



GT400HF65A5H

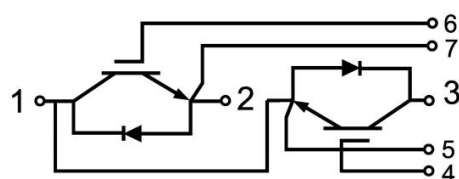
IGBT Module

Preliminary Data

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated $>6\mu\text{s}$
- Low Switching Loss
- 100% RBSOA Tested($2\times I_c$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Industrial Inverters
- Motor Drives
- UPS Systems

IGBT, Inverter

Maximum Rated Values ($T_c=25^\circ\text{C}$ unless otherwise specified)

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_c	Continuous Collector Current	$T_c=100^\circ\text{C}$	400	A
		$T_c=25^\circ\text{C}$	445	A
I_{CM}	Peak Collector Current Repetitive	$t_p=1\text{ms}$	800	A
P_D	Maximum Power Dissipation (IGBT)	$T_c=25^\circ\text{C}$ $T_J=175^\circ\text{C}$	1419	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	$I_C=4\text{mA}$, $V_{CE}=V_{GE}$	4.0	4.7	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.60	1.80	V
			$T_J=125^{\circ}\text{C}$	1.85		V
			$T_J=150^{\circ}\text{C}$	1.90		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			± 400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		29.08		nF
C_{oes}	Output Capacitance			1.78		nF
C_{res}	Reverse Transfer Capacitance			0.53		nF

Switching Characteristics

Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300V, I_C=400A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		545		ns
			$T_J=125^{\circ}C$		564		
			$T_J=150^{\circ}C$		565		
t_r	Rise Time		$T_J=25^{\circ}C$		283		ns
			$T_J=125^{\circ}C$		284		
			$T_J=150^{\circ}C$		285		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=300V, I_C=400A,$ $R_{Goff}=4.7\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		432		ns
			$T_J=125^{\circ}C$		436		
			$T_J=150^{\circ}C$		438		
t_f	Fall Time		$T_J=25^{\circ}C$		513		ns
			$T_J=125^{\circ}C$		529		
			$T_J=150^{\circ}C$		556		
E_{on}	Turn-on Switching Loss	$V_{CC}=300V, I_C=400A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ $di/dt=1183A/\mu s$ ($T_J=150^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		12.0		mJ
			$T_J=125^{\circ}C$		13.2		
			$T_J=150^{\circ}C$		14.0		



E _{off}	Turn-off Switching Loss	V _{CC} =300V, I _C =400A, R _{Goff} =4.7Ω, V _{GE} =±15V, du/dt=2160V/μs (T _J =150°C) Inductive Load	T _J =25°C		18.0		mJ
			T _J =125°C		23.0		
			T _J =150°C		24.0		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2.01		μC
R _{G(int)}	Internal Gate Resistance		T _J =25°C		1		Ω
SCSOA	V _{CC} =300V, V _{GE} =±15V, T _J =150°C			6			μs
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.11	°C/W

Diode, Inverter

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _F	Diode Continuous Forward Current	T _C =100°C	400	A
I _{FM}	Peak Diode Current Repetitive	t _p =1ms	800	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =400A	T _J =25℃		1.65		V
			T _J =125℃		1.70		
			T _J =150℃		1.70		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt=1492A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		140		ns
			T _J =125℃		161		
			T _J =150℃		179		
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℃		8.10		μC
			T _J =125℃		14.10		
			T _J =150℃		16.03		



E _{rec}	Reverse Recovery Energy	I _F =400A, -diF/dt=1492/μs(T _J =150°C), V _R =300V, V _{GE} =-15V	T _J =25°C		1.0		mJ
			T _J =125°C		2.4		
			T _J =150°C		2.8		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.15	°C/W

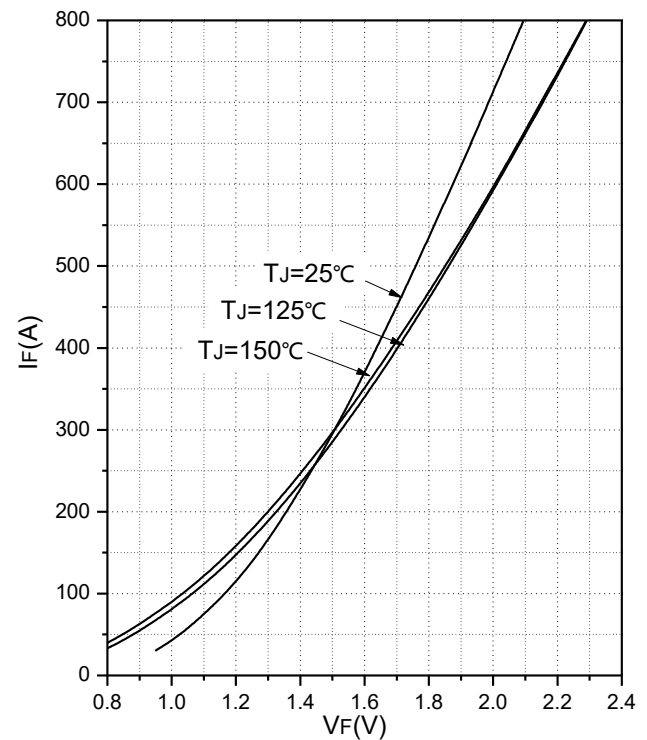
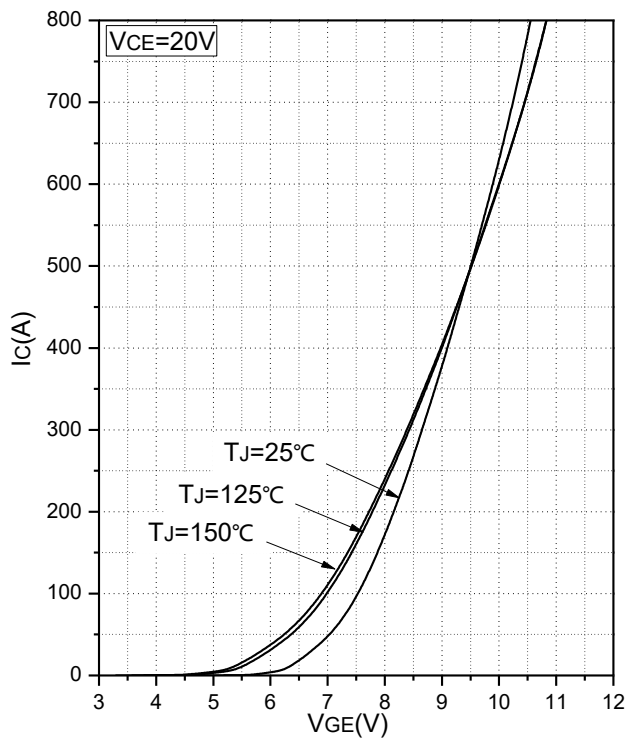
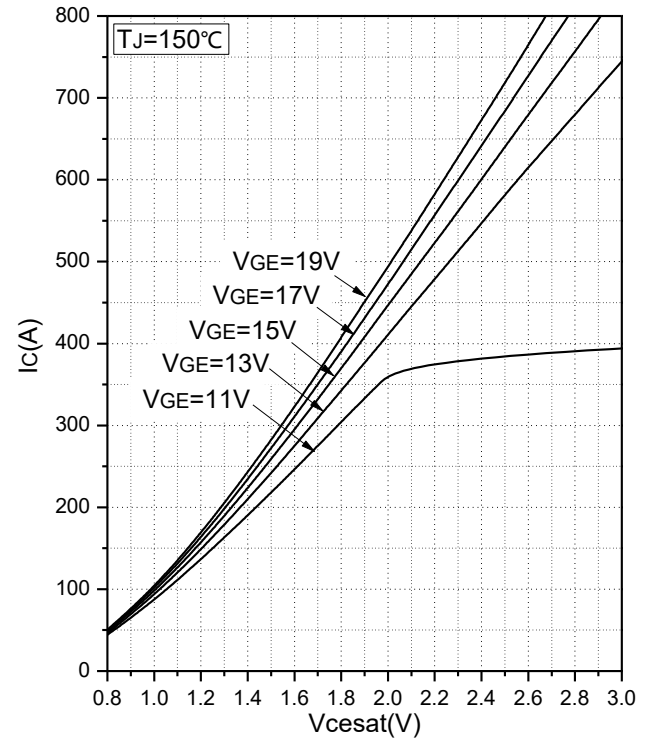
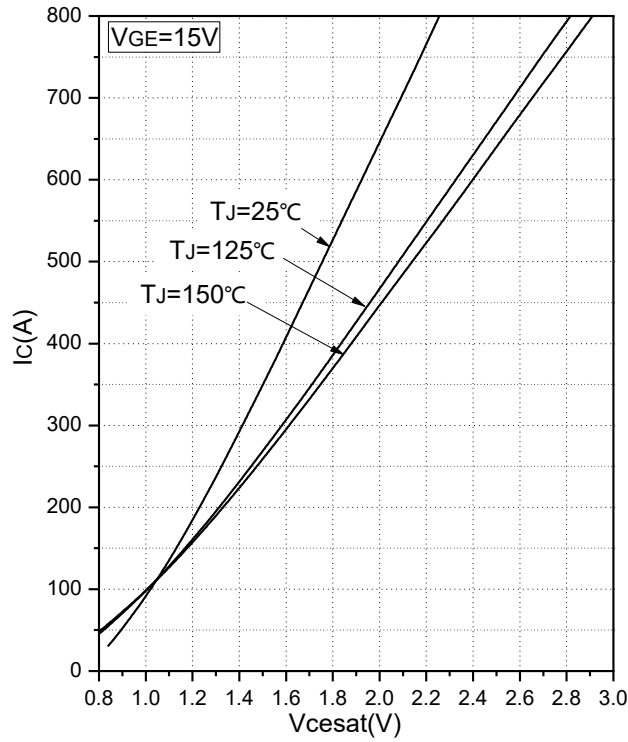
Module

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)				0.05	°C/W
M	Power Terminals Screw:M5		3.0		5.0	N·m
M	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			200		g

Ordering Information Table

Device code	G	T	400	HF	65	A5	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Field Stop Trench Gate IGBT
- ③ - Rated Current (400=400A)
- ④ - Circuit Configuration (Half Bridge)
- ⑤ - Rated Voltage (65=650V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



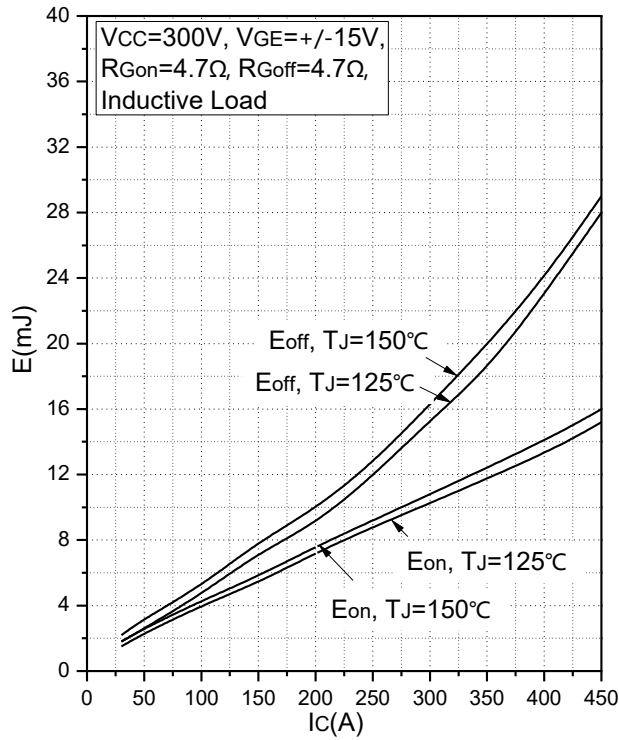


Fig.5 Typical Switching Loss vs. Collector Current

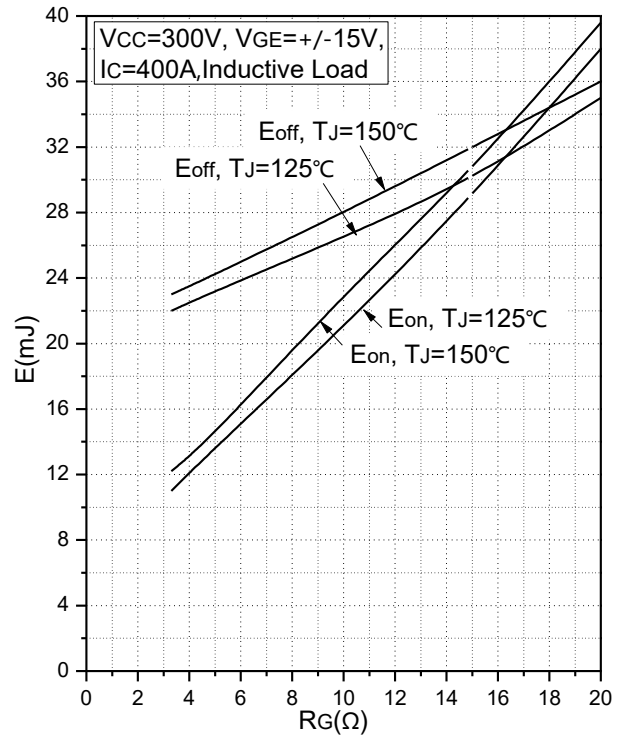


Fig.6 Typical Switching Loss vs. Gate Resistance

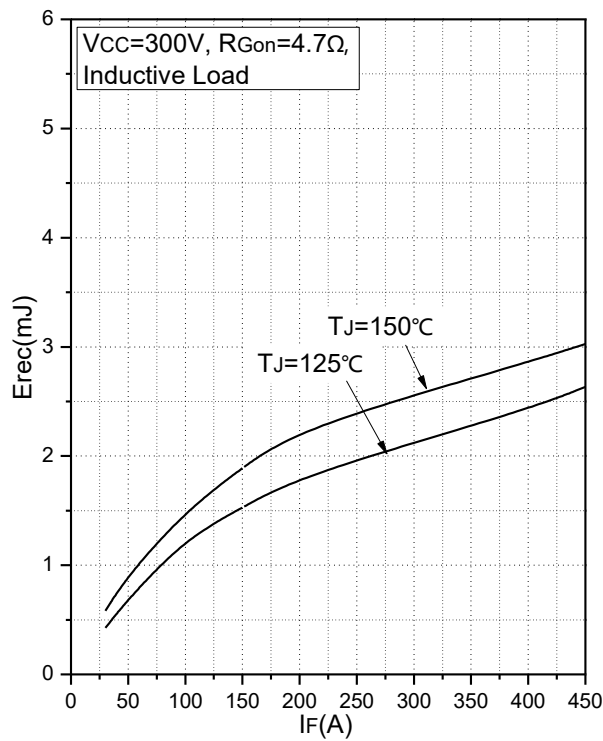


Fig.7 Typical Switching Loss vs. Forward Current

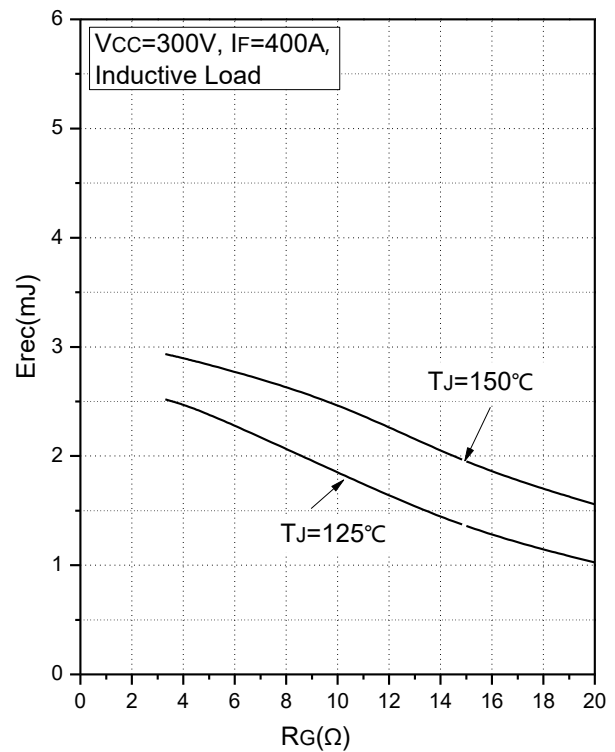


Fig.8 Typical Switching Loss vs. Gate Resistance

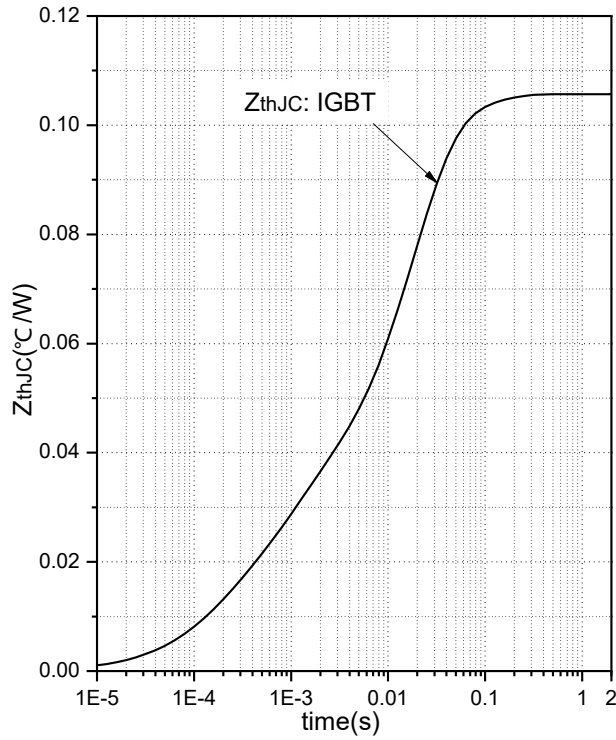


Fig.9 Transient Thermal Impedance (IGBT)

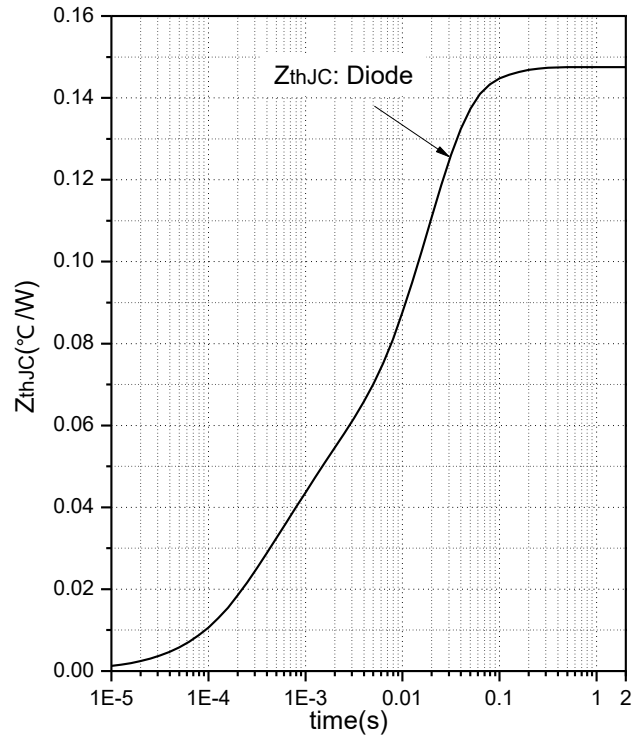


Fig.10 Transient Thermal Impedance (Diode)

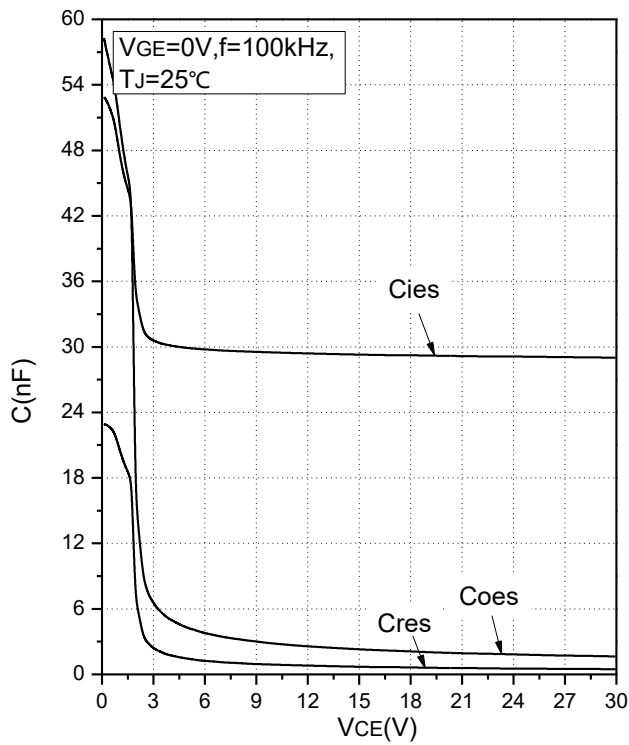


Fig.11 Capacitance Characteristics

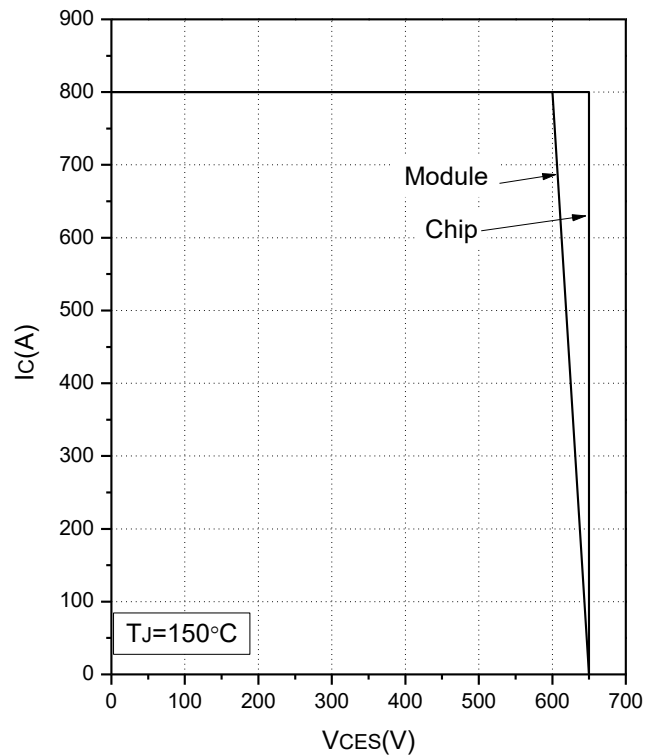
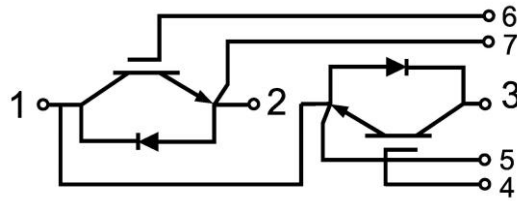


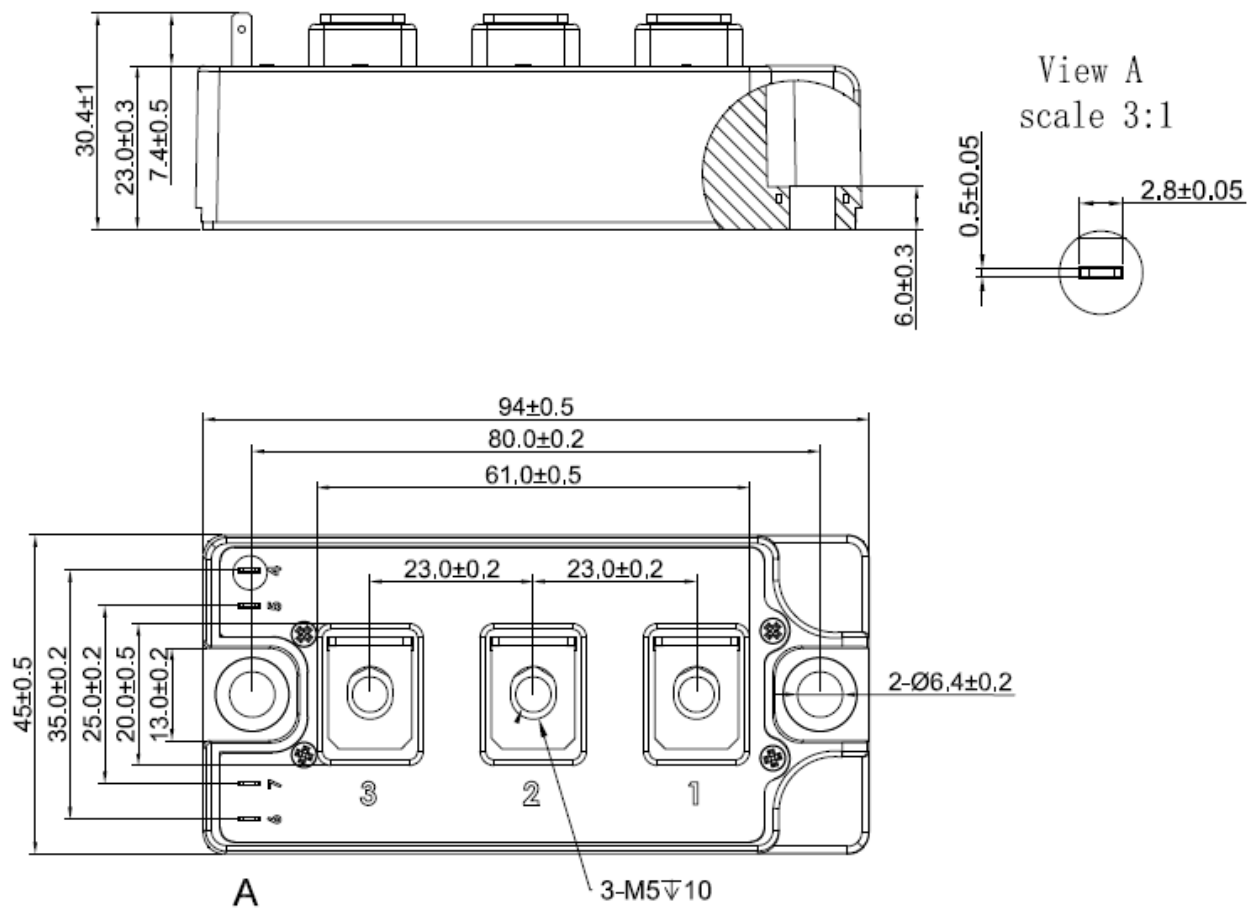
Fig.12 Reverse Bias Safe Operation Area (RBSOA)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcement

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