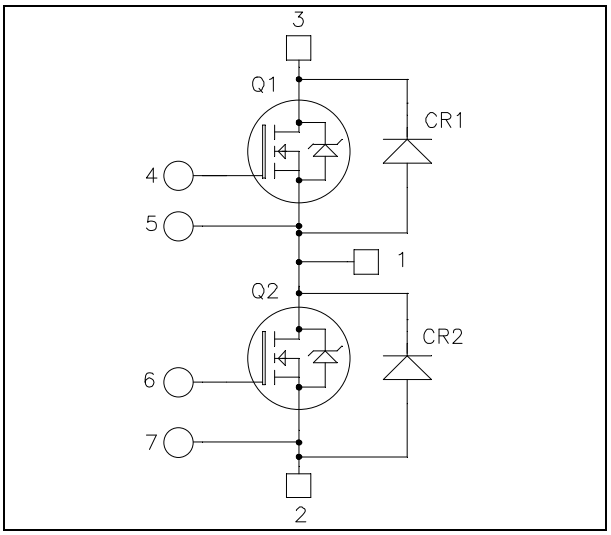
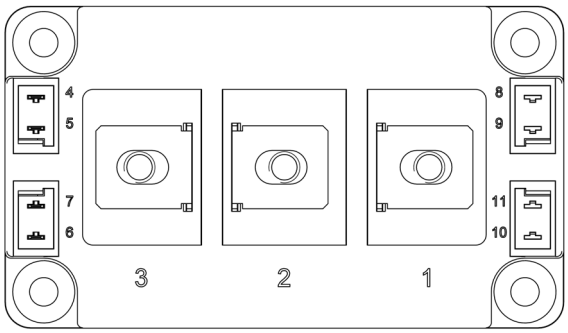
APTMC120AM16CD3AG

Phase leg
SiC MOSFET Power Module

V_{DSS} = 1200V
R_{DSon} = 16mΩ typ @ Tj = 25°C
I_D = 98A @ Tc = 25°C





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
- Kelvin emitter for easy drive
- High level of integration
- AlN substrate for improved thermal performance
- M6 power connectors

Benefits

- Stable temperature behavior
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- 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		1200	V
I_D	Continuous Drain Current	T_c = 25°C	131	A
		T_c = 80°C	98	
I_{DM}	Pulsed Drain current		262	
V_{GS}	Gate - Source Voltage		-10/25V	V
R_{DSon}	Drain - Source ON Resistance		20	mΩ
P_D	Maximum Power Dissipation	T_c = 25°C	625	W

CAUTION: These Devices are sensitive to Electrostatic Discharge. Proper Handling Procedures Should Be Followed.
See application note APT0502 on www.microsemi.com

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} = 1200V				500	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 20V I_D = 100A	T_j = 25°C		16	20	mΩ
			T_j = 150°C		30	42	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 5mA		1.7	2.2		V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V				1.25	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			4.75		nF
C_{oss}	Output Capacitance				0.4		
C_{rss}	Reverse Transfer Capacitance				0.033		
Q_g	Total gate Charge	V_{GS} = 0/+20V V_{Bus} = 800V I_D = 100A			246		nC
Q_{gs}	Gate – Source Charge				54		
Q_{gd}	Gate – Drain Charge				90		
$T_{d(on)}$	Turn-on Delay Time	V_{GS} = -5/+20V V_{Bus} = 800V I_D =100A ; T_J =150°C R_L = 8Ω ; R_{Gext} = 10Ω			20		ns
T_r	Rise Time				20		
$T_{d(off)}$	Turn-off Delay Time				75		
T_f	Fall Time				35		
E_{on}	Turn on Energy	Inductive Switching V_{GS} = -5/+20V V_{Bus} = 600V I_D = 100A R_{Gext} = 10Ω	T_j = 150°C		2.2		mJ
E_{off}	Turn off Energy		T_j = 150°C		1.25		
R_{Gint}	Internal gate resistance				1.9		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.20	°C/W

Source - Drain 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		3.3		V
		V_{GS} = -2V, I_{SD} = 50A		3.1		
t_{rr}	Reverse Recovery Time	I_{SD} = 100A ; V_{GS} = -5V V_R = 800V ; di_F/dt = 1750A/µs		40		ns
Q_{rr}	Reverse Recovery Charge			825		nC
I_{rr}	Reverse Recovery Current			32		A

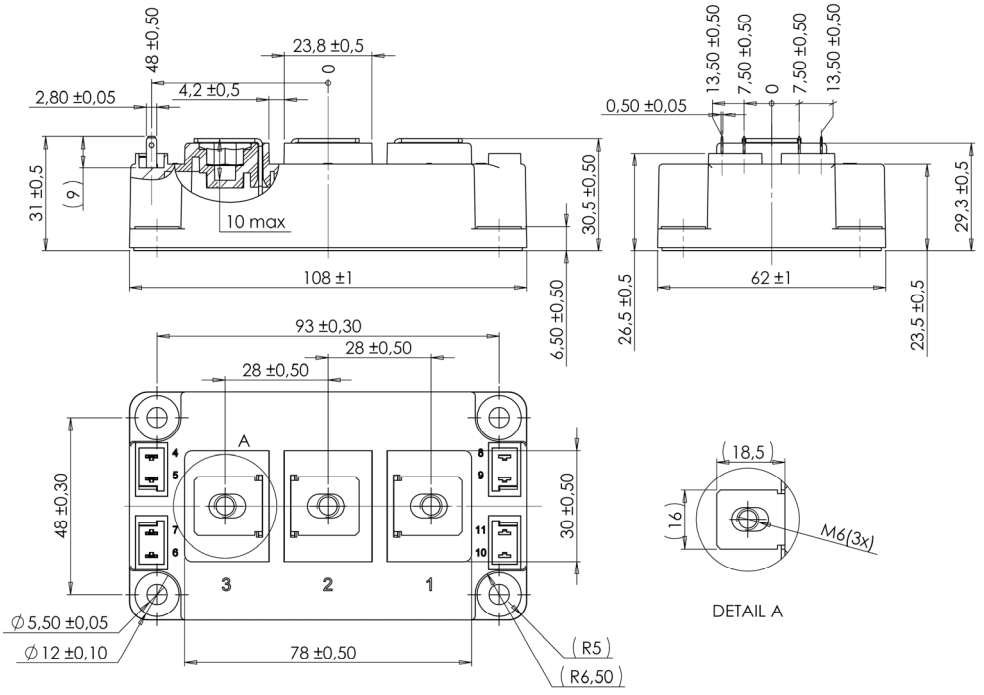
SiC schottky diode ratings and characteristics (per SiC diode)

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
V_{RRM}	Peak Repetitive Reverse Voltage					1200	V
I_{RRM}	Reverse Leakage Current	V_R=1200V	T_j = 25°C		192	1200	µA
			T_j = 175°C		336	6000	
I_F	DC Forward Current		Tc = 125°C		60		A
V_F	Diode Forward Voltage	I_F = 60A	T_j = 25°C		1.6	1.8	V
			T_j = 175°C		2.3	3	
Q_C	Total Capacitive Charge	I_F = 60A, V_R = 1200V di/dt =2400A/µs			480		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			576		pF
		f = 1MHz, V_R = 800V			414		
R_{thJC}	Junction to Case Thermal Resistance					0.19	°C/W

Thermal and package characteristics

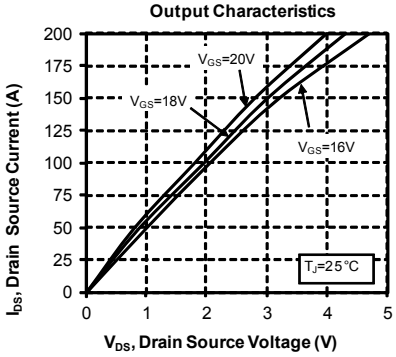
Symbol	Characteristic			Min	Max	Unit
V_{ISOL}	RMS Isolation Voltage, any terminal to case t =1 min, 50/60Hz			4000		V
T_J	Operating junction temperature range	SiC MOSFET		-40	150	°C
		SiC diode		-40	175	
T_{JOP}	Recommended junction temperature under switching conditions			-40	$T_J$max -25	
T_{STG}	Storage Temperature Range			-40	125	
T_C	Operating Case Temperature			-40	100	
Torque	Mounting torque	For terminals	M6	3	5	N.m
		To Heatsink	M6	3	5	
Wt	Package Weight				350	g

D3 Package outline (dimensions in mm)

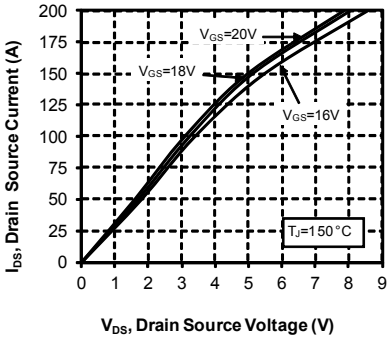


Typical SiC MOSFET Performance Curve

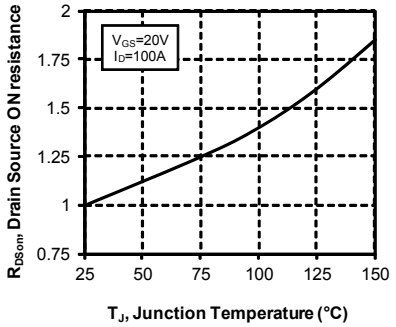
Output Characteristics



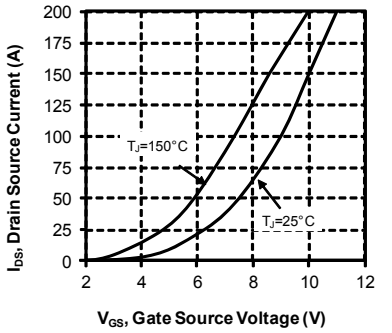
Output Characteristics



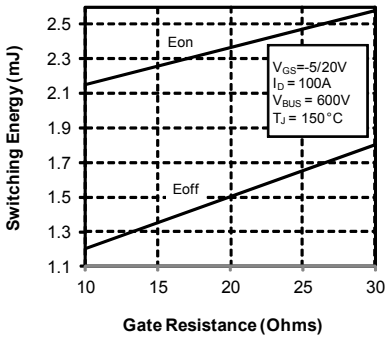
Normalized $R_{DS(on)}$ vs. Temperature



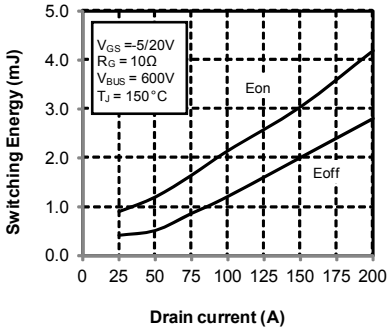
Transfert Characteristics



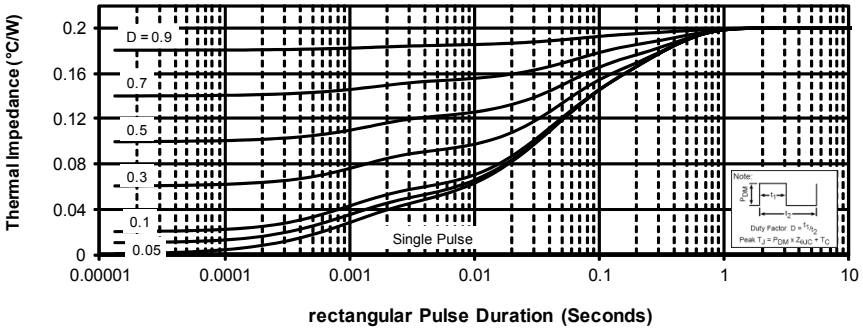
inductive switching energy vs RG



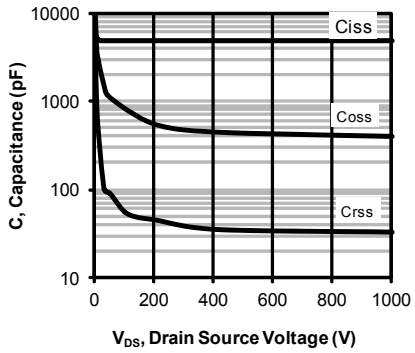
Inductive switching energy vs current



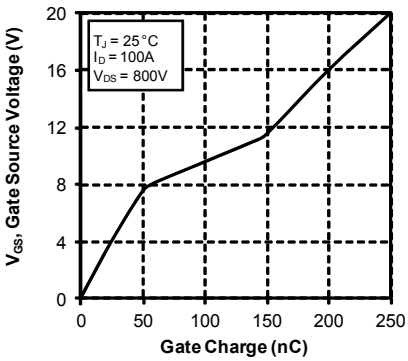
Maximum Effective Transient Thermal Impedance, Junction to Case vs Pulse Duration



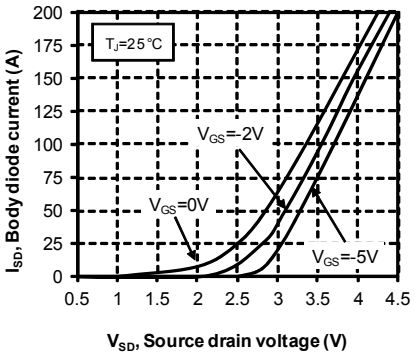
Capacitance vs Drain Source Voltage



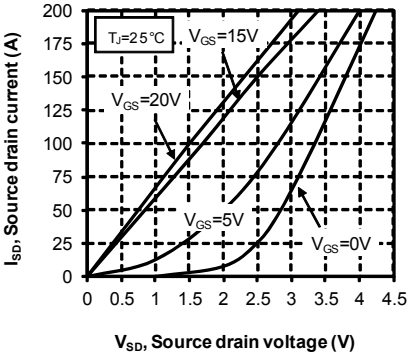
Gate Charge vs Gate Source Voltage



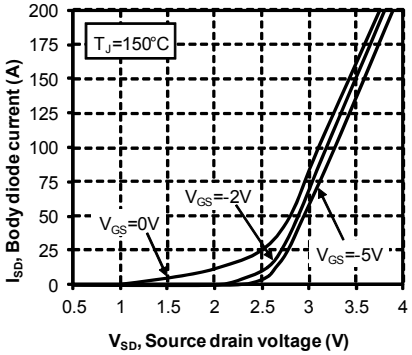
Body diode Characteristics



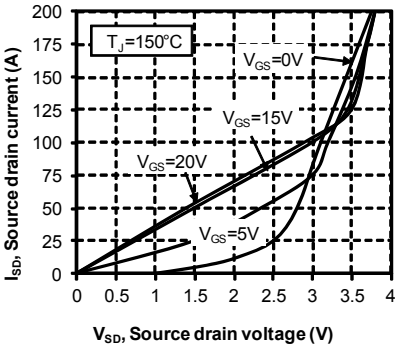
Output Characteristics



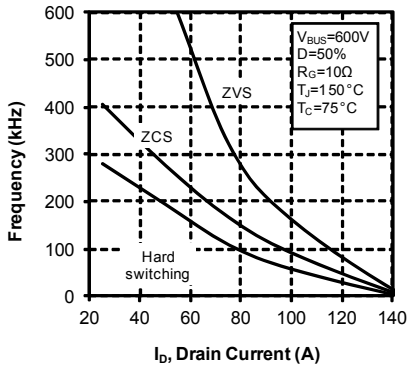
Body diode Characteristics



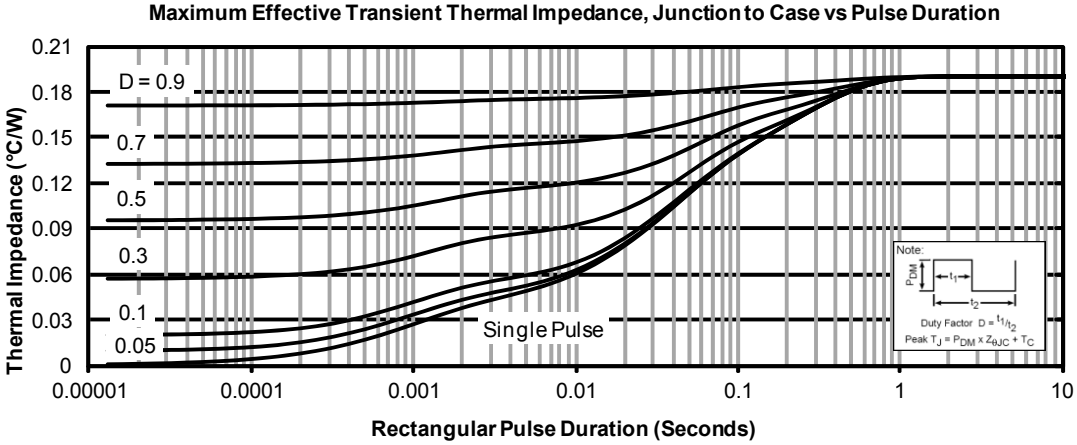
Output Characteristics

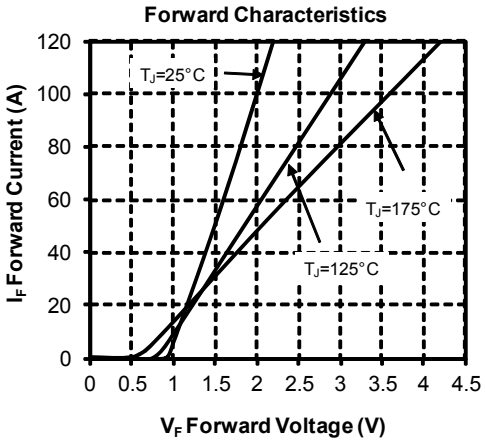


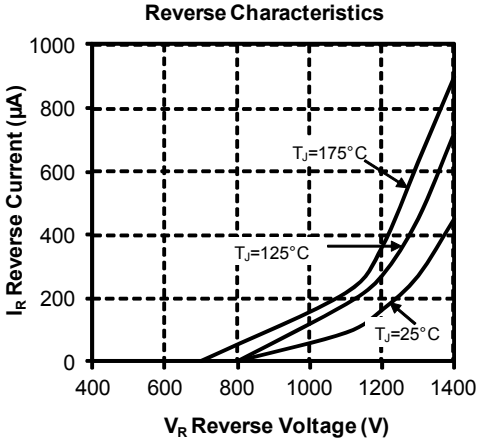
Operating Frequency vs Drain Current

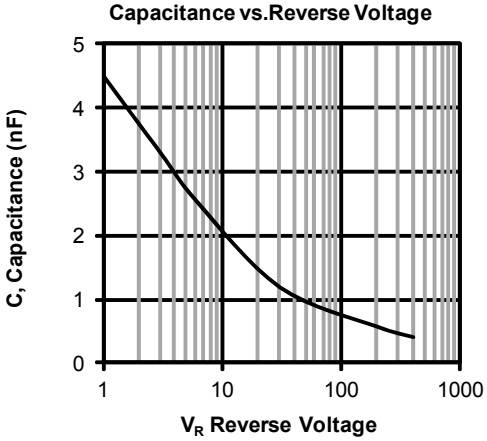


Typical SiC diode Performance Curve









DISCLAIMER

The information contained in the document (unless it is publicly available on the Web without access restrictions) is PROPRIETARY AND CONFIDENTIAL information of Microsemi and cannot be copied, published, uploaded, posted, transmitted, distributed or disclosed or used without the express duly signed written consent of Microsemi. If the recipient of this document has entered into a disclosure agreement with Microsemi, then the terms of such Agreement will also apply. This document and the information contained herein may not be modified, by any person other than authorized personnel of Microsemi. No license under any patent, copyright, trade secret or other intellectual property right is granted to or conferred upon you by disclosure or delivery of the information, either expressly, by implication, inducement, estoppels or otherwise. Any license under such intellectual property rights must be approved by Microsemi in writing signed by an officer of Microsemi.

Microsemi reserves the right to change the configuration, functionality and performance of its products at anytime without any notice. This product has been subject to limited testing and should not be used in conjunction with life-support or other mission-critical equipment or applications. Microsemi assumes no liability whatsoever, and Microsemi disclaims any express or implied warranty, relating to sale and/or use of Microsemi products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright or other intellectual property right. Any performance specifications believed to be reliable but are not verified and customer or user must conduct and complete all performance and other testing of this product as well as any user or customers final application. User or customer shall not rely on any data and performance specifications or parameters provided by Microsemi. It is the customer's and user's responsibility to independently determine suitability of any Microsemi product and to test and verify the same. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the User. Microsemi specifically disclaims any liability of any kind including for consequential, incidental and punitive damages as well as lost profit. The product is subject to other terms and conditions which can be located on the web at http://www.microsemi.com/legal/tnc.asp

Life Support Application

Seller's Products are not designed, intended, or authorized for use as components in systems intended for space, aviation, surgical implant into the body, in other applications intended to support or sustain life, or for any other application in which the failure of the Seller's Product could create a situation where personal injury, death or property damage or loss may occur (collectively "Life Support Applications").
Buyer agrees not to use Products in any Life Support Applications and to the extent it does it shall conduct extensive testing of the Product in such applications and further agrees to indemnify and hold Seller, and its officers, employees, subsidiaries, affiliates, agents, sales representatives and distributors harmless against all claims, costs, damages and expenses, and attorneys' fees and costs arising, directly or directly, out of any claims of personal injury, death, damage or otherwise associated with the use of the goods in Life Support Applications, even if such claim includes allegations that Seller was negligent regarding the design or manufacture of the goods.

Buyer must notify Seller in writing before using Seller's Products in Life Support Applications. Seller will study with Buyer alternative solutions to meet Buyer application specification based on Sellers sales conditions applicable for the new proposed specific part.