistance					1.2	°C/W

## Thermal and package characteristics

Symbol	Characteristic	Min	Max	Unit		
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>JOP</sub>	Recommended junction temperature under switching conditions	-40	T <sub>Jmax</sub> -25			
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
Wt	Package Weight				160	g

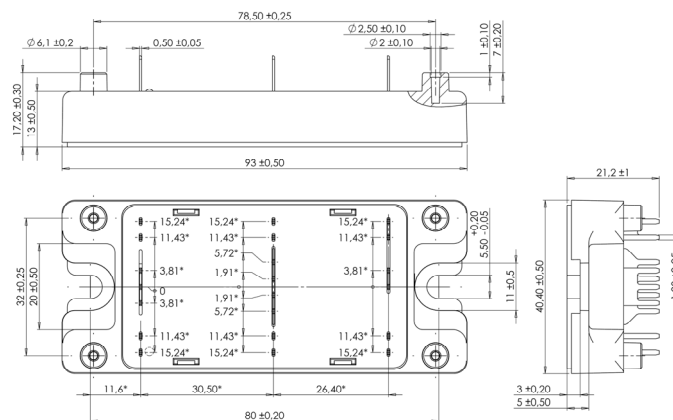
## Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

Symbol	Characteristic	Min	Typ	Max	Unit
R <sub>25</sub>	Resistance @ 25°C		50		kΩ
ΔR <sub>25</sub> /R <sub>25</sub>			5		%
B <sub>25/85</sub>	T <sub>25</sub> = 298.15 K		3952		K
ΔB/B			4		%

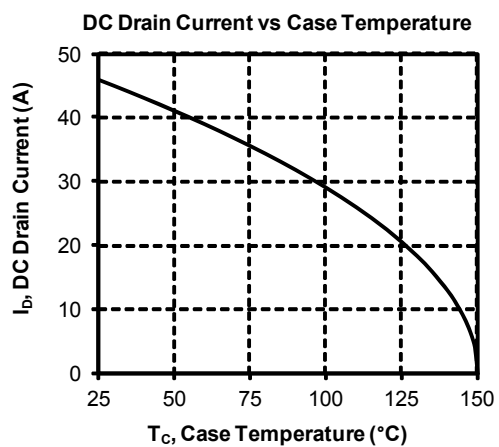
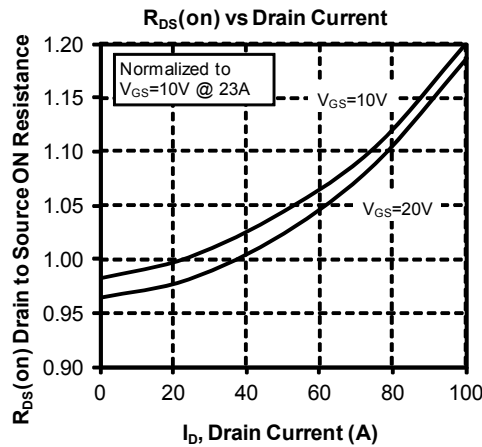
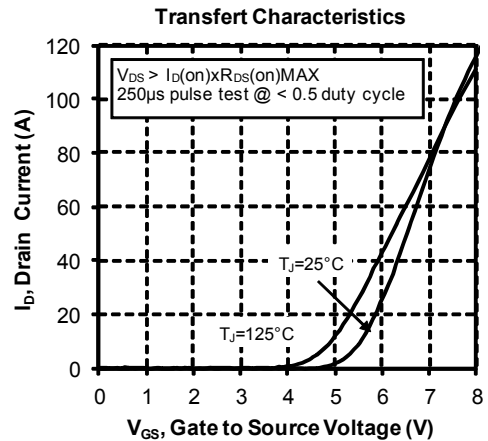
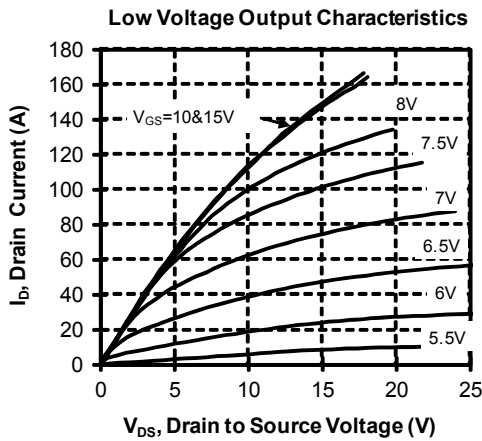
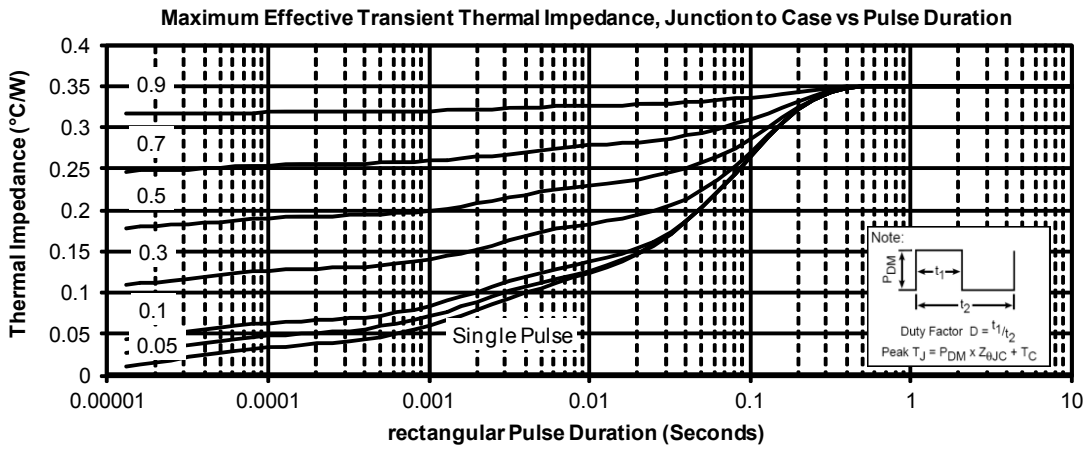
$$R_T = \frac{R_{25}}{\exp \left[ B_{25/85} \left( \frac{1}{T} - \frac{1}{T_{25}} \right) \right]}$$

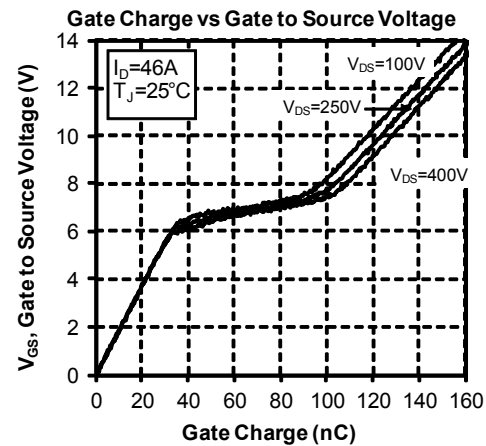
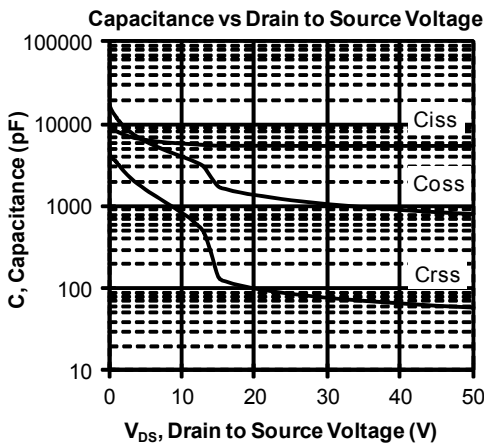
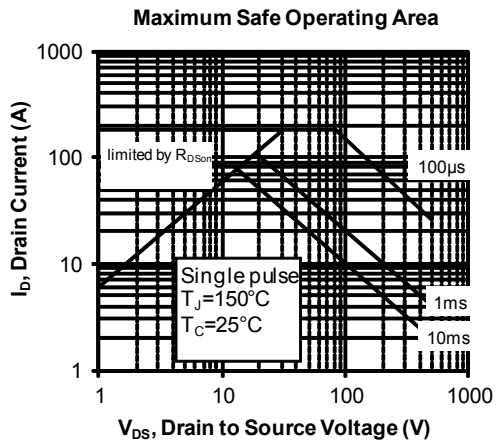
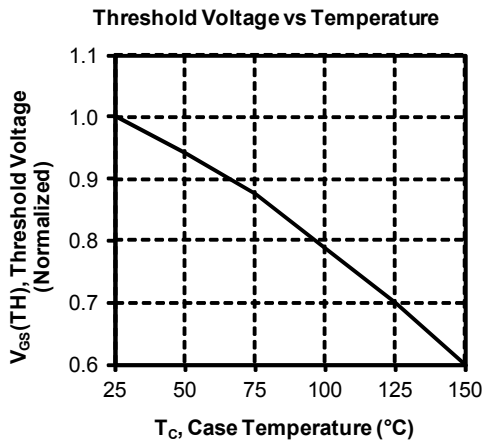
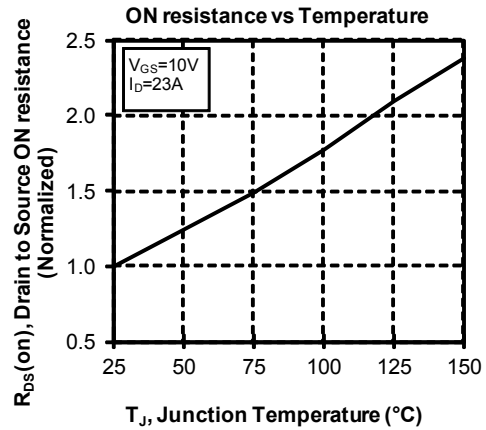
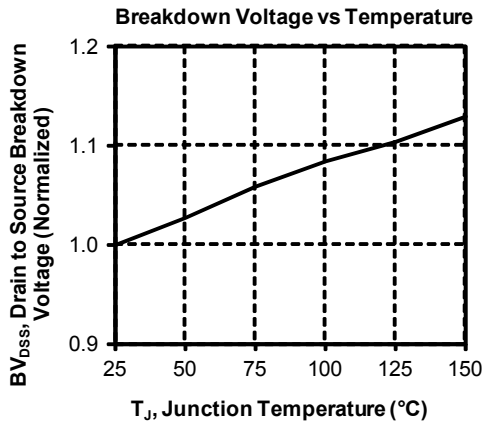
T: Thermistor temperature  
R<sub>T</sub>: Thermistor value at T

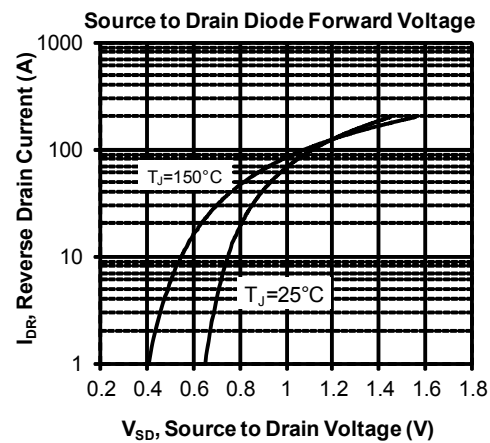
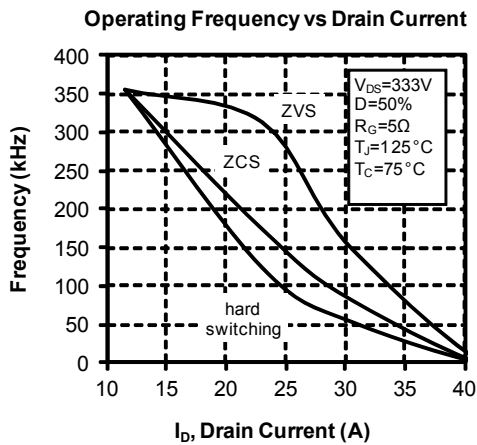
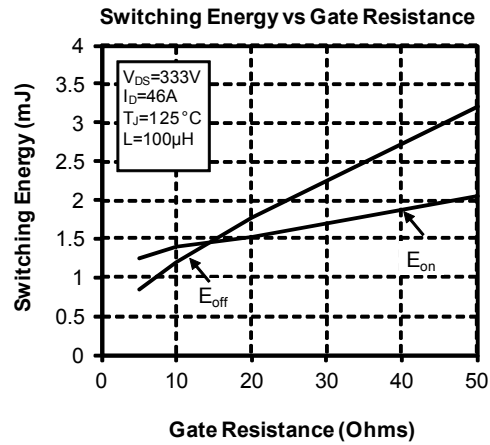
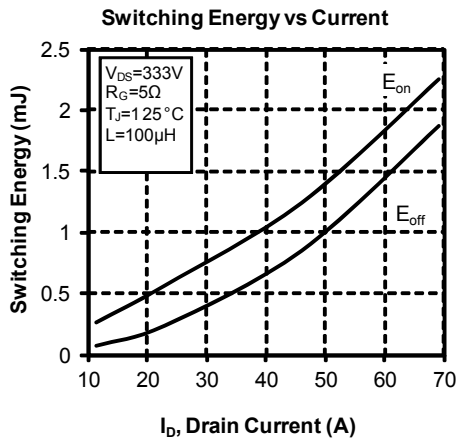
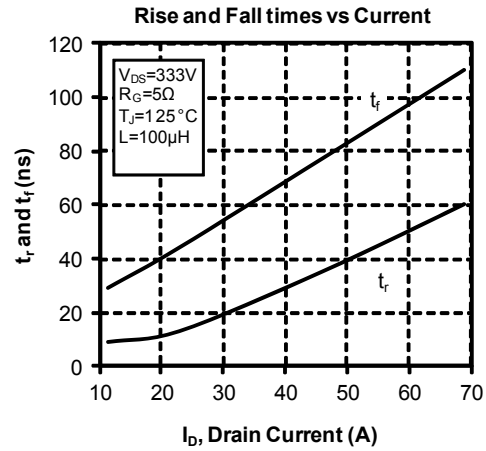
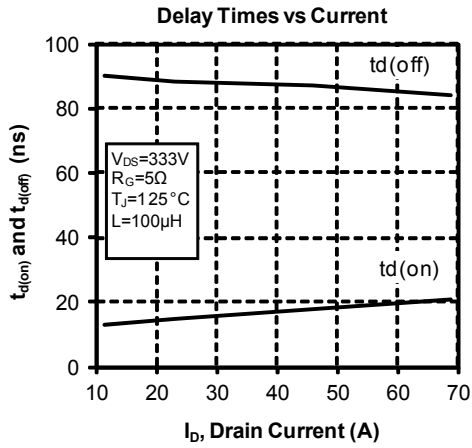
## SP4 Package outline (dimensions in mm)



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

**Typical Performance Curve**






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