

GT15PI120B3H

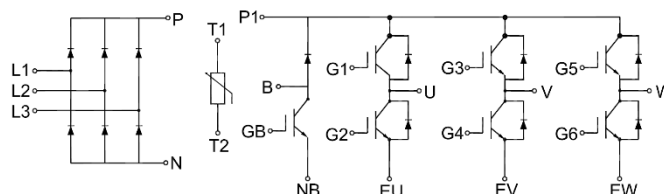
IGBT Module

Preliminary Data

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated $>10\mu\text{s}$
- 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:

- Motor Drives
- Air Conditioning
- Auxiliary Inverters

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	15	A
		T _C =25°C	30	A
I _{CM}	Repetitive Peak Collector Current	t _p =1ms	30	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C, T _{Jmax} =175°C	199	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 =0.5mA, V _{CE} =V _{GE}	5.0	5.8	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =15A, V _{GE} =15V	T _J =25°C	1.80	2.20	V
			T _J =125°C	2.15		V
			T _J =150°C	2.25		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			200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz		1.02		nF
C _{oes}	Output Capacitance			0.11		nF
C _{res}	Reverse Transfer Capacitance			0.02		nF

Switching Characteristics

Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		84		ns
			$T_J=125^{\circ}C$		92		
			$T_J=150^{\circ}C$		96		
t_r	Rise Time		$T_J=25^{\circ}C$		68		ns
			$T_J=125^{\circ}C$		78		
			$T_J=150^{\circ}C$		86		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=15A,$ $R_{Goff}=36\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		158		ns
			$T_J=125^{\circ}C$		168		
			$T_J=150^{\circ}C$		190		
t_f	Fall Time		$T_J=25^{\circ}C$		158		ns
			$T_J=125^{\circ}C$		214		
			$T_J=150^{\circ}C$		271		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=15A,$ $R_{Gon}=36\Omega, V_{GE}=\pm 15V,$ $di/dt=166A/\mu s(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		2.13		mJ
			$T_J=125^{\circ}C$		2.49		
			$T_J=150^{\circ}C$		2.62		



E_{off}	Turn-off Switching Loss	$V_{CC}=600V$, $I_C=15A$, $R_{Goff}=36\Omega$, $V_{GE}=\pm 15V$, $du/dt=4130V/\mu s$ ($T_J=150^\circ C$), Inductive Load	$T_J=25^\circ C$		1.28		mJ
			$T_J=125^\circ C$		1.49		
			$T_J=150^\circ C$		1.53		
Q_g	Total Gate Charge	$V_{GE}=\pm 15V \dots -15V$	$T_J=25^\circ C$		2782		nC
$R_{G(int)}$	Internal Gate Resistance				0		Ω
I_{SC}	$V_{CC}=600V$, $V_{GE}=\pm 15V$, $t_p=10\mu s$, $T_J=25^\circ C$				55		A
$R_{\theta JC}$	Thermal Resistance: Junction-to-Case (per IGBT)					0.75	$^\circ C/W$

Diode, Inverter

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	$T_C=100^\circ C$	15	A
I_{FM}	Diode Maximum Forward Current	$t_p=1ms$	30	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =15A	T _J =25℃		1.70		V
			T _J =125℃		1.80		
			T _J =150℃		1.80		
t _{rr}	Reverse Recovery Time	I _F =15A, -diF/dt=130A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		306		ns
			T _J =125℃		538		
			T _J =150℃		602		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		10.9		A
			T _J =125℃		11.8		
			T _J =150℃		12.1		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		2.1		μC
			T _J =125℃		3.3		
			T _J =150℃		3.6		



E _{rec}	Reverse Recovery Energy	I _F =15A, -diF/dt=130A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		0.54		mJ
			T _J =125℃		1.02		
			T _J =150℃		1.03		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					1.36	℃/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	$T_C=100^\circ C$	15	A
		$T_C=25^\circ C$	30	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1ms$	30	A
P_D	Maximum Power Dissipation per IGBT	$T_C=25^\circ C$, $T_{Jmax}=175^\circ C$	199	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	$I_C=0.5mA$, $V_{CE}=V_{GE}$		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15A$, $V_{GE}=15V$	$T_J=25^\circ C$		1.80	2.20	V
			$T_J=125^\circ C$		2.15		V
			$T_J=150^\circ C$		2.25		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V$, $V_{CE}=V_{CES}$, $T_J=25^\circ C$				1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20V$, $V_{CE}=0V$, $T_J=25^\circ C$				200	nA
C_{ies}	Input Capacitance	$V_{CE}=25V$, $V_{GE}=0V$, $f=100kHz$			1.02		nF
C_{oes}	Output Capacitance				0.11		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} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		84		ns	
			T _J =125℃		92			
			T _J =150℃		96			
t _r	Rise Time		T _J =25℃		68		ns	
			T _J =125℃		78			
			T _J =150℃		86			
t _{d(off)}	Turn-off Delay Time		V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		158		ns
				T _J =125℃		168		
				T _J =150℃		190		
t _f	Fall Time	T _J =25℃			158		ns	
		T _J =125℃			214			
		T _J =150℃			271			
E _{on}	Turn-on Switching Loss	T _J =25℃			2.13		mJ	
		T _J =125℃			2.49			
		T _J =150℃			2.62			
E _{off}	Turn-off Switching Loss	T _J =25℃		1.28		mJ		
		T _J =125℃		1.49				
		T _J =150℃		1.53				
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		2782		nC	
R _{G(int)}	Internal Gate Resistance				0		Ω	
I _{SC}	V _{CC} =600V, V _{GE} =±15V, t _p =10μs, T _J =25℃				55		A	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.75	℃/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	$T_C=100^\circ C$	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.	Units
V _{FM}	Forward Voltage	I _F =10A	T _J =25°C		1.70		V
			T _J =125°C		1.80		
			T _J =150°C		1.75		
t _{rr}	Reverse Recovery Time	I _F =10A, -diF/dt=176A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		217		ns
			T _J =125°C		241		
			T _J =150°C		256		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		7.4		A
			T _J =125°C		8.4		
			T _J =150°C		8.8		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.7		μC
			T _J =125°C		0.8		
			T _J =150°C		0.9		
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.17		mJ
			T _J =125°C		0.35		
			T _J =150°C		0.48		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case(per Diode)					1.71	°C/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	$T_C=80^\circ\text{C}$	20	A
I_{RMSM}	Maximum RMS Current at Rectifier Output	$T_C=80^\circ\text{C}$	30	A
I_{FSM}	Surge Current @ $t_p=10\text{ms}$	$T_J=25^\circ\text{C}$	300	A
		$T_J=150^\circ\text{C}$	245	
I^2t	I^2t - value	$T_J=25^\circ\text{C}$	450	A^2s
		$T_J=150^\circ\text{C}$	300	



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_F	Forward Voltage	$I_F=15\text{A}$	$T_J=25^{\circ}\text{C}$		1.15		V
			$T_J=125^{\circ}\text{C}$		1.10		
I_R	Reverse Current	$V_R=1600\text{V}$	$T_J=25^{\circ}\text{C}$			1	mA
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.94	$^{\circ}\text{C/W}$

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	$T_C=25^{\circ}\text{C}$		5		k Ω
$\Delta R/R$	$T_C=100^{\circ}\text{C}$, $R_{100}=465\Omega$	-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

Module

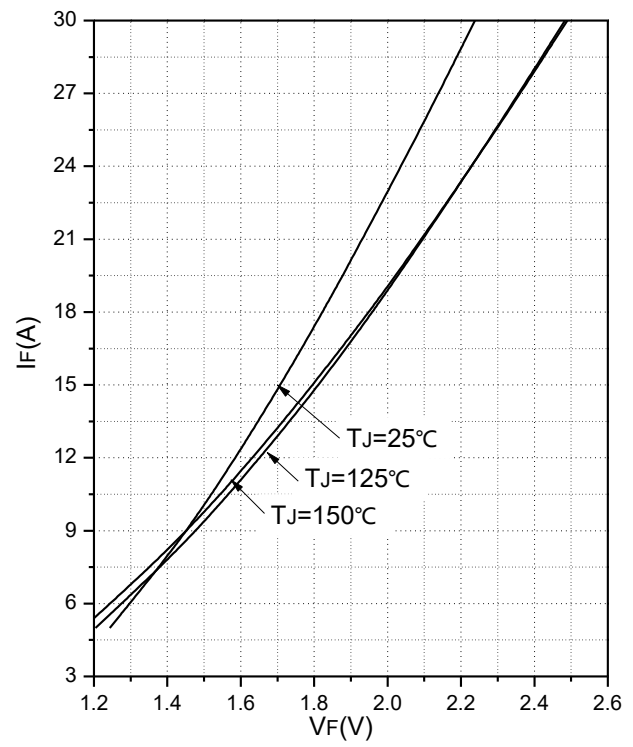
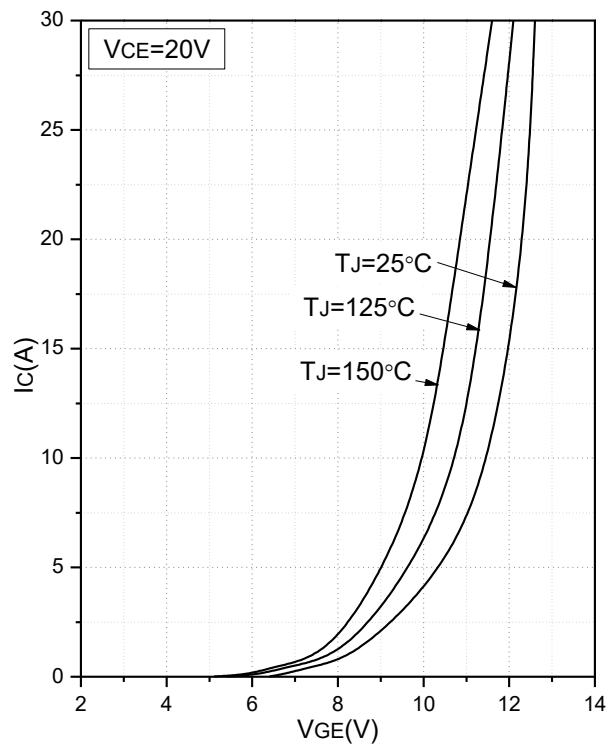
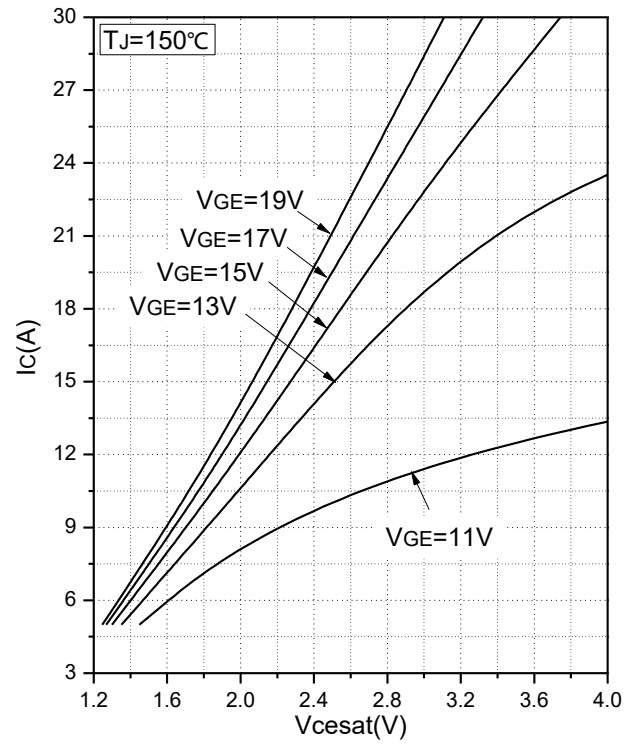
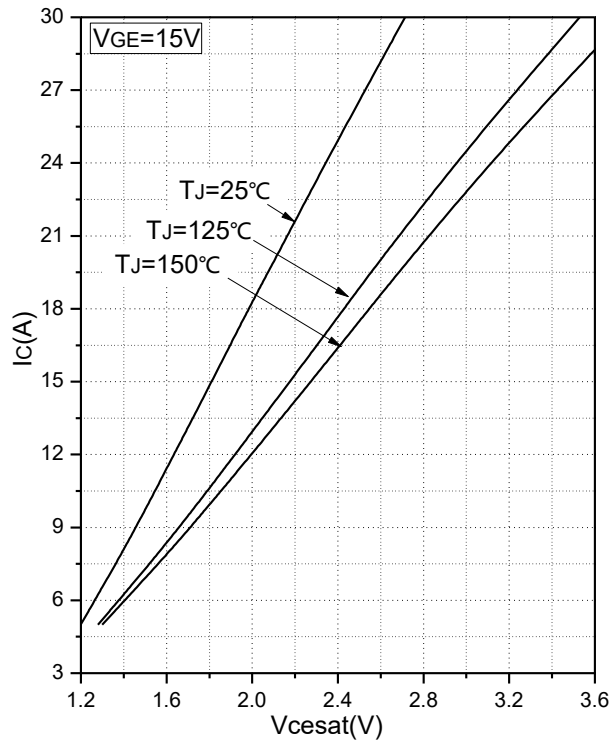
Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
T_J	Maximum Junction Temperature				175	$^{\circ}\text{C}$
T_{JOP}	Maximum Operating Junction Temperature Range		-40		+150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature		-40		+125	$^{\circ}\text{C}$
CTI	Comparative Tracking Index		200			
$R_{\theta CS}$	Case-to-Sink Thermally (Conductive Grease Applied)				0.08	$^{\circ}\text{C/W}$
T	Mounting Screw:M4		1.5		1.8	N·m
G	Weight			23		g



Ordering Information Table

Device code	G	T	15	PI	120	B3	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (15=15A)
- ④ - Circuit Configuration (Power Integrated)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



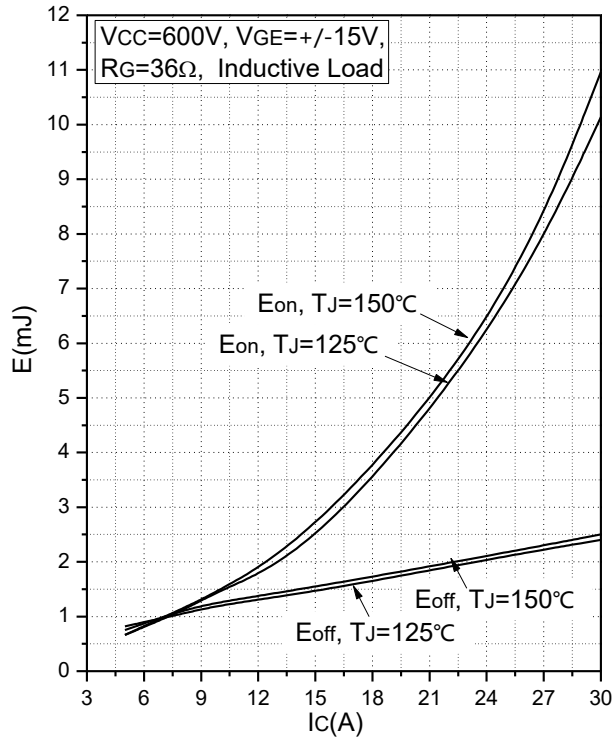


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

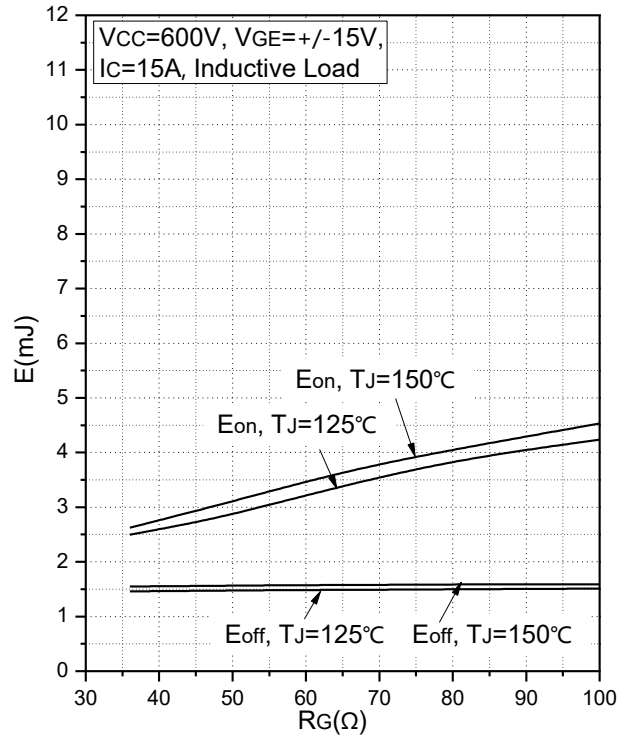


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

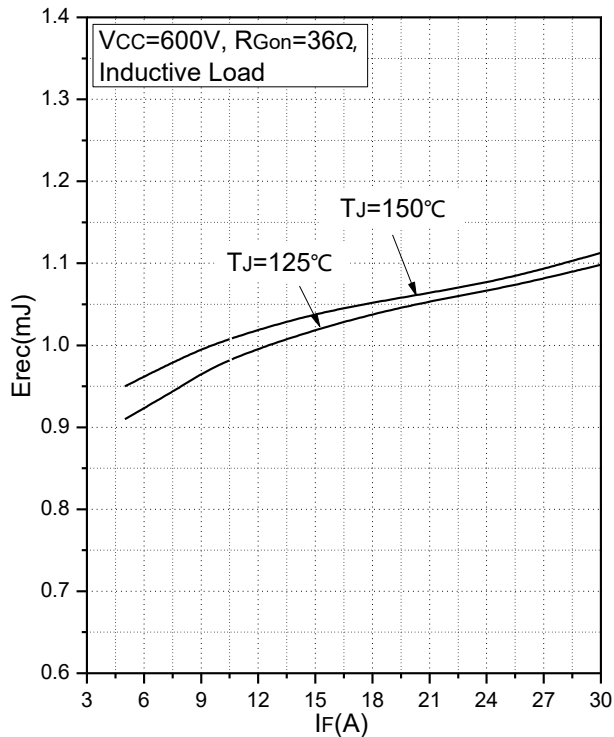


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

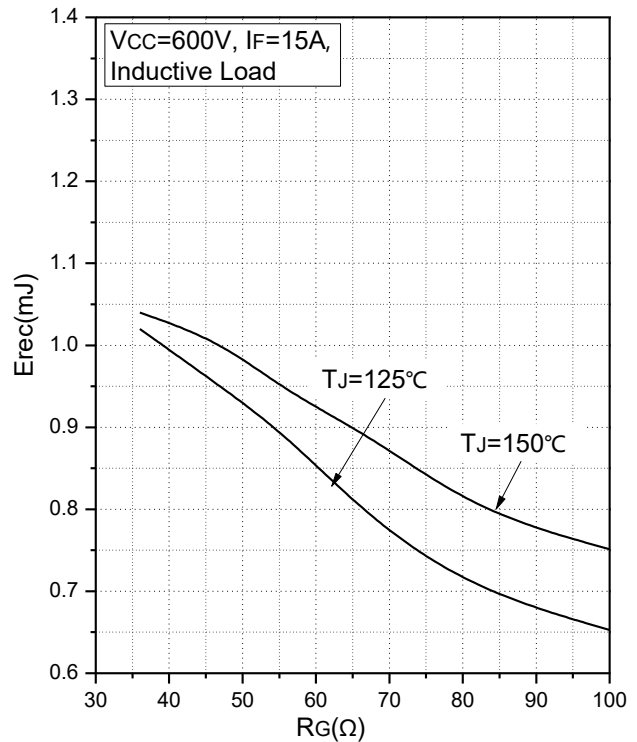


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

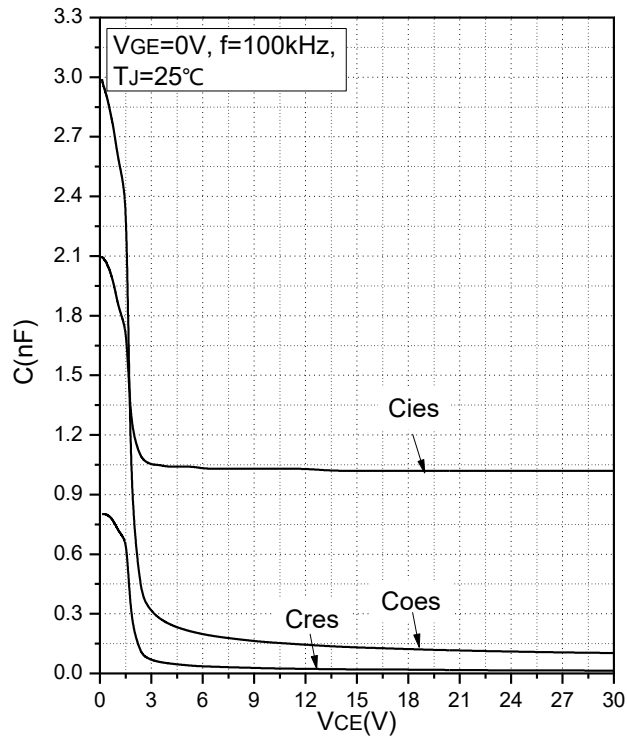


Fig.9 Capacitance Characteristics (Inverter)

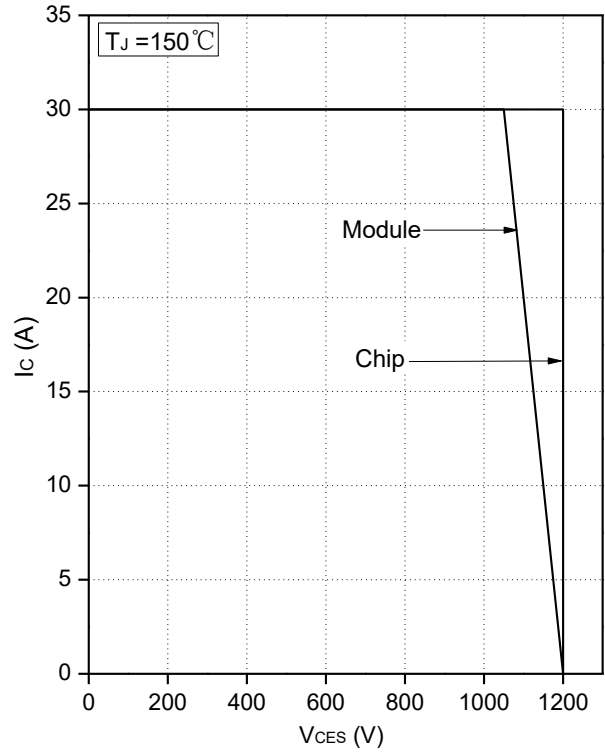


Fig.10 Reverse Bias Safe Operation Area (Inverter)

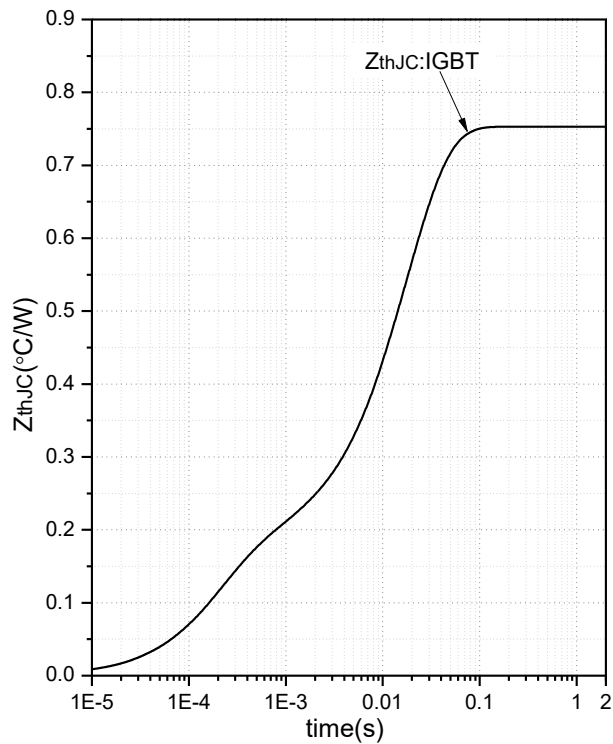


Fig.11 Transient Thermal Impedance IGBT (Inverter)

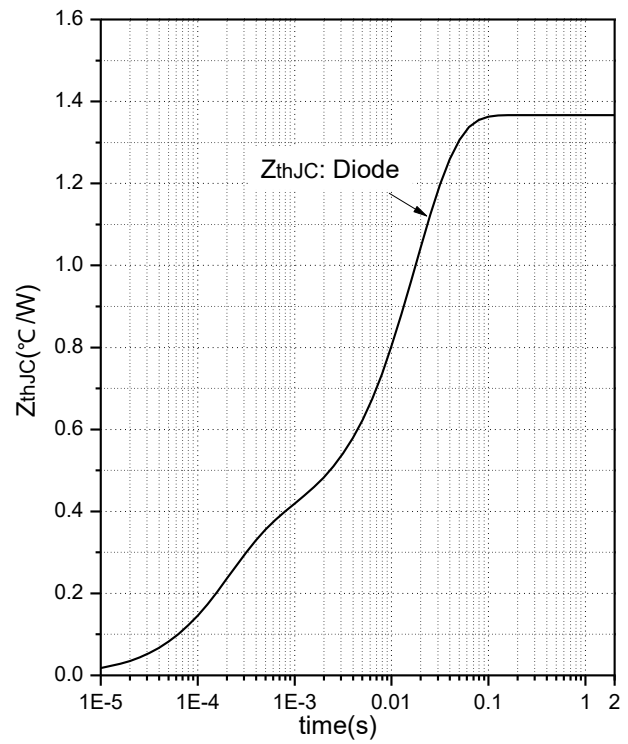


Fig.12 Transient Thermal Impedance Diode (Inverter)

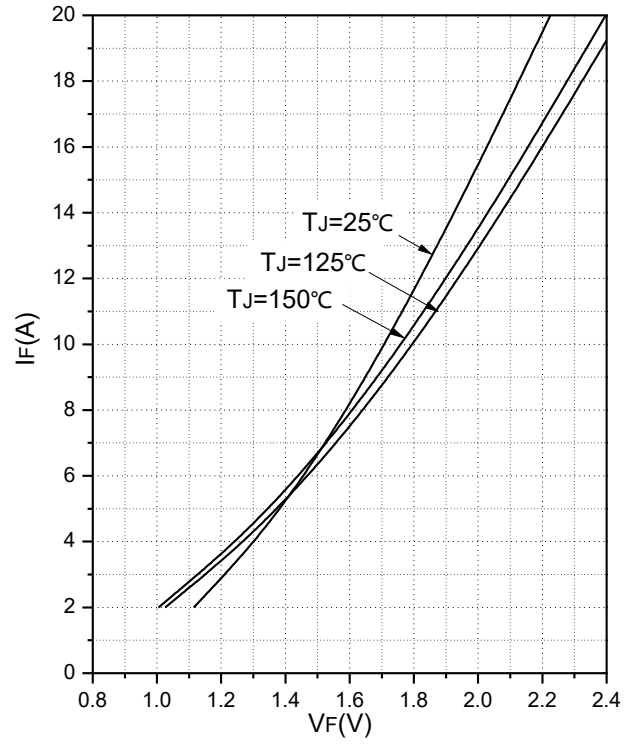
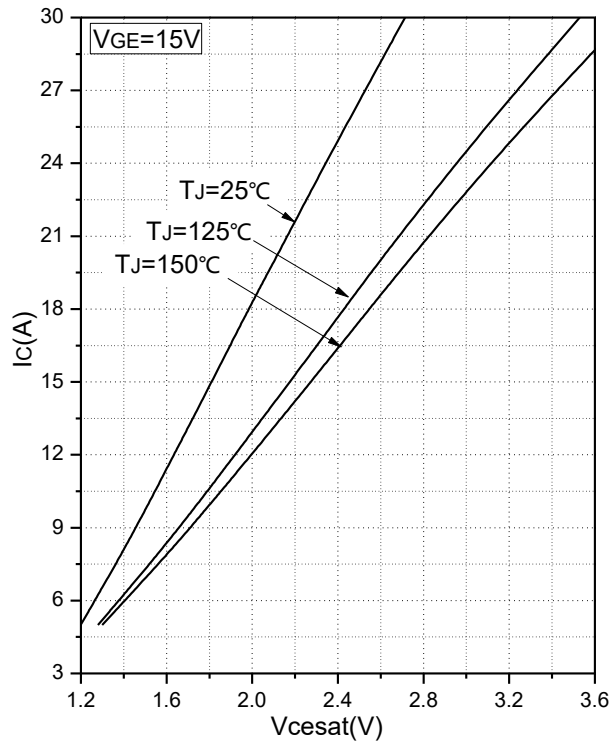


Fig.13 Typical Saturation Voltage Characteristics (Brake-Chopper) Fig.14 Forward Characteristics of Diode (Brake-Chopper)

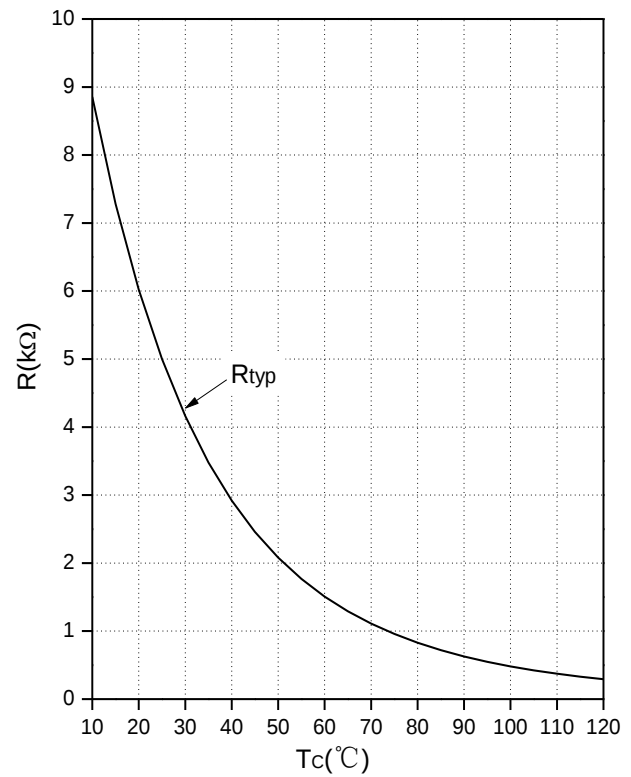
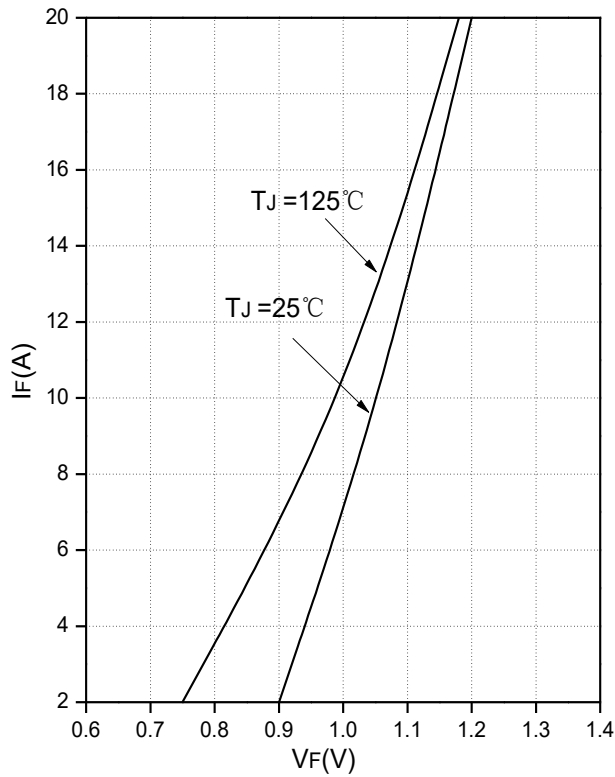


Fig.15 Forward Characteristics of Diode (Rectifier)

Fig.16 NTC Temperature Characteristics



Revision	Notes
01	Initial Release

Announcement

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The datasheet with “REV.” + “Arabic numerals” is based on engineering data for initial reference purpose only.

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