



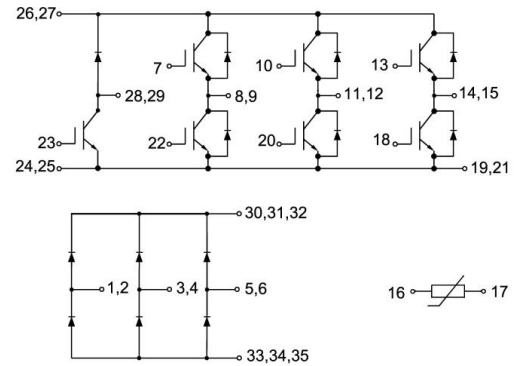
GT75PI120T6H-T4

IGBT Module

Preliminary Data

Features:

- Field Stop Trench Gate 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



Applications:

- Motor Drives
- Servo Drives
- 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	75	A
		T _C =25°C	150	A
I _{CM}	Peak Collector Current Repetitive	t _p =1ms	150	A
P _D	Maximum Power Dissipation (IGBT)	T _C =25°C T _{Jmax} =175°C	523	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	$I_C=2.4\text{mA}$, $V_{CE}=V_{GE}$	5.0	5.7	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=75\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.70	2.10	V
			$T_J=125^{\circ}\text{C}$	2.10		V
			$T_J=150^{\circ}\text{C}$	2.20		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		7.97		nF
C_{oes}	Output Capacitance			1.22		nF
C_{res}	Reveres Transfer Capacitance			0.54		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=75A,$ $R_{Gon}=10\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		118		ns
			$T_J=125^{\circ}C$		128		
			$T_J=150^{\circ}C$		134		
t_r	Rise Time		$T_J=25^{\circ}C$		44		ns
			$T_J=125^{\circ}C$		54		
			$T_J=150^{\circ}C$		54		
$t_{d(off)}$	Turn-off Delay Time	$T_J=25^{\circ}C$		302		ns	
		$T_J=125^{\circ}C$		332			
		$T_J=150^{\circ}C$		340			
t_f	Fall Time	$T_J=25^{\circ}C$		166		ns	
		$T_J=125^{\circ}C$		260			
		$T_J=150^{\circ}C$		266			
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=75A,$ $R_{Gon}=10\Omega, V_{GE}=\pm 15V,$ $di/dt=1251A/\mu s(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		4.5		mJ
		$T_J=125^{\circ}C$		6.8			
		$T_J=150^{\circ}C$		7.8			



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =75A, R _{Goff} =10Ω, V _{GE} =±15V, du/dt=5221V/μs(T _J =150°C), Inductive Load	T _J =25°C		5.6		mJ
			T _J =125°C		7.7		
			T _J =150°C		8.1		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		2892		nC
R _{G(int)}	Internal Gate Resistor		T _J =25°C		6.0		Ω
I _{SC}	V _{CC} =600V, V _{GE} =+/-15V, tp=10μs, T _J =150°C				320		A
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.29	°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	75	A
I _{FM}	Repetitive Peak Forward Current	tp=1ms	150	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 =75A	T _J =25°C		1.65		V
			T _J =125°C		1.75		
			T _J =150°C		1.75		
t _{rr}	Reverse Recovery Time	I _F =75A, -diF/dt=1558A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		160		ns
			T _J =125°C		244		
			T _J =150°C		282		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		92.8		A
			T _J =125°C		94.5		
			T _J =150°C		96.1		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		7.2		μC
			T _J =125°C		10.9		
			T _J =150°C		12.4		



E _{rec}	Reverse Recovery Energy	I _F =75A, -diF/dt=1558A/μs(T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		2.64		mJ
			T _J =125°C		4.00		
			T _J =150°C		4.66		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.50	°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	50	A
		T _C =25°C	100	A
I _{CM}	Peak Collector Current Repetitive	t _P =1ms	100	A
P _D	Maximum Power Dissipation (IGBT)	T _C =25°C T _{Jmax} =175°C	391	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 =1.7mA, V _{CE} =V _{GE}		5.0	5.6	6.5	V
V _{CE(sat)}	Collector-Emitter Saturation Voltage	I _C =50A, V _{GE} =15V	T _J =25°C		1.75	2.10	V
			T _J =125°C		2.20		V
			T _J =150°C		2.30		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			5.32		nF
C _{oes}	Output Capacitance				0.81		nF
C _{res}	Reveres Transfer Capacitance				0.34		nF



Switching Characteristics

t _{d(on)}	Turn-on Delay Time	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		58		ns	
			T _J =125℃		62			
			T _J =150℃		66			
t _r	Rise Time		T _J =25℃		36		ns	
			T _J =125℃		38			
			T _J =150℃		40			
t _{d(off)}	Turn-off Delay Time	V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		262		ns	
			T _J =125℃		288			
			T _J =150℃		302			
t _f	Fall Time		T _J =25℃		170		ns	
			T _J =125℃		218			
			T _J =150℃		244			
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =50A, R _{Gon} =15Ω, V _{GE} =±15V, di/dt=1212A/μs(T _J =150℃), Inductive Load	T _J =25℃		2.7		mJ	
			T _J =125℃		3.8			
			T _J =150℃		3.9			
E _{off}	Turn-off Switching Loss		V _{CC} =600V, I _C =50A, R _{Goff} =15Ω, V _{GE} =±15V, du/dt=5557V/μs(T _J =150℃), Inductive Load	T _J =25℃		3.7		mJ
				T _J =125℃		5.1		
				T _J =150℃		5.3		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V		T _J =25℃		2850		nC
R _{G(int)}	Internal Gate Resistor			T _J =25℃		3.0		Ω
I _{SC}	V _{CC} =600V, V _{GE} =+/- 15V, t _p =10μs, T _J =150℃				209		A	
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.38	℃/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	$T_C=100^\circ C$	25	A
I_{FM}	Peak Diode Current Repetitive	$t_p=1ms$	50	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 =25A	T _J =25℃		1.70		V
			T _J =125℃		1.85		
			T _J =150℃		1.85		
I _{rr}	Peak Reverse Recovery Current	I _F =25A, -diF/dt=346A/μs(T _J =150℃), V _R =600V, V _{GE} =-15V	T _J =25℃		13.6		A
			T _J =125℃		16.8		
			T _J =150℃		17.9		
t _{rr}	Reverse Recovery Time		T _J =25℃		350		ns
			T _J =125℃		403		
			T _J =150℃		430		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		2.43		μC
			T _J =125℃		3.58		
			T _J =150℃		4.26		
E _{rec}	Reverse Recovery Energy		T _J =25℃		0.65		mJ
			T _J =125℃		1.32		
			T _J =150℃		1.46		
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					1.14	℃/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	$T_C=80^{\circ}\text{C}$	78	A
I_{RMSM}	Maximum RMS Current At Rectifier Output	$T_C=80^{\circ}\text{C}$	136	A
I_{FSM}	Surge Current @ $t_p=10\text{ ms}$	$T_J=25^{\circ}\text{C}$	900	A
		$T_J=150^{\circ}\text{C}$	705	
I^2t	I^2t - Value	$T_J=25^{\circ}\text{C}$	4050	A^2s
		$T_J=150^{\circ}\text{C}$	2485	



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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V _F	Forward Voltage	I _F =50A	T _J =25°C		1.20		V
			T _J =125°C		1.15		
I _R	Reverse Current	V _R =1600V	T _J =25°C			1	mA
R _{θJC}	Thermal Resistance: Junction-to-Case (per Diode)					0.46	°C/W

Internal NTC-Thermistor Characteristics

Symbol	Description	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

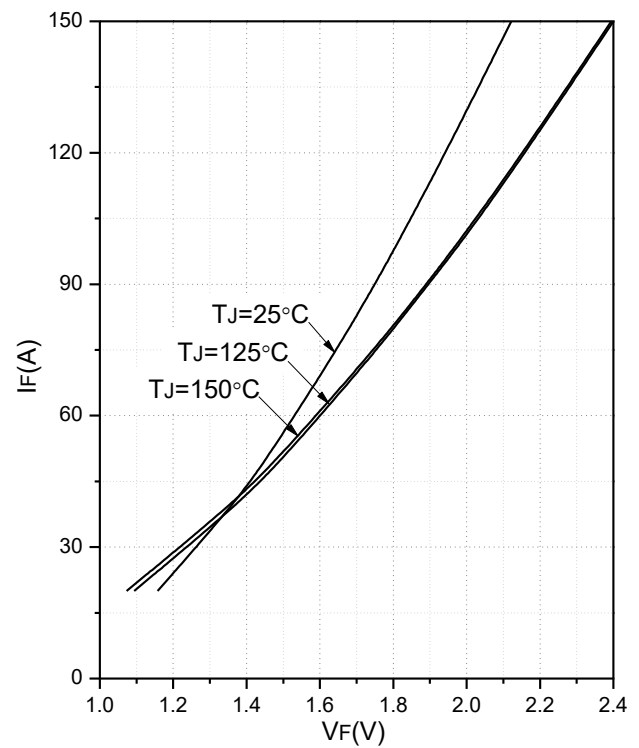
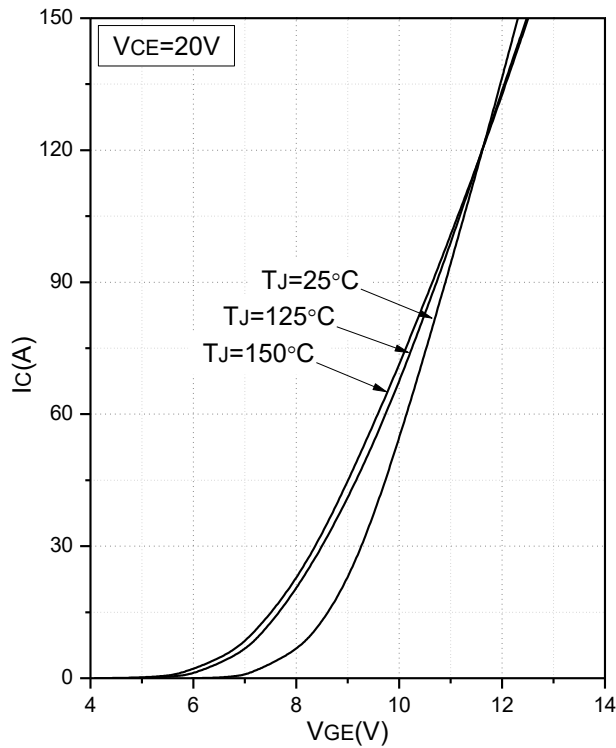
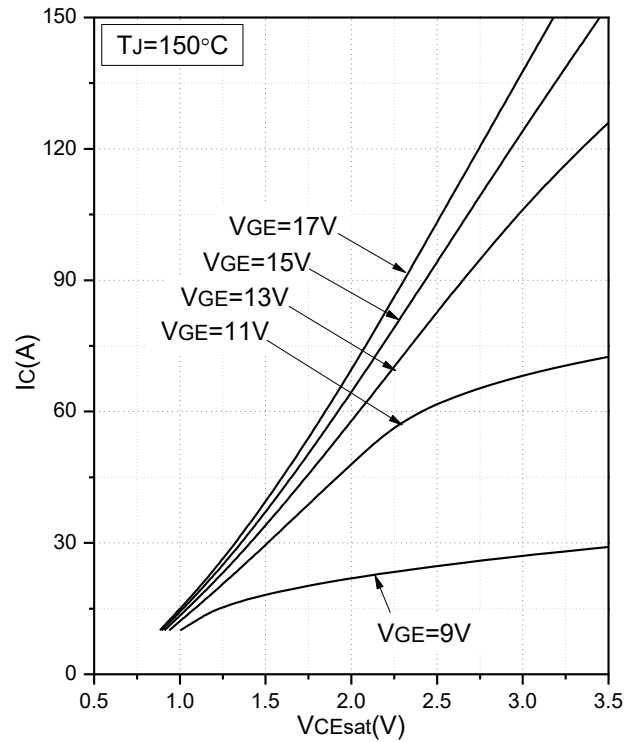
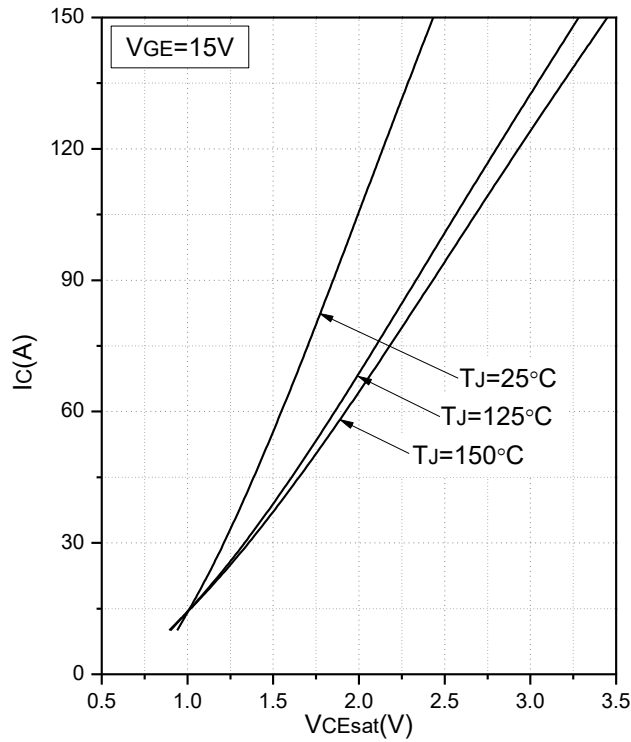
Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+125	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)				0.03	°C/W
T	Mounting Screw:M5		3.0		6.0	N·m
G	Weight			300		g

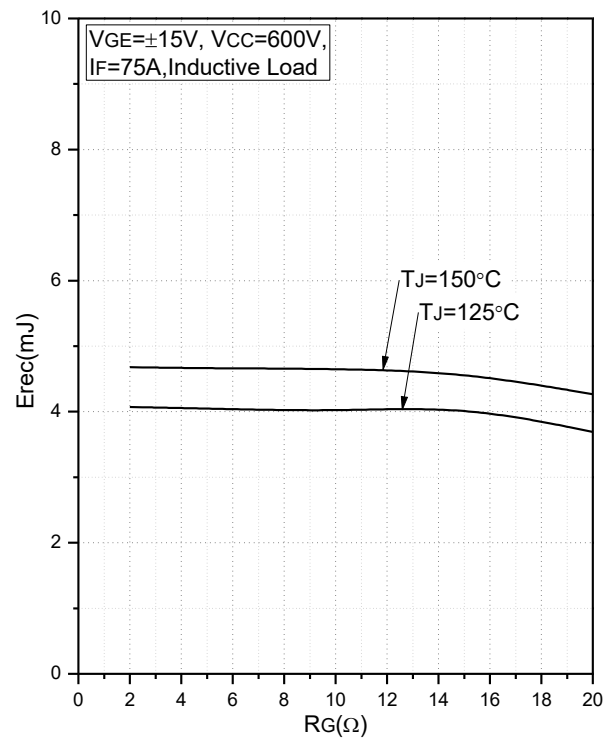
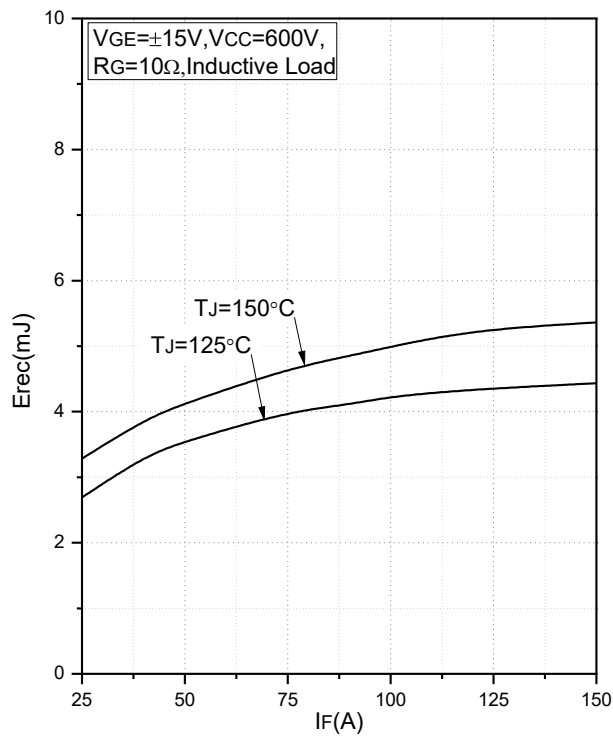
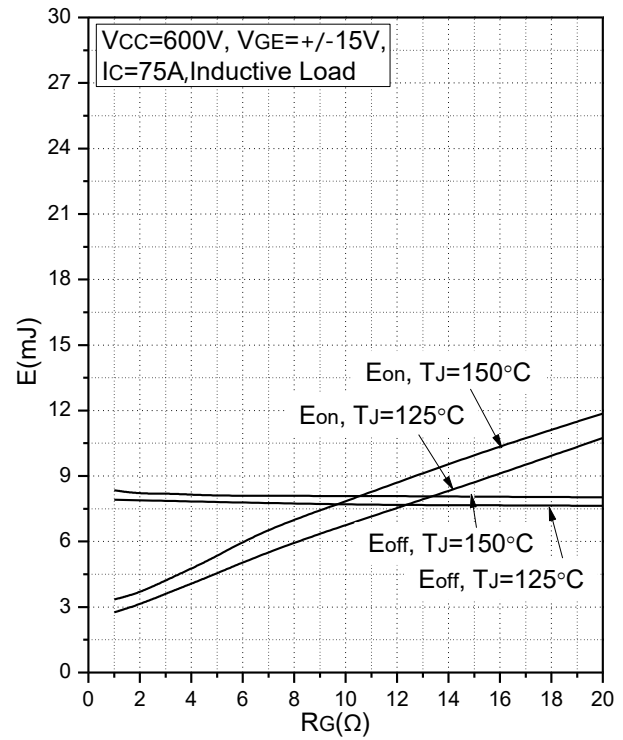
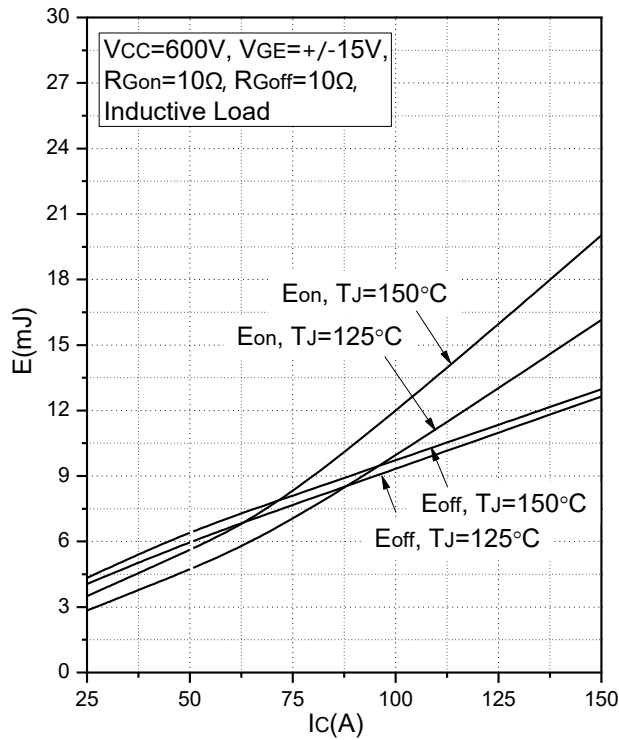


Ordering Information Table

Device code	G	T	75	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 (75=75A)
- ④ - Circuit Configuration PI (Power Integrated)
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
- ⑧ - Internal Control Code





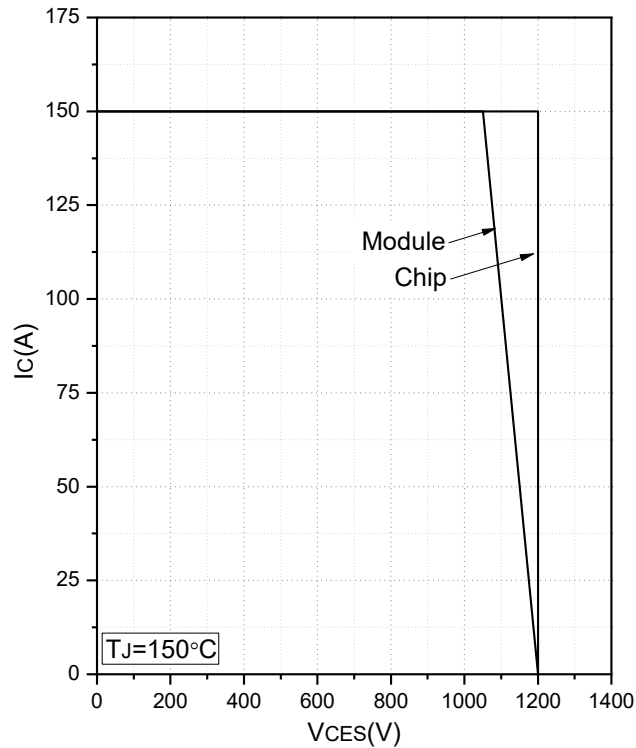


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

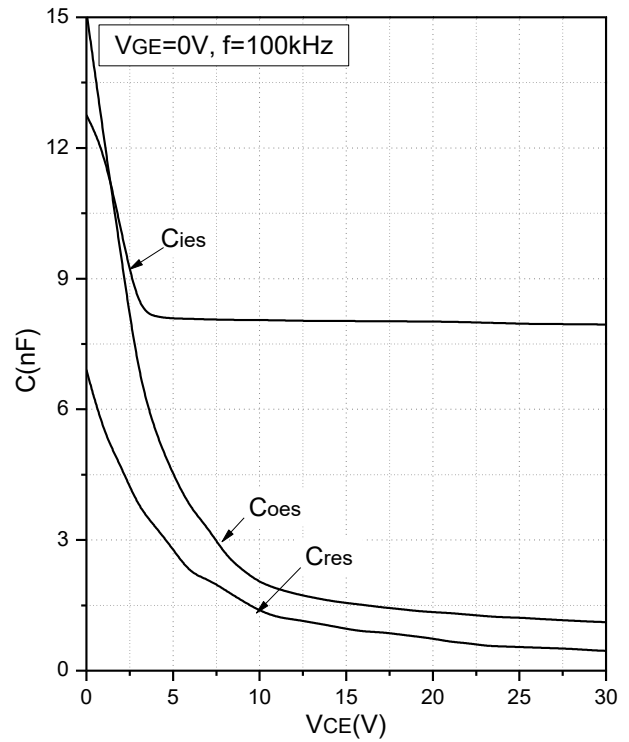


Fig.10 Capacitance Characteristics

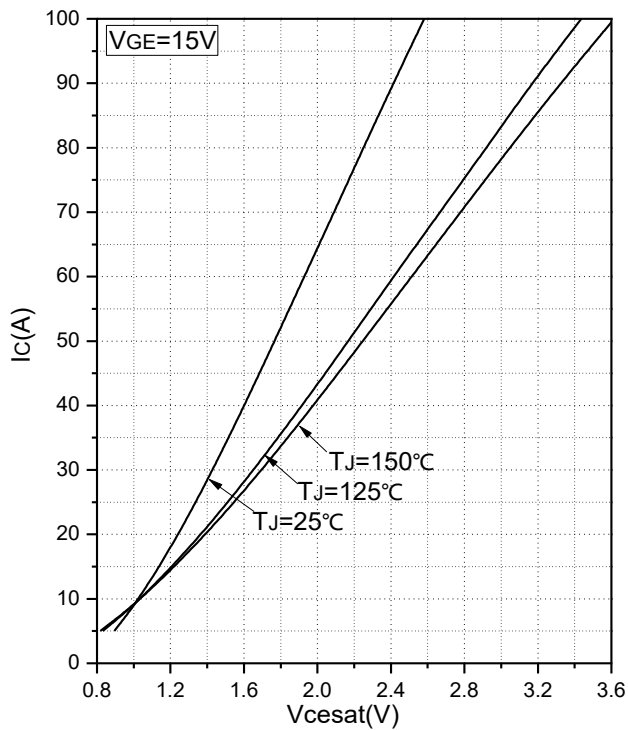


Fig.11 Typical Saturation Voltage Characteristics (Brake-Chopper)

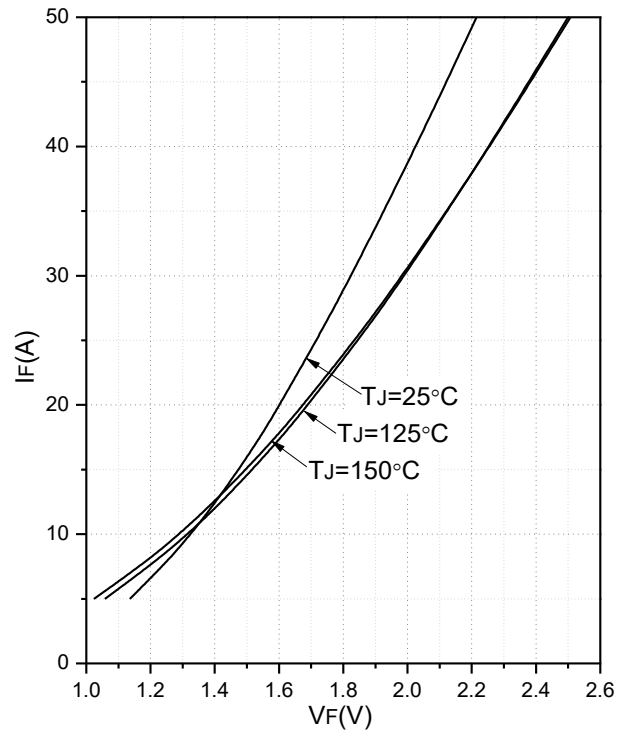


Fig.12 Forward Characteristics of Diode (Brake-Chopper)

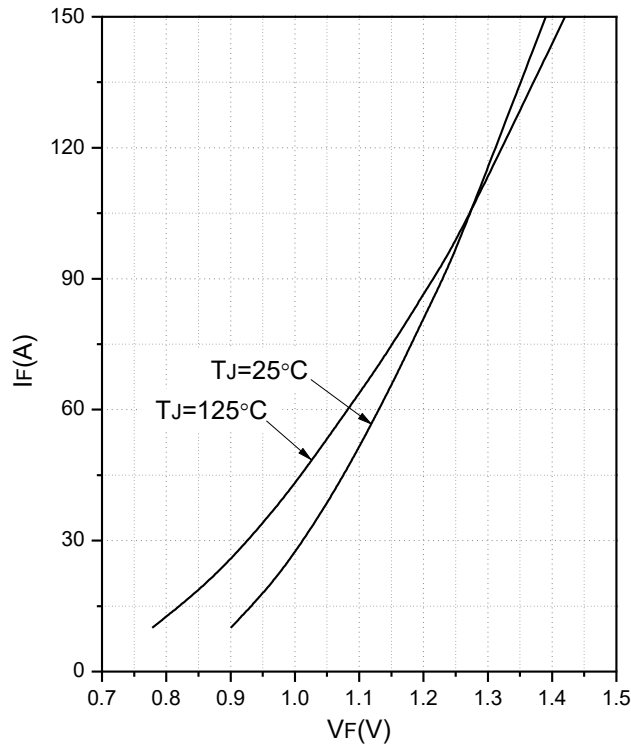


Fig.13 Forward Characteristics of Diode (Rectifier)

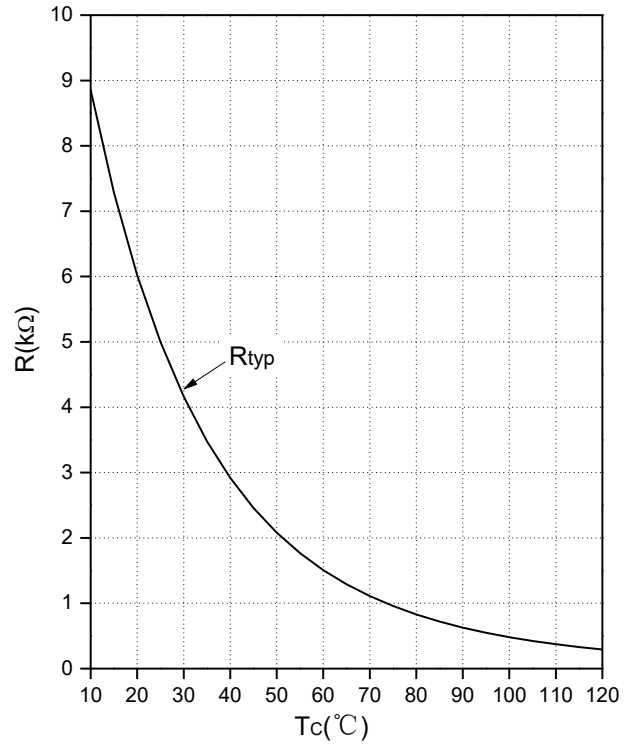


Fig.14 NTC Temperature Characteristics

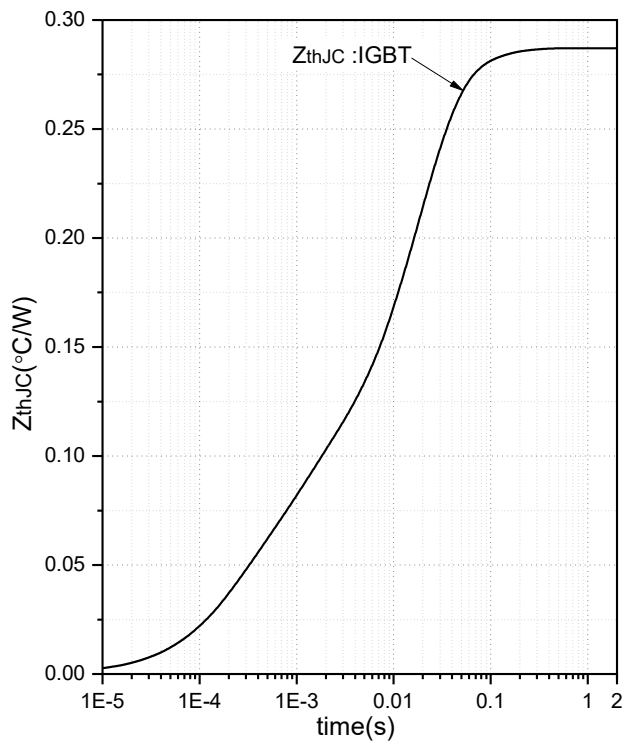


Fig.15 Transient Thermal Impedance (Inverter-IGBT)

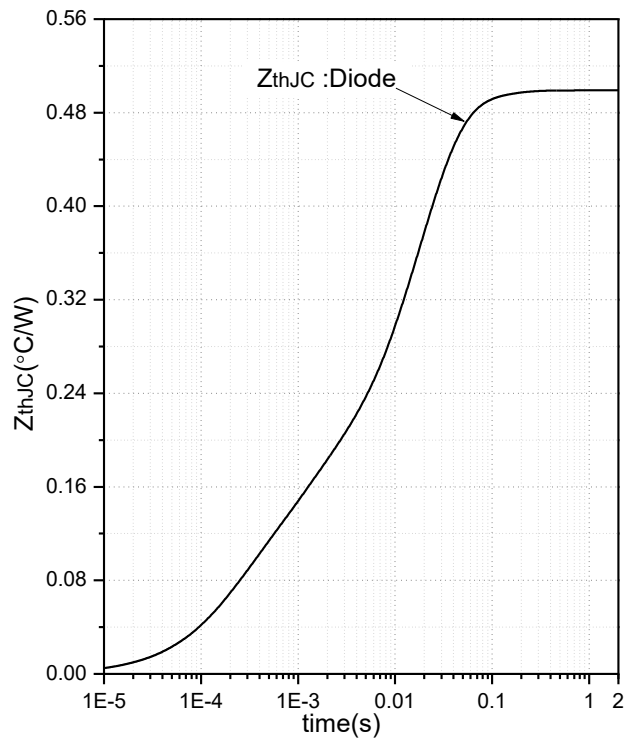


Fig.16 Transient Thermal Impedance (Inverter-Diode)



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”.