



GT450HF65T2NH

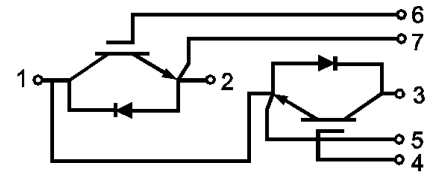
IGBT Module

Preliminary Data

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated > 10 μ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested (2 $\times$ I_C)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- High Power Converters
- Industrial Motor Drives
- UPS Systems

IGBT, Inverter

Maximum Rated Values of IGBT (T_C=25°C unless otherwise specified)

V _{CES}	Collector-Emitter Blocking Voltage		650	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	450	A
		T _C =25°C	550	A
I _{CM}	Repetitive Peak Collector Current	T _J =175°C	900	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =175°C	1699	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	$I_C=7.2\text{mA}$, $V_{CE}=V_{GE}$	4.3	4.6	5.3	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.55	1.90	V
			$T_J=125^{\circ}\text{C}$	1.80		V
			$T_J=150^{\circ}\text{C}$	1.85		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			600	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		32.54		nF
C_{oes}	Output Capacitance			2.10		nF
C_{res}	Reverse Transfer Capacitance			0.59		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300V, I_C=450A,$ $R_{Gon}=10\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		897		ns
			$T_J=125^{\circ}C$		909		
			$T_J=150^{\circ}C$		929		
t_r	Rise Time		$T_J=25^{\circ}C$		328		ns
			$T_J=125^{\circ}C$		357		
			$T_J=150^{\circ}C$		358		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		846		ns
			$T_J=125^{\circ}C$		852		
			$T_J=150^{\circ}C$		858		
t_f	Fall Time	$T_J=25^{\circ}C$		154		ns	
		$T_J=125^{\circ}C$		165			
		$T_J=150^{\circ}C$		168			
E_{on}	Turn-on Switching Loss	$V_{CC}=300V, I_C=450A,$ $R_{Gon}=10\Omega, V_{GE}=\pm 15V,$ $di/dt=1072A/\mu s$ ($T_J=150^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		15		mJ
		$T_J=125^{\circ}C$		19			
		$T_J=150^{\circ}C$		21			



E_{off}	Turn-off Switching Loss	$V_{CC}=300V, I_C=450A,$ $R_{Goff}=10\Omega, V_{GE}=\pm 15V,$ $du/dt=1187V/\mu s (T_J=150^\circ C)$ Inductive Load	$T_J=25^\circ C$		28		mJ
			$T_J=125^\circ C$		31		
			$T_J=150^\circ C$		34		
Q_g	Total Gate Charge	$V_{GE}=+15V \dots -15V$	$T_J=25^\circ C$		2.21		μC
$R_{G(int)}$	Internal Gate Resistance		$T_J=25^\circ C$		0.67		Ω
SCSOA	$V_{CC}=300V, V_{GE}=\pm 15V, T_J=150^\circ C$				6		μs
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.088	$^\circ C/W$

Diode, Reverse

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	650	V
I_F	Diode Continuous Forward Current	$T_C=100^\circ C$	450	A
I_{FM}	Peak Diode Current Repetitive	$t_p=1ms$	900	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =450A	T _J =25℃		1.65		V
			T _J =125℃		1.75		
			T _J =150℃		1.75		
t _{rr}	Reverse Recovery Time	I _F =450A, -diF/dt=1372A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		180		ns
			T _J =125℃		196		
			T _J =150℃		228		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		100		A
			T _J =125℃		131		
			T _J =150℃		144		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		8.5		μC
			T _J =125℃		14.1		
			T _J =150℃		16.7		



E _{rec}	Reverse Recovery Energy	I _F =450A, -diF/dt=1372A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		0.85		mJ
			T _J =125℃		2.11		
			T _J =150℃		2.68		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.119	℃/W

Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)				0.03	°C/W
T	Power Terminals Screw:M6		3.0		5.0	N·m
T	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			300		g

Ordering Information Table

Device code

G	T	450	HF	65	T2N	H
①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (450=450A)
- ④ - Circuit Configuration: HF (Half Bridge)
- ⑤ - Rated Voltage (65=650V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

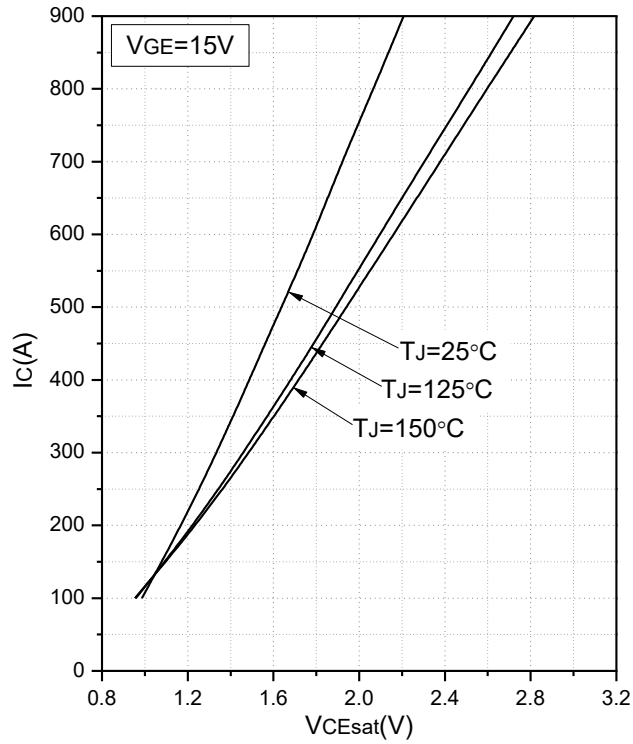


Fig.1 Typical Saturation Voltage Characteristics

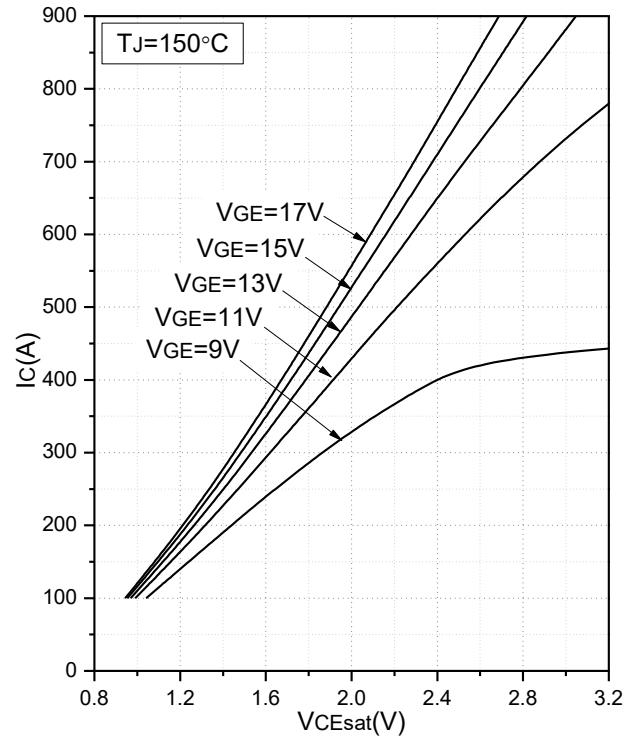


Fig.2 Typical Output Characteristics

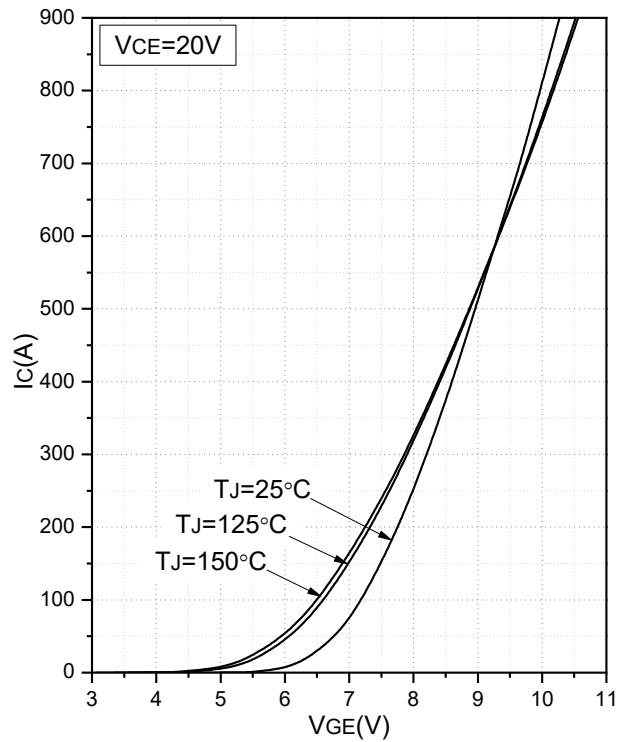


Fig.3 Transfer Characteristics

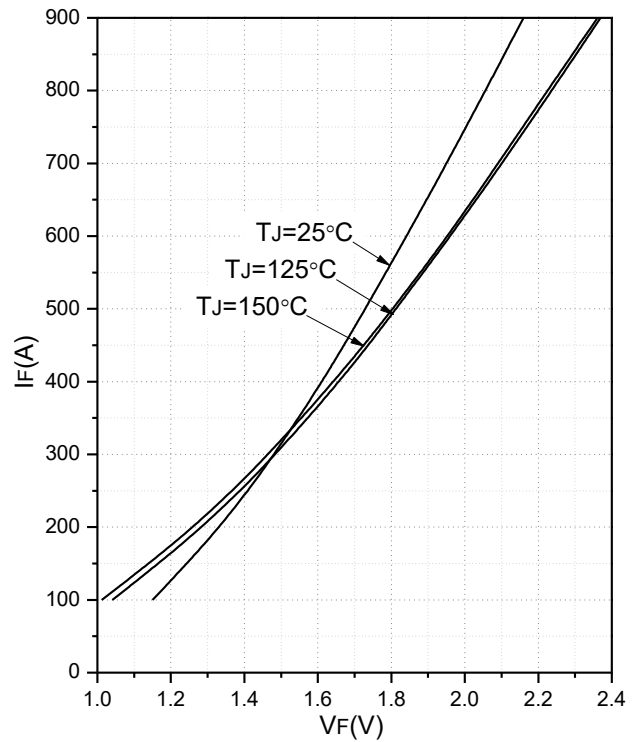


Fig.4 Forward Characteristics of Diode

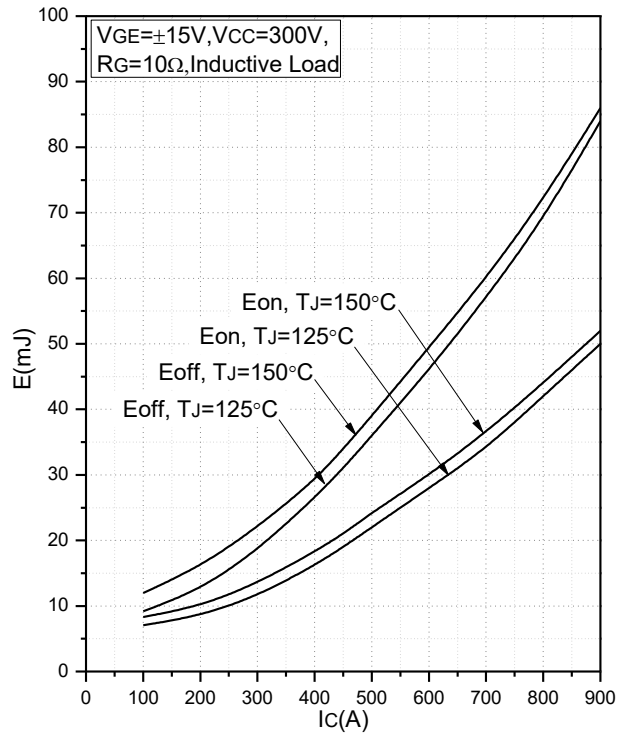


Fig. 5 Typical Switching Loss vs. Collector Current

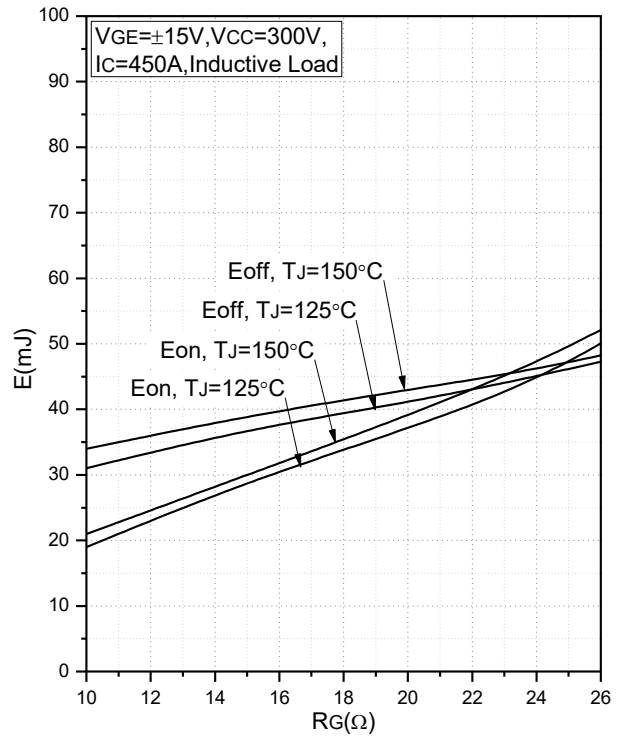


Fig. 6 Typical Switching Loss vs. Gate Resistance

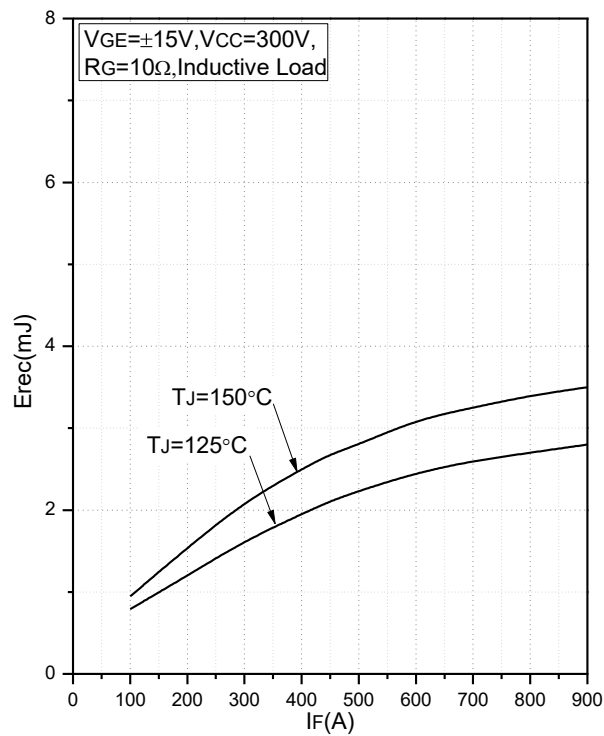


Fig. 7 Typical Switching Loss vs. Forward Current

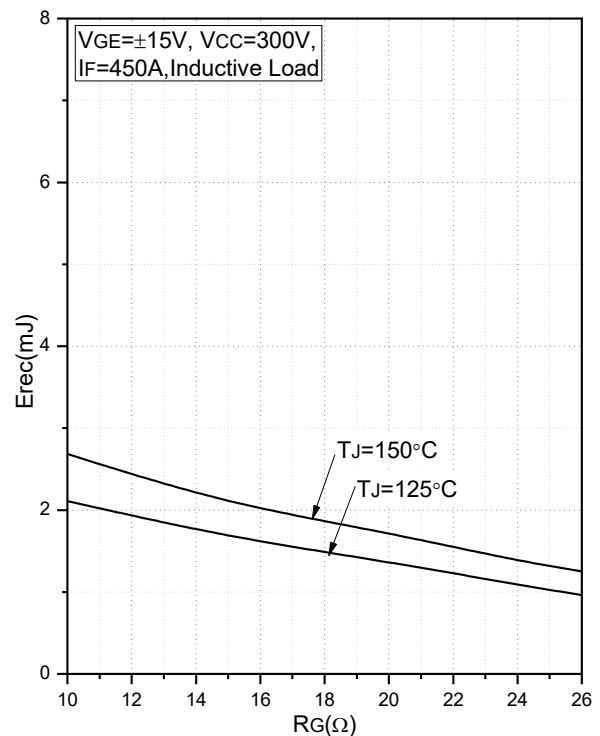


Fig. 8 Typical Switching Loss vs. Gate Resistance

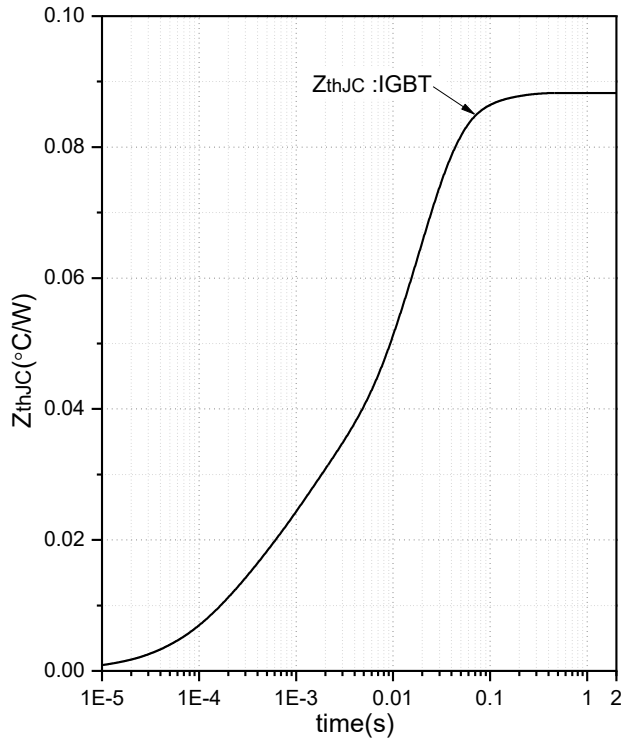


Fig.9 Transient Thermal Impedance (IGBT)

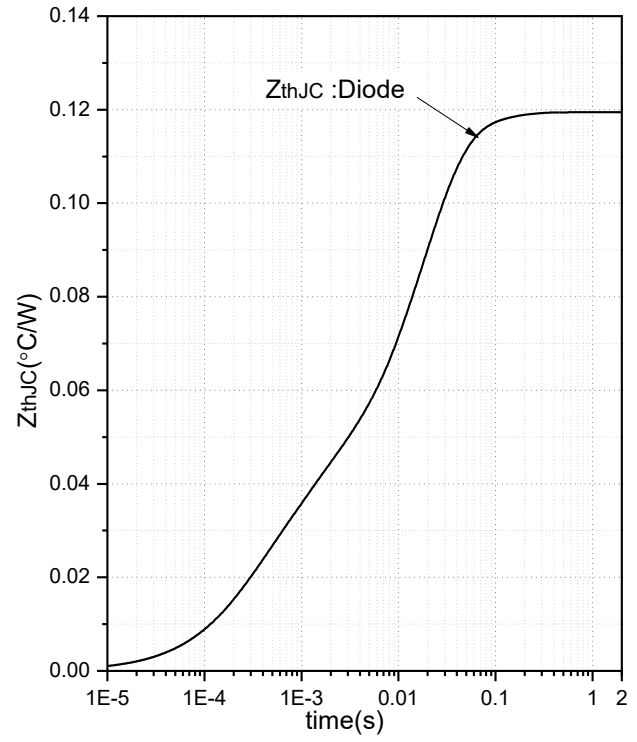


Fig.10 Transient Thermal Impedance (Diode)

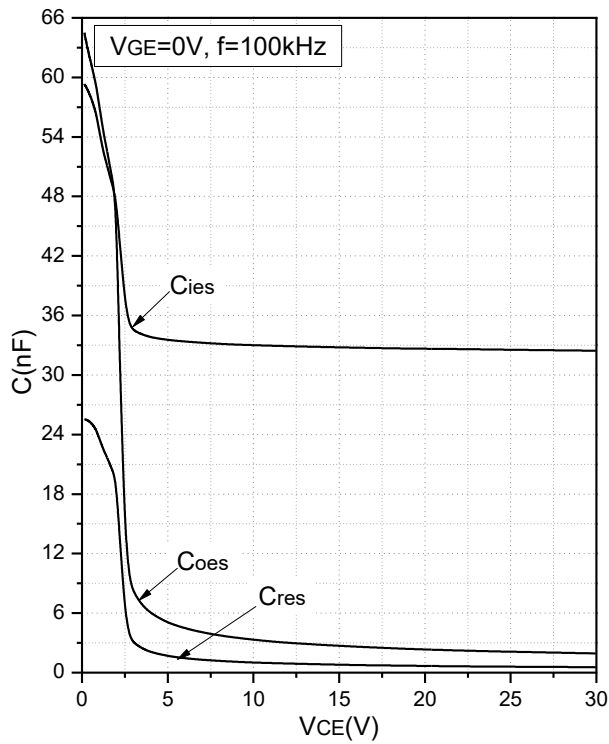


Fig.11 Capacitance Characteristics

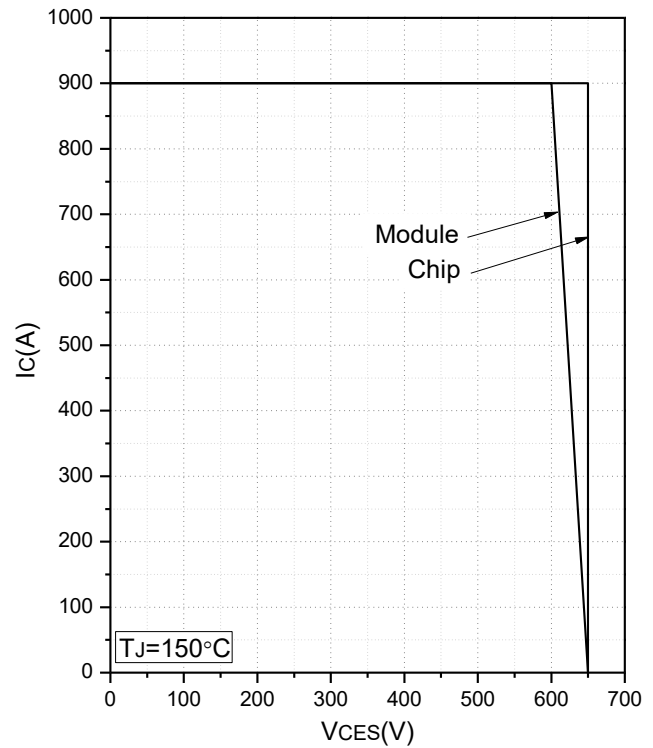
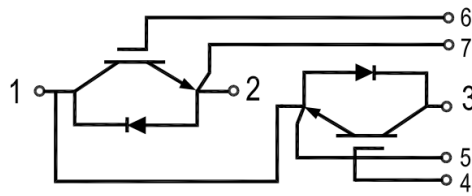


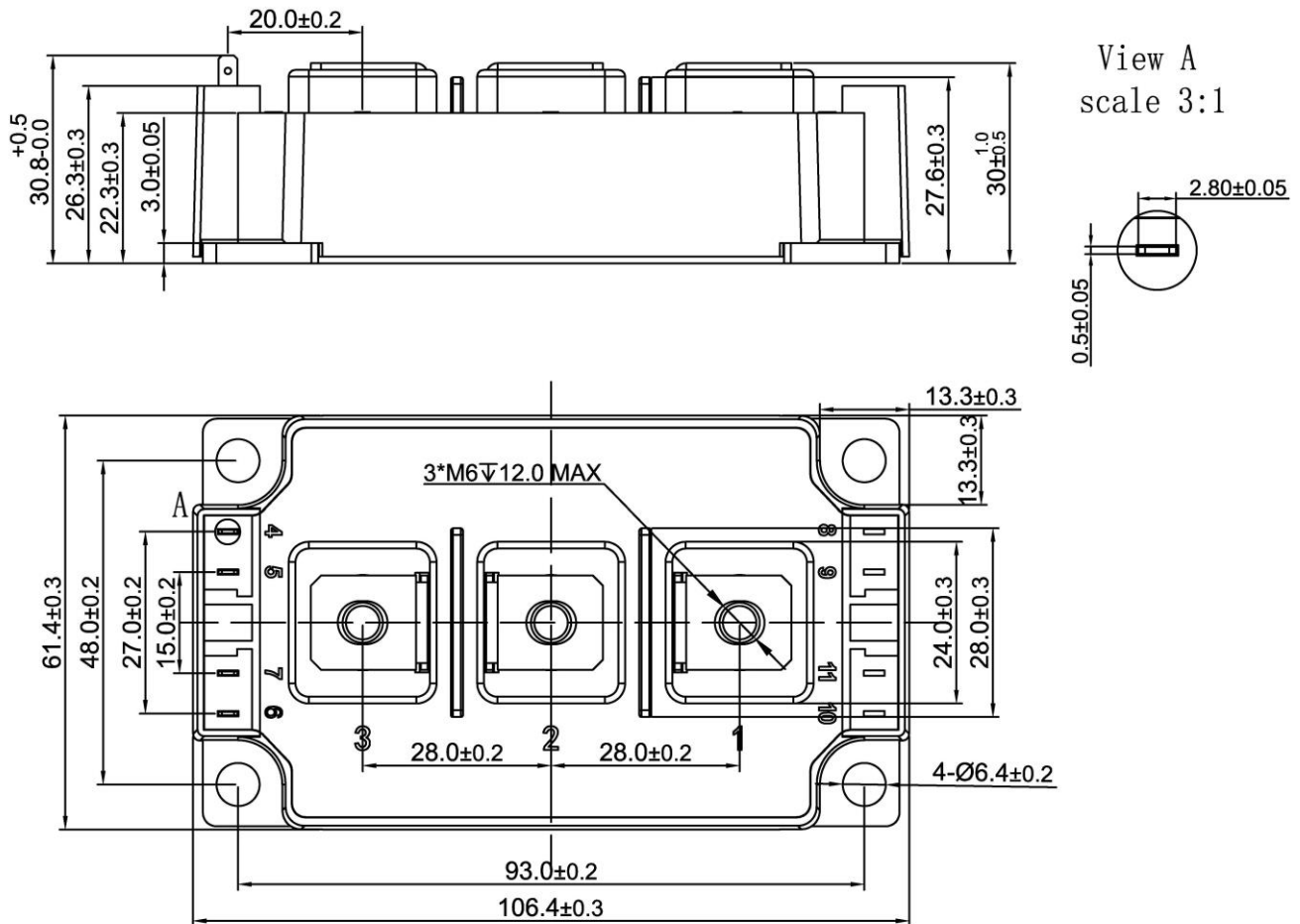
Fig.12 Reverse Bias Safe Operation Area (RBSOA)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcement

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