



GT150PI120T6H-T4

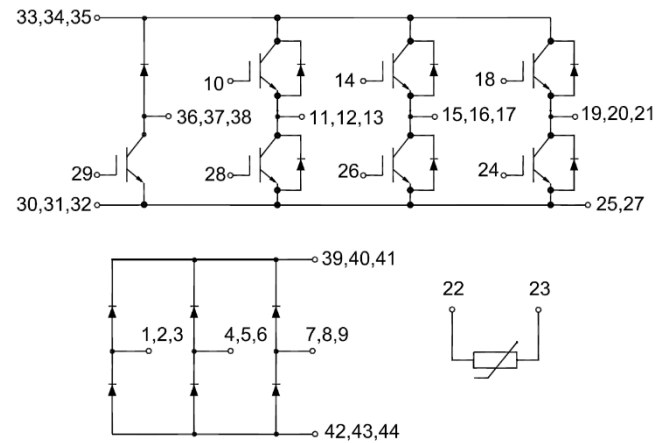
IGBT Module

Preliminary Datasheet

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:

- Industrial Inverters
- Servo Applications

IGBT, Inverter

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

V_{CES}	Collector-Emitter Blocking Voltage		1200	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C=100^\circ\text{C}$	150	A
		$T_C=25^\circ\text{C}$	289	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	300	A
P_D	Maximum Power Dissipation (per IGBT)	$T_C=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	955	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	$I_C=5.3\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=150\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.65	2.00	V
			$T_J=125^{\circ}\text{C}$	1.90		V
			$T_J=150^{\circ}\text{C}$	1.95		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		16.8		nF
C_{oes}	Output Capacitance			0.79		nF
C_{res}	Reverse Transfer Capacitance			0.19		nF

Switching Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =150A, R _{Gon} =6.8Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		153		ns
			T _J =125℃		162		
			T _J =150℃		165		
t _r	Rise Time		T _J =25℃		64		ns
			T _J =125℃		74		
			T _J =150℃		78		
t _{d(off)}	Turn-off Delay Time	T _J =25℃		392		ns	
		T _J =125℃		440			
		T _J =150℃		446			
t _f	Fall Time	T _J =25℃		186		ns	
		T _J =125℃		264			
		T _J =150℃		288			
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =150A, R _{Gon} =6.8Ω, V _{GE} =±15V, di/dt=1655A/μs(T _J =150℃), Inductive Load	T _J =25℃		6.5		mJ
		T _J =125℃		10.1			
		T _J =150℃		10.9			



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =150A, R _{Goff} =6.8Ω, V _{GE} =±15V, du/dt=5316V/μs(T _J =150°C), Inductive Load	T _J =25°C		13.2		mJ
			T _J =125°C		17.3		
			T _J =150°C		18.2		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2860		nC
R _{g internal}	Internal Gate Resistor				3.0		Ω
I _{SC}	V _{CC} =600V, V _{GE} =+/-15V, t _p =10μs, T _J =150°C				880		A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.16	°C/W

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		150	A
I _{FM}	Peak FWD Current Repetitive	t _p =1ms	300	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 =150A	T _J =25°C		1.85		V
			T _J =125°C		2.00		
			T _J =150°C		2.05		
t _{rr}	Reverse Recovery Time	I _F =150A, -diF/dt=2085A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		160		ns
			T _J =125°C		290		
			T _J =150°C		322		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		130		A
			T _J =125°C		131		
			T _J =150°C		135		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		12.4		μC
			T _J =125°C		20.3		
			T _J =150°C		22.8		



E _{rec}	Reverse Recovery Energy	I _F =150A, -diF/dt=2085A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		4.6		mJ
			T _J =125°C		7.0		
			T _J =150°C		7.4		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.33	°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	100	A
		T _C =25°C	200	A
I _{CM}	Repetitive Peak Collector Current	tp=1ms	200	A
P _D	Maximum Power Dissipation per IGBT	T _C =25°C T _{Jmax} =175°C	710	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 =2.4mA, V _{CE} =V _{GE}		5.0	5.7	6.6	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =100A, V _{GE} =15V	T _J =25℃		1.65	2.00	V
			T _J =125℃		2.00		V
			T _J =150℃		2.10		V
I _{CES}	Collector-Emitter Leakage Current	V _{GE} =0V, V _{CE} =V _{CES} , T _J =25℃				1	mA
I _{GES}	Gate-Emitter Leakage Current	V _{GE} =20V, V _{CE} =0V, T _J =25℃				200	nA
C _{ies}	Input Capacitance	V _{CE} =25V, V _{GE} =0V, f=100kHz			11.46		nF
C _{oes}	Output Capacitance				1.52		nF
C _{res}	Reveres Transfer Capacitance				0.74		nF



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =100A, R _{Gon} =10Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		164		ns	
			T _J =125℃		168			
			T _J =150℃		172			
t _r	Rise Time		T _J =25℃		54		ns	
			T _J =125℃		62			
			T _J =150℃		66			
t _{d(off)}	Turn-off Delay Time		V _{CC} =600V, I _C =100A, R _{Goff} =10Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		354		ns
				T _J =125℃		394		
				T _J =150℃		404		
t _f	Fall Time	T _J =25℃			164		ns	
		T _J =125℃			228			
		T _J =150℃			250			
E _{on}	Turn-on Switching Loss	T _J =25℃			7.0		mJ	
		T _J =125℃			10.3			
		T _J =150℃			11.2			
E _{off}	Turn-off Switching Loss	T _J =25℃		8.1		mJ		
		T _J =125℃		10.5				
		T _J =150℃		11.2				
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25℃		2858		nC	
R _{g internal}	Internal Gate Resistor		T _J =25℃		5.0		Ω	
I _{SC}	V _{CC} =600V, V _{GE} =+/-15V, t _p =10μs, T _J =150℃				440		A	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.21	℃/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		50	A
I_{FM}	Peak Diode Current Repetitive	$t_p=1ms$	100	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 =50A	T _J =25℃		1.75		V
			T _J =125℃		1.90		
			T _J =150℃		1.90		
t _{rr}	Reverse Recovery Time	I _F =50A, -diF/dt=953A/μs(T _J =150℃), V _{rr} =600V, V _{GE} =-15V	T _J =25℃		270		ns
			T _J =125℃		474		
			T _J =150℃		482		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		45		A
			T _J =125℃		47		
			T _J =150℃		47		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		6.9		μC
			T _J =125℃		8.8		
			T _J =150℃		9.4		
E _{rec}	Reverse Recovery Energy		T _J =25℃		2.33		mJ
			T _J =125℃		3.22		
			T _J =150℃		3.43		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.71	℃/W

Diode, Rectifier

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	1800	V
I _{FRMSM}	Maximum RMS Forward Current per Chip	T _C =80°C	150	A
I _{RMSM}	Maximum RMS Current at Rectifier Output	T _C =80°C	150	A
I _{FSM}	Surge Current @t _p =10ms	T _J =25°C	1800	A
		T _J =150°C	1575	
I ² t	I ² t - value	T _J =25°C	16200	A ² s
		T _J =150°C	12400	



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =150A	T _J =25°C		1.17		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)					0.23	°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)	RMS, 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)				0.03	°C/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g

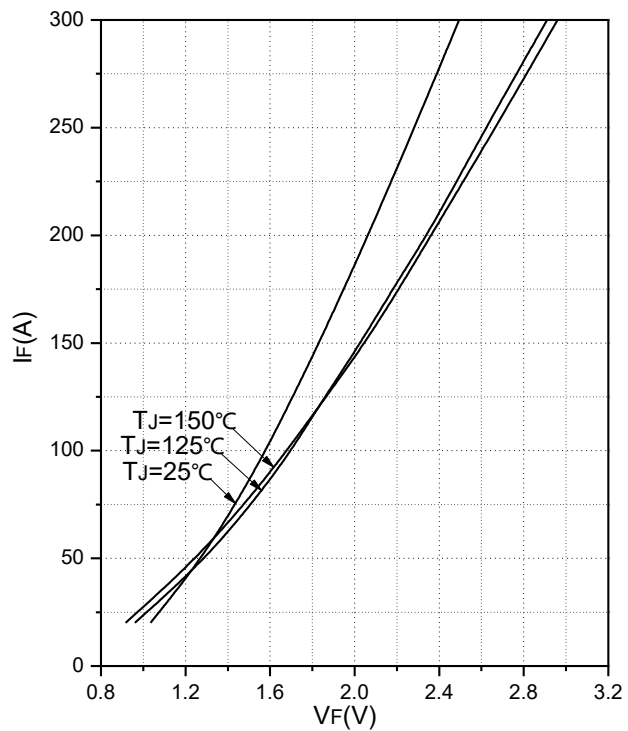
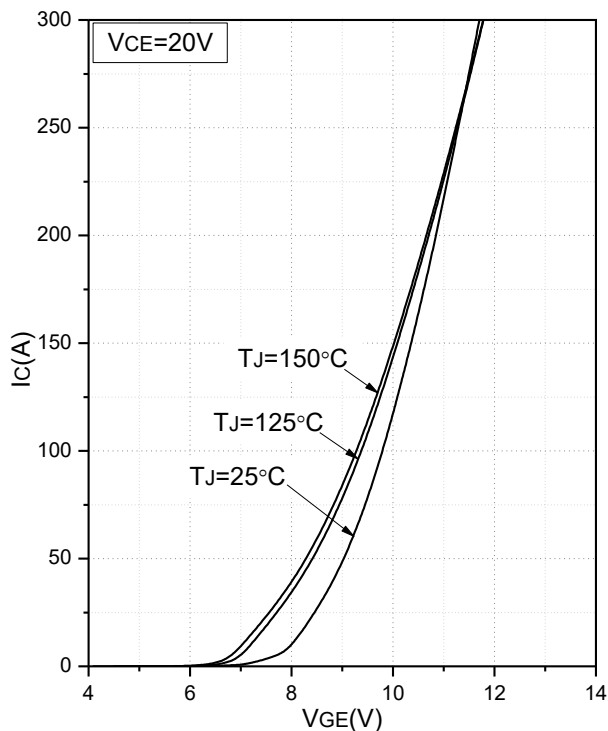
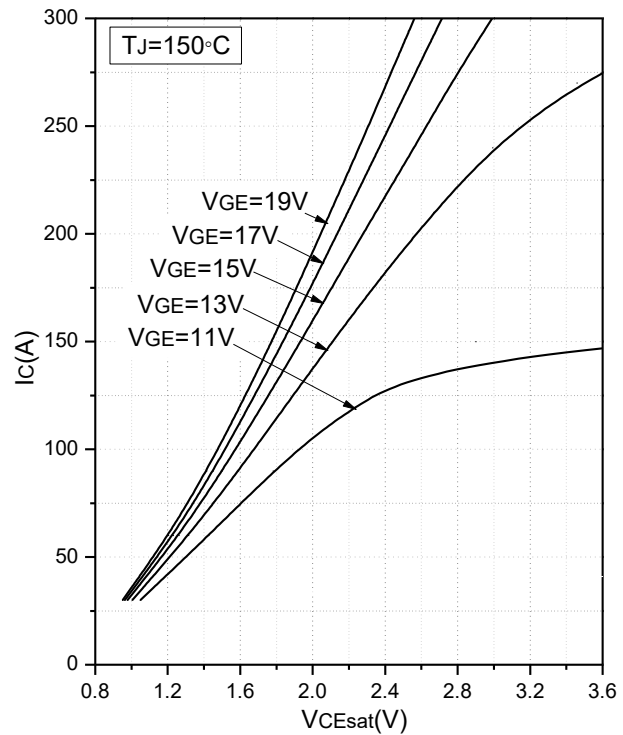
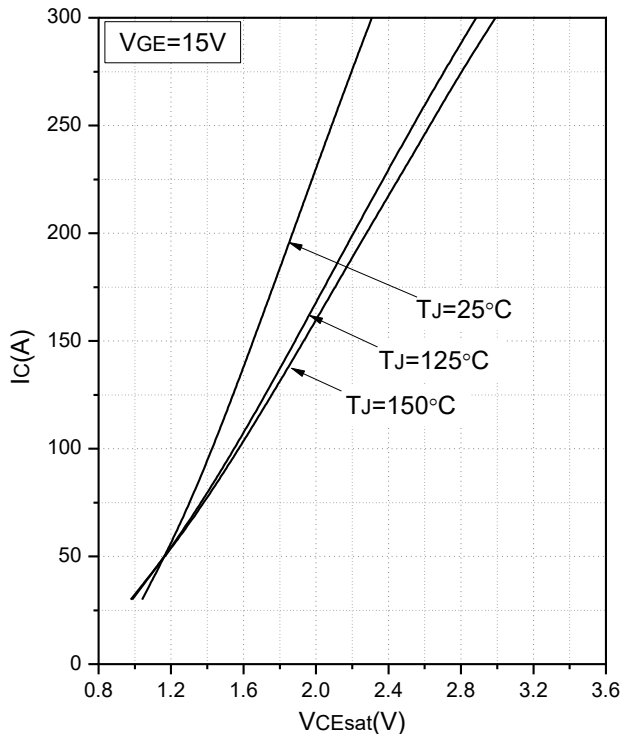


Ordering Information Table

Device code

G	T	150	PI	120	T6	H	-	T4
①	②	③	④	⑤	⑥	⑦		⑧

- ① - IGBT Module
- ② - Trench, Low Switching Losses IGBT
- ③ - Rated Current (150=150A)
- ④ - Circuit Configuration: Power Integrated
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Code



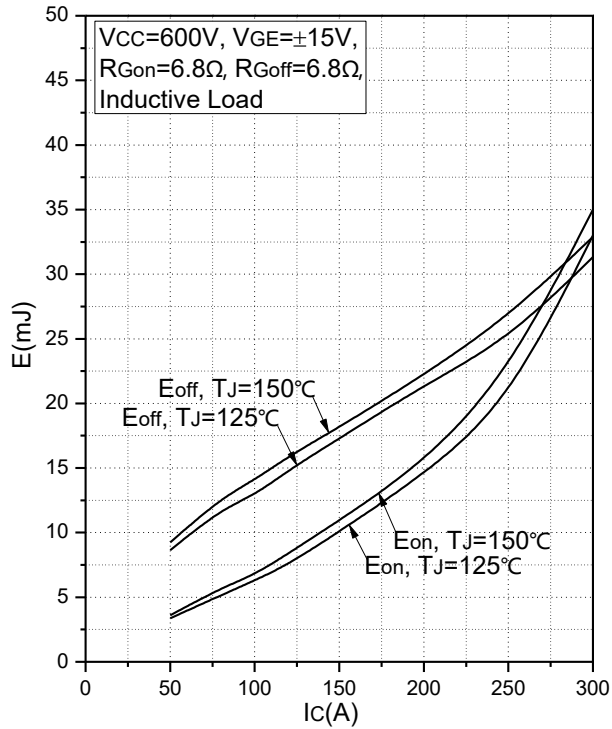


Fig.5 Typical Switching Loss vs. Collector Current

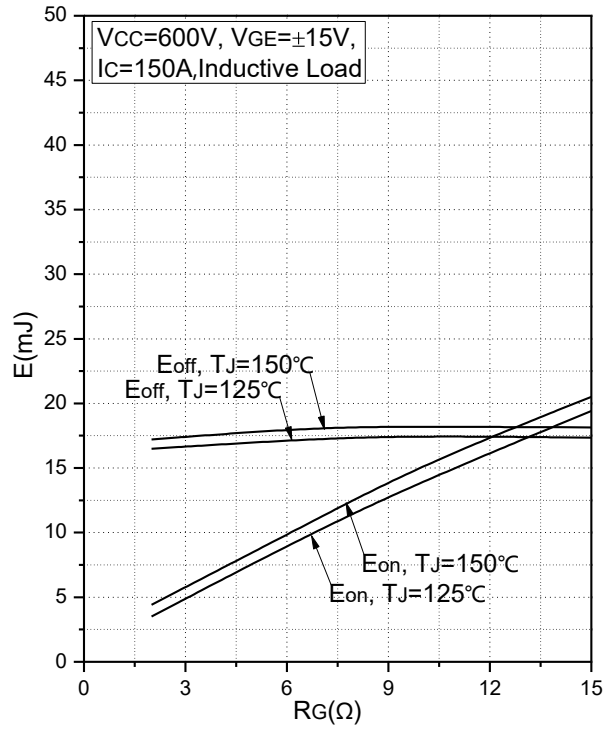


Fig.6 Typical Switching Loss vs. Gate Resistance

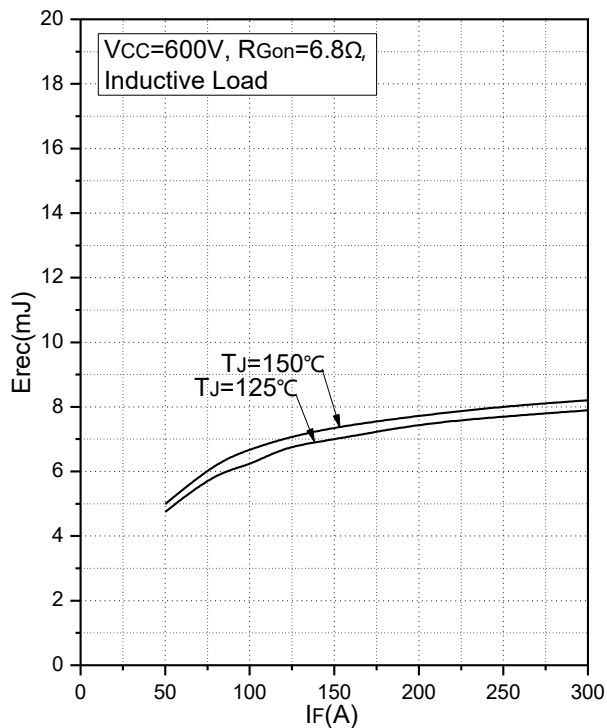


Fig.7 Typical Switching Loss vs. Forward Current

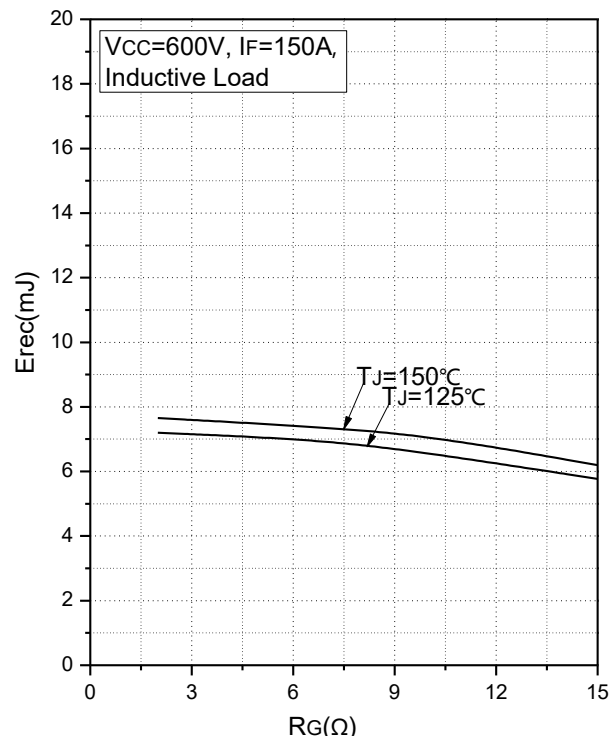
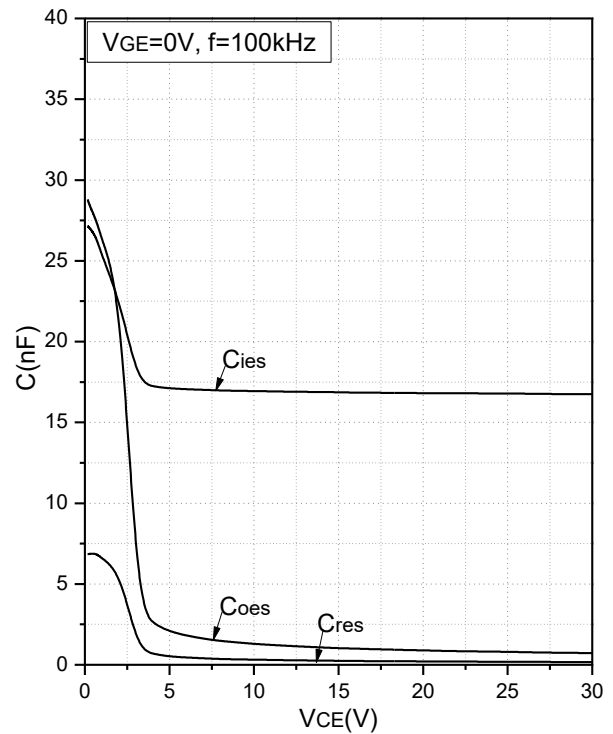
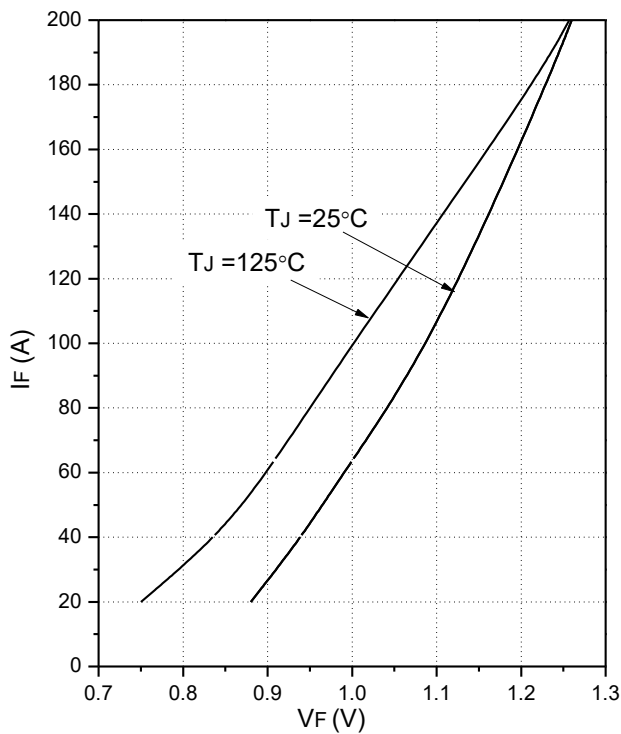
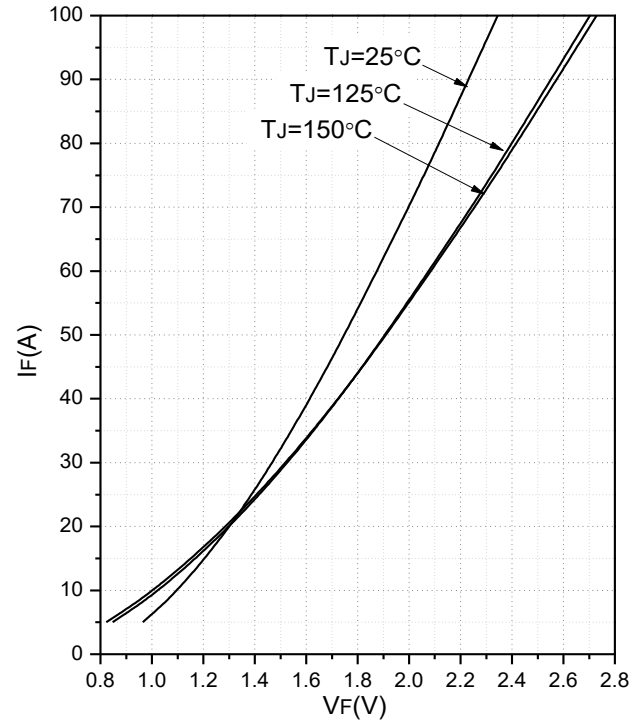
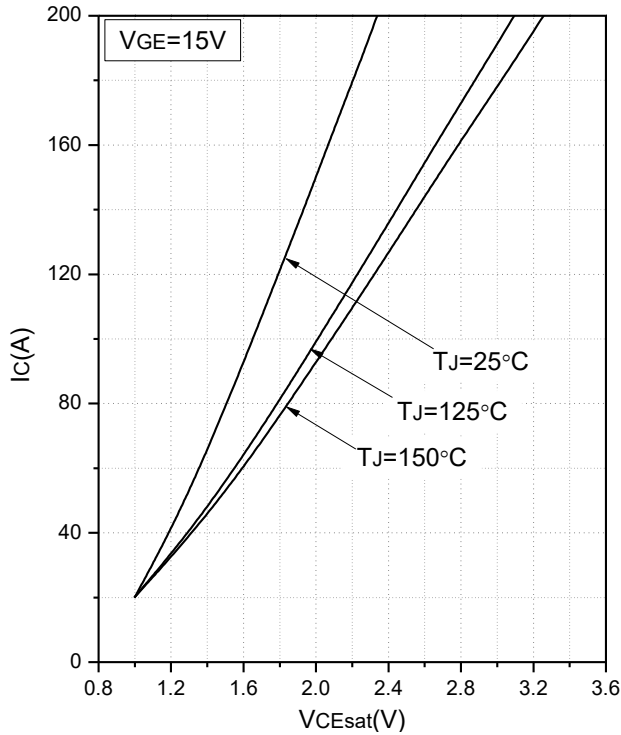


Fig.8 Typical Switching Loss vs. Gate Resistance



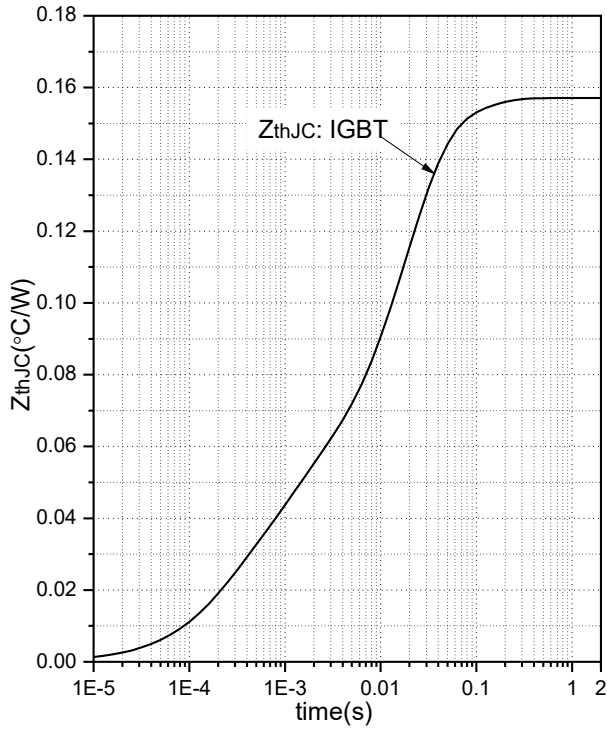


Fig.13 Transient Thermal Impedance (Inverter IGBT)

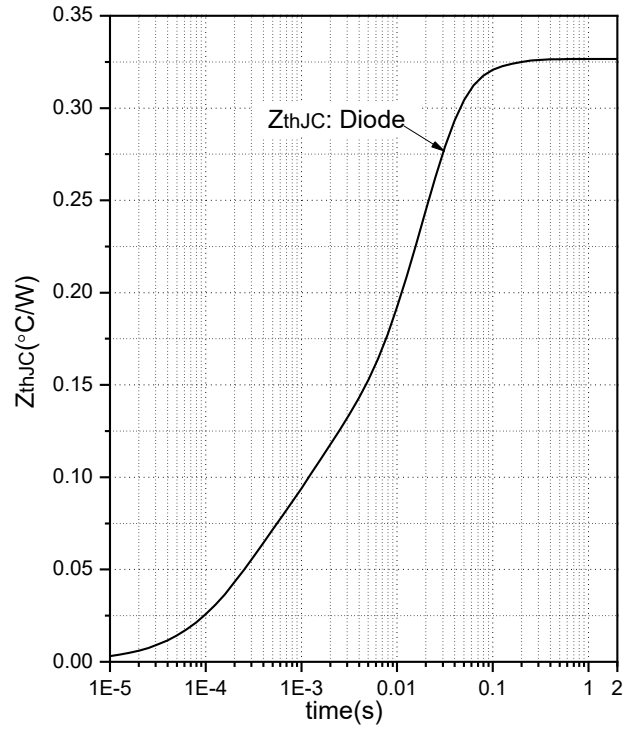


Fig.14 Transient Thermal Impedance (Inverter Diode)

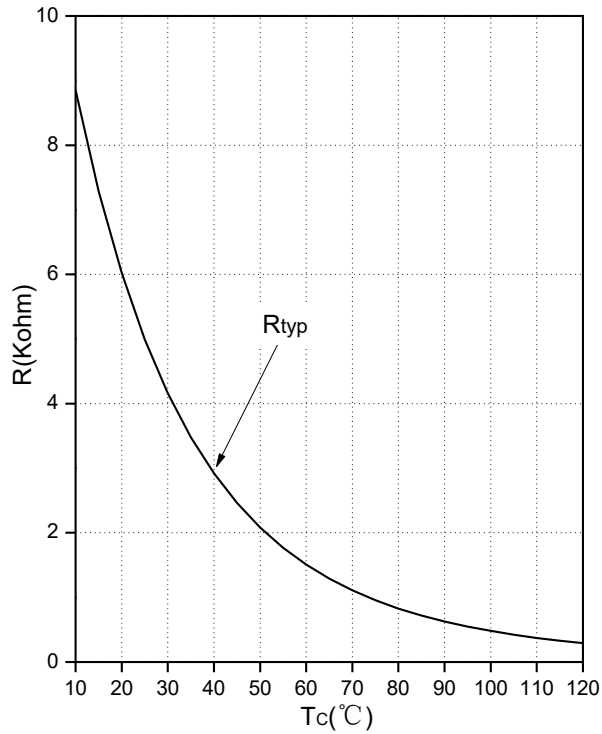


Fig.15 NTC Temperature Characteristics

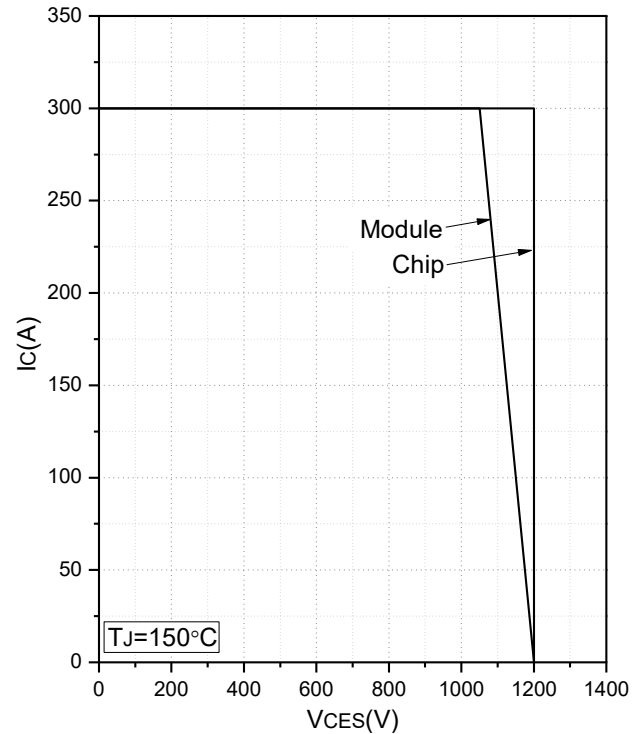
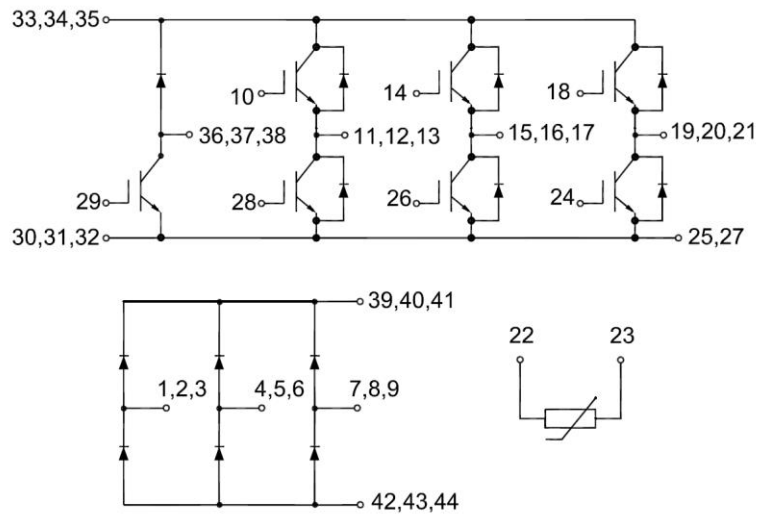


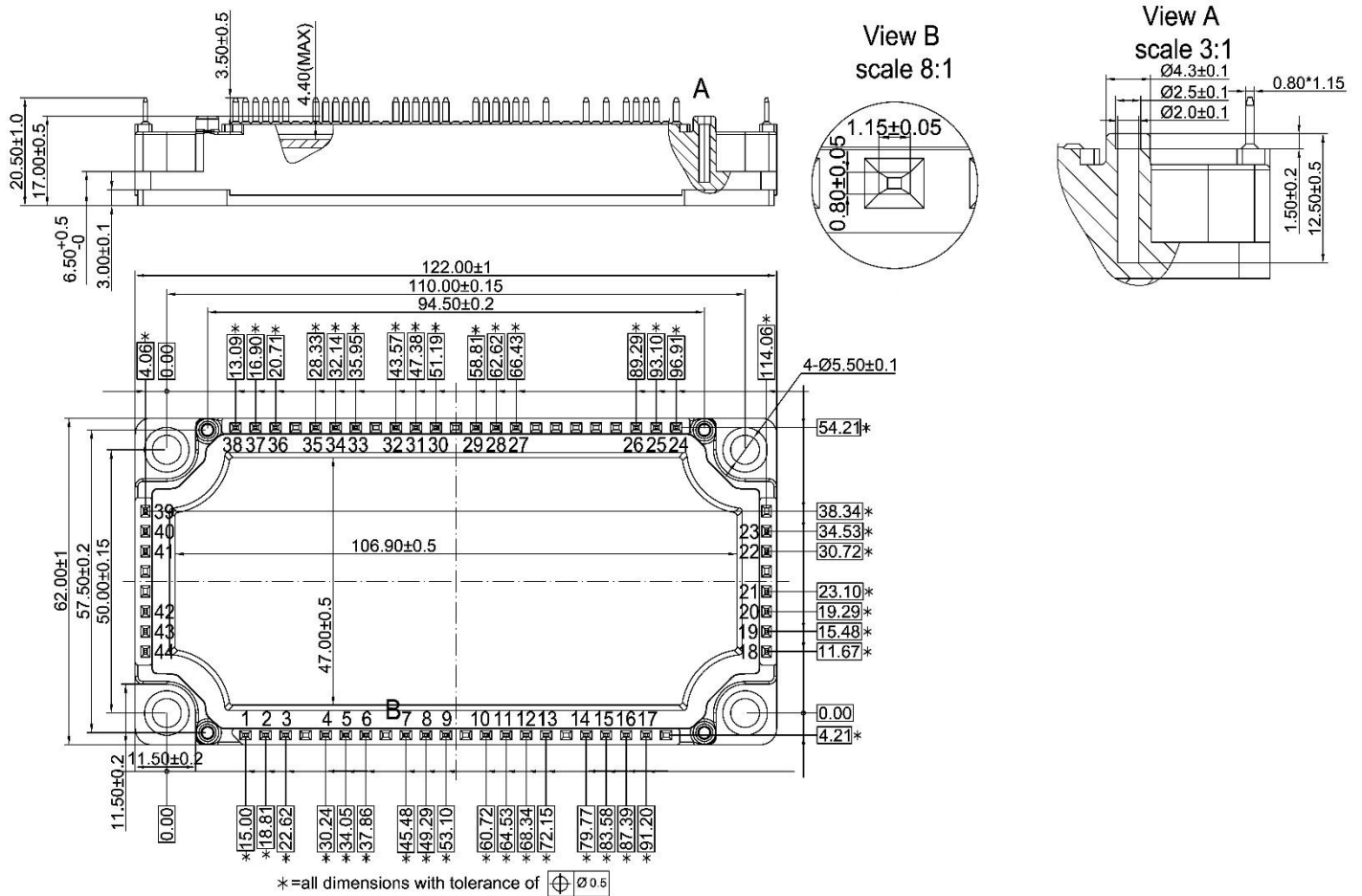
Fig.16 Reverse Bias Safe Operation Area (RBSOA)



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcements

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