



GT25PI120T5H

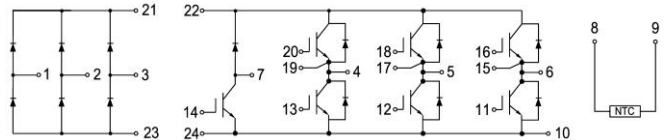
IGBT Module

Preliminary Data

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated > 10 μ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested (2xI_c)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Circuit Diagram



Applications:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

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

V _{CES}	Collector-Emitter Blocking Voltage	T _J =25°C	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	25	A
		T _C =25°C	50	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	50	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =150°C	196	W



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

Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=1\text{mA}$, $V_{CE}=V_{GE}$, $T_J=25^\circ\text{C}$	5.00	5.60	6.50	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=25\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.65	1.90	V
			$T_J=125^\circ\text{C}$	1.95		V
			$T_J=150^\circ\text{C}$	2.00		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^\circ\text{C}$			100	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$, $T_J=25^\circ\text{C}$		2.41		nF
C_{oes}	Output Capacitance			0.17		nF
C_{res}	Reverse Transfer Capacitance			0.02		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}$, $I_C=25\text{A}$, $R_{Gon}=20\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	101		ns		
			$T_J=125^\circ\text{C}$	99				
			$T_J=150^\circ\text{C}$	99				
t_r	Rise Time		$V_{CC}=600\text{V}$, $I_C=25\text{A}$, $R_{Goff}=20\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	39		ns	
				$T_J=125^\circ\text{C}$	38			
				$T_J=150^\circ\text{C}$	37			
$t_{d(off)}$	Turn-off Delay Time			$V_{CC}=600\text{V}$, $I_C=25\text{A}$, $R_{Goff}=20\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	137		ns
					$T_J=125^\circ\text{C}$	147		
					$T_J=150^\circ\text{C}$	144		
t_f	Fall Time	$V_{CC}=600\text{V}$, $I_C=25\text{A}$, $R_{Goff}=20\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load			$T_J=25^\circ\text{C}$	494		ns
					$T_J=125^\circ\text{C}$	723		
					$T_J=150^\circ\text{C}$	728		
E_{on}	Turn-on Switching Loss		$V_{CC}=600\text{V}$, $I_C=25\text{A}$, $R_{Gon}=20\Omega$, $V_{GE}=\pm 15\text{V}$, $di/dt=548\text{A}/\mu\text{s}$ ($T_J=150^\circ\text{C}$) Inductive Load		$T_J=25^\circ\text{C}$	2.14		mJ
					$T_J=125^\circ\text{C}$	2.76		
					$T_J=150^\circ\text{C}$	2.97		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =25A, R _{Goff} =20Ω, V _{GE} =±15V, du/dt=2299V/μs (T _J =150°C) Inductive Load	T _J =25°C	1.97	mJ
			T _J =125°C	3.22	
			T _J =150°C	3.54	
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C	128	nC
RBSOA	I _C =50A, V _{CC} =1050V, V _p =1200V, R _G =20Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid	
I _{SC}	V _{CC} =600V, V _{GE} =±15V, R _G =20Ω, tp=10μs, T _J =125°C			90	A
R _{θJC}	IGBT Thermal Resistance: Junction-To-Case(per IGBT)			0.637	°C/W

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		25	A
I _{FM}	Repetitive Peak Forward Current	tp=1ms	50	A

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

Symbol	Description	Conditions	Min	Typ	Max	Unit
V _{FM}	Forward Voltage	I _F =25A	T _J =25°C	1.65	1.90	V
			T _J =125°C	1.70		
			T _J =150°C	1.70		
t _{rr}	Reverse Recovery Time		T _J =25°C	213		ns
			T _J =125°C	441		
			T _J =150°C	458		
I _{rr}	Peak Reverse Recovery Current	I _F =25A, -diF/dt=695A/μs(T _J =150°C) V _{rr} =600V, V _{GE} =-15V	T _J =25°C	24.4		A
			T _J =125°C	29.1		
			T _J =150°C	30.3		
Q _{rr}	Reverse Recovery Charge		T _J =25°C	2.59		μC
			T _J =125°C	4.97		
			T _J =150°C	5.52		



E _{rec}	Reverse Recovery Energy	I _F =25A, -diF /dt=695A/μs(T _J =150°C) V _{rr} =600V, V _{GE} =-15V	T _J =25°C	0.85	mJ
			T _J =125°C	1.95	
			T _J =150°C	2.17	
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per Diode)			0.804	°C/W

IGBT, Brake-Chopper Maximum Rated Values (T_C=25°C unless otherwise specified)

V _{CES}	Collector-Emitter Blocking Voltage	T _J =25°C	1200	V
V _{GES}	Gate-Emitter Voltage		±20	V
I _C	Continuous Collector Current	T _C =100°C	15	A
		T _C =25°C	30	A
I _{CM}	Repetitive Peak Collector Current	tp=1ms	30	A
t _{sc}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =150°C	145	W

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

Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =1mA, V _{CE} =V _{GE} , T _J =25°C	5.0	5.7	6.5	V
V _{CESat}	Collector-Emitter Saturation Voltage	I _C =15A, V _{GE} =15V	T _J =25°C	1.90	2.20	V
			T _J =125°C	2.30		V
			T _J =150°C	2.40		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES} , T _J =25°C			1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} = ±20V, V _{CE} = 0V, T _J =25°C			100	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz, T _J =25°C		1.12		nF
C _{oes}	Output Capacitance			0.03		nF
C _{res}	Reverse Transfer Capacitance			0.02		nF



Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=39\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$	115	ns	
			$T_J=125^\circ C$	110		
			$T_J=150^\circ C$	110		
t_r	Rise Time		$V_{CC}=600V, I_C=15A,$ $R_{Goff}=39\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$	42	ns
				$T_J=125^\circ C$	49	
				$T_J=150^\circ C$	53	
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=15A,$ $R_{Goff}=39\Omega, V_{GE}=\pm 15V,$ Inductive Load		$T_J=25^\circ C$	145	ns
				$T_J=125^\circ C$	158	
				$T_J=150^\circ C$	161	
t_f	Fall Time		$V_{CC}=600V, I_C=15A,$ $R_{Goff}=39\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^\circ C$	275	ns
				$T_J=125^\circ C$	336	
				$T_J=150^\circ C$	353	
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=39\Omega, V_{GE}=\pm 15V,$ $di/dt=229A/\mu s$ ($T_J=150^\circ C$) Inductive Load		$T_J=25^\circ C$	2.03	mJ
				$T_J=125^\circ C$	2.27	
				$T_J=150^\circ C$	2.42	
E_{off}	Turn-off Switching Loss		$V_{CC}=600V, I_C=15A,$ $R_{Goff}=39\Omega, V_{GE}=\pm 15V,$ $du/dt=2268V/\mu s$ ($T_J=150^\circ C$) Inductive Load	$T_J=25^\circ C$	0.64	mJ
				$T_J=125^\circ C$	0.89	
				$T_J=150^\circ C$	0.97	
Q_g	Total Gate Charge	$V_{GE}=+15V \dots -15V$			113	nC
RBSOA	$I_C=30A, V_{CC}=1050V, V_p=1200V, R_G=39\Omega, V_{GE}=+15V$ to 0V, $T_J=150^\circ C$			Trapezoid		
I_{SC}	$V_{CC}=600V, t_p=10\mu s, V_{GE}=\pm 15V, R_G=39\Omega, T_J=125^\circ C$			73.4	A	
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per IGBT)			0.863	$^\circ C/W$	

Diode, Brake-Chopper Maximum Rated Values ($T_C=25^\circ C$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ C$	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	$t_p=1ms$	20	A



Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit	
V_{FM}	Forward Voltage	$I_F=10\text{A}$	$T_J=25^\circ\text{C}$		1.75		V
			$T_J=125^\circ\text{C}$		1.90		
			$T_J=150^\circ\text{C}$		1.85		
t_{rr}	Reverse Recovery Time		$T_J=25^\circ\text{C}$		381		ns
			$T_J=125^\circ\text{C}$		490		
			$T_J=150^\circ\text{C}$		583		
I_{rr}	Peak Reverse Recovery Current	$I_F=10\text{A}$, $-diF/dt=250\text{A}/\mu\text{s}$ ($T_J=150^\circ\text{C}$)	$T_J=25^\circ\text{C}$		8.4		A
			$T_J=125^\circ\text{C}$		9.0		
			$T_J=150^\circ\text{C}$		10.4		
Q_{rr}	Reverse Recovery Charge	$V_R=600\text{V}$, $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$		1.34		μC
			$T_J=125^\circ\text{C}$		2.11		
			$T_J=150^\circ\text{C}$		2.58		
E_{rec}	Reverse Recovery Energy		$T_J=25^\circ\text{C}$		0.33		mJ
			$T_J=125^\circ\text{C}$		0.68		
			$T_J=150^\circ\text{C}$		0.78		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per Diode)				1.451	$^\circ\text{C}/\text{W}$	

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	$T_J=25^\circ\text{C}$	15	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	$T_J=80^\circ\text{C}$	25	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^\circ\text{C}$	320	A
		$T_J=125^\circ\text{C}$	240	
I^2t	I^2t - value	$T_J=25^\circ\text{C}$	512	A^2s
		$T_J=125^\circ\text{C}$	288	



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

Symbol	Description	Conditions	Min	Typ	Max	Unit
V _F	Forward Voltage	I _F =15A	T _J =25°C		1.05	V
			T _J =125°C		1.00	
I _R	Reverse Current	V _R =1200V	T _J =25°C		1	mA
R _{θJC}	Diode Thermal Resistance: Junction-To-Case(per Diode)				0.917	°C/W

Internal NTC-Thermistor Characteristics

R ₂₅	T _C =25°C	5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =481Ω		±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



Module

Symbol	Description	Min	Typ	Max	Unit
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 30s		4500	V
Material of Module Baseplate		Copper			
Internal Isolation		Al ₂ O ₃			
Creepage Distance		10.0			mm
Clearance		7.5			mm
L _{SCE}	Stray Inductance Module		60		nH
T _J	Maximum Junction Temperature			150	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	°C
T _{stg}	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			
R _{ecs}	Case-To-Sink Thermally (Conductive Grease Applied)			0.04	°C/W
M	Mounting Screw:M5	3.0		6.0	N-m
G	Weight		200		g

Ordering Information Table

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

- ① - IGBT Module
- ② - Trench & Field Stop 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)

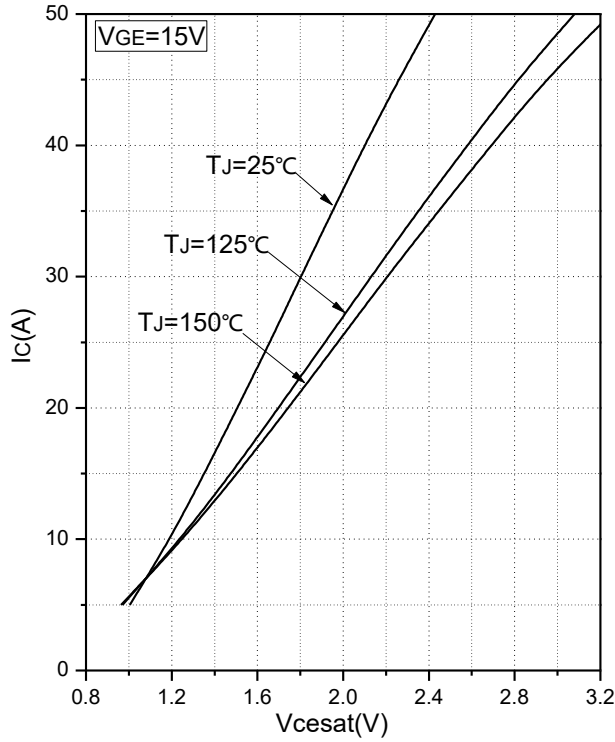


Fig.1 Typical Saturation Voltage Characteristics(Inverter)

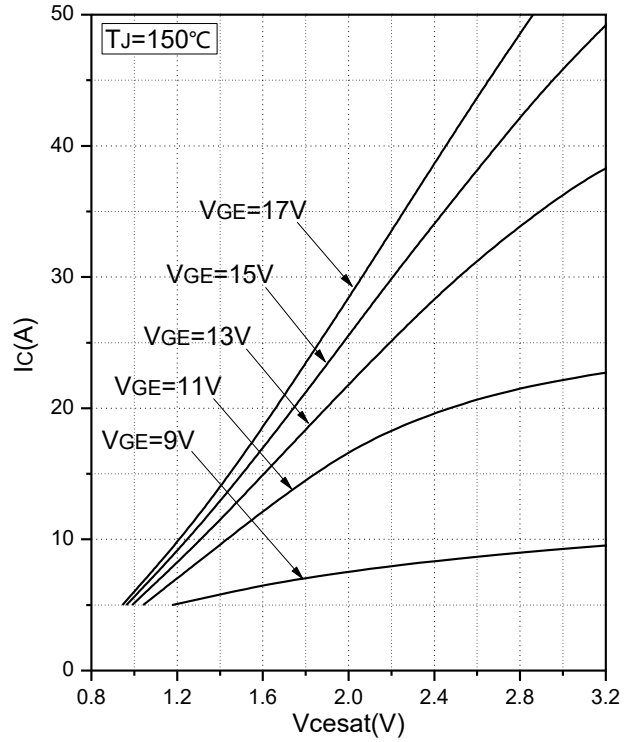


Fig.2 Typical Output Characteristics(Inverter)

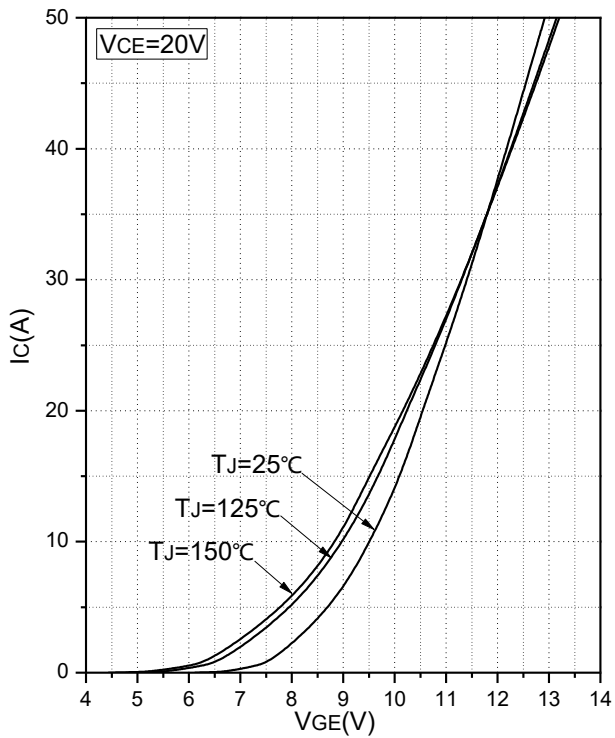


Fig.3 Transfer Characteristic (Inverter)

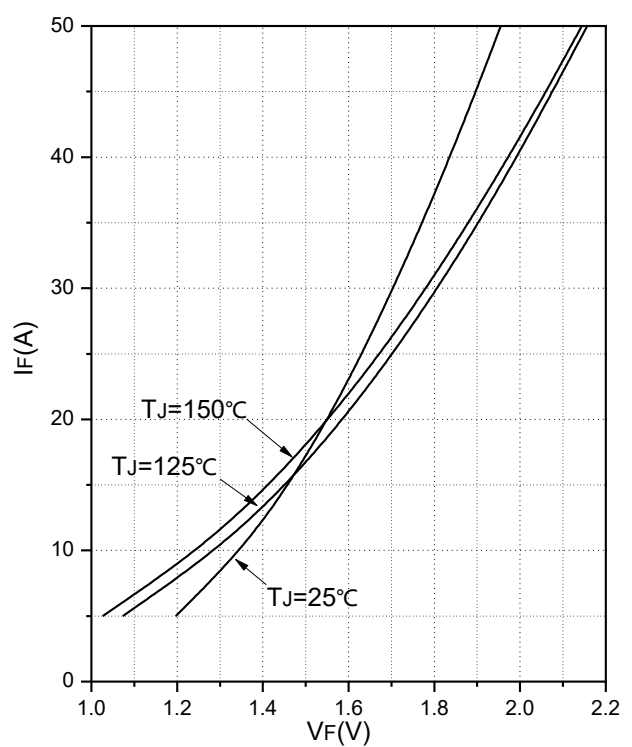


Fig.4 Forward Characteristics of Diode (Inverter)

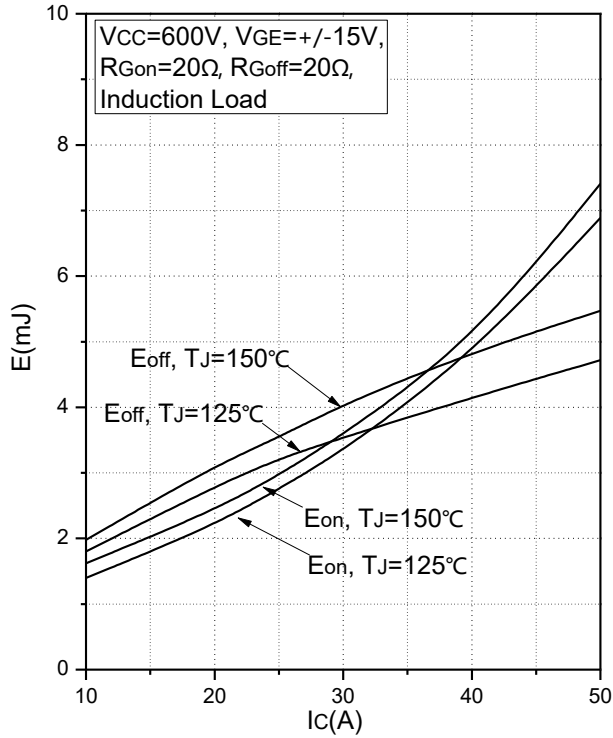


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

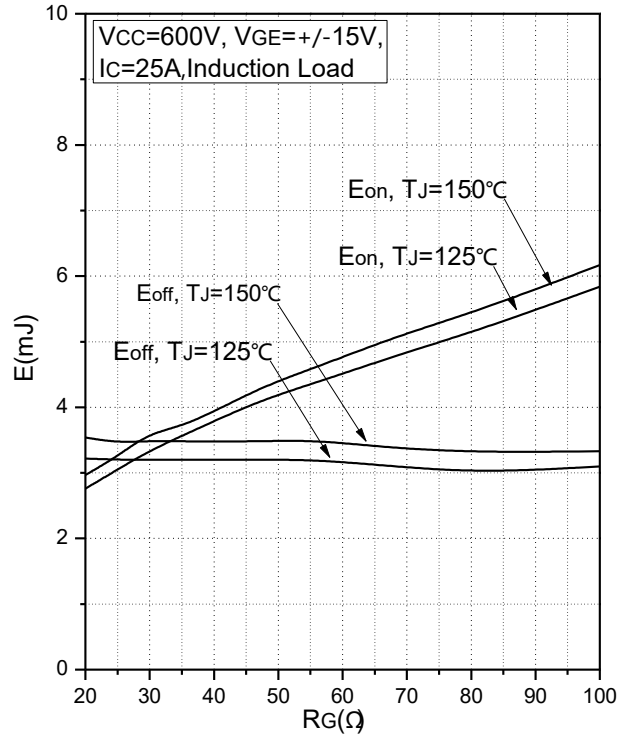


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

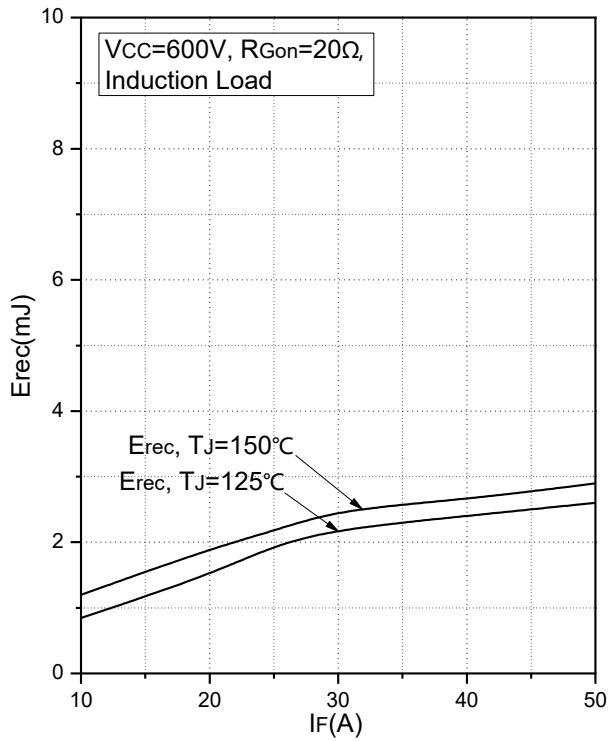


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

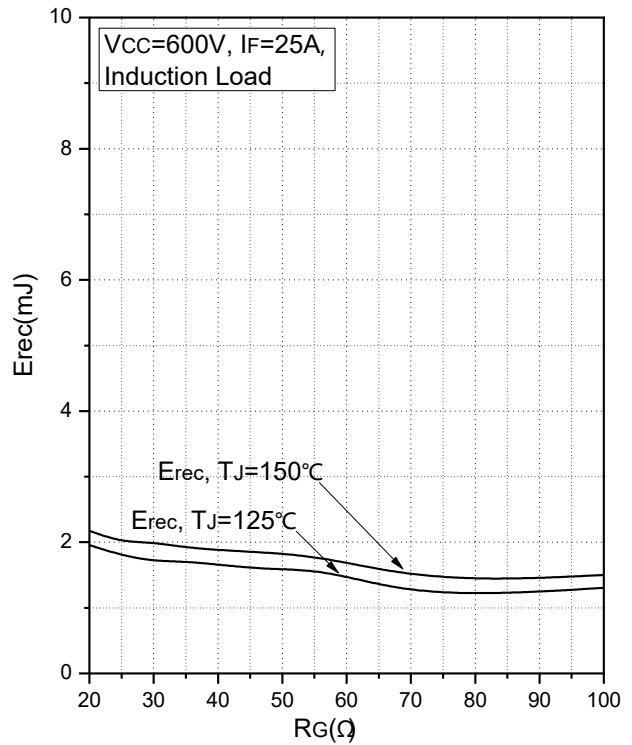


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

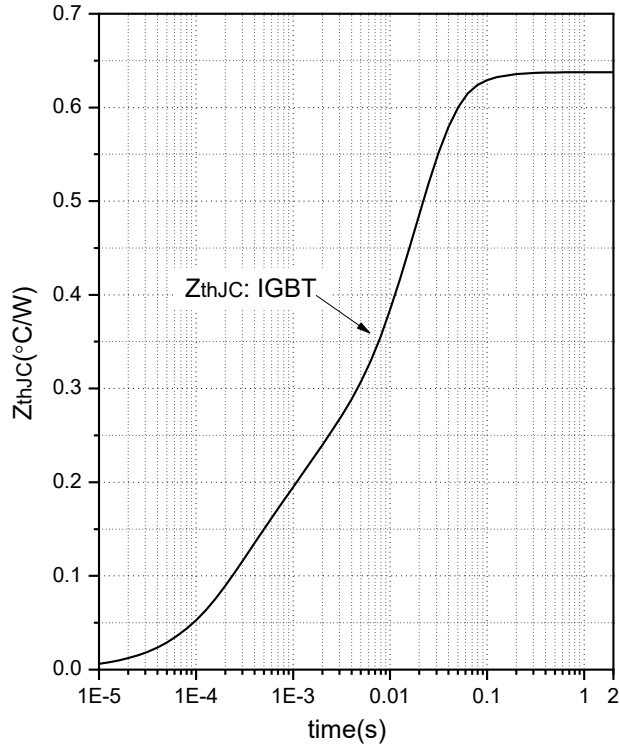


Fig.9 Transient Thermal Impedance (Inverter-IGBT)

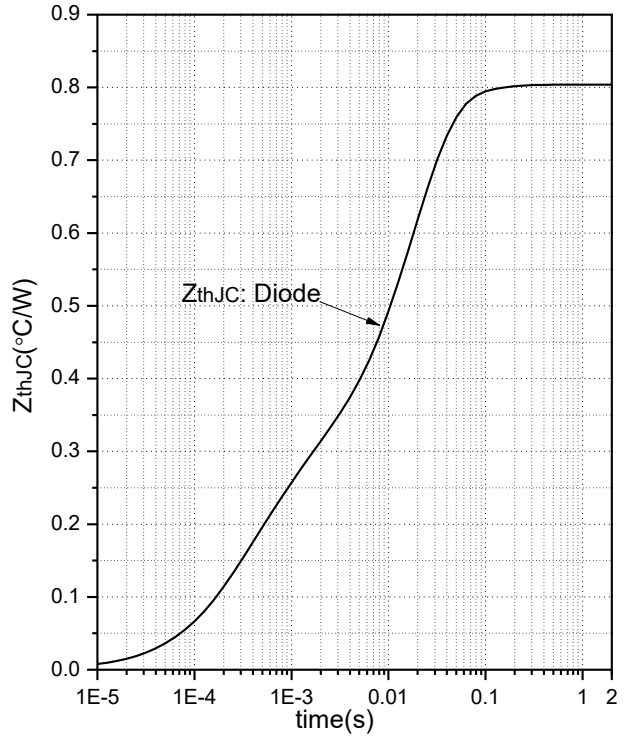


Fig.10 Transient Thermal Impedance (Inverter-Diode)

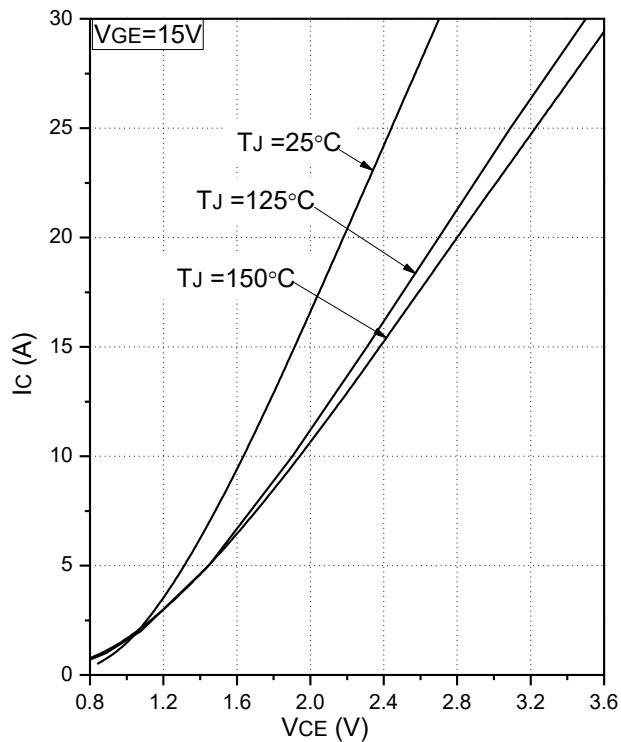


Fig.11 Typical Saturation Voltage Characteristics (Brake-Chopper)

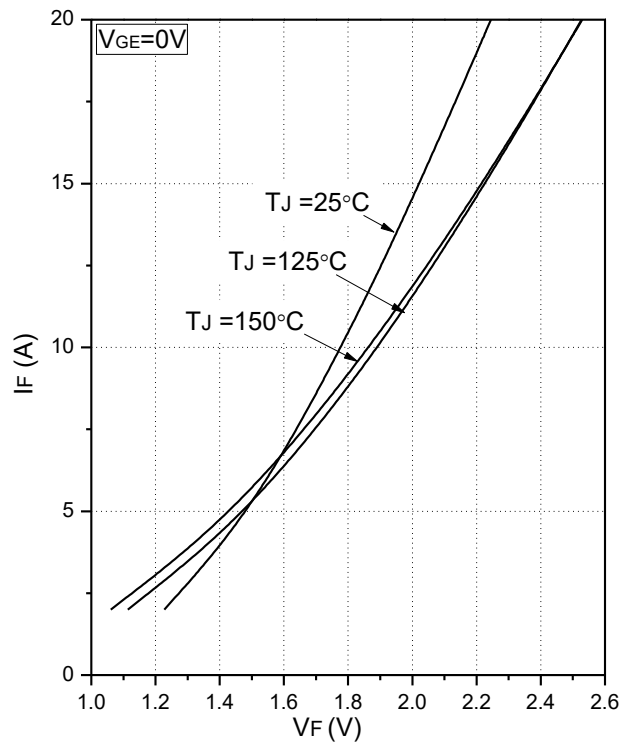


Fig.12 Forward Characteristics of Diode (Brake-Chopper)

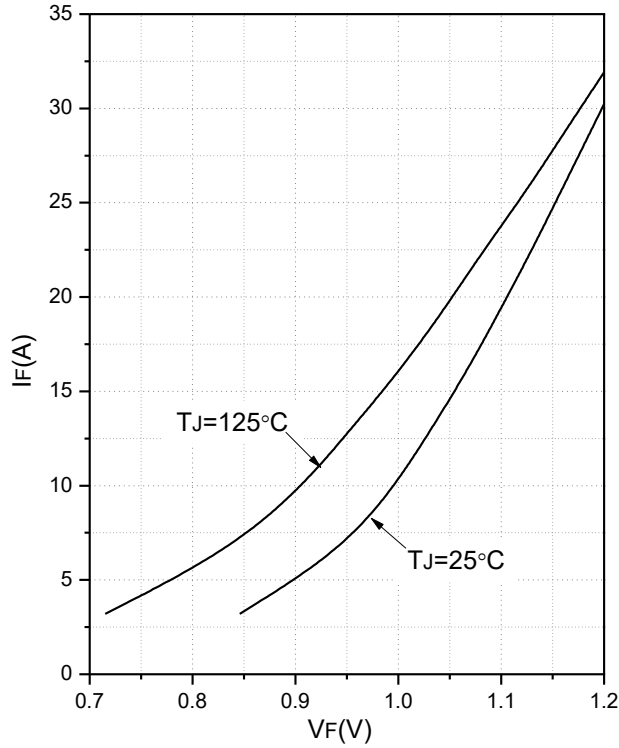


Fig.13 Forward Characteristics of Diode (Rectifier)

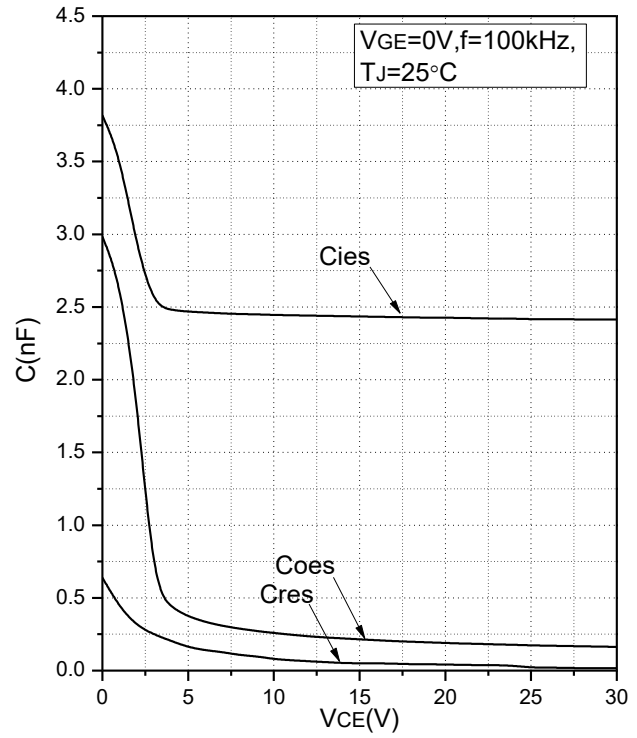


Fig.14 Capacitance Characteristics

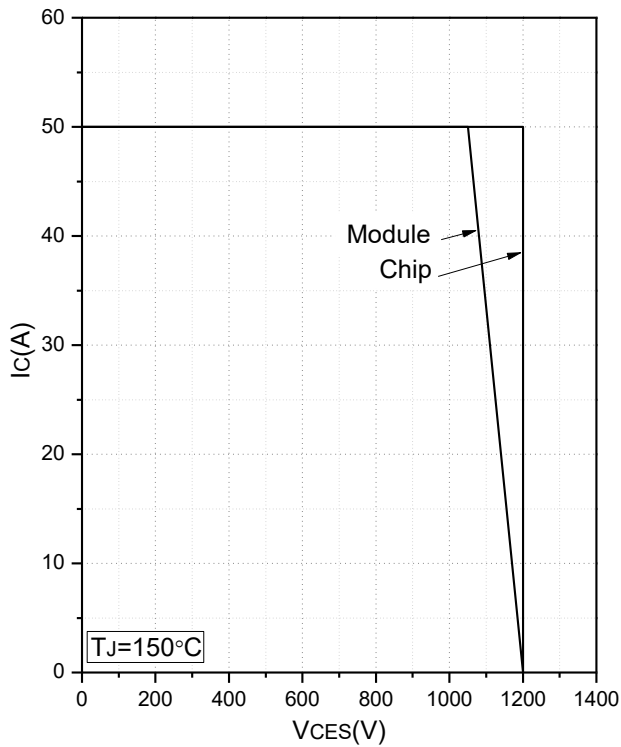


Fig.15 Reverse Bias Safe Operation Area (RBSOA)

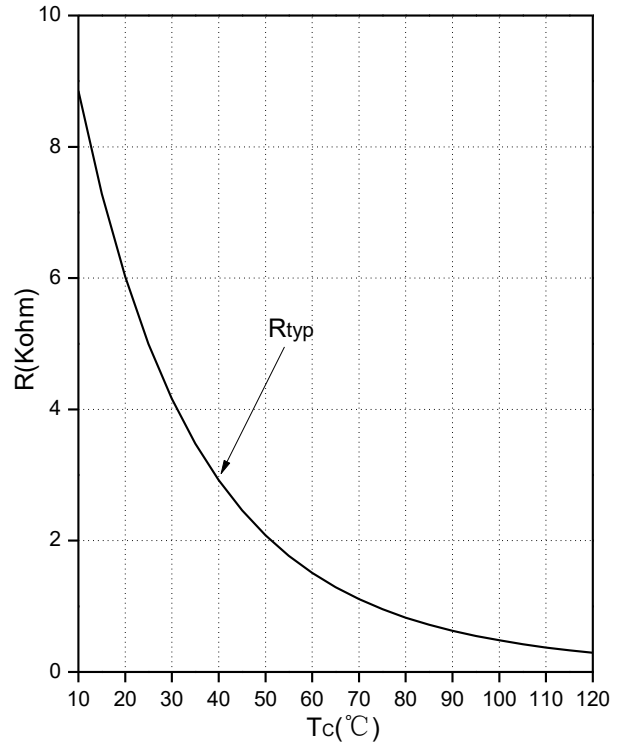
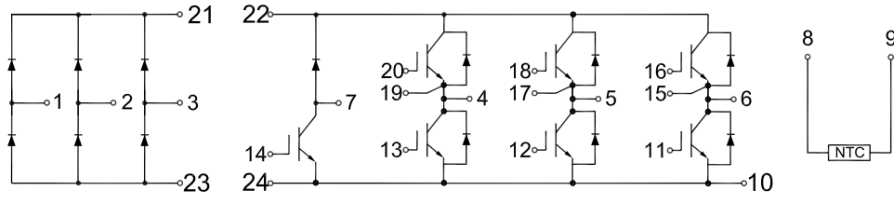


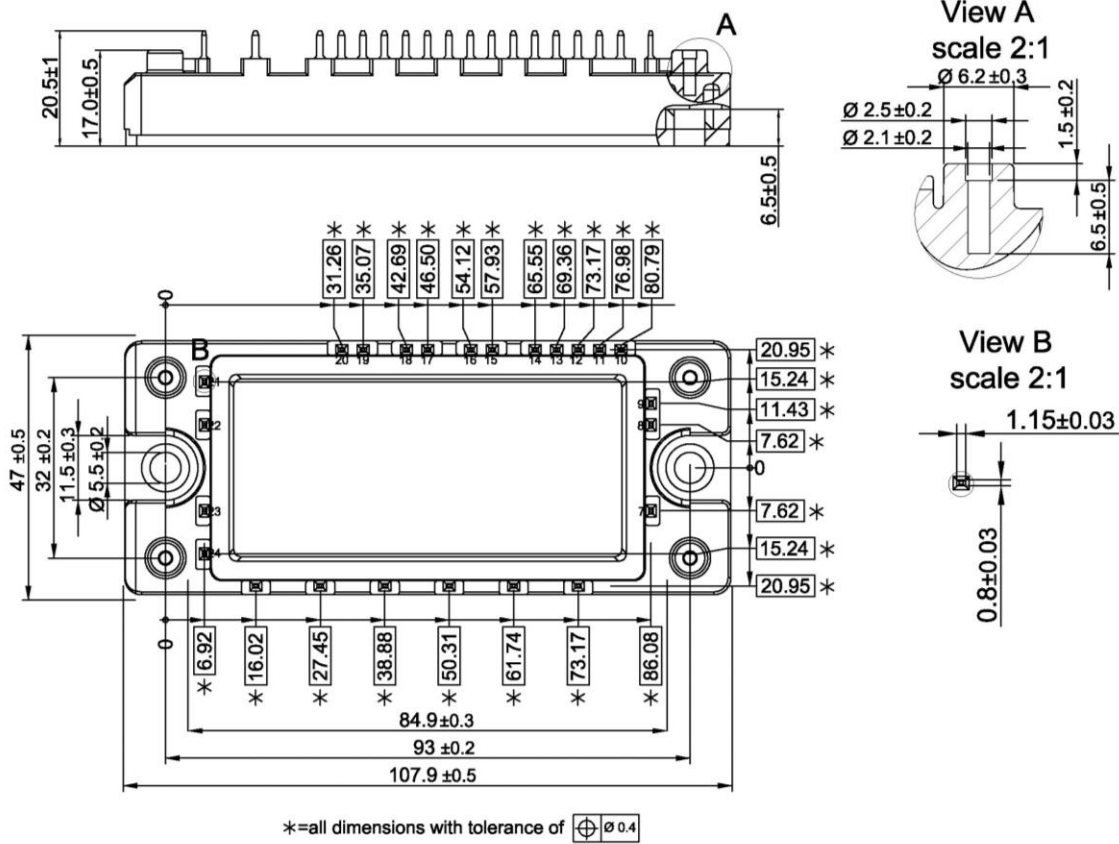
Fig.16 NTC Temperature Characteristics



Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
08/11/2023	01	Initial Release

Announcement

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