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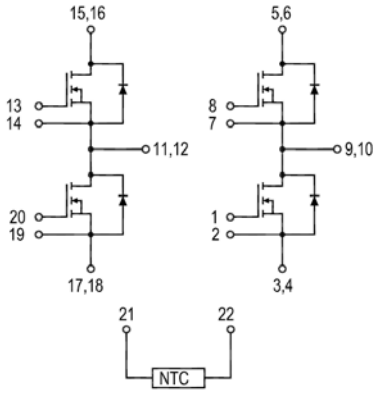
GCMS020A120B1H1

1200V 20 mohm SiC MOSFET Module

RoHS

Features:

- Ultra Low Loss
- High-Frequency Operation
- Zero Reverse Recovery Current from Diode
- Zero Turn-off Tail Current from MOSFET
- Normally-off, Fail-safe Device Operation
- Easy of Paralleling



Applications:

- Solar Inverters
- High Voltage DC/DC Converters
- Motor Drives
- EV Chargers
- UPS

Absolute Maximum Ratings (T_C=25℃ unless otherwise specified)

Symbol	Description		Value	Units
V_{DSmax}	Drain-Source Voltage		1200	V
V_{GSmax}	Gate-Source Voltage	Absolute Maximum values	-10/+25	V
V_{GSop}	Gate-Source Voltage	Recommended Operational Values	-5/20	V
$I_{D(DC)}$	Continuous Drain Current	V_{GS}=20V,T_C=25 ^{0}C	95	A
		V_{GS}=20V,T_C=100 ^{0}C	80	A
$I_{D(pluse)}$	Pulsed Drain Current	Pulse width t_p limited by T_{jmax}	160	A
P_D	Power Dissipation	T_c=25^{0}C， T_j=150^{0}C	305	W

Electrical Characteristics of MOSFET (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{(BR)DSS}$	Drain - Source Breakdown Voltage	V_{GS}=0V,I_D=100uA		1.2			KV
$V_{GS(th)\ (chip)}$	Gate Threshold Voltage	V_{DS} = 10 V, I_D =20 mA, T_j=25^{0}C			2.9		V
		V_{DS} = 10 V, I_D =20 mA, T_j=125^{0}C			2.4		
		V_{DS} = 10 V, I_D =20 mA, T_j=150^{0}C			2.3		
$V_{GS(th)\ (terminal)}$	Gate Threshold Voltage	V_{DS} = 10 V, I_D =4 mA, T_j=25^{0}C			2.9		V
		V_{DS} = 10 V, I_D =4 mA, T_j=125^{0}C			2.2		
		V_{DS} = 10 V, I_D =4 mA, T_j=150^{0}C			2.1		
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1.2 kV, V_{GS} = 0V				1	mA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0V				400	nA
$R_{DS(on)\ (chip)}$	On State Resistance	V_{GS} = 20 V, I_{DS} =80 A, T_J = 25˚C			20		mΩ
		V_{GS} = 20 V, I_{DS} =80 A, T_J = 150˚C			42		
$R_{DS(on)\ (terminal)}$	On State Resistance	V_{GS} = 20 V, I_{DS} = 80 A, T_J = 25˚C			20		mΩ
		V_{GS} = 20 V, I_{DS} = 80 A, T_J = 125˚C			28		
		V_{GS} = 20 V, I_{DS} = 80 A, T_J = 150˚C			32		
g_{fs}	Transconductance	V_{DS}= 20 V, I_{DS} = 80 A, Tj=25^{0}C			30.2		S
		V_{DS}= 20 V, I_{DS} = 80 A, Tj=150^{0}C			26.4		
$C_{iss(chip)}$	Input Capacitance	V_{DS} = 1000V, f = 1MHz, V_{AC} = 25 mV			3786		nF
$C_{oss(chip)}$	Output Capacitance				300		
$C_{rss(chip)}$	Reverse Transfer Capacitance				20		
E_{on}	Turn-On Switching Energy	V_{DD} = 600 V, V_{GS} = -5V/+20V I_D = 80 A, $R_{G(ext)}$ = 20 Ω	Tj=25^{0}C		1.0		mJ
			Tj=125^{0}C		1.5		
			Tj=150^{0}C		1.6		
E_{off}	Turn-Off Switching Energy		Tj=25^{0}C		0.3		
			Tj=125^{0}C		0.6		
			Tj=150^{0}C		0.8		
$R_{G(int)}$	Internal Gate Resistance	f =1MHz, V_{AC} = 25 mV			0.9		Ω

Q_{GS}	Gate-Source Charge	V_{DD}= 800 V, V_{GS} = -5V/+20V, I_D= 80 A,			56		nC
Q_{GD}	Gate-Drain Chrage				74		
Q_G	Total Gate Chrage				230		
$t_{d(on)}$	Turn-on delay time	V_{DD} = 600V, V_{GS} = -5/+20V, I_D = 80 A, $R_{G(ext)}$ = 20 Ω, Timing relative to V_{DS}	Tj=25^{0}C		104		ns
			Tj=125^{0}C		98		
			Tj=150^{0}C		96		
t_r	Rise Time		Tj=25^{0}C		63		
			Tj=125^{0}C		56		
			Tj=150^{0}C		57		
$t_{d(off)}$	Turn-off delay time		Tj=25^{0}C		181		
			Tj=125^{0}C		216		
			Tj=150^{0}C		220		
t_f	Fall Time		Tj=25^{0}C		94		
			Tj=125^{0}C		99		
			Tj=150^{0}C		99		
$R_{\theta JCM}$	Thermal Resistance Junction-To-Case for MOSFET				0.41		^{0}C /W

Built-in SiC Body Diode Characteristics (T_C=25^{0}C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{SD(chip)}$	Diode Forward Voltage	I_{SD} = 40 A, V_{GS} = -5V , T_j=25^{0}C		3.6		V
		I_{SD} = 40 A, V_{GS} = -5V, T_j=150^{0}C		3.3		
T_{rr}	Reverse Recovery Time	I_{SD} = 80 A, V_{GS} = -5V , T_j=25^{0}C,V_R=800V, di_F/dt= 2200 A/μs		108		ns
Q_{rr}	Reverse Recovery Charge			566		nC
I_{rrm}	Peak Reverse Recovery Current			30		A

Free-Wheeling SiC Diode Characteristics (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{F(terminal)}$	Diode Forward Voltage	I_F = 80 A, V_{GS} = 0 V ,T_j=25^{0}C		2.5		V
		I_F = 80 A, V_{GS} = 0 V ,T_j=125^{0}C		2.9		
		I_F = 80 A, V_{GS} = 0 V ,T_j=150^{0}C		3.0		
Q_C	Total Capacitive Charge	V_R = 1200 V, T_J = 27°C		129		nC
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case			1.21		^{0}C /W
$I_{F(chip)}$	Continuous Diode Forward Current	T_C=25^{0}C， T_j=175^{0}C		94		A
		T_C=125^{0}C， T_j=175^{0}C		52		
		T_C=150^{0}C， T_j=175^{0}C		35		

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage(All Terminals Shorted)	f = 50Hz, 1minute	2500			V
T_J	Maximum Junction Temperature				150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	℃
T_{stg}	Storage Temperature		-40		+125	℃
$R_{\theta CS}$	Case-To-Sink (Conductive Grease Applied)			0.1		℃/W
T	Mounting Screw:M6		1.0		1.5	N·m
G	Weight			25		g

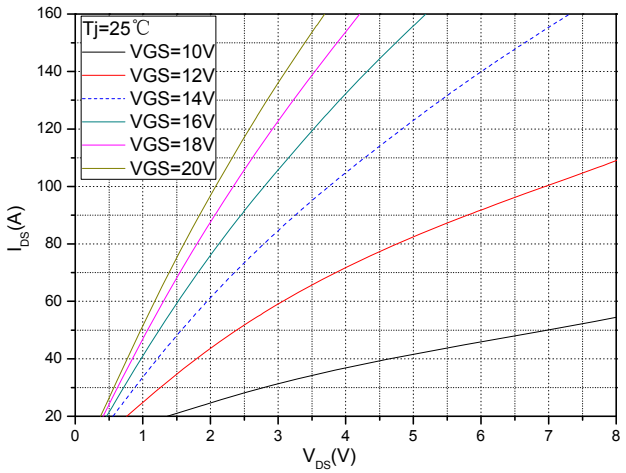


Fig.1 Typical Output Characteristics Tj=25^{0}C (terminal)

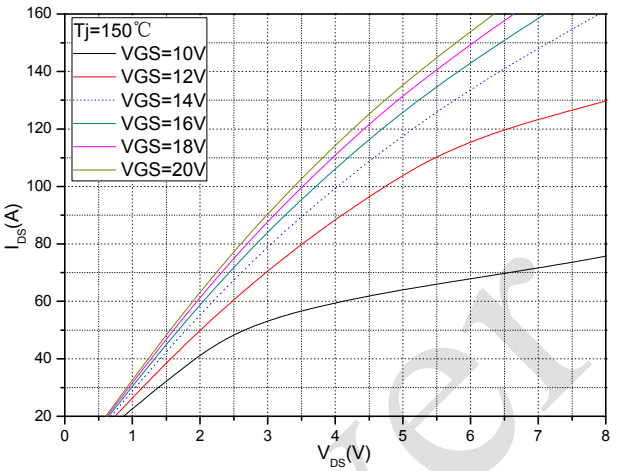


Fig.2 Typical Output Characteristics Tj=150^{0}C (terminal)

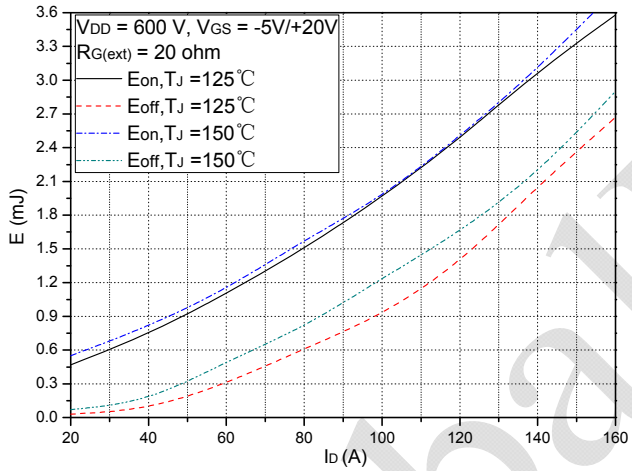


Fig.3 Typical Switching Loss vs. Collector Current

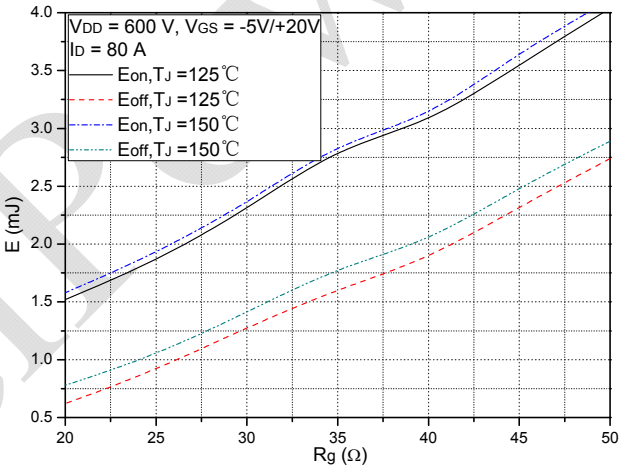


Fig.4 Typical Switching Loss vs. Gate Resistance

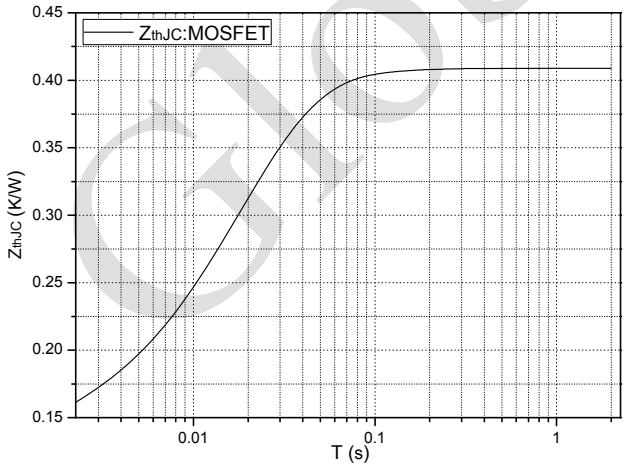


Fig.5 Transient thermal impedance (MOSFET)

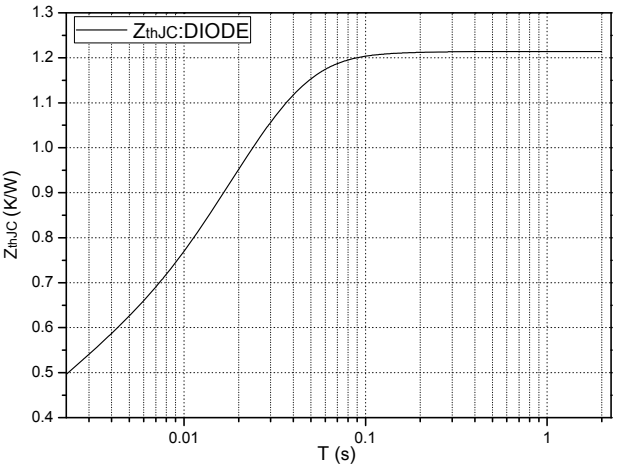


Fig.6 Transient thermal impedance
(Free-Wheeling SiC Diode)

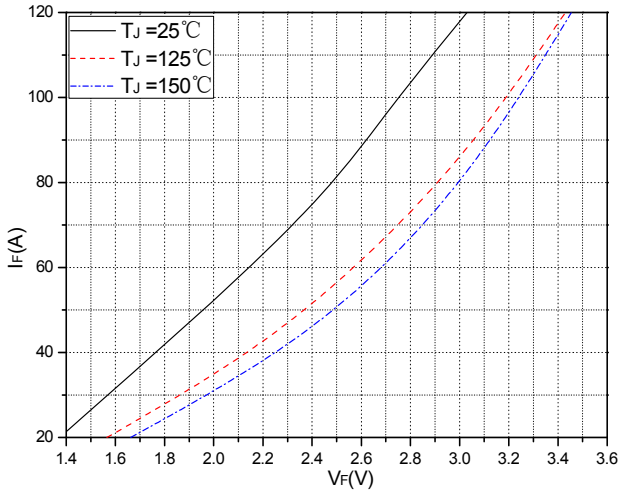


Fig.7 Forward Characteristics of Diode

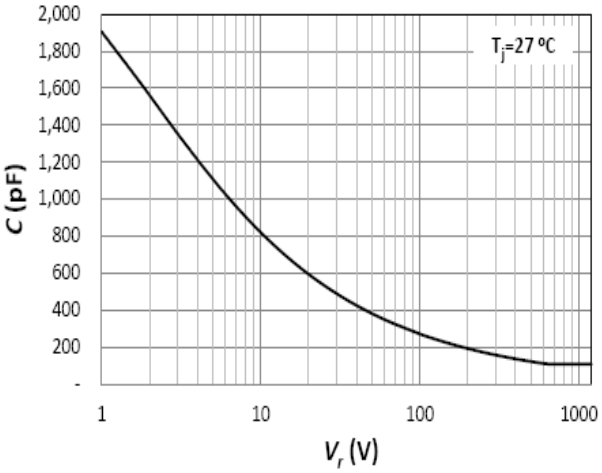


Fig.8 Capacitance (Free-Wheeling SiC Diode)

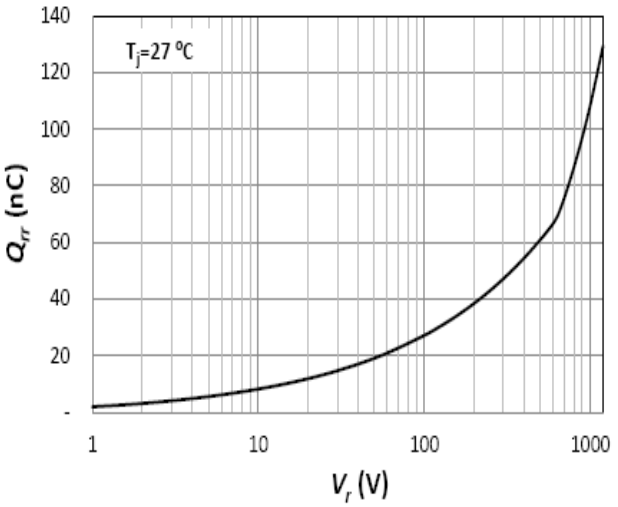


Fig.9 Recovery Charge (Free-Wheeling SiC Diode)

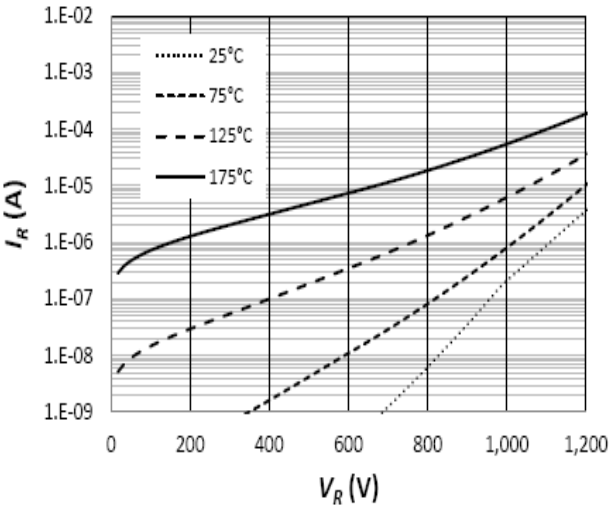
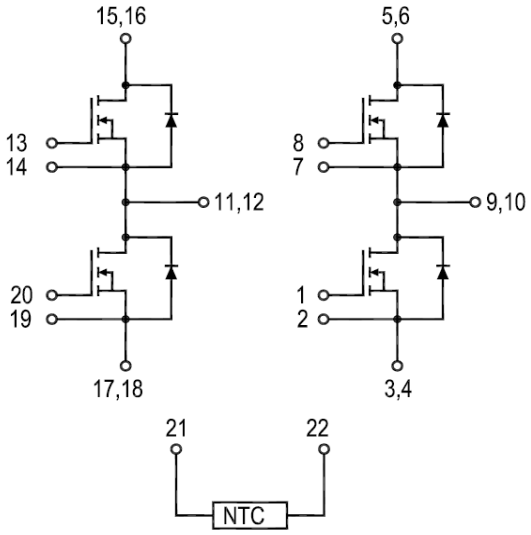
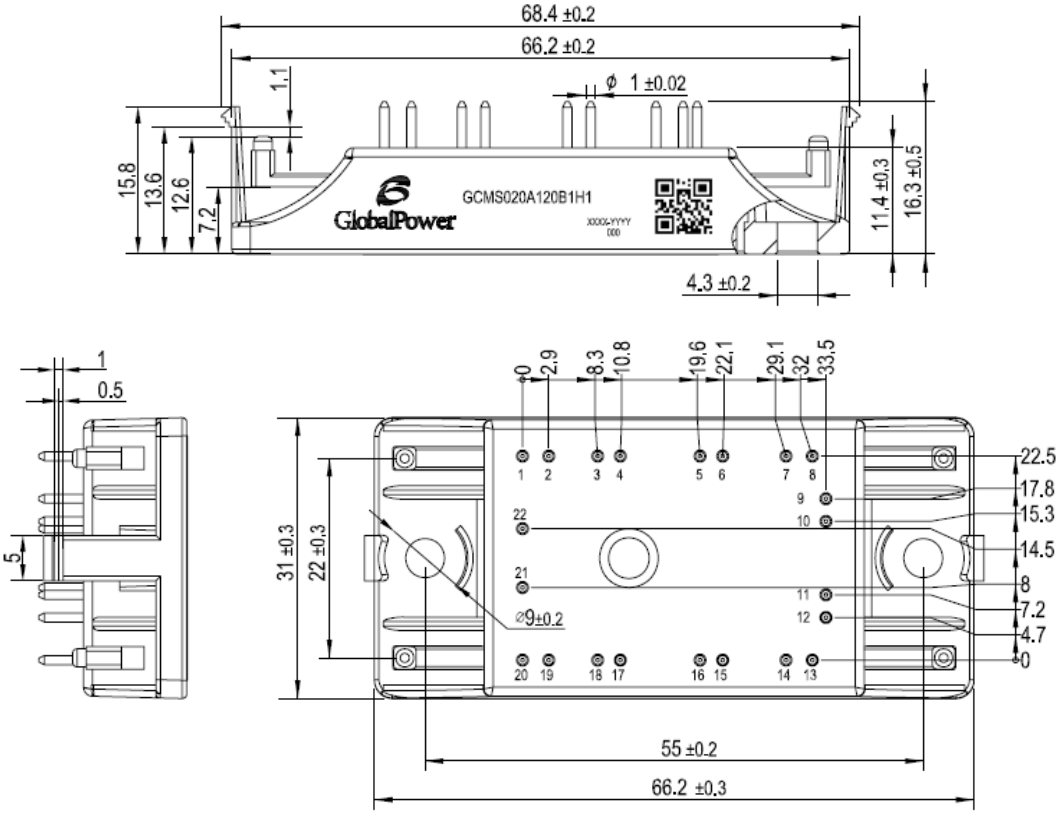


Fig.10 Reverse Characteristics (Free-Wheeling SiC Diode)

Internal Circuit



Package Outline (Unit: mm):



Revision History

Date	Revision	Notes
5/29/2015	0.1	Initial release of preliminary datasheet
4/15/2016	0.2	Add the test data and revised package drawing

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Notes

- **RoHS Compliance**
  The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented March, 2013. RoHS Declarations for this product can be obtained from the Product Documentation sections of www.gptechgroup.com.

- **REACh Compliance**
  REACh substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact our office at GPTG Headquarters in Lake Forest, California to insure you get the most up-to-date REACh SVHC Declaration.
  REACh banned substance information (REACh Article 67) is also available upon request.

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