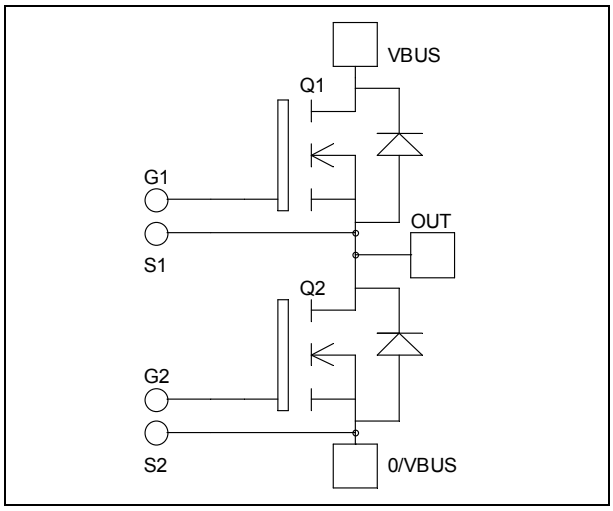
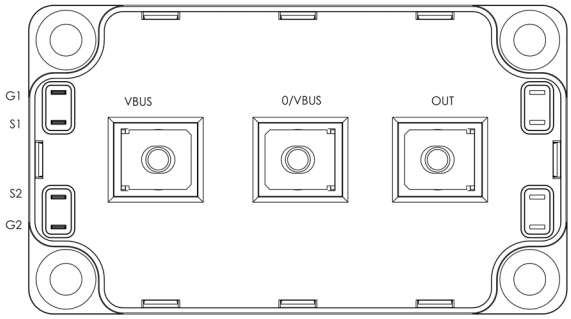
Phase leg MOSFET Power Module

V_{DSS} = 100V
R_{DSon} = 2.25mΩ typ @ Tj = 25°C
I_D = 495A @ Tc = 25°C





Application

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

Features

- Power MOS V® FREDFETs
  - Low R_{DSon}
  - Low input and Miller capacitance
  - Low gate charge
  - Avalanche energy rated
  - Fast intrinsic diode
  - 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 Handling Procedures Should Be Followed. See application note APT0502 on www.microsemi.com

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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		

Source - Drain diode ratings and characteristics

Symbol	*Characteristic*	*Test Conditions*		*Min*	*Typ*	*Max*	*Unit*
I_S	Continuous Source current (Body diode)		Tc = 25°C			495	A
			Tc = 80°C			370	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 400A				1.3	V
dv/dt	Peak Diode Recovery ❶					5	V/ns
t_{rr}	Reverse Recovery Time	I_S = - 400A V_R = 66V di_S/dt = 400A/µs	T_j = 25°C			190	ns
			T_j = 125°C			370	
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		1.6		µC
			T_j = 125°C		6.8		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 495A di/dt ≤ 400A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

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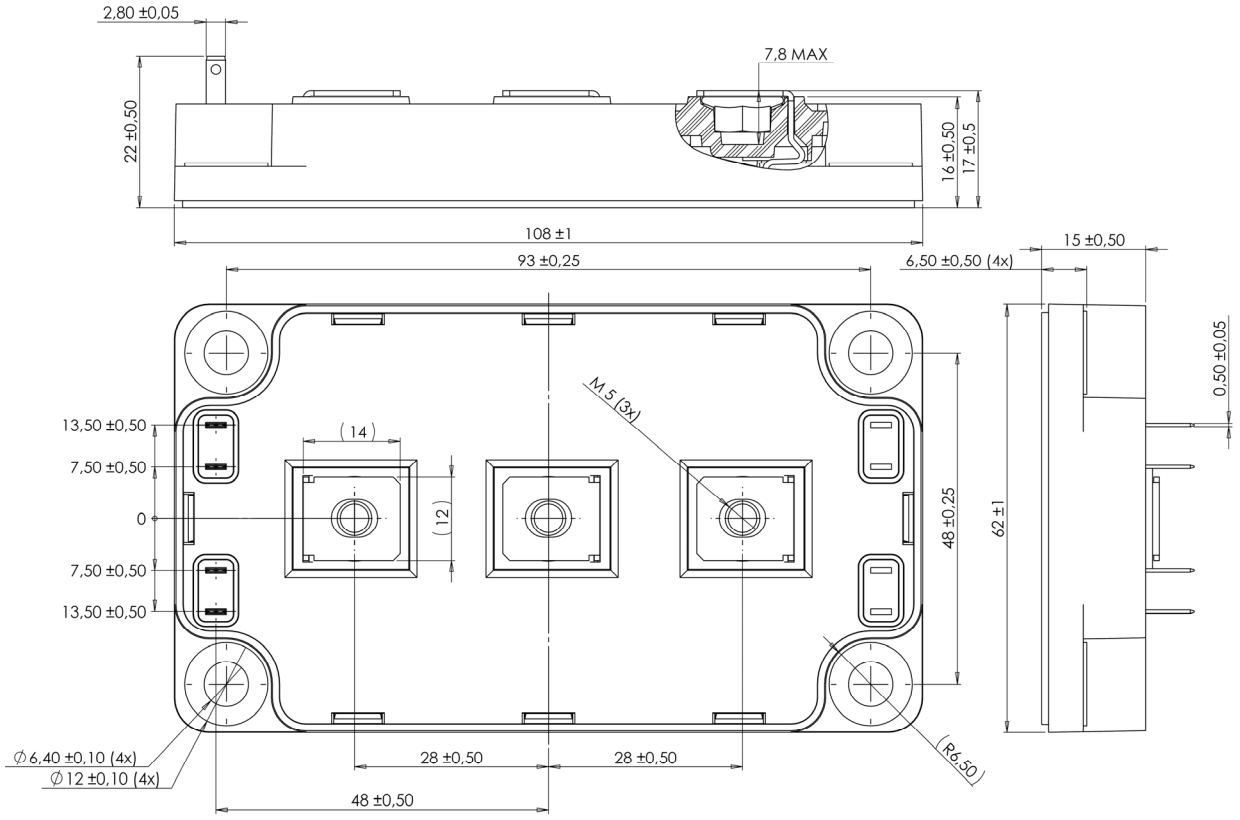
Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Typ*	*Max*	*Unit*
R_{thJC}	Junction to Case Thermal Resistance					0.1	°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 terminals	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

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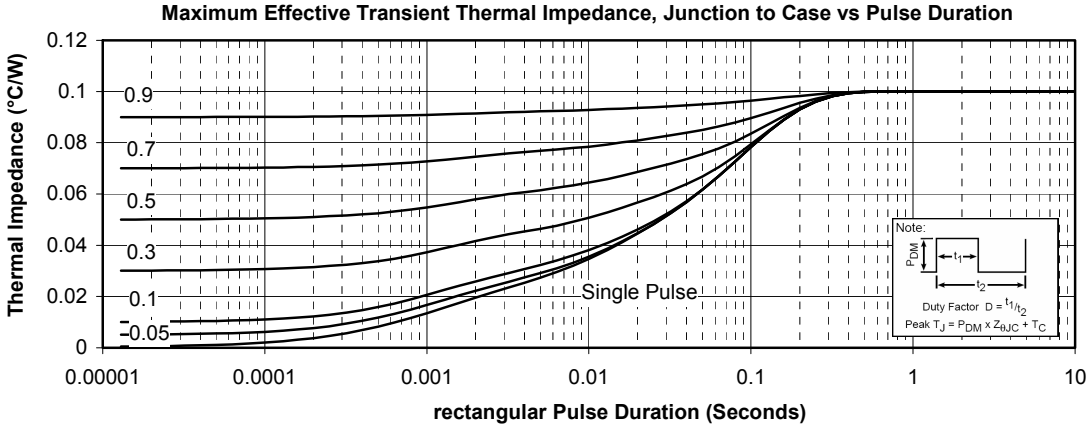
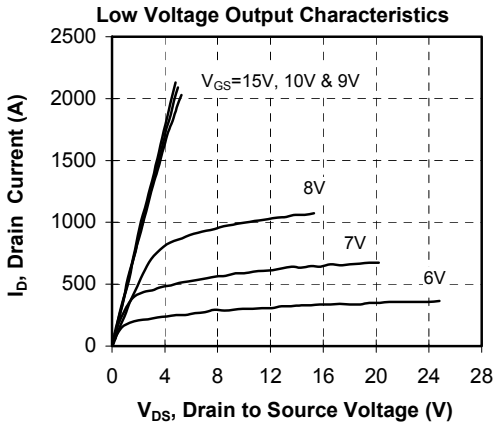
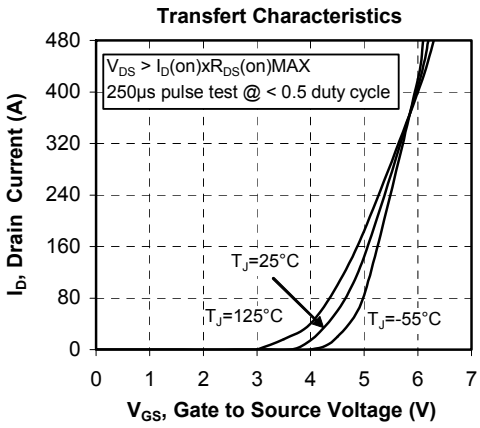
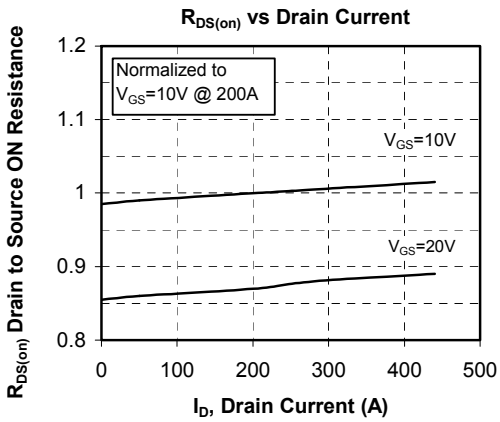
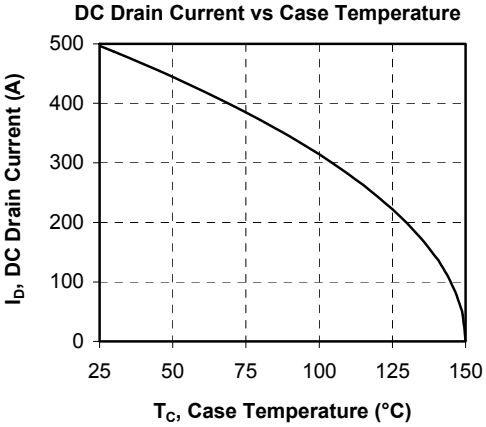
Typical Performance Curve











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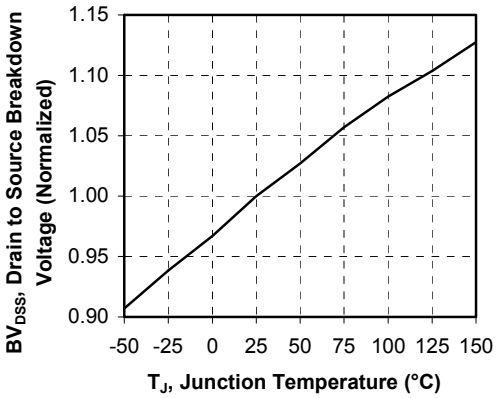
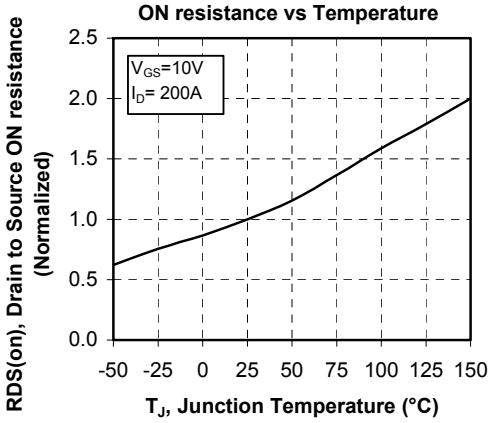
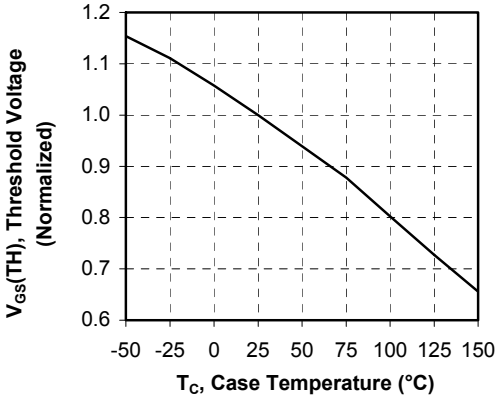
Breakdown Voltage vs Temperature



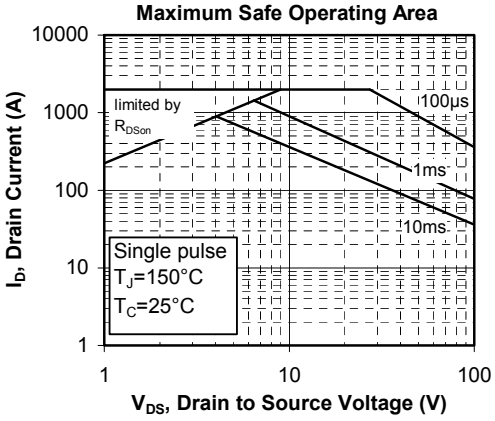
ON resistance vs Temperature



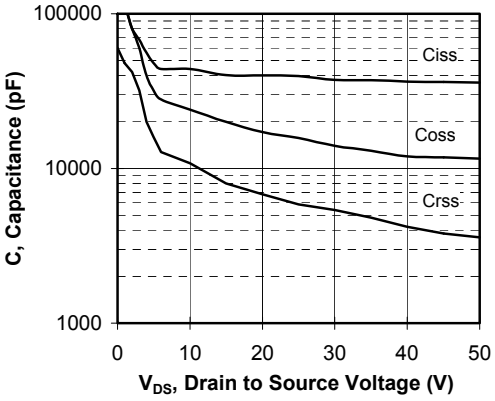
Threshold Voltage vs Temperature



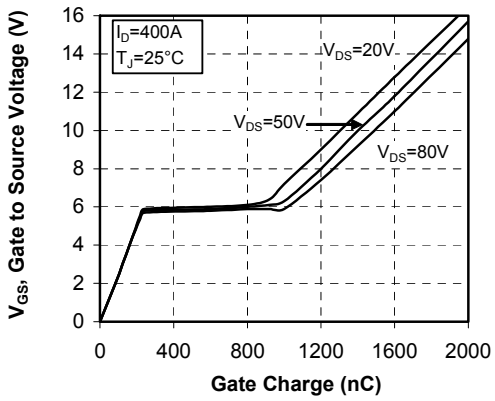
Maximum Safe Operating Area



Capacitance vs Drain to Source Voltage



Gate Charge vs Gate to Source Voltage



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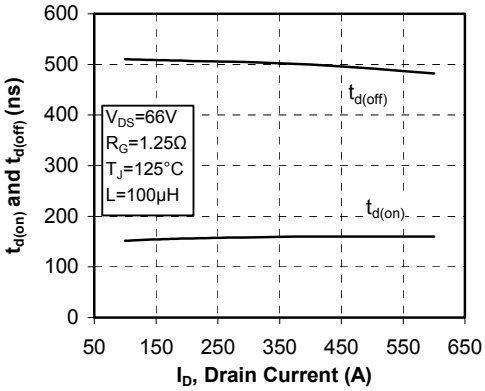
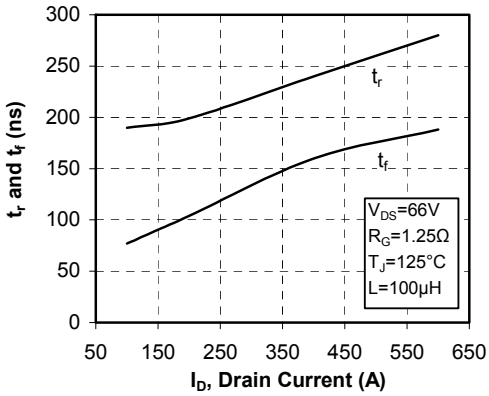
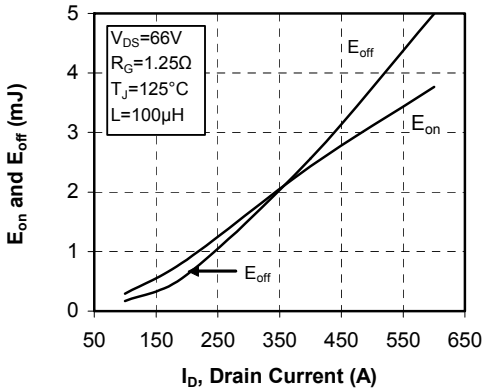
Delay Times vs Current



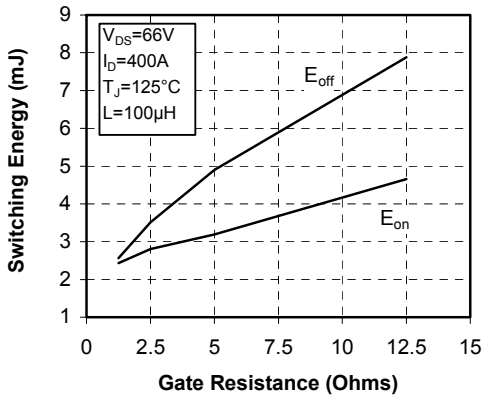
Rise and Fall times vs Current



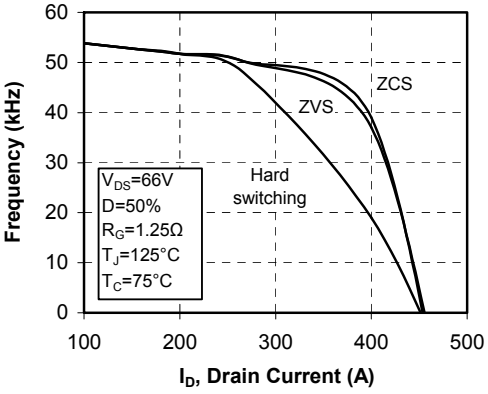
Switching Energy vs Current



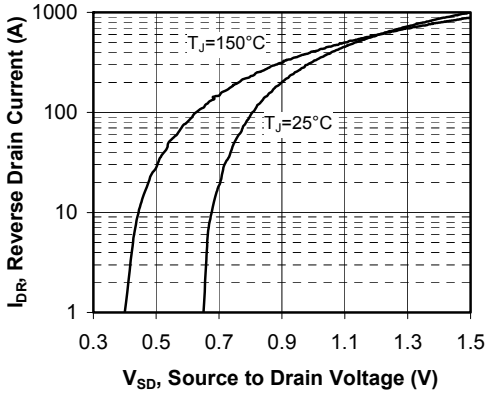
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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