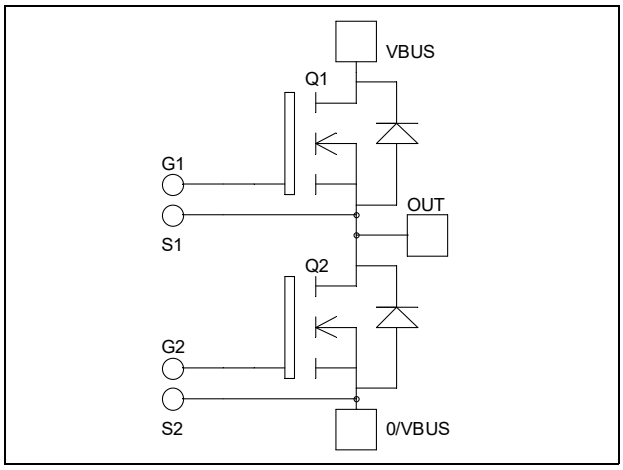
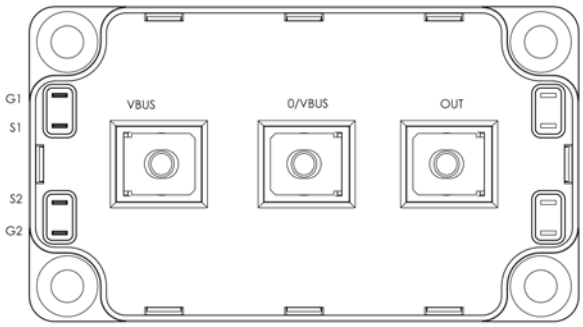
APTM50AM17FG

Phase leg MOSFET Power Module

V_{DSS} = 500V
R_{DSon} = 17mΩ typ @ Tj = 25°C
I_D = 180A @ Tc = 25°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
- 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

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		500	V
I_D	Continuous Drain Current	T_c = 25°C	180	A
		T_c = 80°C	135	
I_{DM}	Pulsed Drain current		720	
V_{GS}	Gate - Source Voltage		±30	V
R_{DSon}	Drain - Source ON Resistance		20	mΩ
P_D	Power Dissipation	T_c = 25°C	1250	W
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.

Electrical Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V, V_{DS} = 500V			400	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 10V, I_D = 90A		17	20	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10mA	3		5	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = ±30 V, V_{DS} = 0V			±200	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 25V f = 1MHz		28		nF
C_{oss}	Output Capacitance			5.6		
C_{rss}	Reverse Transfer Capacitance			0.36		
Q_g	Total gate Charge	V_{GS} = 10V V_{Bus} = 250V I_D = 180A		560		nC
Q_{gs}	Gate – Source Charge			160		
Q_{gd}	Gate – Drain Charge			280		
$T_{d(on)}$	Turn-on Delay Time	**Inductive switching @ 125°C** V_{GS} = 15V V_{Bus} = 333V I_D = 180A R_G = 0.5Ω		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} = 15V, V_{Bus} = 333V I_D = 180A, R_G = 0.5Ω		4140		µJ
E_{off}	Turn-off Switching Energy			3380		
E_{on}	Turn-on Switching Energy	**Inductive switching @ 125°C** V_{GS} = 15V, V_{Bus} = 333V I_D = 180A, R_G = 0.5Ω		6224		µJ
E_{off}	Turn-off Switching Energy			4052		
R_{thJC}	Junction to Case Thermal Resistance				0.1	°C/W

Source - Drain diode ratings and characteristics

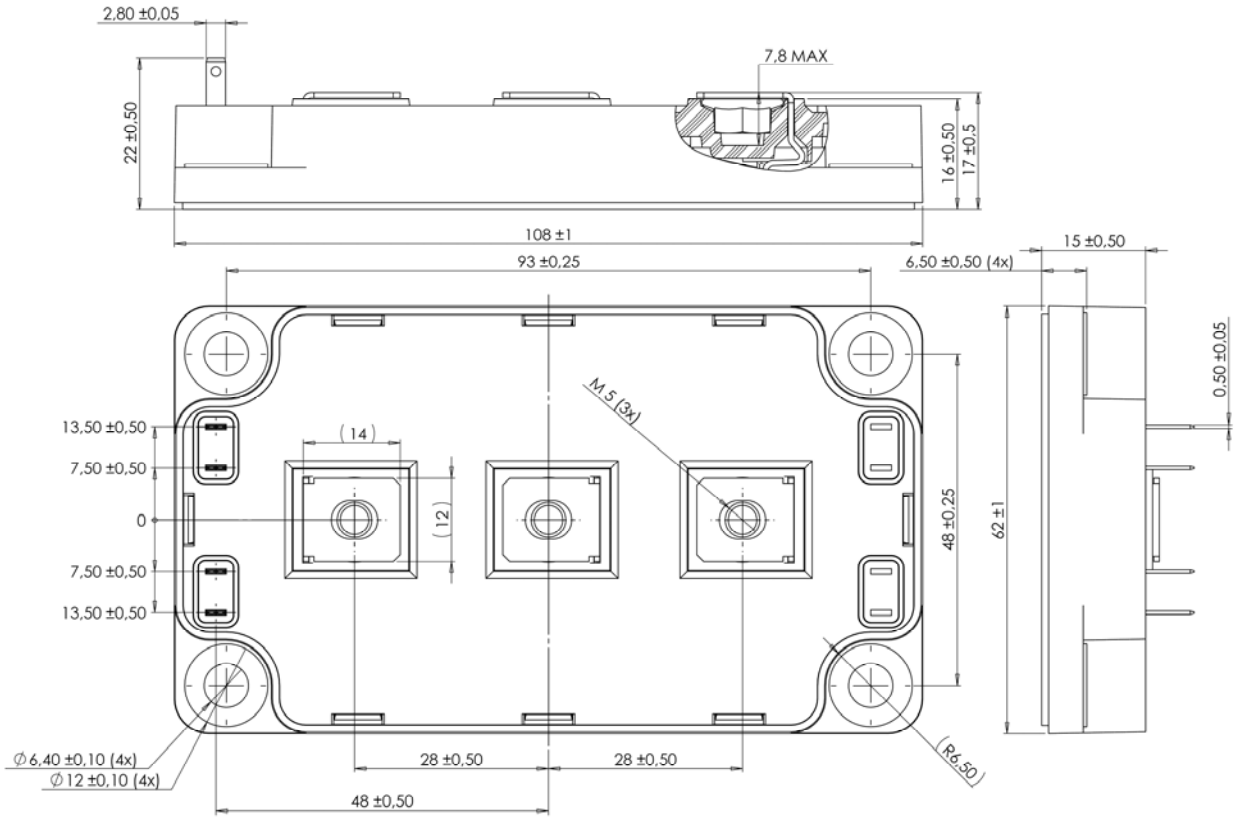
Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_S	Continuous Source current (Body diode)		Tc = 25°C			180	A
			Tc = 80°C			135	
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_S = - 180A				1.3	V
dv/dt	Peak Diode Recovery ❶					15	V/ns
t_{rr}	Reverse Recovery Time	I_S = -180A V_R = 333V di_S/dt = 400A/µs	T_j = 25°C			270	ns
			T_j = 125°C			540	
Q_{rr}	Reverse Recovery Charge		T_j = 25°C		10.4		µC
			T_j = 125°C		38.4		

❶ dv/dt numbers reflect the limitations of the circuit rather than the device itself.
$I_S \le$ - 180A di/dt ≤ 700A/µs $V_R \le V_{DSS}$ $T_j \le$ 150°C

Thermal and package characteristics

Symbol	*Characteristic*			*Min*	*Max*	*Unit*
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range			-40	150	°C
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M6	3	5	N.m
		For terminals	M5	2	3.5	
Wt	Package Weight				300	g

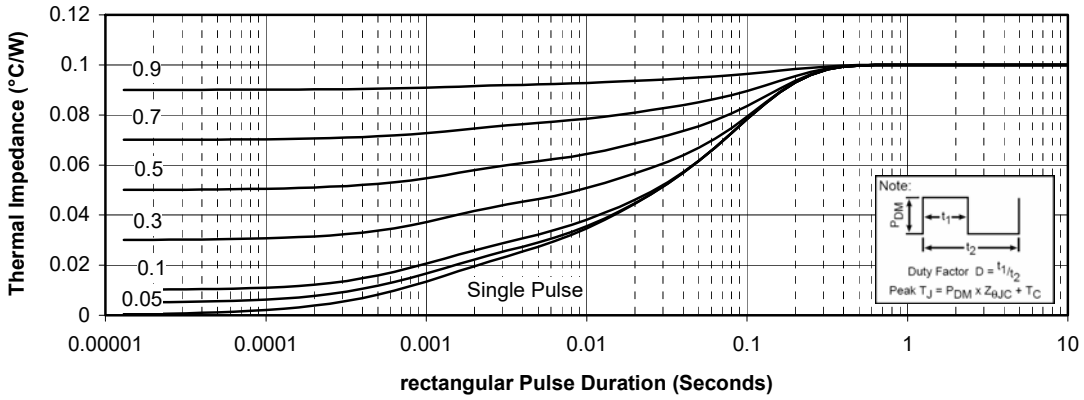
Package outline (dimensions in mm)



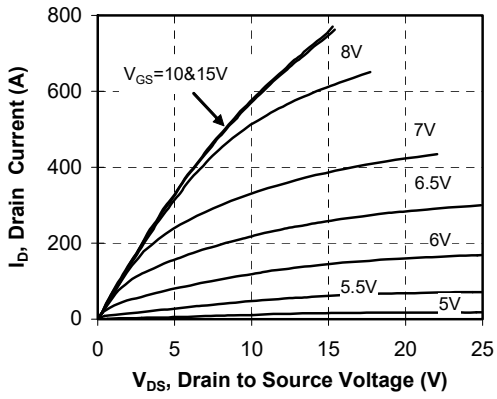
See application note APT0601 - Mounting Instructions for SP6 Power Modules on www.microsemi.com

Typical Performance Curve

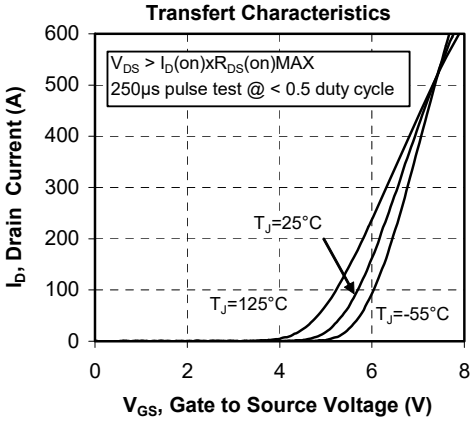
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



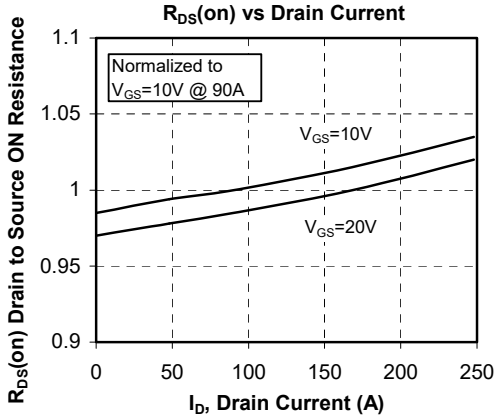
Low Voltage Output Characteristics



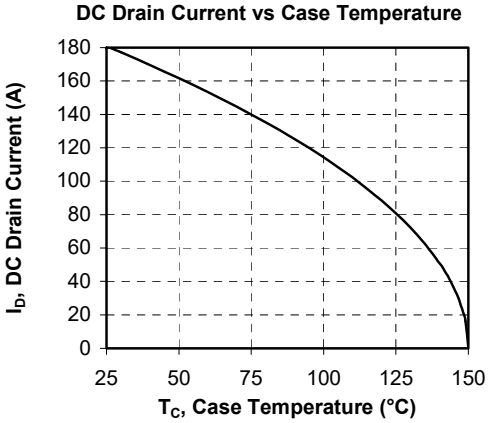
Transfert Characteristics



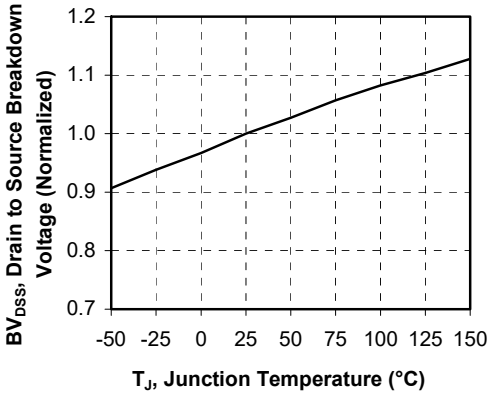
R_{DS}(on) vs Drain Current



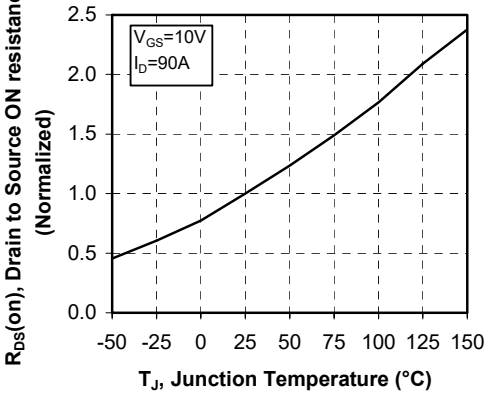
DC Drain Current vs Case Temperature



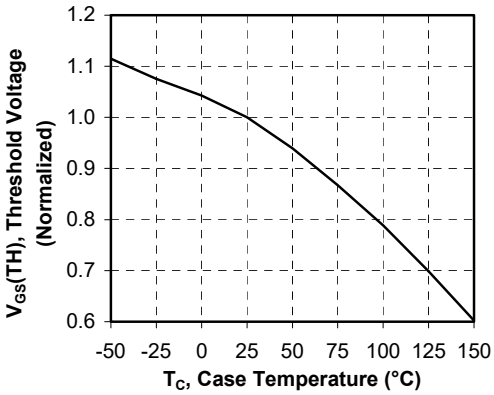
Breakdown Voltage vs Temperature



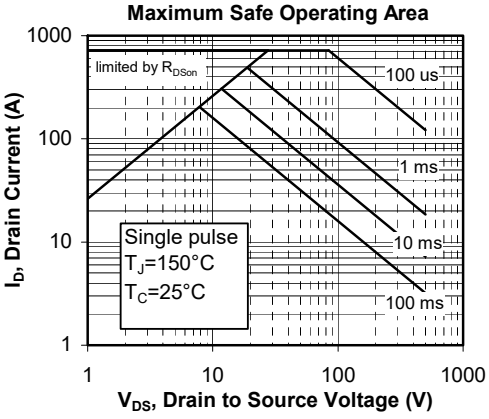
ON resistance vs Temperature



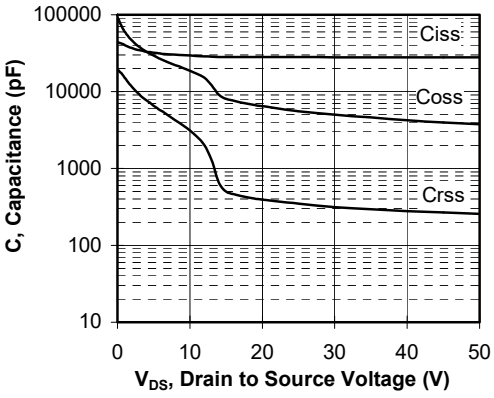
Threshold Voltage vs Temperature



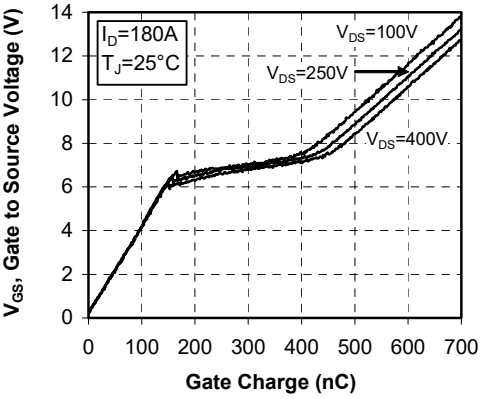
Maximum Safe Operating Area



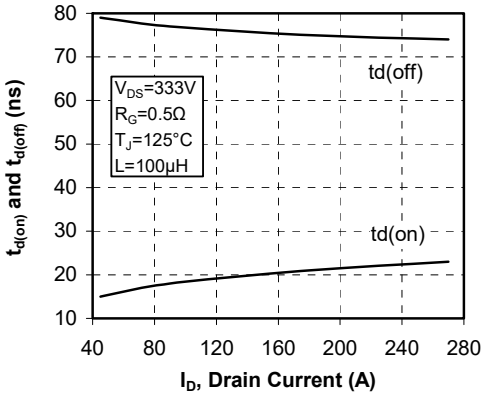
Capacitance vs Drain to Source Voltage



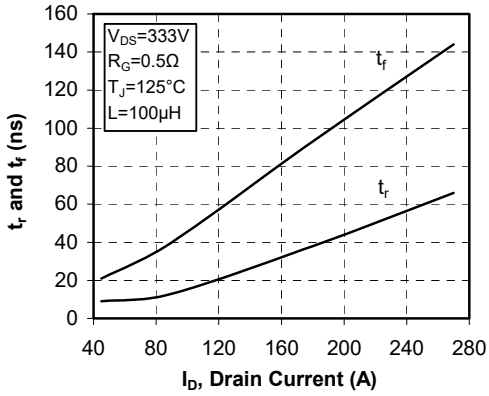
Gate Charge vs Gate to Source Voltage



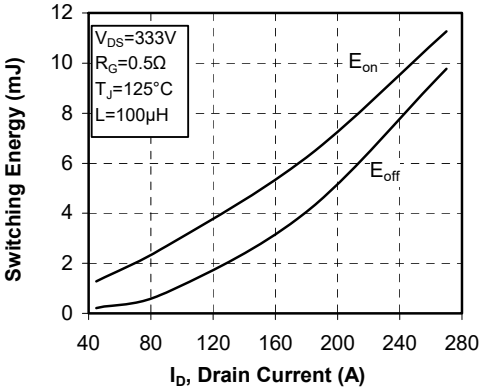
Delay Times vs Current



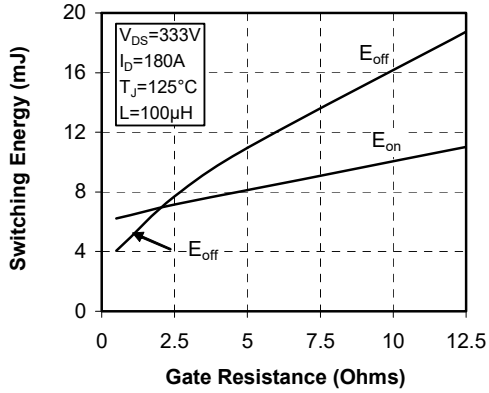
Rise and Fall times vs Current



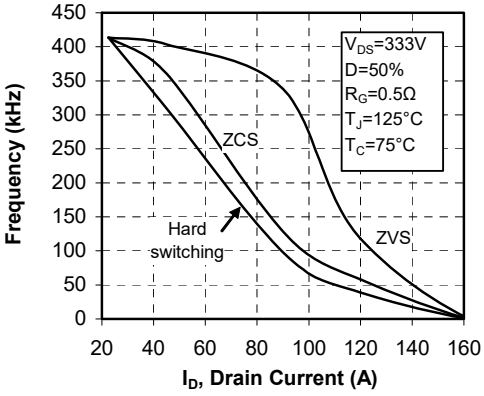
Switching Energy vs Current



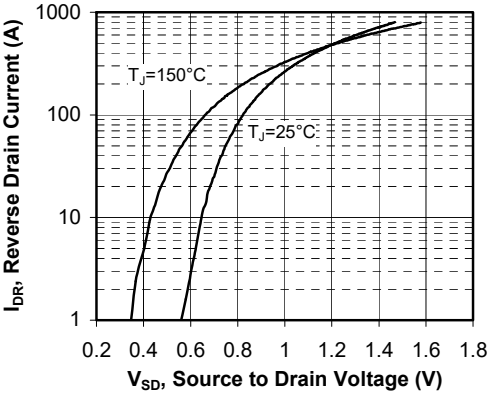
Switching Energy vs Gate Resistance



Operating Frequency vs Drain Current



Source to Drain Diode Forward Voltage



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