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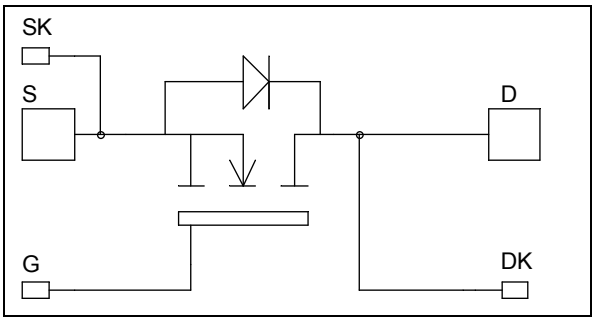
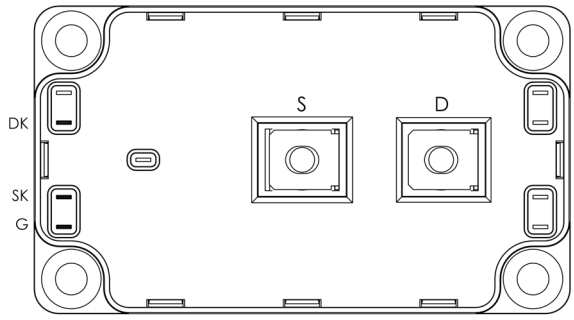
Single Switch MOSFET Power Module

V_{DSS} = 1000V
R_{DSon} = 45mΩ typ @ Tj = 25°C
I_D = 215A @ Tc = 25°C





Application

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

Features

- Power MOS 7® 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
  - M5 power connectors
- High level of integration
- AlN substrate for improved thermal performance

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		1000	V
I_D	Continuous Drain Current	T_c = 25°C	215	A
		T_c = 80°C	160	
I_{DM}	Pulsed Drain current		860	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		52	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	5000	W
I_{AR}	Avalanche current (repetitive and non repetitive)		30	A
E_{AR}	Repetitive Avalanche Energy		50	mJ
E_{AS}	Single Pulse Avalanche Energy		3200	

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} = 1000V	T_j = 25°C			600	µA
		V_{GS} = 0V, V_{DS} = 800V	T_j = 125°C			3	mA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 107.5A			45	52	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 30mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V				±600	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		42.7		nF
C_{oss}	Output Capacitance			7.6		
C_{rss}	Reverse Transfer Capacitance			1.3		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 500V I_D = 215A		1602		nC
Q_{gs}	Gate – Source Charge			204		
Q_{gd}	Gate – Drain Charge			1038		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 670V I_D = 215A R_G = 0.5Ω		18		ns
T_r	Rise Time			14		
$T_{d(off)}$	Turn-off Delay Time			140		
T_f	Fall Time			55		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 670V I_D = 215A, R_G = 0.5Ω		7.2		mJ
E_{off}	Turn-off Switching Energy			4.3		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 670V I_D = 215A, R_G = 0.5Ω		12		mJ
E_{off}	Turn-off Switching Energy			5.8		

Source - Drain diode ratings and characteristics

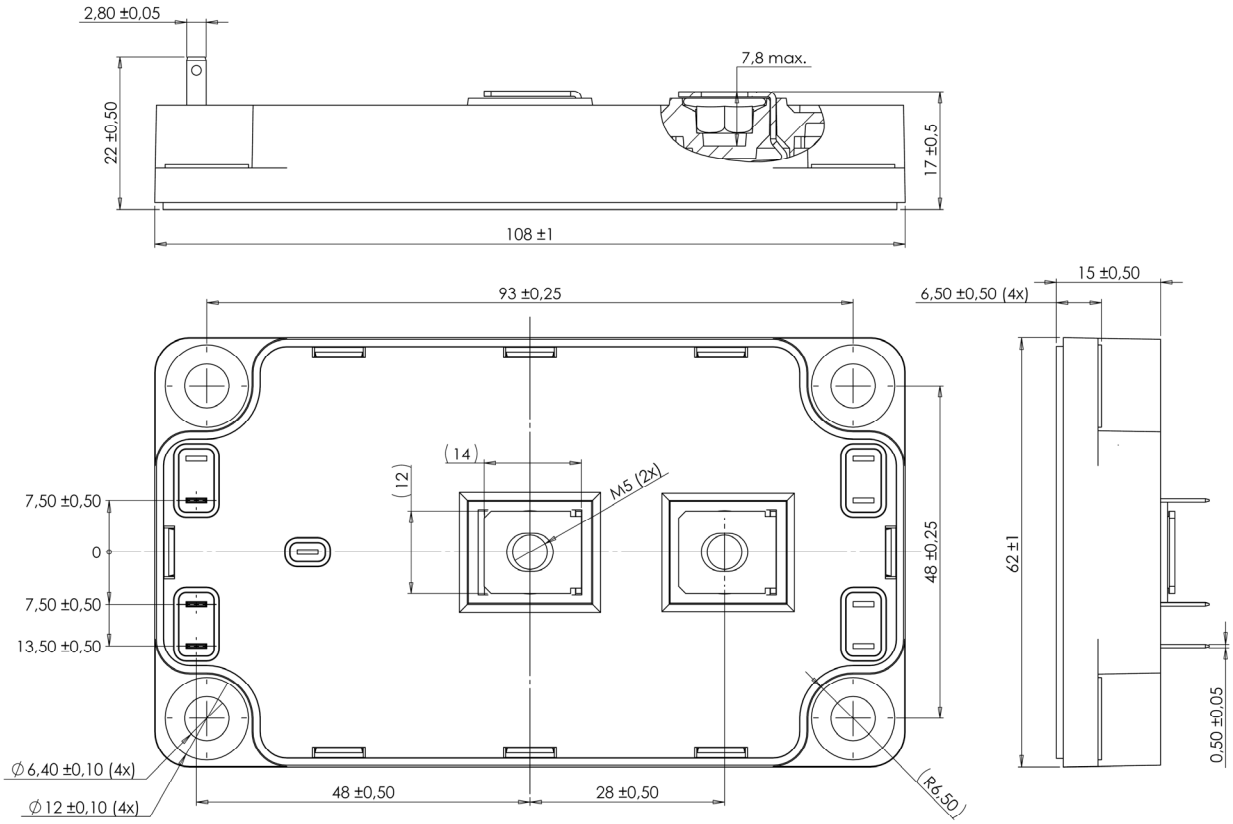
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			215	A
			Tc = 80°C			160	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 215A				1.3	V
dv/dt	Peak Diode Recovery ❶					18	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 215A V_R = 670V di_S/dt = 600A/µs	T_j = 25°C			310	ns
			T_j = 125°C			625	
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		12		µC
			T_j = 125°C		36		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 215A di/dt ≤ 700A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance					0.025	°C/W
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	M6	3		5	N.m
		For teminals	M5	2		3.5	
Wt	Package Weight					300	g

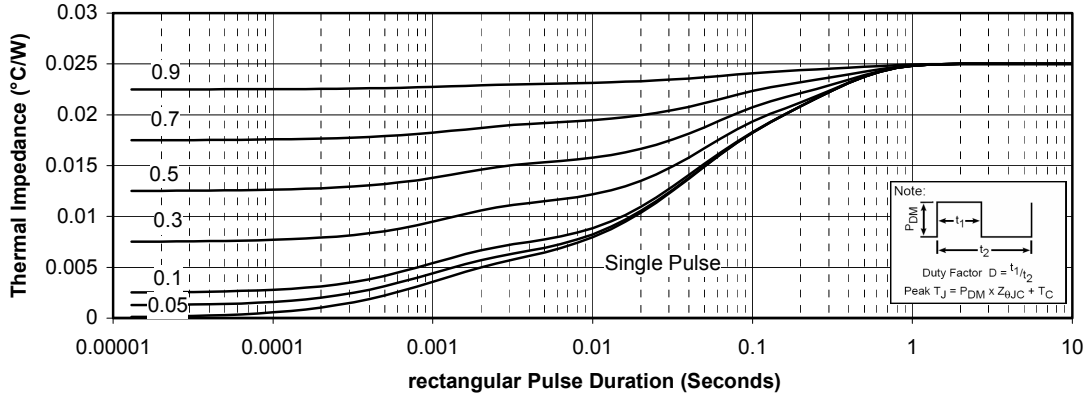
SP6 Package outline (dimensions in mm)



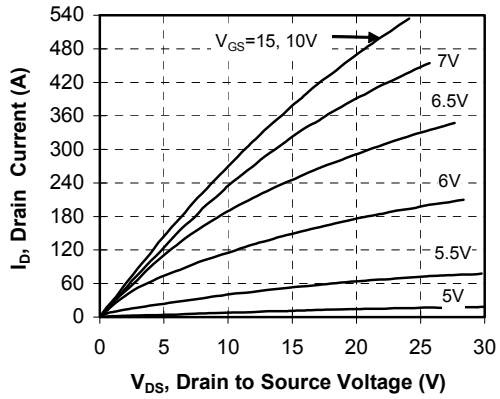
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical Performance Curve

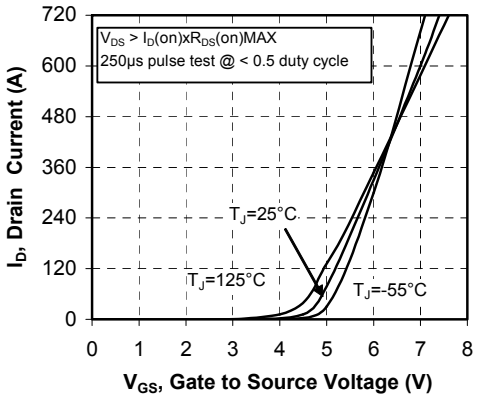
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



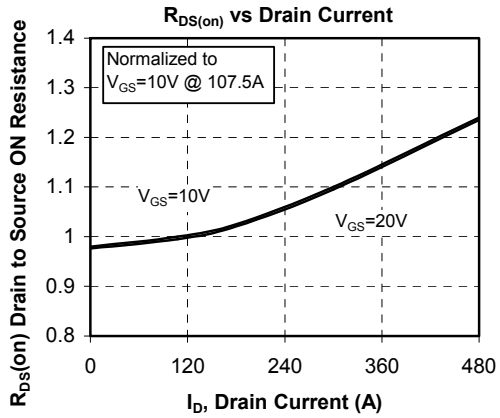
Low Voltage Output Characteristics



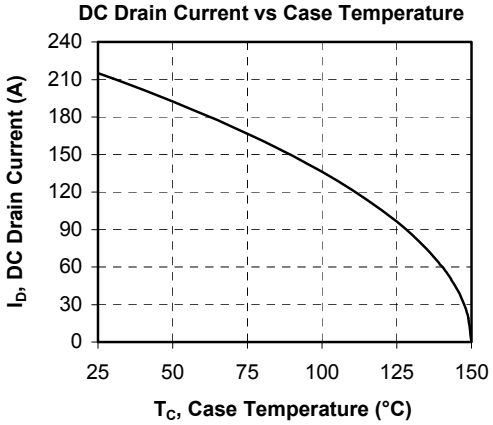
Transfert Characteristics



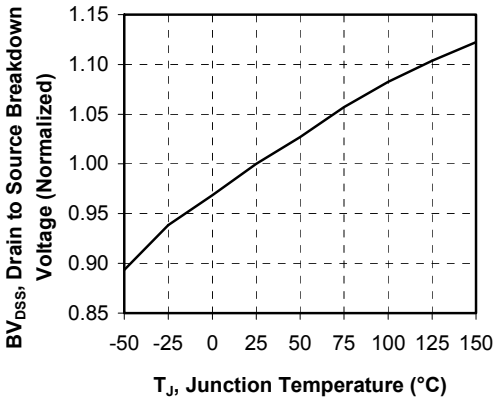
$R_{DS(on)}$ vs Drain Current



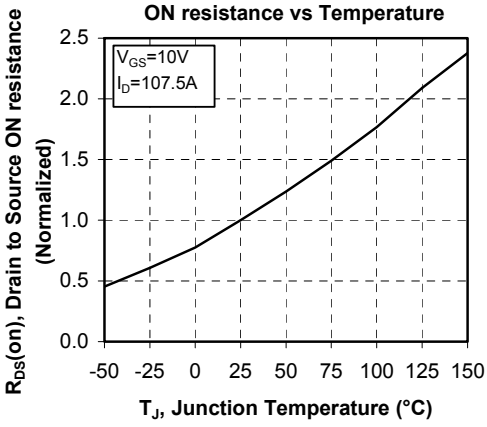
DC Drain Current vs Case Temperature



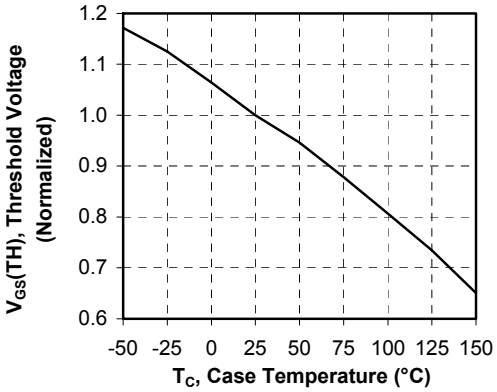
Breakdown Voltage vs Temperature



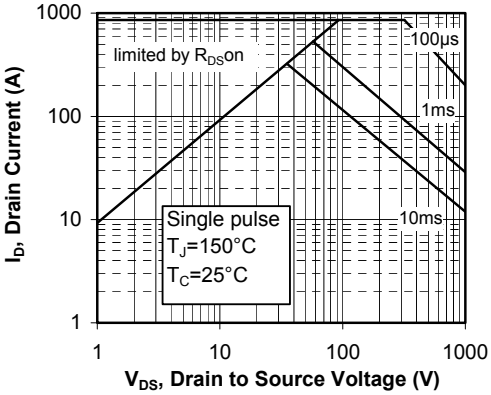
ON resistance vs Temperature



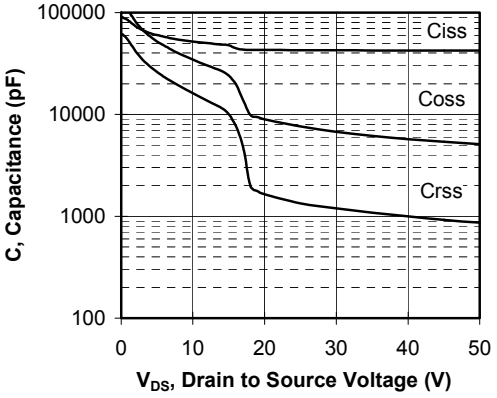
Threshold Voltage vs Temperature



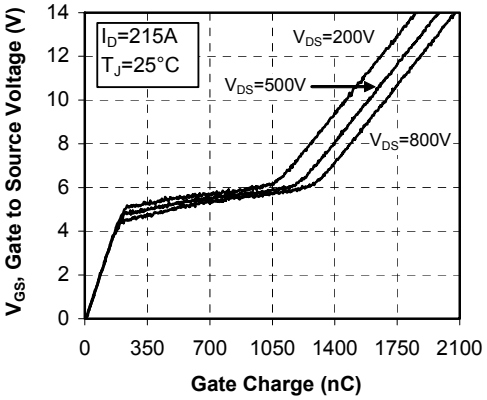
Maximum Safe Operating Area



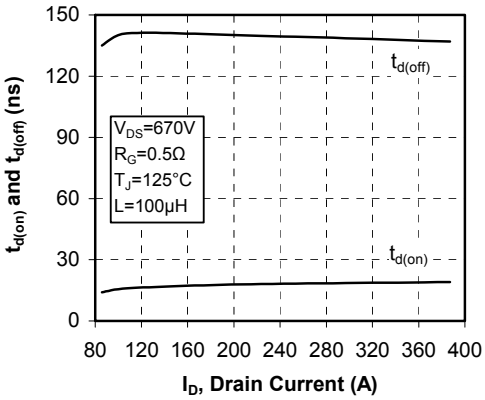
Capacitance vs Drain to Source Voltage



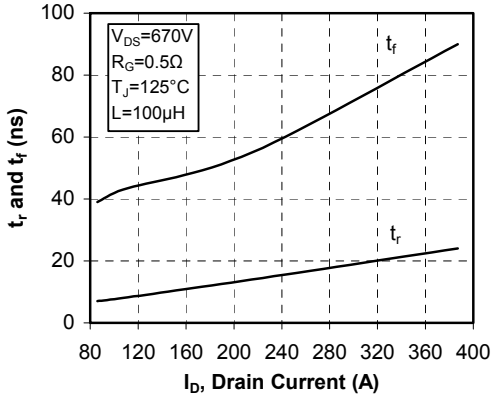
Gate Charge vs Gate to Source Voltage



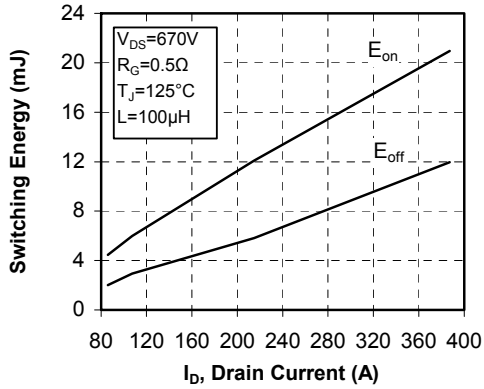
Delay Times vs Current



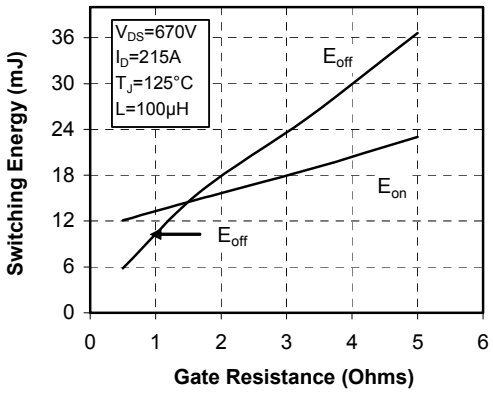
Rise and Fall times vs Current



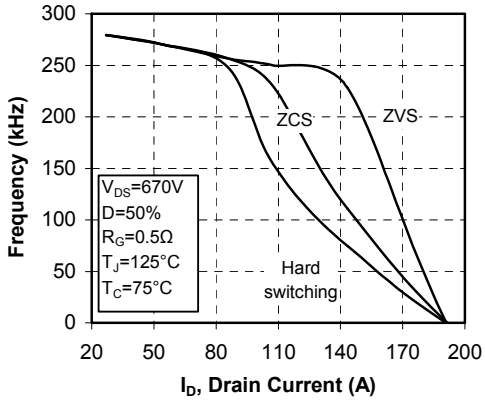
Switching Energy vs Current



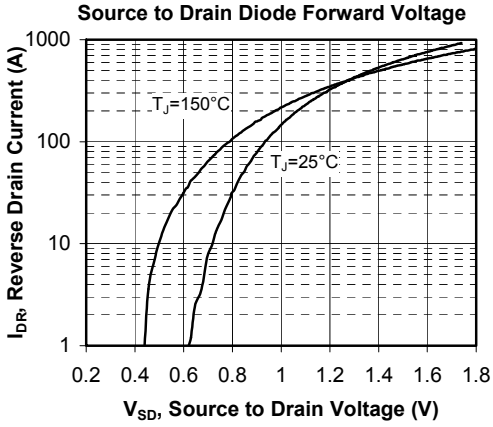
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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