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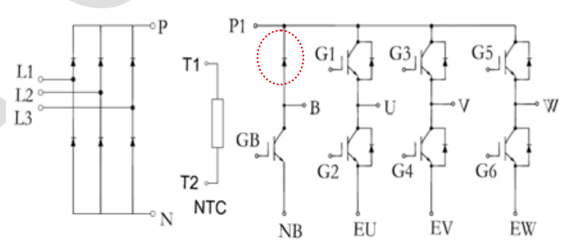
GHIS030A060B2P2
Si IGBT/ SiC SBD PIM Module

Features：

- Short Circuit Rated 10μs
- Low Saturation Voltage: $V_{CE\ (sat)}$ = 1.80V @ I_C = 30A , T_C=25℃
- Low Switching Loss
- SiC SBD for boost diode: V_F= 1.70V @ I_F = 20A , T_C=25℃
- 100% RBSOA Tested（2×Ic）
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications：



- Industrial Inverters
- Servo Applications

IGBT, Inverter
Maximum Rated Values (T_C=25℃ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃	30	A
		T_C = 25℃	60	A
I_{CM}	Repetitive Peak Collector Current	T_J = 150℃	60	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	220	W

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

Static characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1 mA, V_{CE} = V_{GE}		3.0	4.5	5.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 30 A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		2.00		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} = 0V, V_{CE} = V_{CES}, T_J = 25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V, T_J = 25℃				200	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f ＝1MHz			1.9		nF
C_{oes}	Output Capacitance				0.25		nF

Switching Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 30A, R_G = 20 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		65		ns
			T_J = 125℃		60		
t_r	Rise Time		T_J = 25℃		50		ns
			T_J = 125℃		50		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		120		ns
			T_J = 125℃		130		
t_f	Fall Time		T_J = 25℃		100		ns
			T_J = 125℃		140		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.27		mJ
			T_J = 125℃		0.38		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.29		mJ
			T_J = 125℃		0.44		
Q_g	Total Gate Charge		T_J = 25℃		160		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=60A,V_{CC}=480V,Vp=600V, Rg = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	Short Circuit Safe Operation Area	V_{CC} = 300V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{θJC}$	IGBT Thermal Resistance: Junction-To-Case				0.56		℃/W

Diode, Inverter
Maximum Rated Values (T_C=25℃ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	600	V
I_F	Diode Continuous Forward Current	30	A
I_{FM}	Diode Maximum Forward Current	60	A

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 30 A , V_{GE} = 0V	T_J = 25℃		1.40	1.60	V
			T_J = 125℃		1.40		
I_{rr}	Peak Reverse Recovery Current	I_F=30A, di/dt =900A/μs, V_{rr} = 300V, V_{GE} = -15V	T_J = 25℃		25		A
			T_J = 125℃		30		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		1.31		μC
			T_J = 125℃		2.26		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.14		mJ
			T_J = 125℃		0.31		
$R_{θJC}$	Diode Thermal Resistance: Junction-To-Case				1.51		℃/W

IGBT, Brake-Chopper
Maximum Rated Values (T_C=25℃ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		600	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C = 80℃,	30	A
		T_C = 25℃	60	A
I_{CM}	Peak Collector Current Repetitive	T_J = 150℃	60	A
t_{SC}	Short Circuit Withstand Time		>10	µs
P_D	Maximum Power Dissipation per IGBT	T_C = 25℃ T_{Jmax}=150℃	220	W

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

Static characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 1 mA, V_{CE} = V_{GE}		3.0	4.5	5.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C = 30 A, V_{GE} = 15V	T_J = 25℃		1.80	2.10	V
			T_J = 125℃		2.00		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE} = 0V, V_{CE} = V_{CES}, T_J = 25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE} = ±20V, V_{CE} = 0V, T_J = 25℃				200	nA
C_{ies}	Input Capacitance	V_{CE} = 25V, V_{GE} = 0V , f ＝1MHz			1.90		nF
C_{oes}	Output Capacitance				0.25		nF

Switching Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{CC} = 300V,I_C = 30A, R_G =20 Ω,V_{GE} = ±15V, Inductive Load	T_J = 25℃		65		ns
			T_J = 125℃		60		
t_r	Rise Time		T_J = 25℃		50		ns
			T_J = 125℃		50		
$t_{d(off)}$	Turn-off Delay Time		T_J = 25℃		120		ns
			T_J = 125℃		130		
t_f	Fall Time		T_J = 25℃		100		ns
			T_J = 125℃		140		
E_{on}	Turn-on Switching Loss		T_J = 25℃		0.27		mJ
			T_J = 125℃		0.38		
E_{off}	Turn-off Switching Loss		T_J = 25℃		0.29		mJ
			T_J = 125℃		0.44		
Q_g	Total Gate Charge		T_J = 25℃		160		nC
RBSOA	Reverse Bias Safe Operation Area	I_C=60A,V_{CC}=480V,Vp=600V, Rg = 15Ω, V_{GE}=+15V to 0V, T_J =150°C		Trapezoid			
SCSOA	Short Circuit Safe Operation Area	V_{CC} = 300V, V_{GE} = 15V, T_J = 150℃		10			μs
$R_{θJC}$	IGBT Thermal Resistance: Junction-To-Case				0.56		℃/W

Maximum Rated Values of SiC SBD Brake-Chopper (T_C=25℃ unless otherwise specified)

Symbol	Description	Conditions	Value	Unit
V_{RRM}	Repetitive Peak Reverse Voltage	T_j=25 °C	600	V
I_F	Diode Continuous Forward Current	T_C=125 °C, T_j=175 °C	25	A
$I_{F,SM}$	Surge Non-repetitive Forward Current	T_C=125 °C, t_p=8.3 ms sine half wave	100	A
dv/dt	Diode dv/dt Ruggedness	Turn-on slew rate, repetitive	50	V/ns

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_R	DC Blocking Voltage	I_R=100 uA		600			V
V_F	Forward Voltage	I_F = 20A, V_{GE} = 0V	T_J = 25℃		1.7	1.9	V
			T_J = 175℃		2.2		
I_R	Reverse leakage Current	V_R=600V	T_J = 25℃		12	500	μA
		V_R=600V	T_J = 175℃		230		
Q_C	Total Capacitive Charge	V_R=600V	T_J = 25℃		45		nC
C	Total Capacitance	V_R=1V, f=1 MHz			1054		pF
		V_R=300V, f=1 MHz			93		
		V_R=600V, f=1 MHz			76		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				TBD	1.2	℃/W

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F = 15 A , V_{GE} = 0V	T_J = 25℃		1.20	1.30	V
			T_J = 125℃		1.10		
I_{rr}	Peak Reverse Recovery Current	I_F =15A, di/dt =690A/μs, V_{rr} = 300V, V_{GE} = -15V	T_J = 25℃		20		A
			T_J = 125℃		30		
Q_{rr}	Reverse Recovery Charge		T_J = 25℃		0.82		μC
			T_J = 125℃		1.50		
E_{rec}	Reverse Recovery Energy		T_J = 25℃		0.12		mJ
			T_J = 125℃		0.34		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				1.51		℃/W

Diode, Rectifier (T_C=25℃ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	T_J =25℃	1200	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	T_J =80℃	50	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	T_J =80℃	60	A
I_{FSM}	Surge Current @t_p=10 ms	T_J =25℃	420	A
		T_J =150℃	350	
I^2t	I^2t - value	T_J =25℃	900	A^2s
		T_J =150℃	650	

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

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_F	Forward voltage	I_F = 30 A	T_J =25℃		1.00		V
			T_J =150℃		0.90		
I_R	Reverse current	V_R=600V	T_J =25℃			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case				0.59		℃/W

Internal NTC-Thermistor Characteristic

R_{25}	T_C =25℃	5		kΩ
ΔR/R	T_C =100℃，R_{100} =481Ω		±5	%
P_{25}	T_C =25℃	50		mW
$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	3380		K
$B_{25/80}$	$R_2=R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	3440		K

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:M4		1.0		1.5	N·m
G	Weight			25		g

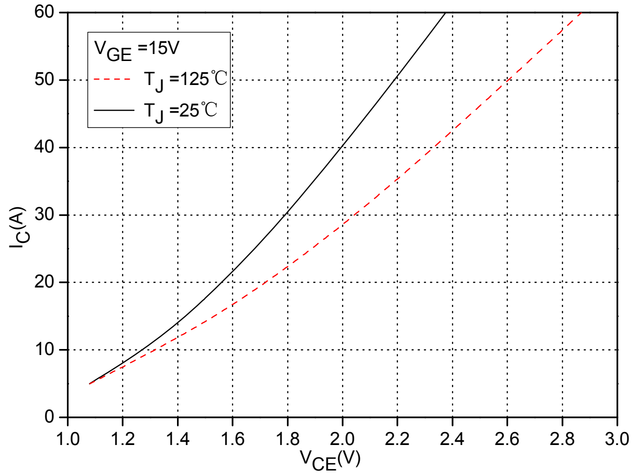


Fig.1 Typical Saturation Voltage Characteristics (Inverter)

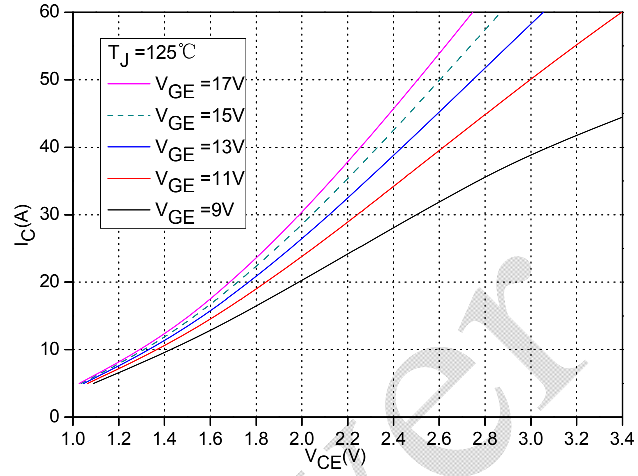


Fig.2 Typical Output Characteristics (Inverter)

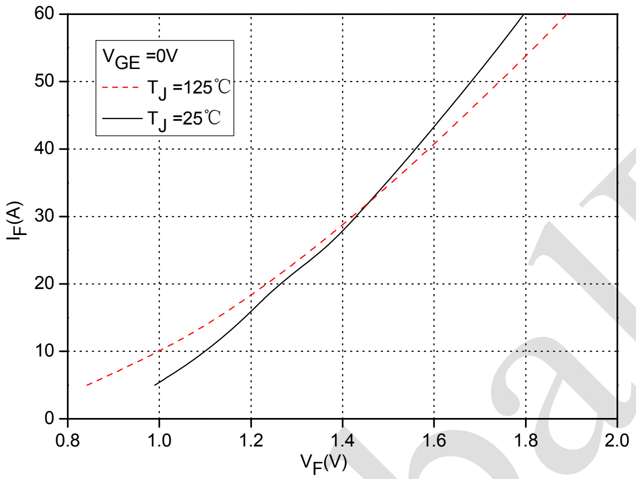


Fig.3 Forward Characteristics of FWD (Inverter)

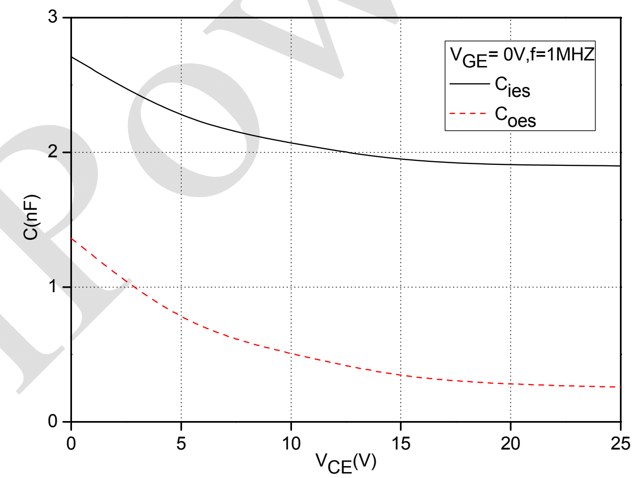


Fig.4 Capacitance Characteristics

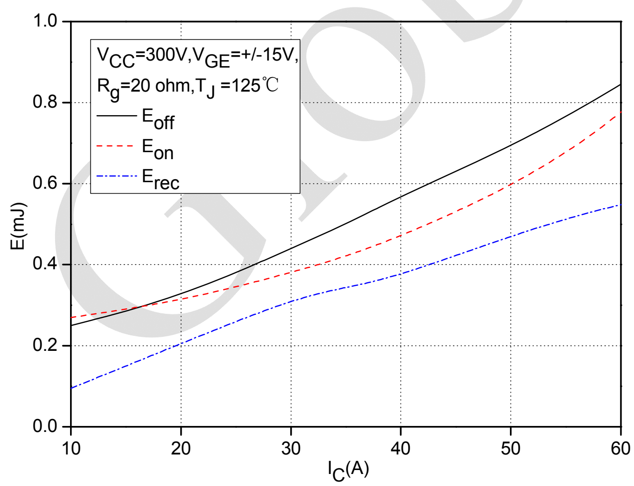


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

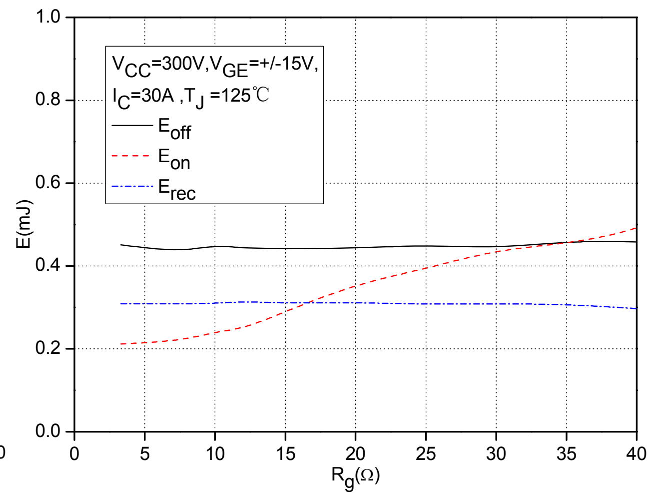


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

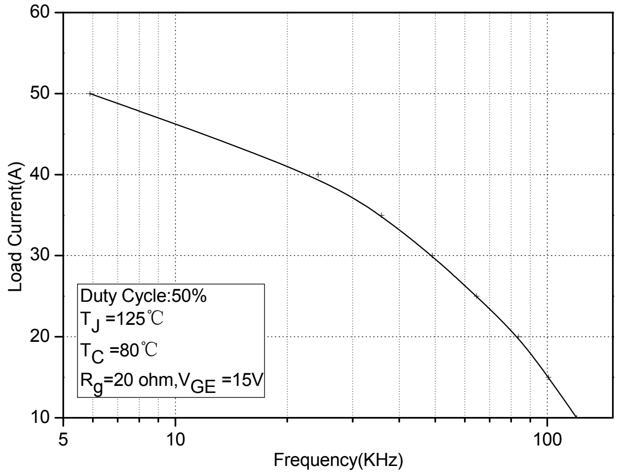


Fig.7 Typical Load Current vs. Frequency (Inverter)

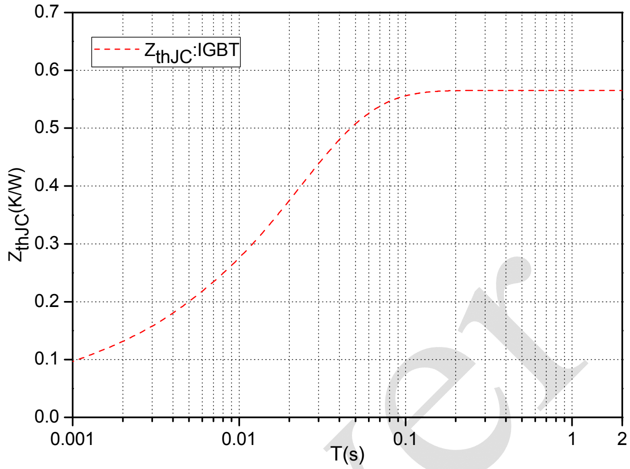


Fig.8 Transient Thermal Impedance IGBT (Inverter)

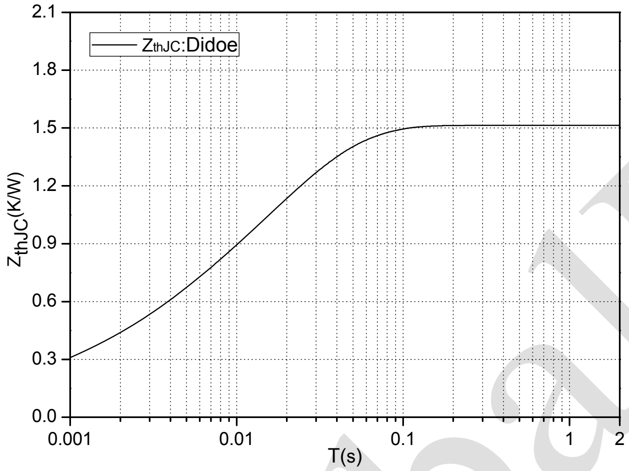


Fig.9 Transient thermal impedance Diode (Inverter)

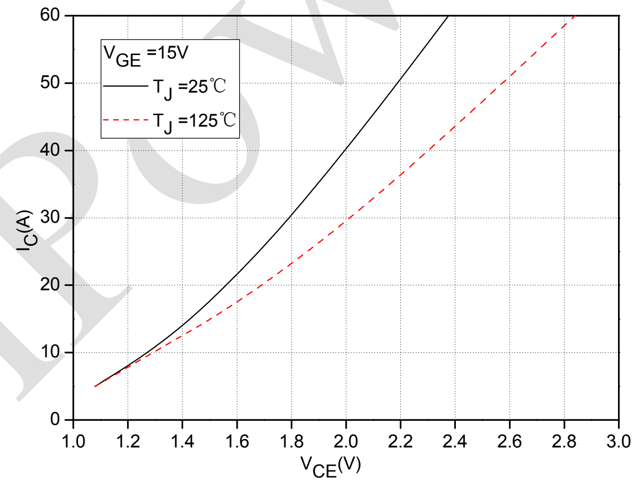


Fig.10 Typical Saturation Voltage Characteristics (Brake-Chopper)

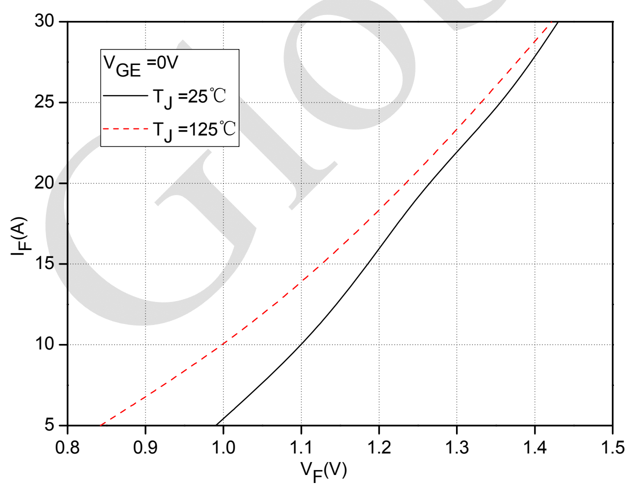


Fig.11 Forward Characteristics of FWD (Brake-Chopper)

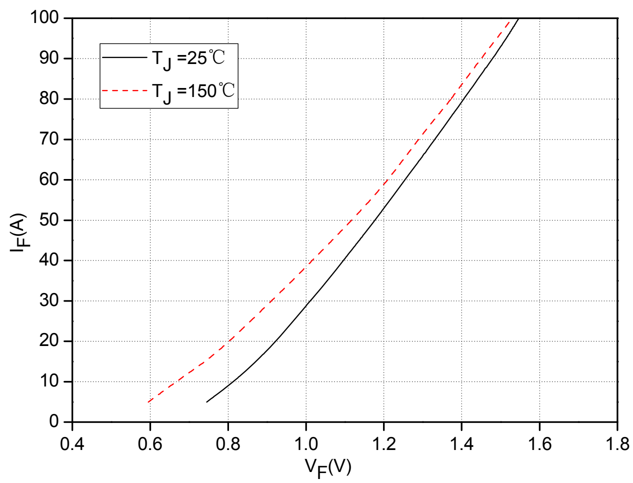


Fig.12 Forward Characteristics of Diode (Rectifier)

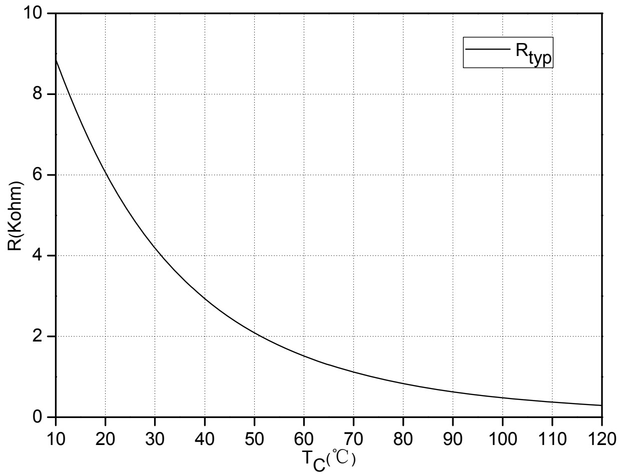


Fig.13 NTC Temperature characteristics

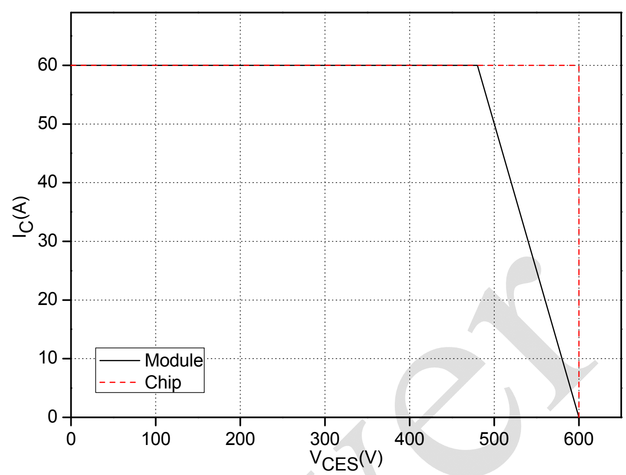


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

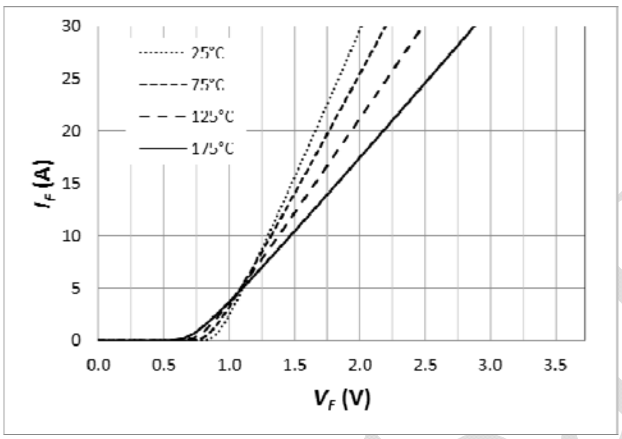


Fig. 15 Forward Characteristics of SiC Diode (Boost)

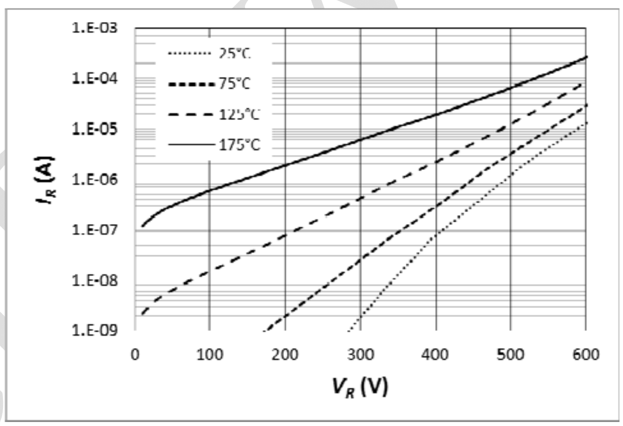


Fig. 16 Leakage Current of SiC Diode (Boost)

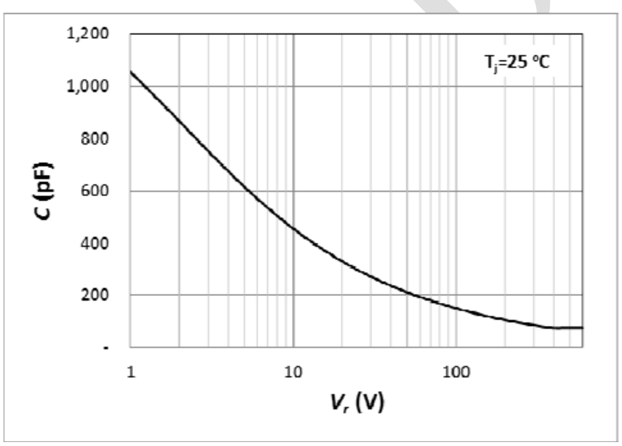


Fig. 17 Capacitance Characteristics of SiC Diode (Boost)

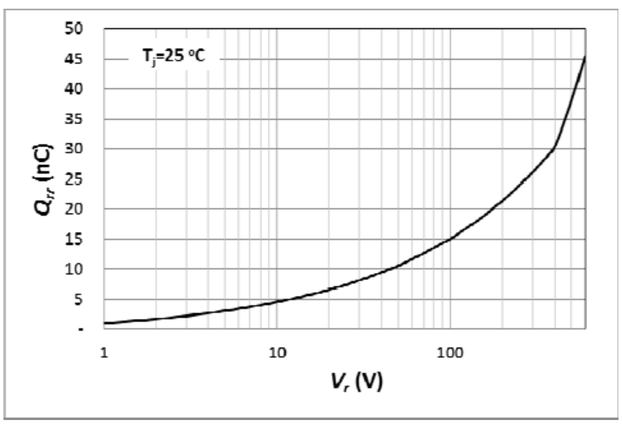
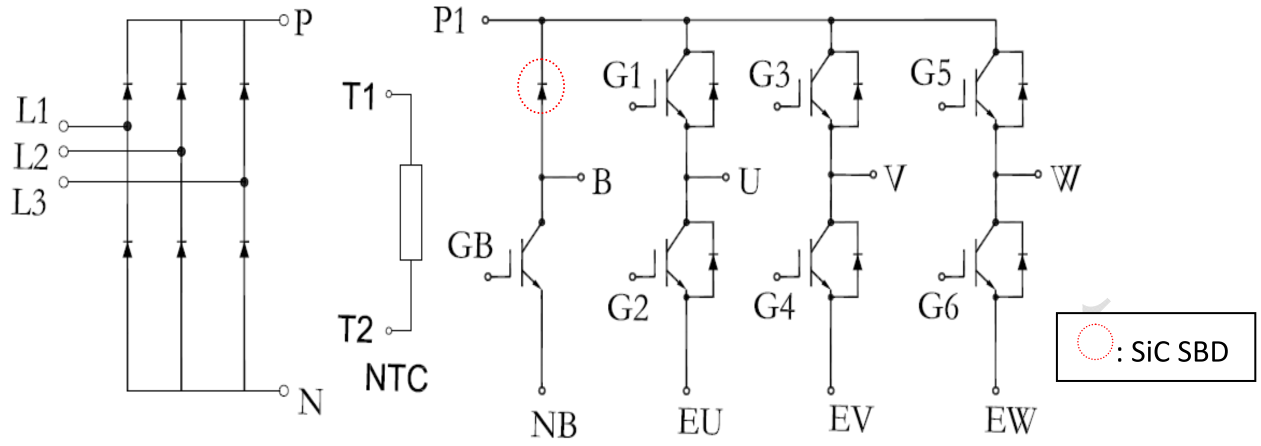
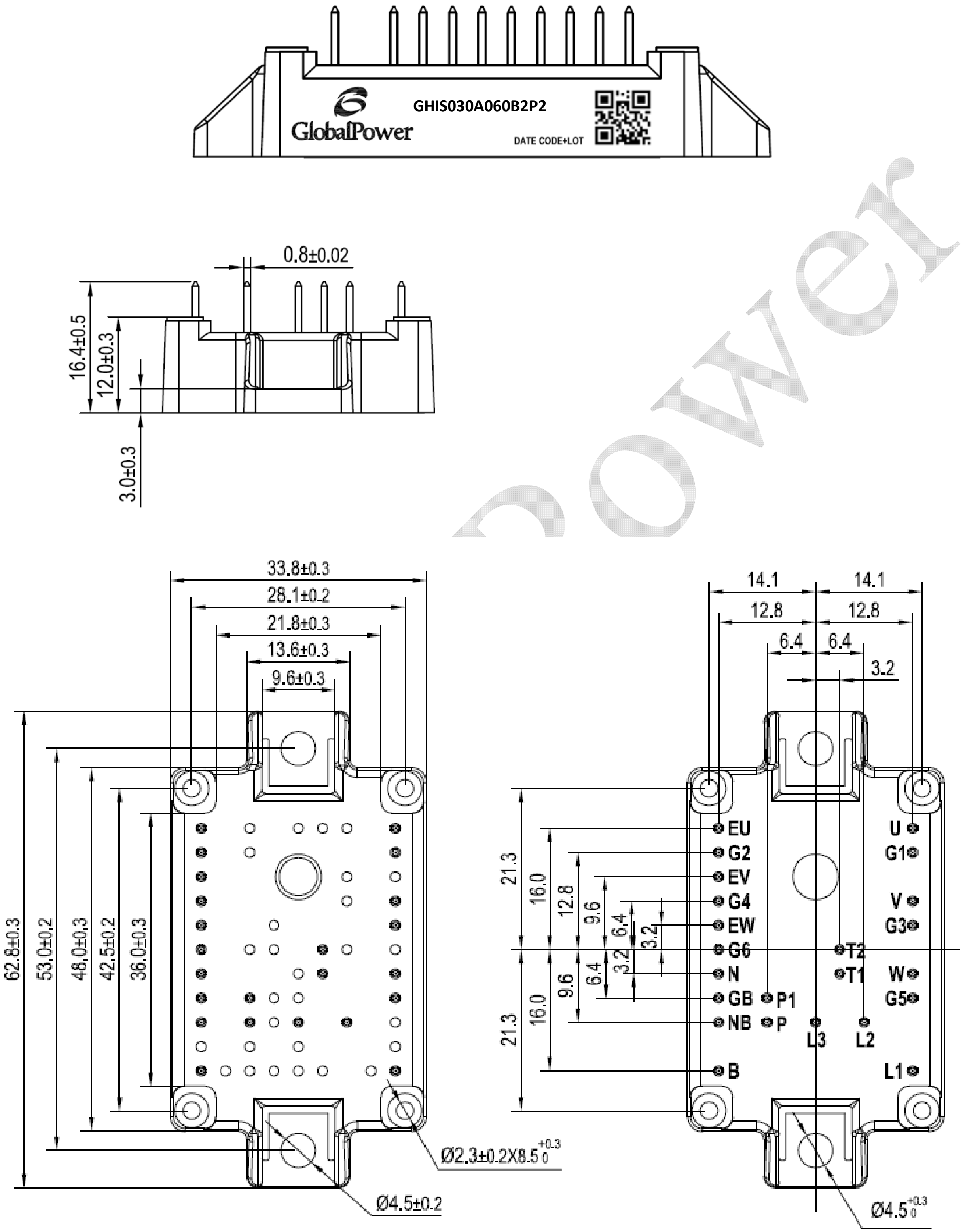


Fig. 18 Recovery Charge of Boost SiC Diode (Boost)

Internal Circuit:



Package Outline (Unit: mm):



Revision History

Date	Revision	Notes
4/22/2015	0.1	Initial release of preliminary datasheet

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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.

- This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, or air traffic control.

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