



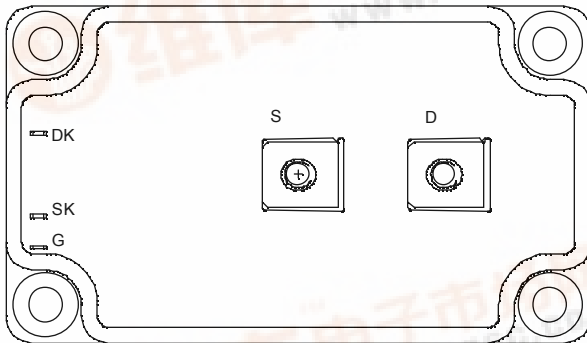
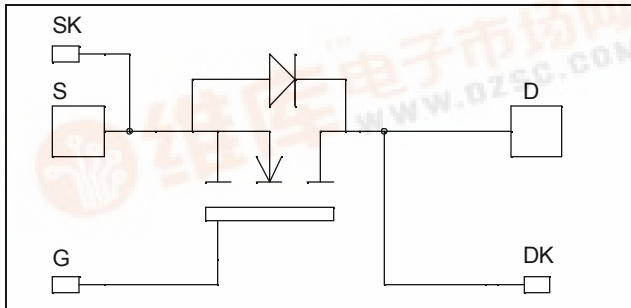
APT0502UM03FAG

Single Switch MOSFET Power Module

$$V_{DSS} = 200V$$

$$R_{DSon} = 3m\Omega \text{ typ @ } T_j = 25^\circ C$$

$$I_D = 580A \text{ @ } T_c = 25^\circ C$$



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
 - 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	$T_c = 25^\circ C$	A
		$T_c = 80^\circ C$	
I_{DM}	Pulsed Drain current	2320	
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	3.6	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	2270
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	$V_{GS} = 0V, V_{DS} = 200V$ $T_j = 25^\circ\text{C}$			500	μA
		$V_{GS} = 0V, V_{DS} = 160V$ $T_j = 125^\circ\text{C}$			3000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10V, I_D = 290A$		3	3.6	$m\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 15mA$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30V, V_{DS} = 0V$			± 400	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1MHz$		43.3		nF
C_{oss}	Output Capacitance			13.9		
C_{rss}	Reverse Transfer Capacitance			0.87		
Q_g	Total gate Charge	$V_{GS} = 10V$ $V_{Bus} = 100V$ $I_D = 580A$		840		nC
Q_{gs}	Gate – Source Charge			318		
Q_{gd}	Gate – Drain Charge			402		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15V$ $V_{Bus} = 133V$ $I_D = 580A$ $R_G = 0.8\Omega$		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 $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 580A, R_G = 0.8\Omega$		5		mJ
E_{off}	Turn-off Switching Energy			5.6		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15V, V_{Bus} = 133V$ $I_D = 580A, R_G = 0.8\Omega$		5.6		mJ
E_{off}	Turn-off Switching Energy			5.9		

Source - Drain diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			580	A
		$T_c = 80^\circ\text{C}$			434	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0V, I_S = -580A$			1.3	V
dv/dt	Peak Diode Recovery ❶				8	V/ns
t_{rr}	Reverse Recovery Time	$I_S = -580A$ $V_R = 500V$ $di/dt = 600A/\mu s$	$T_j = 25^\circ\text{C}$		230	ns
			$T_j = 125^\circ\text{C}$		450	
Q_{rr}	Reverse Recovery Charge	$I_S = -580A$ $V_R = 500V$ $di/dt = 600A/\mu s$	$T_j = 25^\circ\text{C}$	5.4		μC
			$T_j = 125^\circ\text{C}$	20.4		

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

$$I_S \leq -580A \quad di/dt \leq 700A/\mu s \quad V_R \leq V_{DSS} \quad T_j \leq 150^\circ\text{C}$$

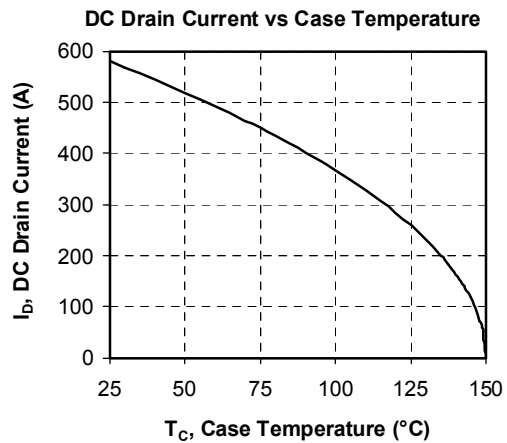
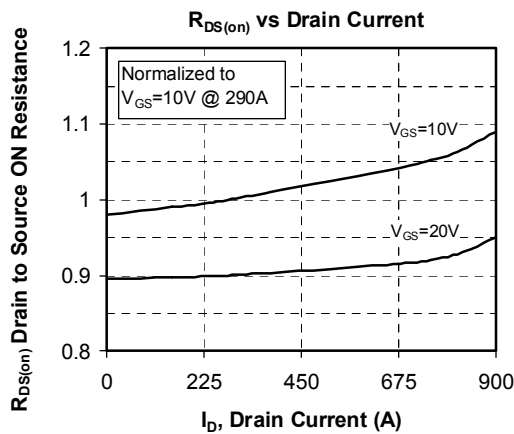
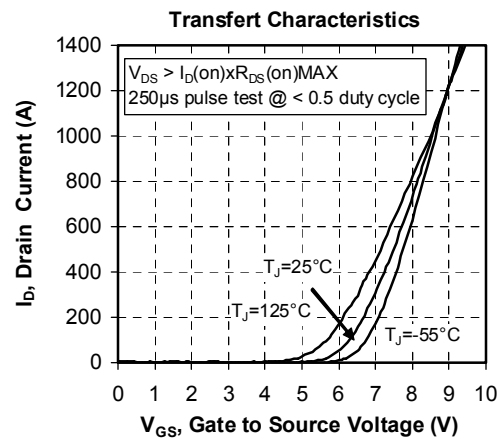
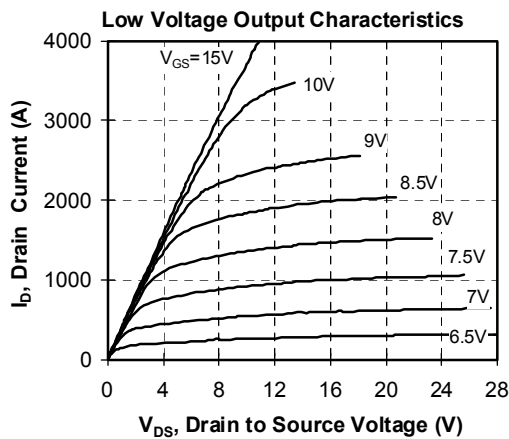
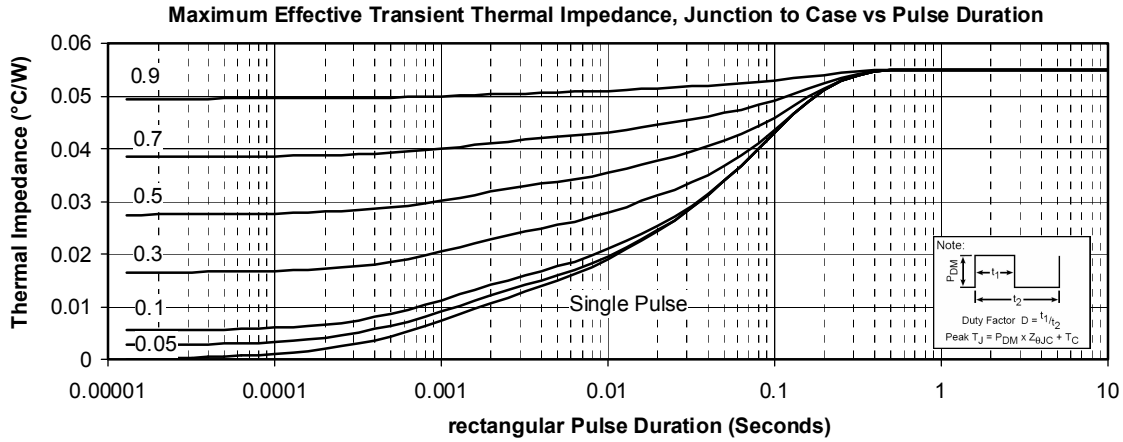


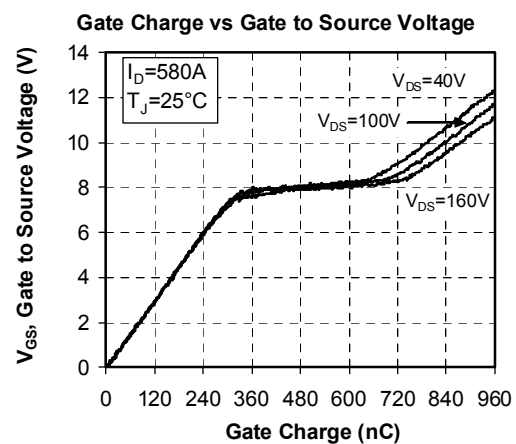
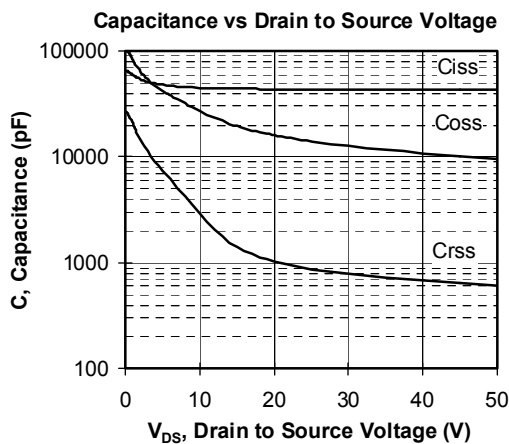
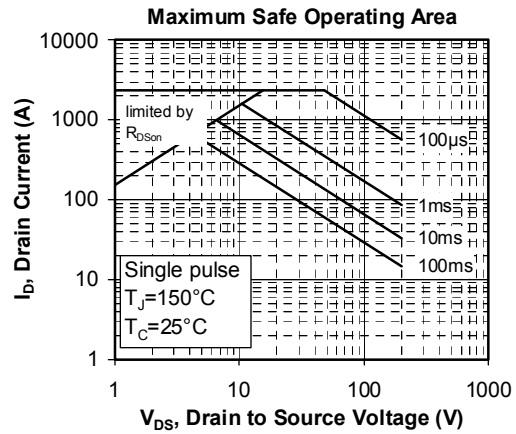
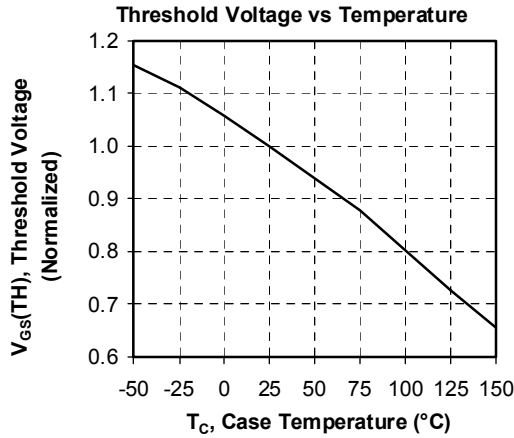
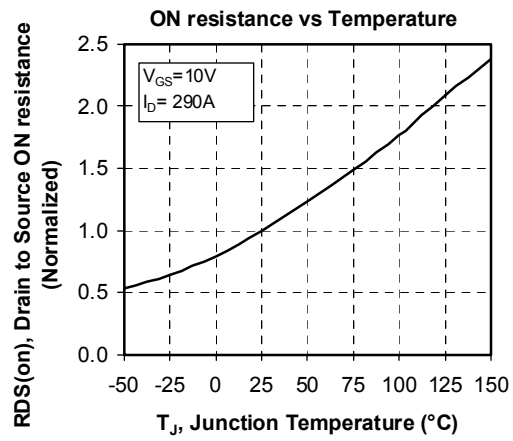
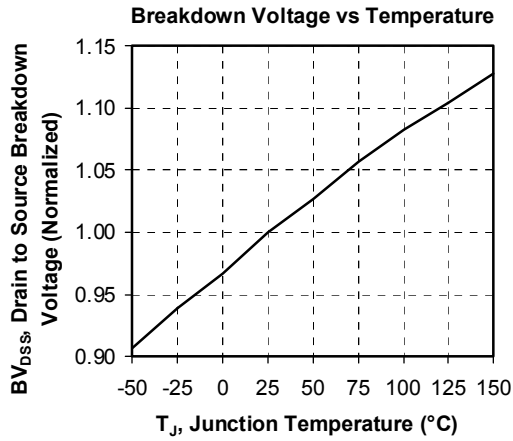
<i>Symbol</i>	<i>Characteristic</i>	<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>
R _{thJC}	Junction to Case Thermal Resistance			0.055	°C/W
V _{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, Isol<1mA, 50/60Hz	2500			V
T _J	Operating junction temperature range	-40		150	°C
T _{STG}	Storage Temperature Range	-40		125	
T _C	Operating Case Temperature	-40		100	
Torque	Mounting torque	To heatsink	M6	3	N.m
		For terminals	M5	2	
Wt	Package Weight			280	g

[illegible]

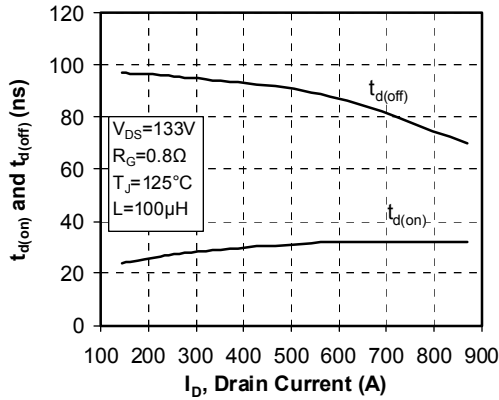
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical Performance Curve

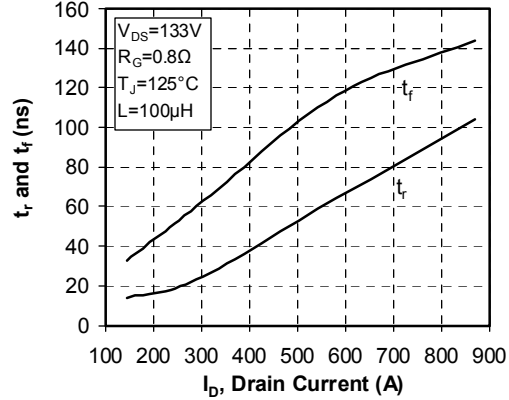




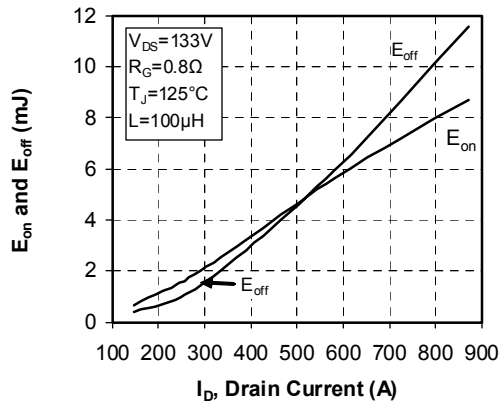
Delay Times vs Current



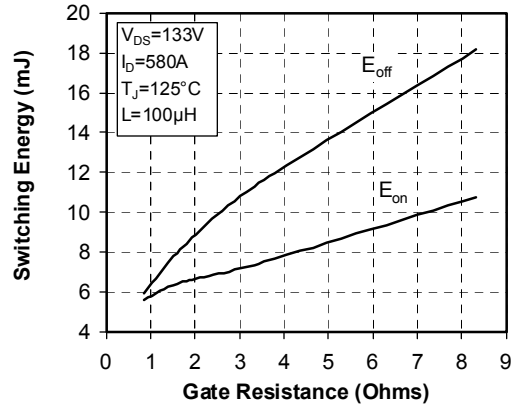
Rise and Fall times vs Current



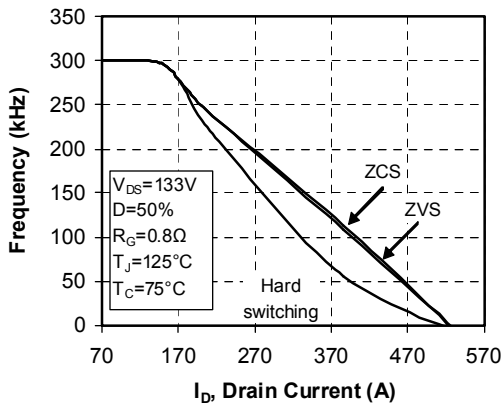
Switching Energy vs Current



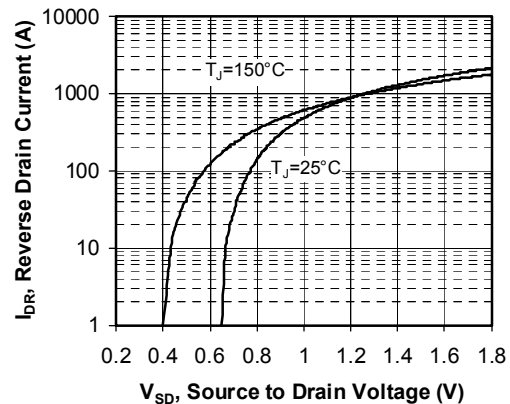
Switching Energy vs Gate Resistance



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.