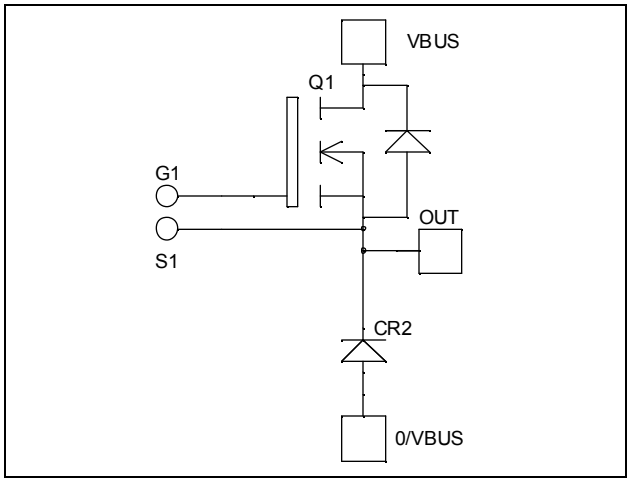
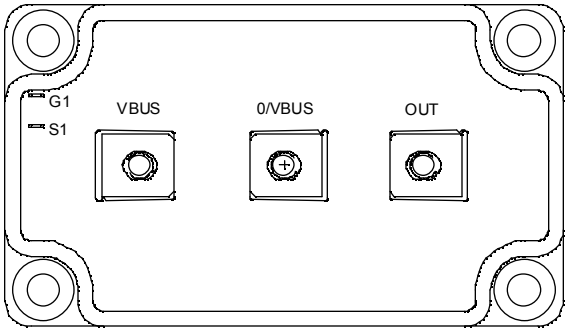
Buck chopper MOSFET Power Module

V_{DSS} = 100V
R_{DSon} = 2.25mΩ typ @ Tj = 25°C
I_D = 495A @ 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
  - M5 power connectors
- High level of integration

Benefits

- Outstanding performance at high frequency operation
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- 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	495	A
		T_c = 80°C	370	
I_{DM}	Pulsed Drain current		1900	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		2.5	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	1250	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 Handing 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			400	µA
		V_{GS} = 0V, V_{DS} = 80V	T_j = 125°C			2000	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 200A			2.25	2.5	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10mA		2		4	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±400	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		40		nF
C_{oss}	Output Capacitance			15.7		
C_{rss}	Reverse Transfer Capacitance			5.9		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 50V I_D = 400A		1360		nC
Q_{gs}	Gate – Source Charge			240		
Q_{gd}	Gate – Drain Charge			720		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 66V I_D = 400A R_G = 1.25Ω		160		ns
T_r	Rise Time			240		
$T_{d(off)}$	Turn-off Delay Time			500		
T_f	Fall Time			160		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 400A, R_G = 1.25Ω		2.2		mJ
E_{off}	Turn-off Switching Energy			2.41		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 66V I_D = 400A, R_G = 1.25Ω		2.43		mJ
E_{off}	Turn-off Switching Energy			2.56		

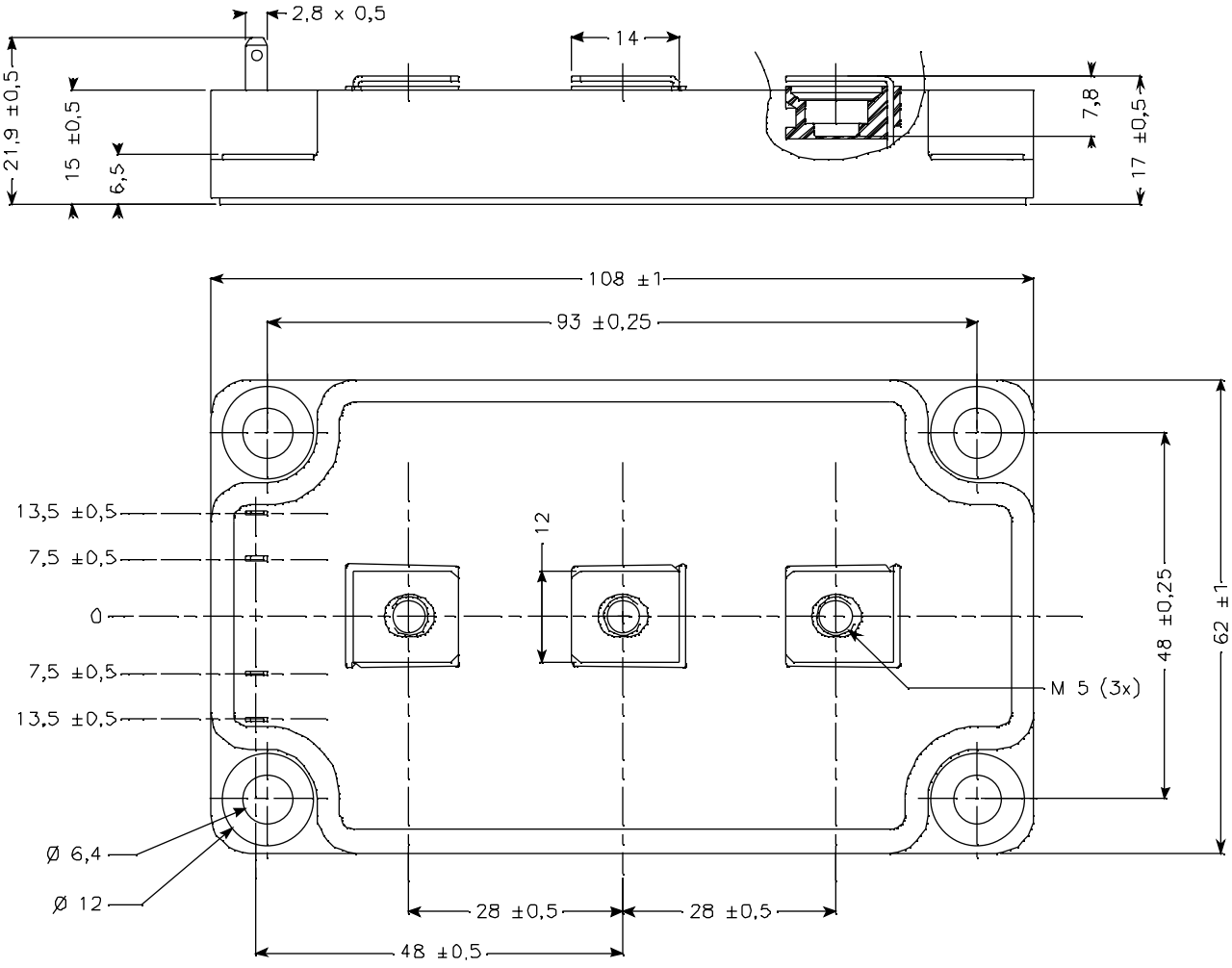
Chopper diode ratings and characteristics

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			750	µA
			T_j = 125°C			1000	
I_F	DC Forward Current		Tc = 80°C		400		A
V_F	Diode Forward Voltage	I_F = 400A			1		V
		I_F = 800A			1.4		
		I_F = 400A	T_j = 125°C		0.9		
t_{rr}	Reverse Recovery Time	I_F = 400A V_R = 133V di/dt =800A/µs	T_j = 25°C		60		ns
			T_j = 125°C		110		
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		800		nC
			T_j = 125°C		3360		

Thermal and package characteristics

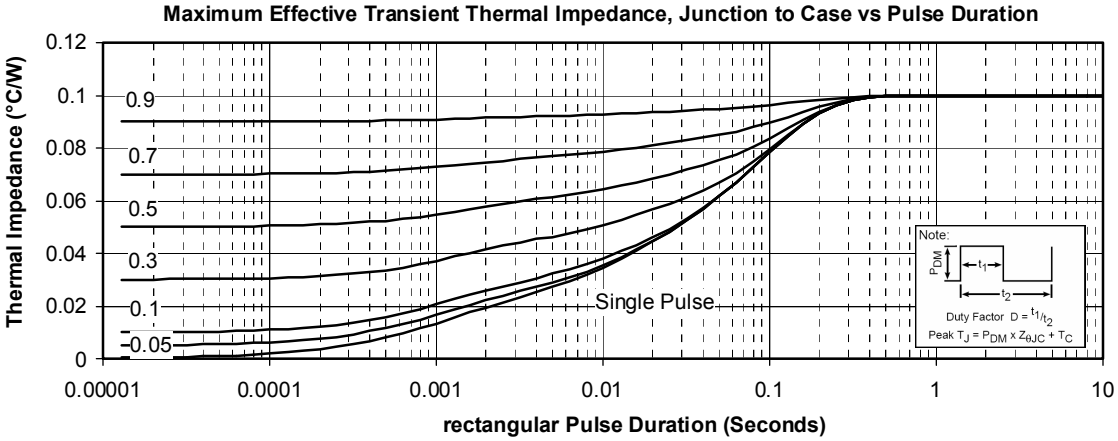
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance	Transistor				0.1	°C/W
		Diode				0.14	
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, I Isol<1mA, 50/60Hz			2500			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
		For terminals	M5	2		3.5	
Wt	Package Weight					280	g

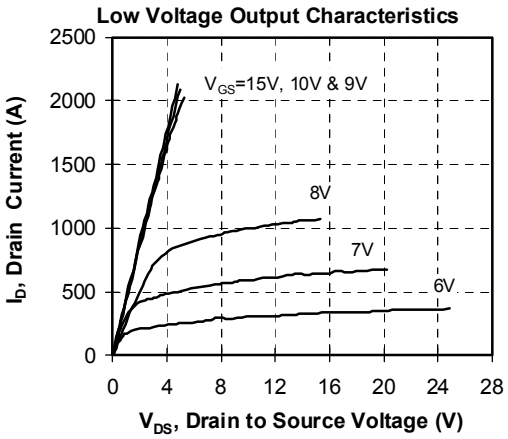
SP6 Package outline (dimensions in mm)

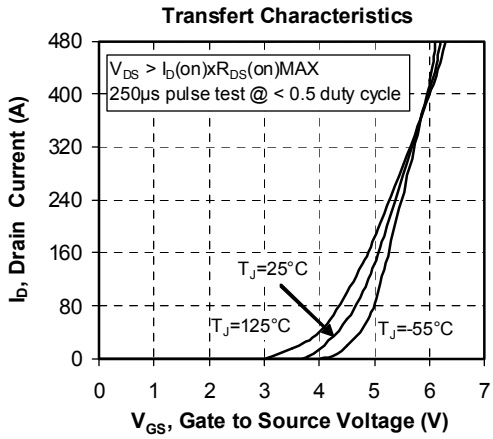


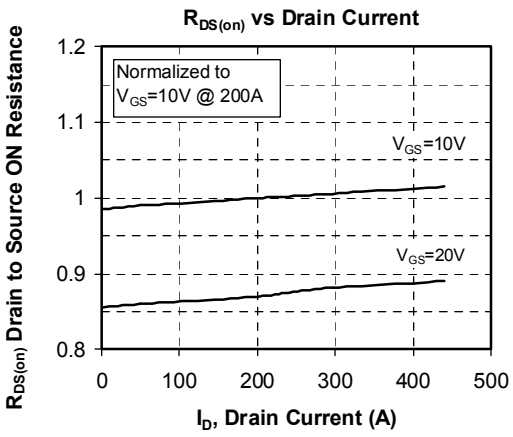
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

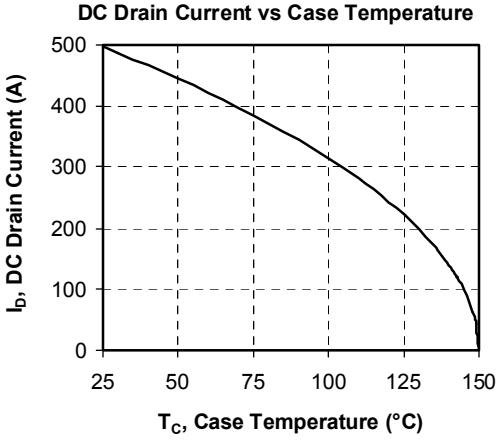
Typical Performance Curve



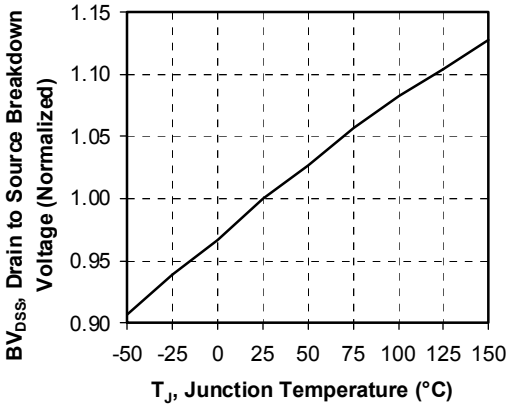




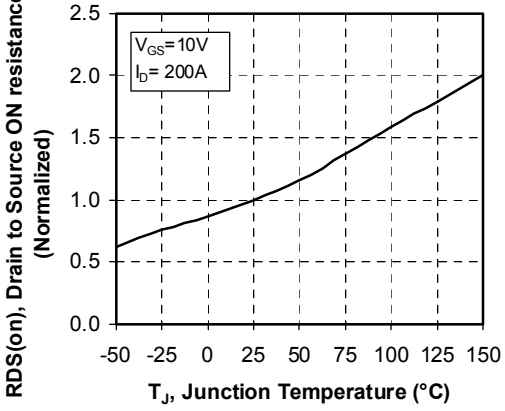




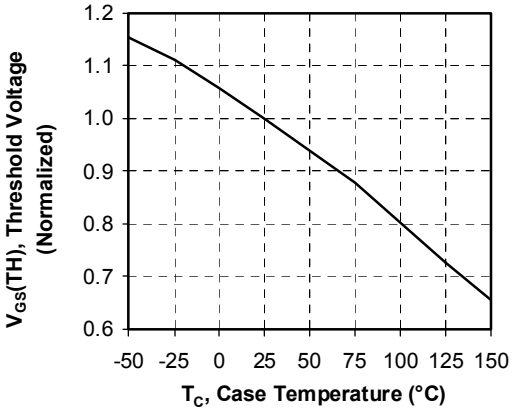
Breakdown Voltage vs Temperature



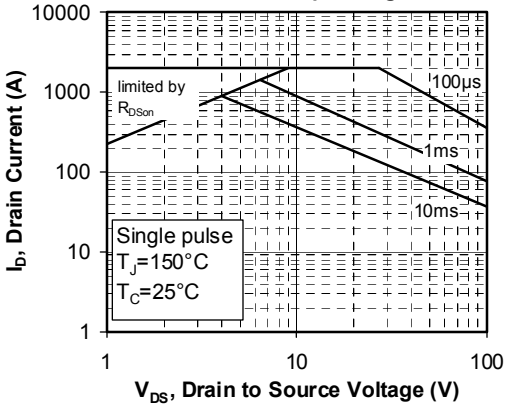
ON resistance vs Temperature



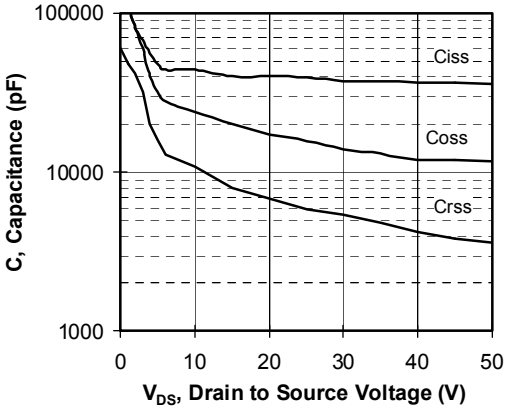
Threshold Voltage vs Temperature



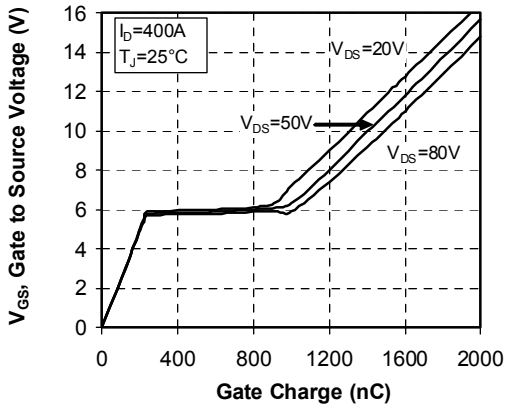
Maximum Safe Operating Area



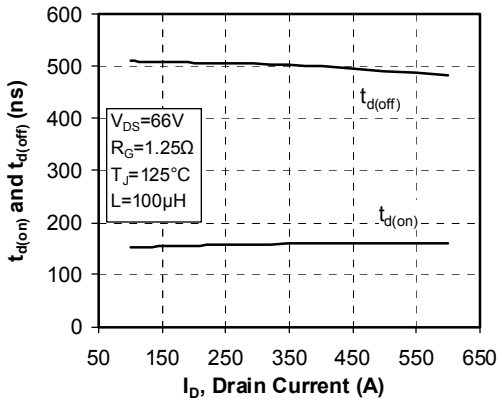
Capacitance vs Drain to Source Voltage



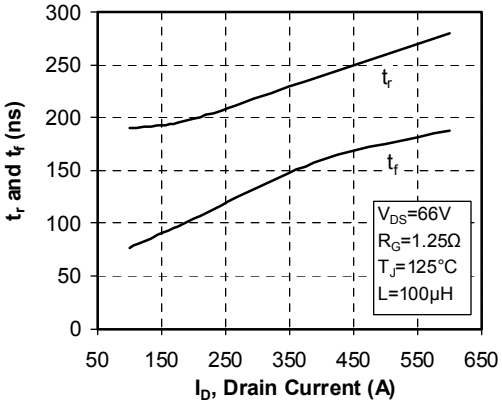
Gate Charge vs Gate to Source Voltage



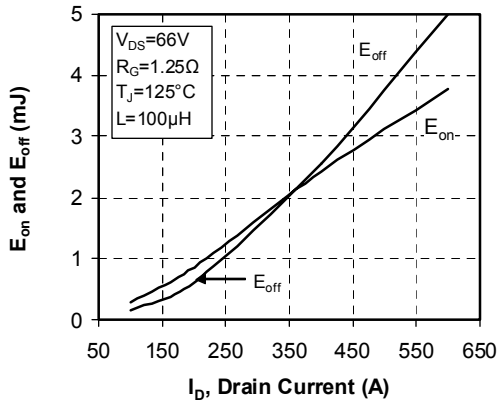
Delay Times vs Current



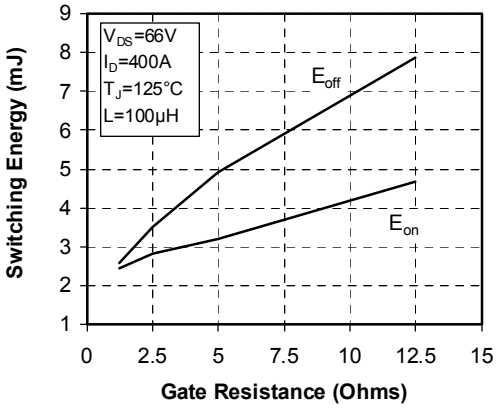
Rise and Fall times vs Current



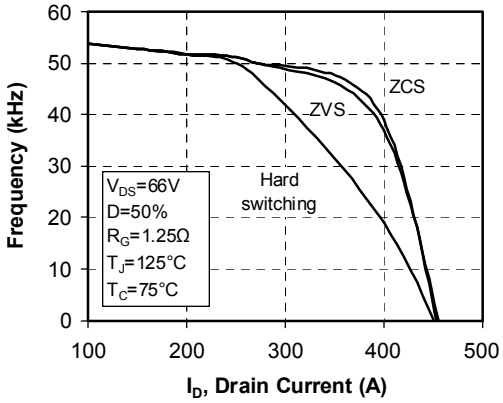
Switching Energy vs Current



Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage