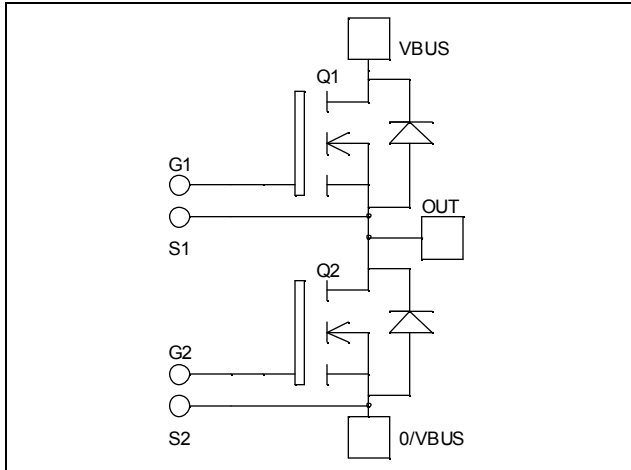


Phase leg MOSFET Power Module

$V_{DSS} = 500V$
 $R_{DSon} = 17m\Omega \text{ typ @ } T_j = 25^\circ C$
 $I_D = 180A \text{ @ } T_c = 25^\circ C$

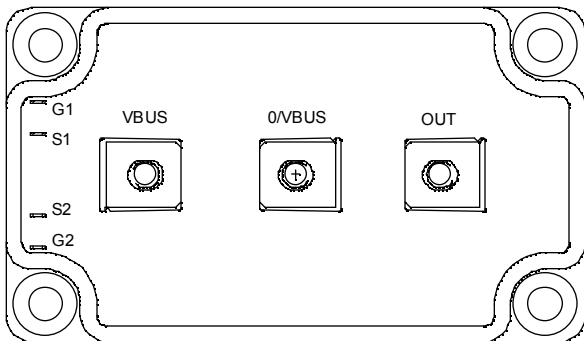


Application

- 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



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	$T_c = 25^\circ C$	180
		$T_c = 80^\circ C$	135
I_{DM}	Pulsed Drain current	720	A
V_{GS}	Gate - Source Voltage	± 30	V
R_{DSon}	Drain - Source ON Resistance	20	m Ω
P_D	Maximum Power Dissipation	$T_c = 25^\circ C$	1250
I_{AR}	Avalanche current (repetitive and non repetitive)	51	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	$V_{GS} = 0\text{V}, V_{DS} = 500\text{V}$			400	μA
		$V_{GS} = 0\text{V}, V_{DS} = 400\text{V}$			2000	
$R_{DS(on)}$	Drain – Source on Resistance	$V_{GS} = 10\text{V}, I_D = 90\text{A}$		17	20	$\text{m}\Omega$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 10\text{mA}$	3		5	V
I_{GSS}	Gate – Source Leakage Current	$V_{GS} = \pm 30\text{V}, V_{DS} = 0\text{V}$			± 200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	$V_{GS} = 0\text{V}$		28		nF
C_{oss}	Output Capacitance	$V_{DS} = 25\text{V}$		5.6		
C_{rss}	Reverse Transfer Capacitance	$f = 1\text{MHz}$		0.36		
Q_g	Total gate Charge	$V_{GS} = 10\text{V}$		560		nC
Q_{gs}	Gate – Source Charge	$V_{Bus} = 250\text{V}$		160		
Q_{gd}	Gate – Drain Charge	$I_D = 180\text{A}$		280		
$T_{d(on)}$	Turn-on Delay Time	Inductive switching @ 125°C $V_{GS} = 15\text{V}$ $V_{Bus} = 333\text{V}$ $I_D = 180\text{A}$ $R_G = 0.5\Omega$		21		ns
T_r	Rise Time			38		
$T_{d(off)}$	Turn-off Delay Time			75		
T_f	Fall Time			93		
E_{on}	Turn-on Switching Energy	Inductive switching @ 25°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 180\text{A}, R_G = 0.5\Omega$		4140		μJ
E_{off}	Turn-off Switching Energy			3380		
E_{on}	Turn-on Switching Energy	Inductive switching @ 125°C $V_{GS} = 15\text{V}, V_{Bus} = 333\text{V}$ $I_D = 180\text{A}, R_G = 0.5\Omega$		6224		μJ
E_{off}	Turn-off Switching Energy			4052		

Source - Drain diode ratings and characteristics

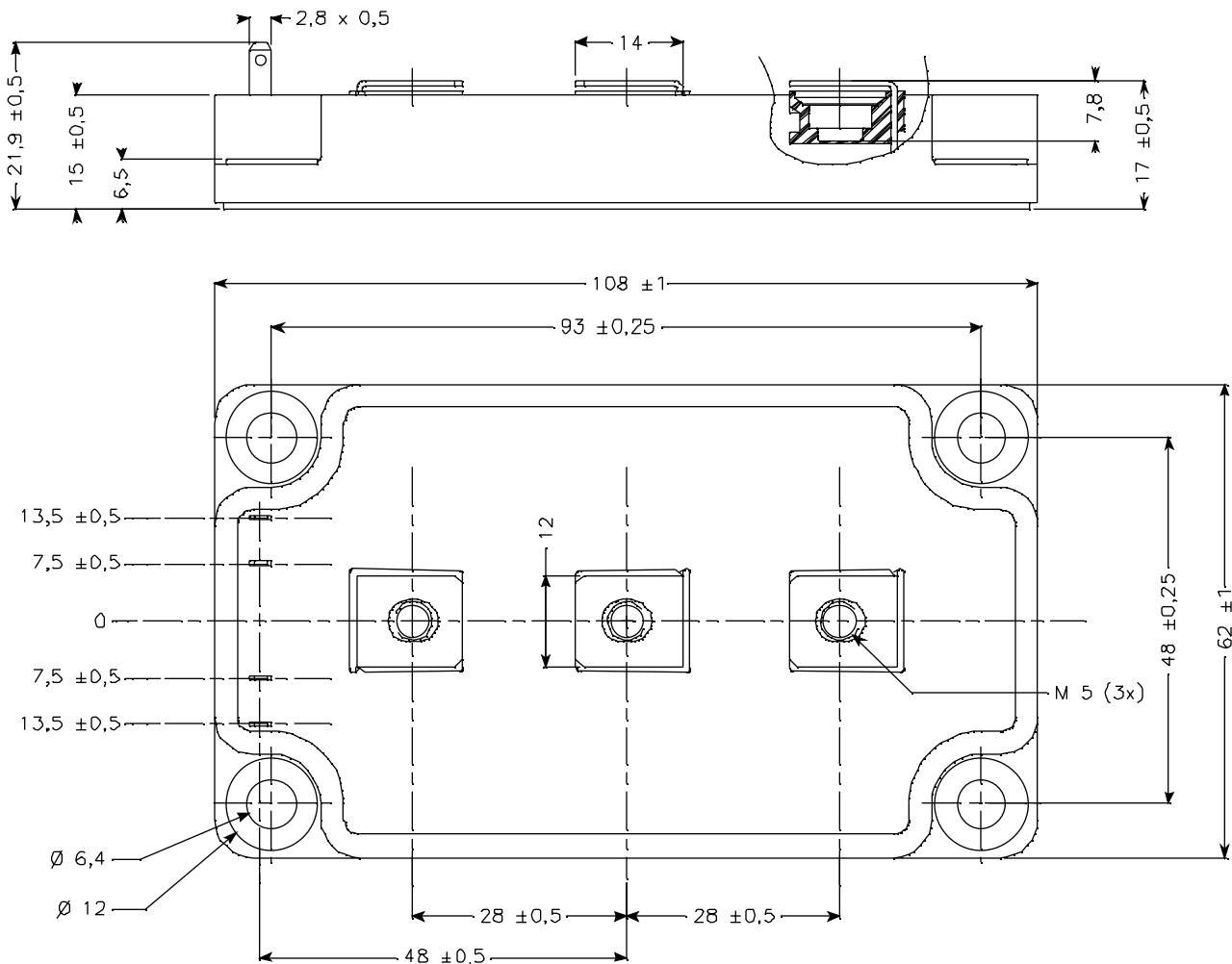
Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit	
I_S	Continuous Source current (Body diode)	$T_c = 25^\circ\text{C}$			180	A	
		$T_c = 80^\circ\text{C}$			135		
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = -180\text{A}$			1.3	V	
dv/dt	Peak Diode Recovery ①				15	V/ns	
t_{rr}	Reverse Recovery Time	$I_S = -180\text{A}$ $V_R = 333\text{V}$ $di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$			270	ns
			$T_j = 125^\circ\text{C}$			540	
Q_{rr}	Reverse Recovery Charge	$I_S = -180\text{A}$ $V_R = 333\text{V}$ $di/dt = 400\text{A}/\mu\text{s}$	$T_j = 25^\circ\text{C}$		10.4	μC	
			$T_j = 125^\circ\text{C}$		38.4		

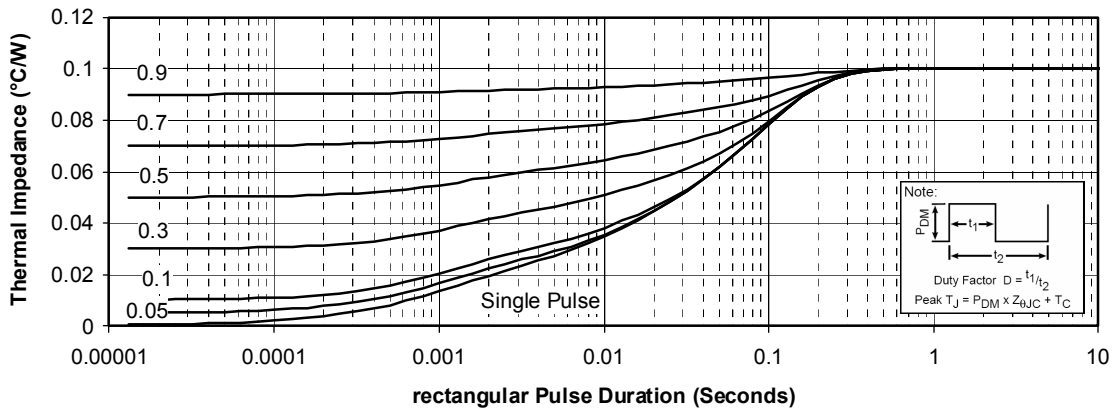
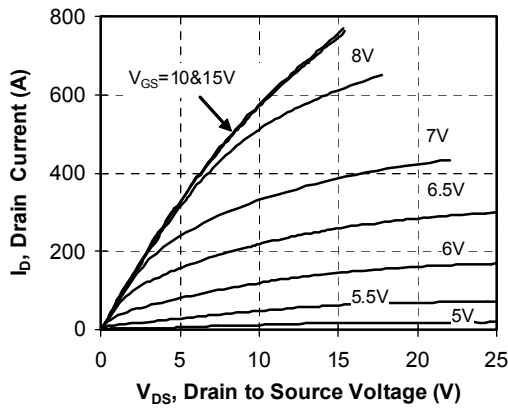
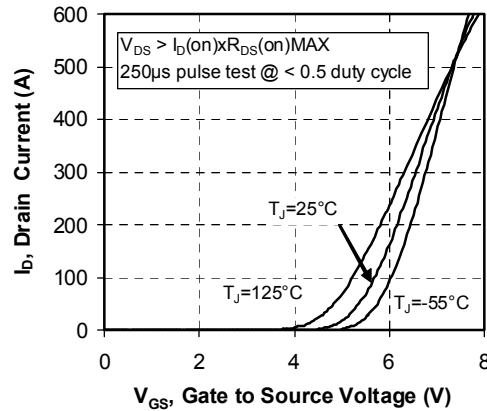
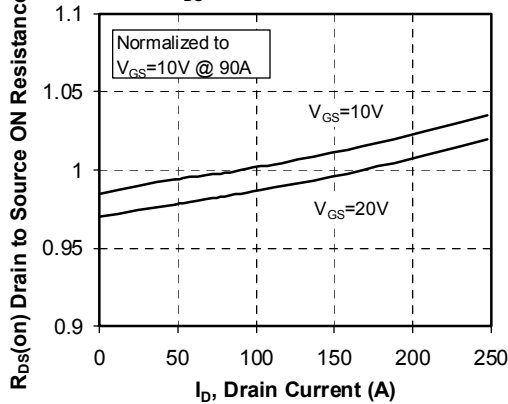
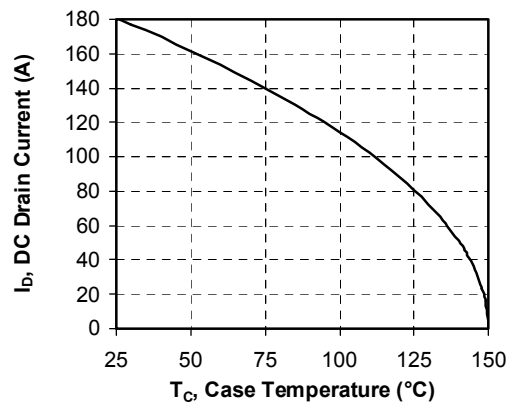
 ① dv/dt numbers reflect the limitations of the circuit rather than the device itself.

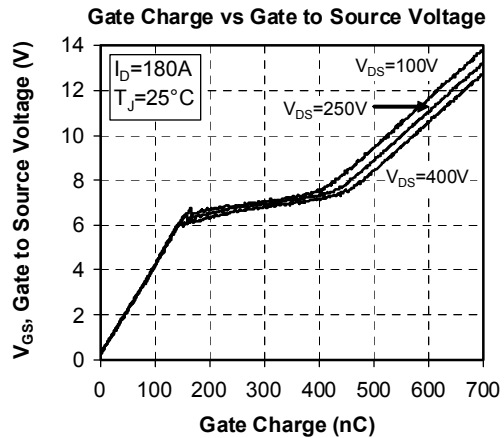
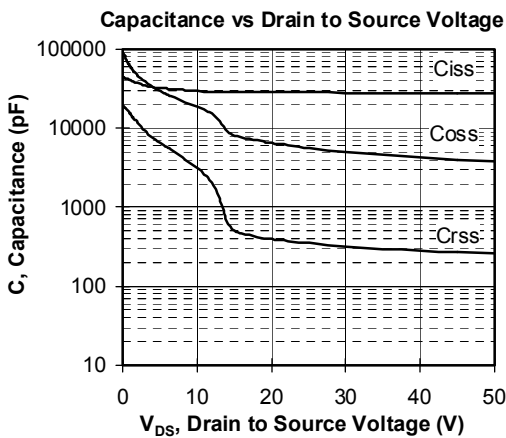
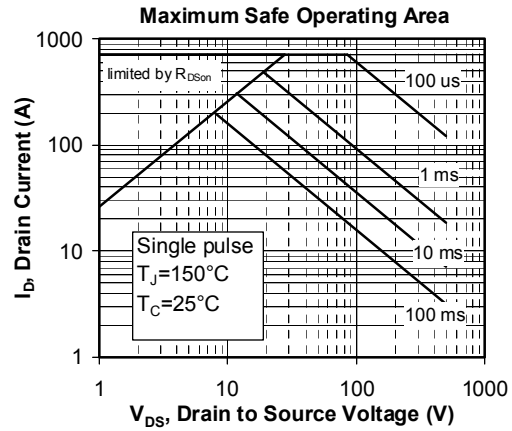
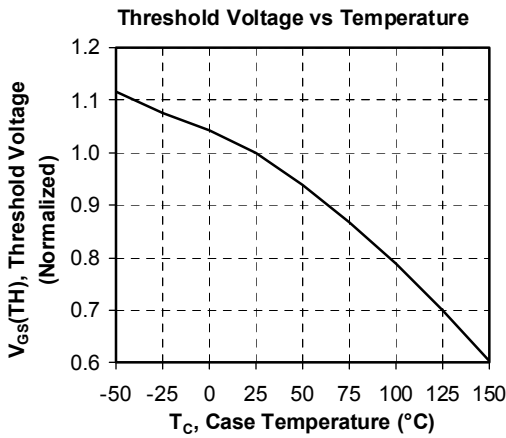
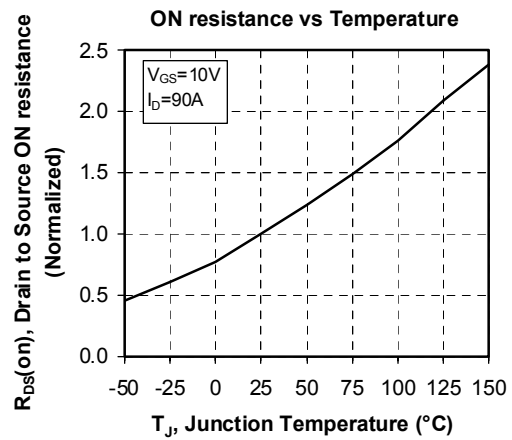
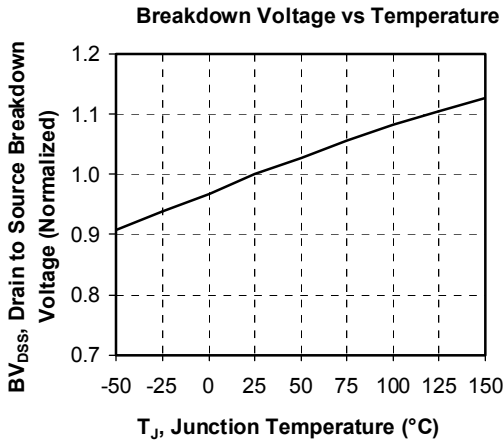
 $I_S \leq -180\text{A}$ $di/dt \leq 700\text{A}/\mu\text{s}$ $V_R \leq V_{DSS}$ $T_j \leq 150^\circ\text{C}$

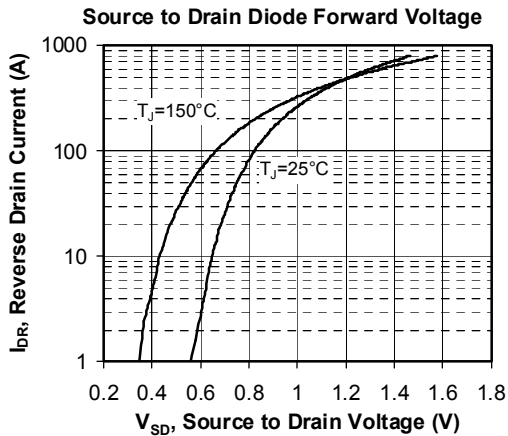
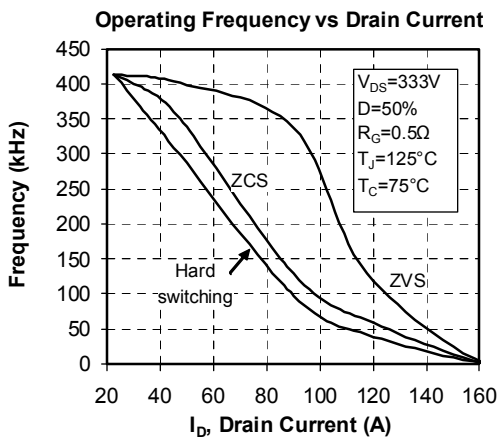
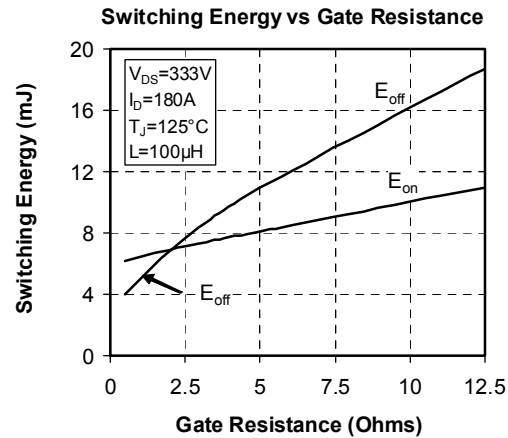
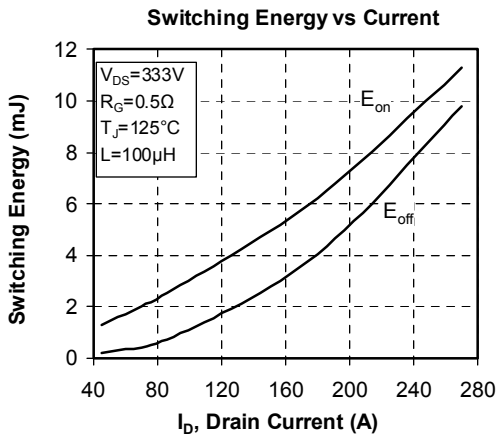
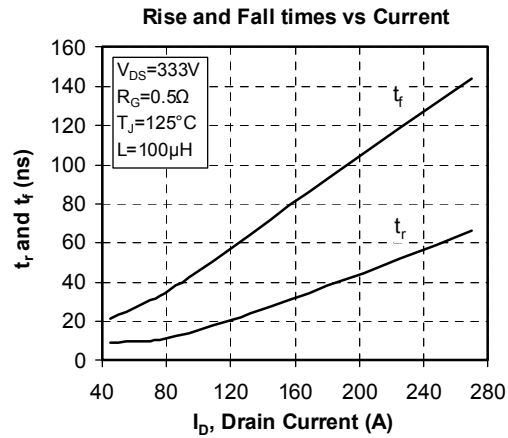
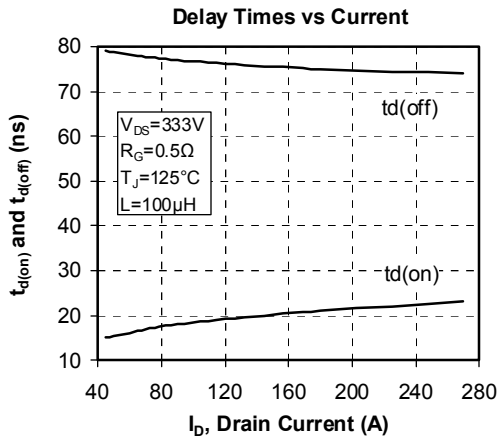
Thermal and package characteristics
Symbol Characteristic

		<i>Min</i>	<i>Typ</i>	<i>Max</i>	<i>Unit</i>	
R_{thJC}	Junction to Case Thermal Resistance			0.1	°C/W	
V_{ISOL}	RMS Isolation Voltage, any terminal to case $t=1$ min, $I_{isol}<1$ mA, 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	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
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration

Low Voltage Output Characteristics

Transfer Characteristics

 $R_{DS(on)}$ vs Drain Current

DC Drain Current vs Case Temperature






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