

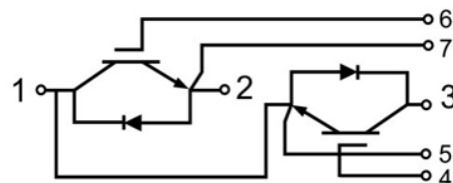
GT400HF120T2NH

Circuit Diagram

IGBT Module

Features:

- $V_{CES}=1200V$ $I_C=400A$ Trench & Field Stop IGBT Module
- Short Circuit Capability
- Low Switching Loss
- 100% RBSOA Tested($2 \times I_C$)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- High-power Converters
- UPS System
- Motor Drives
- Servo Drives
- Wind Turbines



Type	Package	Marking
GT400HF120T2NH	T2N	GT400HF120T2NH

IGBT, Inverter

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

Symbol	Description		Value	Unit
V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=90^\circ C$	400	A
		$T_C=25^\circ C$	800	A
I_{CM}	Peak Collector Current Repetitive	t_p limited by T_{Jmax}	800	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	2500	W

GT400HF120T2NH

IGBT Module Datasheet



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	$I_C=17\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.4	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=400\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70	2.10	V
			$T_J=125^{\circ}\text{C}$	2.00		V
			$T_J=175^{\circ}\text{C}$	2.20		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200\text{V}$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			400	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		46.9		nF
C_{oes}	Output Capacitance			2.30		nF
C_{res}	Reverse Transfer Capacitance			0.51		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=400A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		162		ns
			$T_J=125^{\circ}C$		174		
			$T_J=175^{\circ}C$		177		
t_r	Rise Time		$T_J=25^{\circ}C$		37		ns
			$T_J=125^{\circ}C$		44		
			$T_J=175^{\circ}C$		49		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		263		ns
			$T_J=125^{\circ}C$		301		
			$T_J=175^{\circ}C$		315		
t_f	Fall Time	$T_J=25^{\circ}C$		214		ns	
		$T_J=125^{\circ}C$		301			
		$T_J=175^{\circ}C$		317			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=400A,$ $R_{Gon}=1\Omega, V_{GE}=\pm 15V,$ $di/dt=6500A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		22		mJ
		$T_J=125^{\circ}C$		36			
		$T_J=175^{\circ}C$		45			

GT400HF120T2NH

IGBT Module Datasheet



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =400A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=4500V/μs(T _J =175°C) Inductive Load	T _J =25°C		30		mJ
			T _J =125°C		41		
			T _J =175°C		45		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2.69		μC
R _{G (int)}	Internal Gate Resistance		T _J =25°C		1.0		Ω
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	μs
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.06	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				0.048		°C/W

note1: Short circuit withstand time cannot exceed 10μs under specified condition

Diode, Inverter

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1200	V
I _F	Diode Continuous Forward Current		400	A
I _{FM}	Diode Maximum Forward Current	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°C		1.64	2.10	V
			T _J =125°C		1.74		
			T _J =175°C		1.70		
t _{rr}	Reverse Recovery Time	I _F =400A, -diF/dt=8400A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		225		ns
			T _J =125°C		361		
			T _J =175°C		462		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		440		A
			T _J =125°C		416		
			T _J =175°C		408		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		36		μC
			T _J =125°C		57		
			T _J =175°C		70		



GT400HF120T2NH

IGBT Module Datasheet

E _{rec}	Reverse Recovery Energy	I _F =400A, -diF/dt=8400A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		14		mJ
			T _J =125°C		22		
			T _J =175°C		28		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.100	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.080		°C/W

Module

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s	2500			V
T _{Jmax}	Maximum Junction Temperature		-40		+175	°C
T _{JOP}	Maximum Operating Junction Temperature Range ^{note2}		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
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

note2: T_{JOP} > 150°C is only allowed for operation at overload conditions.

Ordering Information Table

Device code	G	T	400	HF	120	T2N	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 (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Characteristic diagram

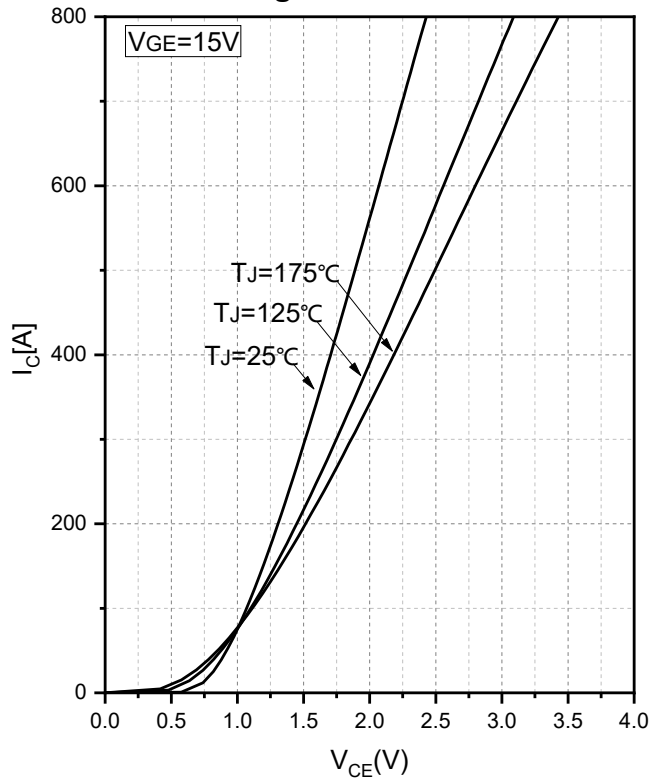


Fig.1 Typical Saturation Voltage Characteristics

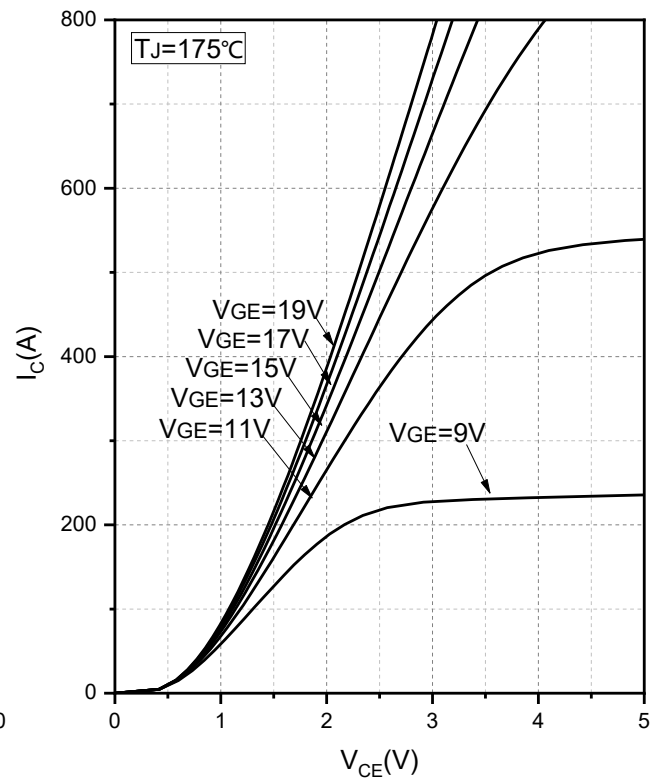


Fig.2 Typical Output Characteristics

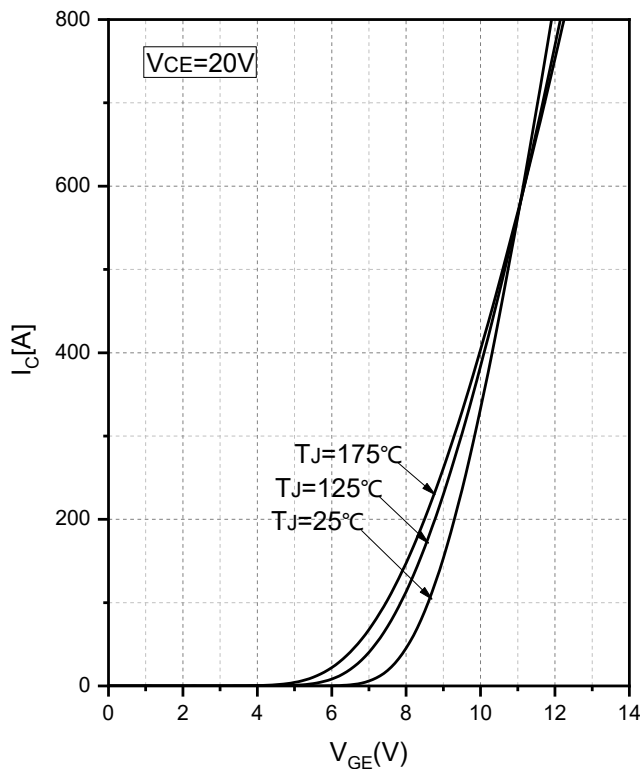


Fig.3 Transfer Characteristic

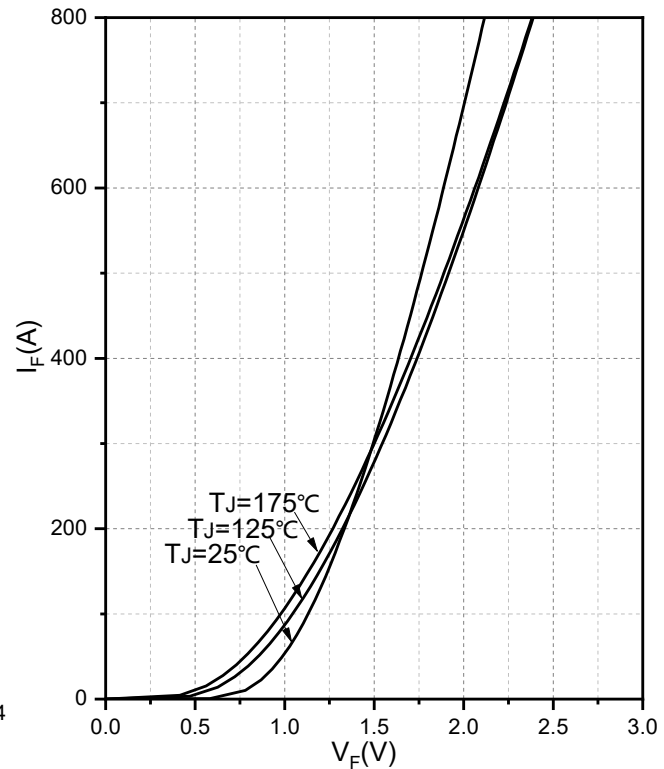


Fig.4 Forward Characteristics of Diode

GT400HF120T2NH

IGBT Module Datasheet

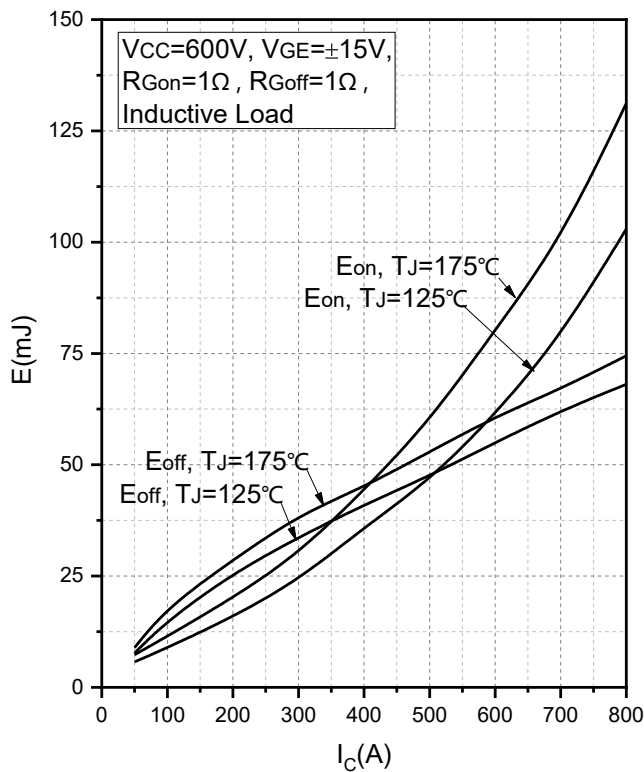


Fig.5 Typical Switching Loss vs. Collector Current

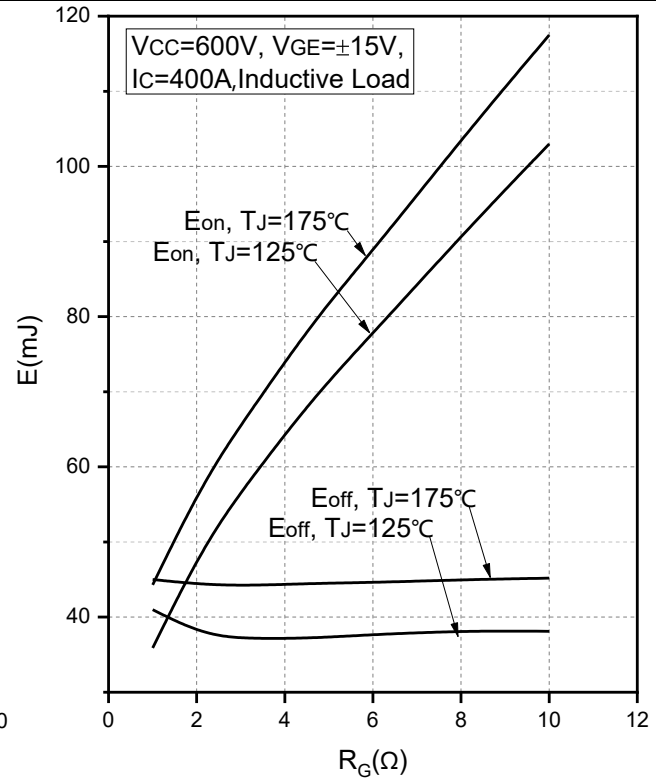


Fig.6 Typical Switching Loss vs. Gate Resistance

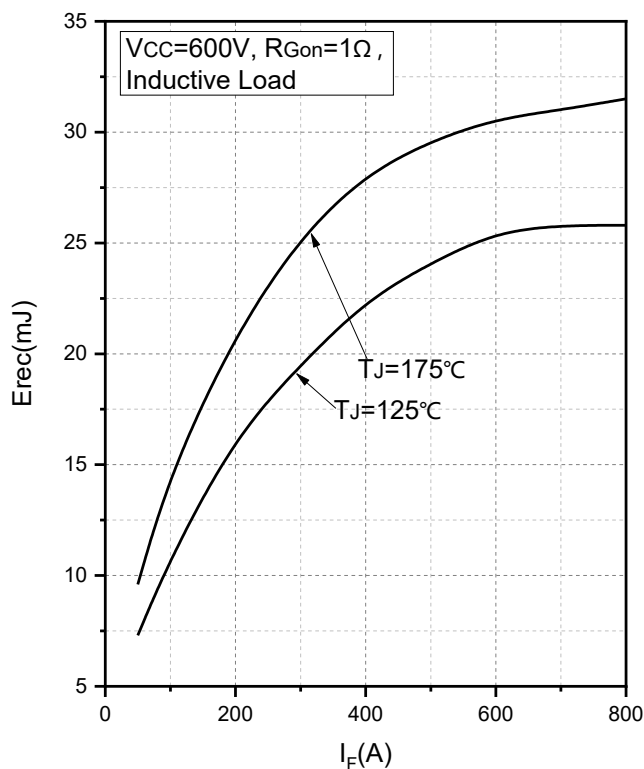


Fig.7 Typical Switching Loss vs. Forward Current

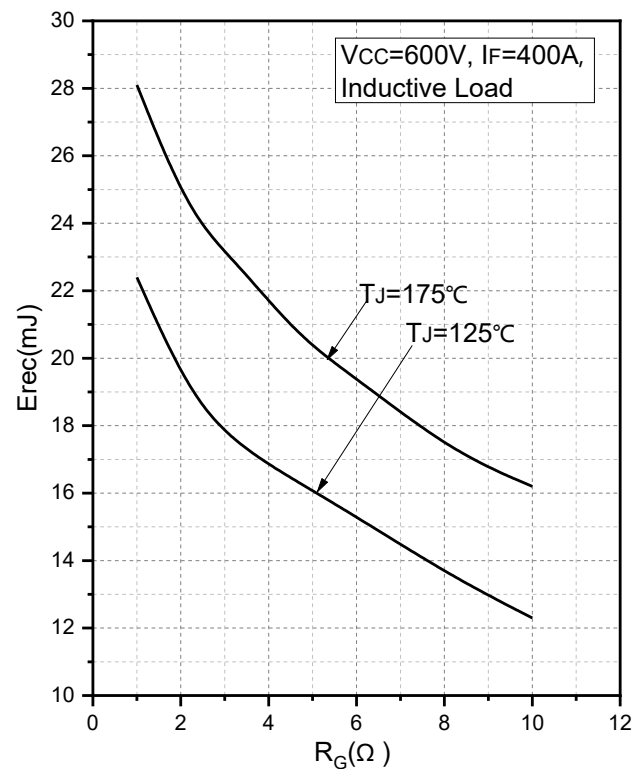


Fig.8 Typical Switching Loss vs. Gate Resistance

GT400HF120T2NH

IGBT Module Datasheet

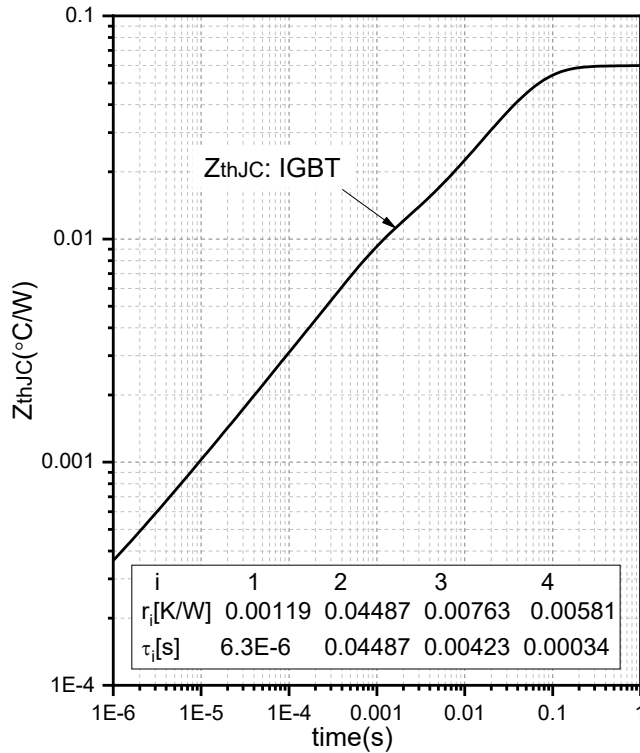


Fig.9 Transient Thermal Impedance (IGBT)

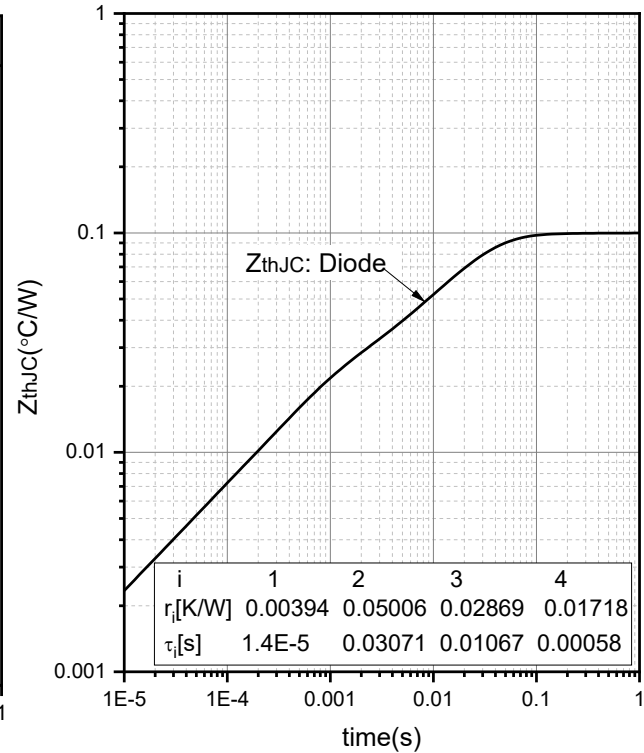


Fig.10 Transient Thermal Impedance (Diode)

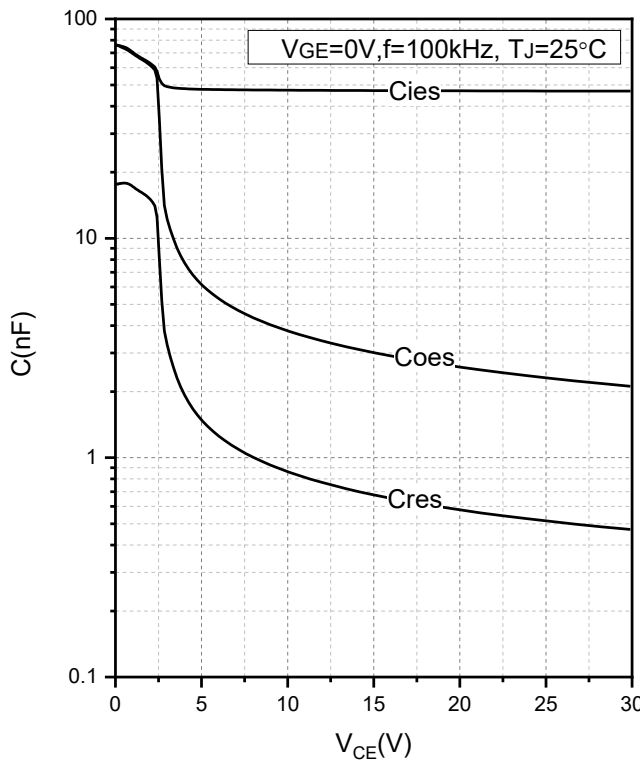


Fig.11 Capacitance Characteristics

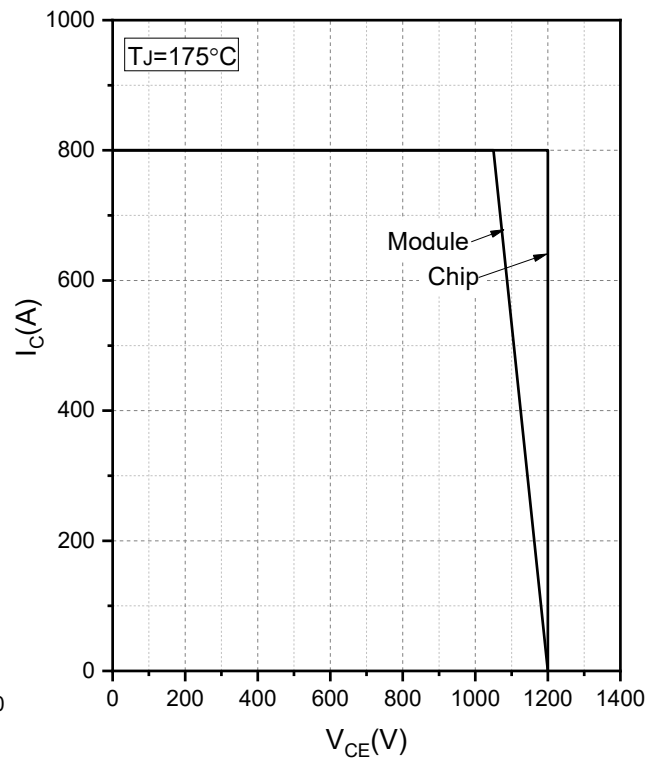


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

GT400HF120T2NH

IGBT Module Datasheet

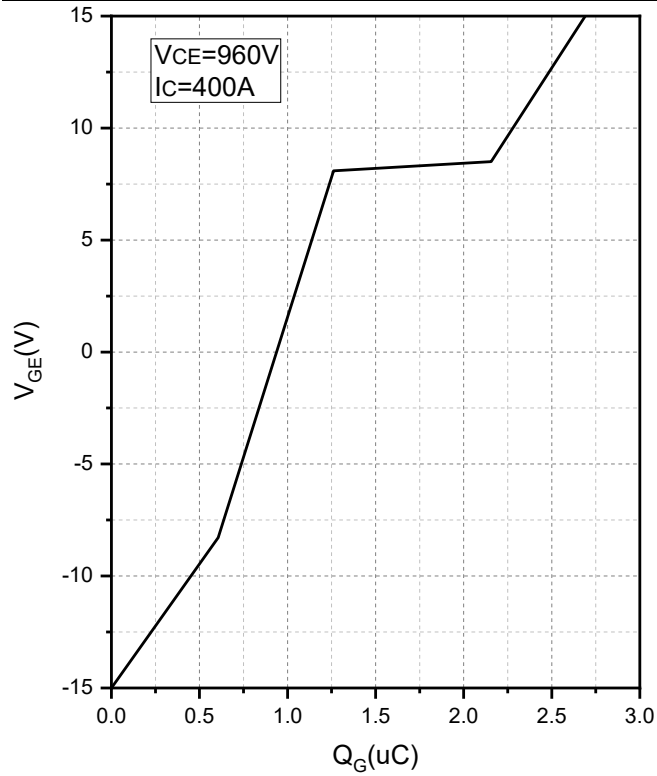


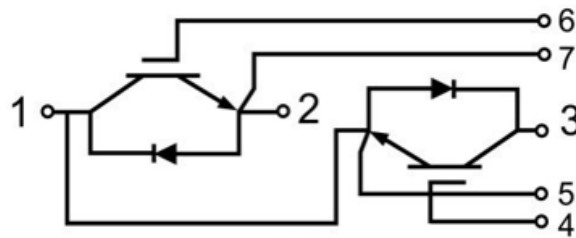
Fig.13 Gate Charge Characteristics

GT400HF120T2NH

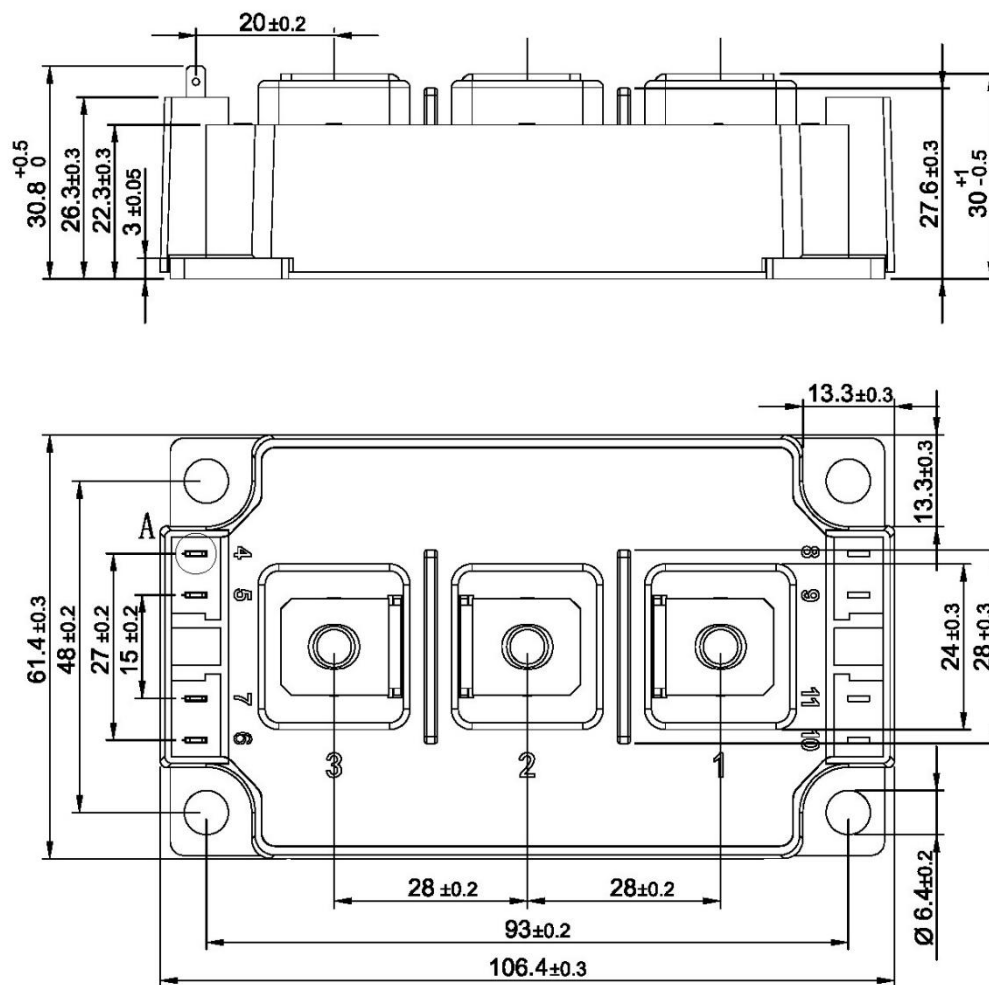
IGBT Module Datasheet



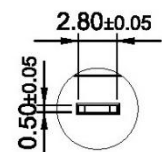
Internal Circuit:



Package Outline (Unit: mm):



View A
scale 3:1



GT400HF120T2NH

IGBT Module Datasheet



Revision	Notes
A	Final Datasheet Initial Release

Announcement

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