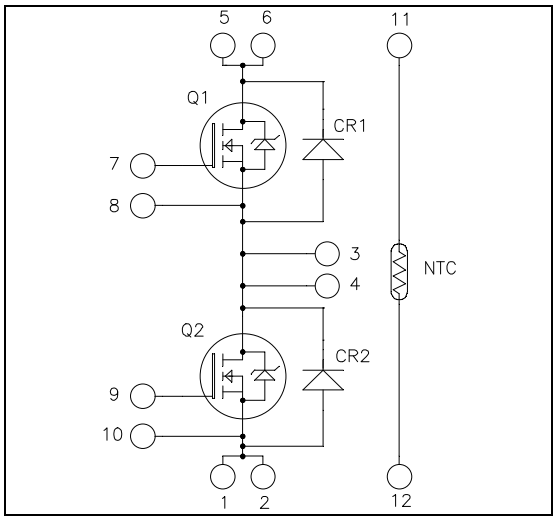
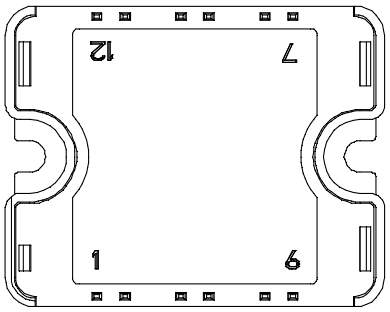
APTMC170AM30CT1AG

Phase leg SiC MOSFET Power Module

V_{DSS} = 1700V
R_{DSon} = 35mΩ max @ Tj = 25°C
I_D = 100A @ Tc = 25°C





Pins 1/2 ; 3/4 ; 5/6 must be shorted together

Application

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

Features

- ***SiC Power MOSFET***
  - High speed switching
  - Low $R_{DS(on)}$
  - Ultra low loss
- ***SiC Schottky Diode***
  - Zero reverse recovery
  - Zero forward recovery
  - Temperature Independent switching behavior
  - Positive temperature coefficient on VF
- Very low stray inductance
- Kelvin source for easy drive
- Internal thermistor for temperature monitoring
- 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
- Solderable terminals both for power and signal for easy PCB mounting
- Low profile
- RoHS Compliant

All ratings @ T_j = 25°C unless otherwise specified

Absolute maximum ratings (per SiC MOSFET)

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		1700	V
I_D	Continuous Drain Current	T_c = 25°C	100	A
		T_c = 80°C	74	
I_{DM}	Pulsed Drain current		200	
V_{GS}	Gate - Source Voltage		-10/25	V
V_{GSOP}	Gate - Source Voltage ; recommended operation values		-5/20	
R_{DSon}	Drain - Source ON Resistance		35	mΩ
P_D	Power Dissipation	T_c = 25°C	700	W

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.

Electrical Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V , V_{DS} = 1700V				200	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 20V, I_D = 100A	T_j = 25°C		22.5	35	mΩ
			T_j = 150°C		45		
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 36mA		2	2.4	4	V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V				1.2	µA

Dynamic Characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 1000V f = 1MHz			7344		pF
C_{oss}	Output Capacitance				342		
C_{rss}	Reverse Transfer Capacitance				14		
Q_g	Total gate Charge	V_{GS} = -5/+20V V_{Bus} = 900V I_D = 100A			380		nC
Q_{gs}	Gate – Source Charge				74		
Q_{gd}	Gate – Drain Charge				140		
$T_{d(on)}$	Turn-on Delay Time	V_{GS} = -5/+20V V_{Bus} = 900V I_D =100A R_{Gext} = 10Ω			105		ns
T_r	Rise Time				75		
$T_{d(off)}$	Turn-off Delay Time				210		
T_f	Fall Time				55		
E_{on}	Turn on Energy	Inductive Switching V_{GS} = -5/+20V V_{Bus} = 900V I_D = 100A R_{Gext} = 10Ω	T_j = 150°C		4.4		mJ
E_{off}	Turn off Energy		T_j = 150°C		3		
R_{Gint}	Internal gate resistance				3.15		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.18	°C/W

Body diode ratings and characteristics (per SiC MOSFET)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	V_{GS} = -5V I_{SD} = 50A	T_j = 25°C		4.1		V
			T_j = 150°C		3.6		
t_{rr}	Reverse Recovery Time	I_{SD} = 100A ; V_{GS} = -5V V_R = 900V ; di_F/dt = 2800A/µs			70		ns
Q_{rr}	Reverse Recovery Charge				1		µC
I_{rr}	Reverse Recovery Current				28		A

SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					1700	V
I_{RRM}	Reverse Leakage Current	V_R=1700V	T_j = 25°C		40	200	µA
			T_j = 175°C		200	800	
I_F	DC Forward Current		Tc = 125°C		50		A
V_F	Diode Forward Voltage	I_F = 50A	T_j = 25°C		1.8	2	V
			T_j = 175°C		3.2	4	
Q_C	Total Capacitive Charge	I_F = 50A, V_R = 1700V di/dt =800A/µs			340		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			400		pF
		f = 1MHz, V_R = 400V			280		
R_{thJC}	Junction to Case Thermal Resistance					0.24	°C/W

Temperature sensor NTC (see application note APT0406 on www.microsemi.com).

Symbol	Characteristic		Min	Typ	Max	Unit
R_{25}	Resistance @ 25°C			50		kΩ
$\Delta R_{25}/R_{25}$				5		%
$B_{25/85}$	T_{25} = 298.15 K			3952		K
ΔB/B		T_C=100°C		4		%

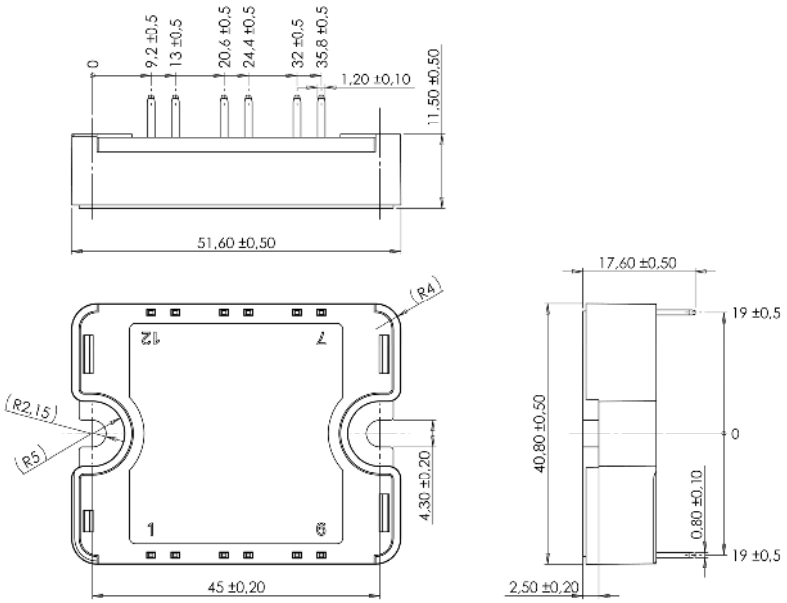
$$R_T = \frac{R_{25}}{\exp\left[B_{25/85}\left(\frac{1}{T_{25}} - \frac{1}{T}\right)\right]}$$

T: Thermistor temperature
R_T: Thermistor value at T

Thermal and package characteristics

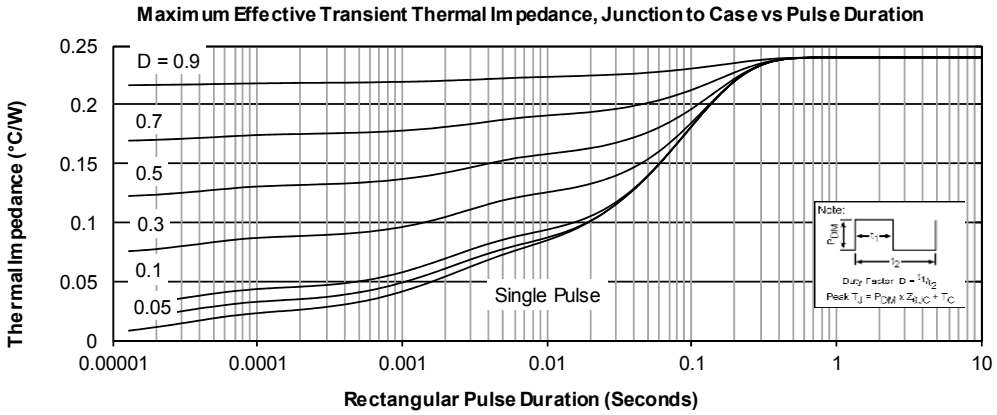
Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range	SiC MOSFET		-40	150	°C
		SiC diode		-40	175	
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	125	
Torque	Mounting torque	To heatsink	M4	2	3	N.m
Wt	Package Weight				80	g

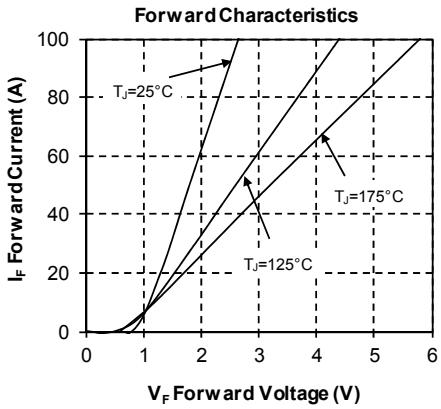
Package outline (dimensions in mm)

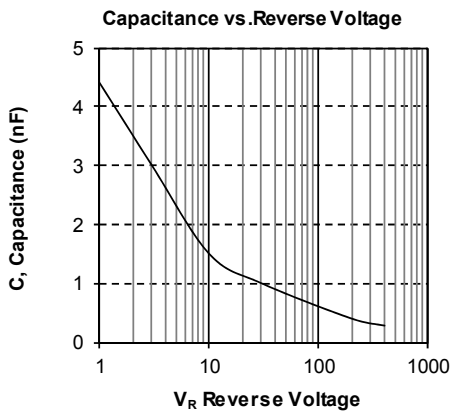


See application note 1904 - Mounting Instructions for SP1 Power Modules on www.microsemi.com

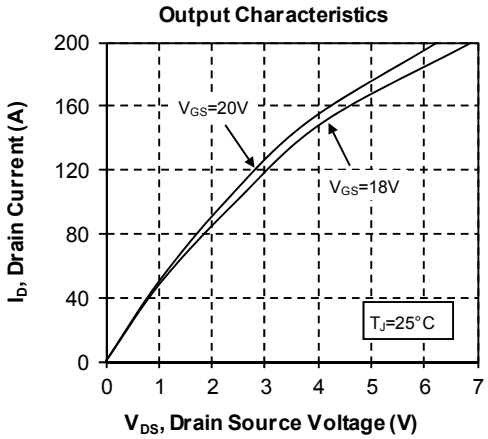
Typical SiC diode Performance Curve

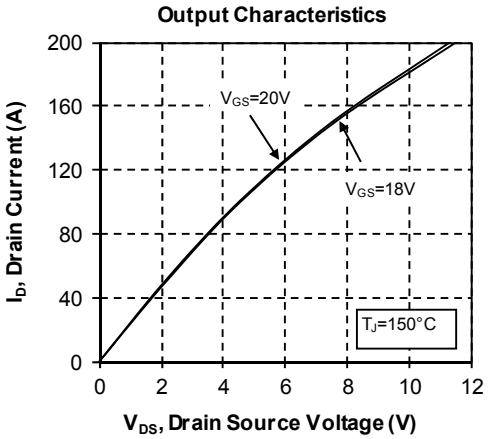


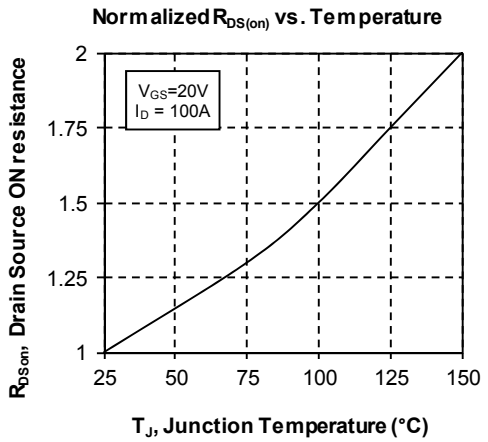


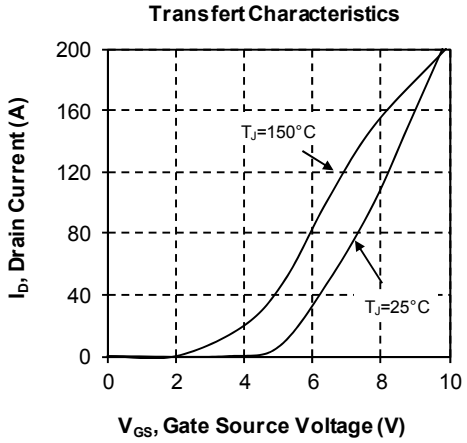


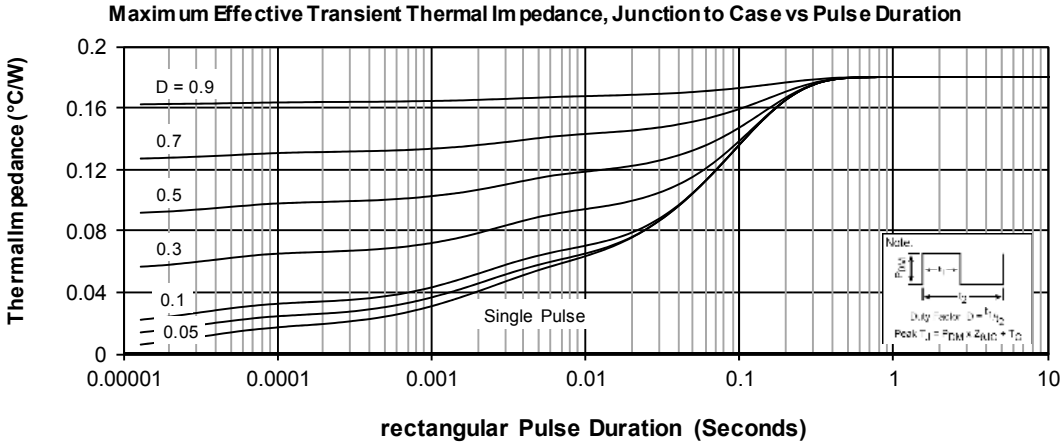
Typical SiC MOSFET Performance Curve



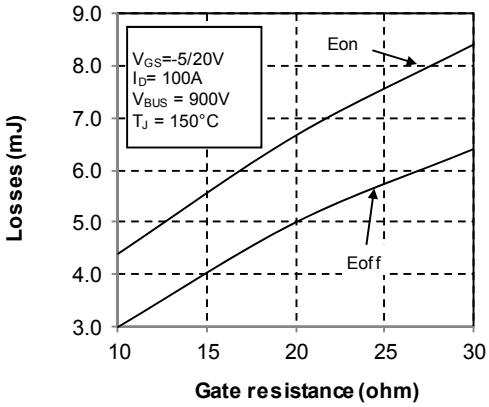




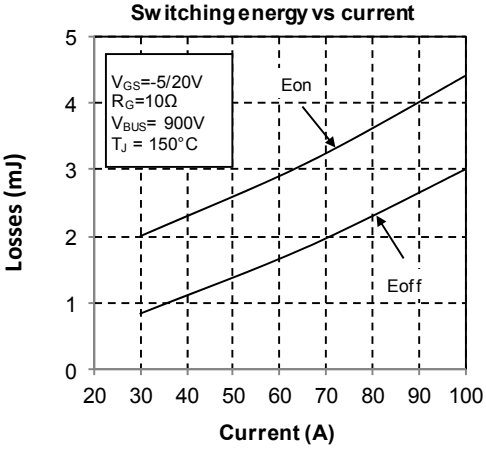




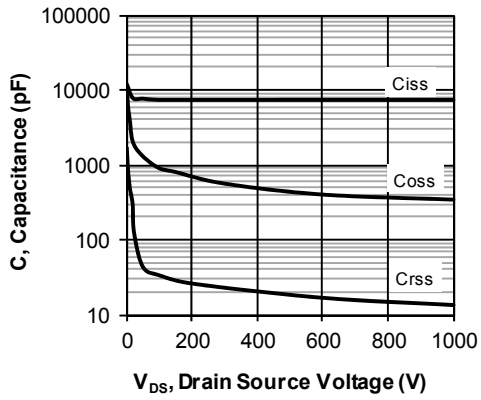
Switching energy vs Rg



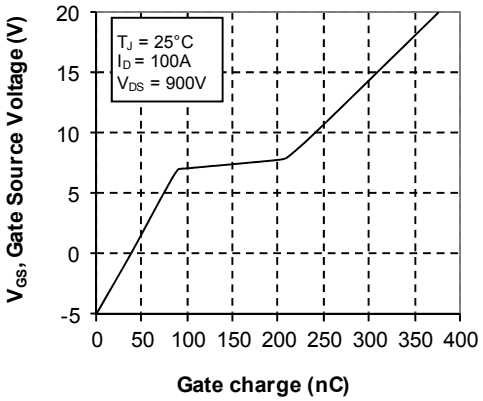
Switching energy vs current



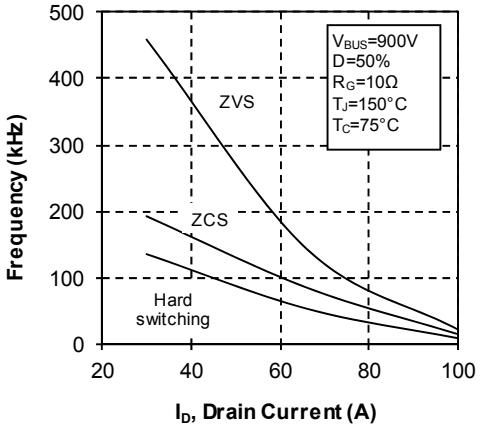
Capacitance vs Drain to Source Voltage



Gate charge characteristics



Operating Frequency vs Drain Current



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