

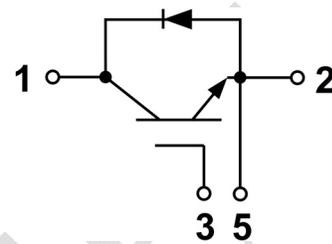


# GF600SD120T2ZH

## IGBT Module

### Features:

- Non Punch Through (NPT) Technology
- Short Circuit Rated  $>10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested( $2\times I_c$ )
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



### Applications:

- Motor Drives
- Induction Heating
- Ultrasonic Device
- High Frequency Switching Application

### IGBT, Inverter

#### Maximum Rated Values of IGBT( $T_C=25^\circ\text{C}$ unless otherwise specified)

$V_{CES}$	Collector-Emitter Blocking Voltage		1200	V
$V_{GES}$	Gate-Emitter Voltage		$\pm 20$	V
$I_C$	Continuous Collector Current	$T_C=80^\circ\text{C}$	600	A
		$T_C=25^\circ\text{C}$	1200	A
$I_{CM}$	Repetitive Peak Collector Current	$T_J=150^\circ\text{C}$	1200	A
$t_{SC}$	Short Circuit Withstand Time		$>10$	$\mu\text{s}$
$P_D$	Maximum Power Dissipation	$T_C=25^\circ\text{C}$ $T_{Jmax}=150^\circ\text{C}$	5208	W



## Electrical Characteristics of IGBT ( $T_C=25^\circ\text{C}$ unless otherwise specified)

### Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=24\text{mA}$ , $V_{CE}=V_{GE}$	5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600\text{A}$ , $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	3.50	3.65	V
			$T_J=125^\circ\text{C}$	4.25		V
$I_{CES}$	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$ , $V_{CE}=V_{CES}$ , $T_J=25^\circ\text{C}$			1	mA
$I_{GES}$	Gate-Emitter Leakage Current	$V_{GE}=\pm 20\text{V}$ , $V_{CE}=0\text{V}$ , $T_J=25^\circ\text{C}$			800	nA
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}$ , $V_{GE}=0\text{V}$ , $f=100\text{kHz}$		47.0		nF
$C_{oes}$	Output Capacitance			3.92		nF
$C_{res}$	Reverse Transfer Capacitance			2.08		nF

### Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}$ , $I_C=600\text{A}$ , $R_{Gon}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , Inductive Load	$T_J=25^\circ\text{C}$		865		ns
			$T_J=125^\circ\text{C}$		900		
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		220		ns
			$T_J=125^\circ\text{C}$		221		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600\text{V}$ , $I_C=600\text{A}$ , $R_{Goff}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , Inductive Load	$T_J=25^\circ\text{C}$		875		ns
			$T_J=125^\circ\text{C}$		925		
$t_f$	Fall Time		$T_J=25^\circ\text{C}$		134		ns
			$T_J=125^\circ\text{C}$		126		
$E_{on}$	Turn-on Switching Loss	$V_{CC}=600\text{V}$ , $I_C=600\text{A}$ , $R_{Gon}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , $di/dt=2148\text{A}/\mu\text{s}$ ( $T_J=125^\circ\text{C}$ ), Inductive Load	$T_J=25^\circ\text{C}$		24.8		mJ
			$T_J=125^\circ\text{C}$		28.8		
$E_{off}$	Turn-off Switching Loss	$V_{CC}=600\text{V}$ , $I_C=600\text{A}$ , $R_{Goff}=1\Omega$ , $V_{GE}=\pm 15\text{V}$ , $du/dt=3443\text{V}/\mu\text{s}$ ( $T_J=125^\circ\text{C}$ ), Inductive Load	$T_J=25^\circ\text{C}$		67.2		mJ
			$T_J=125^\circ\text{C}$		74.0		
$Q_g$	Total Gate Charge	$V_{GE}=+15\text{V} \dots -15\text{V}$	$T_J=25^\circ\text{C}$		6.76		$\mu\text{C}$
$R_{g\ internal}$	Internal Gate Resistor		$T_J=25^\circ\text{C}$		0.415		$\Omega$
RBSOA	Reverse Bias Safe Operation Area	$I_C=1200\text{A}$ , $V_{CC}=1050\text{V}$ , $V_p=1200\text{V}$ , $R_{Goff}=1\Omega$ , $V_{GE}=+15\text{V}$ to $0\text{V}$ , $T_J=150^\circ\text{C}$	Trapezoid				
SCSOA	SCSOA	$V_{CC}=600\text{V}$ , $V_{GE}=15\text{V}$ , $T_J=150^\circ\text{C}$	10				$\mu\text{s}$
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case				0.024		$^\circ\text{C}/\text{W}$



## Diode, Inverter

### Maximum Rated Values of Diode ( $T_C=25^\circ\text{C}$ unless otherwise specified)

$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V
$I_F$	Diode Continuous Forward Current	600	A
$I_{FM}$	Diode Maximum Forward Current	1200	A

### Electrical Characteristics of Diode ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{FM}$	Forward Voltage	$I_F=600\text{A}$	$T_J=25^\circ\text{C}$	2.05		V
			$T_J=125^\circ\text{C}$	2.25		
$t_{rr}$	Reverse Recovery Time		$T_J=25^\circ\text{C}$	172		ns
			$T_J=125^\circ\text{C}$	269		
$I_{rr}$	Peak Reverse Recovery Current	$I_F=600\text{A}$ , $-diF/dt = 2632\text{A}/\mu\text{s}(T_J=125^\circ\text{C})$ , $V_{rr}=600\text{V}$ , $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$	169		A
			$T_J=125^\circ\text{C}$	250		
$Q_{rr}$	Reverse Recovery Charge		$T_J=25^\circ\text{C}$	18.9		$\mu\text{C}$
			$T_J=125^\circ\text{C}$	40.0		
$E_{rec}$	Reverse Recovery Energy		$T_J=25^\circ\text{C}$	5.64		mJ
			$T_J=125^\circ\text{C}$	17.7		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case				0.065	$^\circ\text{C}/\text{W}$



## Module

Symbol	Description	Min.	Typ.	Max.	Units
$V_{iso}$	Isolation Voltage (All Terminals Shorted)	f=50Hz, 1minute	2500		V
$T_J$	Maximum Junction Temperature			150	°C
$T_{JOP}$	Maximum Operating Junction Temperature Range	-40		+150	°C
$T_{stg}$	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)			0.03	°C/W
T	Signal Terminals Screw:M4	1.1		2.0	N·m
T	Power Terminals Screw:M6	2.5		5.0	N·m
T	Mounting Screw:M6	3.0		6.0	N·m
G	Weight		320		g

## Ordering Information Table

Device code	G	F	600	SD	120	T2Z	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - NPT, Fast IGBT
- ③ - Rated Current (600=600A)
- ④ - Circuit Configuration (Single Switch)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

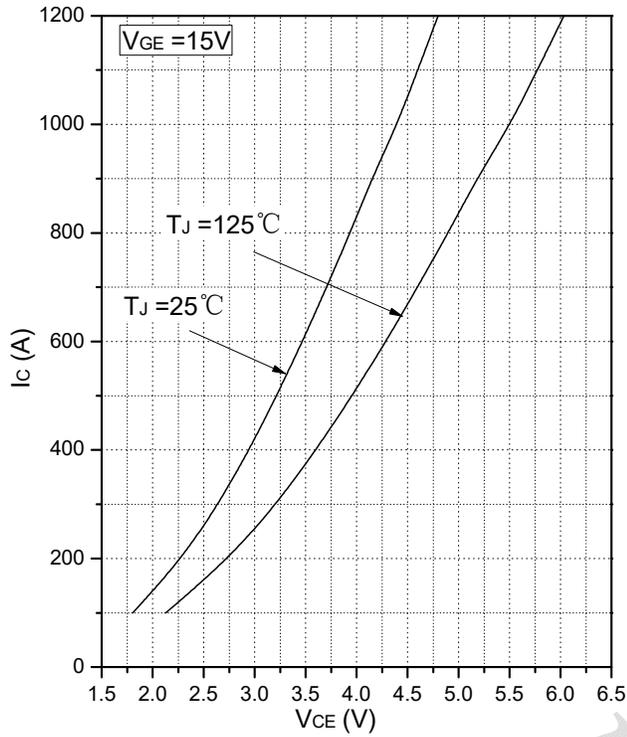


Fig.1 Typical Saturation Voltage Characteristics

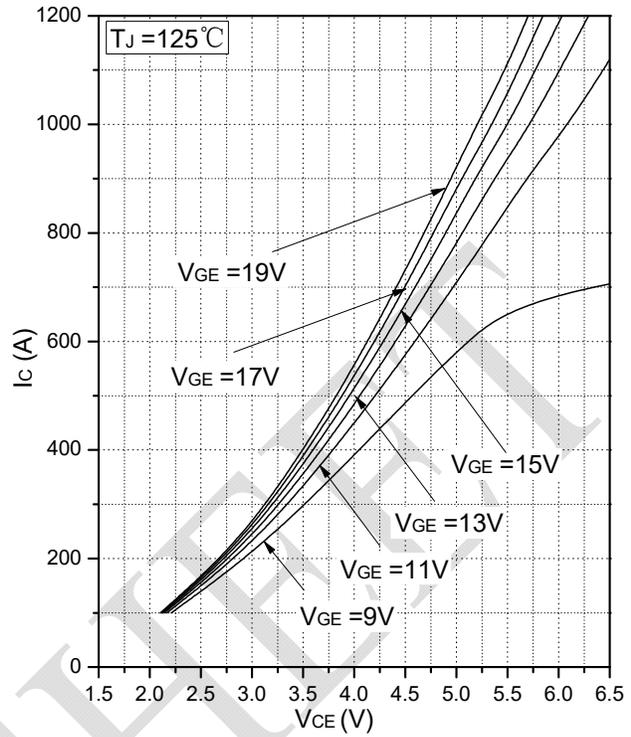


Fig.2 Typical Output Characteristics

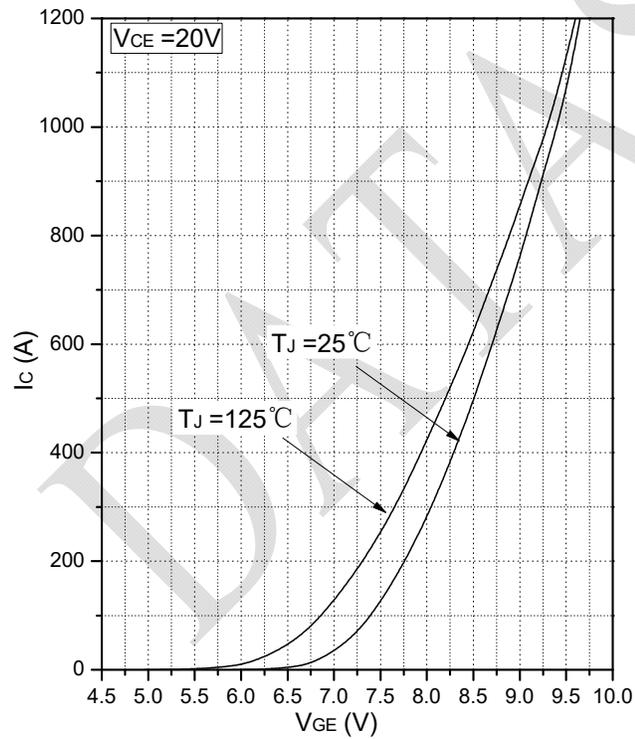


Fig.3 Transfer Characteristic

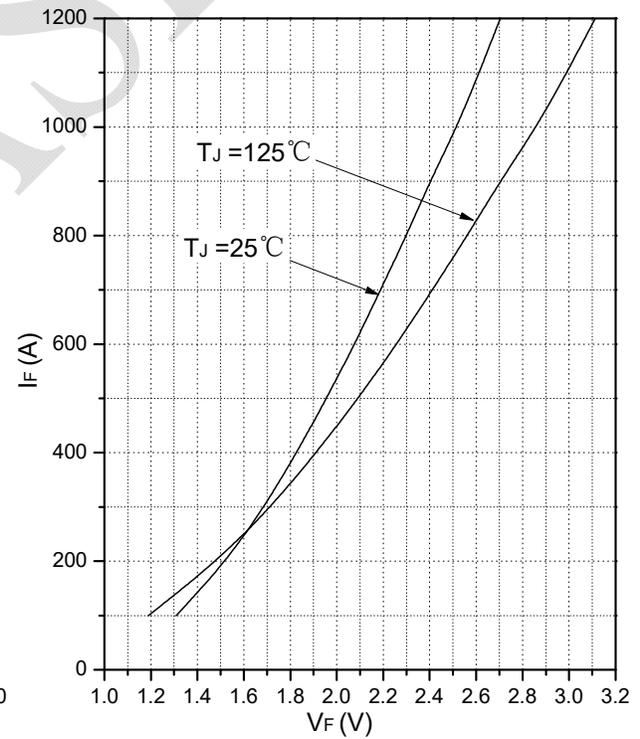


Fig.4 Forward Characteristics of Diode

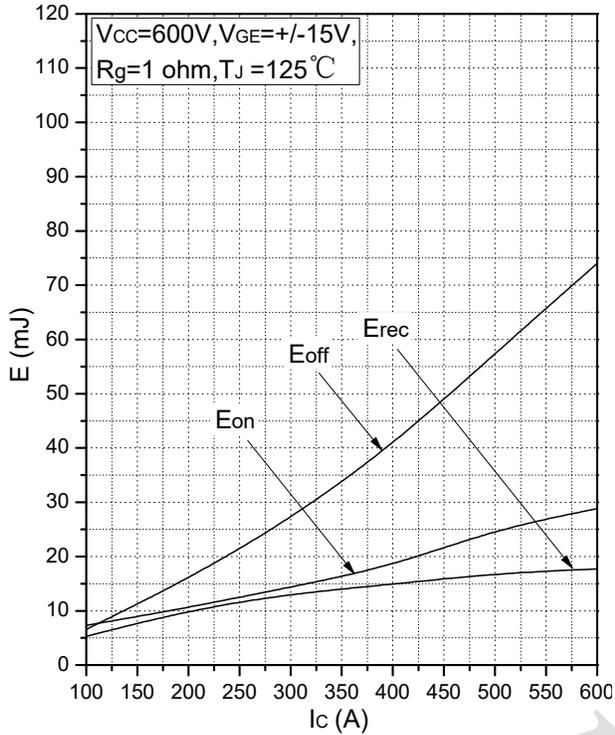


Fig.5 Typical Switching Loss vs. Collector Current

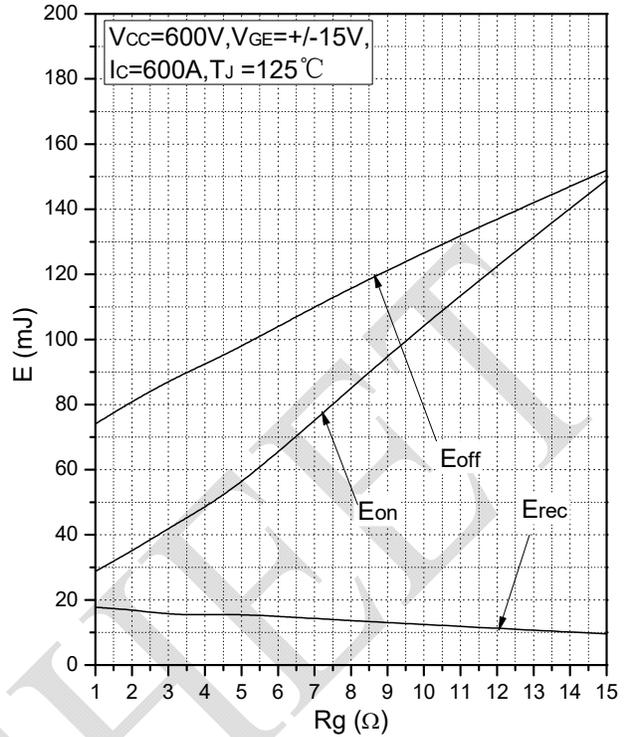


Fig.6 Typical Switching Loss vs. Gate Resistance

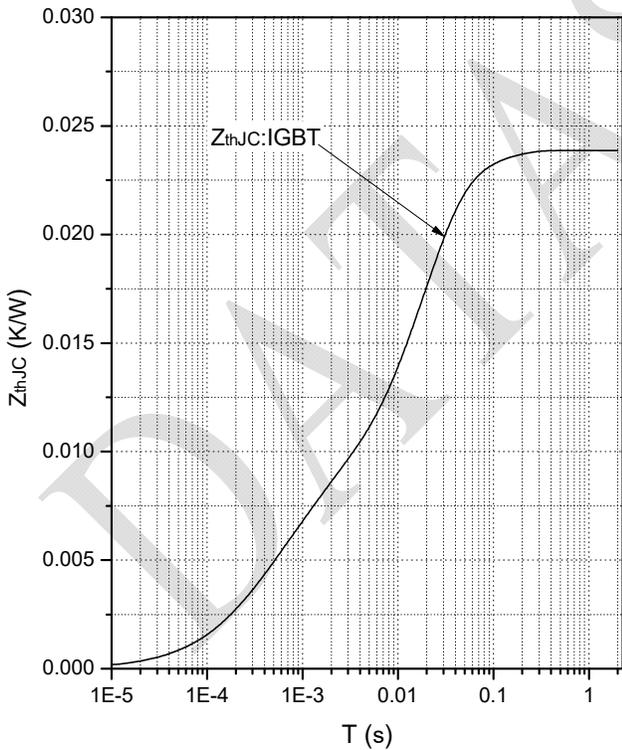


Fig.7 Transient Thermal Impedance (IGBT)

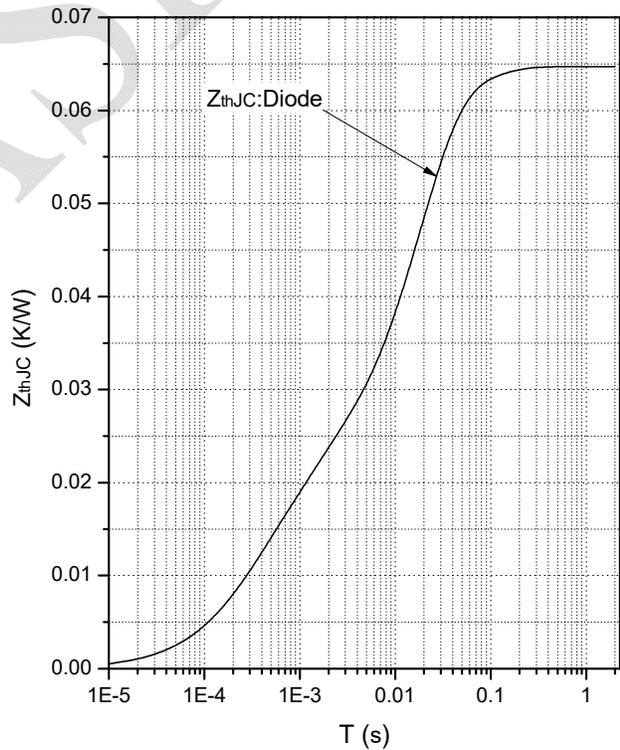


Fig.8 Transient Thermal Impedance (Diode)

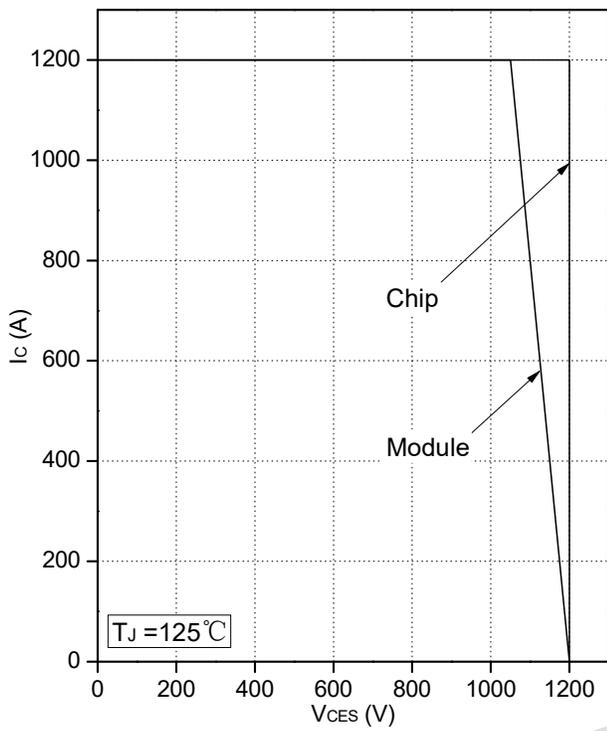
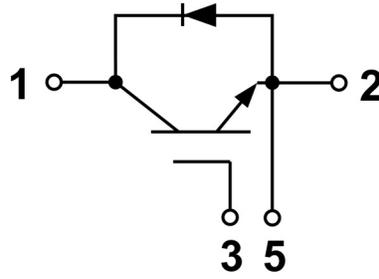


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

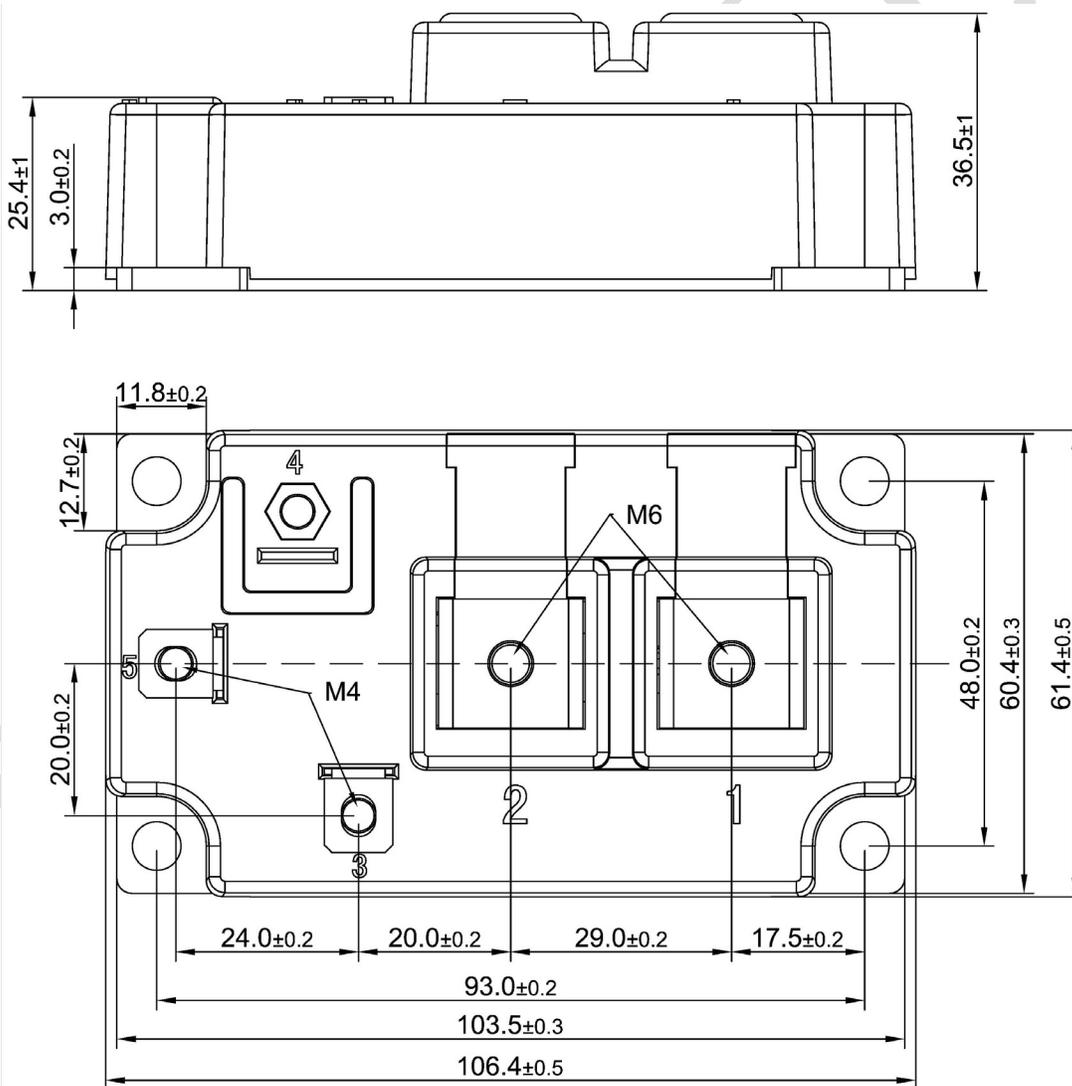
DATA SHEET



## Internal Circuit



## Package Outline (Unit: mm):







Date	Revision	Notes
03/01/2022	A	Final Version
04/12/2022	B	Updated Electrical Characteristics

## Announcements

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The released datasheet would be issued with “REV.” + “alphabet characters”.