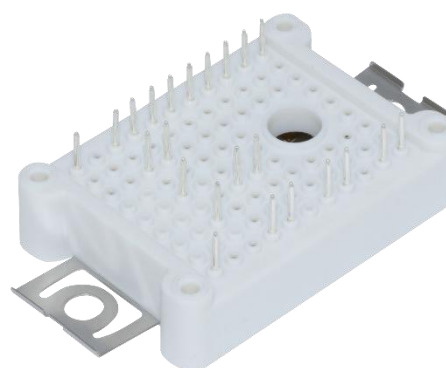
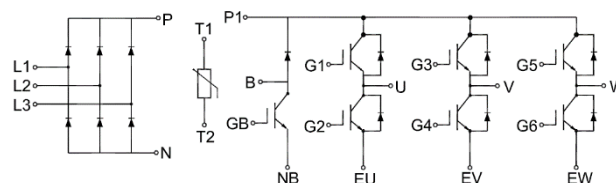


Circuit Diagram

IGBT Module

Features:

- $V_{CES}=1200V$ $I_C=20A$ 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:

- Auxiliary Inverters
- Motor Drives
- Air Conditioning

Type	Package	Marking
GT20PI120B3H	B3	GT20PI120B3H

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}	$T_C=90^\circ C$	20	A
		$T_C=25^\circ C$	40	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	40	A
P_D	Maximum Power Dissipation (IGBT)	$T_C=25^\circ C$, $T_{Jmax}=175^\circ C$	200	W

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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	$I_C=0.5\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=20\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	2.20	2.65	V
			$T_J=125^{\circ}\text{C}$	2.89		V
			$T_J=175^{\circ}\text{C}$	3.20		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		907		pF
C_{oes}	Output Capacitance			210		pF
C_{res}	Reverse Transfer Capacitance			7.19		pF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=20A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		35		ns
			$T_J=125^{\circ}C$		34		
			$T_J=175^{\circ}C$		32		
t_r	Rise Time		$T_J=25^{\circ}C$		24		ns
			$T_J=125^{\circ}C$		27		
			$T_J=175^{\circ}C$		28		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		133		ns
			$T_J=125^{\circ}C$		147		
			$T_J=175^{\circ}C$		156		
t_f	Fall Time	$T_J=25^{\circ}C$		101		ns	
		$T_J=125^{\circ}C$		140			
		$T_J=175^{\circ}C$		152			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=20A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ $di/dt=324A/\mu s(T_J=175^{\circ}C)$ Inductive Load	$T_J=25^{\circ}C$		1.80		mJ
		$T_J=125^{\circ}C$		2.05			
		$T_J=175^{\circ}C$		2.30			

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IGBT Module Datasheet



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =20A, R _{Goff} =36Ω, V _{GE} =±15V, du/dt=5300V/μs(T _J =175°C) Inductive Load	T _J =25°C		1.02		mJ
			T _J =125°C		1.15		
			T _J =175°C		1.26		
Q _g	Total Gate Charge	V _{CE} =960V, V _{GE} =±15V, I _C =20A	T _J =25°C		84		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)					0.753	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m · K))				1.128		°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		20	A
I _{FM}	Diode Maximum Forward Current	tp=1ms	40	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 =20A	T _J =25°C		2.06	2.50	V
			T _J =125°C		2.25		
			T _J =175°C		2.27		
t _{rr}	Reverse Recovery Time	I _F =20A, -diF/dt=300A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		212		ns
			T _J =125°C		314		
			T _J =175°C		390		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		5.51		A
			T _J =125°C		7.66		
			T _J =175°C		8.58		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.82		μC
			T _J =125°C		1.49		
			T _J =175°C		1.99		

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IGBT Module Datasheet



E _{rec}	Reverse Recovery Energy	I _F =20A, -diF/dt=300A/μs(T _J =175°C), V _R =600V, V _{GE} --15V	T _J =25°C		0.48		mJ
			T _J =125°C		1.01		
			T _J =175°C		1.40		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					1.323	°C/W
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				1.981		°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}	$T_C=90^\circ C$	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)	$T_C=25^\circ C, T_{Jmax}=175^\circ C$	200	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	5.81	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15A$, $V_{GE}=15V$	$T_J=25^\circ C$		1.88	2.20	V
			$T_J=125^\circ C$		2.32		V
			$T_J=175^\circ C$		2.50		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				15.3		pF

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IGBT Module Datasheet



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		35		ns
			T _J =125°C		34		
			T _J =175°C		31		
t _r	Rise Time		T _J =25°C		27		ns
			T _J =125°C		30		
			T _J =175°C		32		
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25°C		135		ns
			T _J =125°C		152		
			T _J =175°C		156		
t _f	Fall Time		T _J =25°C		113		ns
			T _J =125°C		161		
			T _J =175°C		170		
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, di/dt=286A/μs(T _J =175°C) Inductive Load	T _J =25°C		0.98		mJ
			T _J =125°C		1.17		
			T _J =175°C		1.29		
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, du/dt=5500V/μs(T _J =175°C) Inductive Load	T _J =25°C		0.69		mJ
			T _J =125°C		0.90		
			T _J =175°C		0.99		
Q _g	Total Gate Charge	V _{CE} =960V, V _{GE} =± 15V, I _C =15A	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)					0.753	°C/W
R _{θCS}	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ _{grease} = 1 W/(m • K))				1.128		°C/W

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

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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		1.7			
t _{rr}	Reverse Recovery Time	I _F =10A, -diF/dt=300A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		215		ns	
			T _J =125°C		334			
			T _J =175°C		406			
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		6.2		A	
			T _J =125°C		7.6			
			T _J =175°C		8.4			
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.87		μC	
			T _J =125°C		1.5			
			T _J =175°C		1.91			
E _{rec}	Reverse Recovery Energy		I _F =10A, -diF/dt=300A/μs(T _J =175°C), V _R =600V, V _{GE} =-15V	T _J =25°C		0.40		mJ
			T _J =125°C		0.80			
			T _J =175°C		1.04			
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					1.650	°C/W	
R _{θCS}	Diode Thermal Resistance: Case-to-Sink (per Diode, λ _{grease} = 1 W/(m • K))				2.470		°C/W	

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IGBT Module Datasheet



Diode, Rectifier

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1800	V
I_{FRMSM}	Maximum RMS Forward Current per Chip	$T_J=80^{\circ}\text{C}$	30	A
I_{RMSM}	Maximum RMS Forward Current at Rectifier Output	$T_J=80^{\circ}\text{C}$	30	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^{\circ}\text{C}$	315	A
		$T_J=150^{\circ}\text{C}$	260	
I^2t	I^2t - value	$T_J=25^{\circ}\text{C}$	495	A^2s
		$T_J=150^{\circ}\text{C}$	340	

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=20\text{A}$	$T_J=25^{\circ}\text{C}$		1.202		V
			$T_J=125^{\circ}\text{C}$		1.187		
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)					0.944	$^{\circ}\text{C}/\text{W}$
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, $\lambda_{\text{grease}} = 1 \text{ W}/(\text{m} \cdot \text{K})$)				1.413		$^{\circ}\text{C}/\text{W}$

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



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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			
T	Mounting Screw:M4	1.5		1.8	N·m
G	Weight		23		g

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

Ordering Information Table

Device code	G	T	20	PI	120	B3	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench & Field Stop IGBT
- ③ - Rated Current (20=20A)
- 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

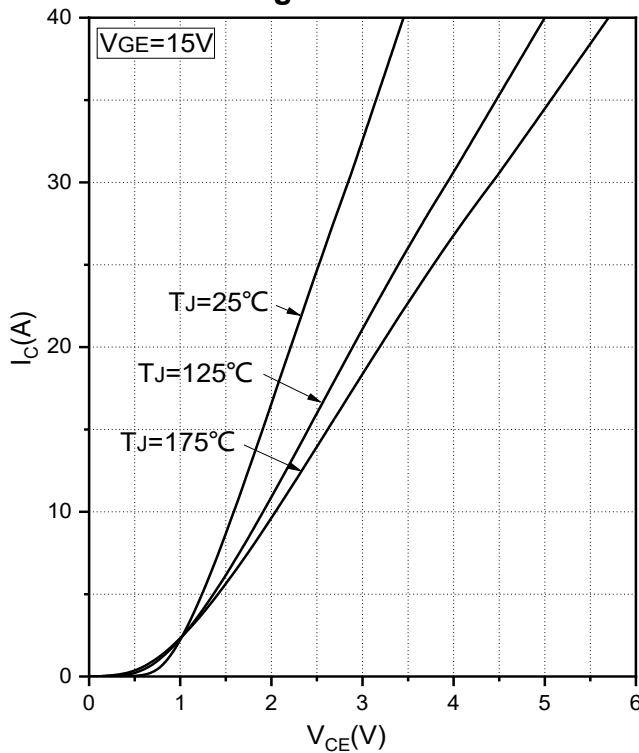


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

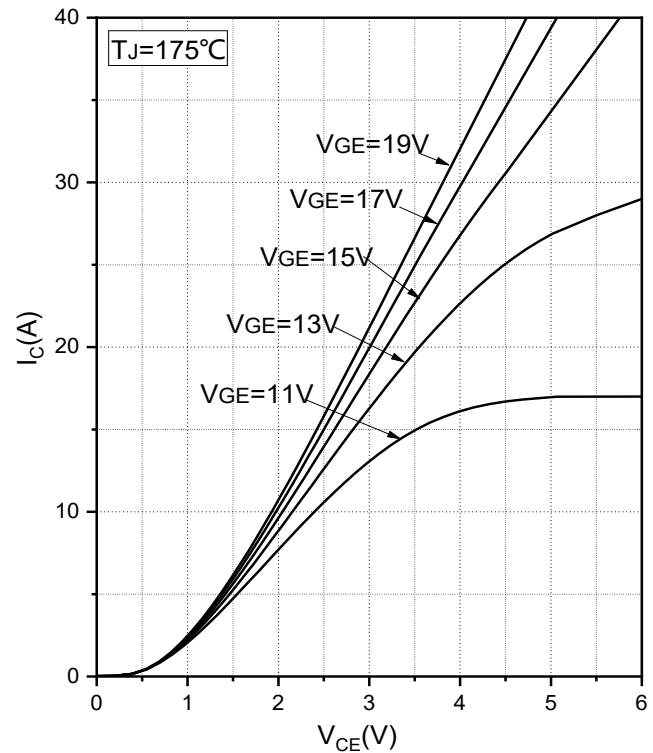


Fig.2 Typical Output Characteristics(Inverter)

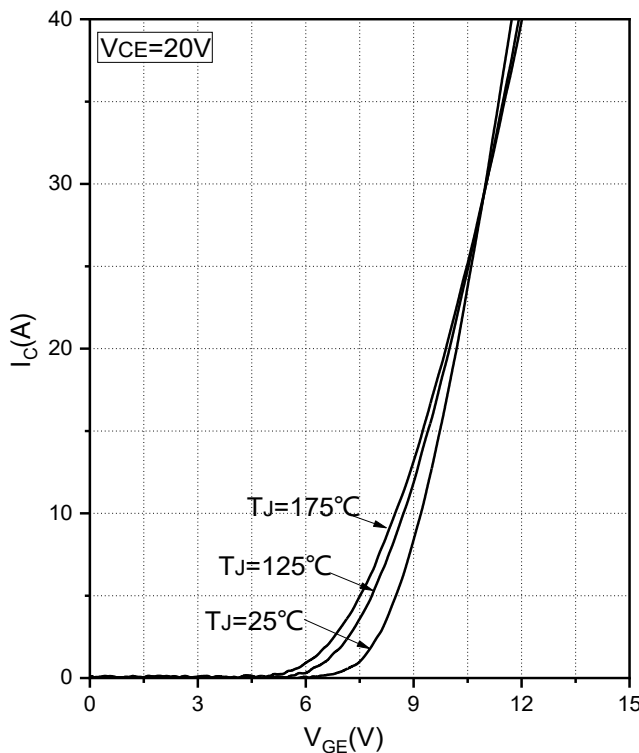


Fig.3 Transfer Characteristic(Inverter)

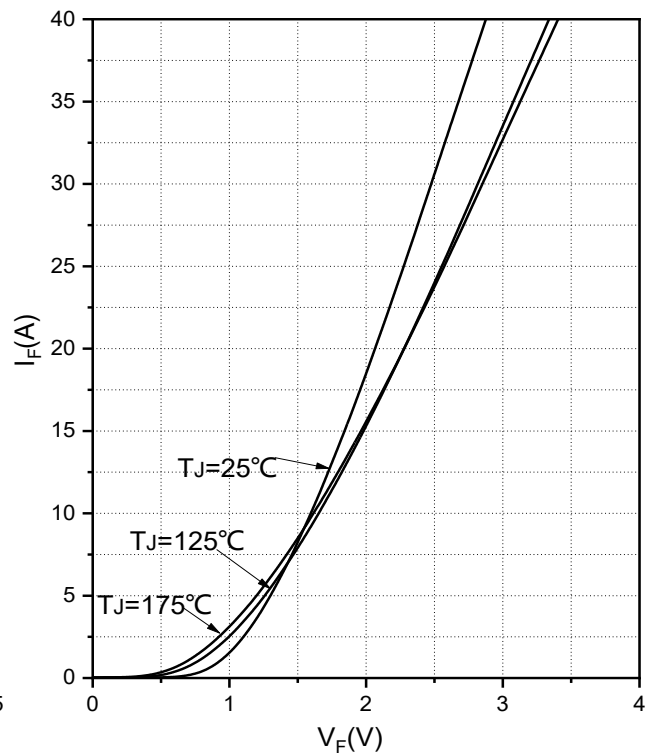


Fig.4 Forward Characteristics of Diode(Inverter)

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IGBT Module Datasheet

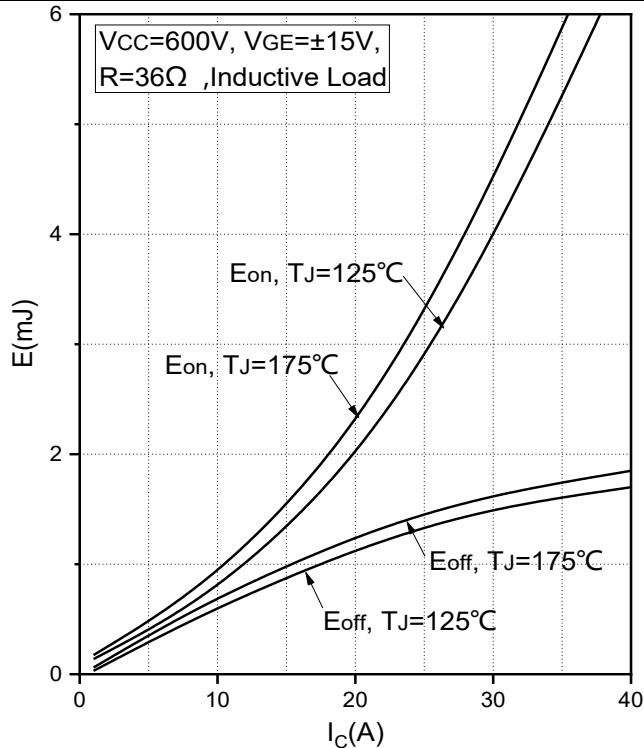


Fig.5 Typical Switching Loss vs. Collector Current(Inverter)

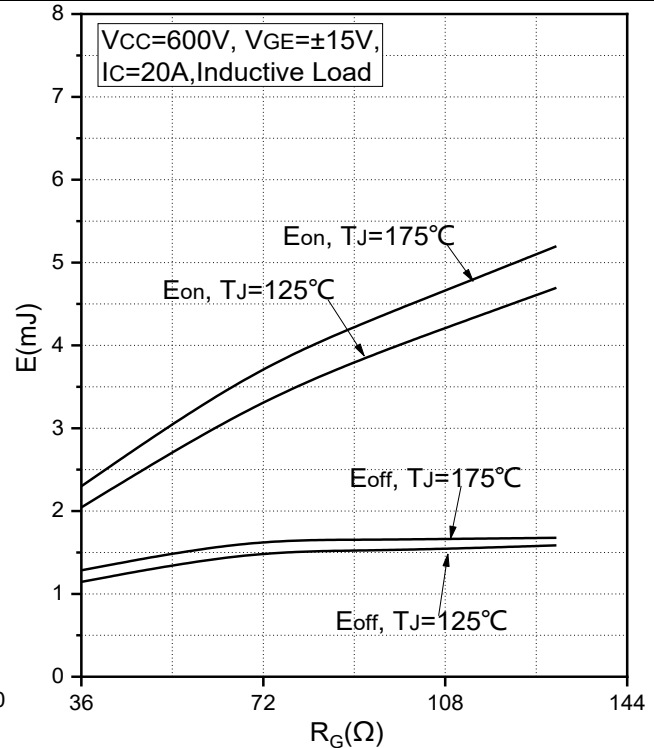


Fig.6 Typical Switching Loss vs. Gate Resistance(Inverter)

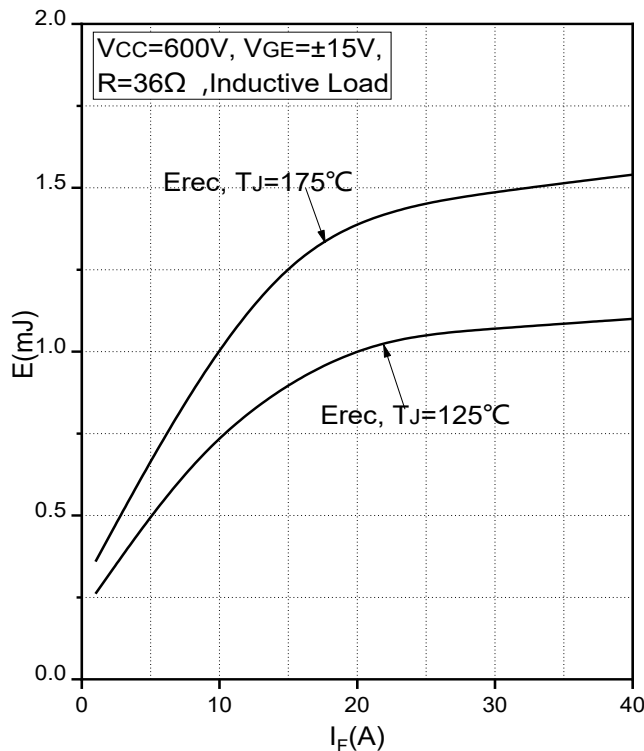


Fig.7 Typical Switching Loss vs. Forward Current(Inverter)

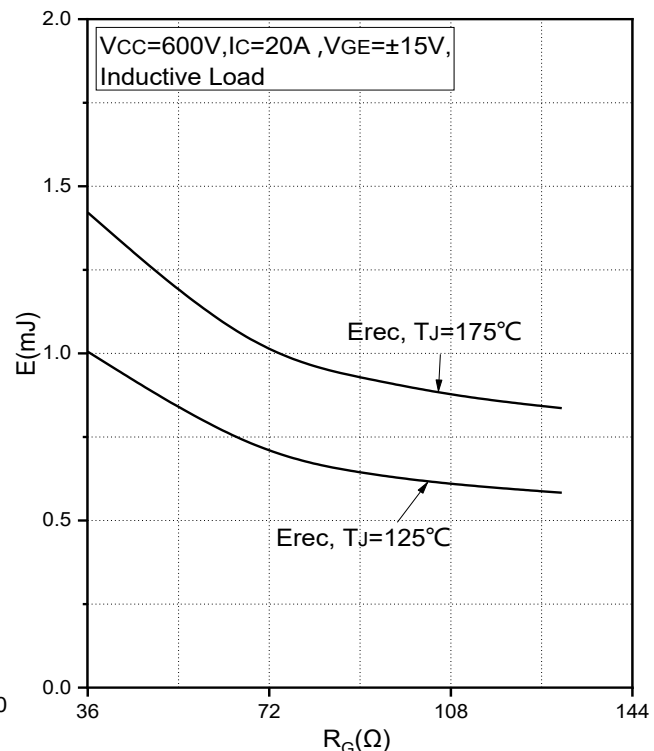


Fig.8 Typical Switching Loss vs. Gate Resistance(Inverter)

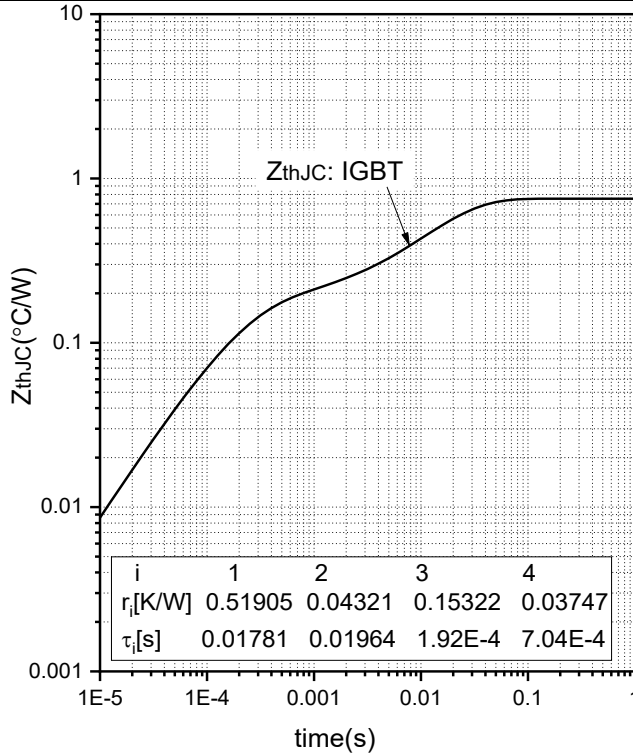


Fig.9 Transient Thermal Impedance (Inverter IGBT)

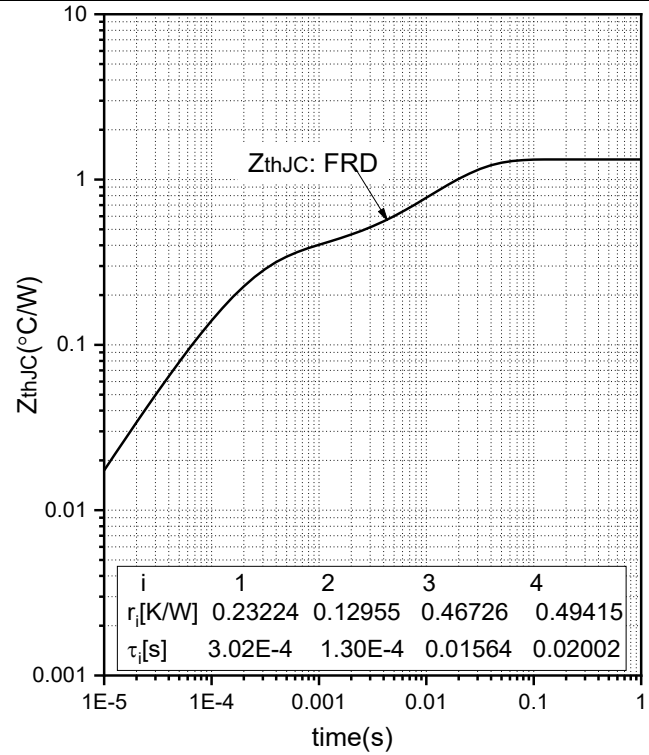


Fig.10 Transient Thermal Impedance (Inverter Diode)

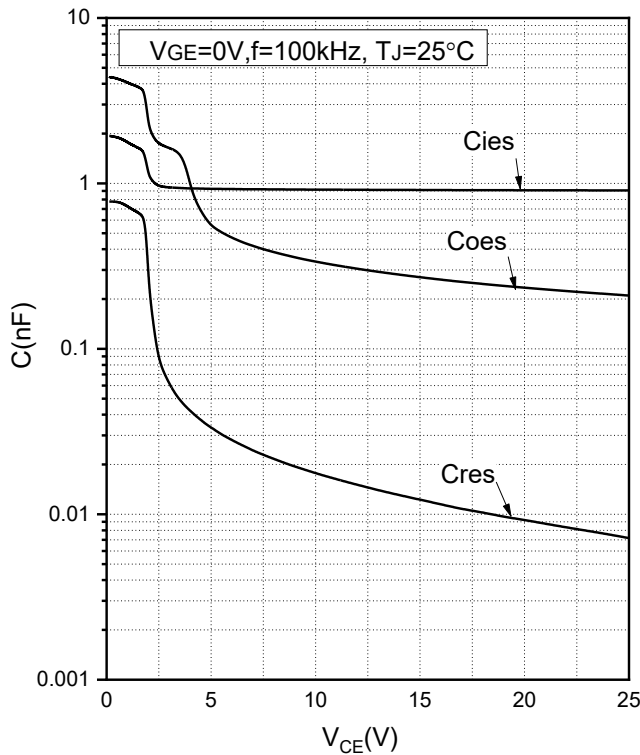


Fig.11 Capacitance Characteristics(Inverter)

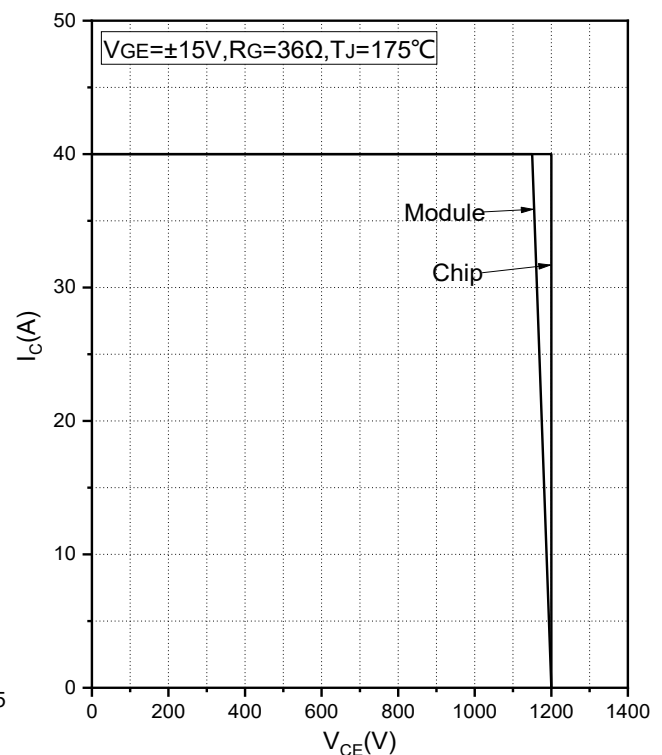


Fig.12 Reverse Bias Safe Operation Area (RBSOA) (Inverter)

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IGBT Module Datasheet

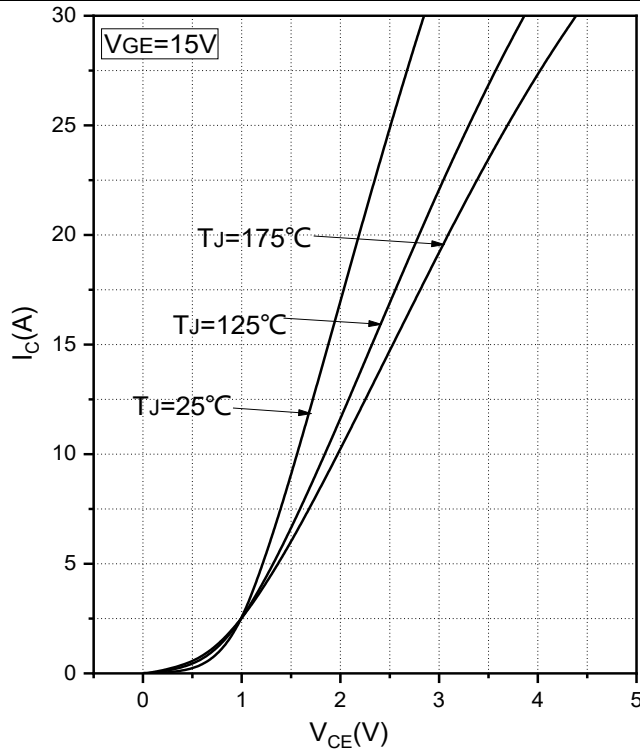


Fig.13 Typical Saturation Voltage Characteristics (Chopper)

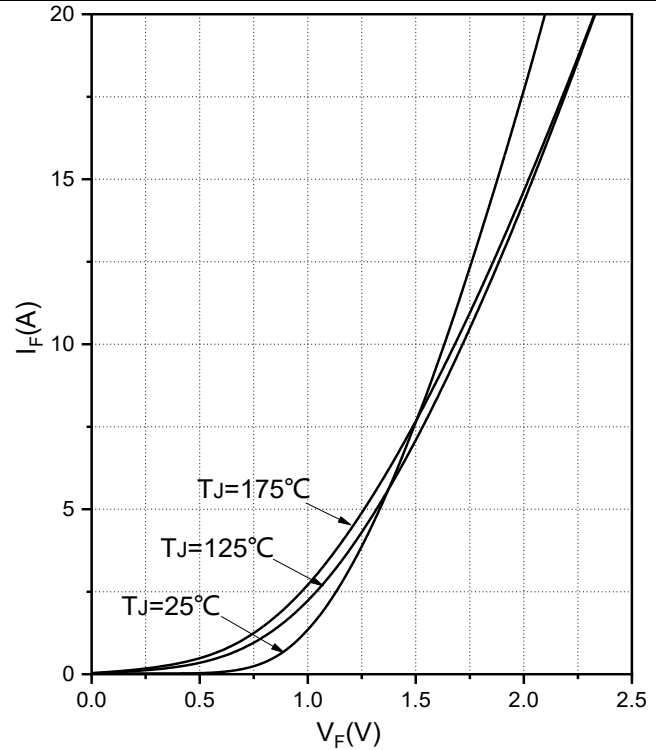


Fig.14 Forward Characteristics of Diode(Chopper)

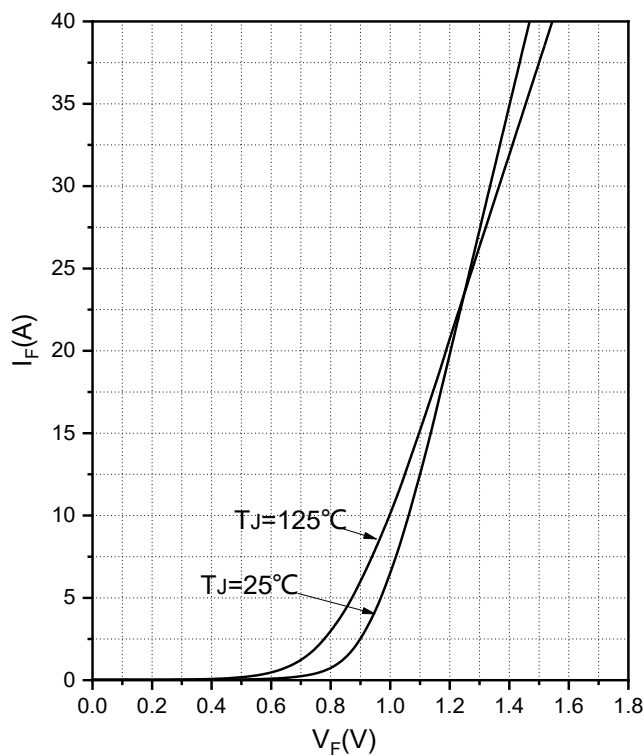


Fig.15 Forward Characteristics of Diode (Rectifier)

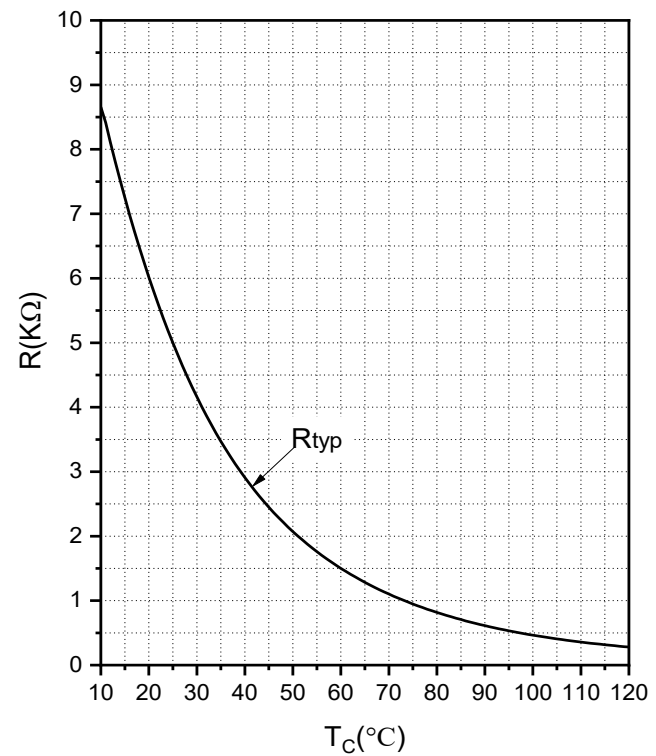
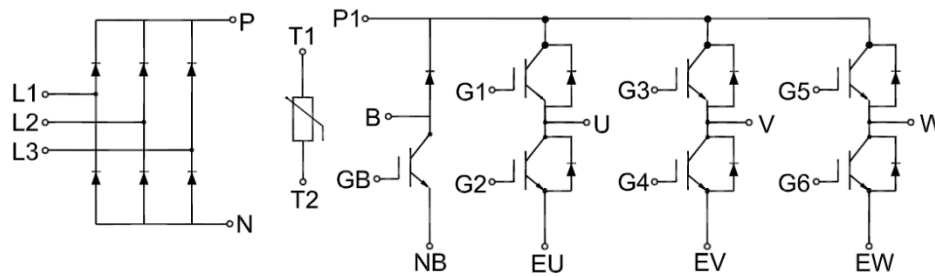


Fig.16 NTC Temperature Characteristics

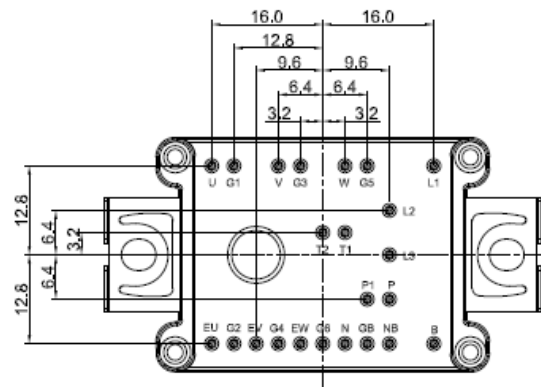
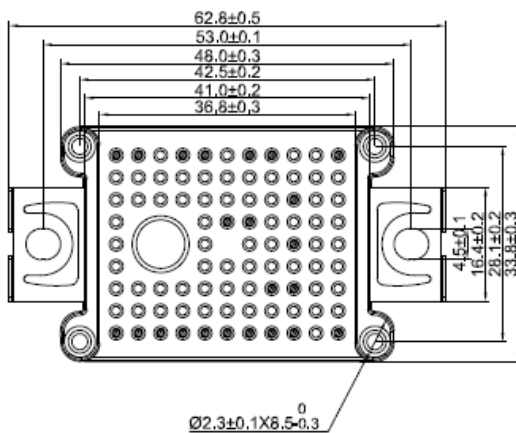
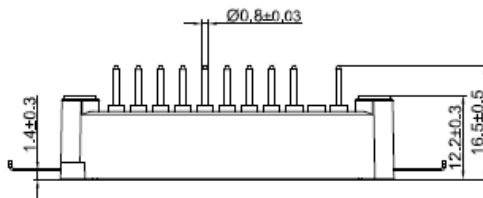
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IGBT Module Datasheet

Internal Circuit:



Package Outline (Unit: mm):





Revision	Notes
02	Engineering Sample Datasheet

Announcement

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