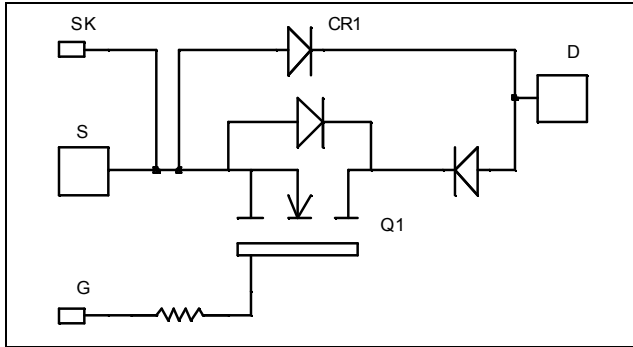


**Single switch  
Series & parallel diodes  
MOSFET Power Module**

$$V_{DSS} = 200V$$

$$R_{DSon} = 4m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 417A @ T_c = 25^\circ C$$

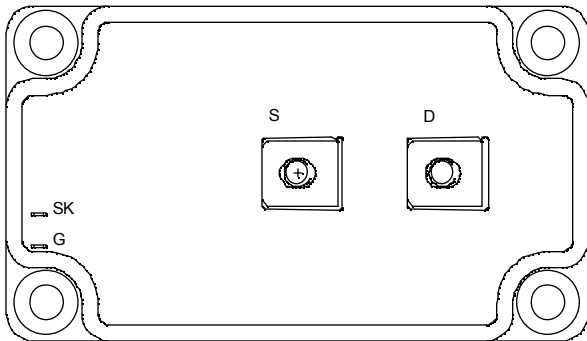


### Application

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

### Features

- Power MOS 7<sup>®</sup> 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
- 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	200	V
$I_D$	Continuous Drain Current	$T_c = 25^\circ C$	417
		$T_c = 80^\circ C$	310
$I_{DM}$	Pulsed Drain current	1670	A
$V_{GS}$	Gate - Source Voltage	$\pm 30$	V
$R_{DSon}$	Drain - Source ON Resistance	5	$m\Omega$
$P_D$	Maximum Power Dissipation	$T_c = 25^\circ C$	1560
$I_{AR}$	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](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	$V_{GS} = 0\text{V}, V_{DS} = 200\text{V}$			500	$\mu\text{A}$
		$V_{GS} = 0\text{V}, V_{DS} = 160\text{V}$	$T_j = 125^\circ\text{C}$		2000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 208.5\text{A}$		4	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	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$			$\pm 200$	nA

**Dynamic Characteristics**

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{V}$ $V_{DS} = 25\text{V}$ $f = 1\text{MHz}$		28.8		nF
$C_{oss}$	Output Capacitance			9.32		
$C_{rss}$	Reverse Transfer Capacitance			0.58		
$Q_g$	Total gate Charge	$V_{GS} = 10\text{V}$ $V_{Bus} = 100\text{V}$ $I_D = 417\text{A}$		560		nC
$Q_{gs}$	Gate – Source Charge			212		
$Q_{gd}$	Gate – Drain Charge			268		
$T_{d(on)}$	Turn-on Delay Time	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}$ $V_{Bus} = 133\text{V}$ $I_D = 417\text{A}$ $R_G = 1.2\Omega$		32		ns
$T_r$	Rise Time			64		
$T_{d(off)}$	Turn-off Delay Time			88		
$T_f$	Fall Time			116		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>25^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$ $I_D = 417\text{A}, R_G = 1.2\Omega$		3396		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			3716		
$E_{on}$	Turn-on Switching Energy	<b>Inductive switching @ <math>125^\circ\text{C}</math></b> $V_{GS} = 15\text{V}, V_{Bus} = 133\text{V}$ $I_D = 417\text{A}, R_G = 1.2\Omega$		3744		$\mu\text{J}$
$E_{off}$	Turn-off Switching Energy			3944		

**Series 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	$V_R = 200\text{V}$	$T_j = 25^\circ\text{C}$		1000	$\mu\text{A}$
			$T_j = 125^\circ\text{C}$		1250	
$I_F$	DC Forward Current	$T_c = 85^\circ\text{C}$		360		A
$V_F$	Diode Forward Voltage	$I_F = 360\text{A}$		1.1	1.15	V
		$I_F = 720\text{A}$		1.4		
		$I_F = 360\text{A}$	$T_j = 125^\circ\text{C}$	0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 360\text{A}$ $V_R = 133\text{V}$ $di/dt = 1000\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	31		ns
			$T_j = 125^\circ\text{C}$	60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 360\text{A}$ $V_R = 133\text{V}$ $di/dt = 1000\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$	360		nC
			$T_j = 125^\circ\text{C}$	1500		

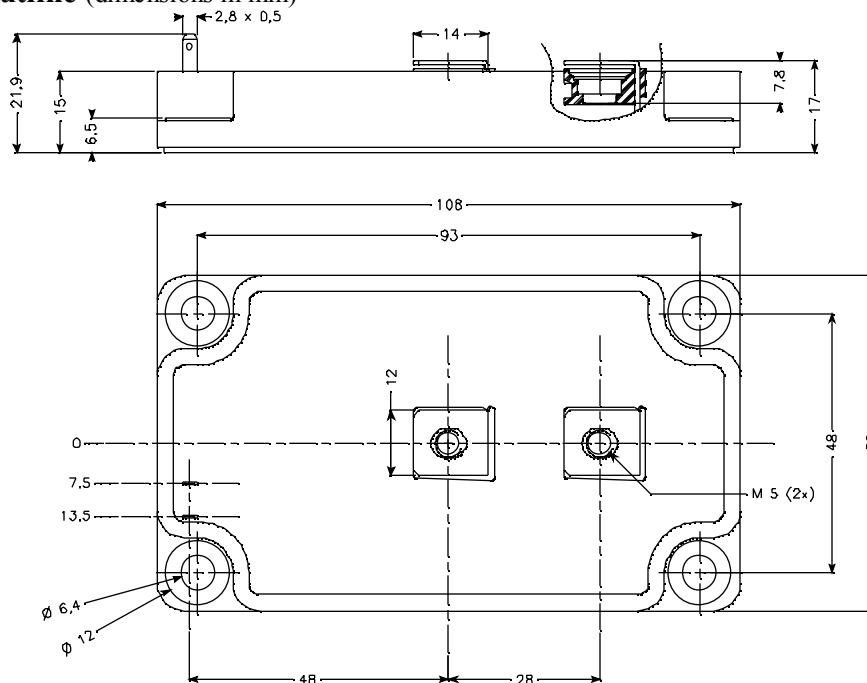
## Parallel diode ratings and characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
$V_{RRM}$	Maximum Peak Repetitive Reverse Voltage			200			V
$I_{RM}$	Maximum Reverse Leakage Current	$V_R=200V$	$T_j = 25^\circ C$			1000	$\mu A$
			$T_j = 125^\circ C$			1250	
$I_F$	DC Forward Current				360		A
$V_F$	Diode Forward Voltage	$I_F = 360A$			1.1	1.15	V
		$I_F = 720A$			1.4		
		$I_F = 360A$	$T_j = 125^\circ C$		0.9		
$t_{rr}$	Reverse Recovery Time	$I_F = 360A$ $V_R = 133V$ $di/dt = 1000A/\mu s$	$T_j = 25^\circ C$		31		ns
			$T_j = 125^\circ C$		60		
$Q_{rr}$	Reverse Recovery Charge	$I_F = 360A$ $V_R = 133V$ $di/dt = 1000A/\mu s$	$T_j = 25^\circ C$		360		nC
			$T_j = 125^\circ C$		1500		

## Thermal and package characteristics

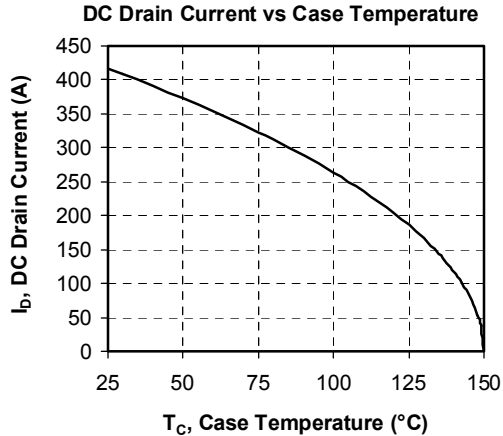
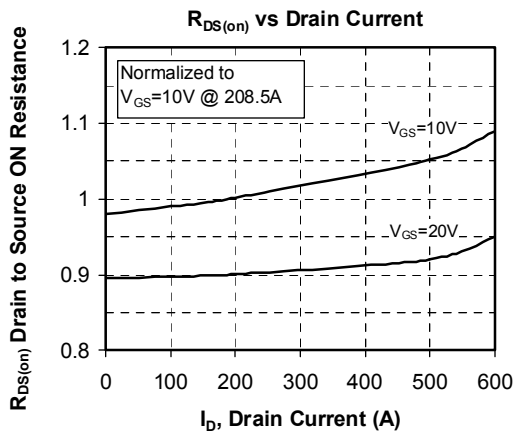
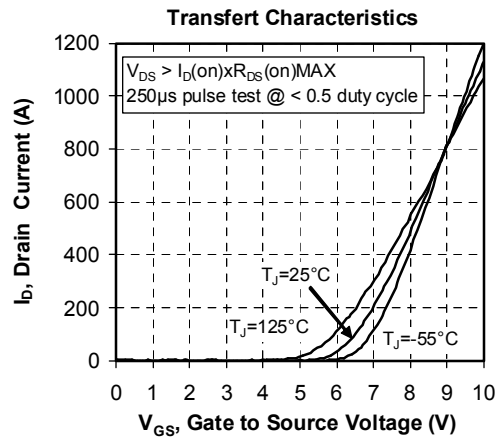
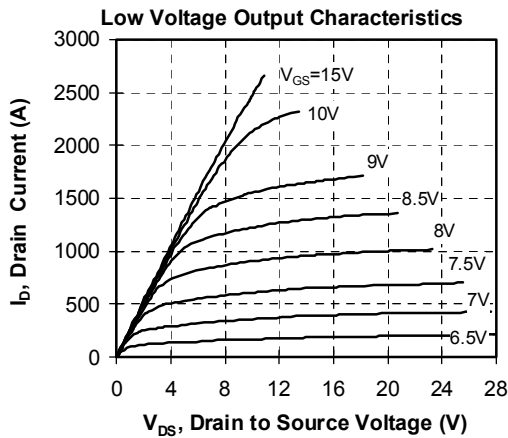
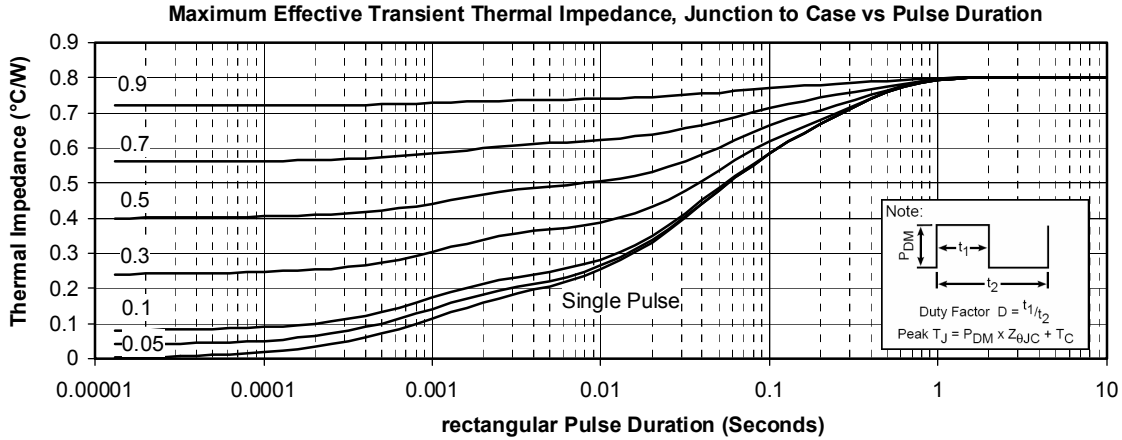
Symbol	Characteristic			Min	Typ	Max	Unit
$R_{thJC}$	Junction to Case Thermal Resistance	Transistor				0.08	$^\circ C/W$
		Series Diode				0.12	
		Parallel Diode				0.12	
$V_{ISOL}$	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{sol}<1mA$ , 50/60Hz			2500			V
$T_J$	Operating junction temperature range			-40		150	$^\circ C$
$T_{STG}$	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

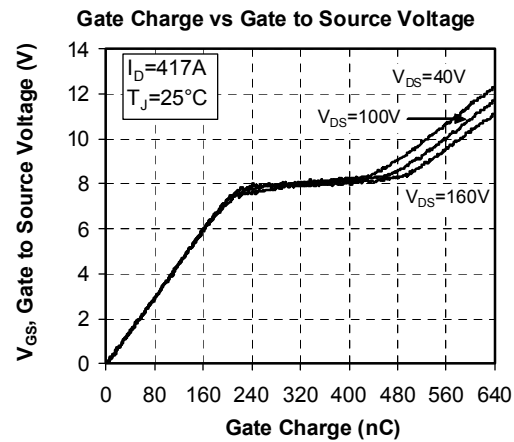
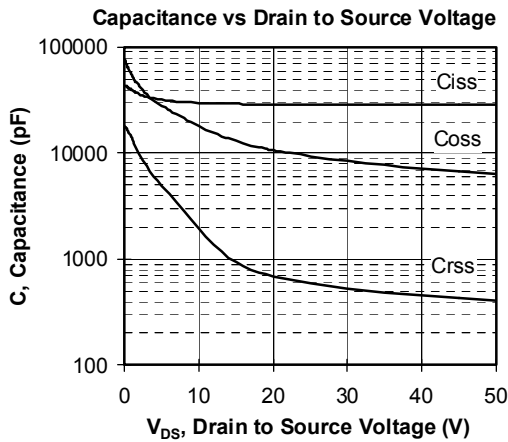
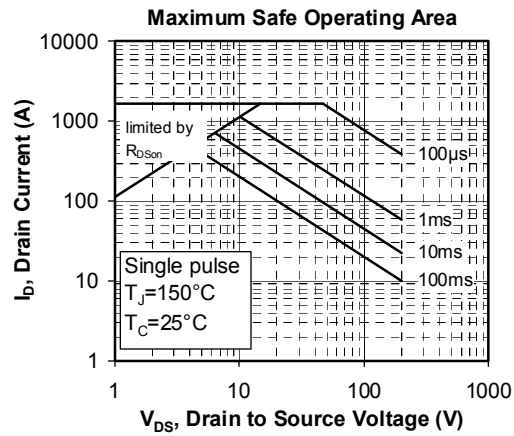
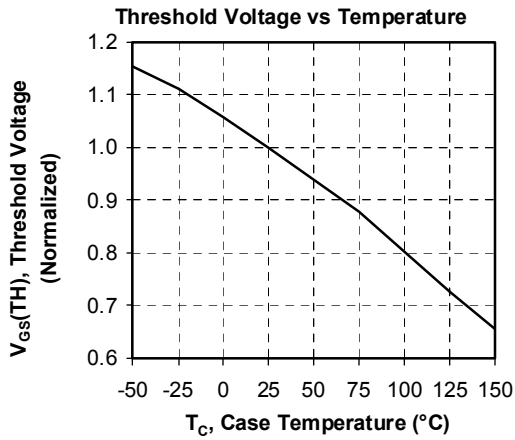
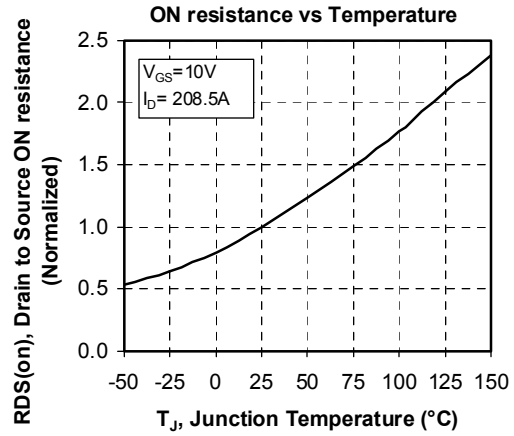
## SP6 Package outline (dimensions in mm)

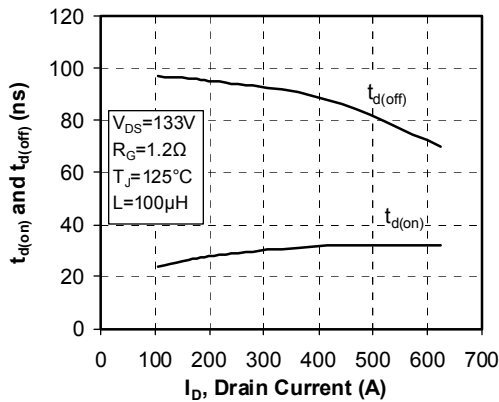
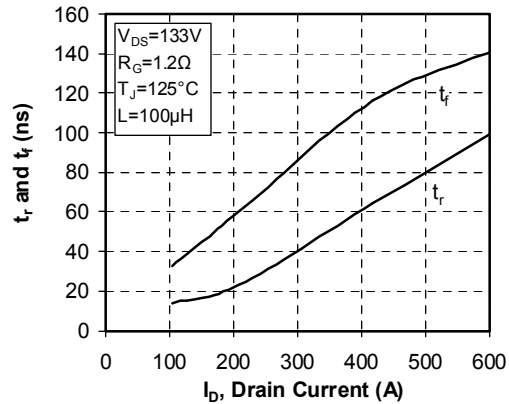
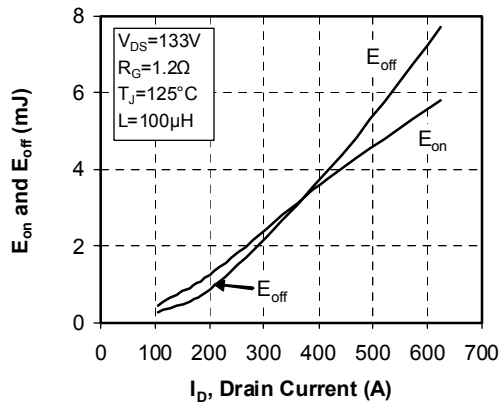
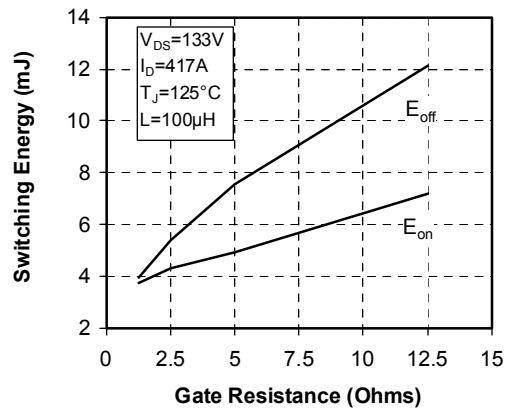
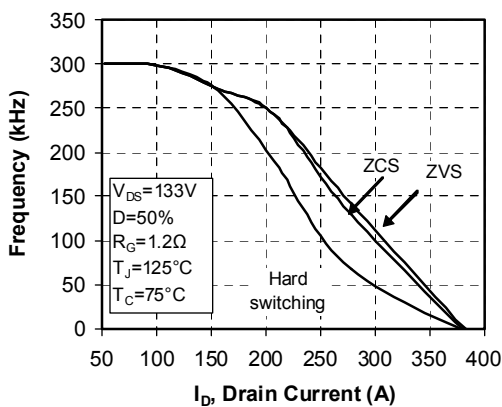
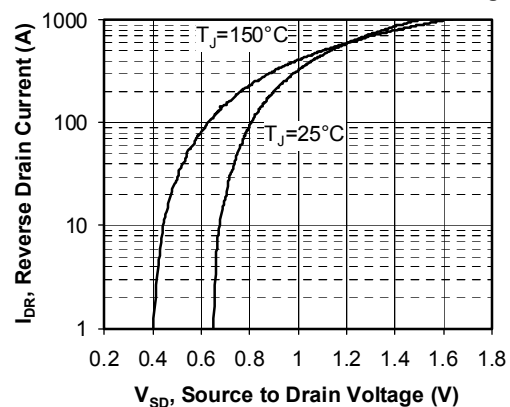


See application note APT0601 - Mounting Instructions for SP6 Power Modules on [www.microsemi.com](http://www.microsemi.com)

## Typical Performance Curve





**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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