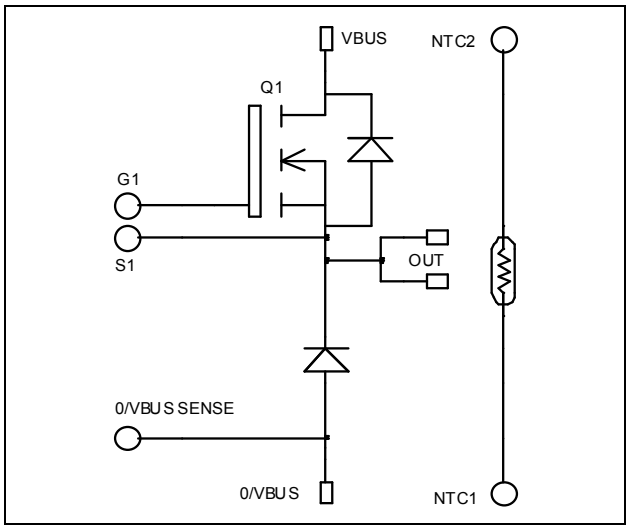
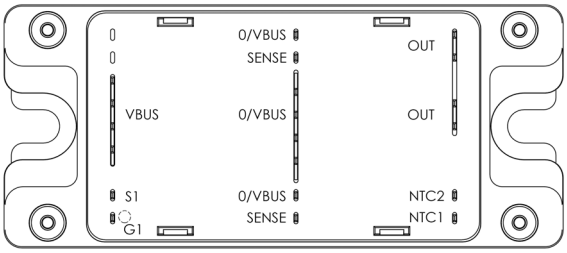
Buck chopper MOSFET Power Module

V_{DSS} = 100V
R_{DSon} = 4.5mΩ typ @ Tj = 25°C
I_D = 278A @ Tc = 25°C





Application

- AC and DC motor control
- Switched Mode Power Supplies

Features

- Power MOS V® 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

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Breakdown Voltage		100	V
I_D	Continuous Drain Current	T_c = 25°C	278	A
		T_c = 80°C	207	
I_{DM}	Pulsed Drain current		1100	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		5	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	780	W
I_{AR}	Avalanche current (repetitive and non repetitive)		100	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

All ratings @ T_j = 25°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} = 100V	T_j = 25°C			200	µA
		V_{GS} = 0V,V_{DS} = 80V	T_j = 125°C			1000	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 125A			4.5	5	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 5mA		2		4	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±200	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		20		nF
C_{oss}	Output Capacitance			8		
C_{rss}	Reverse Transfer Capacitance			2.9		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 50V I_D = 250A		700		nC
Q_{gs}	Gate – Source Charge			120		
Q_{gd}	Gate – Drain Charge			360		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 66V I_D = 250A R_G = 2.5 Ω		80		ns
T_r	Rise Time			165		
$T_{d(off)}$	Turn-off Delay Time			280		
T_f	Fall Time			135		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 250A, R_G =2.5Ω		1.1		mJ
E_{off}	Turn-off Switching Energy			1.2		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 250A, R_G = 2.5Ω		1.22		mJ
E_{off}	Turn-off Switching Energy			1.28		

Chopper diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			200			V
I_{RM}	Maximum Reverse Leakage Current	V_R=200V	T_j = 25°C			350	µA
			T_j = 125°C			600	
I_F	DC Forward Current		Tc = 80°C		200		A
V_F	Diode Forward Voltage	I_F = 200A			1		V
		I_F = 400A			1.4		
		I_F = 200A	T_j = 125°C		0.9		
t_{rr}	Reverse Recovery Time	I_F = 200A V_R = 133V di/dt =400A/µs	T_j = 25°C		60		ns
			T_j = 125°C		110		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		400		nC
			T_j = 125°C		1680		

Thermal and package characteristics

Symbol	Characteristic			Min	Typ	Max	Unit
R_{thJC}	Junction to Case Thermal Resistance		Transistor			0.16	°C/W
			Diode			0.29	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To Heatsink	M5	2.5		4.7	N.m
Wt	Package Weight					160	g

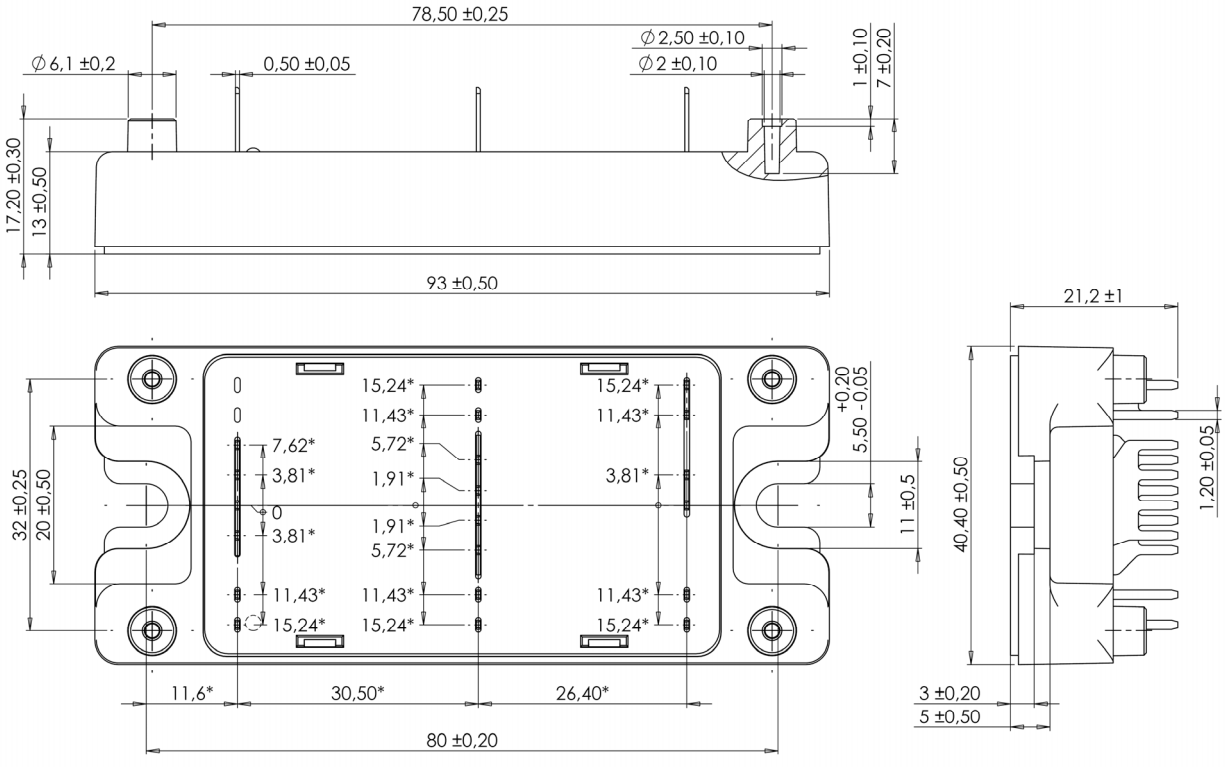
Temperature sensor NTC (see application note APT0406 on www.microsemi.com for more information).

Symbol	Characteristic	Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C		50		kΩ
$B_{25/85}$	T_{25} = 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_T: Thermistor value at T

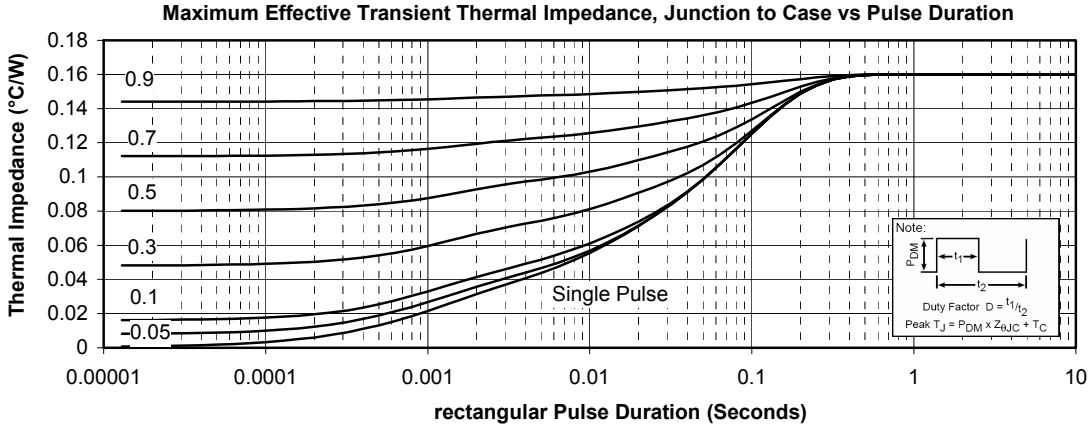
SP4 Package outline (dimensions in mm)

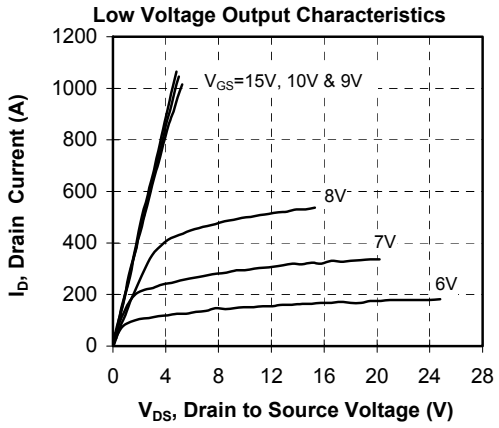


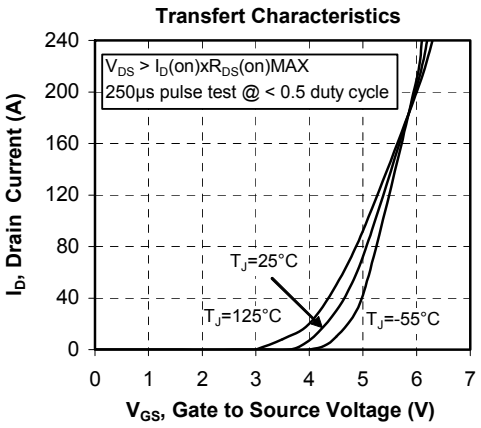
ALL DIMENSIONS MARKED "*" ARE TOLERANCED AS : ⌖ | ∅ 1

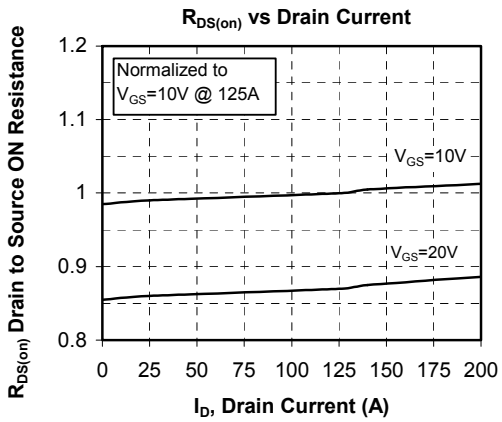
See application note APT0501 - Mounting Instructions for SP4 Power Modules on www.microsemi.com

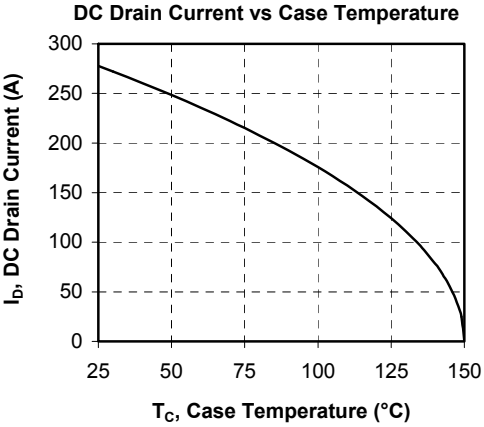
Typical Performance Curve



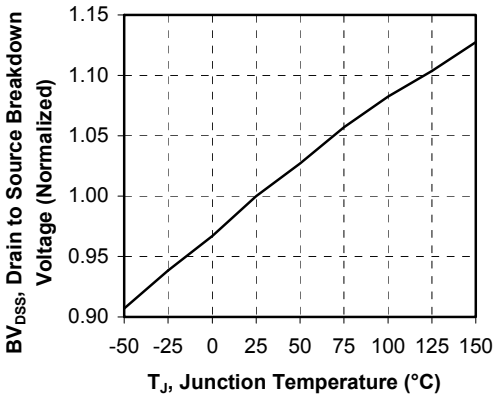




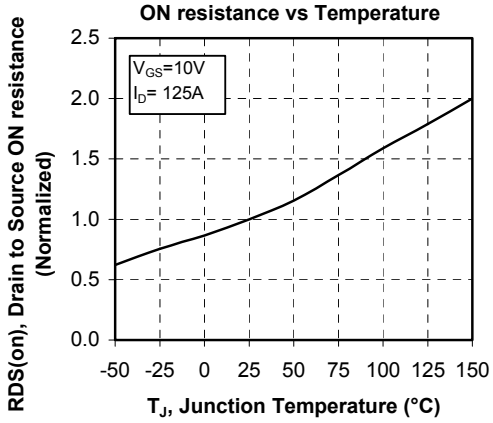




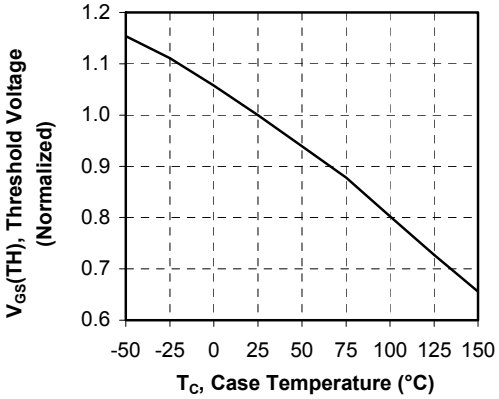
Breakdown Voltage vs Temperature



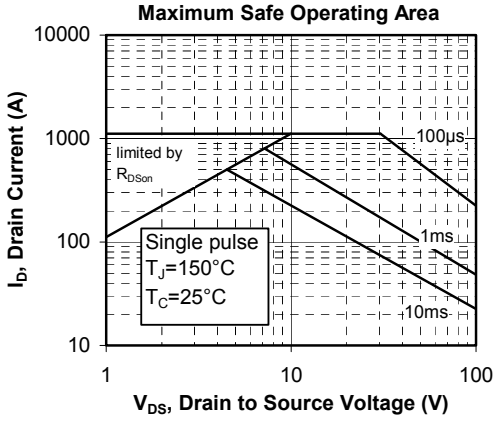
ON resistance vs Temperature



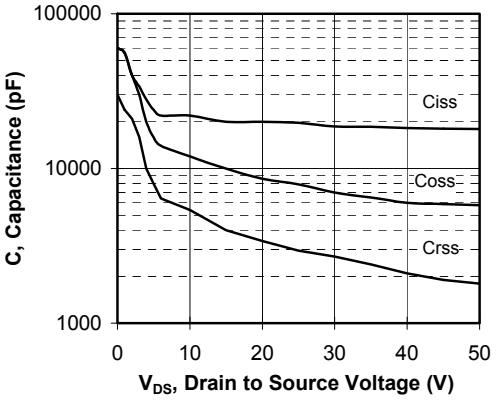
Threshold Voltage vs Temperature



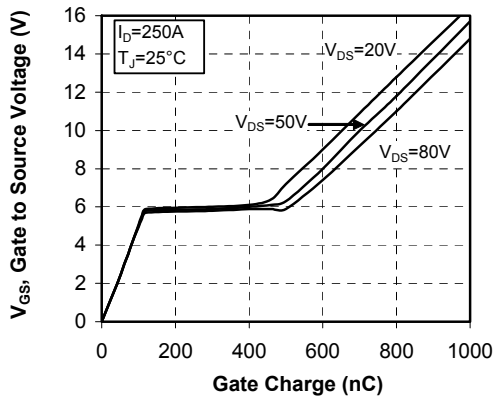
Maximum Safe Operating Area



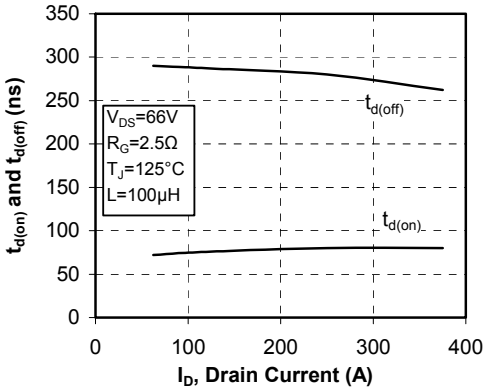
Capacitance vs Drain to Source Voltage



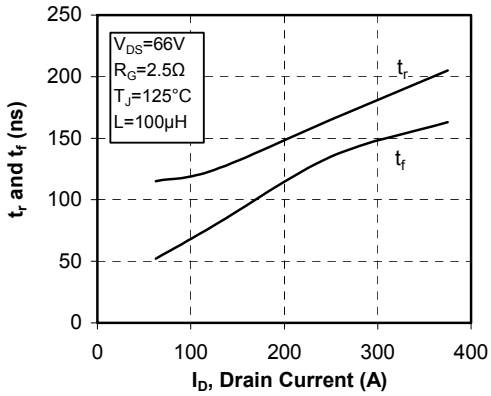
Gate Charge vs Gate to Source Voltage



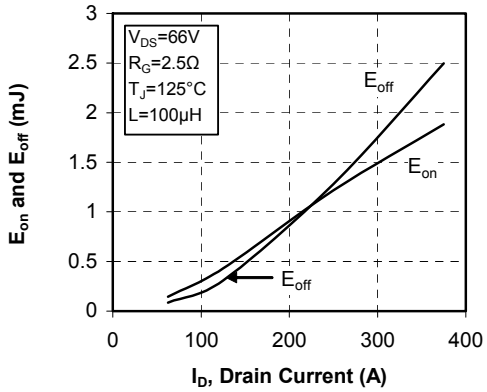
Delay Times vs Current



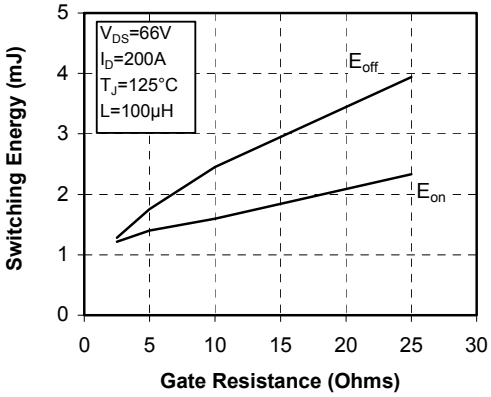
Rise and Fall times vs Current



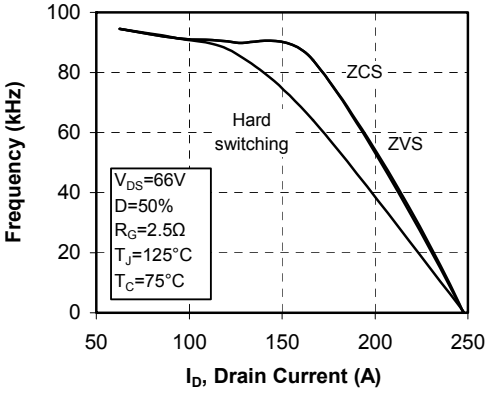
Switching Energy vs Current



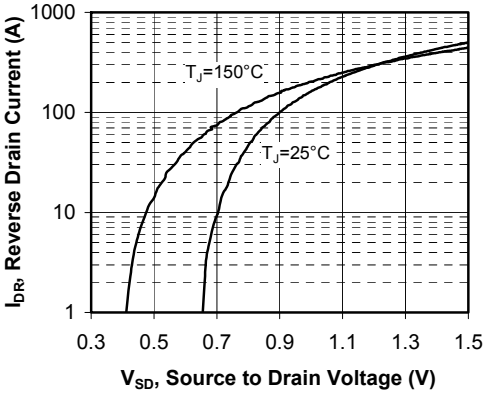
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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