



GT25PI120C6H

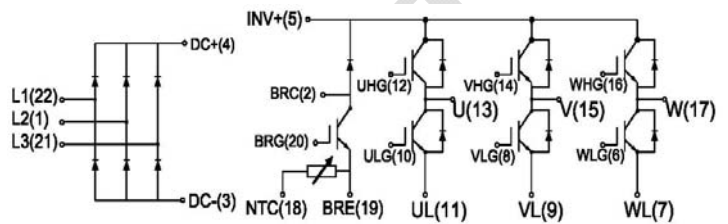
IGBT Module

Preliminary Data

Features:

- Trench & Field Stop IGBT
- Short Circuit Rated >10 μ s
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested(2 \times I_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		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}	Repetitive Peak Collector Current	T _J =175°C	50	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _c =25°C T _{Jmax} =175°C	224	W



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	5.6	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=25\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.70	2.10	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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^\circ\text{C}$			200	nA
C_{ies}	Input Capacitance			2.42		nF
C_{oes}	Output Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		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	$T_J=25^\circ\text{C}$		102		ns
			$T_J=125^\circ\text{C}$		99		
			$T_J=150^\circ\text{C}$		99		
t_r	Rise Time		$T_J=25^\circ\text{C}$		39		ns
			$T_J=125^\circ\text{C}$		39		
			$T_J=150^\circ\text{C}$		37		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^\circ\text{C}$		138		ns
			$T_J=125^\circ\text{C}$		147		
			$T_J=150^\circ\text{C}$		145		
t_f	Fall Time	$T_J=25^\circ\text{C}$		494		ns	
		$T_J=125^\circ\text{C}$		723			
		$T_J=150^\circ\text{C}$		729			
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	129	nC
RBSOA	I _C =50A, V _{CC} =1050V, V _p =1200V, R _G =20Ω, V _{GE} =+15V to 0V, T _J =150°C	Trapezoid			
SCSOA	V _{CC} =600V, V _{GE} =±15V, R _{Gon} =20Ω, R _{Goff} =20Ω, t _p =10us, T _J =125°C			90	A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case(per leg)				0.67 °C/W

Diode, Inverter

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

V _{RRM}	Repetitive Peak Reverse Voltage	1200	V
I _F	Diode Continuous Forward Current	25	A
I _{FM}	Diode Maximum Forward Current	50	A

Electrical Characteristics of FWD (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	1.65		V
			T _J =125°C	1.70		
			T _J =150°C	1.70		
t _{rr}	Reverse Recovery Time		T _J =25°C	212		ns
			T _J =125°C	441		
			T _J =150°C	458		
I _{rr}	Peak Reverse Recovery Current	I _F =25A, -di _F /dt=695A/μs(T _J =150°C), V _R =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	2.60		μC
			T _J =125°C	4.97		
			T _J =150°C	5.52		



E _{rec}	Reverse Recovery Energy	I _F =25A, -di _F /dt=695/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C	0.85	mJ
			T _J =125°C	1.95	
			T _J =150°C	2.18	
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)			0.85	°C/W

IGBT, Brake-Chopper

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

V _{CES}	Collector-Emitter Blocking Voltage		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	T _J =175°C	30	A
t _{SC}	Short Circuit Withstand Time		>10	μs
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =175°C	163	W

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

Static characteristics

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{GE(th)}	Gate-Emitter Threshold Voltage	I _C =1mA, V _{CE} =V _{GE}	5.0	5.7	6.5	V
V _{CE(sat)}	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}			1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =±20V, V _{CE} =0V			200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz		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	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=39\Omega, V_{GE}=\pm 15V,$ 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		$T_J=25^\circ C$	113	nC
RBSOA	Reverse Bias Safe Operation Area	$I_C=30A, V_{CC}=1050V, V_p=1200V,$ $R_{Goff}=39\Omega, V_{GE}=+15V \text{ to } 0V, T_J=150^\circ C$	Trapezoid		
SCSOA	Short Circuit Safe Operation Area	$V_{CC}=600V, V_{GE}=\pm 15V, t_p=10\mu s$ $R_{Gon}=39\Omega, R_{Goff}=39\Omega, T_J=125^\circ C$	73.4		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case(per IGBT)			0.92	$^\circ C/W$



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	15	A
I_{FM}	Diode Maximum Forward Current	30	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	$I_F=15\text{A}$	$T_J=25^\circ\text{C}$	1.90		V
			$T_J=125^\circ\text{C}$		2.00	
			$T_J=150^\circ\text{C}$		2.00	
I_{rr}	Peak Reverse Recovery Current		$T_J=25^\circ\text{C}$	8.40		A
			$T_J=125^\circ\text{C}$		9.10	
			$T_J=150^\circ\text{C}$		9.70	
Q_{rr}	Reverse Recovery Charge	$I_F=15\text{A}$, $-di_F/dt = 367\text{A}/\mu\text{s}$, ($T_J=150^\circ\text{C}$) $V_{rr}=600\text{V}$, $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$	1.34		μC
			$T_J=125^\circ\text{C}$		2.14	
			$T_J=150^\circ\text{C}$		2.33	
E_{rec}	Reverse Recovery Energy		$T_J=25^\circ\text{C}$	0.37		mJ
			$T_J=125^\circ\text{C}$		0.70	
			$T_J=150^\circ\text{C}$		0.80	
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case(per Diode)				1.38	$^\circ\text{C}/\text{W}$



Diode, Rectifier

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^\circ\text{C}$	1600	V
I_F	Diode Continuous Forward Current	$T_J=80^\circ\text{C}$	30	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^\circ\text{C}$	300	A
		$T_J=150^\circ\text{C}$	250	
I^2t	I^2t - value	$T_J=25^\circ\text{C}$	450	A ² s
		$T_J=150^\circ\text{C}$	312	

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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=30\text{A}$	$T_J=25^\circ\text{C}$	1.30		V
			$T_J=150^\circ\text{C}$	1.35		
I_R	Reverse Current	$V_R=1600\text{V}$			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case(per Leg)				1.14	$^\circ\text{C}/\text{W}$

Internal NTC-Thermistor Characteristics

R_{25}	$T_C=25^\circ\text{C}$	22.7		k Ω
$\Delta R/R$	$T_C=100^\circ\text{C}$, $R_{100}=1481\Omega$		± 5	%
P_{25}	$T_C=25^\circ\text{C}$	5		mW
$B_{25/50}$	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15\text{K}))]$	3950		K
$B_{25/80}$	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15\text{K}))]$	4000		K



Module

Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	2500			V
T _J	Maximum Junction Temperature			175	°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)			0.07	°C/W
T	Mounting Screw:M4	1		1.5	N·m
G	Weight		39		g

Ordering Information Table

Device code

G	T	25	PI	120	C6	H
①	②	③	④	⑤	⑥	⑦

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

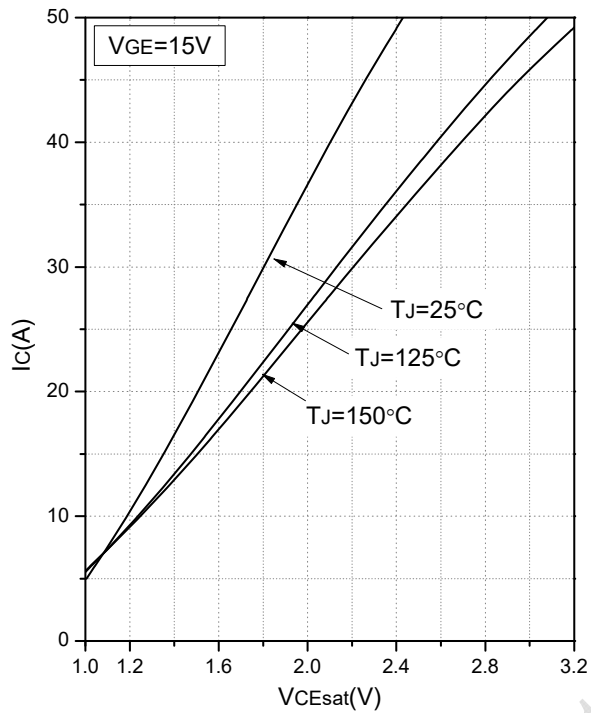


Fig.1 Typical Saturation Voltage Characteristics

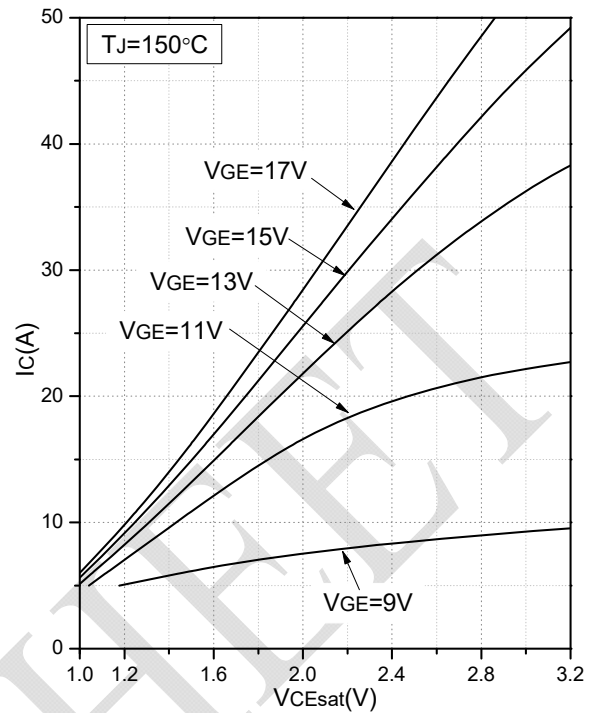


Fig.2 Typical Output Characteristics

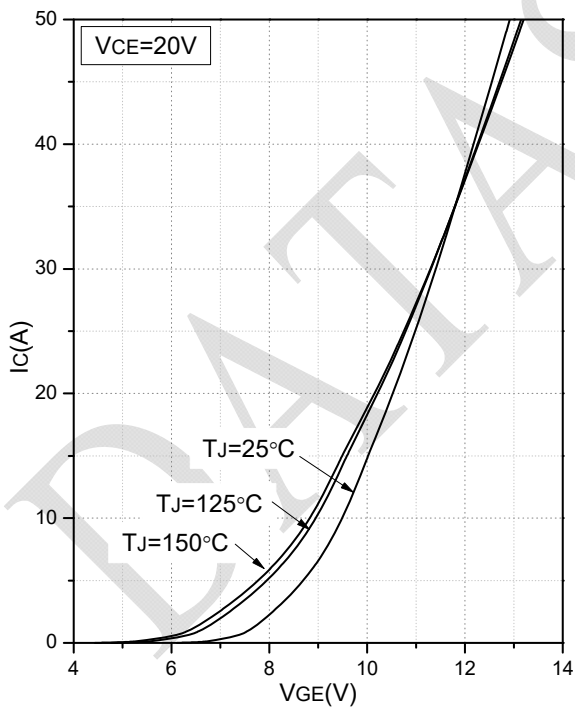


Fig.3 Transfer Characteristic

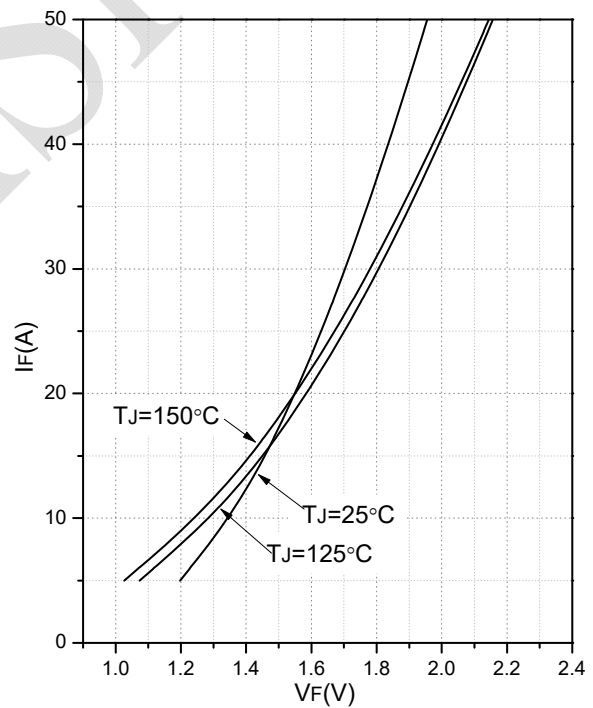


Fig.4 Forward Characteristics of Diode

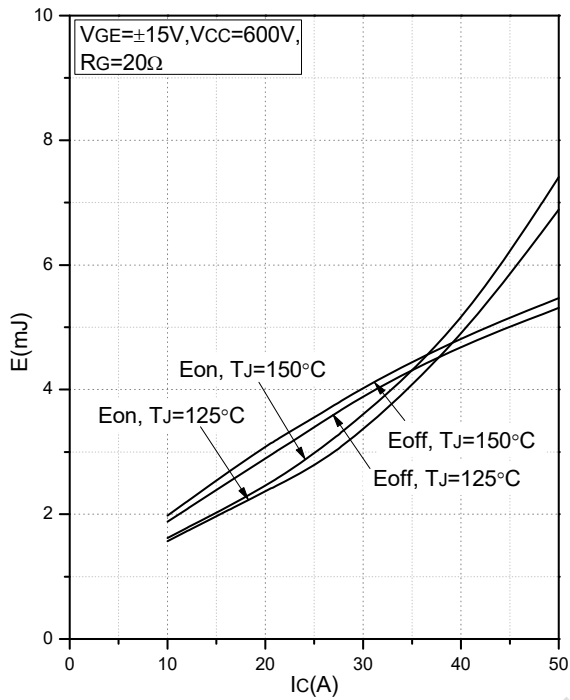


Fig.5 Typical Switching Loss vs. Collector Current

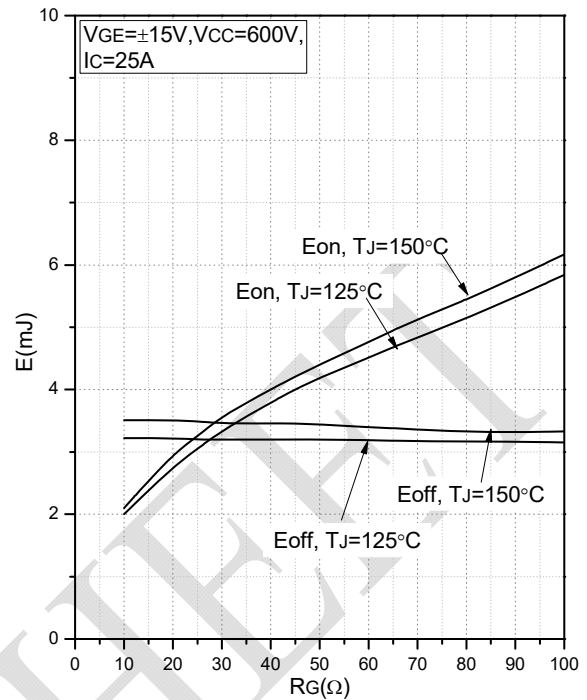


Fig.6 Typical Switching Loss vs. Gate Resistance

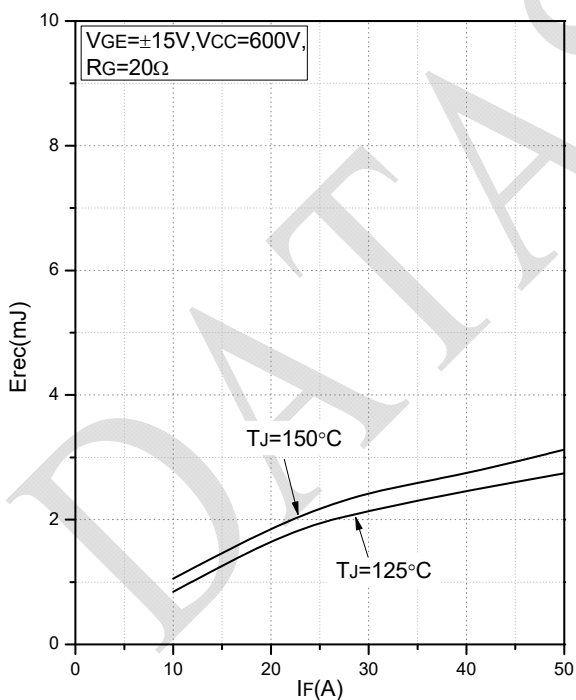


Fig.7 Typical Switching Loss vs. Forward Current

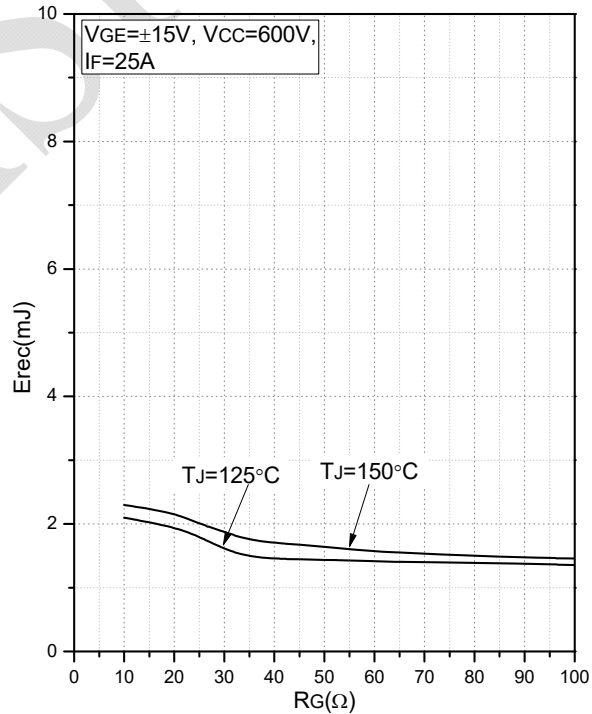


Fig.8 Typical Switching Loss vs. Gate Resistance

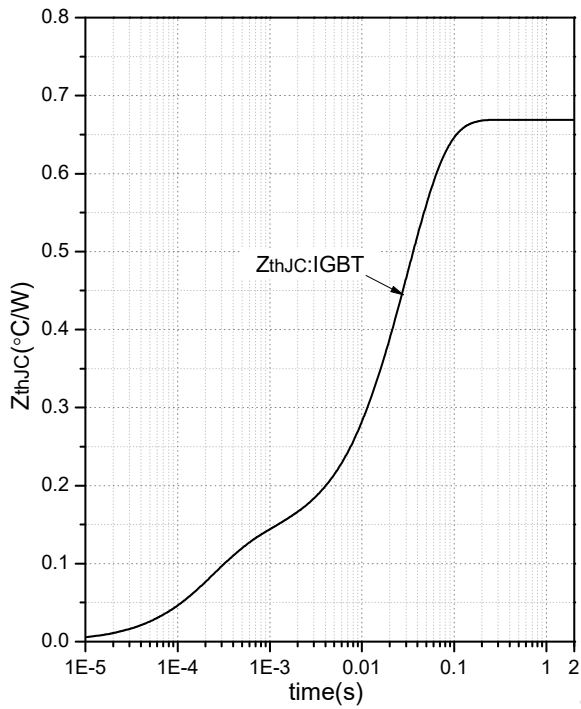


Fig.9 Transient Thermal Impedance (IGBT)

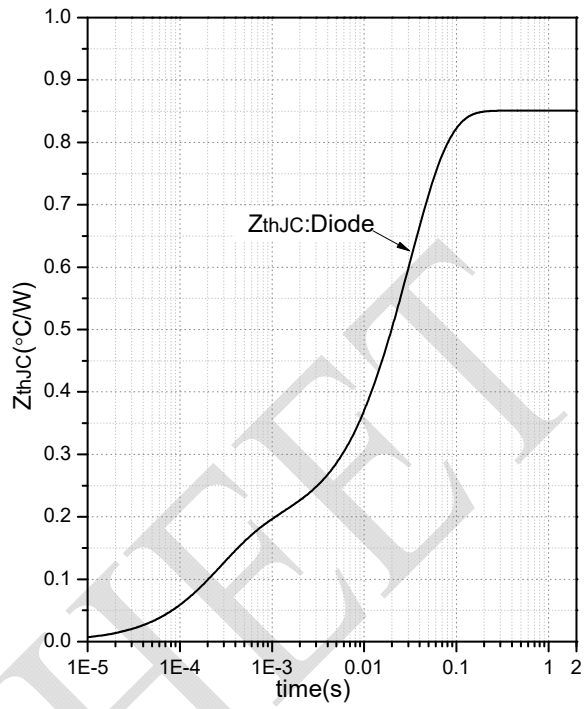


Fig.10 Transient Thermal Impedance (Diode)

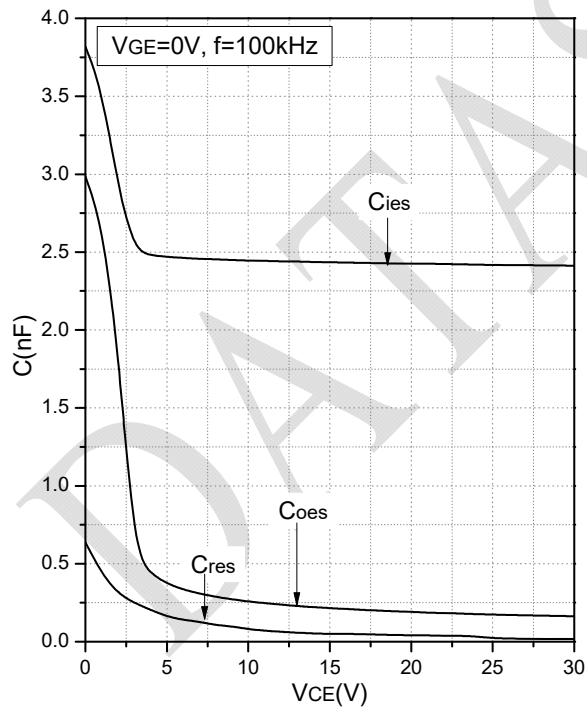


Fig.11 Capacitance Characteristics

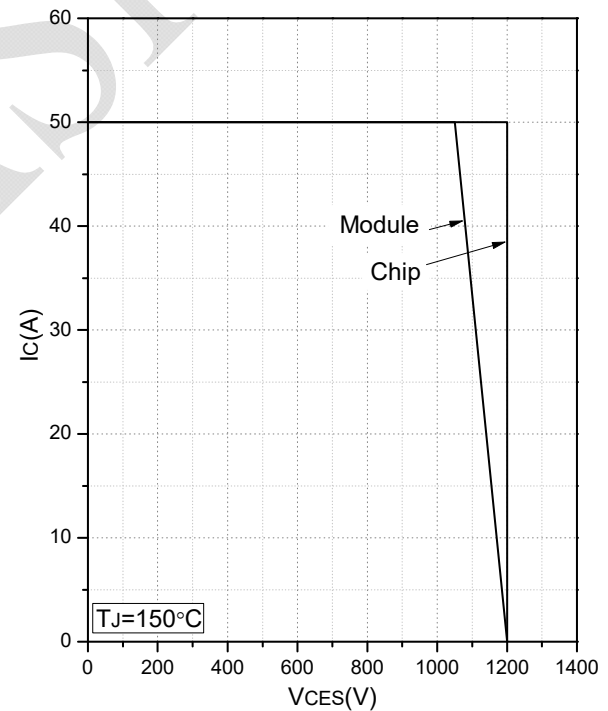


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

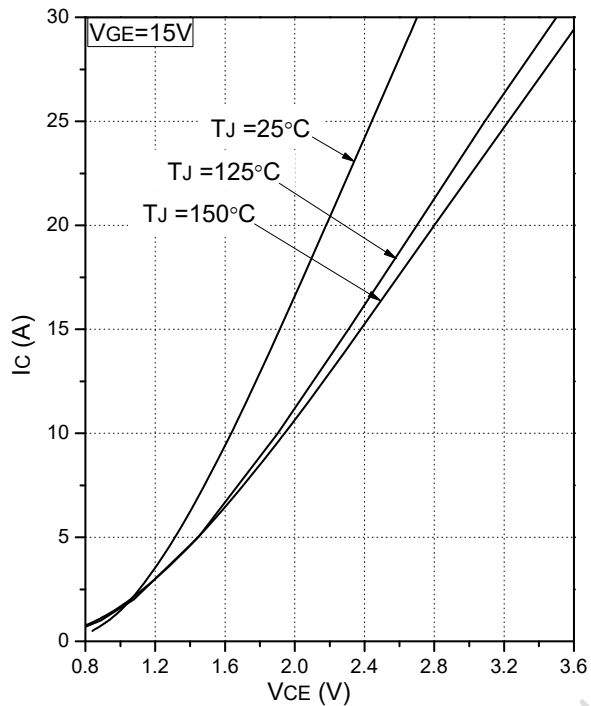


Fig.13 Typical Saturation Voltage Characteristics (Brake-Chopper)

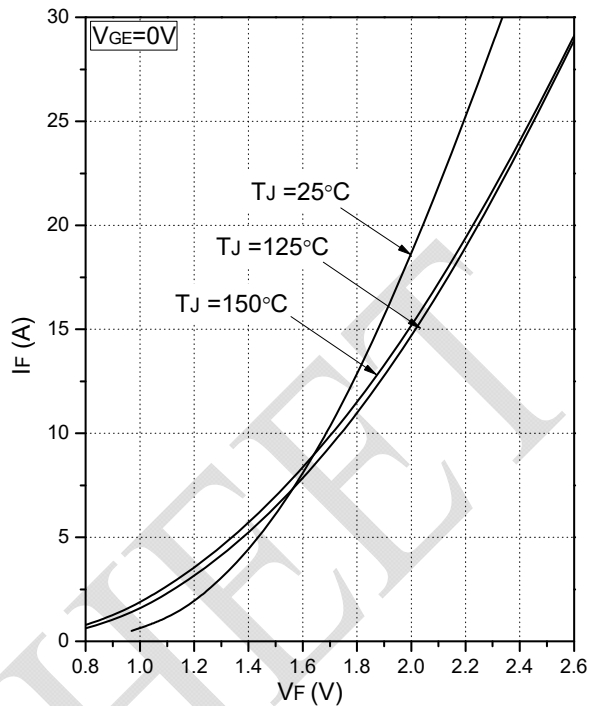


Fig.14 Forward Characteristics of Diode (Brake-Chopper)

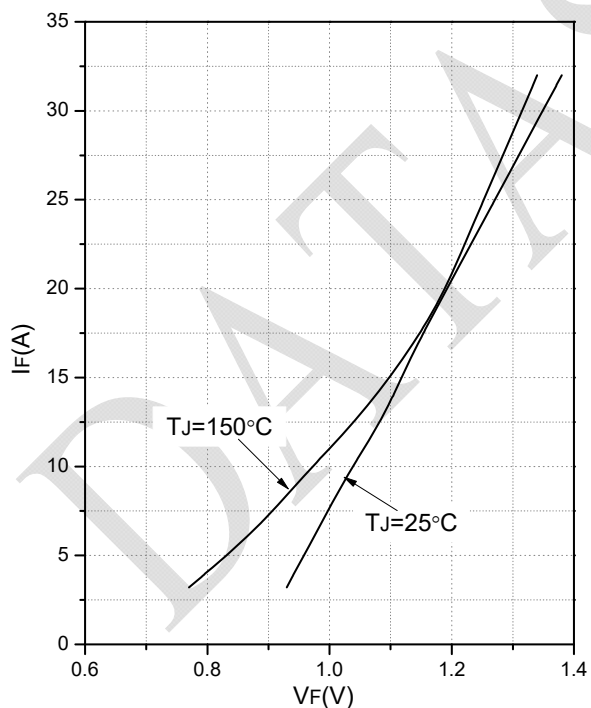


Fig.15 Forward Characteristics of Diode (Rectifier)

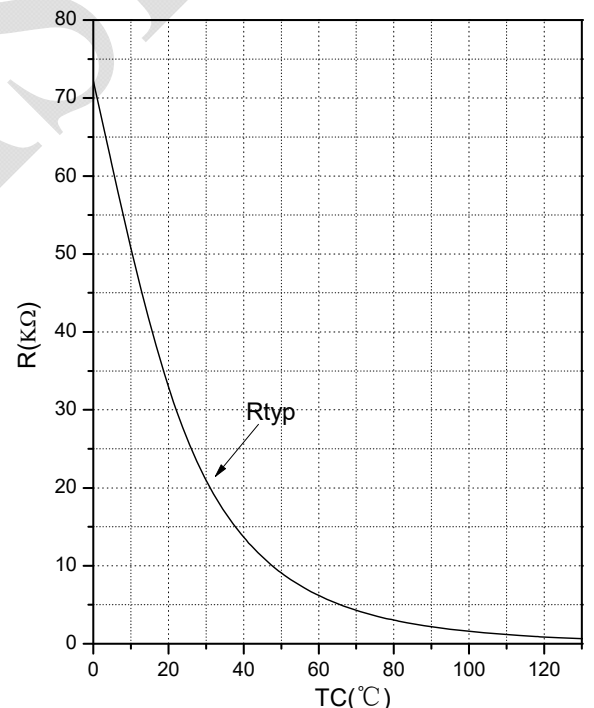
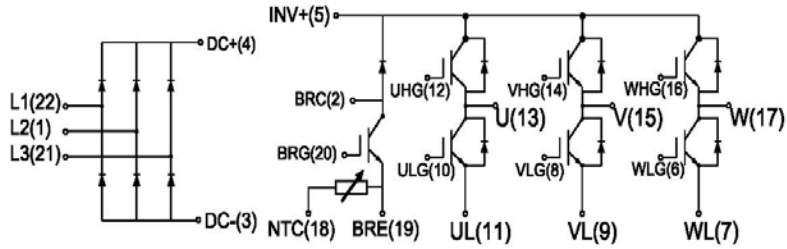


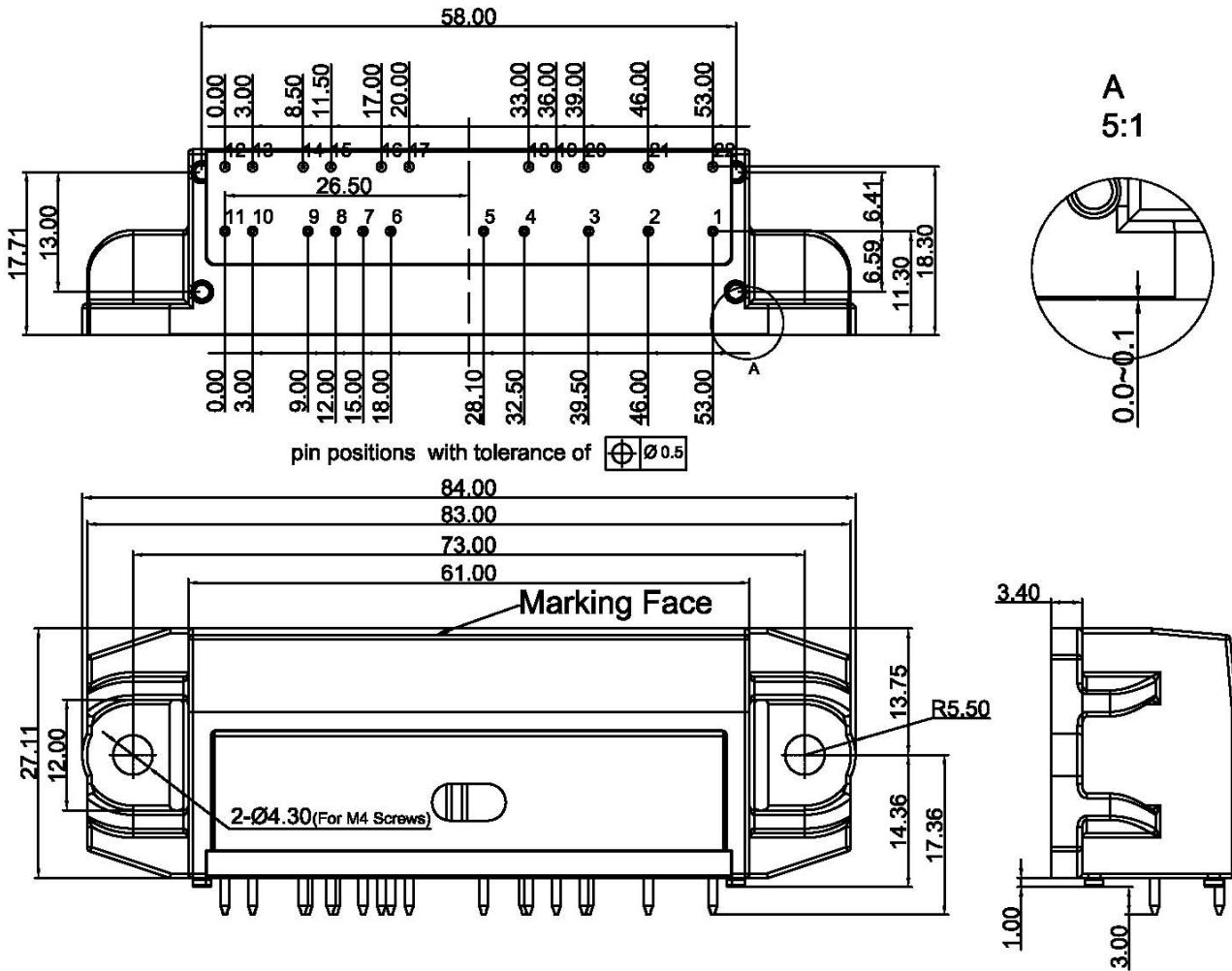
Fig.16 NTC Temperature Characteristics



Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
07/24/2023	01	Initial Release

Announcements

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