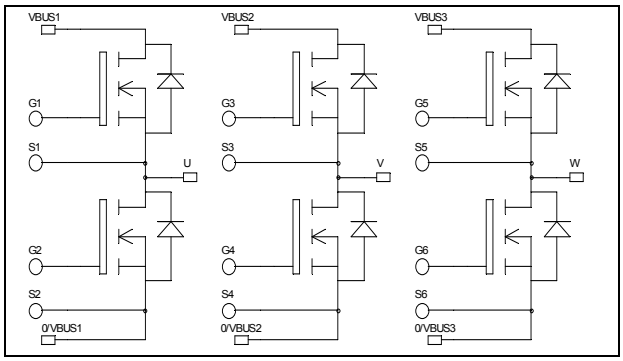
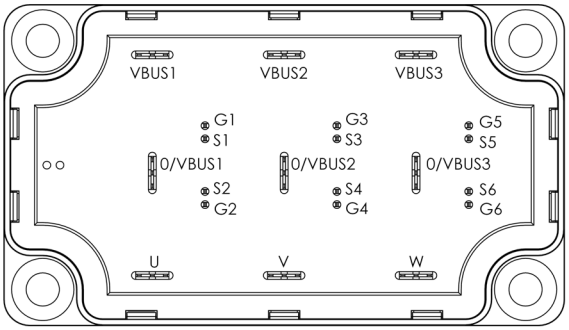
Triple phase leg MOSFET Power Module

V_{DSS} = 1000V
R_{DSon} = 350mΩ typ @ Tj = 25°C
I_D = 22A @ 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
  - Lead frames for power connections
- 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
- Very low (12mm) profile
- Each leg can be easily paralleled to achieve a phase leg of three times the current capability
- Module can be configured as a three phase bridge
- Module can be configured as a boost followed by a full bridge
- 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	22	A
		T_c = 80°C	17	
I_{DM}	Pulsed Drain current		88	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		420	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	390	W
I_{AR}	Avalanche current (repetitive and non repetitive)		25	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} = 1000V	T_j = 25°C			100	µA
		V_{GS} = 0V, V_{DS} = 800V	T_j = 125°C			500	
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 11A			350	420	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 2.5mA		3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30V, V_{DS} = 0V				±100	nA

Dynamic Characteristics

Symbol	*Characteristic*	*Test Conditions*	*Min*	*Typ*	*Max*	*Unit*
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		5.2		nF
C_{oss}	Output Capacitance			0.88		
C_{rss}	Reverse Transfer Capacitance			0.16		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 500V I_D = 22A		186		nC
Q_{gs}	Gate – Source Charge			24		
Q_{gd}	Gate – Drain Charge			122		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 670V I_D = 22A R_G = 5Ω		18		ns
T_r	Rise Time			12		
$T_{d(off)}$	Turn-off Delay Time			155		
T_f	Fall Time			40		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 25°C** V_{GS} = 15V, V_{Bus} = 670V I_D = 22A, R_G = 5Ω		900		µJ
E_{off}	Turn-off Switching Energy			623		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 670V I_D = 22A, R_G = 5Ω		1423		µJ
E_{off}	Turn-off Switching Energy			779		

Source - Drain diode ratings and characteristics

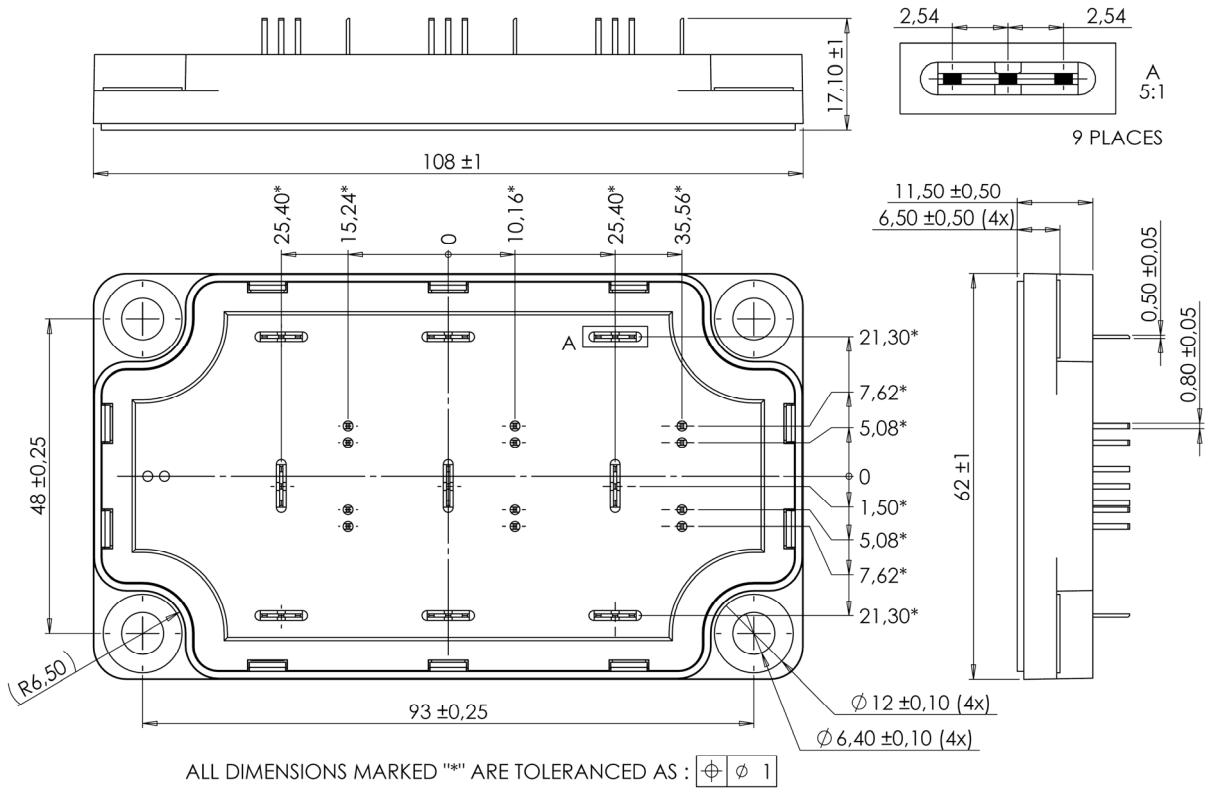
Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			22	A
			Tc = 80°C			17	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 22A				1.3	V
dv/dt	Peak Diode Recovery ❶					18	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 22A V_R = 670V di_S/dt = 100A/µs	T_j = 25°C			320	ns
			T_j = 125°C			650	
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		3.6		µC
			T_j = 125°C		9.72		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 22A di/dt ≤ 700A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

Thermal and package characteristics

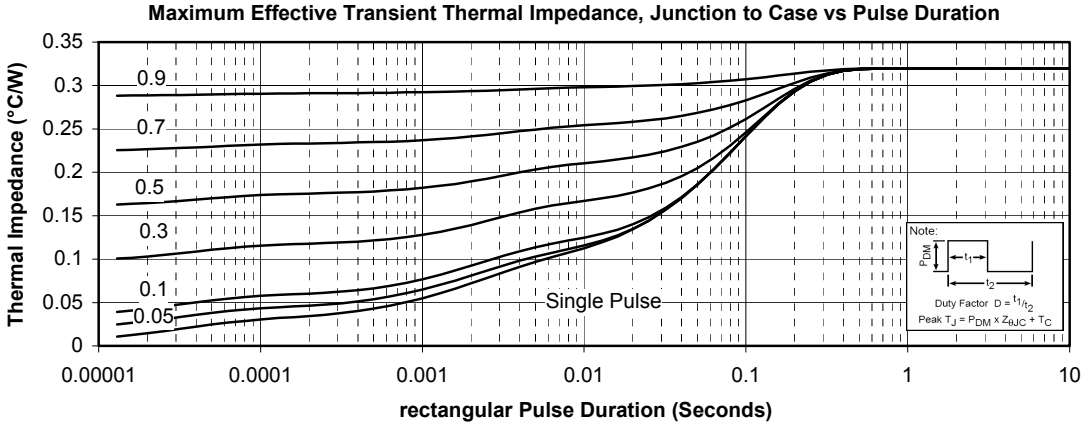
Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance					0.32	°C/W
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000			V
T_J	Operating junction temperature range			-40		150	°C
T_{STG}	Storage Temperature Range			-40		125	
T_C	Operating Case Temperature			-40		100	
Torque	Mounting torque	To heatsink	M6	3		5	N.m
Wt	Package Weight					250	g

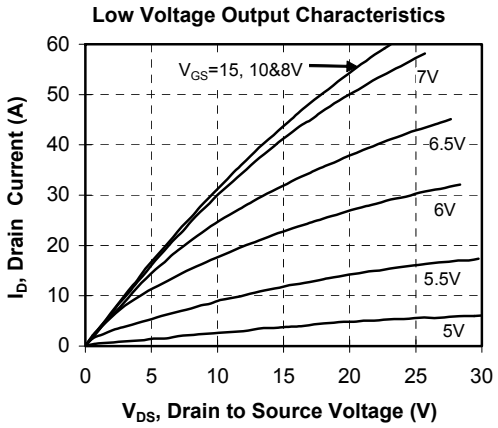
SP6-P Package outline (dimensions in mm)

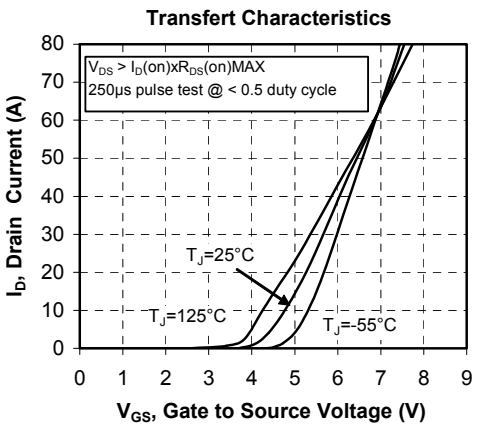


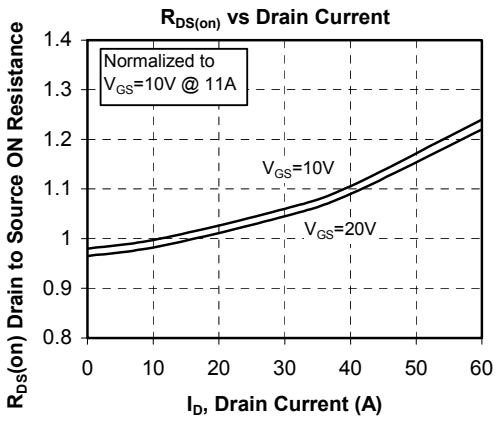
See application note 1902 - Mounting Instructions for SP6-P (12mm) Power Modules on www.microsemi.com

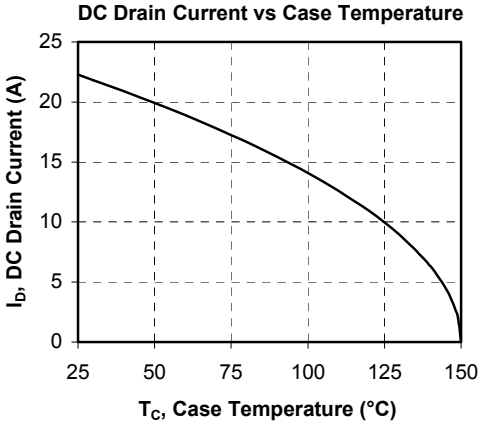
Typical Performance Curve



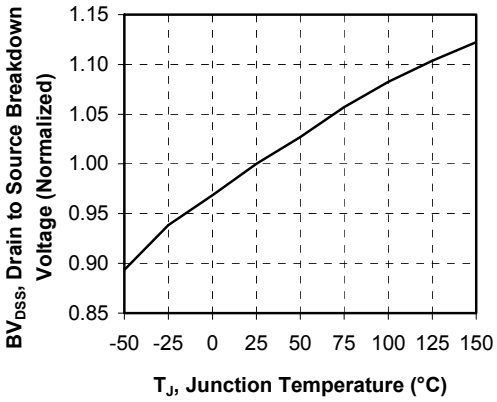




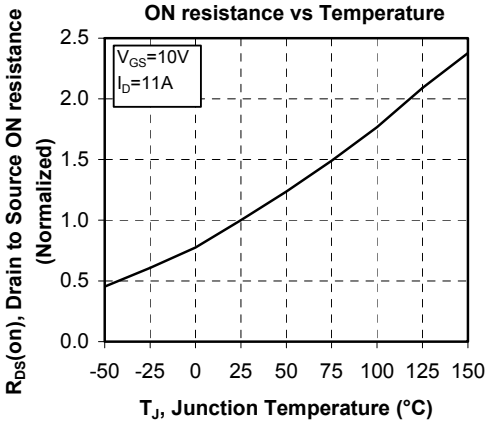




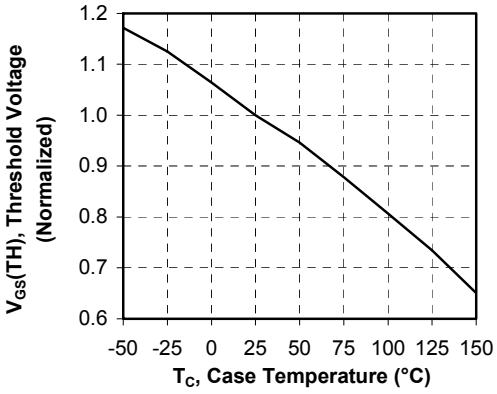
Breakdown Voltage vs Temperature



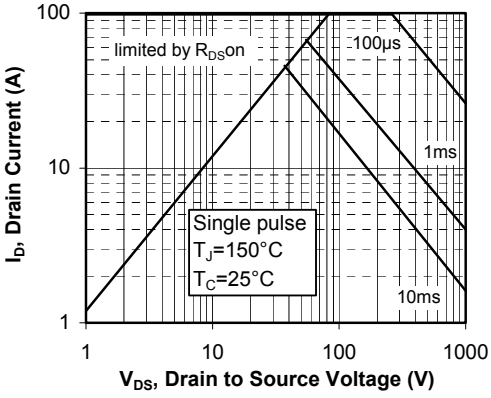
ON resistance vs Temperature



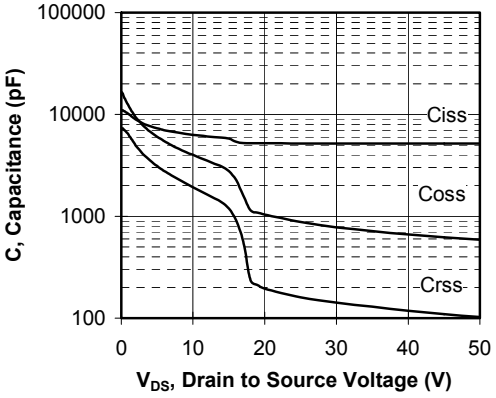
Threshold Voltage vs Temperature



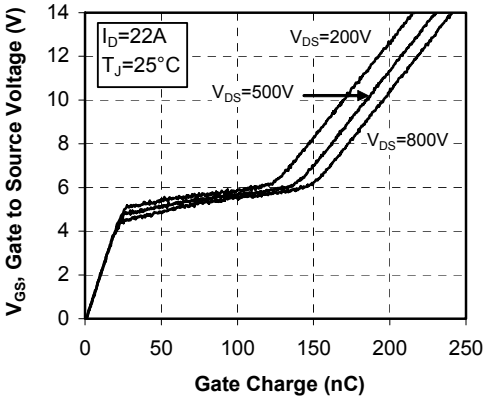
Maximum Safe Operating Area



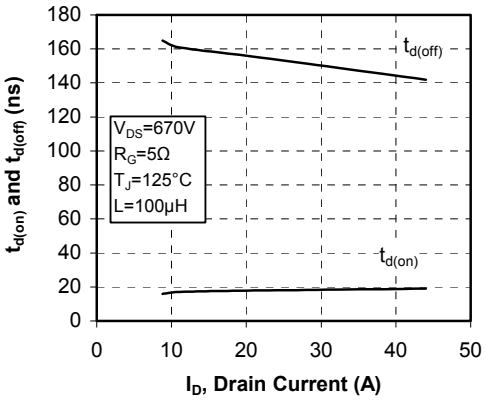
Capacitance vs Drain to Source Voltage



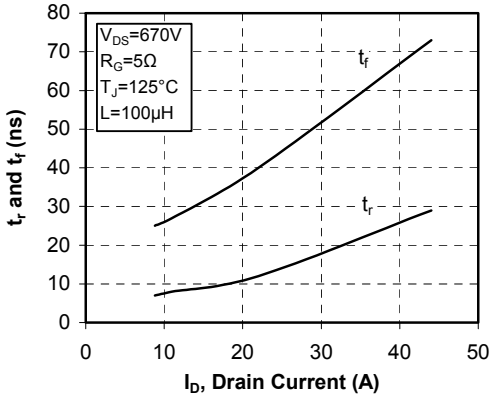
Gate Charge vs Gate to Source Voltage



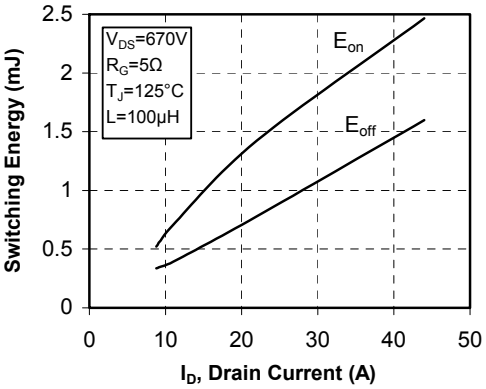
Delay Times vs Current



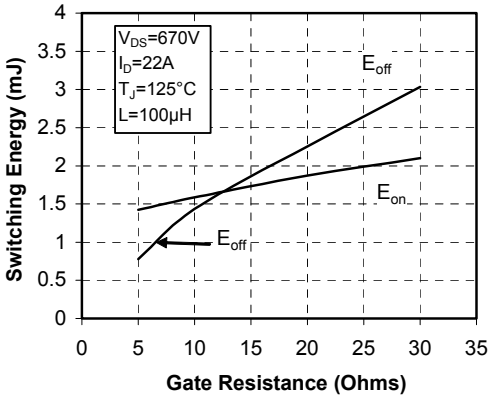
Rise and Fall times vs Current



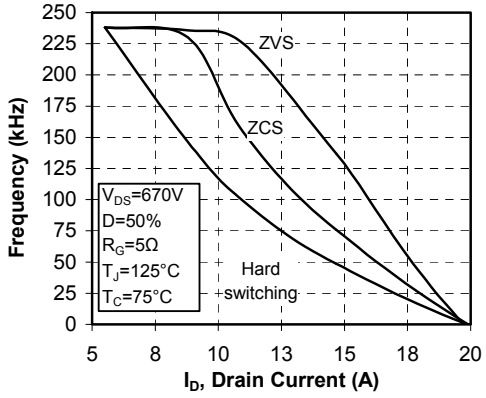
Switching Energy vs Current



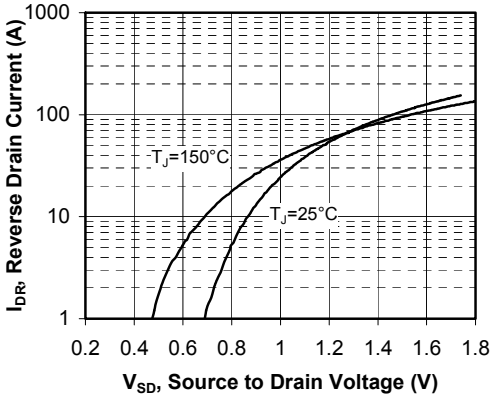
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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