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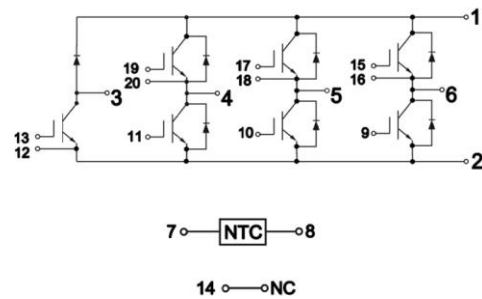
IGBT Module

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

Circuit Diagram



Applications:

- Industrial Inverters
- Servo Applications

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	$T_c=100^\circ\text{C}$	25	A
		$T_c=25^\circ\text{C}$	50	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	50	A
P_D	Maximum Power Dissipation per leg	$T_c=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	278	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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		2.42		nF
C_{oes}	Output Capacitance			0.17		nF
C_{res}	Reverse Transfer Capacitance			0.02		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600V, I_C=25A,$ $R_{Gon}=20\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		102		ns
			$T_J=125^{\circ}C$		99		
			$T_J=150^{\circ}C$		99		
t_r	Rise Time		$T_J=25^{\circ}C$		39		ns
			$T_J=125^{\circ}C$		39		
			$T_J=150^{\circ}C$		37		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600V, I_C=25A,$ $R_{Goff}=20\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		138		ns
			$T_J=125^{\circ}C$		147		
			$T_J=150^{\circ}C$		145		
t_f	Fall Time		$T_J=25^{\circ}C$		494		ns
			$T_J=125^{\circ}C$		723		
			$T_J=150^{\circ}C$		729		
E_{on}	Turn-on Switching Loss	$V_{CC}=600V, I_C=25A,$ $R_{Gon}=20\Omega, V_{GE}=\pm 15V,$ $di/dt=548A/\mu s$ ($T_J=150^{\circ}C$) Inductive Load	$T_J=25^{\circ}C$		2.14		mJ
			$T_J=125^{\circ}C$		2.76		
			$T_J=150^{\circ}C$		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
R _{g internal}	Internal Gate Resistor		T _J =25°C		0		Ω
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)					0.54	°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		25	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	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	I _F =25A, -di _F /dt=695A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		212		ns
			T _J =125°C		441		
			T _J =150°C		458		
I _{rr}	Peak Reverse Recovery Current		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 leg)					0.69	°C/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	$T_C=25^\circ C$ $T_{Jmax}=175^\circ C$	203	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	$I_C=1mA$, $V_{CE}=V_{GE}$		5.0	5.7	6.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=15A$, $V_{GE}=15V$	$T_J=25^\circ C$		1.90	2.20	V
			$T_J=125^\circ C$		2.30		V
			$T_J=150^\circ C$		2.40		V
I_{CES}	Collector-Emitter Leakage Current	$V_{GE}=0V$, $V_{CE}=V_{CES}$				1	mA
I_{GES}	Gate-Emitter Leakage Current	$V_{GE}=\pm 20V$, $V_{CE}=0V$				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} =39Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		115		ns	
			T _J =125℃		110			
			T _J =150℃		110			
t _r	Rise Time		T _J =25℃		42		ns	
			T _J =125℃		49			
			T _J =150℃		53			
t _{d(off)}	Turn-off Delay Time		V _{CC} =600V, I _C =15A, R _{Goff} =39Ω, V _{GE} =±15V, Inductive Load	T _J =25℃		145		ns
				T _J =125℃		158		
				T _J =150℃		161		
t _f	Fall Time	T _J =25℃			275		ns	
		T _J =125℃			336			
		T _J =150℃			353			
E _{on}	Turn-on Switching Loss	V _{CC} =600V, I _C =15A, R _{Gon} =39Ω, V _{GE} =±15V, di/dt=229A/μs (T _J =150℃) Inductive Load		T _J =25℃		2.03		mJ
		T _J =125℃			2.27			
		T _J =150℃			2.42			
E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =15A, R _{Goff} =39Ω, V _{GE} =±15V, du/dt=2268V/μs (T _J =150℃) Inductive Load	T _J =25℃		0.64		mJ	
		T _J =125℃		0.89				
		T _J =150℃		0.97				
Q _g	Total Gate Charge		T _J =25℃		113		nC	
R _{g internal}	Internal Gate Resistor		T _J =25℃		0		Ω	
SCSOA	Short Circuit Safe Operation Area	V _{CC} =600V, V _{GE} =±15V, tp=10us R _{Gon} =39Ω, R _{Goff} =39Ω, T _J =125℃		73.4			A	
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case					0.74	℃/W	



Diode, Brake-Chopper

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

V_{RRM}	Repetitive Peak Reverse Voltage	$T_J=25^{\circ}\text{C}$	1200	V
I_F	Diode Continuous Forward Current		10	A
I_{FM}	Diode Maximum Forward Current	$t_p=1\text{ms}$	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		1.75		V
			T _J =125°C		1.90		
			T _J =150°C		1.85		
t _{rr}	Reverse Recovery Time	I _F =10A, -diF/dt=250A/μs (T _J =150°C), V _{rr} =600V, V _{GE} =-15V	T _J =25°C		381		ns
			T _J =125°C		490		
			T _J =150°C		583		
I _{rr}	Peak Reverse Recovery Current		T _J =25°C		8.4		A
			T _J =125°C		9.0		
			T _J =150°C		10.4		
Q _{rr}	Reverse Recovery Charge		T _J =25°C		1.34		μC
			T _J =125°C		2.11		
			T _J =150°C		2.58		
E _{rec}	Reverse Recovery Energy		T _J =25°C		0.33		mJ
			T _J =125°C		0.68		
			T _J =150°C		0.78		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per Leg)					1.13	°C/W



Internal NTC-Thermistor Characteristics

R ₂₅	T _C =25℃	5		kΩ
△R/R	T _C =100℃, R ₁₀₀ =465Ω		±5	%
P ₂₅	T _C =25℃	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

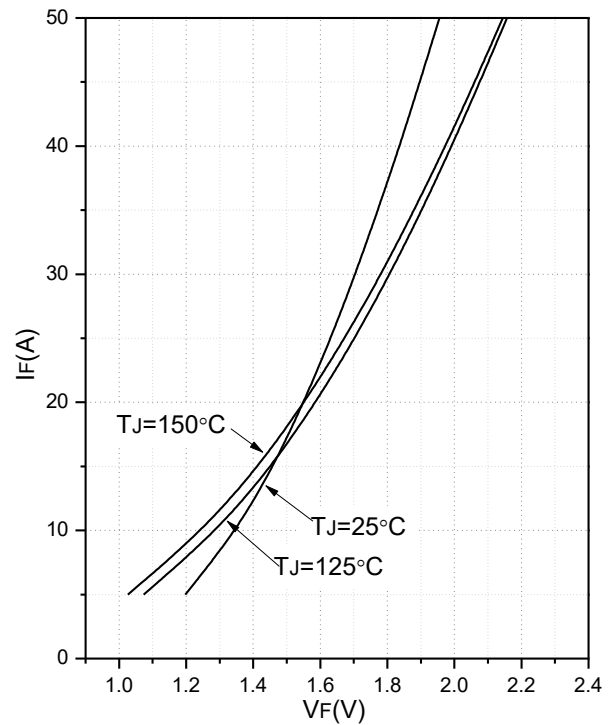
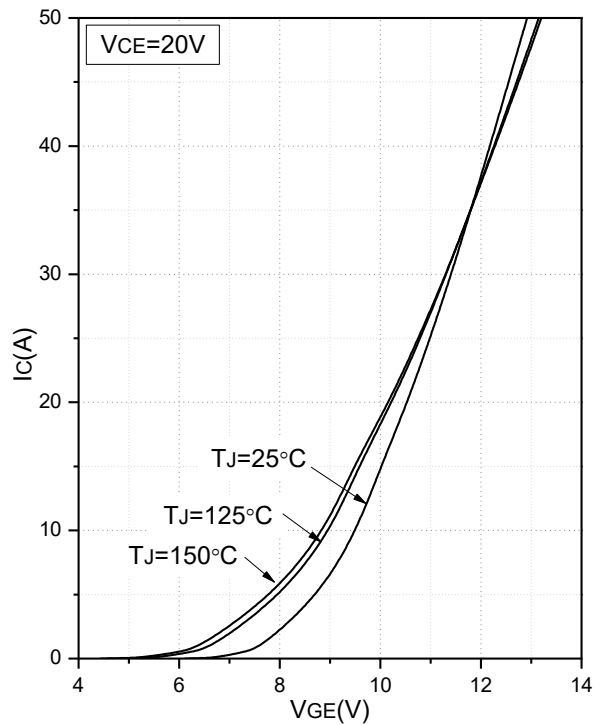
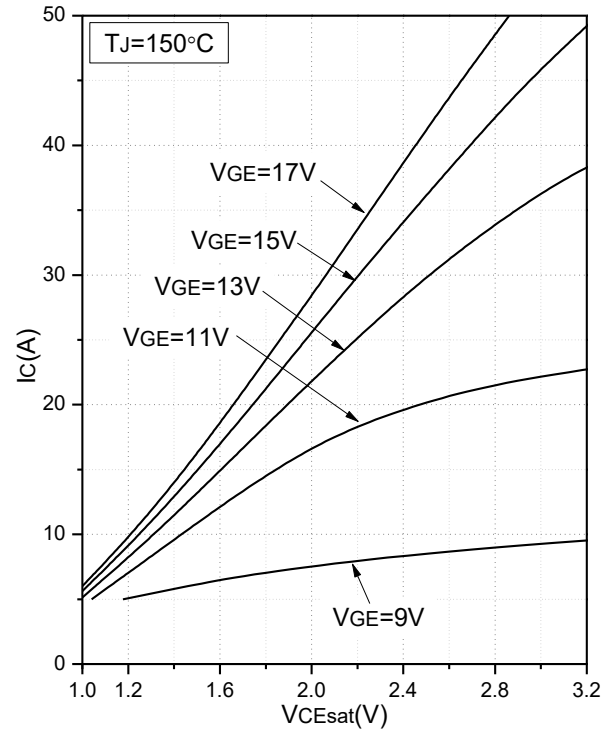
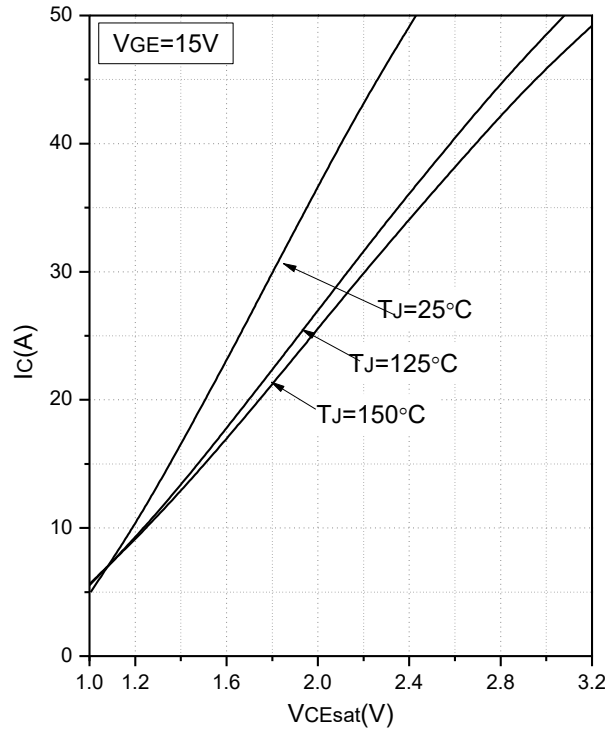
Symbol	Description	Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted) f=50Hz, 1minute	2500			V
T _J	Maximum Junction Temperature			175	℃
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	℃
T _{stg}	Storage Temperature	-40		+125	℃
CTI	Comparative Tracking Index	200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)		0.06		℃/W
T	Mounting Screw:M3	0.75		1.2	N·m
G	Weight		30		g



Ordering Information Table

Device code	G	T	25	FB	120	A1	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: Seven Pack
- ⑤ - Rated Voltage (120=1200V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)



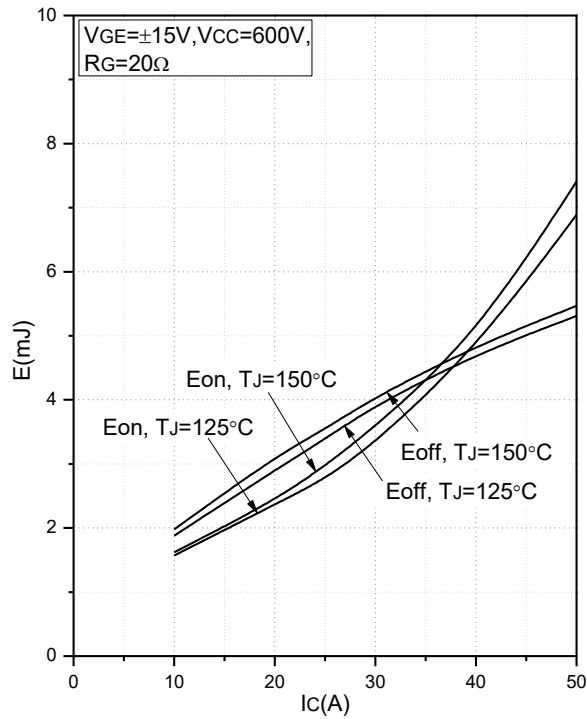


Fig.5 Typical Switching Loss vs. Collector Current

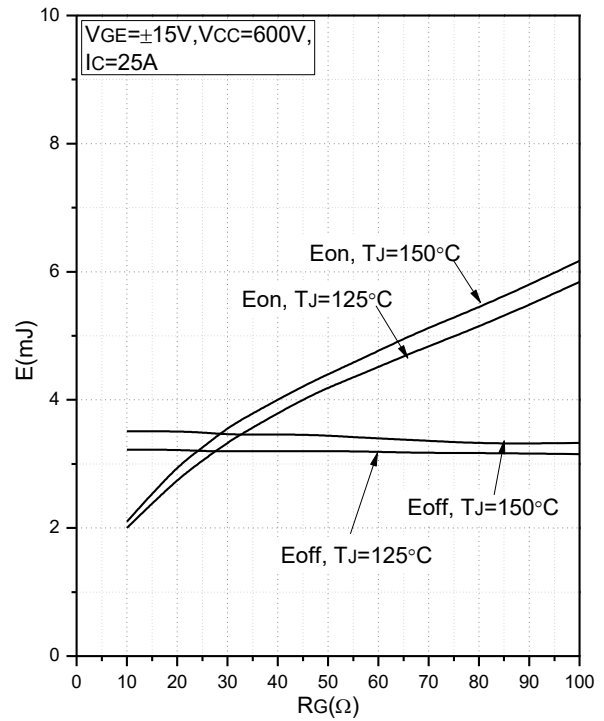


Fig.6 Typical Switching Loss vs. Gate Resistance

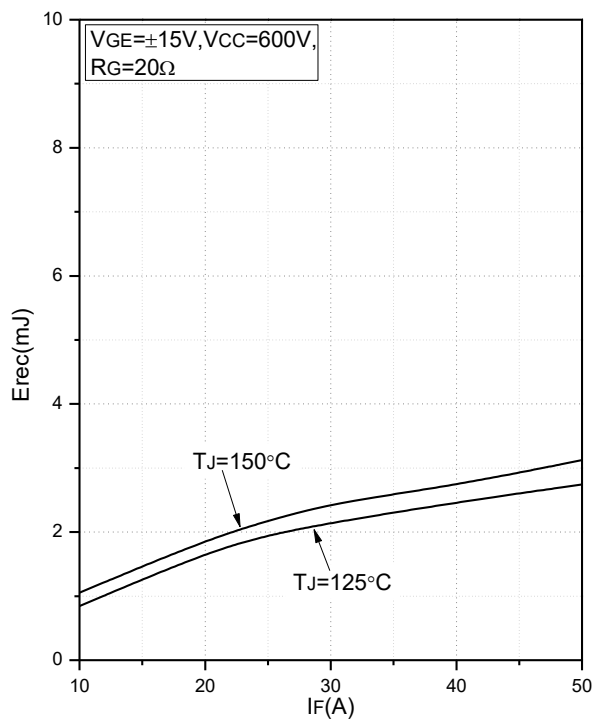


Fig.7 Typical Switching Loss vs. Forward Current

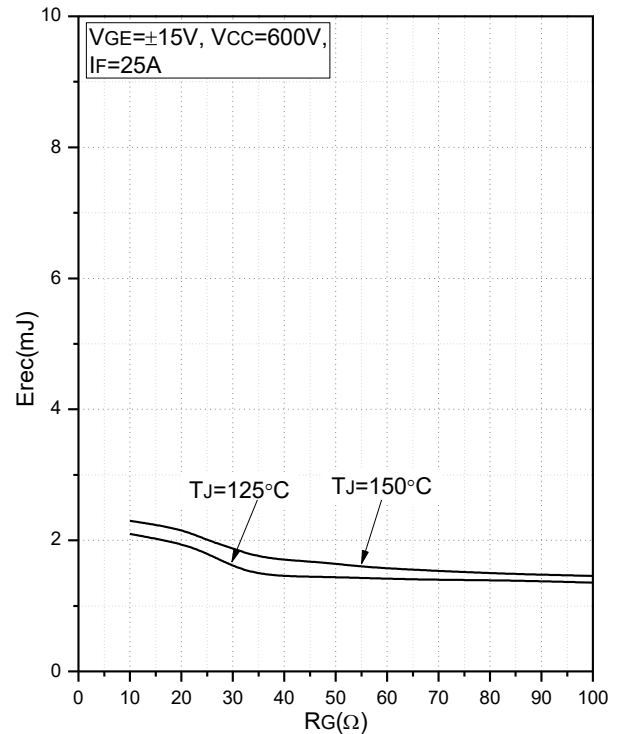


Fig.8 Typical Switching Loss vs. Gate Resistance

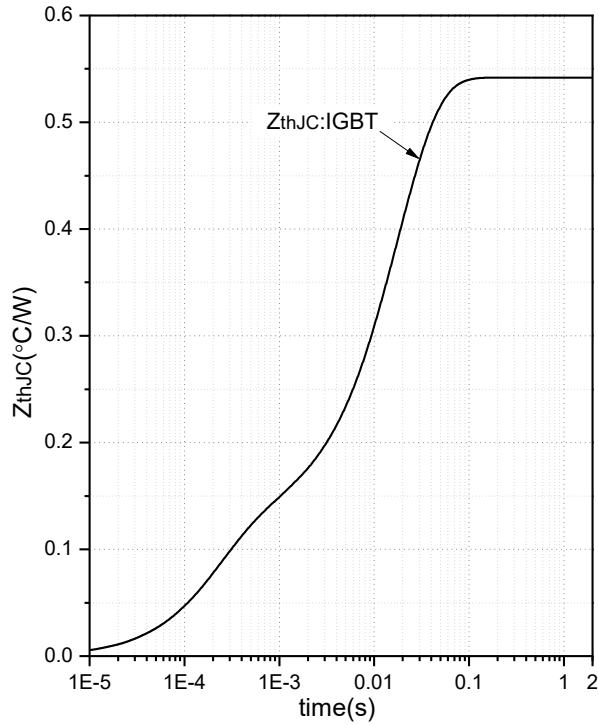


Fig.9 Transient Thermal Impedance (IGBT)

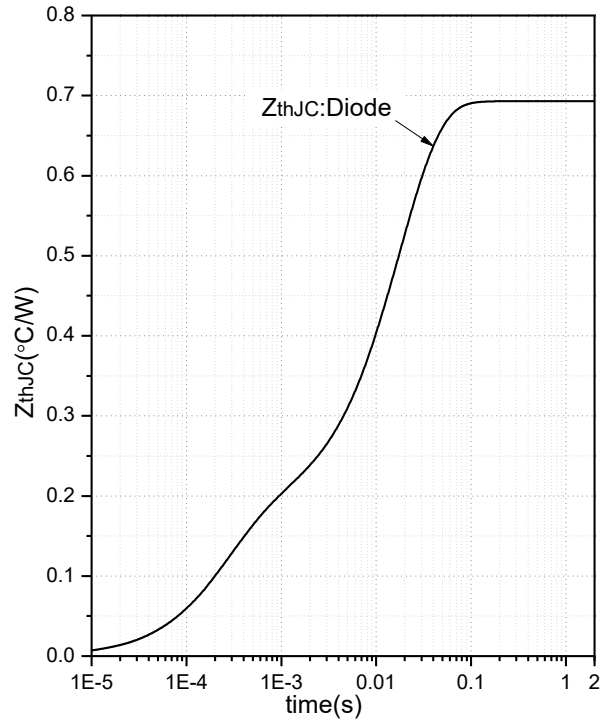


Fig.10 Transient Thermal Impedance (Diode)

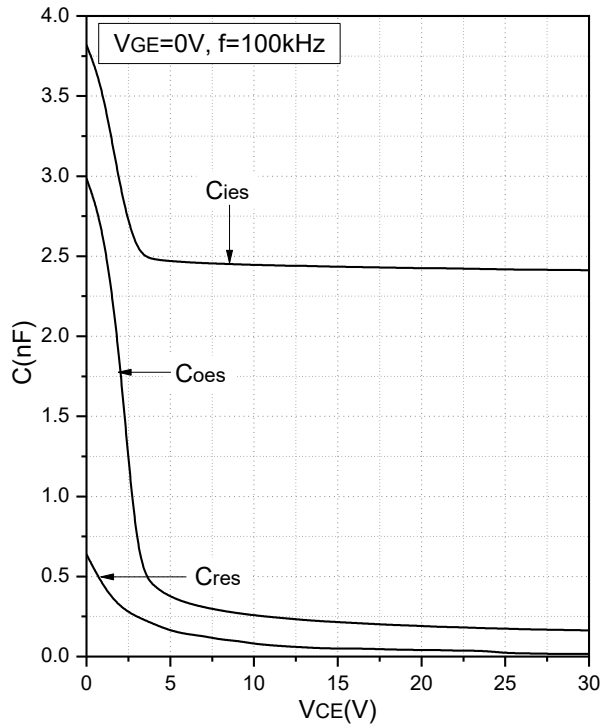


Fig.11 Capacitance Characteristics

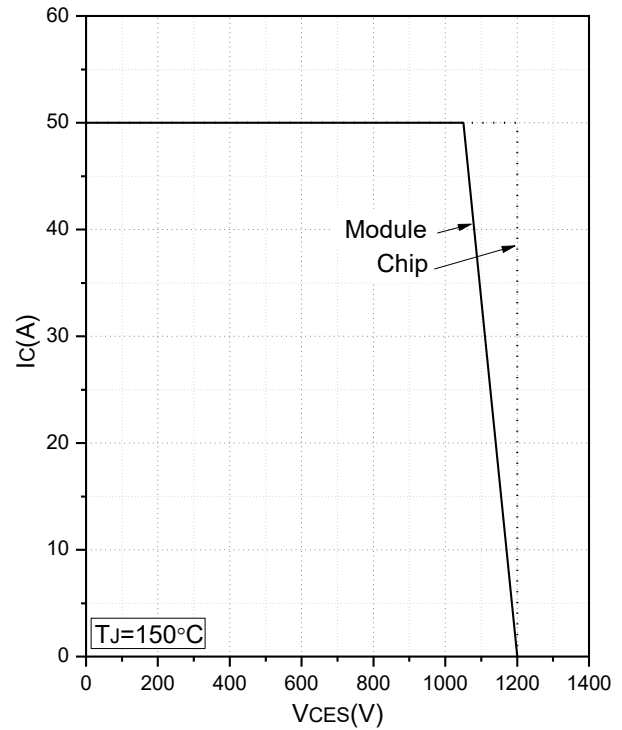


Fig.12 Reverse Bias Safe Operation Area (RBSOA)

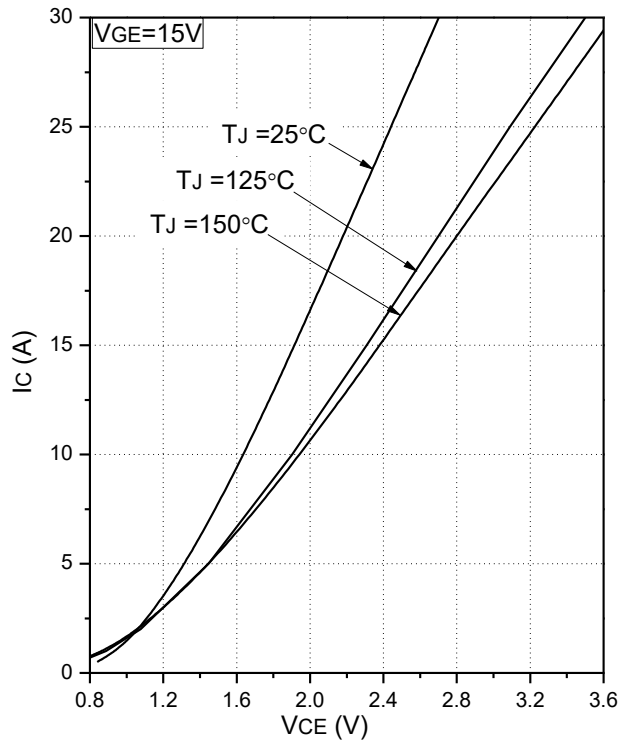


Fig.13 Typical Saturation Voltage Characteristics (Brake-Chopper)

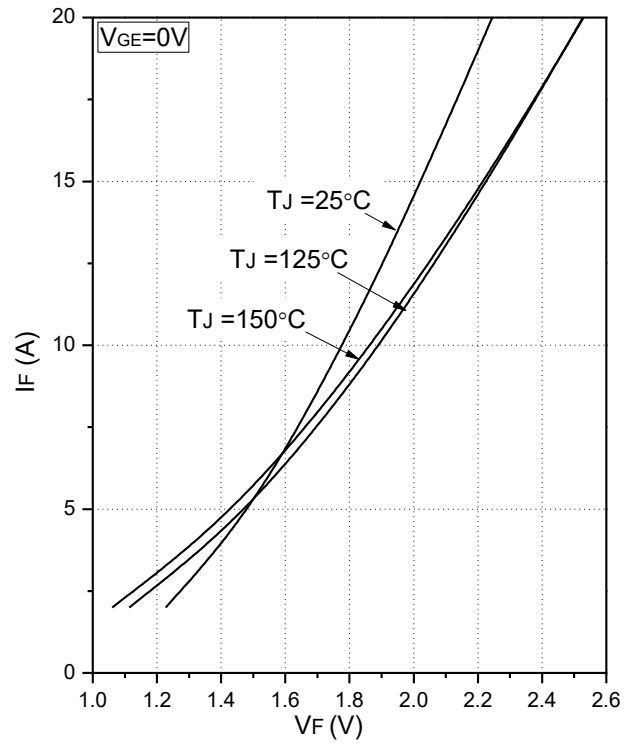


Fig.14 Forward Characteristics of Diode (Brake-Chopper)

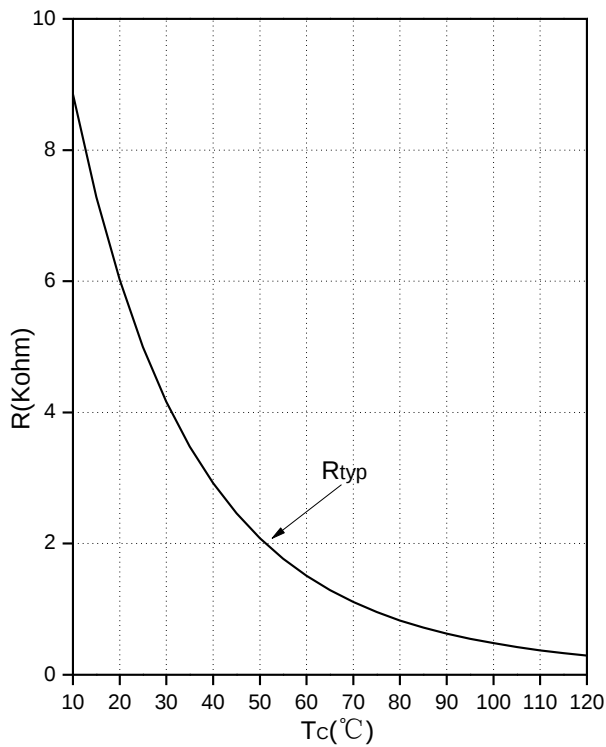
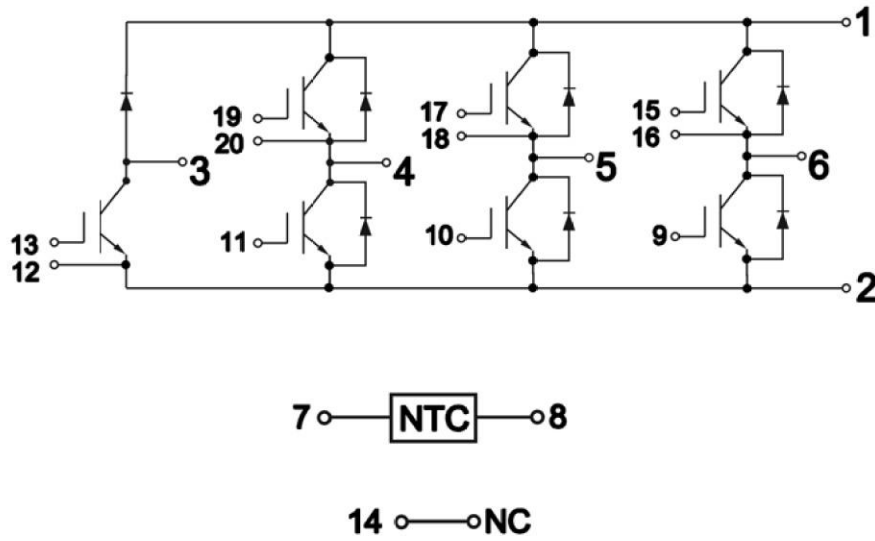


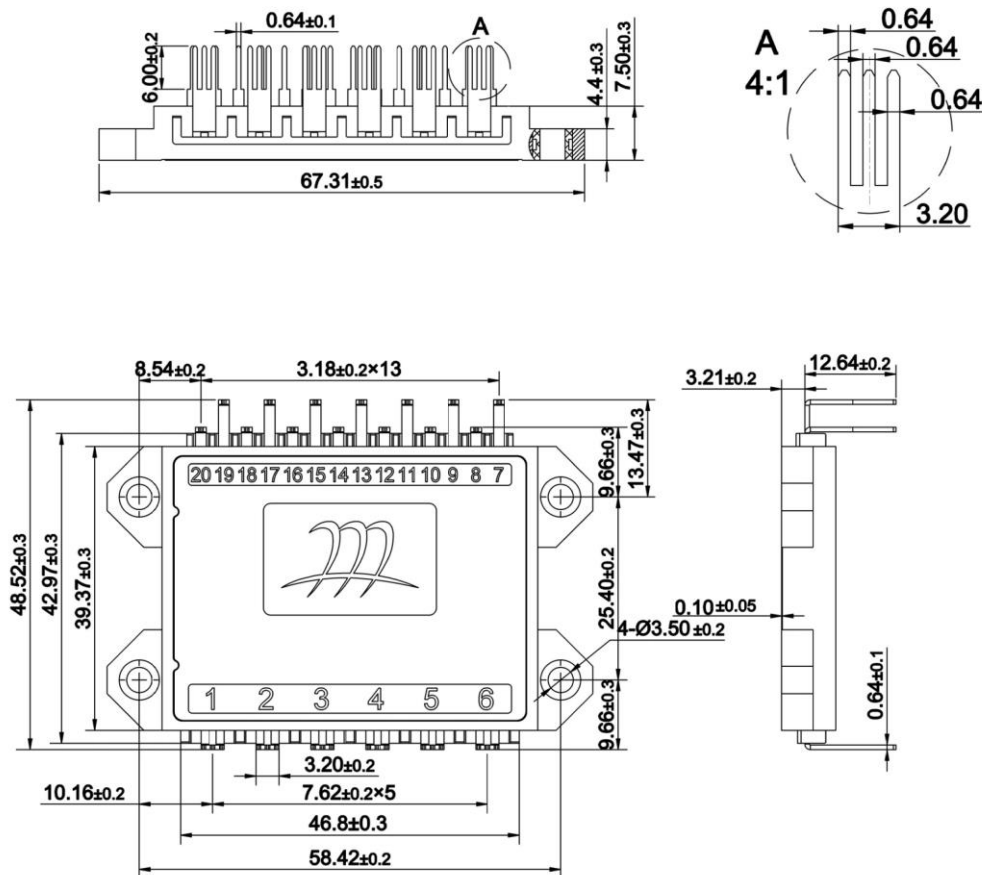
Fig.15 NTC Temperature Characteristics



Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
07/21/2023	01	Initial Release
05/15/2024	02	Update Outlines

Announcements

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