



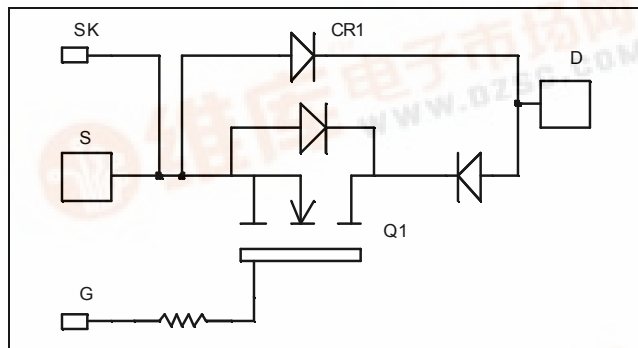
APT0502UM04SAG

Single switch Series & parallel diodes MOSFET Power Module

$$V_{DSS} = 200V$$

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

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



Application

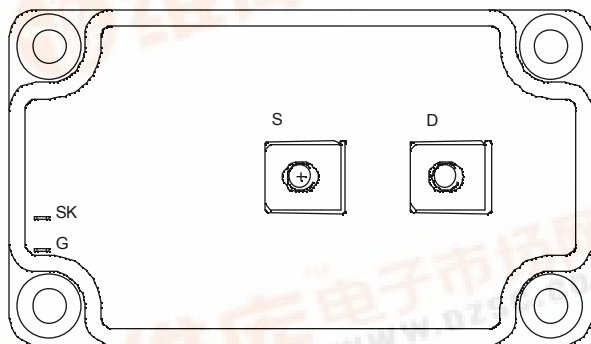
- Welding converters
- Switched Mode Power Supplies
- Uninterruptible Power Supplies
- Motor control

Features

- Power MOS 7[®] 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	± 30	V
R_{DSon}	Drain - Source ON Resistance	5	m Ω
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

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	$V_{GS} = 0V, V_{DS} = 200V$			500	μA
		$V_{GS} = 0V, V_{DS} = 160V$			2000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 208.5A$		4	5	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10mA$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 200	nA

Dynamic Characteristics

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

Series diode ratings and characteristics

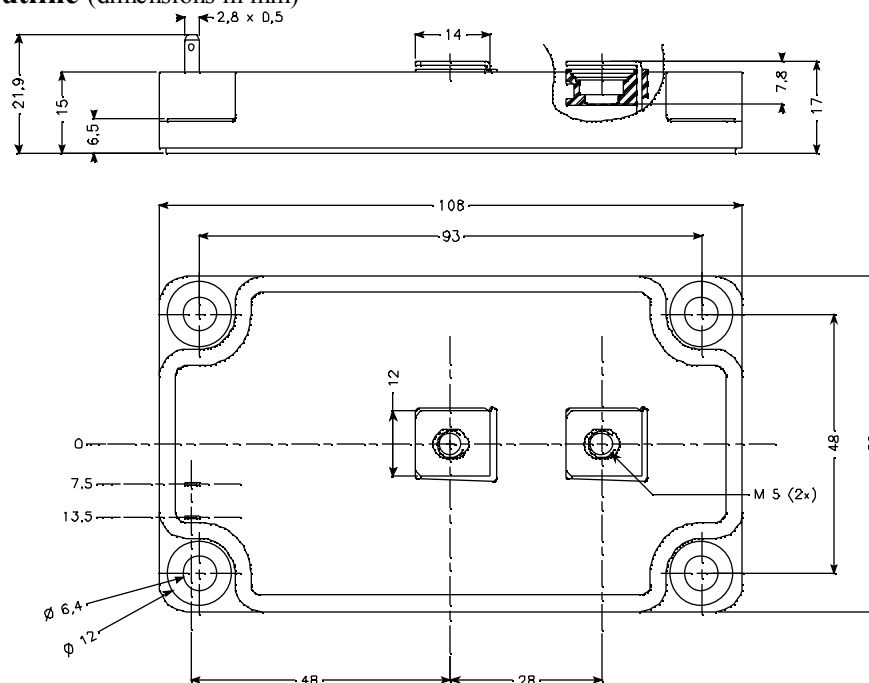
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage		200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R = 200V$	$T_j = 25^\circ\text{C}$		1000	μA
			$T_j = 125^\circ\text{C}$		1250	
I_F	DC Forward Current	$T_c = 85^\circ\text{C}$		360		A
V_F	Diode Forward Voltage	$I_F = 360A$		1.1	1.15	V
		$I_F = 720A$		1.4		
		$I_F = 360A$	$T_j = 125^\circ\text{C}$	0.9		
t_{rr}	Reverse Recovery Time	$I_F = 360A$ $V_R = 133V$ $di/dt = 1000A/\mu s$	$T_j = 25^\circ\text{C}$	31		ns
			$T_j = 125^\circ\text{C}$	60		
Q_{rr}	Reverse Recovery Charge	$T_j = 25^\circ\text{C}$		360		nC
			$T_j = 125^\circ\text{C}$	1500		

Parallel diode ratings and characteristics

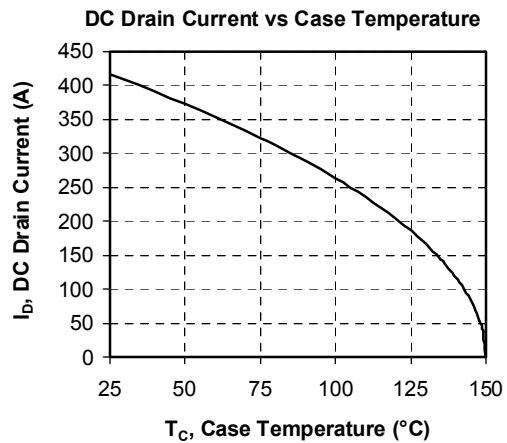
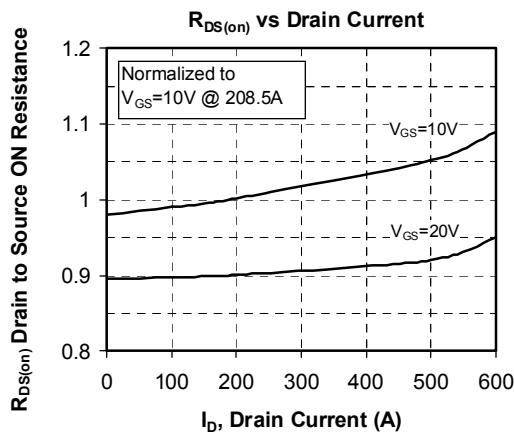
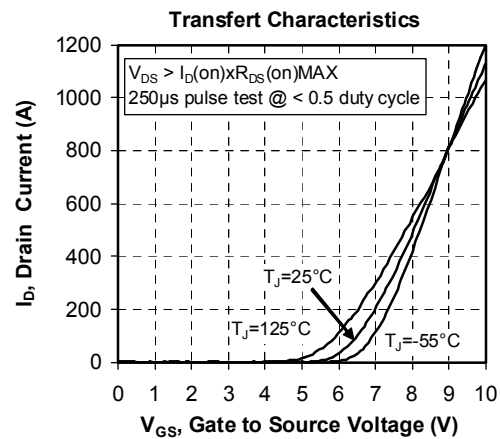
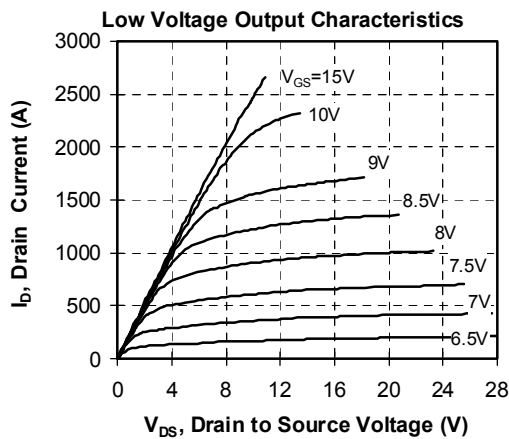
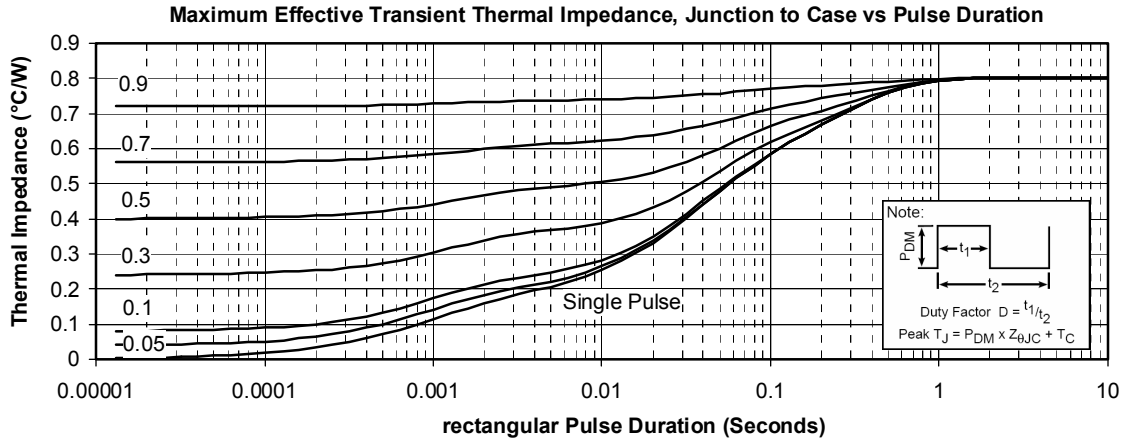
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Maximum Peak Repetitive Reverse Voltage			200			V
I_{RM}	Maximum Reverse Leakage Current	$V_R=200V$	$T_j = 25^\circ C$			1000	μA
			$T_j = 125^\circ C$			1250	
I_F	DC Forward Current		$T_c = 85^\circ C$		360		A
V_F	Diode Forward Voltage	$I_F = 360A$			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		$T_j = 25^\circ C$		360		nC
			$T_j = 125^\circ C$		1500		

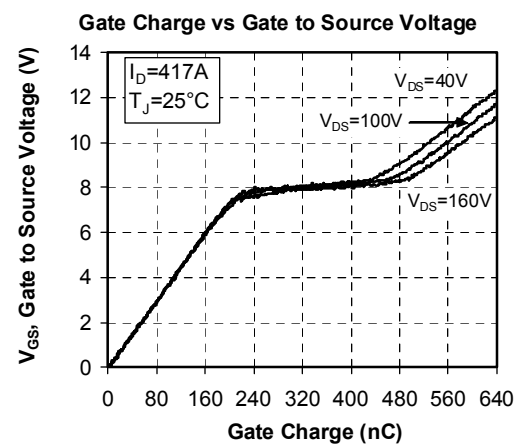
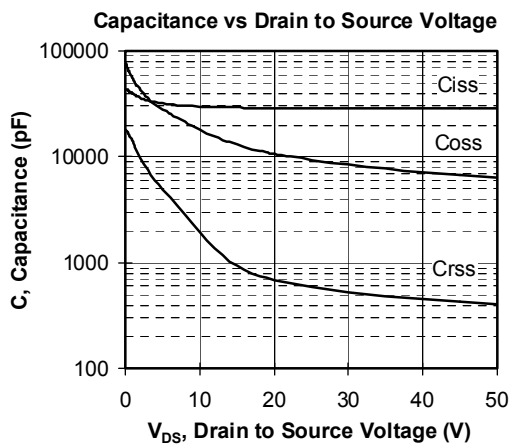
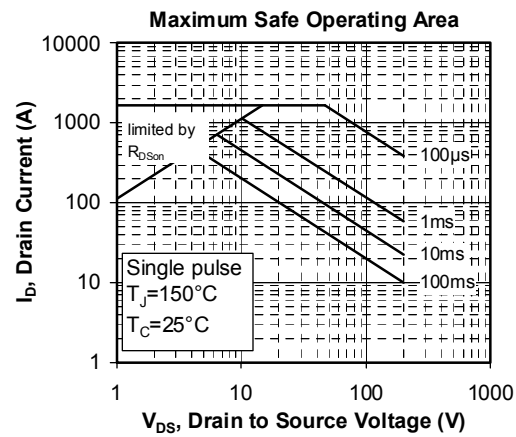
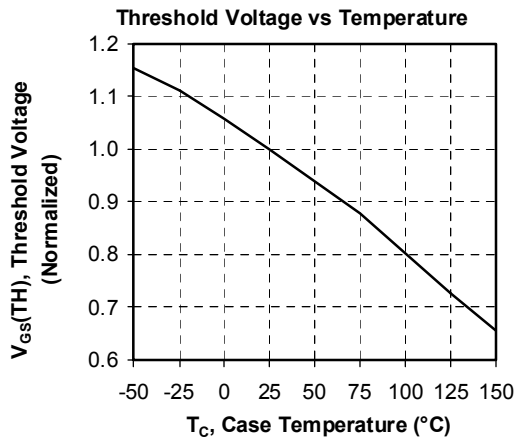
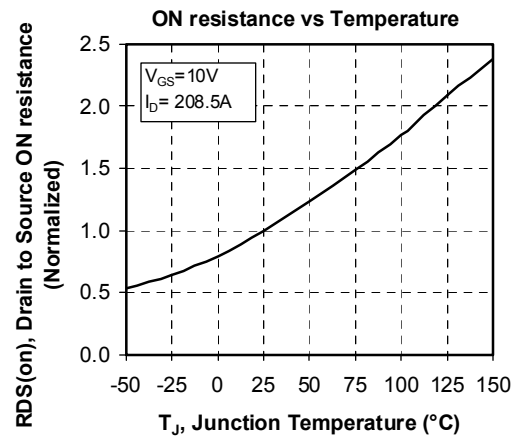
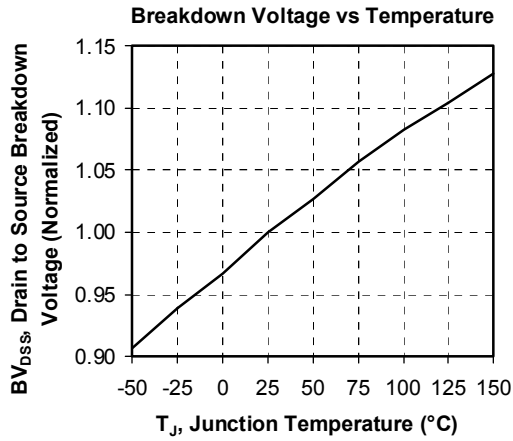
Thermal and package characteristics

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 $t = 1 \text{ min}$, $I_{sol} < 1mA$, 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

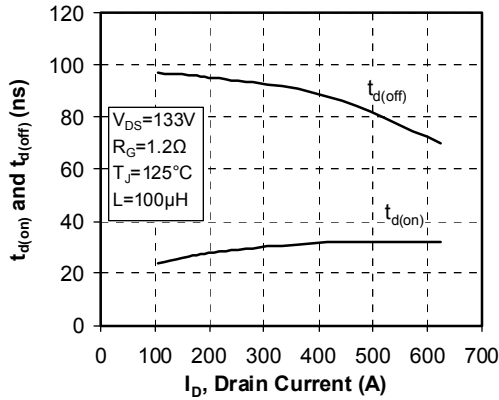
SP6 Package outline (dimensions in mm)

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

Typical Performance Curve

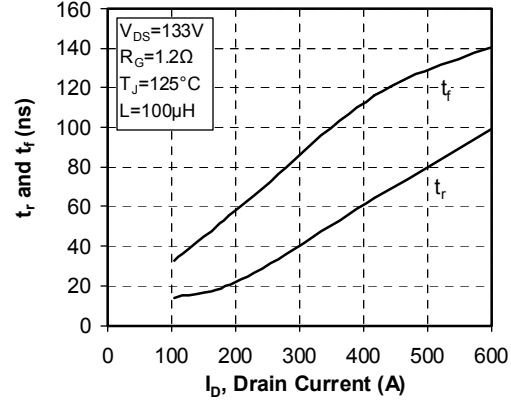




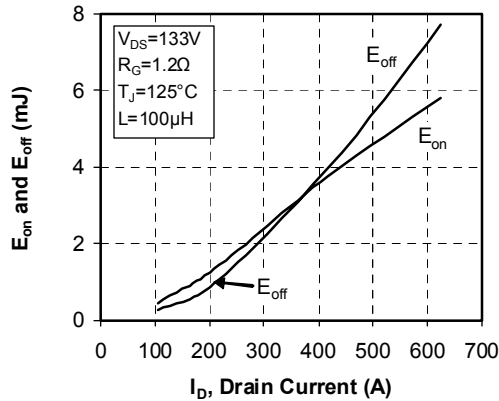
Delay Times vs Current



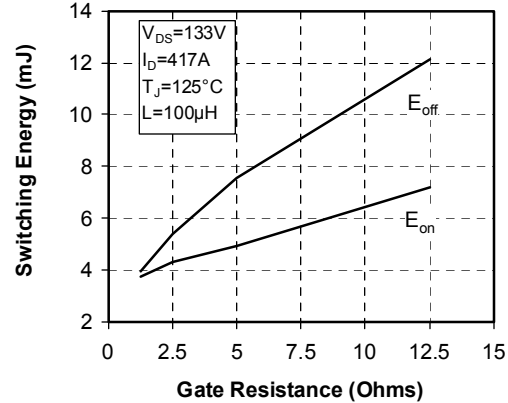
Rise and Fall times vs Current



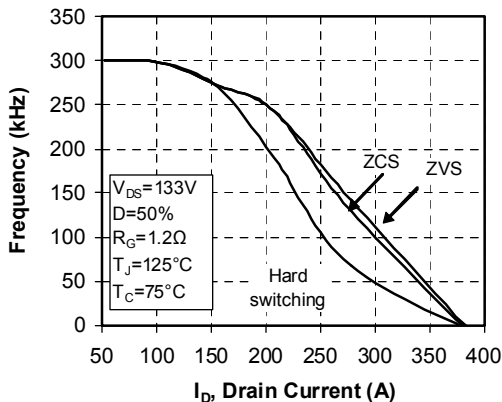
Switching Energy vs Current



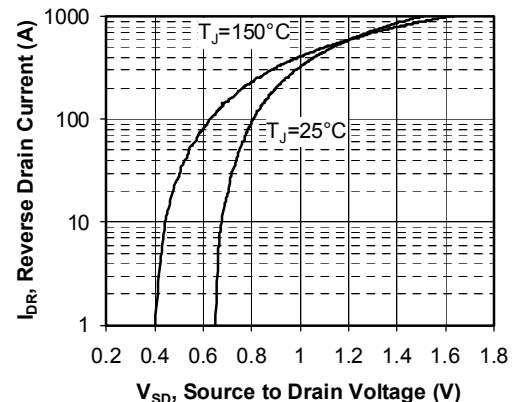
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



Microsemi reserves the right to change, without notice, the specifications and information contained herein

Microsemi's products are covered by one or more of U.S. patents 4,895,810 5,045,903 5,089,434 5,182,234 5,019,522 5,262,336 6,503,786 5,256,583 4,748,103 5,283,202 5,231,474 5,434,095 5,528,058 and foreign patents. U.S. and Foreign patents pending. All Rights Reserved.