



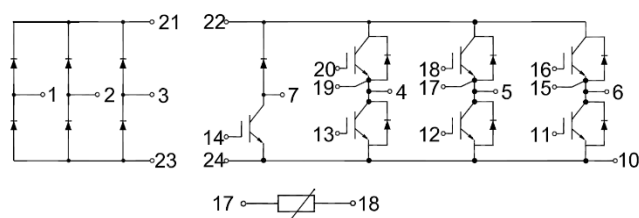
GT15PI120T5H

IGBT Module

Preliminary Data

Features:

- Trench & Field Stop 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



Applications:

- Industrial Inverters
- Servo Applications
- Motor Drives

IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^\circ\text{C}$	15	A
		$T_C=25^\circ\text{C}$	30	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	30	A
P_D	Maximum Power Dissipation per IGBT	$T_C=25^\circ\text{C}$, $T_{Jmax}=175^\circ\text{C}$	170	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	$I_C=0.5\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.80	2.10	V
			$T_J=125^{\circ}\text{C}$	2.15		V
			$T_J=150^{\circ}\text{C}$	2.25		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	$V_{GE}=20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^{\circ}\text{C}$			200	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		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	V _{CC} =600V, I _C =15A, R _{Gon} =36Ω, V _{GE} =±15V, di/dt=166A/μs(T _J =150℃), Inductive Load	T _J =25℃		2.13		mJ
			T _J =125℃		2.49		
			T _J =150℃		2.62		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =15A, R _{Goff} =36Ω, V _{GE} =±15V, du/dt=4130V/μs(T _J =150°C), Inductive Load	T _J =25°C		1.28		mJ
			T _J =125°C		1.49		
			T _J =150°C		1.53		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		350		nC
R _{G(int)}	Internal Gate Resistance				0		Ω
I _{SC}	V _{CC} =600V, V _{GE} =±15V, t _p =10μs, T _J =25°C				55		A
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.87	°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	T _C =100°C	15	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	30	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 =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°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		0.54		mJ
			T _J =125°C		1.02		
			T _J =150°C		1.03		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					1.54	°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	10	A
		T _C =25°C	20	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	20	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =175°C	135	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 =0.35mA, V _{CE} =V _{GE} , T _J =25°C		5.0	5.6	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =10A, V _{GE} =15V	T _J =25°C		1.85	2.25	V
			T _J =125°C		2.20		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, T _J =25°C			684		pF
C _{oes}	Output Capacitance				80		
C _{res}	Reverse Transfer Capacitance				9		



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =10A, R _{Gon} =68Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		72		ns	
			T _J =125℃		77			
			T _J =150℃		80			
t _r	Rise Time		T _J =25℃		62		ns	
			T _J =125℃		63			
			T _J =150℃		67			
t _{d(off)}	Turn-off Delay Time		V _{CC} =600V, I _C =10A, R _{Goff} =68Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		195		ns
				T _J =125℃		197		
				T _J =150℃		197		
t _f	Fall Time	T _J =25℃			435		ns	
		T _J =125℃			441			
		T _J =150℃			452			
E _{on}	Turn-on Switching Loss	T _J =25℃			2.73		mJ	
		T _J =125℃			2.86			
		T _J =150℃			3.06			
E _{off}	Turn-off Switching Loss	T _J =25℃		0.32		mJ		
		T _J =125℃		0.39				
		T _J =150℃		0.41				
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		322		nC	
R _{G(int)}	Internal Gate Resistance				0		Ω	
I _{SC}	V _{CC} =600V, V _{GE} =±15V, t=10μs, T _J =150℃				37		A	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					1.09	℃/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}	Repetitive Peak 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=194A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		240		ns
			T _J =125°C		253		
			T _J =150°C		258		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		9.8		A
			T _J =125°C		10.9		
			T _J =150°C		11.5		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		0.7		μC
			T _J =125°C		0.7		
			T _J =150°C		0.8		
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.17		mJ
			T _J =125°C		0.23		
			T _J =150°C		0.41		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					1.91	°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
		$T_J=125^\circ\text{C}$	245	
I^2t	I^2t - value	$T_J=25^\circ\text{C}$	450	A^2s
		$T_J=125^\circ\text{C}$	300	



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =15A	T _J =25°C		1.15		V
			T _J =125°C		1.10		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					1.07	°C/W

Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R ₂₅	T _C =25°C		5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =465Ω	-5		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

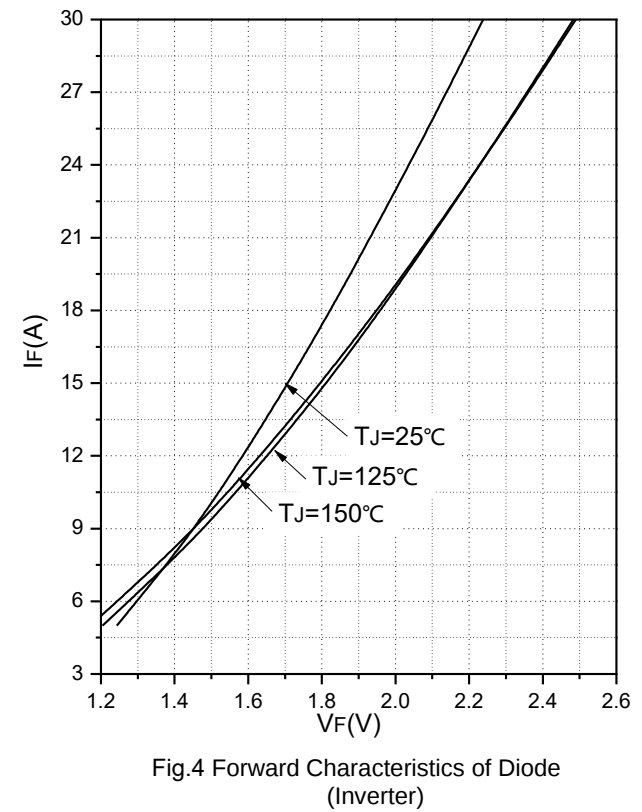
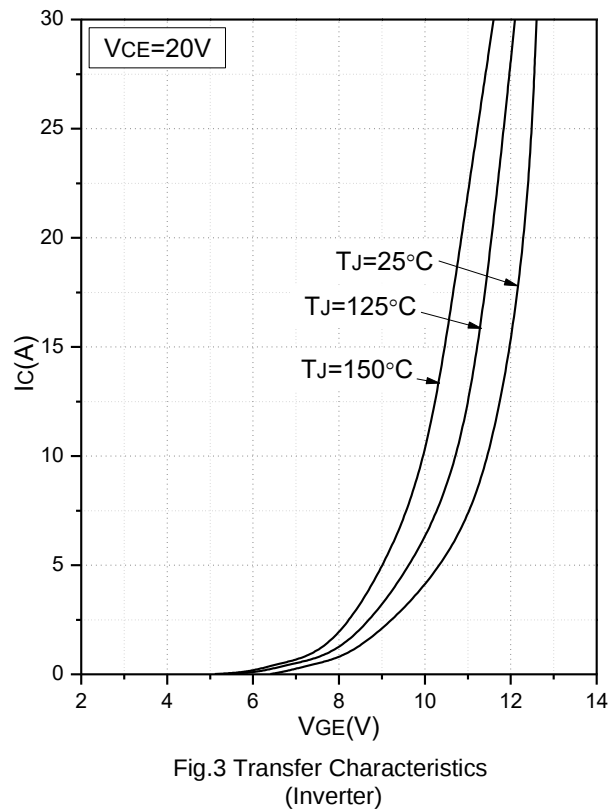
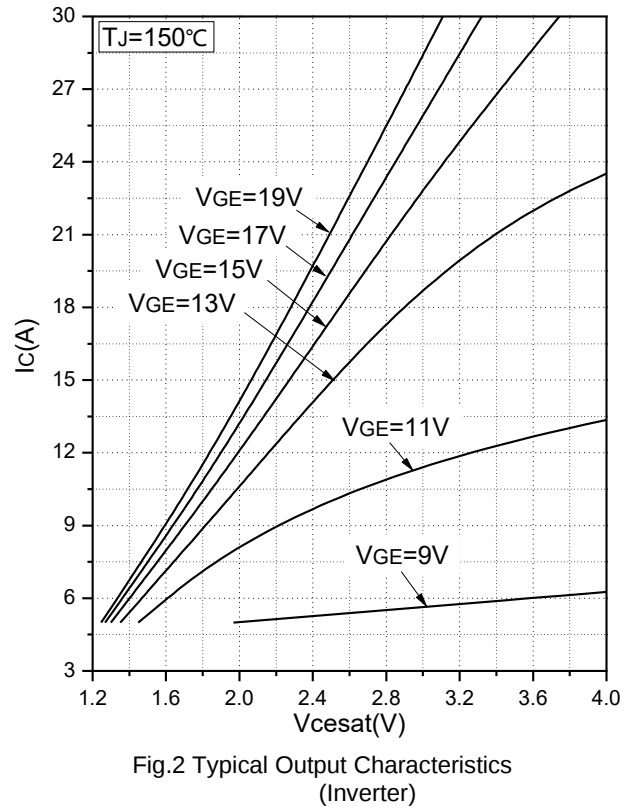
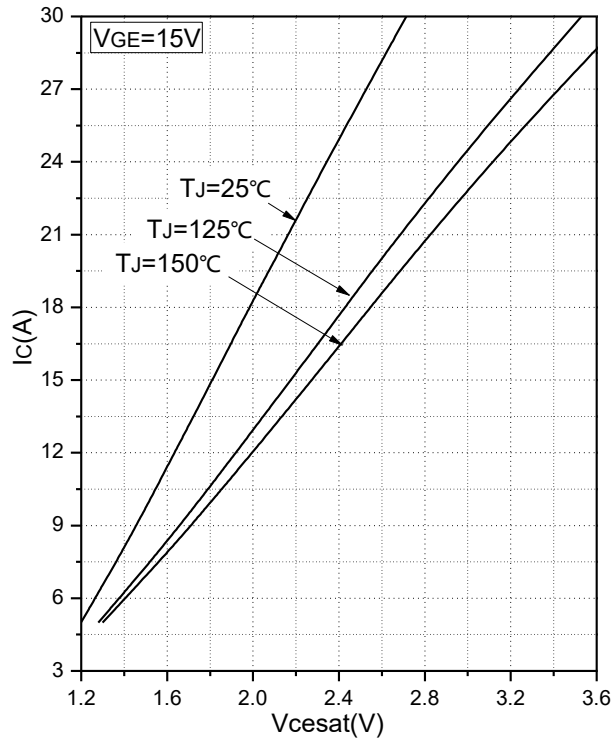
Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)				0.04	°C/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			190		g



Ordering Information Table

Device code	G	T	15	PI	120	T5	H
	①	②	③	④	⑤	⑥	⑦

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



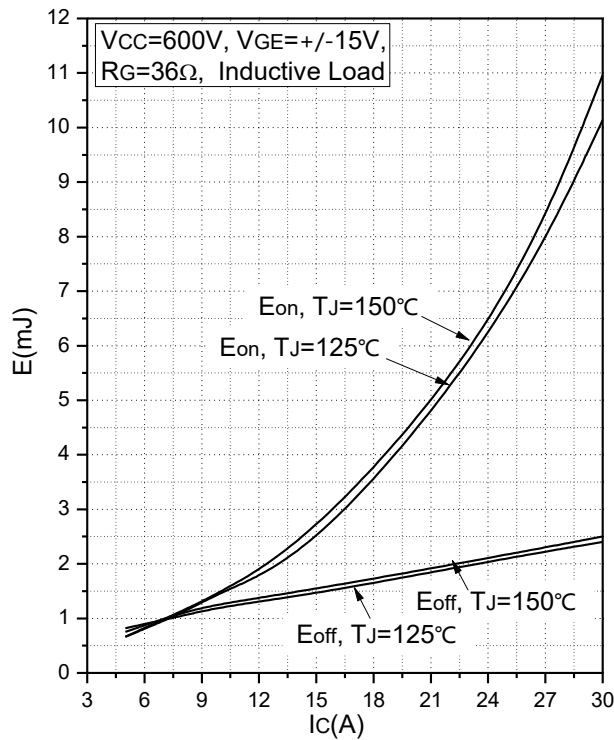


Fig.5 Typical Switching Loss vs. Collector Current (Inverter)

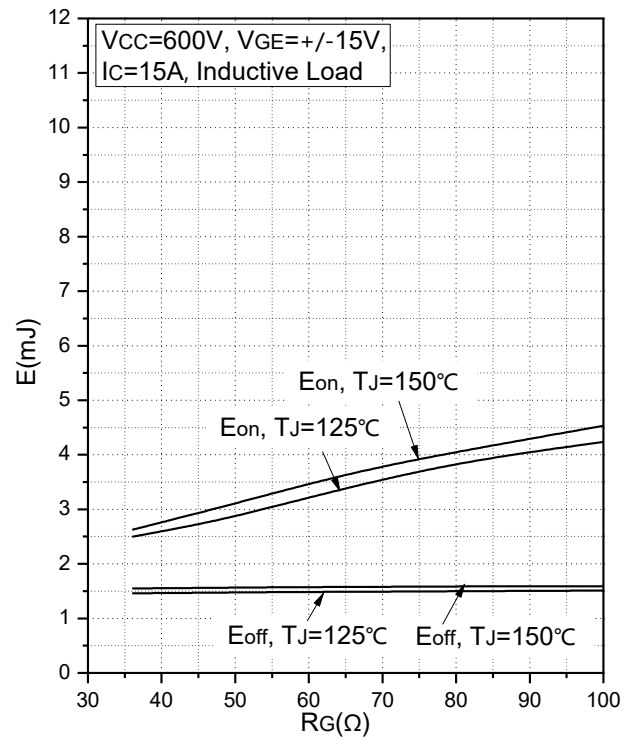


Fig.6 Typical Switching Loss vs. Gate Resistance (Inverter)

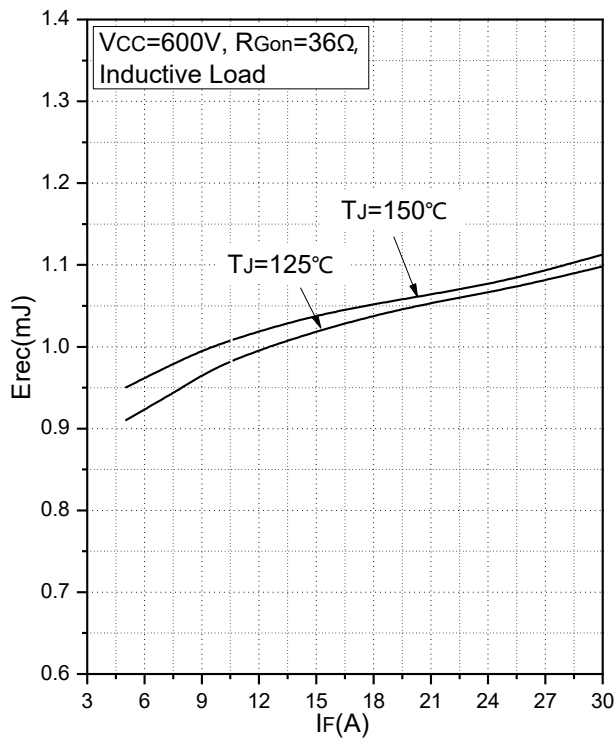


Fig.7 Typical Switching Loss vs. Forward Current (Inverter)

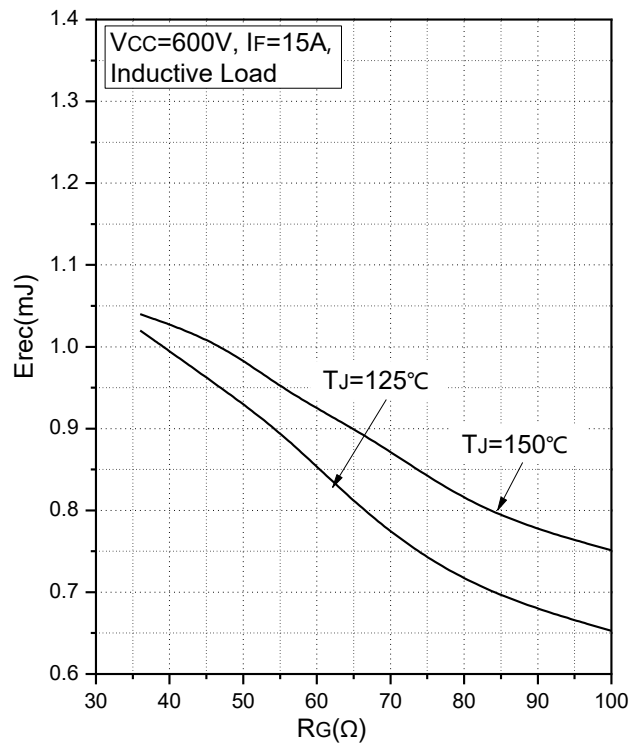


Fig.8 Typical Switching Loss vs. Gate Resistance (Inverter)

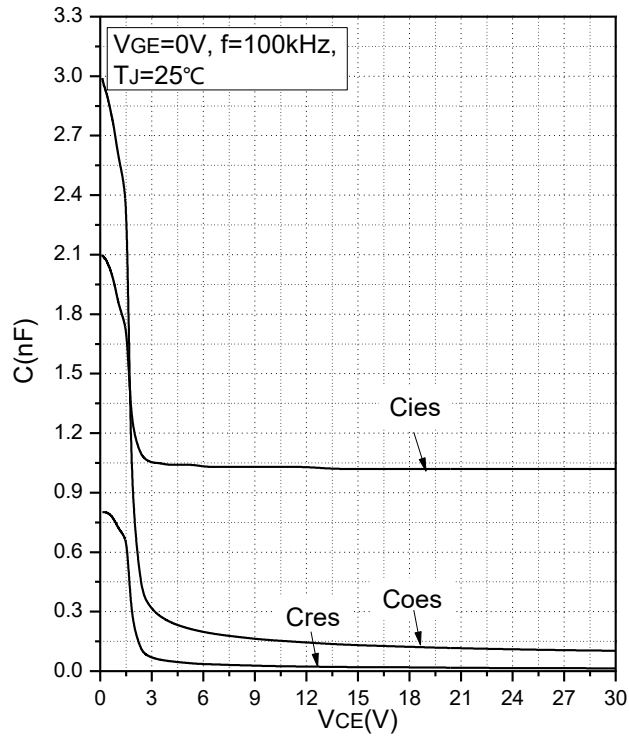


Fig.9 Capacitance Characteristics

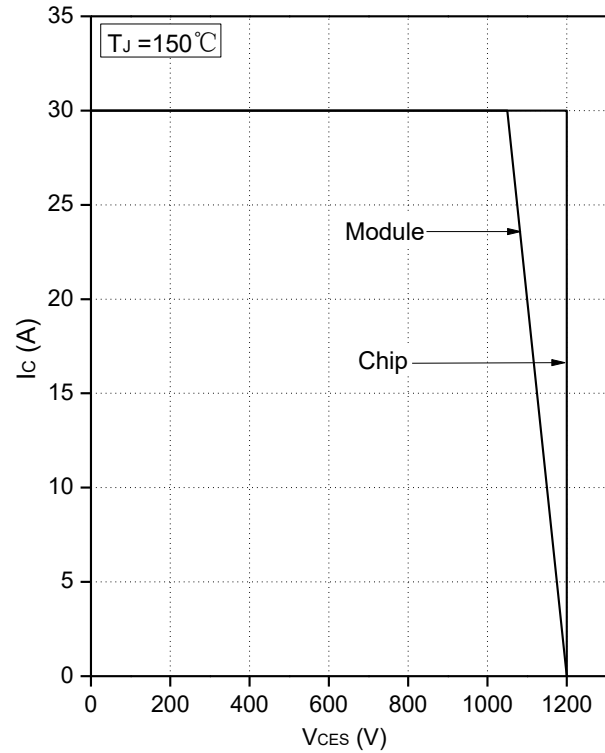


Fig.10 Reverse Bias Safe Operation Area (RBSOA)

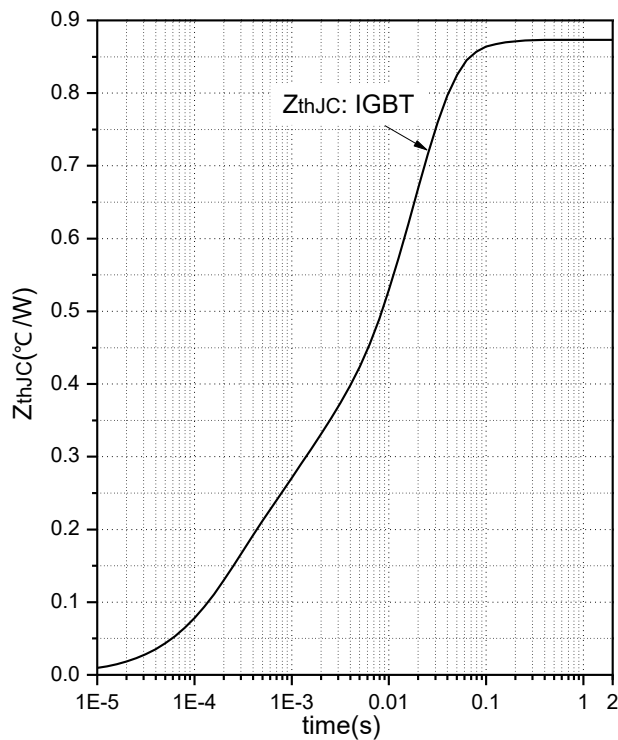


Fig.11 Transient Thermal Impedance (Inverter-IGBT)

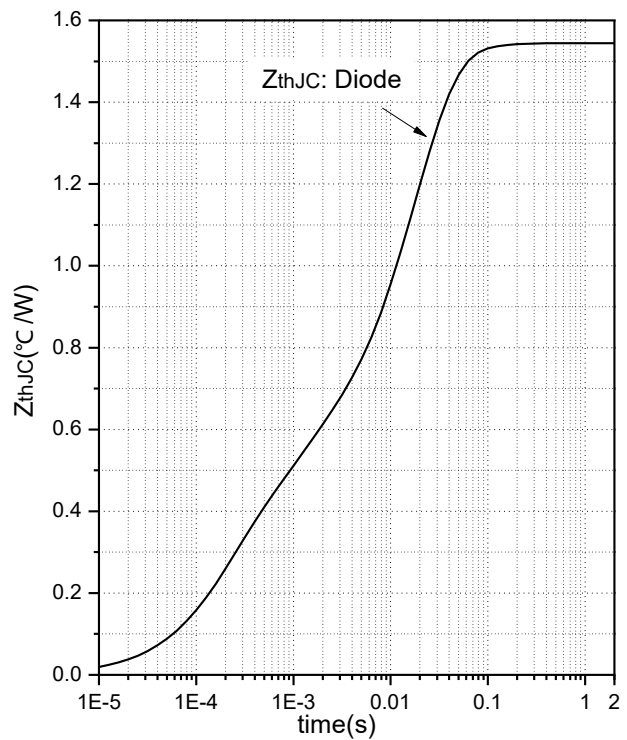
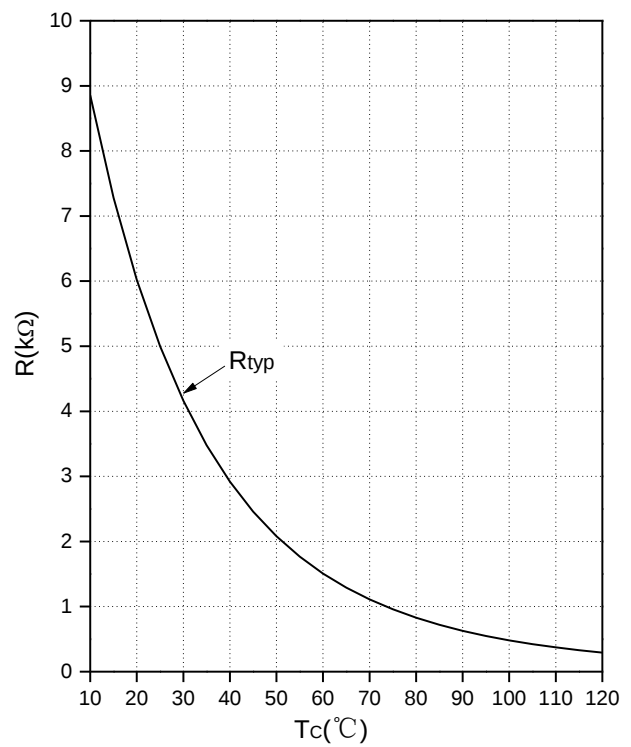
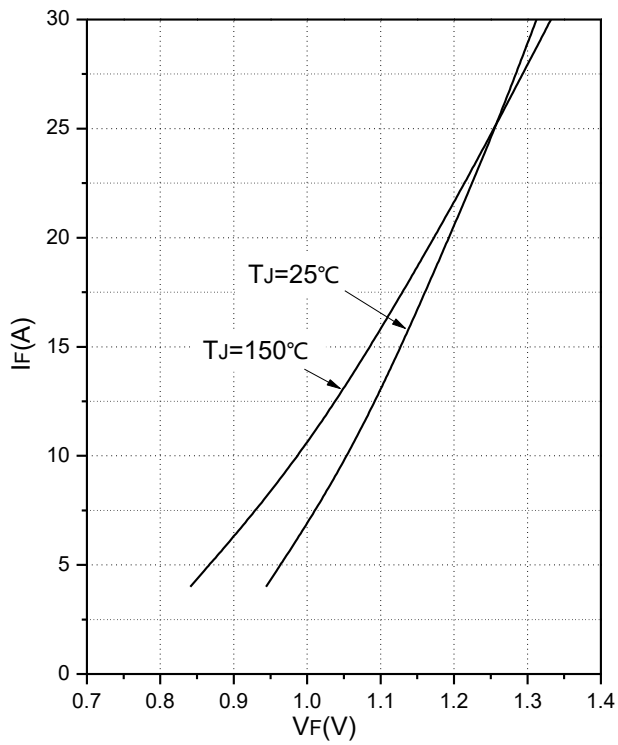
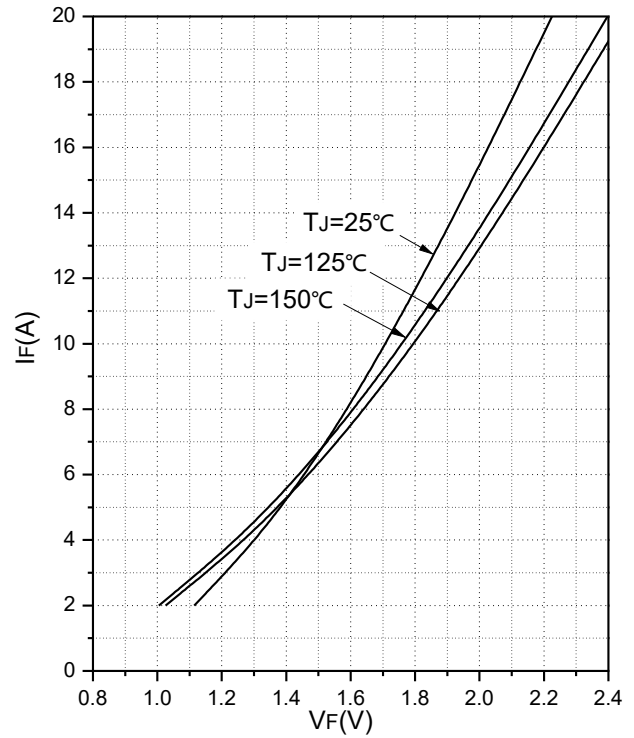
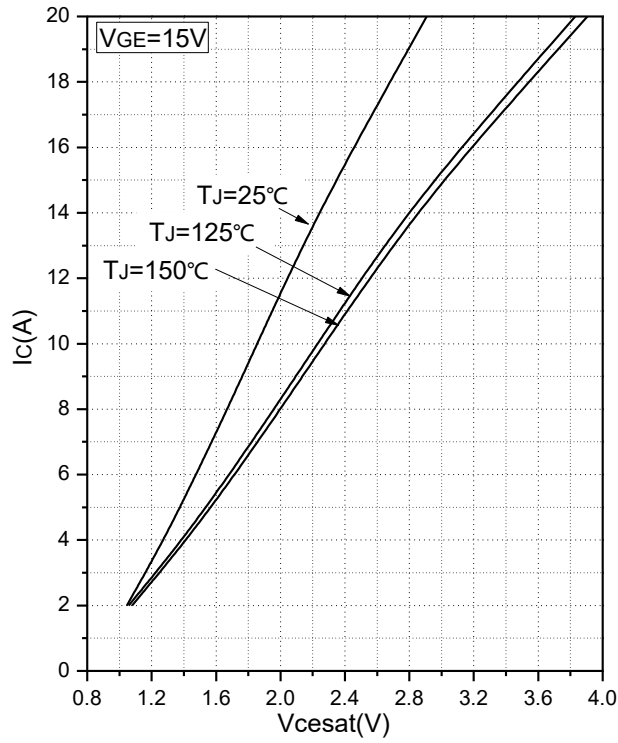


Fig.12 Transient Thermal Impedance (Inverter-Diode)





Revision	Notes
01	Initial Release

Announcement

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