



**THE DATASHEET OF
GCMS008A120B1B1**

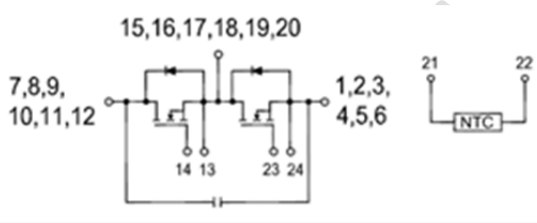


GCMS008A120B1B1

1200V 8.3mΩ SiC MOSFETs Half Bridge Module



Package: 31mm x 66mm x 12mm



Features

- Ultra Low Loss with SiC MOSFETs
- Zero Reverse Recovery Current with SiC SBDs
- Zero Turn-off Tail Current
- High-Frequency Operation
- Positive Temperature Coefficient on VDS(on)
- baseplate-less AlN DBC substrate

Applications

- UPS and SMPS
- Fast DC/DC Converter
- Motor Driver
- Induction Heating/Welding

Benefits

- Outstanding performance at high frequency operation
- Low switching losses
- Better EMI noise with low parasitic inductance
- Direct mounting to heatsink (isolated package)
- Low junction to case thermal resistance
- Easy paralleling due to positive T_C of R_{DS_ON}
- RoHS Compliant

Absolute Maximum Ratings (T_j=25°C unless otherwise specified)

Parameter	Symbol	Conditions	Specifications	Units
Drain - Source Voltage	V _{DS}		1200	V
Continuous Drain Current	I _D	V _{GS} =20V, T _C = 25 °C	300	A
		V _{GS} =20V, T _C = 90 °C	200	A
Gate - Source Voltage	V _{GS}	Absolute maximum	+25/-10	V
Pulsed Drain Current	I _{DS}	Limited by T _{j_max}	750	A
Maximum Power Dissipation	P _D	T _C = 25 °C	1000	W
		T _C = 100 °C	TBD	W
Solder Temperature	T _L	Max for 10 sec	260	°C

Electrical Characteristics of MOSFETs ($T_j=25^{\circ}\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
OFF						
Drain - Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=150\mu A$	1.2			kV
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 1200V, V_{GS} = 0V$	--	250	1000	μA
Gate-Source Leakage Current	I_{GSS}	$V_{DS} = 0V, V_{GS} = 20V$	--	--	± 1.8	μA
ON						
Gate-Source Threshold Voltage	$V_{GS(TH)}$	$V_{DS} = 10V, I_D = 15mA, T_j = 25^{\circ}\text{C}$	2.0	2.6	4	V
		$V_{DS} = 10V, I_D = 15mA, T_j = 150^{\circ}\text{C}$		2.0		
On State Resistance	$R_{DS(ON)(chip)}$	$V_{GS} = 20V, I_D = 150A, T_j = 25^{\circ}\text{C}$	--	8	--	$m\Omega$
		$V_{GS} = 20V, I_D = 150A, T_j = 150^{\circ}\text{C}$	--	14	--	$m\Omega$
	$R_{DS(ON)(terminal)}$	$V_{GS} = 20V, I_{DS} = 150A, T_j = 25^{\circ}\text{C}$		9.5		$m\Omega$
		$V_{GS} = 20V, I_{DS} = 150A, T_j = 125^{\circ}\text{C}$		12.8		$m\Omega$
		$V_{GS} = 20V, I_{DS} = 150A, T_j = 150^{\circ}\text{C}$		14.3		$m\Omega$
Transconductance	g_{fs}	$V_{DS} = 20V, I_D = 150A, T_j = 25^{\circ}\text{C}$		70.8		S
		$V_{DS} = 20V, I_D = 150A, T_j = 150^{\circ}\text{C}$		65.1		
DYNAMIC						
Input Capacitance	C_{ISS}	$V_{DS} = 1000V, V_{GS} = 0V, f = 1\text{ MHz}, V_{AC} = 25mV$	--	8.4	--	nF
Output Capacitance	C_{OSS}		--	660	--	pF
Reverse Transfer Capacitance	C_{RSS}		--	45	--	pF
Internal Gate Resistance	$R_{G(INT)}$	$f = 1\text{ MHz}, V_{AC} = 25mV$		0.37		Ω
Module Stray Inductance	L_{σ}	Between terminal DC+ and DC-	--	10	--	nH
Module Lead Resistance	R_{mod}		--	TBD	--	$m\Omega$
SWITCHING						
Turn-On Delay Time	$t_{d(on)}$	$V_{DD} = 650V, I_D = 150A$ $R_{G(ext)} = 2.5\Omega, V_{GS} = -5/20V$ Inductive Load, $T_j = 25^{\circ}\text{C}$	--	25	--	ns
Rise Time	t_r		--	40	--	ns
Turn-Off Delay Time	$t_{d(off)}$		--	36	--	ns
Fall Time	t_f		--	42	--	ns
Turn-On Switching Energy Loss	E_{ON}		--	TBD	--	mJ
Turn-Off Switching Energy Loss	E_{OFF}		--	TBD	--	mJ
Turn-On Delay Time	$t_{d(on)}$		--	TBD	--	ns
Rise Time	t_r		--	TBD	--	ns

Turn-Off Delay Time	$t_{d(off)}$	$V_{DD}=650V, I_D=150A$ $R_G=2.5\Omega, V_{GS}=-5/20V$ Inductive Load, $T_J=150^\circ C$	--	TBD	--	ns
Fall Time	t_f		--	TBD	--	ns
Turn-On Switching Energy Loss	E_{ON}		--	TBD	--	mJ
Turn-Off Switching Energy Loss	E_{OFF}		--	TBD	--	mJ
Total Gate Charge	Q_G	$V_{DD}=650V, I_D=150A$ $V_{GS}=-5/20V$	--	483	--	nC
Gate-Source Charge	Q_{GS}		--	138	--	nC
Gate-Drain Charge	Q_{GD}		--	150	--	nC

Built-in SiC Body Diode Characteristics ($T_C=25^\circ C$ unless otherwise specified)

Description	Symbol	Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	$V_{SD(chip)}$	$I_{SD}=75A, V_{GS}=-5V, T_J=25^\circ C$		3.3		V
		$I_{SD}=75A, V_{GS}=-5V, T_J=150^\circ C$		3.0		
Reverse Recovery Time	T_{rr}	$I_{SD}=150A, V_{GS}=-5V,$ $T_J=25^\circ C, V_R=800V,$ $diF/dt=1000A/\mu s$		135		ns
Reverse Recovery Charge	Q_{rr}			1218		nC
Peak Reverse Recovery Current	I_{rrm}			40.5		A

Electrical Characteristics of Free-wheeling SiC SBD ($T_C=25^\circ C$ unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Maximum peak repetitive reverse voltage	V_{RRM}		1200	--	--	V
Maximum Reverse Leakage Current	I_{RM}	$V_R=1200V, T_J=25^\circ C$	--	4.1	100	μA
		$V_R=1200V, T_J=150^\circ C$	--	606	--	μA
Diode Forward Voltage	V_F	$I_F=30A, T_J=25^\circ C$	--	1.5	1.7	V
		$I_F=30A, T_J=150^\circ C$	--	2.3	--	V
Total Capacitive Charge	Q_C	$V_R=1200V, I_F<I_{F,max}$	--	52	--	nC
Switching Time	t_c	$di_F/dt=500A/\mu s, T_J=25^\circ C$	--	--	10	ns
Total Capacitance	C	$V_R=1V, f=1MHz$	--	895	--	pF
		$V_R=600V, f=1MHz$	--	52	--	pF
		$V_R=1200V, f=1MHz$	--	43	--	pF

Thermal Characteristics ($T_c=25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
MOSFET Thermal Resistance: Junction-To-Case	$R_{\theta\text{JCM}}$			0.085		$^\circ\text{C}/\text{W}$
Diode Thermal Resistance: Junction-To-Case	$R_{\theta\text{JCD}}$			0.55		$^\circ\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

Parameters	Symbol	Conditions	Min	Typ	Max	Units
Zero Power Resistance	R_{25}	$T_c=25^\circ\text{C}$	--	22.7	--	$\text{k}\Omega$
	R_{100}	$T_c=100^\circ\text{C}$	--	1481	--	Ω
B Value	$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3950		K
	$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		4000		K
Power Dissipation	P_{25}	$T_c=25^\circ\text{C}$		200		mW

Module Characteristics ($T_j=25^\circ\text{C}$ unless otherwise specified)

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

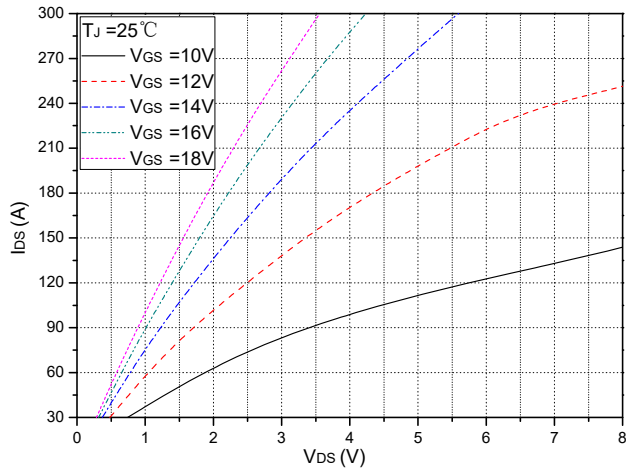


Fig. 1 Typical Output Characteristics Tj=25°C (terminal)

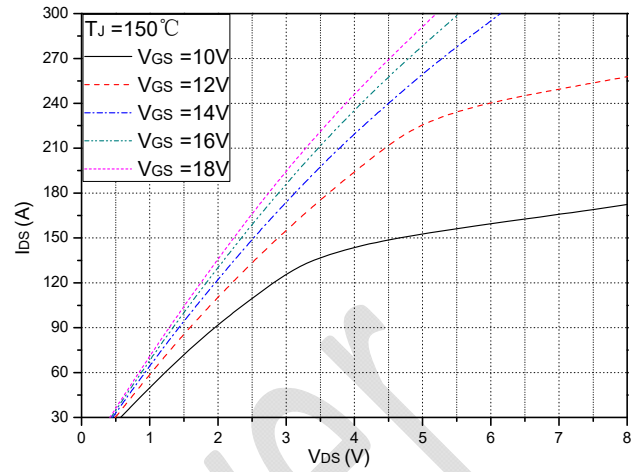


Fig. 2 Typical Output Characteristics Tj=150°C (terminal)

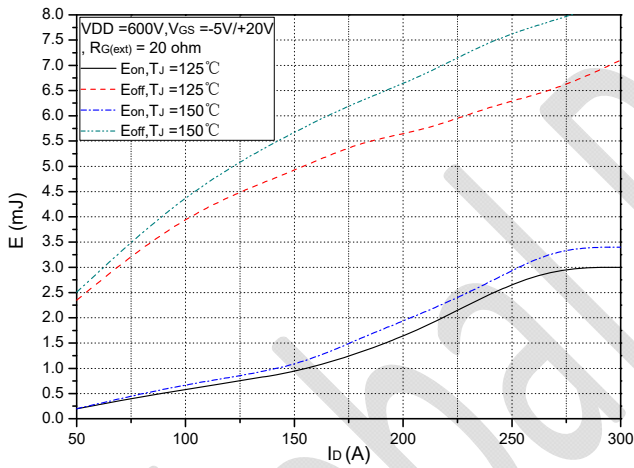


Fig. 3 Typical Switching Loss vs. Collector Current

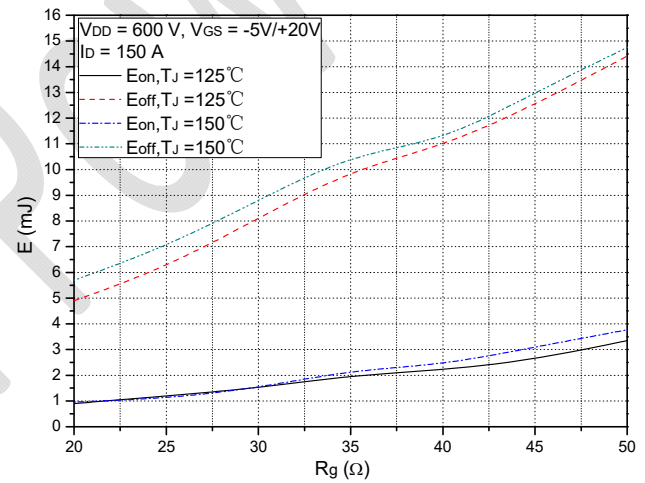


Fig. 4 Typical Switching Loss vs. Gate Resistance

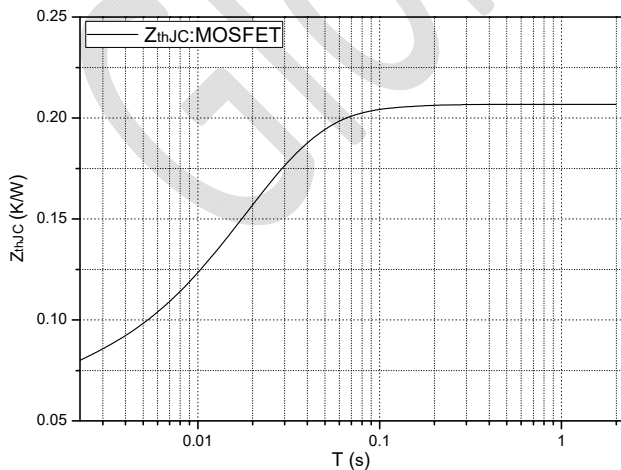


Fig. 5 Transient thermal impedance (MOSFET)

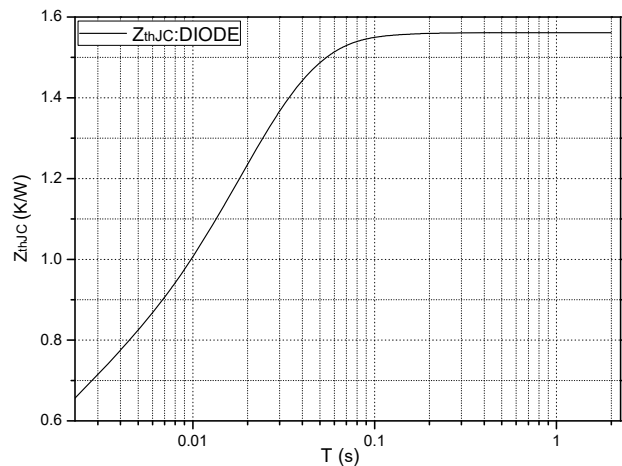


Fig. 6 Transient thermal impedance (SiC Diode)

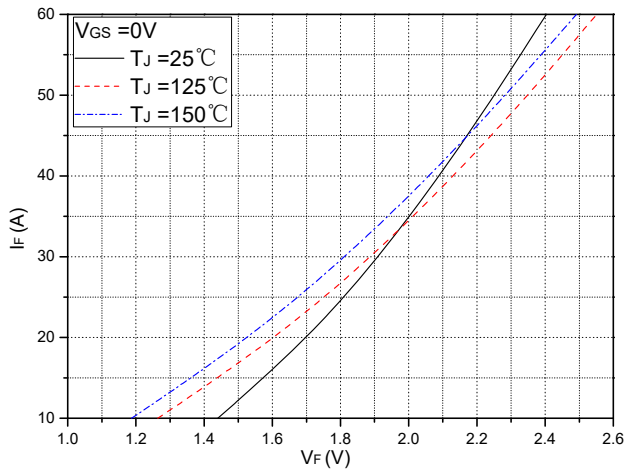


Fig. 7 Forward Characteristics of Diode

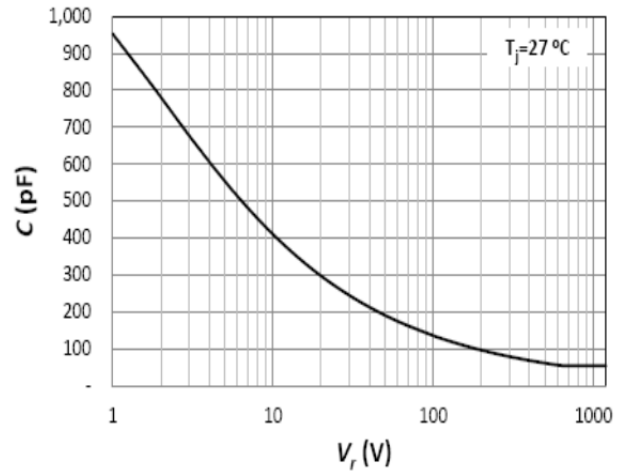


Fig. 8 Capacitance (Free-Wheeling SiC Diode)

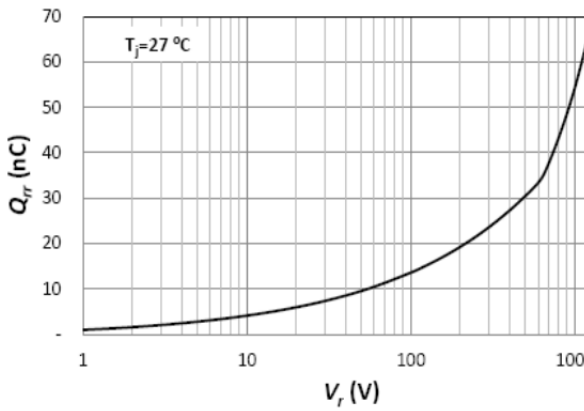


Fig. 9 Recovery Charge (Free-Wheeling SiC Diode)

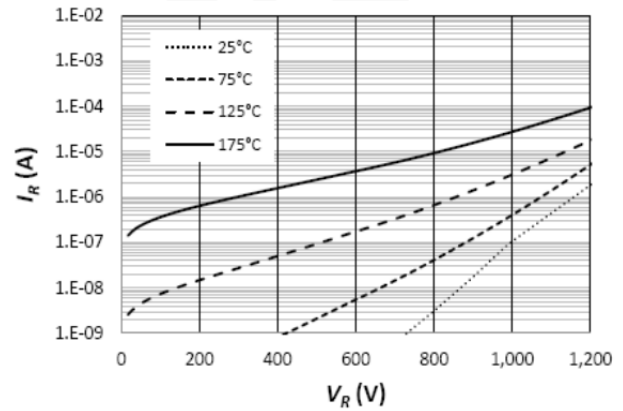


Fig. 10 Reverse Characteristics (Free-Wheeling SiC Diode)

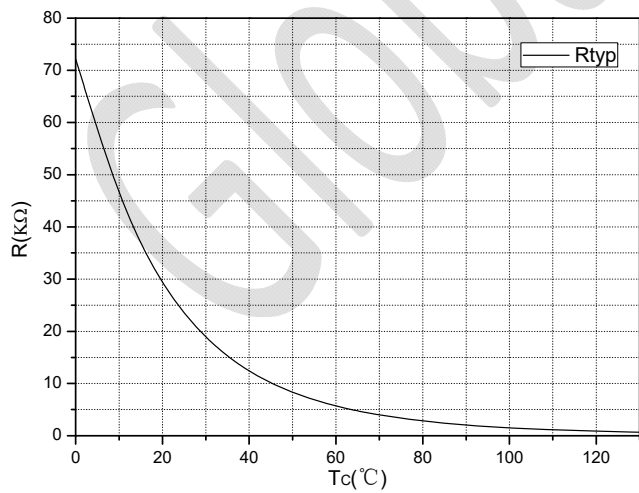
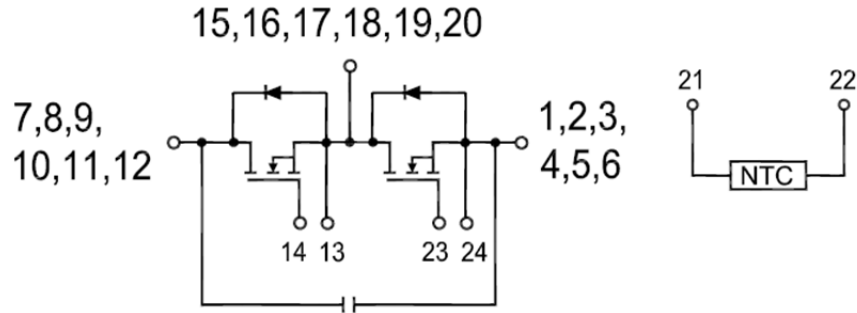


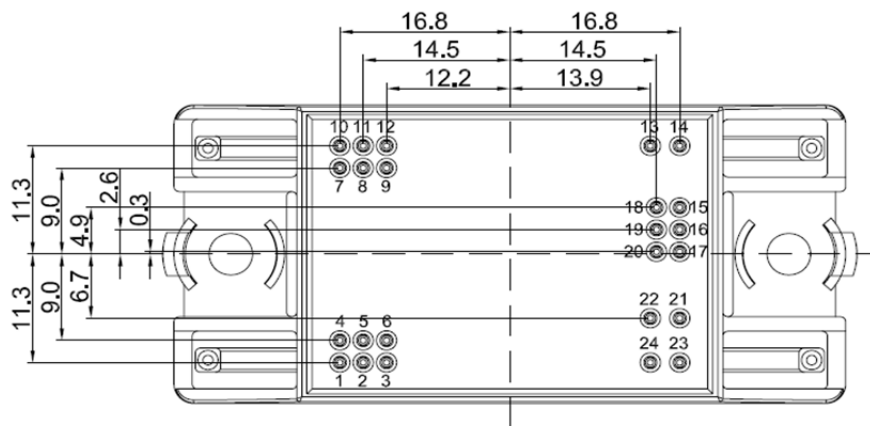
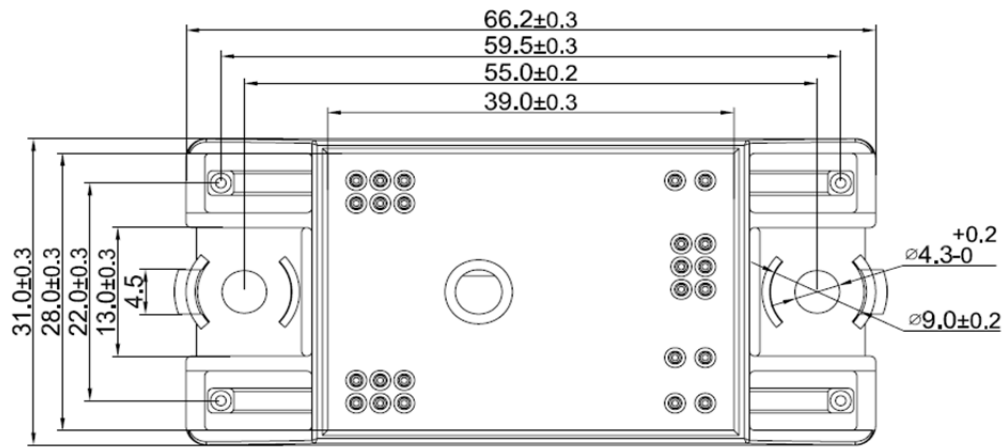
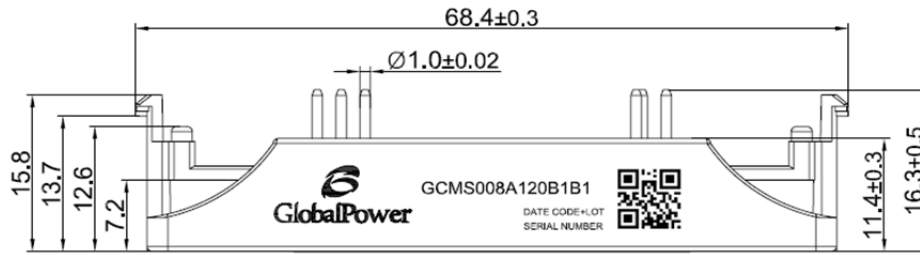
Fig.11 NTC Temperature characteristics

Internal Circuit:



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Preliminary Package Outline (Unit: mm):



Revision History

Date	Revision	Notes
04/20/2016	0.1	Initial release
06/01/2016	0.2	Revised the package outline and pin assignment
09/11/2016	0.3	Updated the test data of the modules

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Notes

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