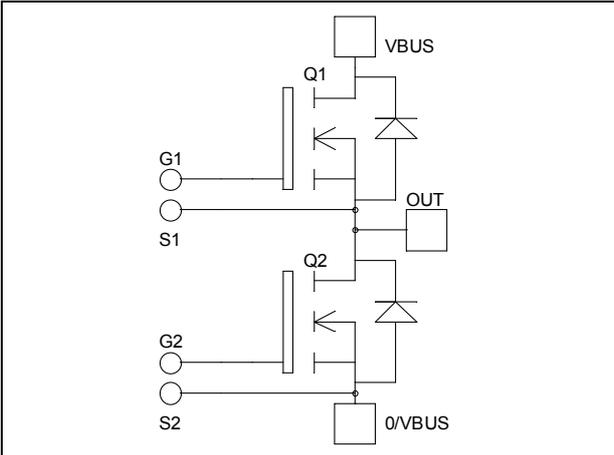


## Phase leg MOSFET Power Module

$V_{DSS} = 500V$   
 $R_{DSon} = 19m\Omega \text{ typ @ } T_j = 25^\circ C$   
 $I_D = 163A \text{ @ } T_c = 25^\circ C$

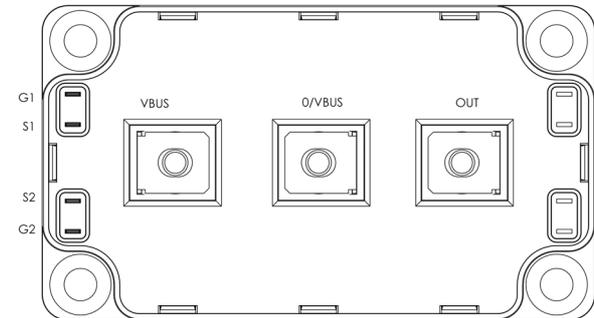


### Application

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

### Features

- Power MOS 7<sup>®</sup> 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



### 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	500	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	163
		$T_c = 80^\circ C$	122
$I_{DM}$	Pulsed Drain current	652	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	22.5	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	1136
$I_{AR}$	Avalanche current (repetitive and non repetitive)	46	A
$E_{AR}$	Repetitive Avalanche Energy	50	mJ
$E_{AS}$	Single Pulse Avalanche Energy	2500	

**CAUTION:** These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed. See application note APT0502 on [www.microsemi.com](http://www.microsemi.com)

All ratings @  $T_j = 25^\circ\text{C}$  unless otherwise specified

**Electrical Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{GS} = 0V, V_{DS} = 500V$ $T_j = 25^\circ\text{C}$			200	$\mu\text{A}$
		$V_{GS} = 0V, V_{DS} = 400V$ $T_j = 125^\circ\text{C}$			1000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 81.5A$		19	22.5	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10\text{mA}$	3		5	V
$I_{GSS}$	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			$\pm 200$	$\text{nA}$

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0V$		22.4		$\text{nF}$
$C_{oss}$	Output Capacitance	$V_{DS} = 25V$		4.8		
$C_{rss}$	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.36		
$Q_g$	Total gate Charge	$V_{GS} = 10V$		492		$\text{nC}$
$Q_{gs}$	Gate – Source Charge	$V_{Bus} = 250V$		132		
$Q_{gd}$	Gate – Drain Charge	$I_D = 163A$		260		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V$ $V_{Bus} = 333V$ $I_D = 163A$ $R_G = 1\Omega$		18		$\text{ns}$
$T_r$	Rise Time			35		
$T_{d(off)}$	Turn-off Delay Time			87		
$T_f$	Fall Time			77		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 163A, R_G = 1\Omega$		3020		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			2904		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15V, V_{Bus} = 333V$ $I_D = 163A, R_G = 1\Omega$		4964		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			3384		

**Source - Drain diode ratings and characteristics**

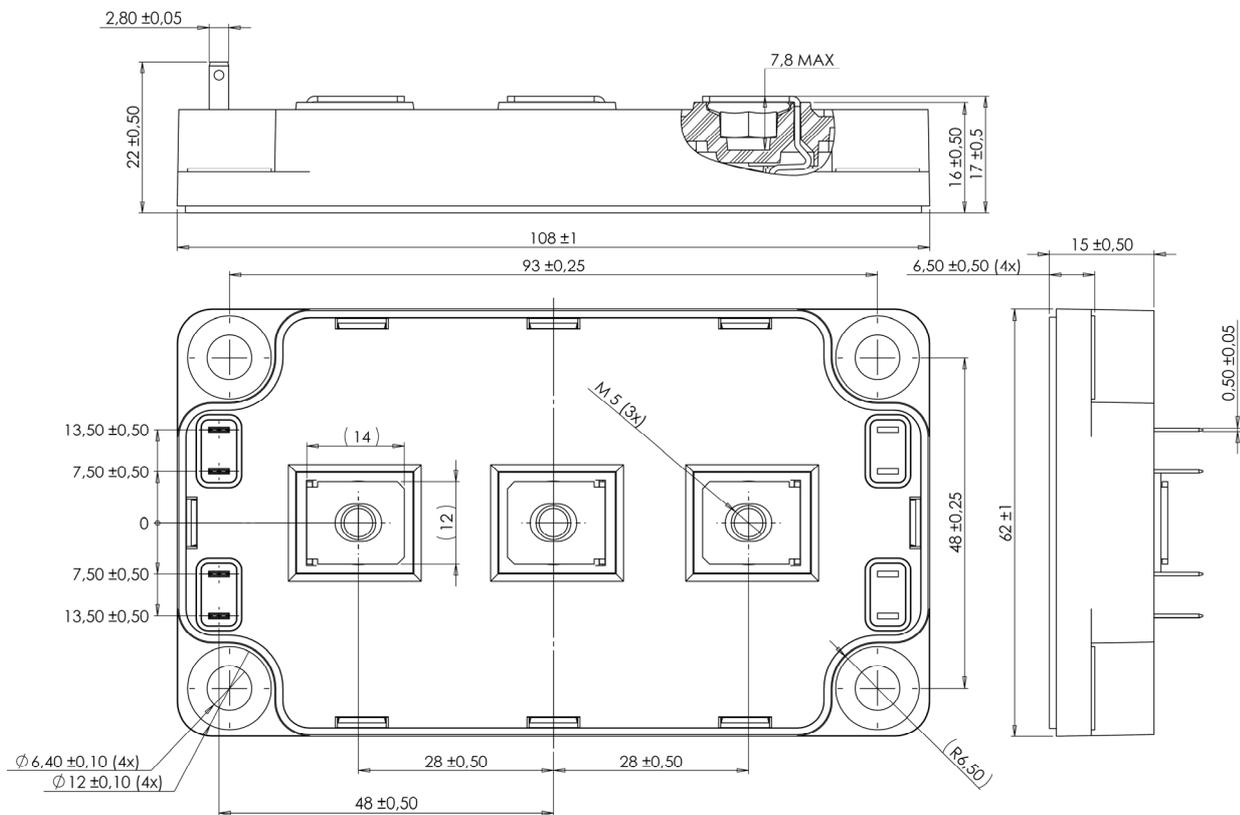
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$I_S$	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			163	A
		$T_c = 80^\circ\text{C}$			122	
$V_{SD}$	Diode Forward Voltage	$V_{GS} = 0V, I_S = -163A$			1.3	V
$dv/dt$	Peak Diode Recovery ①				15	V/ns
$t_{rr}$	Reverse Recovery Time	$I_S = -163A$ $V_R = 333V$	$T_j = 25^\circ\text{C}$		233	$\text{ns}$
			$T_j = 125^\circ\text{C}$		499	
$Q_{rr}$	Reverse Recovery Charge	$di_S/dt = 400A/\mu\text{s}$	$T_j = 25^\circ\text{C}$		7.6	$\mu\text{C}$
			$T_j = 125^\circ\text{C}$		22.8	

 ①  $dv/dt$  numbers reflect the limitations of the circuit rather than the device itself.

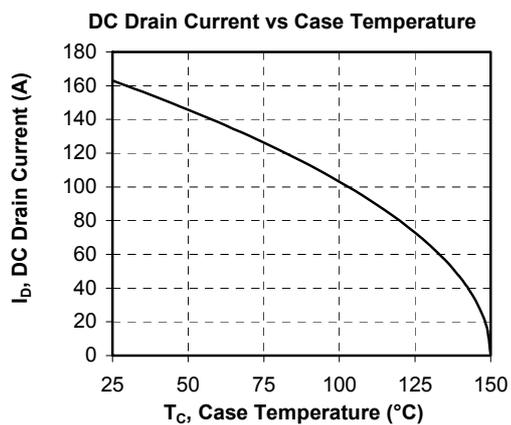
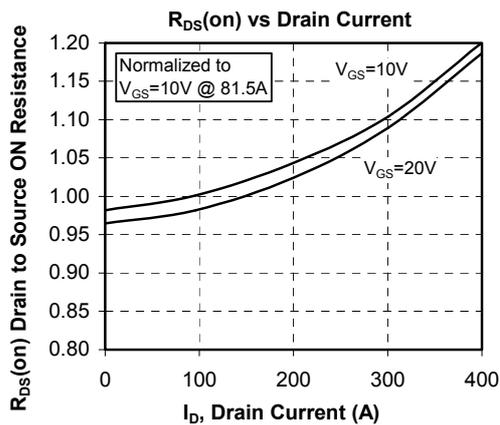
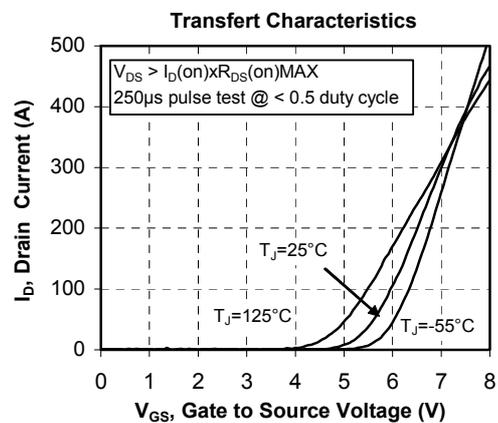
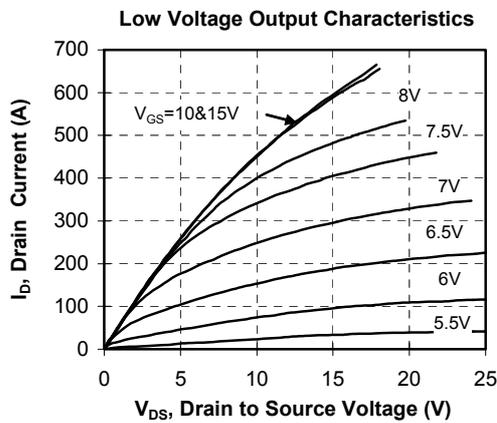
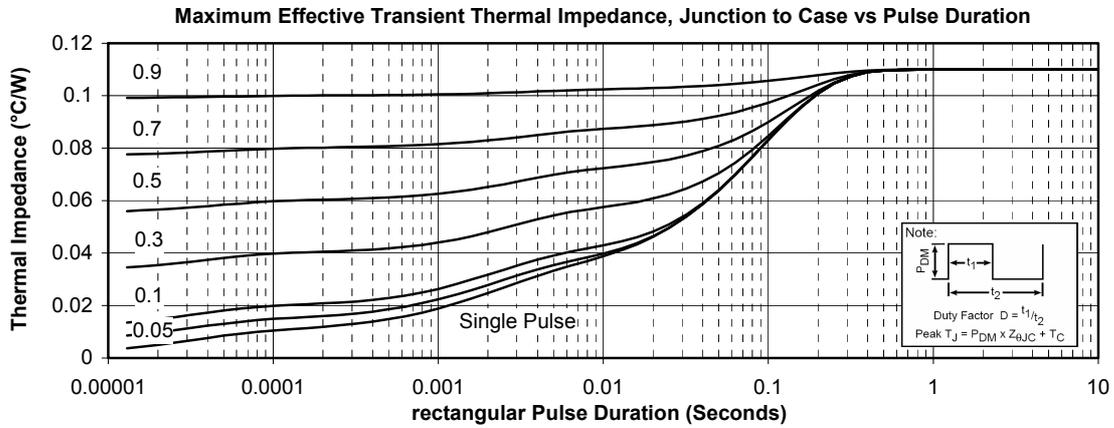
$$I_S \leq -163A \quad di/dt \leq 700A/\mu\text{s} \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

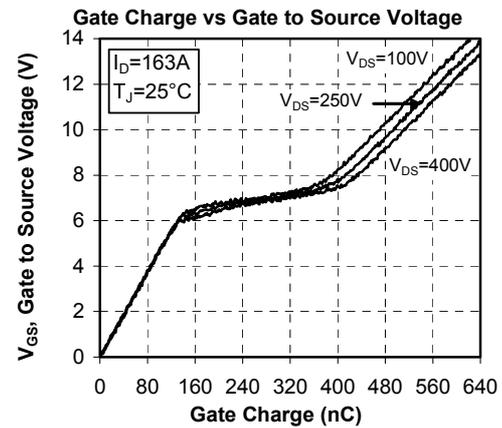
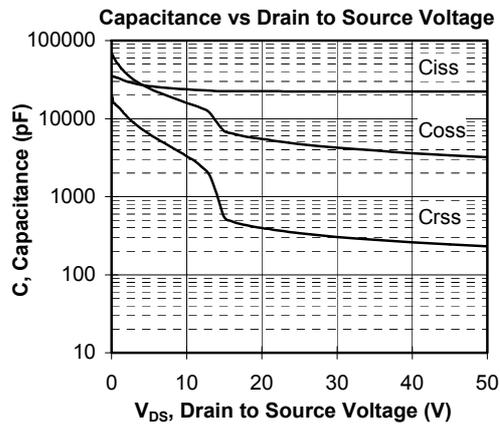
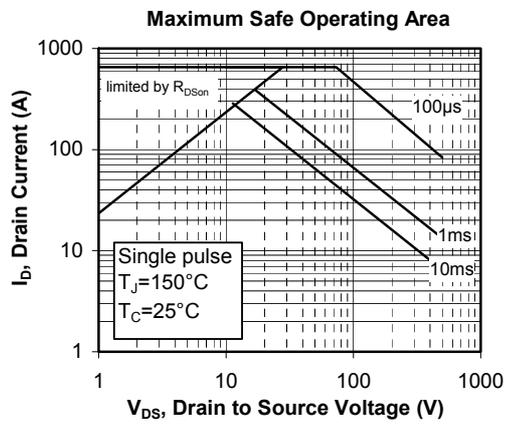
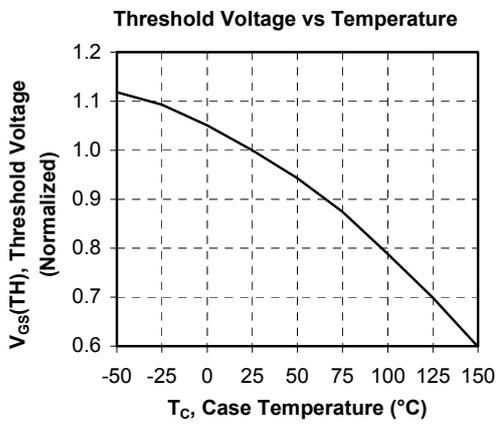
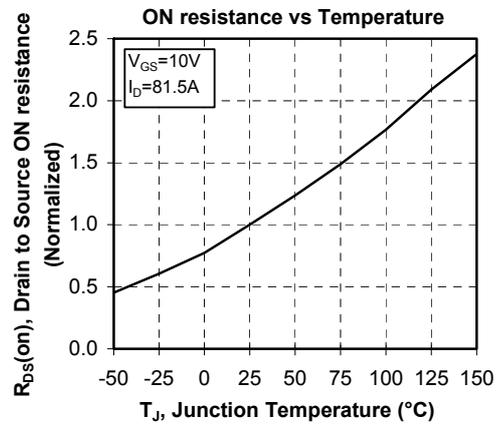
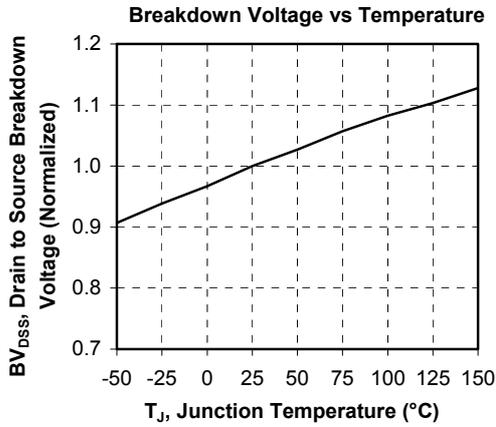
**Thermal and package characteristics**

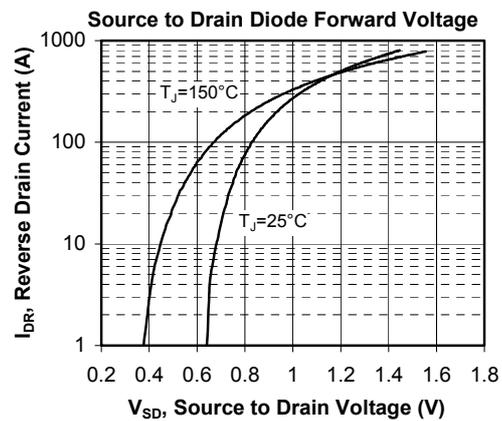
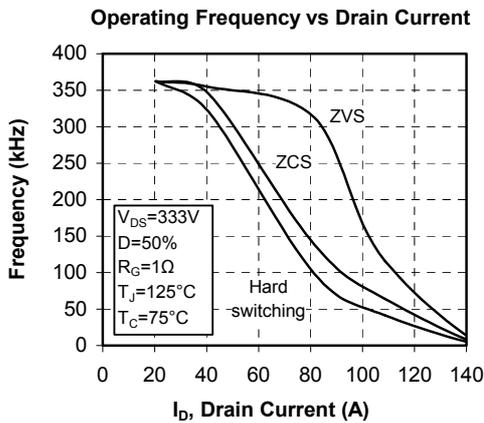
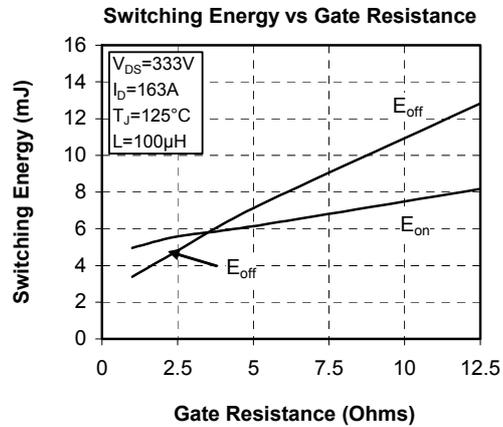
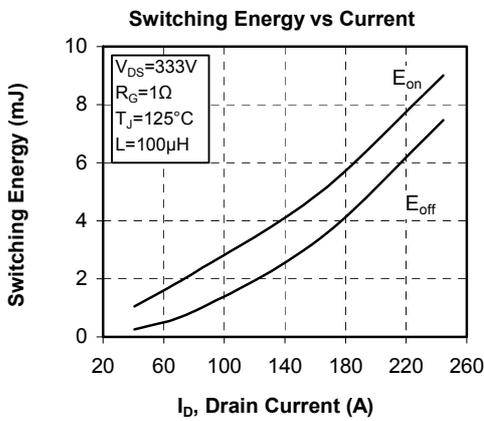
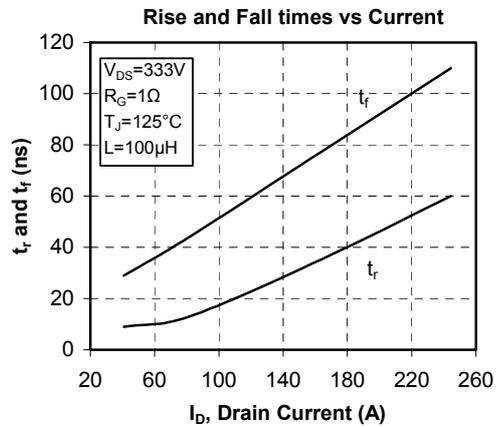
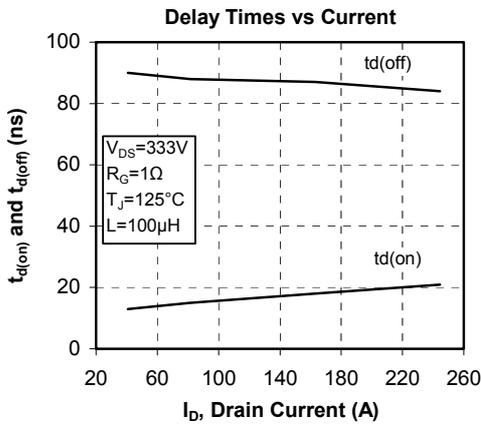
Symbol	Characteristic	Min	Typ	Max	Unit	
R <sub>thJC</sub>	Junction to Case Thermal Resistance			0.11	°C/W	
V <sub>ISOL</sub>	RMS Isolation Voltage, any terminal to case t=1 min, 50/60Hz	4000			V	
T <sub>J</sub>	Operating junction temperature range	-40		150	°C	
T <sub>STG</sub>	Storage Temperature Range	-40		125		
T <sub>C</sub>	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](http://www.microsemi.com)

**Typical Performance Curve**






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