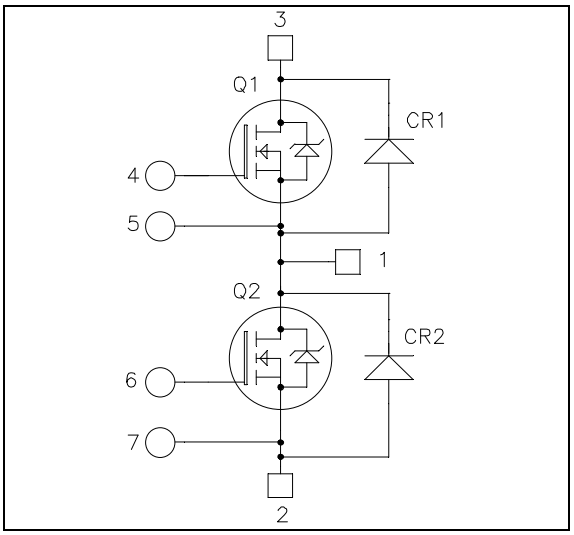
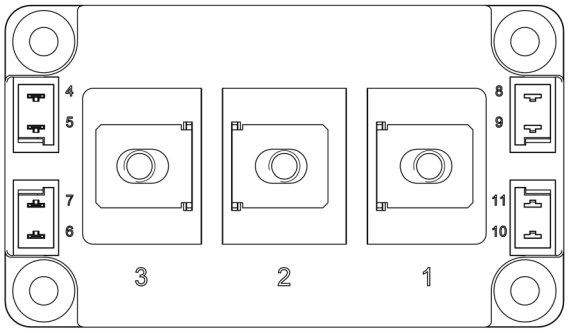
APTSM120AM14CD3AG

Phase leg
Full SiC Power Module

V_{DSS} = 1200V
R_{DSon} = 14mΩ typ @ Tj = 25°C
I_D = 180A @ Tc = 25°C





Application

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

Features

- ***SiC Power MOSFET***
  - Low $R_{DS(on)}$
  - High temperature performance
- ***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
- Very rugged
- 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

Symbol	*Parameter*		*Max ratings*	*Unit*
V_{DSS}	Drain - Source Voltage		1200	V
I_D	Continuous Drain Current	T_c = 25°C	225	A
		T_c = 80°C	180	
I_{DM}	Pulsed Drain current		450	
V_{GS}	Gate - Source Voltage		-10/25V	V
R_{DSon}	Drain - Source ON Resistance		17	mΩ
P_D	Power Dissipation	T_c = 25°C	1430	W

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

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Electrical Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
I_{DSS}	Zero Gate Voltage Drain Current	V_{GS} = 0V , V_{DS} = 1200V			60	600	µA
$R_{DS(on)}$	Drain – Source on Resistance	V_{GS} = 20V, I_D = 120A	T_j = 25°C		14	17	mΩ
			T_j = 175°C		23		
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 6mA		1.7	3		V
I_{GSS}	Gate – Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V				600	nA

Dynamic Characteristics

Symbol	Characteristic	Test Conditions		Min	Typ	Max	Unit
C_{iss}	Input Capacitance	V_{GS} = 0V V_{DS} = 1000V f = 1MHz			15.4		nF
C_{oss}	Output Capacitance				0.72		
C_{rss}	Reverse Transfer Capacitance				0.12		
Q_g	Total gate Charge	V_{GS} = -5/20V V_{Bus} = 600V I_D = 120A			816		nC
Q_{gs}	Gate – Source Charge				240		
Q_{gd}	Gate – Drain Charge				240		
$T_{d(on)}$	Turn-on Delay Time	Inductive Switching V_{GS} = -5/20V ; V_{Bus} = 800V I_D = 120A ; T_J =150°C R_G = 0.8Ω			10		ns
T_r	Rise Time				10		
$T_{d(off)}$	Turn-off Delay Time				45		
T_f	Fall Time				30		
E_{on}	Turn on Energy	Inductive Switching V_{GS} = -5/+20V V_{Bus} = 600V I_D = 120A R_G = 0.8Ω	T_j = 150°C		2.6		mJ
E_{off}	Turn off Energy		T_j = 150°C		1.5		
R_{Gint}	Internal gate resistance				0.55		Ω
R_{thJC}	Junction to Case Thermal Resistance					0.105	°C/W

Body diode ratings and characteristics

Symbol	Characteristic	Test Conditions	Min	Typ	Max	Unit
V_{SD}	Diode Forward Voltage	V_{GS} = 0V, I_{SD} = 120A		3.9		V
t_{rr}	Reverse Recovery Time	I_{SD} = 120A ; V_{GS} = -2V V_R = 800V ; di_F/dt = 600A/µs		140		ns
Q_{rr}	Reverse Recovery Charge			690		nC
I_{rr}	Reverse Recovery Current			12		A

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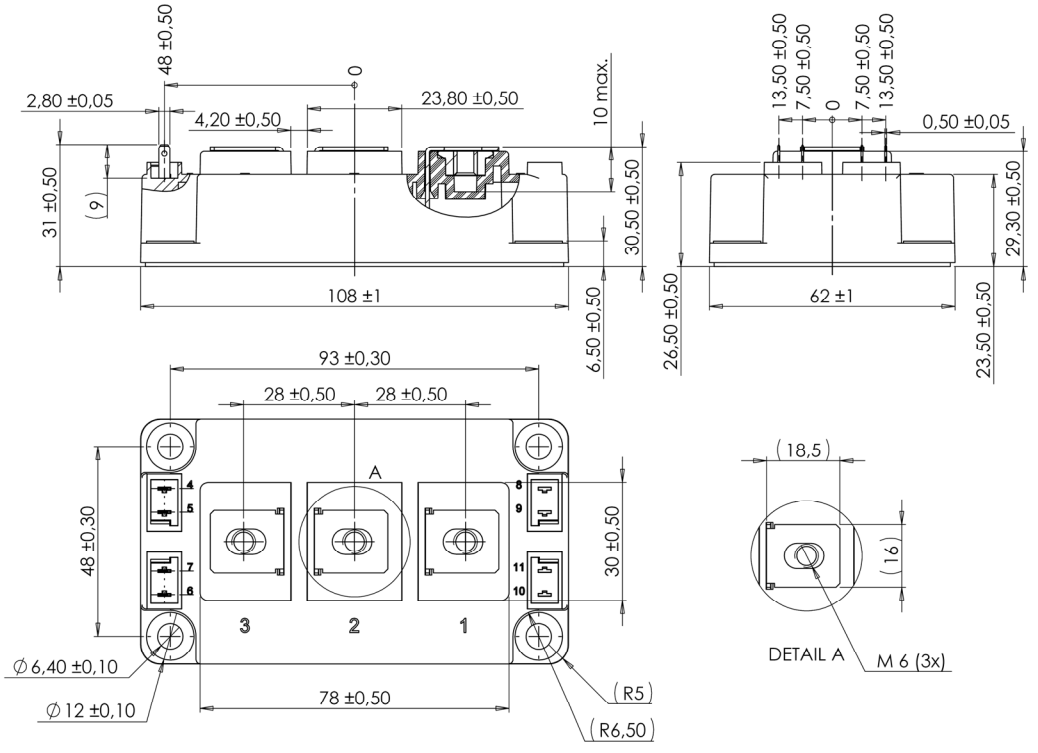
SiC schottky diode ratings and characteristics

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		60	1200	µA
			T_j = 175°C		3000		
I_F	Forward Current		Tc = 125°C		60		A
V_F	Diode Forward Voltage	I_F = 60A	T_j = 25°C		1.5	1.8	V
			T_j = 175°C		2.3		
Q_C	Total Capacitive Charge	I_F = 60A, V_R = 600V di/dt =3000A/µs			720		nC
C	Total Capacitance	f = 1MHz, V_R = 200V			690		pF
		f = 1MHz, V_R = 400V			510		
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			-40	175	°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	For terminals	M6	3	5	N.m
		To Heatsink	M6	3	5	
Wt	Package Weight				350	g

Package outline (dimensions in mm)



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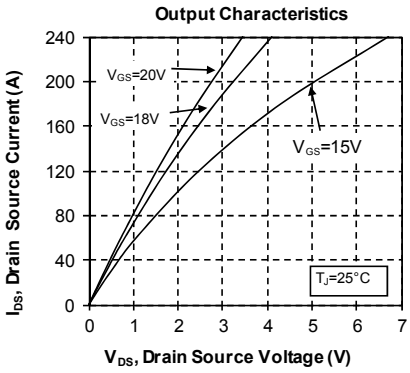
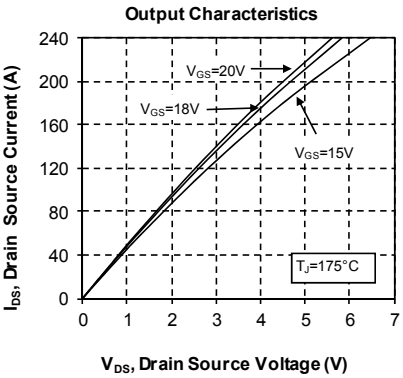
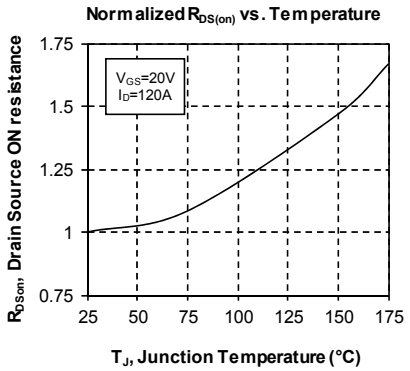
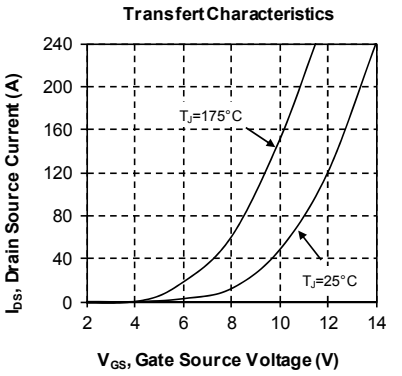
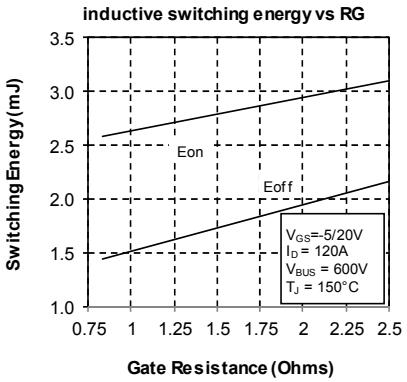
Typical SiC MOSFET Performance Curve

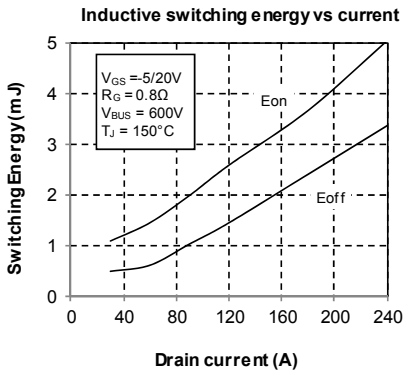


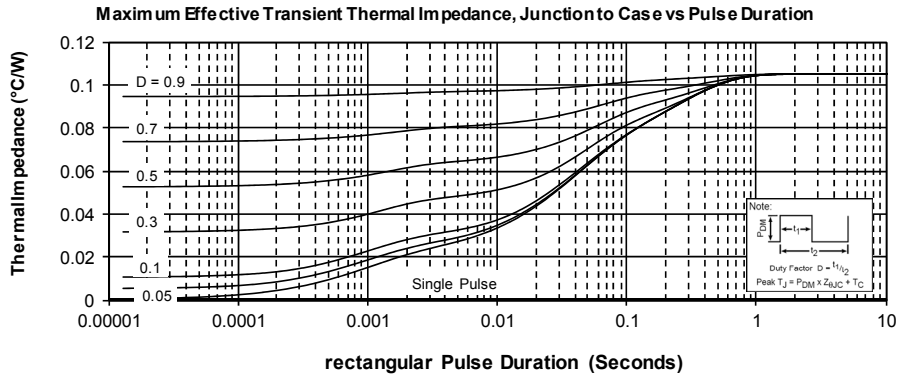












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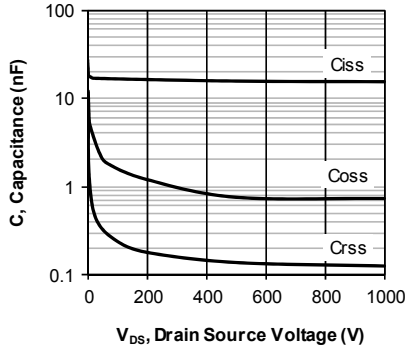
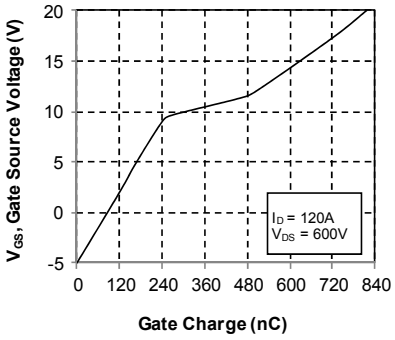
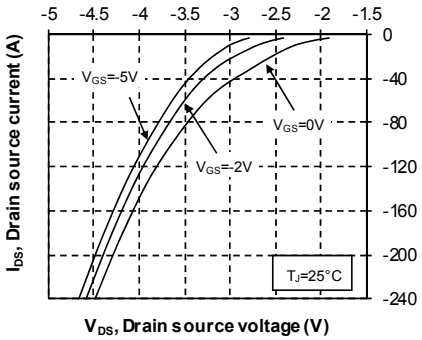
Capacitance vs Drain Source Voltage



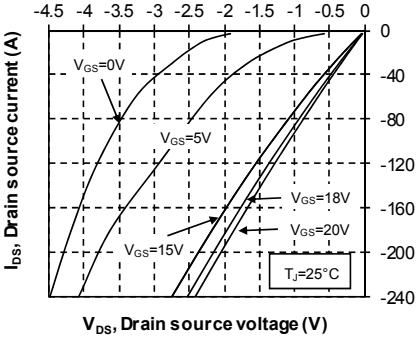
Gate Charge vs Gate Source Voltage



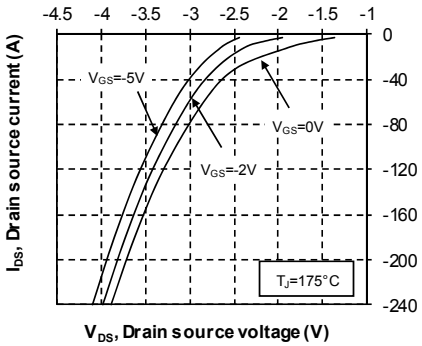
Body diode Characteristics



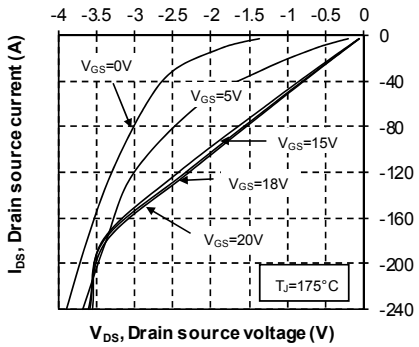
3rd quadrant Characteristics



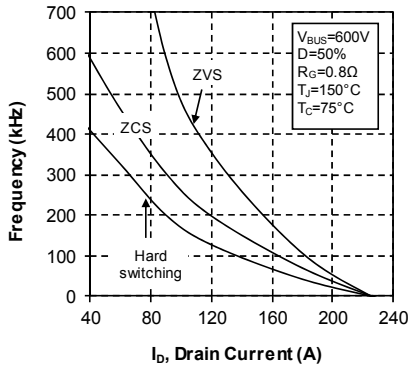
Body diode Characteristics



3rd quadrant Characteristics



Operating Frequency vs Drain Current



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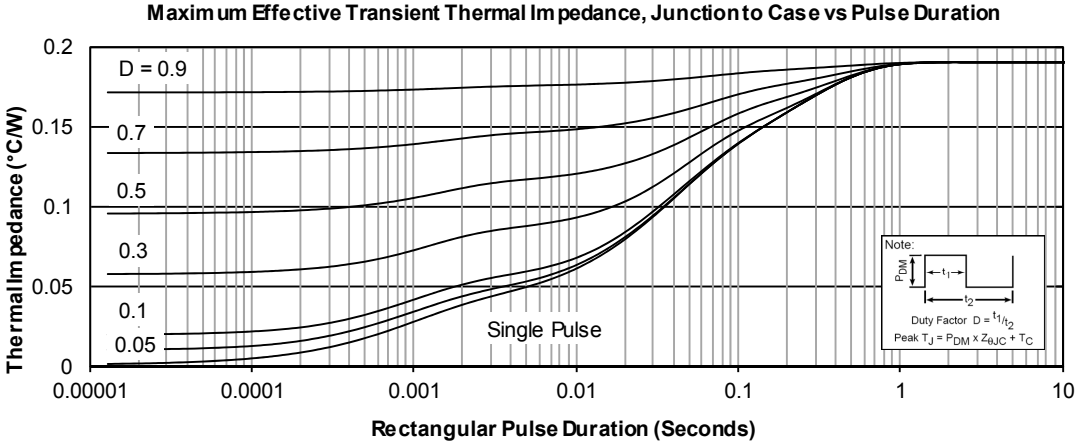
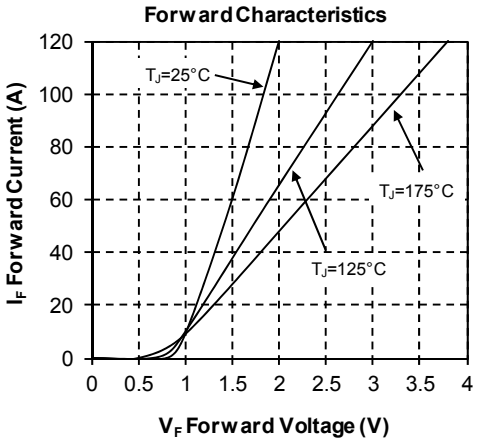
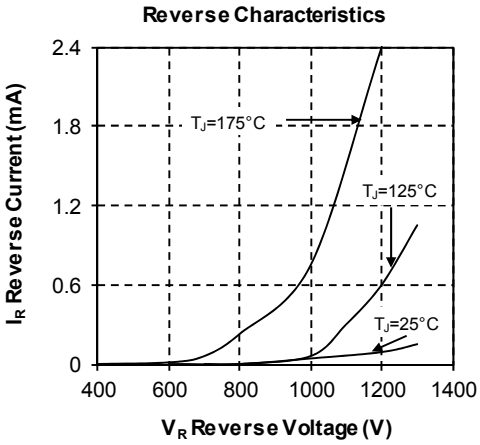
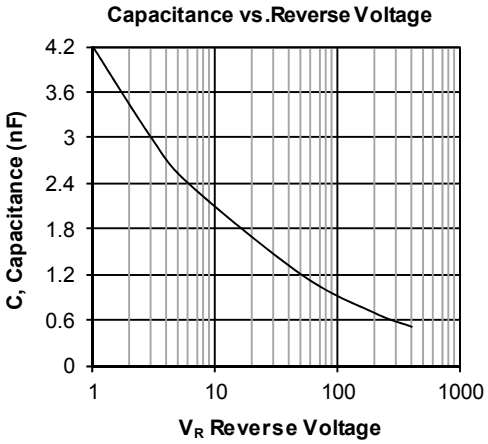
Typical SiC diode Performance Curve









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