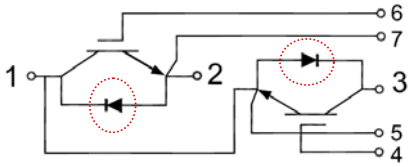
# GHIS200A120S3B1

## Si IGBT hybrid module with SiC SBDs

### Features：

- Low Saturation Voltage: $V_{CE\ (sat)}$ = 1.80V @ $I_C$ = 200A , $T_C$=25℃
- Low Switching Loss
- SiC SBD for Freewheeling diode: $V_F$= 1.60V @ $I_F$ = 200A , $T_J$=25℃
- 100% RBSOA Tested（2×Ic）
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

### Applications：




- Welding Machine/ Cutting Machine
- Induction Heating
- Ultrasonic Device
- PV System
- UPS and SMPS

### Maximum Rated Values of IGBT($T_C$=25℃ unless otherwise specified)

| | | | | |
|---|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Blocking Voltage | | 1200 | V |
| $V_{GES}$ | Gate-Emitter Voltage | | ±20 | V |
| $I_C$ | Continuous Collector Current | $T_C$ = 80℃ | 200 | A |
| | | $T_C$ = 25℃ | 400 | A |
| $I_{CM}$ | Repetitive Peak Collector Current | $T_J$ = 175℃ | 400 | A |
| $t_{SC}$ | Short Circuit Withstand Time | | >10 | μs |
| $P_D$ | Maximum Power Dissipation per IGBT | $T_C$ = 25℃<br>$T_{Jmax}$=175℃ | 1070 | 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 | IC = 1mA, VCE = VGE | | 4.0 | 4.5 | 5.0 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$ = 200A, $V_{GE}$ = 15V | $T_J$ = 25℃ | | 1.80 | 2.00 | V |
| | | | $T_J$ = 125℃ | | 2.10 | | V |
| $I_{CES}$ | Collector-Emitter Leakage Current | $V_{GE}$ = 0V, $V_{CE}$ = $V_{CES}$, $T_J$ = 2℃ | | | | 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 | | | 20.0 | | nF |
| $C_{oes}$ | Output Capacitance | | | | 1.08 | | nF |

Switching Characteristics

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}$ = 600V,$I_C$ =200A, $R_G$ = 15 Ω,$V_{GE}$ = ±15V, Inductive Load | $T_J$ = 25℃ | | 1100 | | ns |
| | | | $T_J$ = 125℃ | | 1080 | | |
| $t_r$ | Rise Time | | $T_J$ = 25℃ | | 200 | | ns |
| | | | $T_J$ = 125℃ | | 205 | | |
| $t_{d(off)}$ | Turn-off Delay Time | | $T_J$ = 25℃ | | 900 | | ns |
| | | | $T_J$ = 125℃ | | 950 | | |
| $t_f$ | Fall Time | | $T_J$ = 25℃ | | 110 | | ns |
| | | | $T_J$ = 125℃ | | 140 | | |
| $E_{on}$ | Turn-on Switching Loss | | $T_J$ = 25℃ | | TBD | 19.0 | mJ |
| | | | $T_J$ = 125℃ | | TBD | 22.9 | |
| $E_{off}$ | Turn-off Switching Loss | | $T_J$ = 25℃ | | TBD | 15.2 | mJ |
| | | | $T_J$ = 125℃ | | TBD | 19.6 | |
| $Q_g$ | Total Gate Charge | | $T_J$ = 25℃ | | 2100 | | nC |
| RBSOA | Reverse Bias Safe Operation Area | $I_C$=400A,$V_{CC}$=960V,Vp=1200V, 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 |
| $R_{\theta JC}$ | IGBT Thermal Resistance: Junction-To-Case | | | | 0.14 | | ℃/W |

## Maximum Rated Values of SiC Diode ($T_C$=25℃ unless otherwise specified)

| Symbol | Description | Conditions | Value | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | $T_j$=25 °C | 1200 | V |
| $I_F$ | Diode Continuous Forward Current | $T_C$=125 °C, $T_j$=175 °C | 279 | A |
| $I_{F,SM}$ | Surge Non-repetitive Forward Current | $T_C$=125 °C, $t_p$=8.3 ms sine half wave | 900 | A |
| dv/dt | Diode dv/dt Ruggedness | Turn-on slew rate, repetitive | 50 | V/ns |

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

| Symbol | Description | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_R$ | DC Blocking Voltage | $I_R$=100 uA | | 1200 | | | V |
| $V_F$ | Forward Voltage | $I_F$ = 200A, $V_{GE}$ = 0V | $T_J$ = 25℃ | | 1.7 | 1.8 | V |
| | | | $T_J$ = 175℃ | | 2.3 | 2.8 | |
| $I_R$ | Reverse leakage Current | $V_R$=1200V | $T_J$ = 25℃ | | 28 | 500 | μA |
| | | $V_R$=1200V | $T_J$ = 175℃ | | 1050 | | |
| $Q_C$ | Total Capacitive Charge | $V_R$=1200V | $T_J$ = 25℃ | | 776 | | nC |
| C | Total Capacitance | $V_R$=1V, f=1 MHz | | | 11428 | | pF |
| | | $V_R$=600V, f=1 MHz | | | 667 | | |
| | | $V_R$=1200V, f=1 MHz | | | 647 | | |
| $R_{\theta JC}$ | Diode Thermal Resistance: Junction-To-Case | | | | TBD | 0.21 | ℃/W |

## Module

| Symbol | Description | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{iso}$ | Isolation Voltage(All Terminals Shorted) | f = 50Hz, 1minute | | | 2500 | V |
| $T_J$ | Maximum Junction Temperature | | | | 175 | ℃ |
| $T_{JOP}$ | 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 | Power Terminals Screw:M6 | | 4.0 | | 6.0 | N·m |
| T | Mounting Screw:M6 | | 4.0 | | 6.0 | N·m |
| G | Weight | | | 230 | | g |

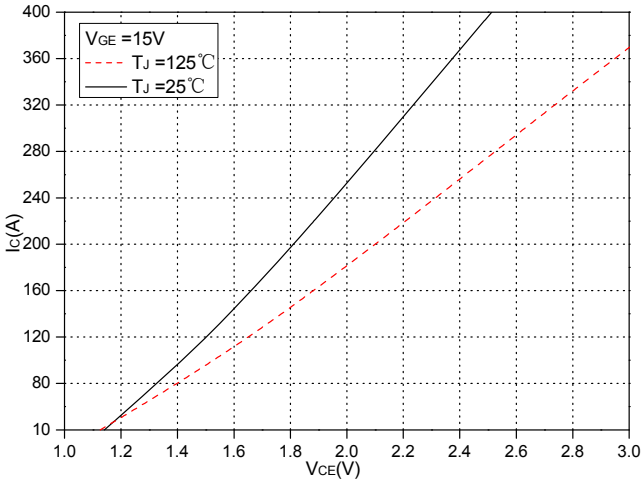



Fig.1 Typical Saturation Voltage Characteristics

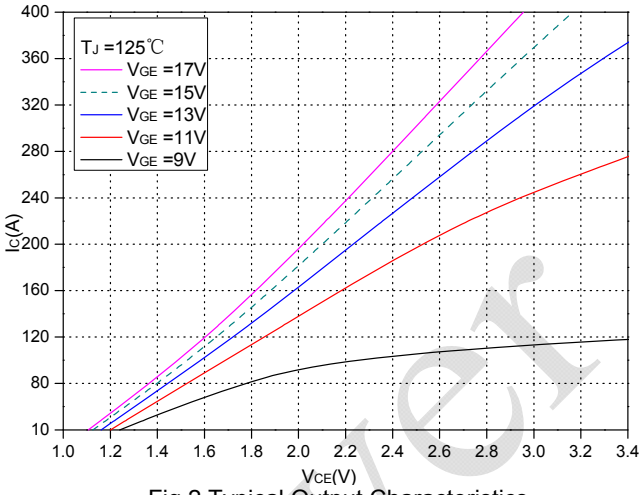



Fig.2 Typical Output Characteristics

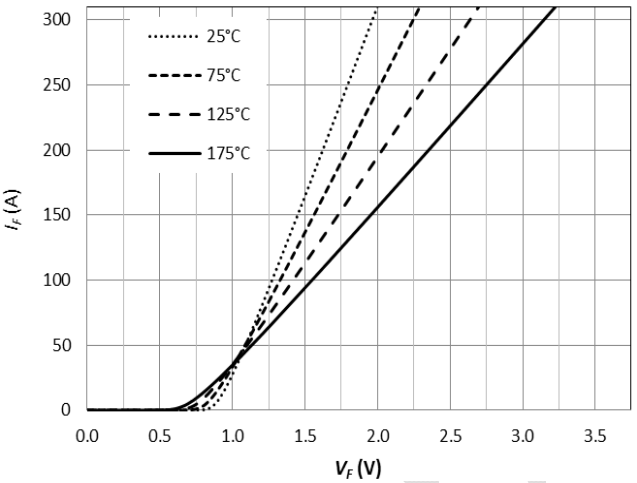



Fig.3 Forward Characteristics of Diode

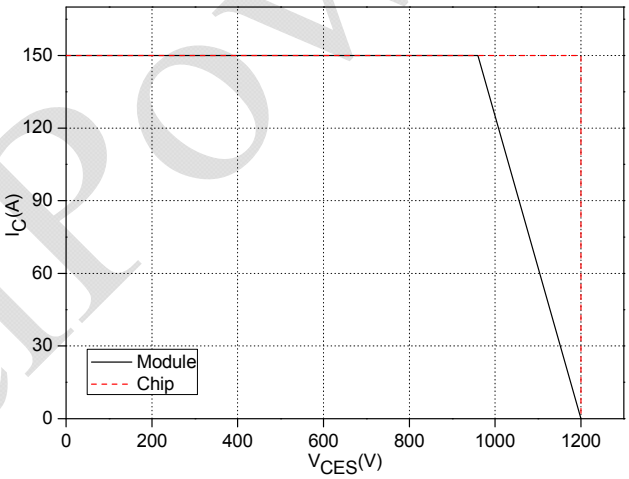



Fig.4 Reverse Bias Safe Operation Area (RBSOA)

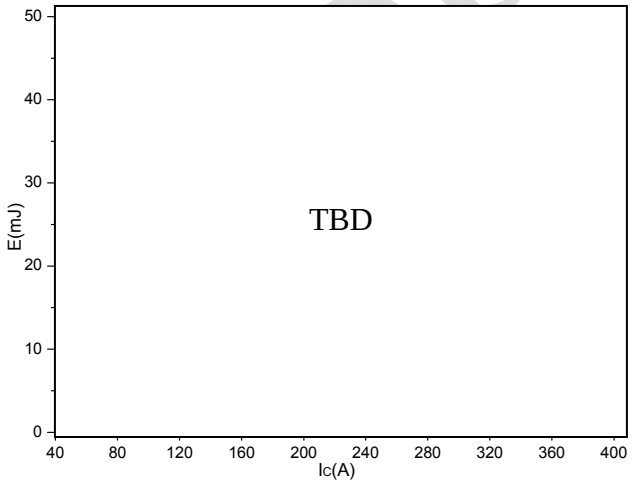



Fig.5 Typical Switching Loss vs. Collector Current

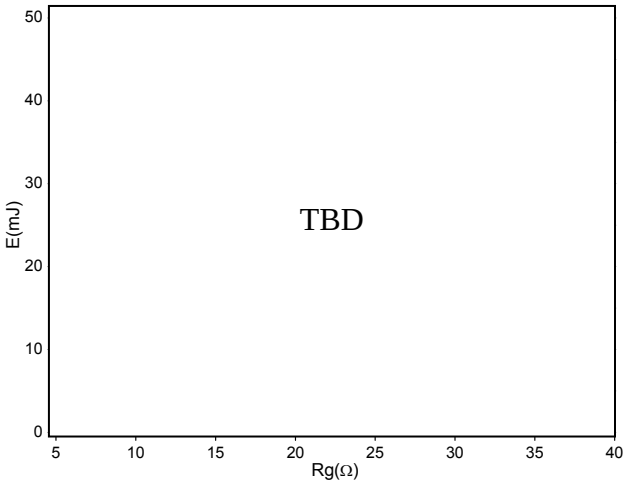



Fig.6 Typical Switching Loss vs. Gate Resistance

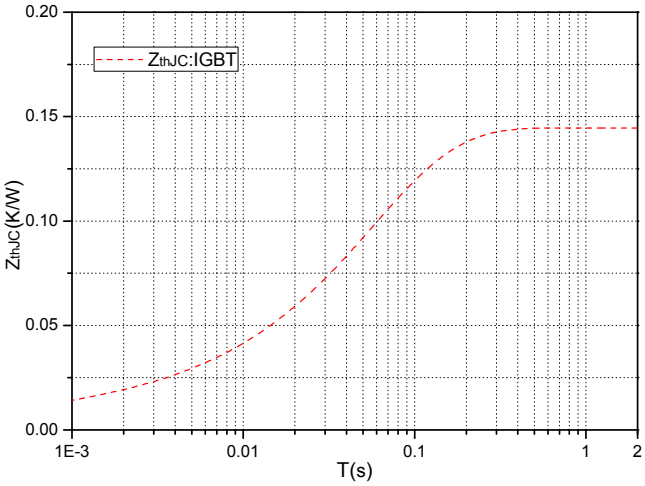



Fig.7 Transient thermal impedance (IGBT)

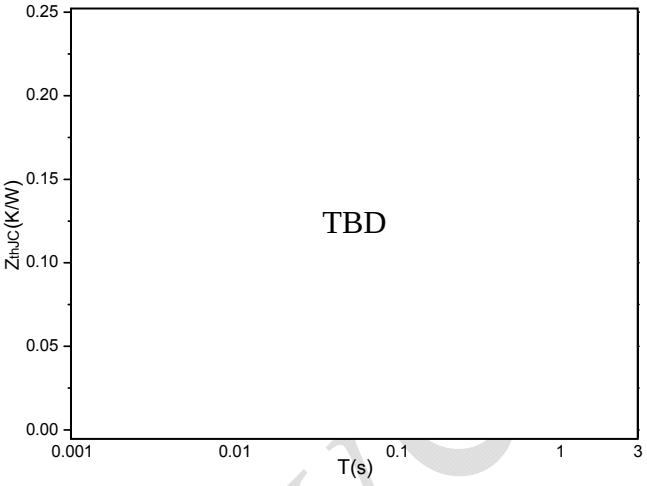



Fig.8 Transient thermal impedance (Diode)

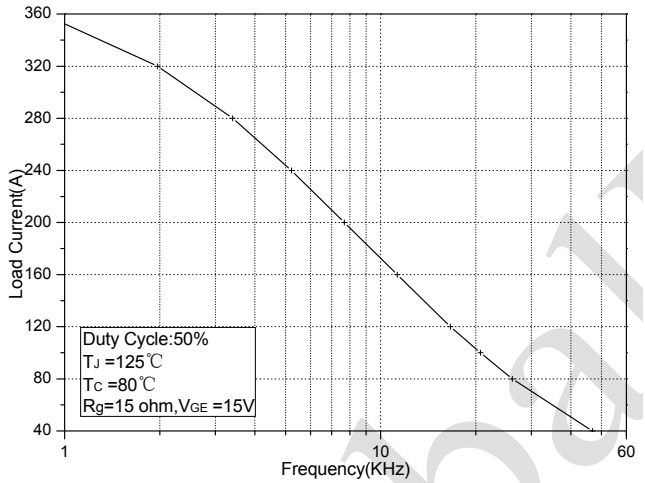



Fig.9 Typical Load Current vs. Frequency

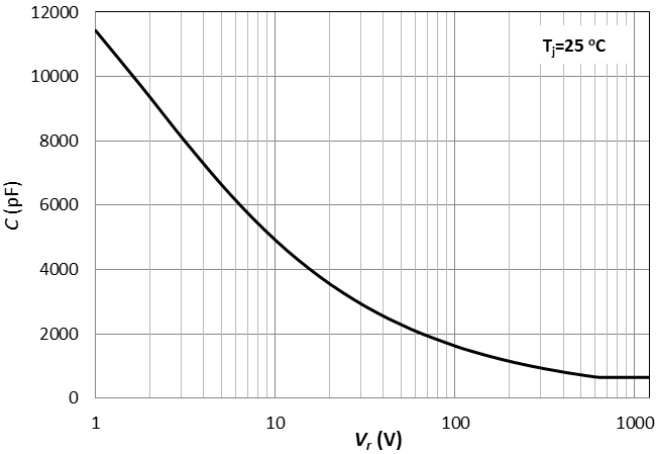



Fig.10 Capacitance Characteristics of Diode

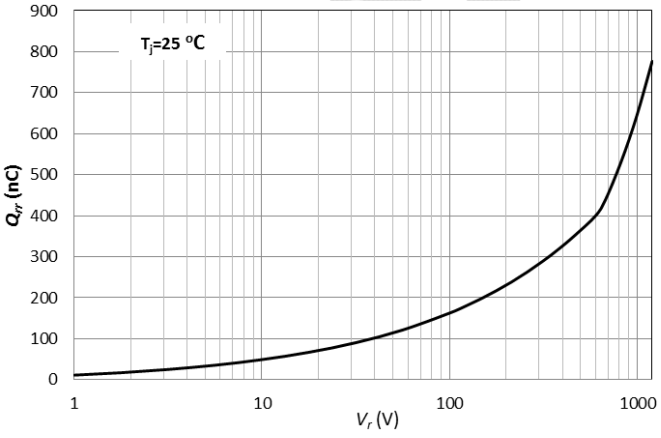



Fig. 11 Diode Recovery Charge

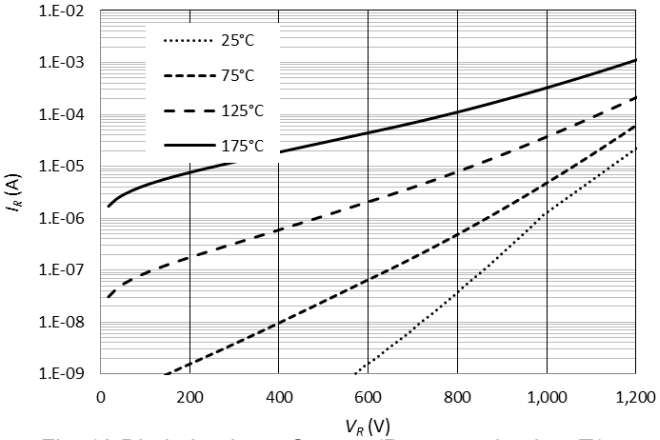
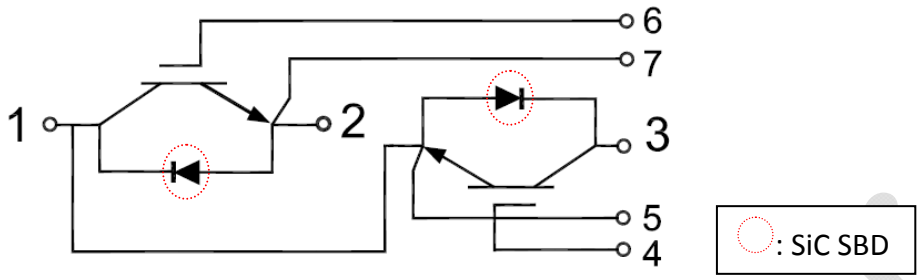
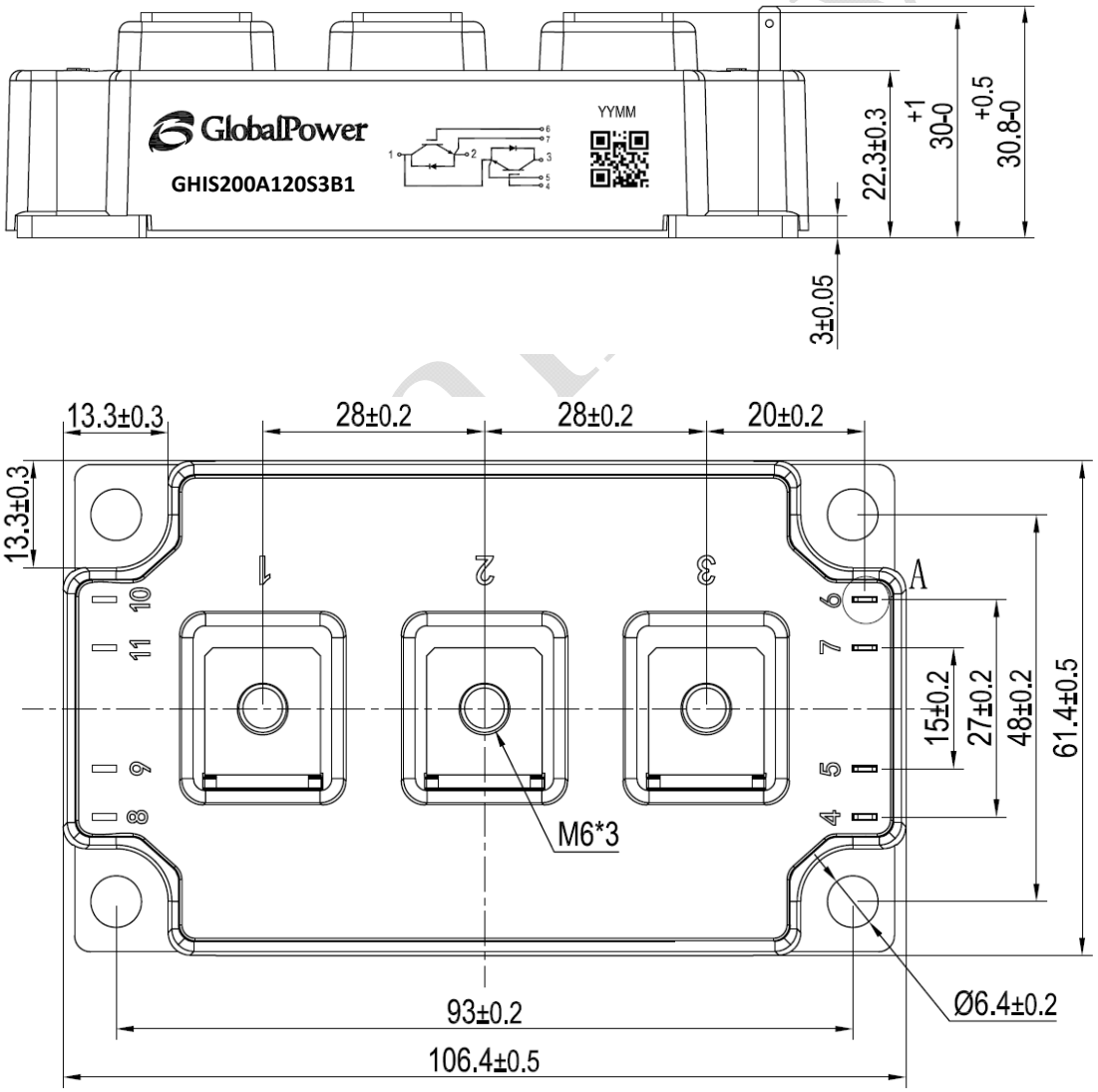



Fig. 12 Diode Leakage Current (Parameterized on $T_j$)

## 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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