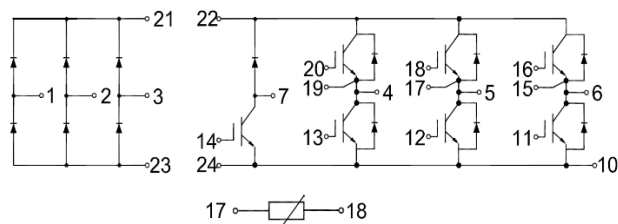


Circuit Diagram

IGBT Module

Features:

- $V_{CES}=1200V$ $I_C=25A$ 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:

- Industrial Inverters
- Motor Drives
- Servo Drives

Type	Package	Marking
GT25PI120T5H	T5	GT25PI120T5H

IGBT, Inverter

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}	$T_C=100^\circ C$	25	A
		$T_C=25^\circ C$	50	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	50	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C$, $T_{Jmax}=175^\circ C$	230	W

GT25PI120T5H

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	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=25\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.75	2.10	V
			$T_J=125^{\circ}\text{C}$	2.16		V
			$T_J=175^{\circ}\text{C}$	2.33		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		1600		pF
C_{oes}	Output Capacitance			426		pF
C_{res}	Reverse Transfer Capacitance			36		pF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=25A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		57		ns
			$T_J=125^{\circ}C$		52		
			$T_J=175^{\circ}C$		48		
t_r	Rise Time		$T_J=25^{\circ}C$		25		ns
			$T_J=125^{\circ}C$		29		
			$T_J=175^{\circ}C$		34		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		208		ns
			$T_J=125^{\circ}C$		236		
			$T_J=175^{\circ}C$		242		
t_f	Fall Time	$T_J=25^{\circ}C$		186		ns	
		$T_J=125^{\circ}C$		254			
		$T_J=175^{\circ}C$		288			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=25A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ $di/dt=580A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		2.5		mJ
		$T_J=125^{\circ}C$		3.1			
		$T_J=175^{\circ}C$		3.4			

GT25PI120T5H

IGBT Module Datasheet



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =25A, R _{Goff} =36Ω, V _{GE} =±15V, du/dt=5500V/μs(T _J =175°C) Inductive Load	T _J =25°C		1.6		mJ
			T _J =125°C		2.1		
			T _J =175°C		2.3		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		155		nC
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note1}					10	us
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.633	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m • K))				0.331		°C/W

note1: Short circuit withstand time cannot exceed 10us 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		25	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	50	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 =25A	T _J =25°C		1.66	2.00	V
			T _J =125°C		1.76		
			T _J =175°C		1.74		
t _{rr}	Reverse Recovery Time	I _F =25A, -diF/dt=720A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		382		ns
			T _J =125°C		500		
			T _J =175°C		643		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		20		A
			T _J =125°C		21		
			T _J =175°C		23		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		2.5		μC
			T _J =125°C		4.0		
			T _J =175°C		5.5		

GT25PI120T5H

IGBT Module Datasheet



E _{rec}	Reverse Recovery Energy	I _F =25A, -diF/dt=1720A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		0.8		mJ
			T _J =125°C		1.5		
			T _J =175°C		2.2		
R _{θJC}	Diode 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))				0.580		°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}	$T_C=100^\circ C$	15	A
		$T_C=25^\circ C$	30	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	30	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	170	W

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

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=0.5mA, V_{CE}=V_{GE}$		4.9	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15A$, $V_{GE}=15V$	$T_J=25^\circ C$		1.86	2.20	V
			$T_J=125^\circ C$		2.31		V
			$T_J=175^\circ C$		2.52		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V$, $V_{CE}=1200V, T_J=25^\circ C$				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	$V_{CE}=25V, V_{GE}=0V$, $f=100kHz$			988		pF
C_{oes}	Output Capacitance				167		pF
C_{res}	Reverse Transfer Capacitance				25		pF

GT25PI120T5H

IGBT Module Datasheet



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =15A, R _{Gon} =47Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		43		ns	
			T _J =125°C		42			
			T _J =175°C		39			
t _r	Rise Time		T _J =25°C		26		ns	
			T _J =125°C		29			
			T _J =175°C		32			
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =15A, R _{Goff} =47Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		160		ns	
			T _J =125°C		178			
			T _J =175°C		182			
t _f	Fall Time		T _J =25°C		126		ns	
			T _J =125°C		141			
			T _J =175°C		144			
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =47Ω, V _{GE} =±15V, di/dt=375A/μs(T _J =175°C) Inductive Load	T _J =25°C		1.2		mJ	
			T _J =125°C		1.4			
			T _J =175°C		1.5			
E _{off}	Turn-off Switching Loss		V _{CC} =600V, I _C =15A, R _{Goff} =47Ω, V _{GE} =±15V, du/dt=7400V/μs(T _J =175°C) Inductive Load	T _J =25°C		0.8		mJ
				T _J =125°C		1.0		
				T _J =175°C		1.1		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V		T _J =25°C		90		nC
T _{SC}	V _{CC} =600V, V _{GE} =±15V, T _J =175°C ^{note2}					10	us	
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.873	°C/W	
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m • K))				0.457		°C/W	

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

GT25PI120T5H

IGBT Module Datasheet



Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	$t_p=1\text{ms}$	20	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 =10A	T _J =25°C		1.64	2.00	V	
			T _J =125°C		1.77			
			T _J =175°C		1.74			
t _{rr}	Reverse Recovery Time	I _F =10A, -diF/dt=450A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		218		ns	
			T _J =125°C		370			
			T _J =175°C		440			
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		9		A	
			T _J =125°C		10			
			T _J =175°C		11			
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.8		μC	
			T _J =125°C		1.4			
			T _J =175°C		1.7			
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.3		mJ	
			T _J =125°C		0.5			
			T _J =175°C		0.7			
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					1.849	°C/W	
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				0.969		°C/W	

GT25PI120T5H

IGBT Module Datasheet



Diode, Rectifier

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1600	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	$T_J=25^{\circ}\text{C}$	40	A
I_{RMSM}	Maximum RMS Forward Current at Rectifier Output	$T_J=80^{\circ}\text{C}$	65	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^{\circ}\text{C}$	450	A
		$T_J=150^{\circ}\text{C}$	370	
I^2t	I^2t - value	$T_J=25^{\circ}\text{C}$	1000	A^2s
		$T_J=150^{\circ}\text{C}$	685	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=25\text{A}$	$T_J=25^{\circ}\text{C}$		1.11		V
			$T_J=150^{\circ}\text{C}$		1.06		
I_R	Reverse Current	$V_R=1600\text{V}$	$T_J=25^{\circ}\text{C}$			1	mA
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per Diode)					0.716	$^{\circ}\text{C}/\text{W}$
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m} \cdot \text{K})$)				0.375		$^{\circ}\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units.
R_{25}	$T_C=25^{\circ}\text{C}$		5		$\text{k}\Omega$
$\Delta R/R$	$T_C=100^{\circ}\text{C}$, $R_{100}=465\Omega$	-5		+5	%
P_{25}	$T_C=25^{\circ}\text{C}$			10	mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$		3380		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$		3440		K
$B_{25/100}$	$R_2=R_{25} \exp[B_{25/100}(1/T_2-1/(298.15\text{K}))]$		3545		K



GT25PI120T5H

IGBT Module Datasheet

Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s			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			
T	Mounting Screw:M6	3		6	N·m
G	Weight		190		g

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

Ordering Information Table

Device code	G	T	25	PI	120	T5	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Field Stop Trench Gate IGBT
- ③ - Rated Current (25=25A)
- ④ - Circuit Configuration:PI (Power Integrated)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



Characteristic diagram

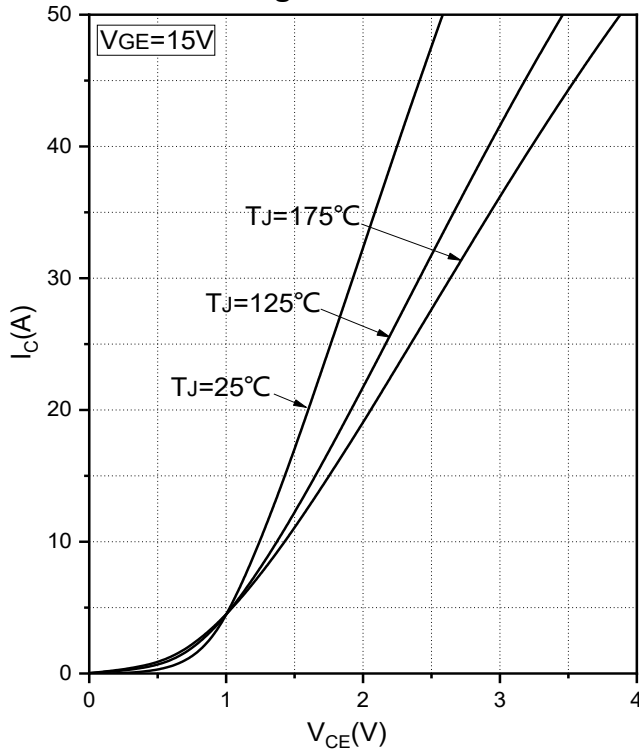


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

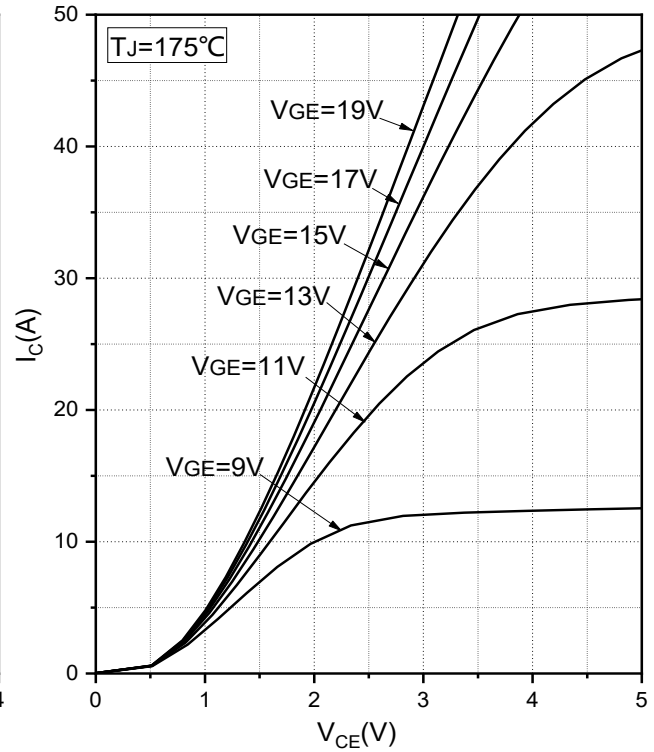


Fig.2 Typical Output Characteristics(Inverter)

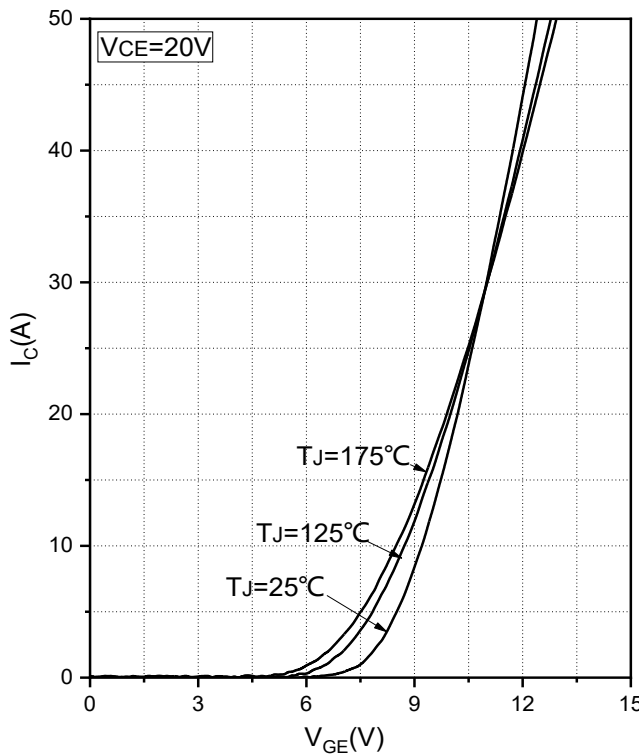


Fig.3 Transfer Characteristic(Inverter)

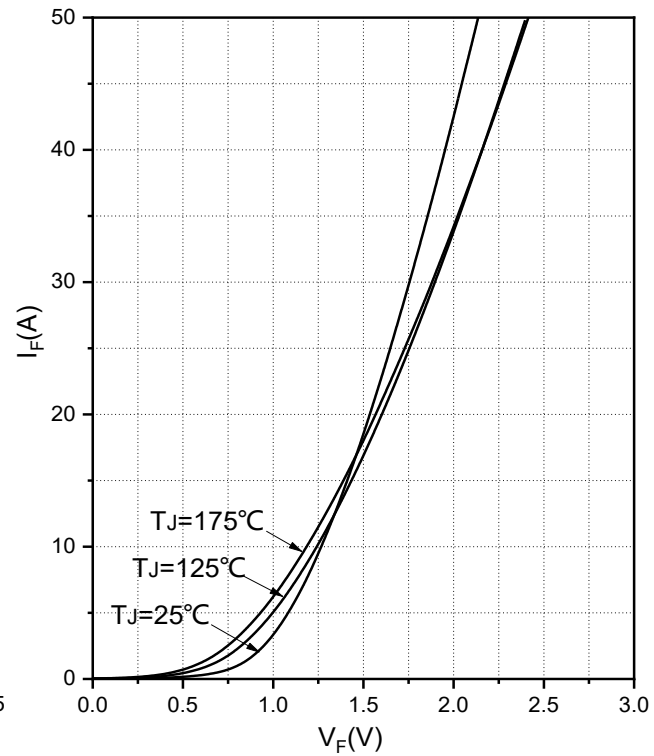


Fig.4 Forward Characteristics of Diode(Inverter)

GT25PI120T5H

IGBT Module Datasheet

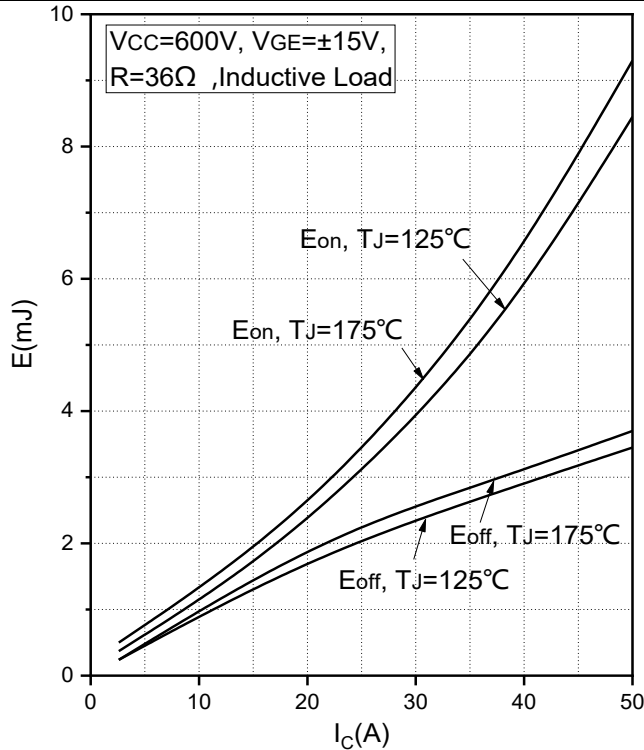


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

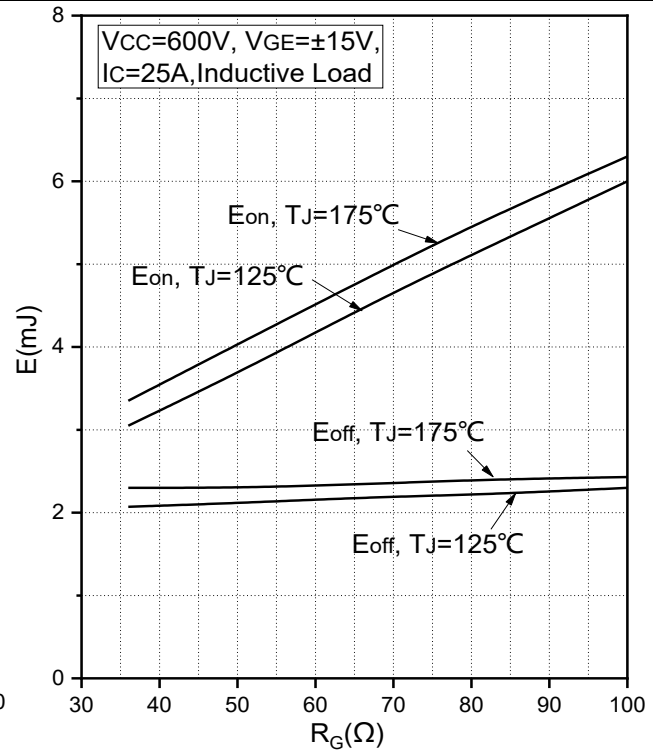


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

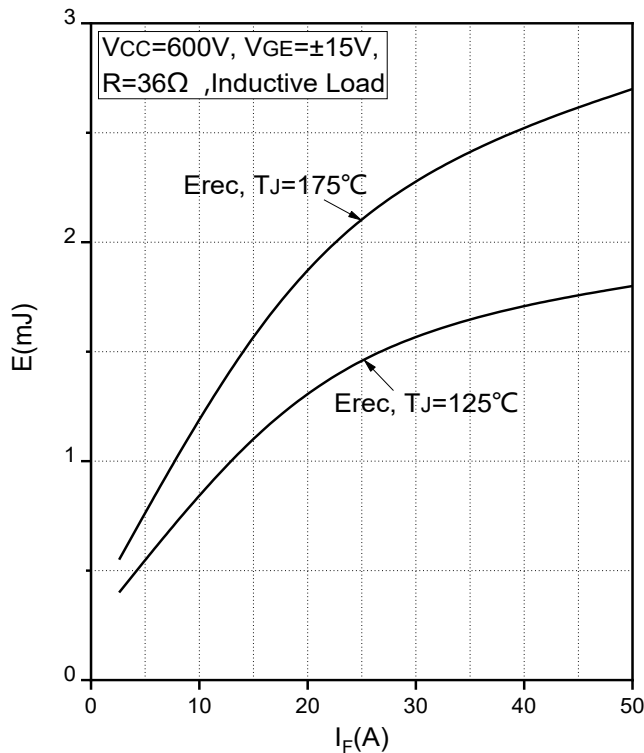


Fig.7 Typical Switching Loss vs. Forward Current(Inverter)

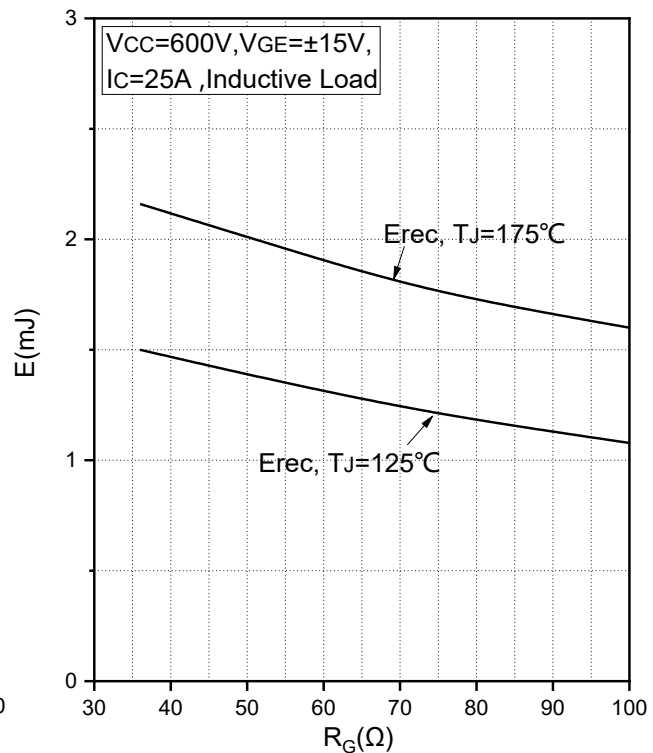


Fig.8 Typical Switching Loss vs. Gate Resistance(Inverter)

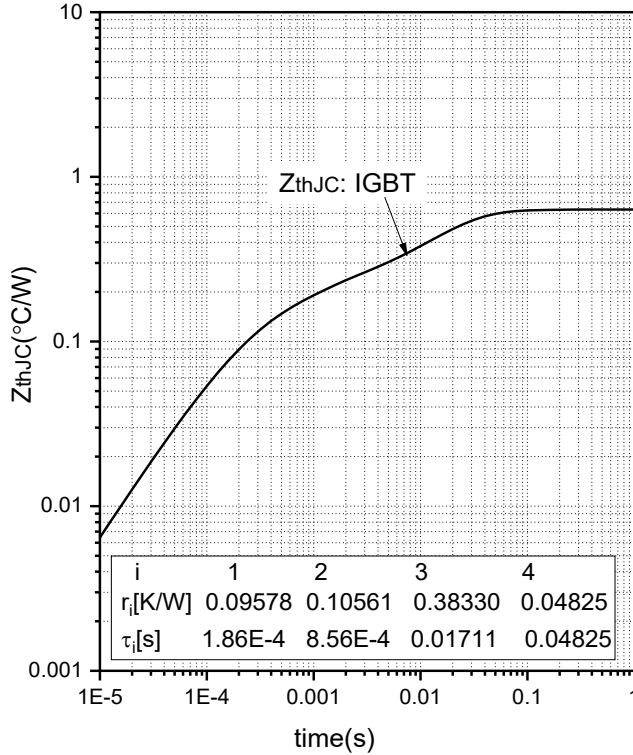


Fig.9 Transient Thermal Impedance (Inverter IGBT)

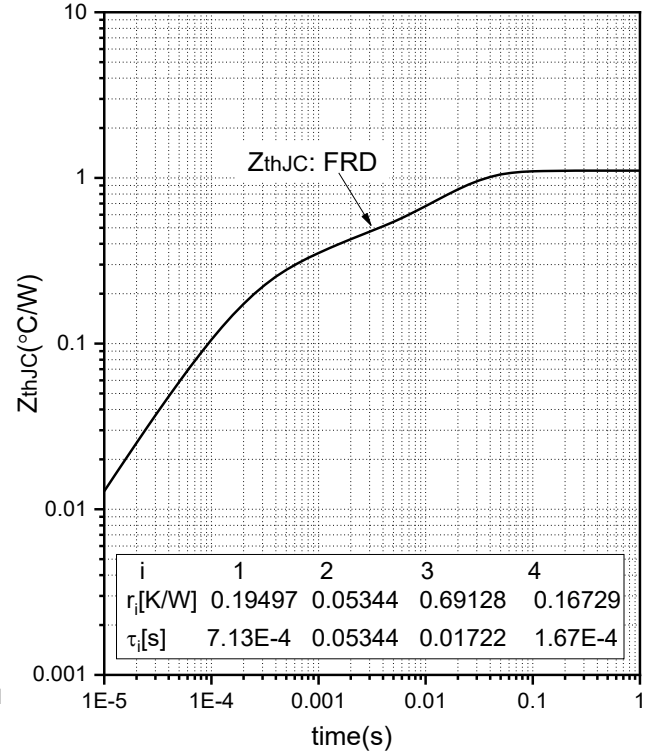


Fig.10 Transient Thermal Impedance (Inverter Diode)

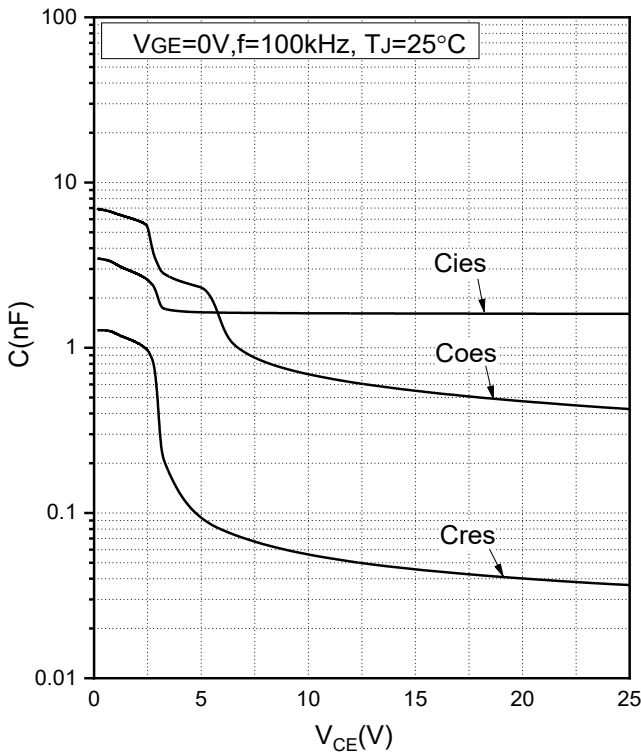


Fig.11 Capacitance Characteristics(Inverter)

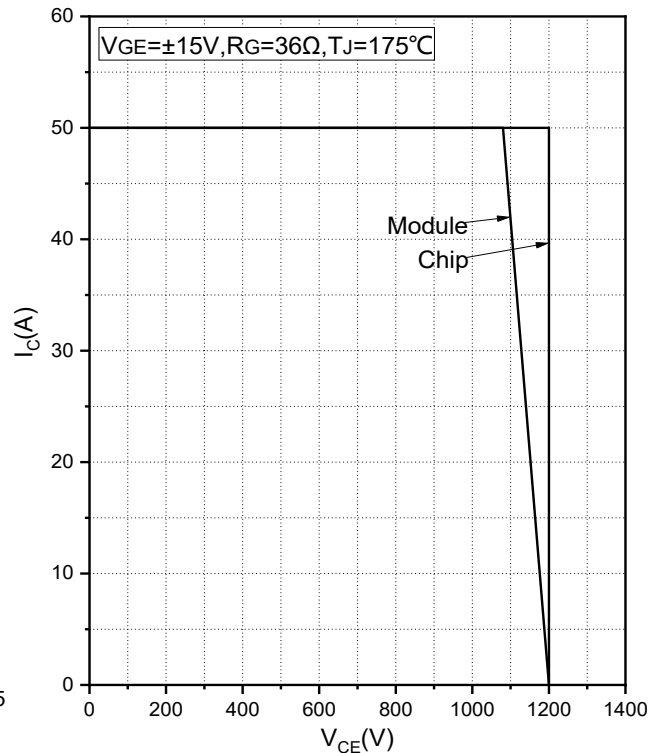


Fig.12 Reverse Bias Safe Operation Area (RBSOA) (Inverter)

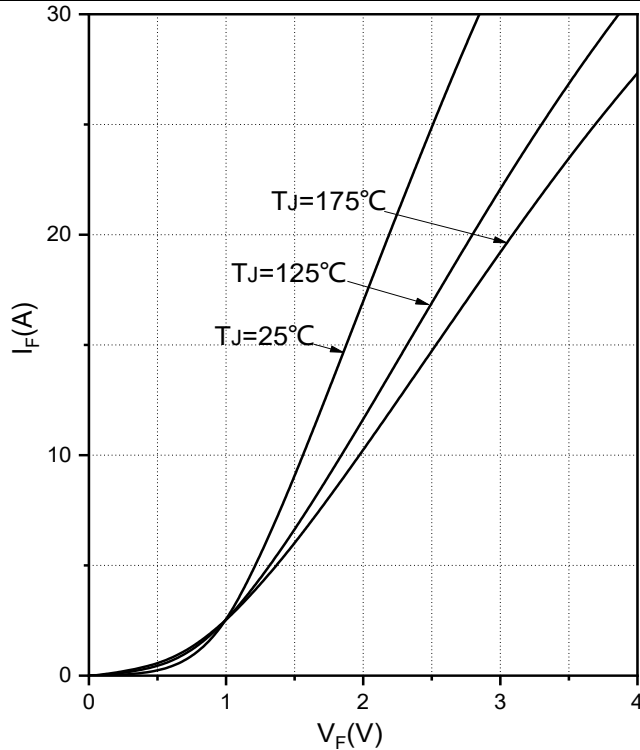


Fig.13 Typical Saturation Voltage Characteristics (Chopper)

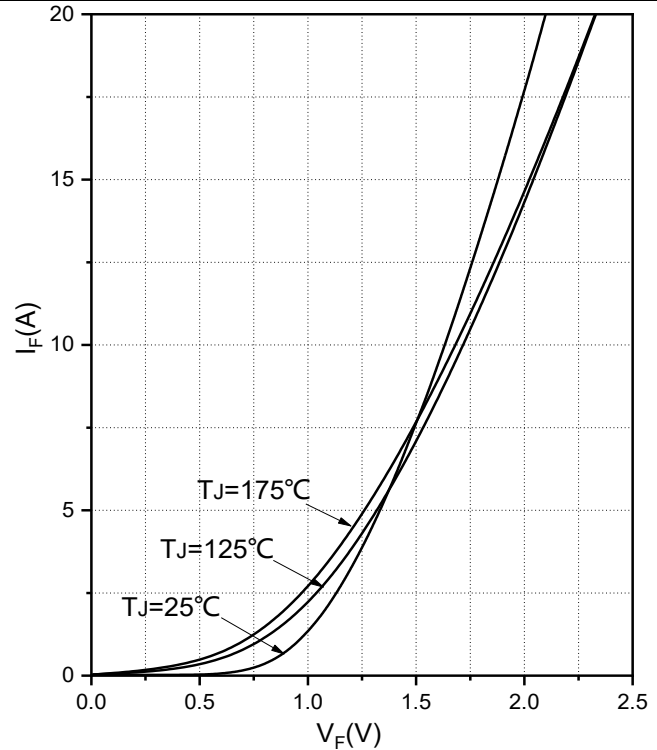


Fig.14 Forward Characteristics of Diode(Chopper)

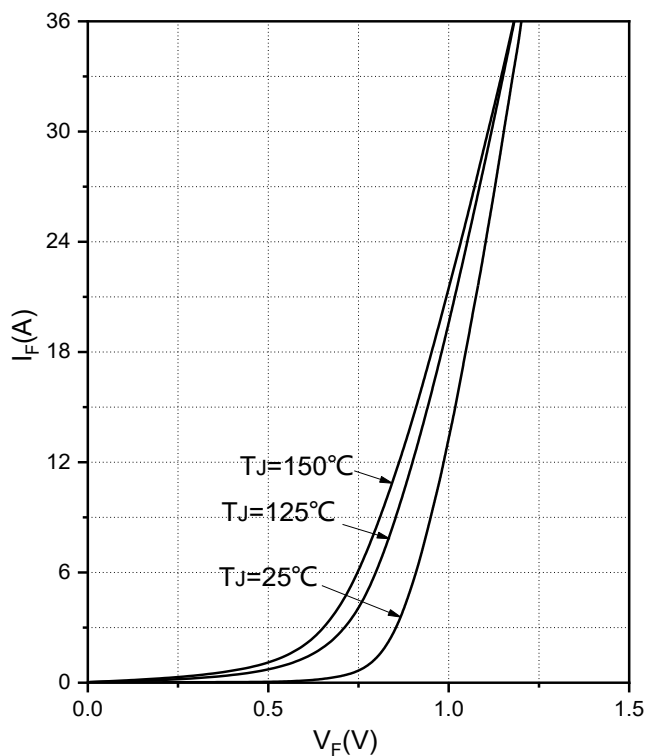


Fig.15 Forward Characteristics of Diode (Rectifier)

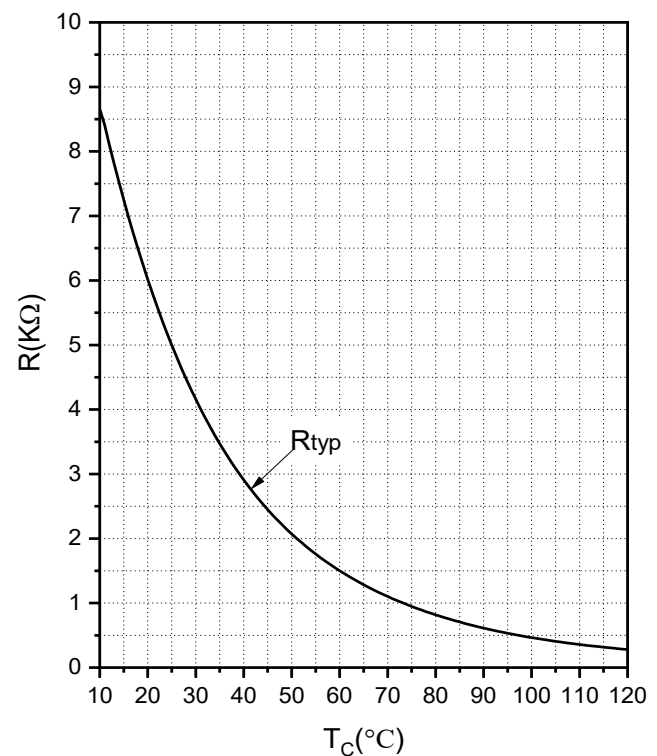


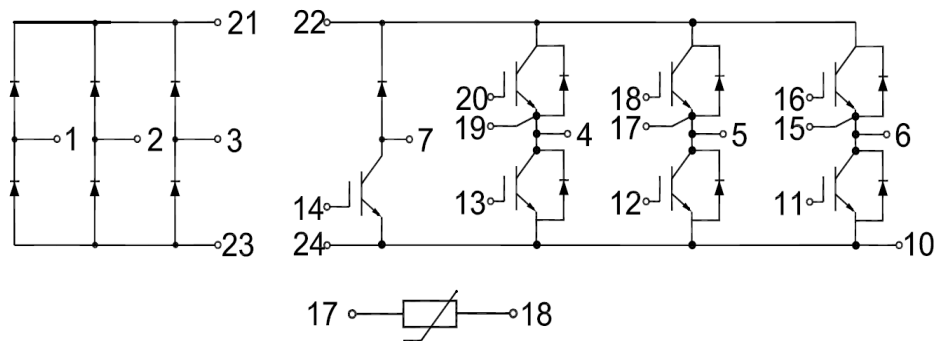
Fig.16 NTC Temperature Characteristics

GT25PI120T5H

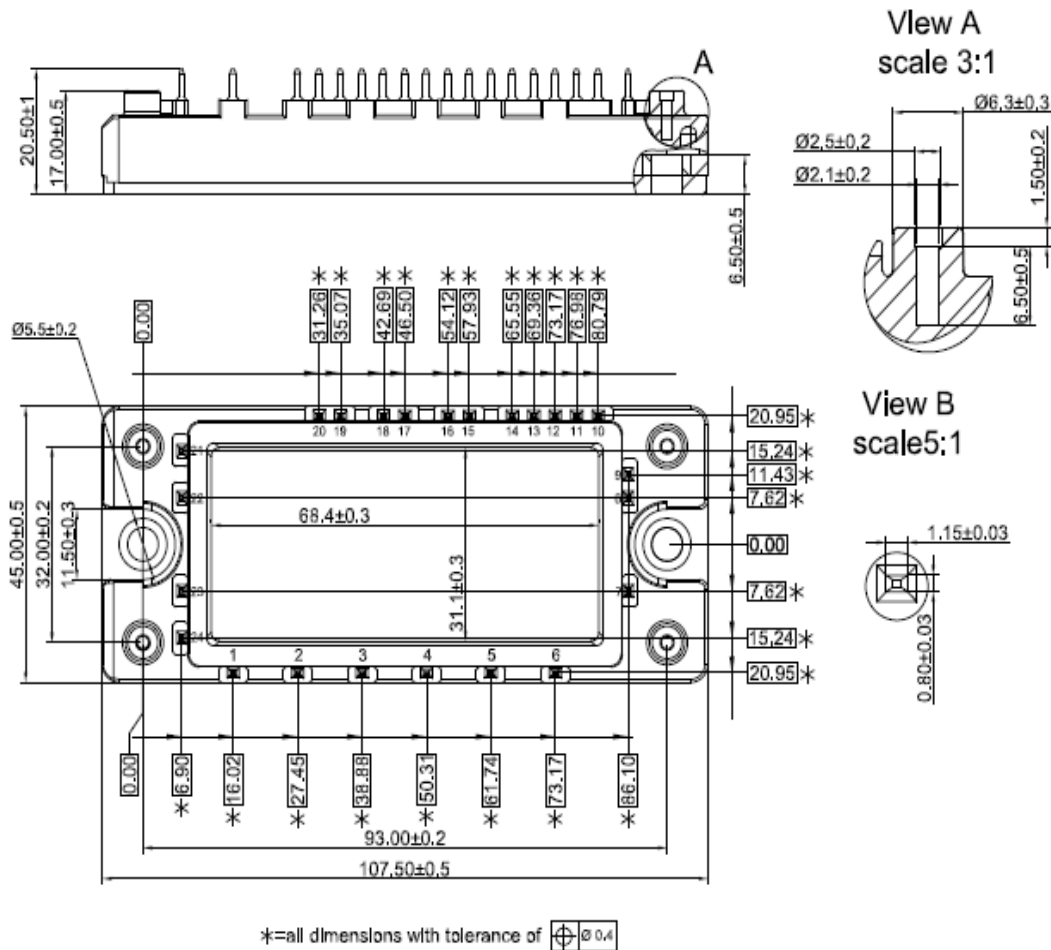
IGBT Module Datasheet



Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
A	Fina Datasheet Initial Release

Announcement

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