

GT100PI120T6H-T4

IGBT Module

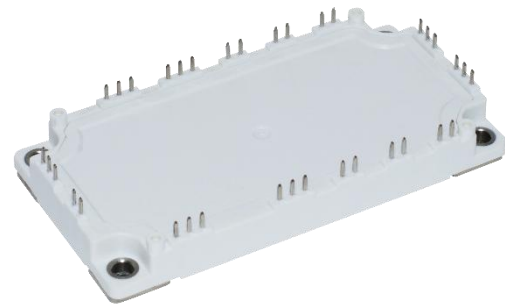
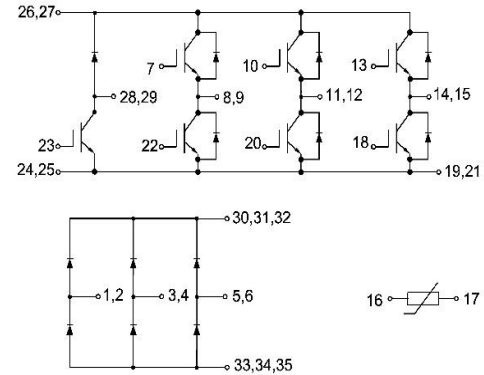
Features:

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

Applications:

- Auxiliary Inverters
- Servo Drives
- Motor Drives

Circuit Diagram



Type	Package	Marking
GT100PI120T6H-T4	T6	GT100PI120T6H-T4

IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage	$T_J=25^\circ C$	1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current Limited by T_{Jmax}	$T_C=90^\circ C$	100	A
		$T_C=25^\circ C$	200	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	200	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C$ $T_{Jmax}=175^\circ C$	700	W

GT100PI120T6H-T4

IGBT Module Datasheet



Electrical Characteristic values ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=4\text{mA}$, $V_{CE}=V_{GE}$, $T_J=25^{\circ}\text{C}$	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=100\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.75	2.10	V
			$T_J=125^{\circ}\text{C}$	2.24		
			$T_J=175^{\circ}\text{C}$	2.40		
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0\text{V}$, $V_{CE}=1200$, $T_J=25^{\circ}\text{C}$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_J=25^{\circ}\text{C}$		11.50		nF
C_{oes}	Output Capacitance			1.48		
C_{res}	Reverse Transfer Capacitance			0.13		

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=100A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		158		ns
			$T_J=125^{\circ}C$		171		
			$T_J=175^{\circ}C$		176		
t_r	Rise Time		$T_J=25^{\circ}C$		44		ns
			$T_J=125^{\circ}C$		52		
			$T_J=175^{\circ}C$		54		
$t_{d(off)}$	Turn-off Delay Time	$T_J=25^{\circ}C$		241		ns	
		$T_J=125^{\circ}C$		280			
		$T_J=175^{\circ}C$		300			
t_f	Fall Time	$T_J=25^{\circ}C$		150		ns	
		$T_J=125^{\circ}C$		232			
		$T_J=175^{\circ}C$		250			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=100A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ $di/dt=1400A/\mu s(T_J=175^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		8.6		mJ
		$T_J=125^{\circ}C$		11.4			
		$T_J=175^{\circ}C$		13.5			



GT100PI120T6H-T4

IGBT Module Datasheet

E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =100A, R _{Goff} =4.7Ω, V _{GE} =±15V, du/dt=4800V/μs(T _J =175°C), Inductive Load	T _J =25°C		6.9		mJ
			T _J =125°C		9.5		
			T _J =175°C		10.8		
Q _g	Total Gate Charge	V _{GE} =-15V...+15V	T _J =25°C		665		nC
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	us
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.214	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m • K))				0.183		°C/W

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

Diode, Inverter

Maximum Rated Values (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		100	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	200	A

Electrical Characteristic values (T_C=25°C unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =100A	T _J =25°C		1.80	2.20	V
			T _J =125°C		1.96		
			T _J =175°C		1.94		
I _{rr}	Peak Reverse Recovery Current	I _F =100A, -di/dt=1600A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		72		A
			T _J =125°C		76		
			T _J =175°C		78		
t _{rr}	Reverse Recovery Time		T _J =25°C		262		ns
			T _J =125°C		415		
			T _J =175°C		540		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		7.6		μC
			T _J =125°C		13.3		
			T _J =175°C		17.7		



GT100PI120T6H-T4

IGBT Module Datasheet

E _{rec}	Reverse Recovery Energy	I _F =100A, -di/dt=1600A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C	2.5		mJ
			T _J =125°C	4.9		
			T _J =175°C	6.8		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)				0.429	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))			0.367		°C/W

IGBT, Brake-Chopper

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current Limited by T_{Jmax}	$T_C=90^\circ C$	50	A
		$T_C=25^\circ C$	100	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	100	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C$ $T_{Jmax}=175^\circ C$	390	W

Electrical Characteristic values

Static Characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1.7mA$, $V_{CE}=V_{GE}$, $T_J=25^\circ C$	5.0	5.9	6.8	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=50A$, $V_{GE}=15V$	$T_J=25^\circ C$	1.72	2.10	V
			$T_J=125^\circ C$	2.15		
			$T_J=175^\circ C$	2.30		
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V$, $V_{CE}=1200$, $T_J=25^\circ C$			1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=20V$, $V_{CE}=0V$, $T_J=25^\circ C$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25V$, $V_{GE}=0V$, $f=100kHz$, $T_J=25^\circ C$		5.28		nF
C_{oes}	Output Capacitance			0.47		
C_{res}	Reverse Transfer Capacitance			0.07		

GT100PI120T6H-T4

IGBT Module Datasheet



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =50A, R _{Gon} =10Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		58		ns	
			T _J =125°C		58			
			T _J =175°C		59			
t _r	Rise Time		T _J =25°C		26		ns	
			T _J =125°C		28			
			T _J =175°C		31			
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =50A, R _{Goff} =10Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		183		ns	
			T _J =125°C		213			
			T _J =175°C		222			
t _f	Fall Time		T _J =25°C		175		ns	
			T _J =125°C		240			
			T _J =175°C		263			
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =50A, R _{Gon} =10Ω, V _{GE} =±15V, di/dt=1200A/μs (T _J =175°C) Inductive Load	T _J =25°C		2.5		mJ	
			T _J =125°C		3.3			
			T _J =175°C		3.8			
E _{off}	Turn-off Switching Loss		V _{CC} =600V, I _C =50A, R _{Goff} =10Ω, V _{GE} =±15V, du/dt=5600V/μs (T _J =175°C) Inductive Load	T _J =25°C		3.3		mJ
				T _J =125°C		4.3		
				T _J =175°C		4.7		
Q _g	Total Gate Charge	V _{GE} =-15V...+15V		T _J =25°C		311		nC
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note2}					10	us	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.384	°C/W	
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m • K))				0.328		°C/W	

note2: Short circuit withstand time cannot exceed 10us under specified condition



GT100PI120T6H-T4

IGBT Module Datasheet

Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage		1200	V
I_F	Diode Continuous Forward Current		25	A
I_{FM}	Repetitive Peak Forward Current	$t_p=1\text{ms}$	50	A

Electrical Characteristic values ($T_C=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Description	Conditions		Min.	Typ.	Max.	Units	
V _{FM}	Forward Voltage	I _F =25A	T _J =25°C		1.64	2.05	V	
			T _J =125°C		1.75			
			T _J =175°C		1.73			
t _{rr}	Reverse Recovery Time	I _F =25A, -diF/dt=1500A/μs(T _J =175°C) V _R =600V, V _{GE} =-15V	T _J =25°C		240		ns	
			T _J =125°C		380			
			T _J =175°C		460			
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		37		A	
			T _J =125°C		38			
			T _J =175°C		38			
Q _{rr}	Reverse Recovery Charge		T _J =25°C		2.5		μC	
			T _J =125°C		4.2			
			T _J =175°C		5.0			
E _{rec}	Reverse Recovery Energy		T _J =25°C		1.0		mJ	
			T _J =125°C		1.8			
			T _J =175°C		2.2			
R _{θJC}	Thermal Resistance: Junction-To-Case (per Diode)					1.107	°C/W	
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.946		°C/W	

GT100PI120T6H-T4

IGBT Module Datasheet



Diode, Rectifier

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1600	V
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _J =25°C	118	A
I _{RMSM}	Maximum RMS Forward Current at Rectifier Output	T _J =80°C	150	A
I _{FSM}	Surge Current @t _p =10ms	T _J =25°C	1350	A
		T _J =150°C	103	
I ² t	I ² t - value	T _J =25°C	9110	A ² s
		T _J =150°C	5300	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =100A	T _J =25°C		1.20		V
			T _J =125°C		1.17		
			T _J =150°C		1.17		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.311	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m · K))				0.266		°C/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units.
R ₂₅	T _C =25°C		5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω	-5		+5	%
P ₂₅	T _C =25°C			10	mW
B _{25/50}	R ₂ =R ₂₅ exp[B _{25/50} (1/T ₂ -1/(298.15K))]		3380		K
B _{25/80}	R ₂ =R ₂₅ exp[B _{25/80} (1/T ₂ -1/(298.15K))]		3440		K
B _{25/100}	R ₂ =R ₂₅ exp[B _{25/100} (1/T ₂ -1/(298.15K))]		3545		K

GT100PI120T6H-T4

IGBT Module Datasheet



Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s	2500			V
T _J	Maximum Junction Temperature		-40		175	°C
T _{JOP}	Maximum Operating Junction Temperature Range ^{note3}		-40		150	°C
T _{stg}	Storage Temperature		-40		125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)				0.013	°C/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g

note3: T_{JOP}> 150°C is only allowed for operation at overload conditions.

Ordering Information Table

Device code	G	T	100	PI	120	T6	H	-	T4
	①	②	③	④	⑤	⑥	⑦		⑧

- ① - IGBT Module
- ② - Trench & Field Stop IGBT
- ③ - Rated Current (40=40A)
- ④ - Circuit Configuration: PI (Power Integrated)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Control Code

GT100PI120T6H-T4

IGBT Module Datasheet



Characteristic diagram

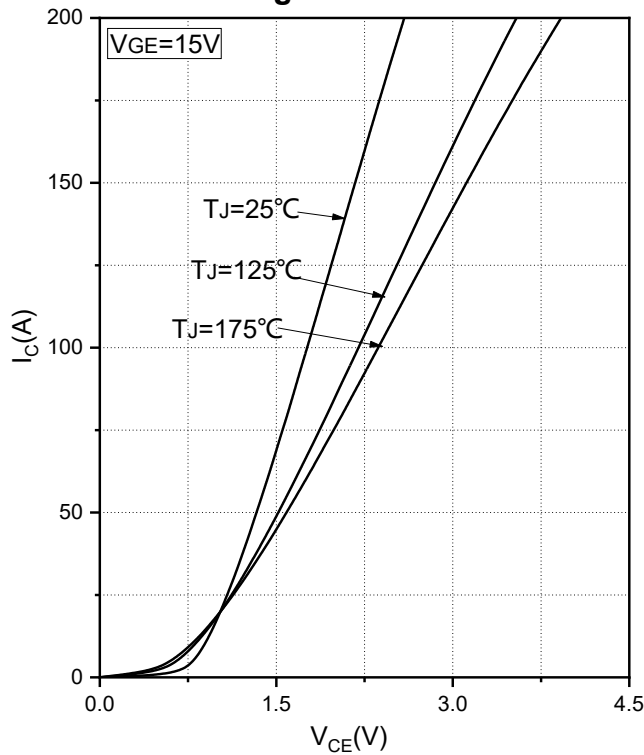


Fig.1 Typical Saturation Voltage Characteristics (Inverter IGBT)

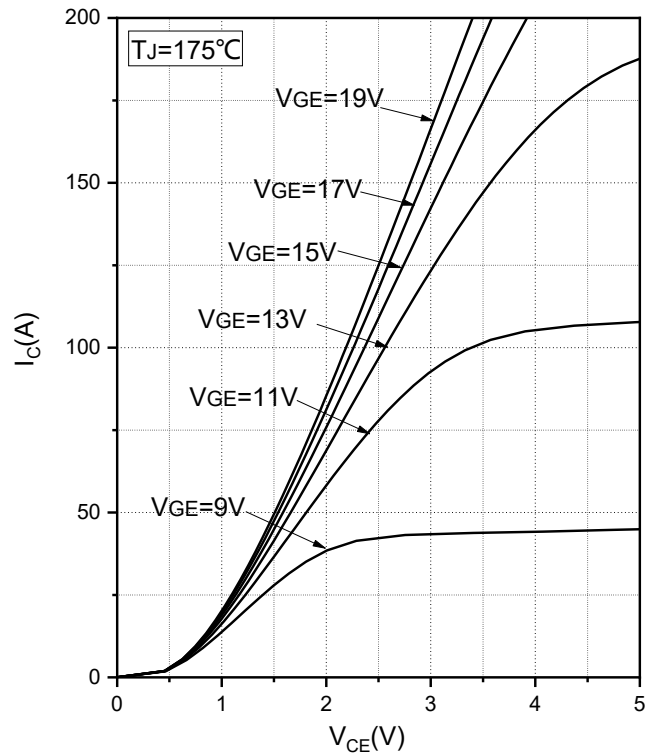


Fig.2 Typical Output Characteristics (Inverter IGBT)

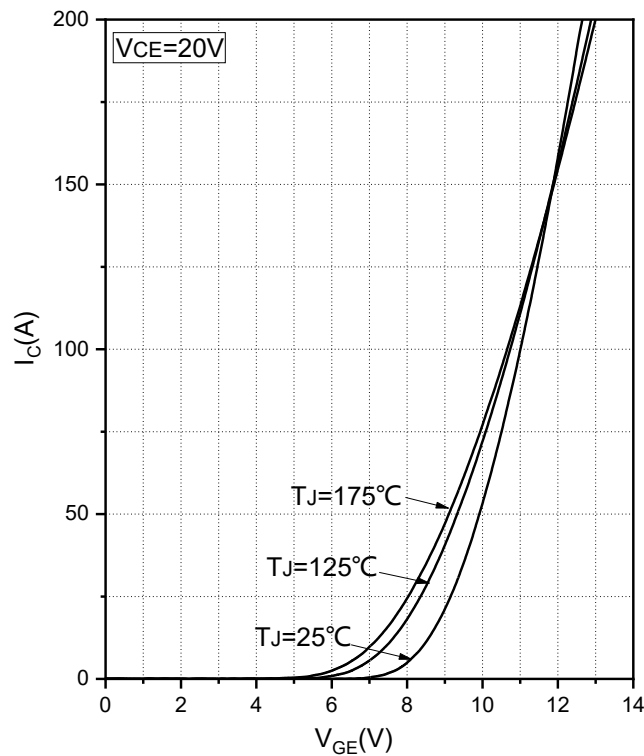


Fig.3 Transfer Characteristics (Inverter IGBT)

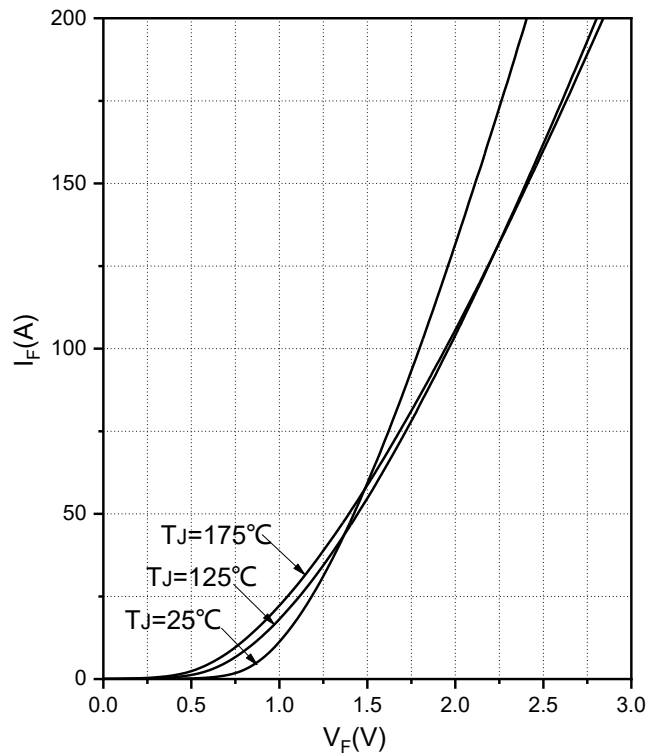


Fig.4 Forward Characteristics (Inverter Diode)

GT100PI120T6H-T4

IGBT Module Datasheet

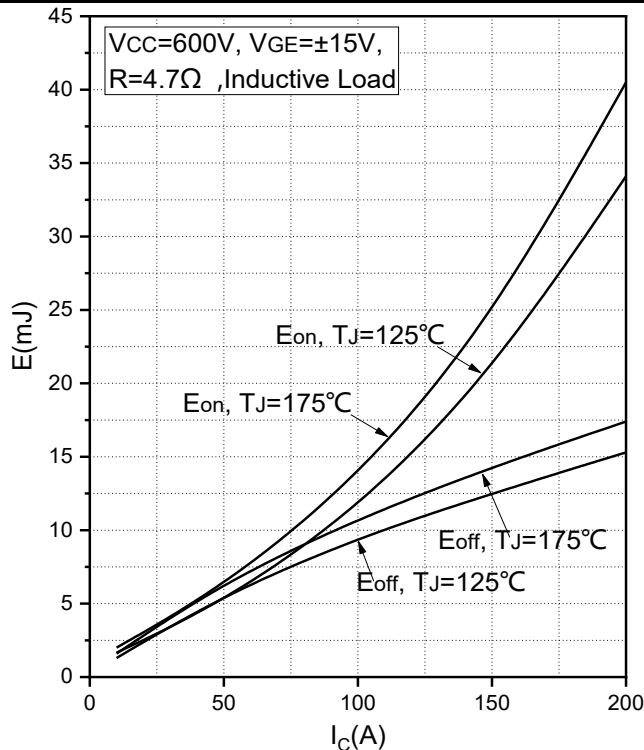


Fig.5 Typical Switching Loss vs. Collector Current
(Inverter IGBT)

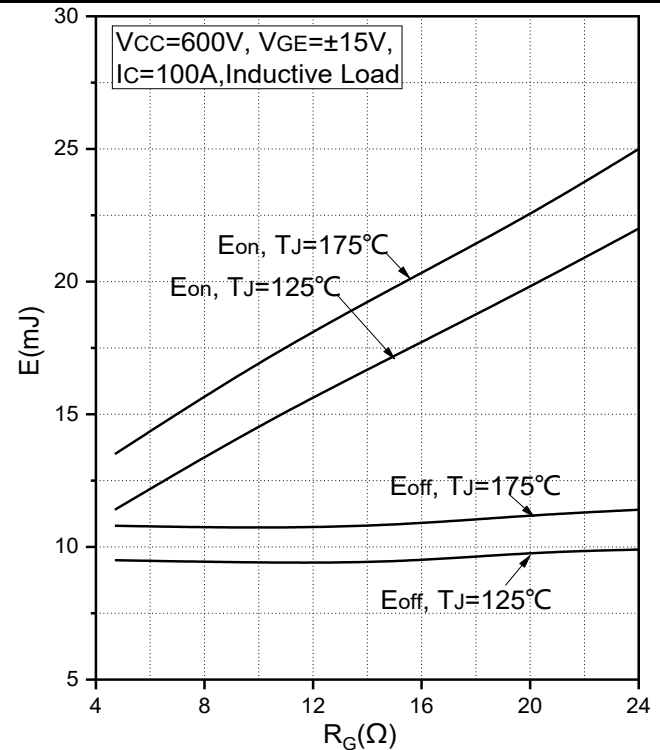


Fig.6 Typical Switching Loss vs. Gate Resistance
(Inverter IGBT)

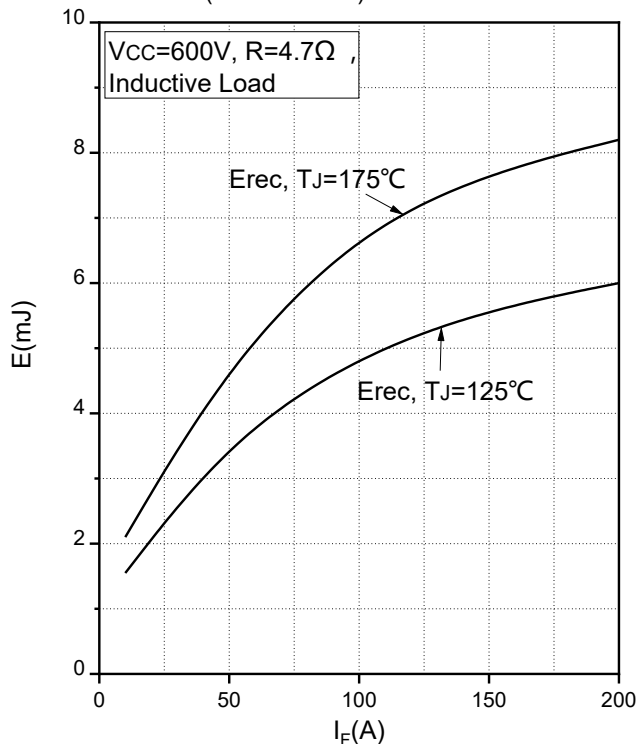


Fig.7 Typical Switching Loss vs. Forward Current
(Inverter Diode)

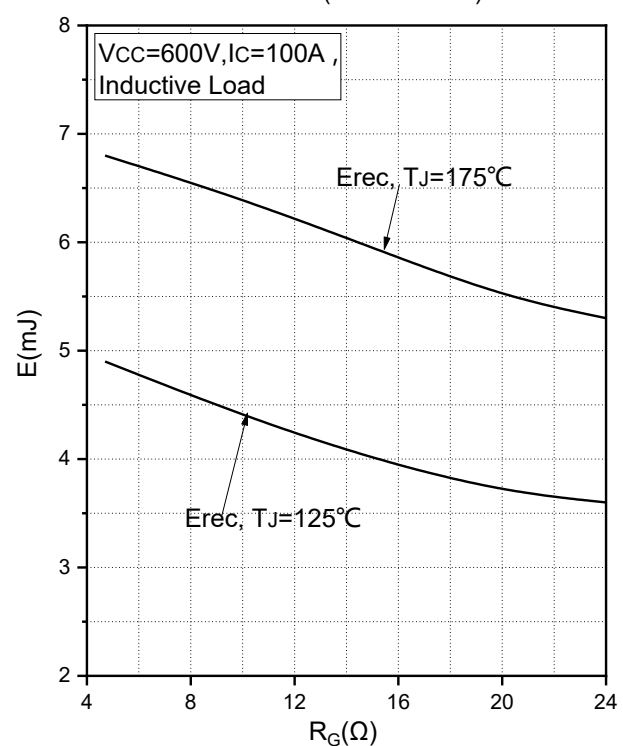


Fig.8 Typical Switching Loss vs. Gate Resistance
(Inverter Diode)

GT100PI120T6H-T4

IGBT Module Datasheet

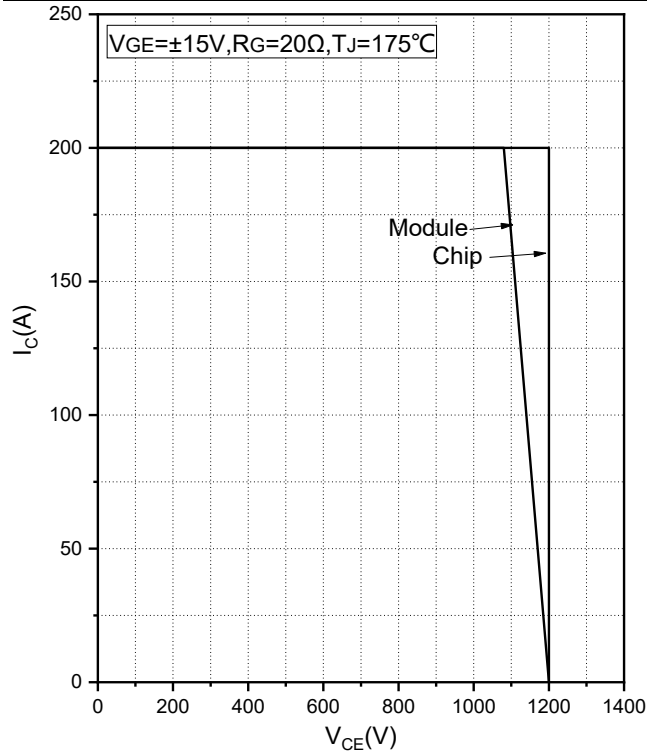


Fig.9 Reverse Bias Safe Operation Area (RBSOA)
(Inverter IGBT)

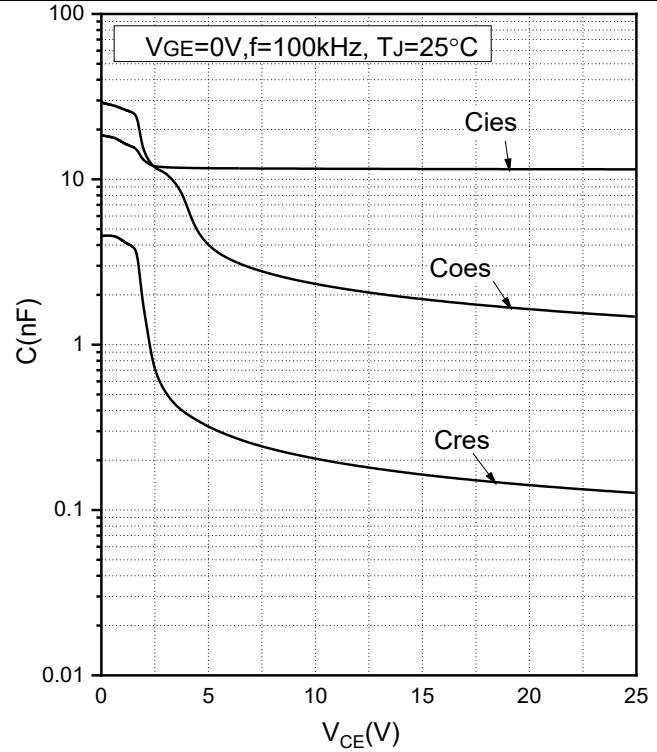


Fig.10 Capacitance Characteristics
(Inverter IGBT)

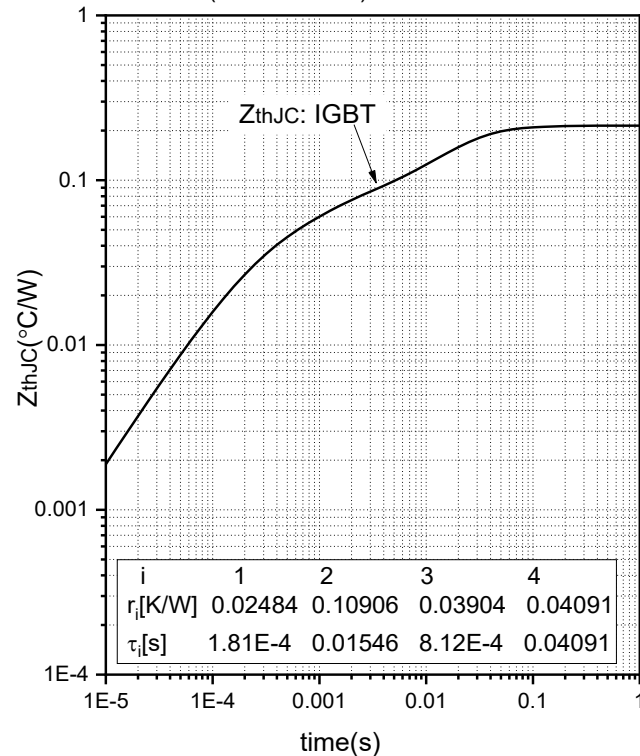


Fig.11 Transient Thermal Impedance (Inverter-IGBT)

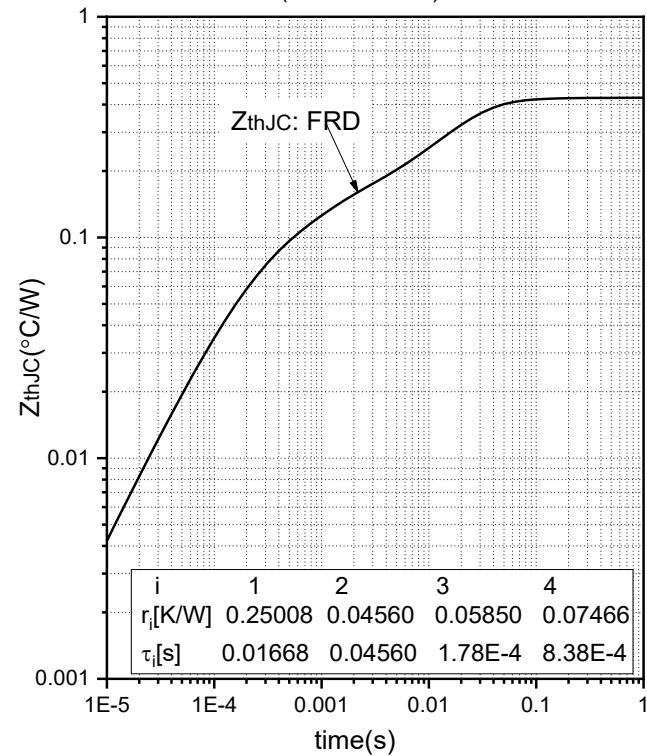


Fig.12 Transient Thermal Impedance (Inverter-Diode)

GT100PI120T6H-T4

IGBT Module Datasheet

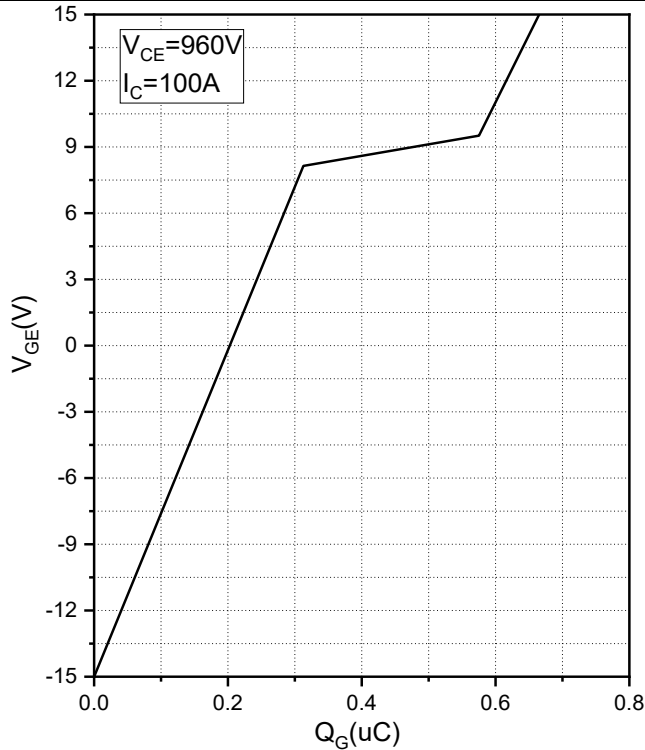


Fig.13 Gate Charge Characteristics(Inverter IGBT)

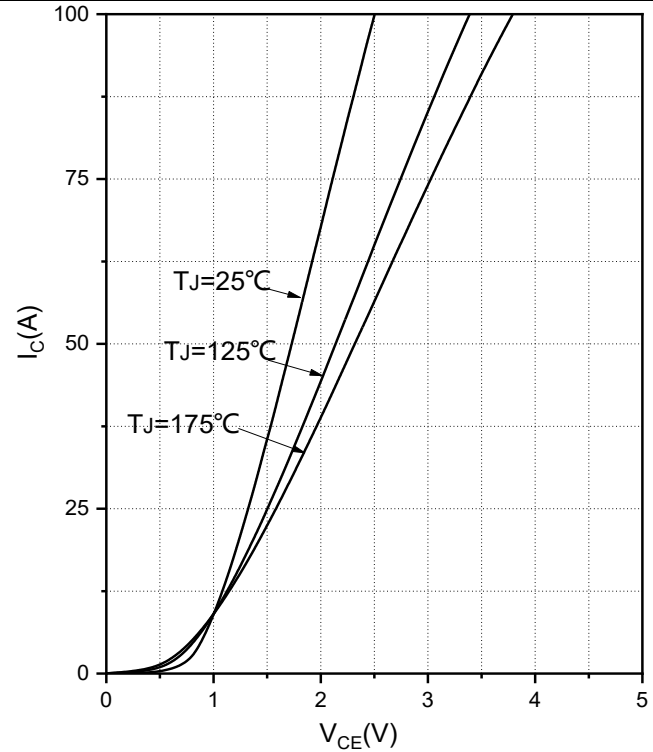


Fig.14 Typical Saturation Voltage Characteristics (Chopper IGBT)

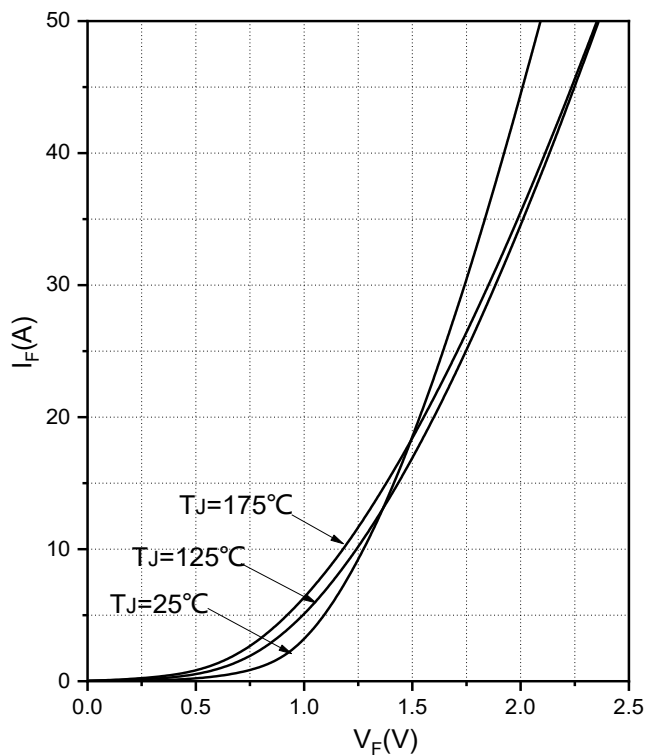


Fig.15 Forward Characteristics (Chopper Diode)

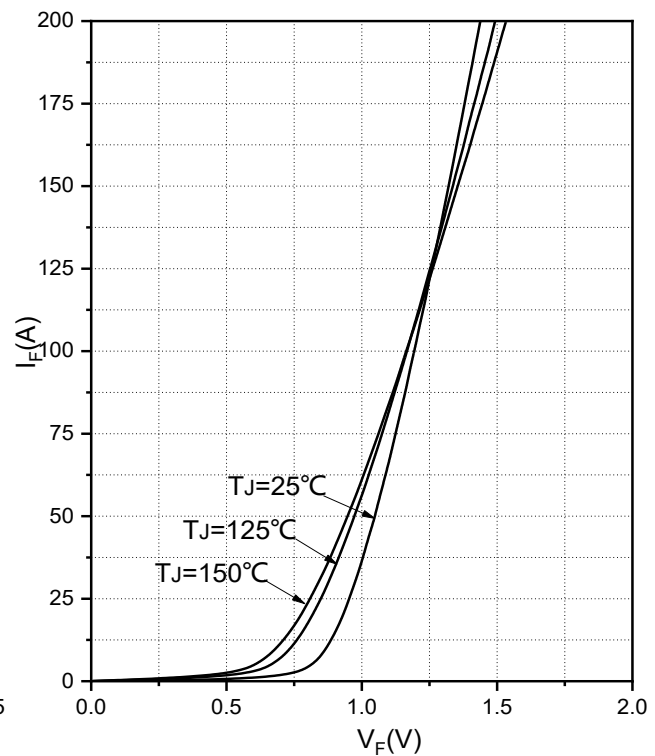


Fig.16 Forward Characteristics (Rectifier Diode)

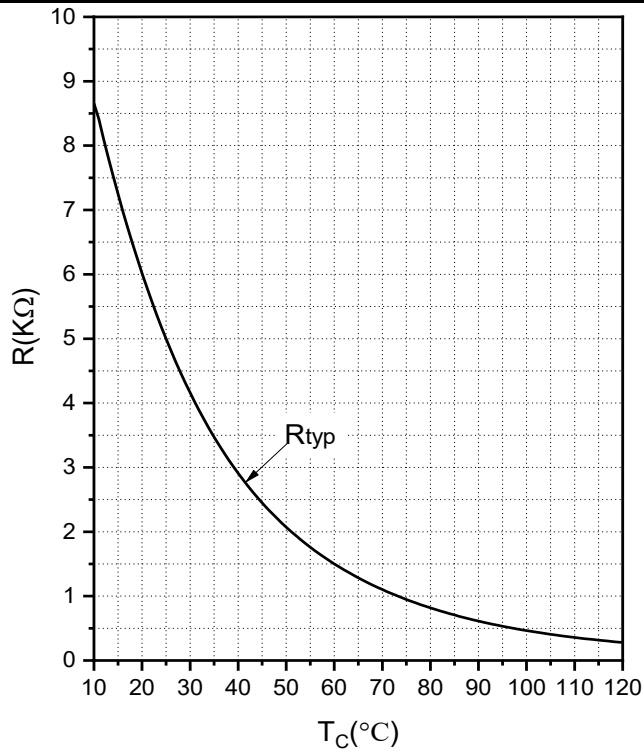


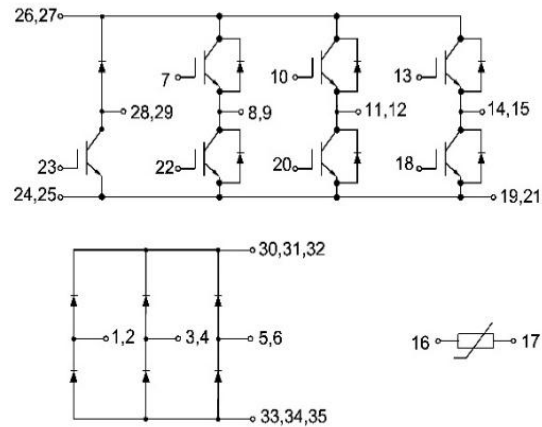
Fig.17 NTC Temperature Characteristics



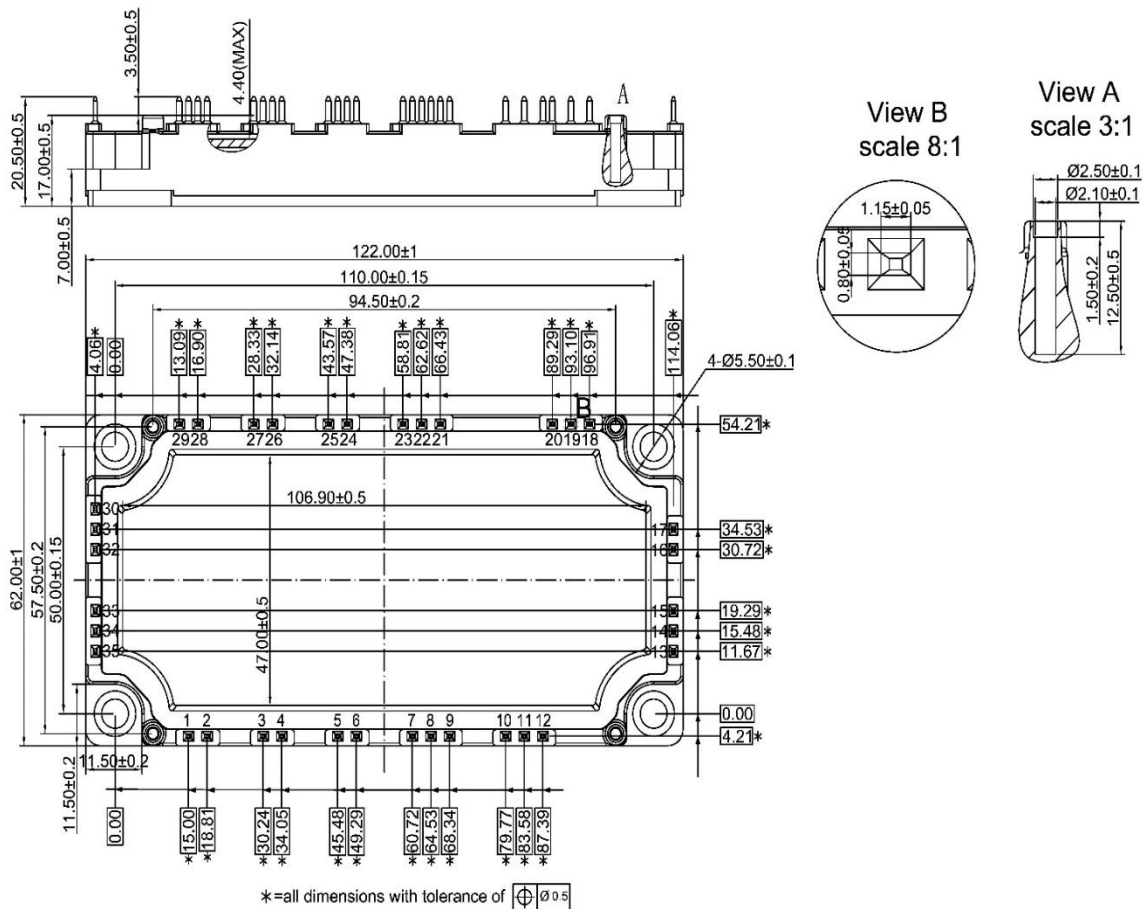
GT100PI120T6H-T4

IGBT Module Datasheet

Internal Circuit



Package Outline (Unit: mm):



GT100PI120T6H-T4

IGBT Module Datasheet



Revision	Notes
A	Fina Datasheet Initial Release

Announcement

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