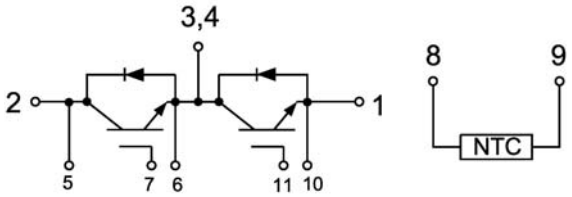
GT450HF120T9H-M

IGBT Module

Features：

- Trench & Field Stop IGBT
- Short Circuit Rated>10μs
- Low Switching Loss
- 100% RBSOA Tested(2×Ic)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications：

- Hybrid Electrical Vehicles(H)EV
- Automotive Applications
- Commercial Agriculture Vehicles
- Motor Drives

IGBT, Inverter
Maximum Rated Values

V_{CES}	Collector-Emitter Blocking Voltage	T_J=25℃	1200	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current	T_C=100℃	450	A
		T_C=25℃	870	A
I_{CM}	Peak Collector Current Repetitive	tp=1ms	900	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃ T_{Jmax}=175℃	2940	W

Electrical Characteristics of IGBT

Static Characteristics

Symbol	Description	Conditions		Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=6mA, V_{CE}=V_{GE}, T_J=25℃		5.0	5.5	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=450A, V_{GE}=15V	T_J=25℃		1.70	1.90	V
			T_J=125℃		1.90		V
			T_J=150℃		2.00		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℃				800	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V , f =100kHz, T_J=25℃			35.81		nF
C_{oes}	Output Capacitance				2.63		nF
C_{res}	Reverse Transfer Capacitance				1.29		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=600V,I_C=450A, R_{Gon} =1Ω,V_{GE}=±15V, Inductive Load	T_J=25℃		0.44		μs
			T_J=125℃		0.45		
			T_J=150℃		0.47		
t_r	Rise Time		T_J=25℃		0.15		μs
			T_J=125℃		0.16		
			T_J=150℃		0.16		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=600V,I_C=450A, R_{Goff} =1Ω,V_{GE}=±15V, Inductive Load	T_J=25℃		0.44		μs
			T_J=125℃		0.46		
			T_J=150℃		0.48		
t_f	Fall Time		T_J=25℃		0.12		μs
			T_J=125℃		0.17		
			T_J=150℃		0.18		
E_{on}	Turn-on Switching Loss	V_{CC}=600V,I_C=450A, R_{Gon} =1Ω,V_{GE}=±15V, di/dt=2340A/μs (T_J=150℃) Inductive Load	T_J=25℃		16.5		mJ
			T_J=125℃		24.5		
			T_J=150℃		26.5		

E_{off}	Turn-off Switching Loss	V_{CC}=600V,I_C=450A, R_{Goff} =1Ω,V_{GE}= ±15V, du/dt=3190V/μs (T_J=150℃) Inductive Load	T_J=25℃		45.9		mJ
			T_J=125℃		58.9		
			T_J=150℃		62.5		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		2.34		uC
$R_{g\ internal}$	Internal Gate Resistance		T_J=25℃		1.67		Ω
RBSOA	I_C=900A,V_{CC}=1050V,Vp=1200V, R_{Goff} = 1Ω, V_{GE}=+15V to 0V, T_J=150°C			Trapezoid			
I_{SC}	SC Data	V_{CC}=600V tp=10us V_{GE}=±15V, R_{Gon}=1ohm, R_{Goff}=1ohm,T_J=150℃			2280		A
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-To-Case(per leg)					0.051	℃/W

Maximum Rated Values of Diode

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	1200	V
I_F	Diode Continuous Forward Current		450	A
I_{FM}	Diode Maximum Forward Current	tp=1ms	900	A
I^2t	I²t - Value	V_R=0V, t_P=10ms,T_J=125℃	36500	A^2s
		V_R=0V, t_P=10ms,T_J=150℃	29000	A^2s

Electrical Characteristics of Diode

Symbol	Description	Conditions		Min	Typ	Max	Unit
V_{FM}	Forward Voltage	I_F=450A	T_J=25℃		1.50		V
			T_J=125℃		1.50		
			T_J=150℃		1.50		
t_{rr}	Reverse Recovery Time	I_F=450A, -diF/dt=2610A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		0.45		μs
			T_J=125℃		0.65		
			T_J=150℃		0.74		
I_{rr}	Peak Reverse Recovery Current		T_J=25℃		305		A
			T_J=125℃		352		
			T_J=150℃		366		

Q_{rr}	Reverse Recovery Charge	I_F=450A, -diF/dt=2610A/μs(T_J=150℃), V_R=600V, V_{GE}=-15V	T_J=25℃		72		μC
			T_J=125℃		114		
			T_J=150℃		132		
E_{rec}	Reverse Recovery Energy		T_J=25℃		35.1		mJ
			T_J=125℃		56.3		
			T_J=150℃		64.7		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)					0.097	℃/W

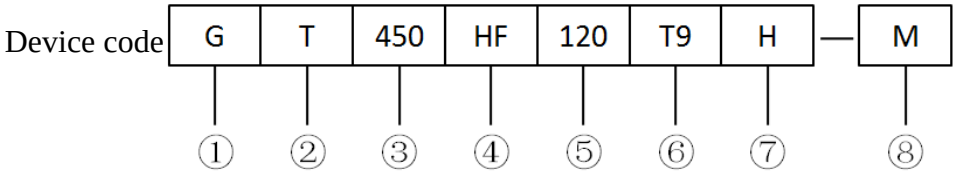
Internal NTC-Thermistor Characteristics

R_{25}	T_C =25℃	5		kΩ
△R/R	T_C =100℃，R_{100} =481Ω		±5	%
P_{25}	T_C =25℃	50		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

Module

Symbol	Description		Min	Typ	Max	Unit
V_{iso}	Isolation Voltage (All Terminals Shorted)	f = 50Hz, 1minute	2500			V
L_{sCE}	Stray Inductance Module			20		nH
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			
$R_{\theta CS}$	Case-To-Sink Thermally (Conductive Grease Applied)				0.02	℃/W
M	Power Terminals Screw:M5		3.0		5.0	N·m
M	Mounting Screw:M6		4.0		6.0	N·m
G	Weight			330		g

Ordering Information Table



① - IGBT Module
② - Field Stop Trench Gate IGBT
③ - Rated Current (450=450A)
④ - Circuit Configuration (Half Bridge)
⑤ - Rated Voltage (120=1200V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)
⑧ - Internal Control Code

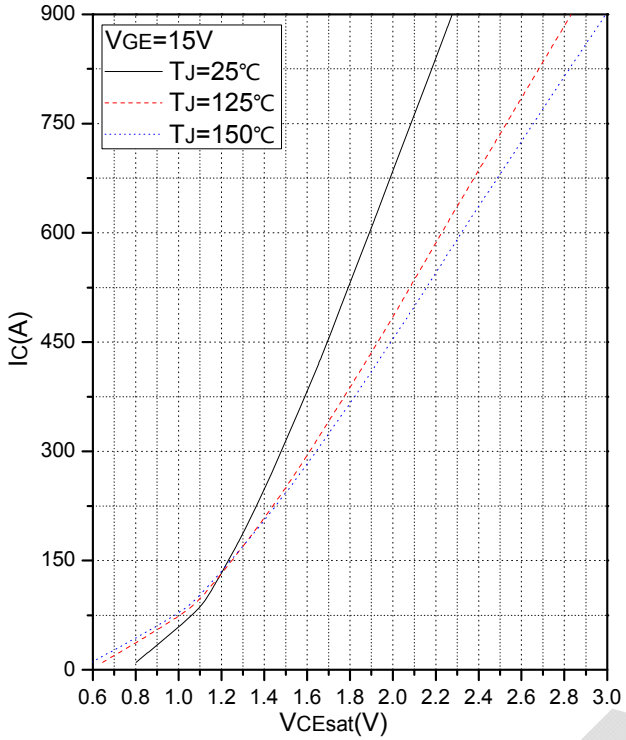


Fig.1 Typical Saturation Voltage Characteristics

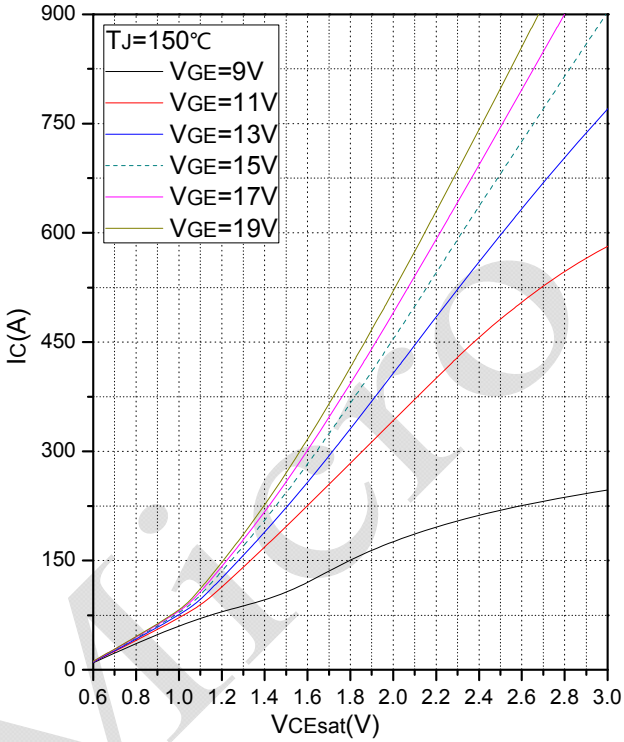


Fig.2 Typical Output Characteristics

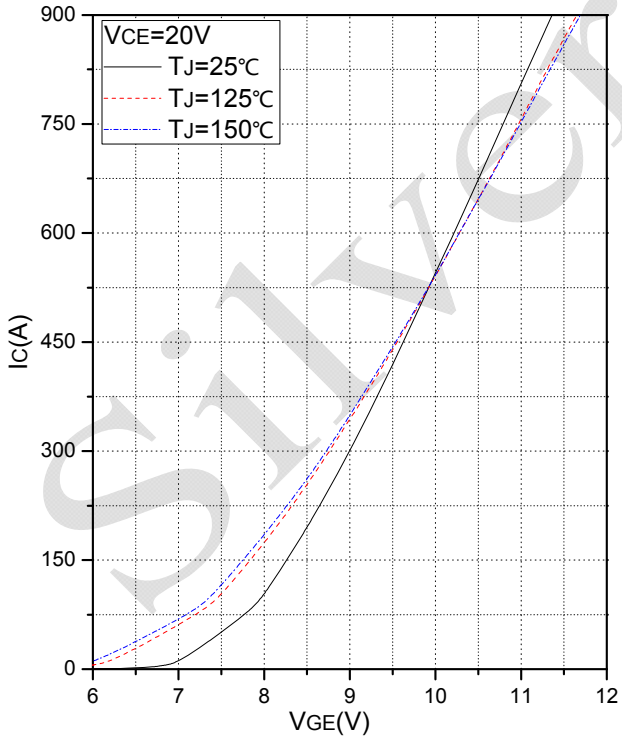


Fig.3 Transfer Characteristic

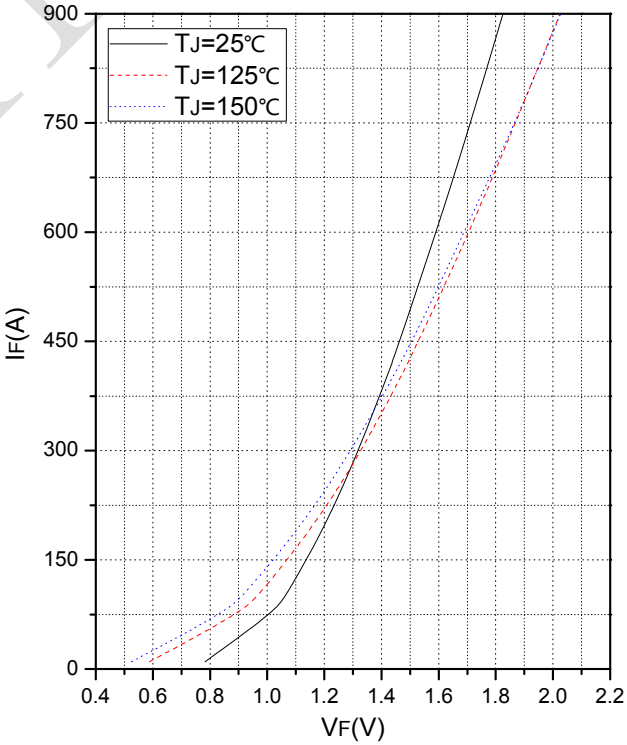


Fig.4 Forward Characteristics of Diode

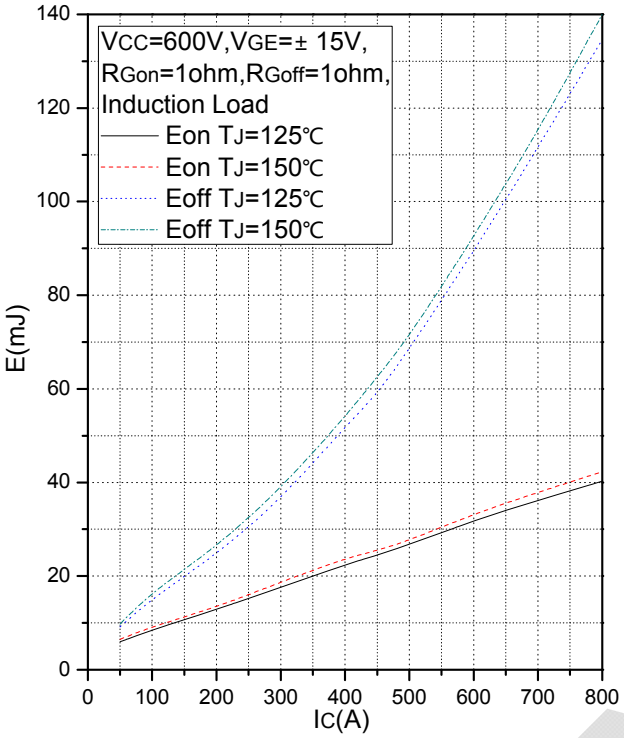


Fig.5 Typical Switching Loss vs. Collector Current

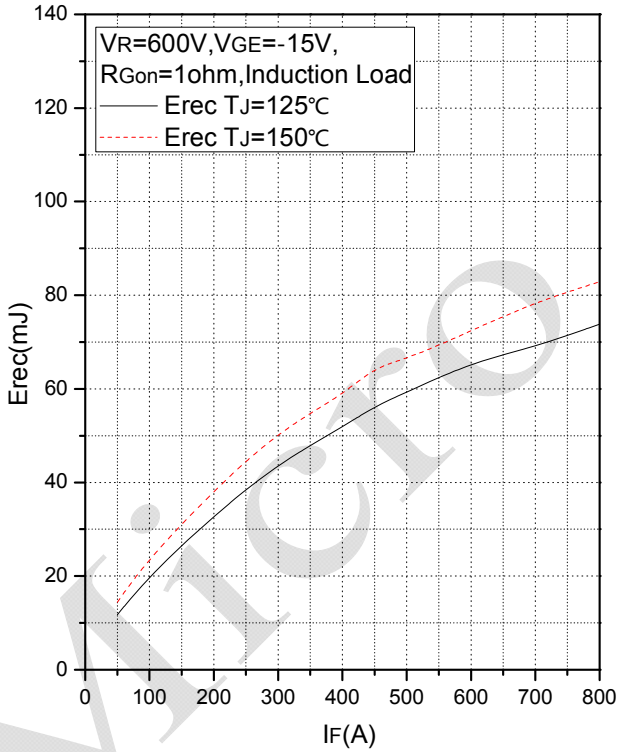


Fig.6 Typical Switching Loss vs. Forward Current

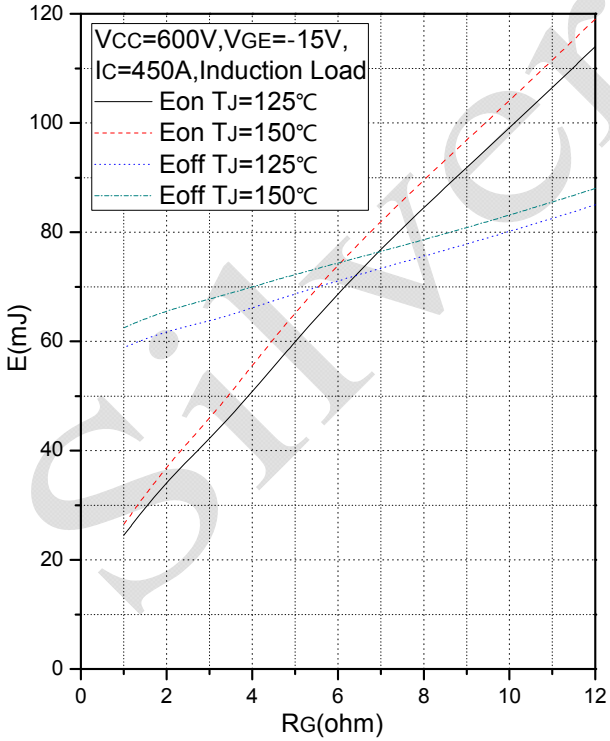


Fig.7 Typical Switching Loss vs. Gate Resistance

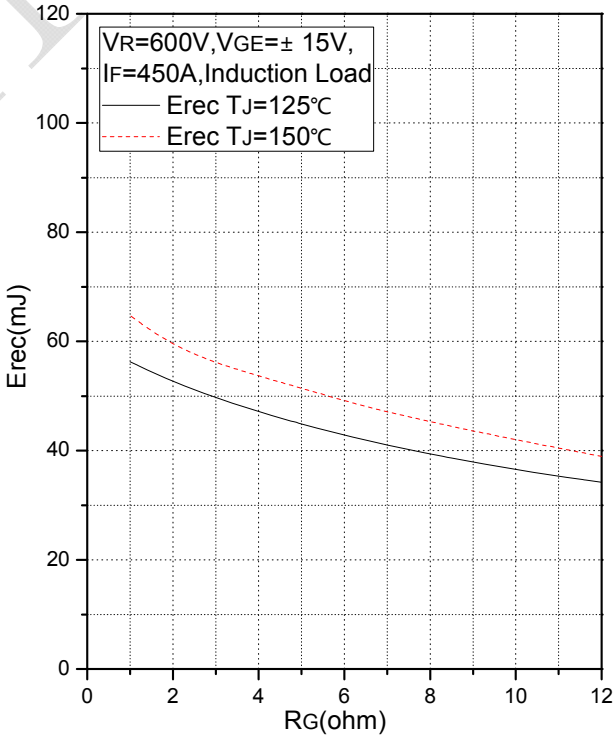


Fig.8 Typical Switching Loss vs. Gate Resistance

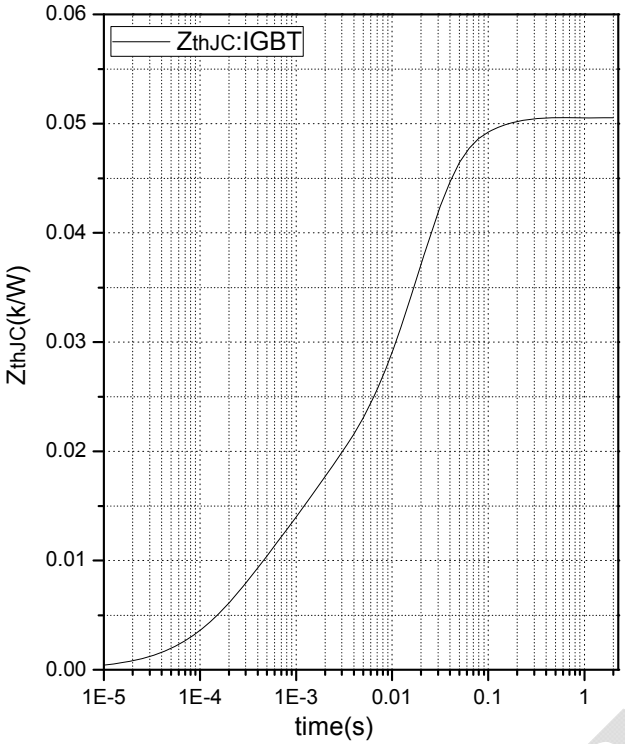


Fig.9 Transient Thermal Impedance (IGBT)

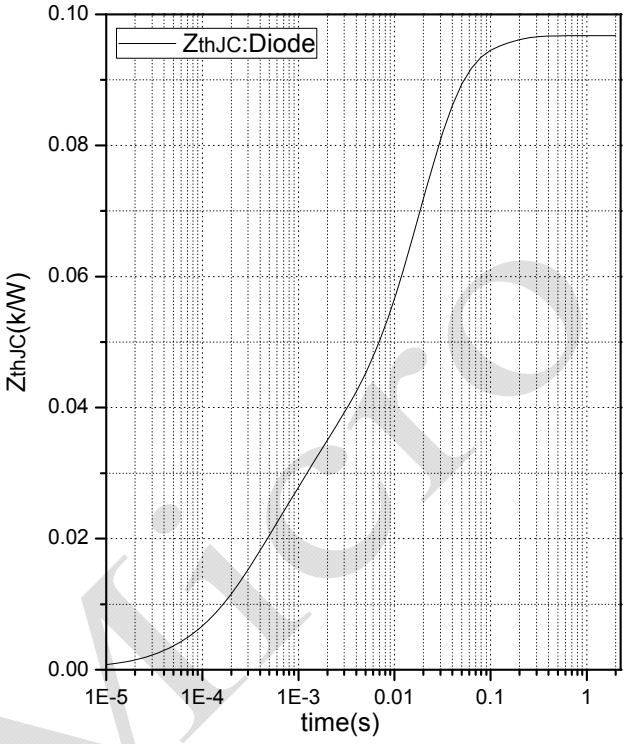


Fig.10 Transient Thermal Impedance (Diode)

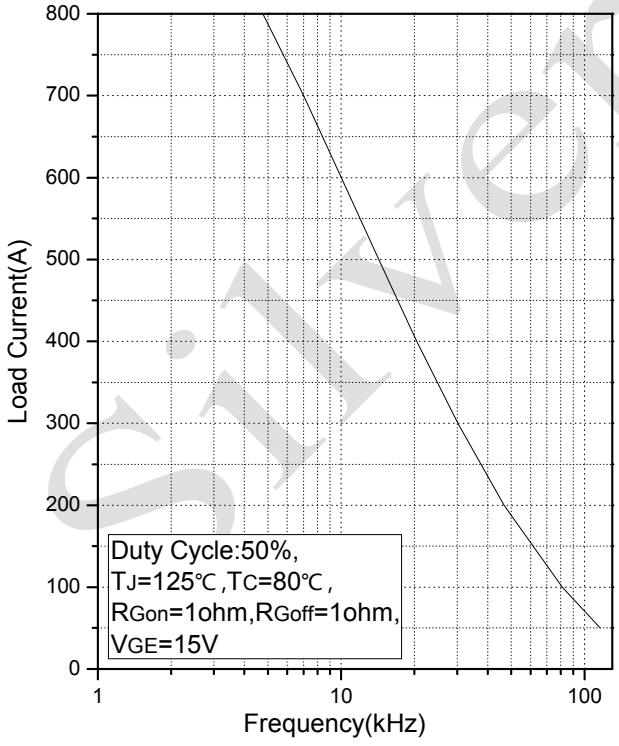


Fig.11 Typical Load Current vs. Frequency

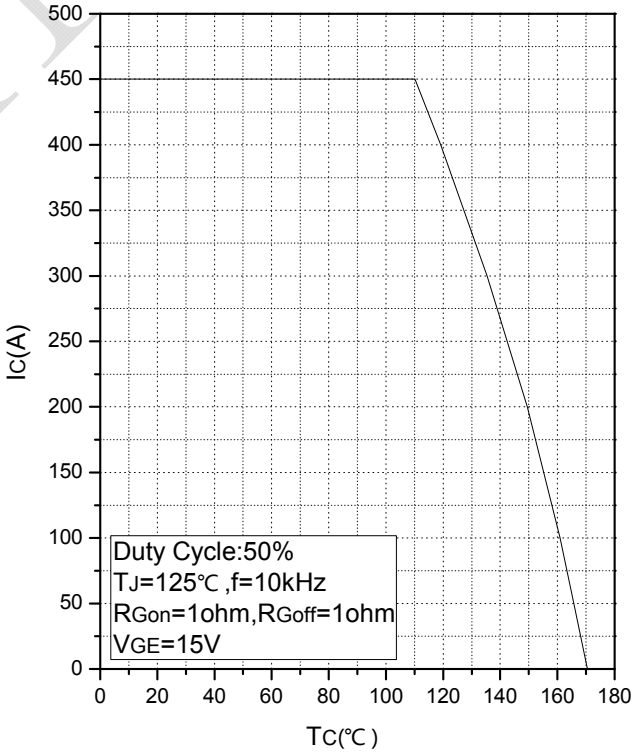


Fig.12 Rated Current vs. Temperature

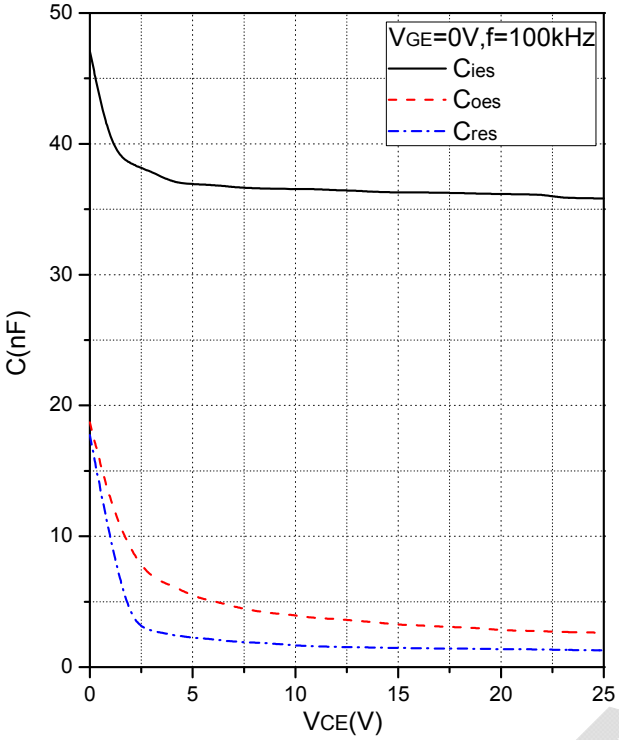


Fig.13 Capacitance Characteristics

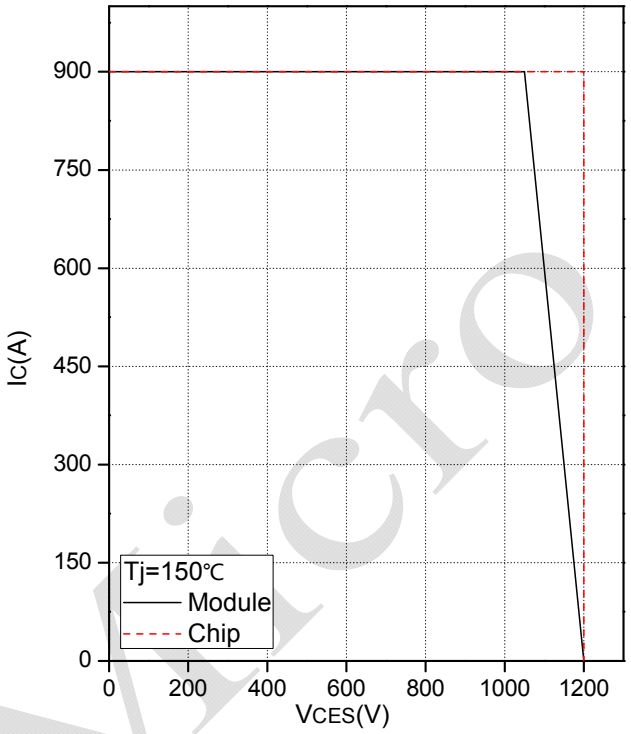


Fig.14 Reverse Bias Safe Operation Area (RBSOA)

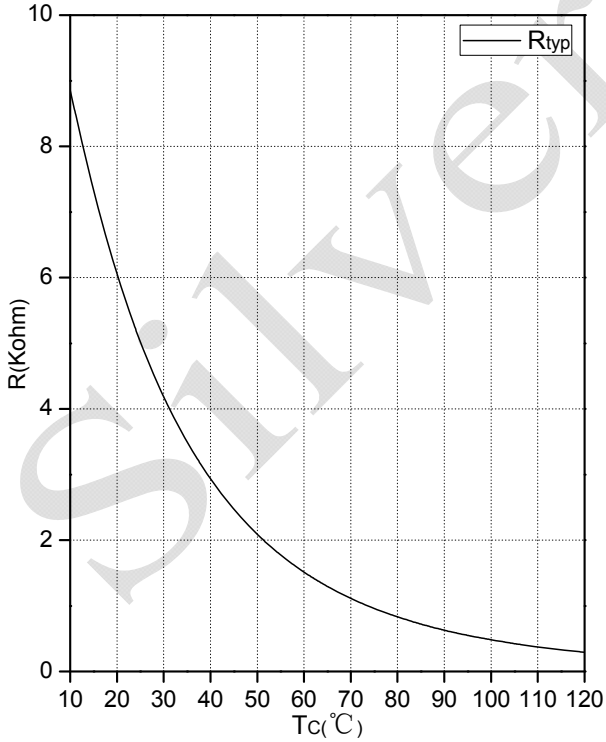
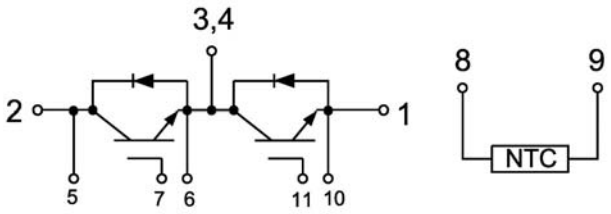
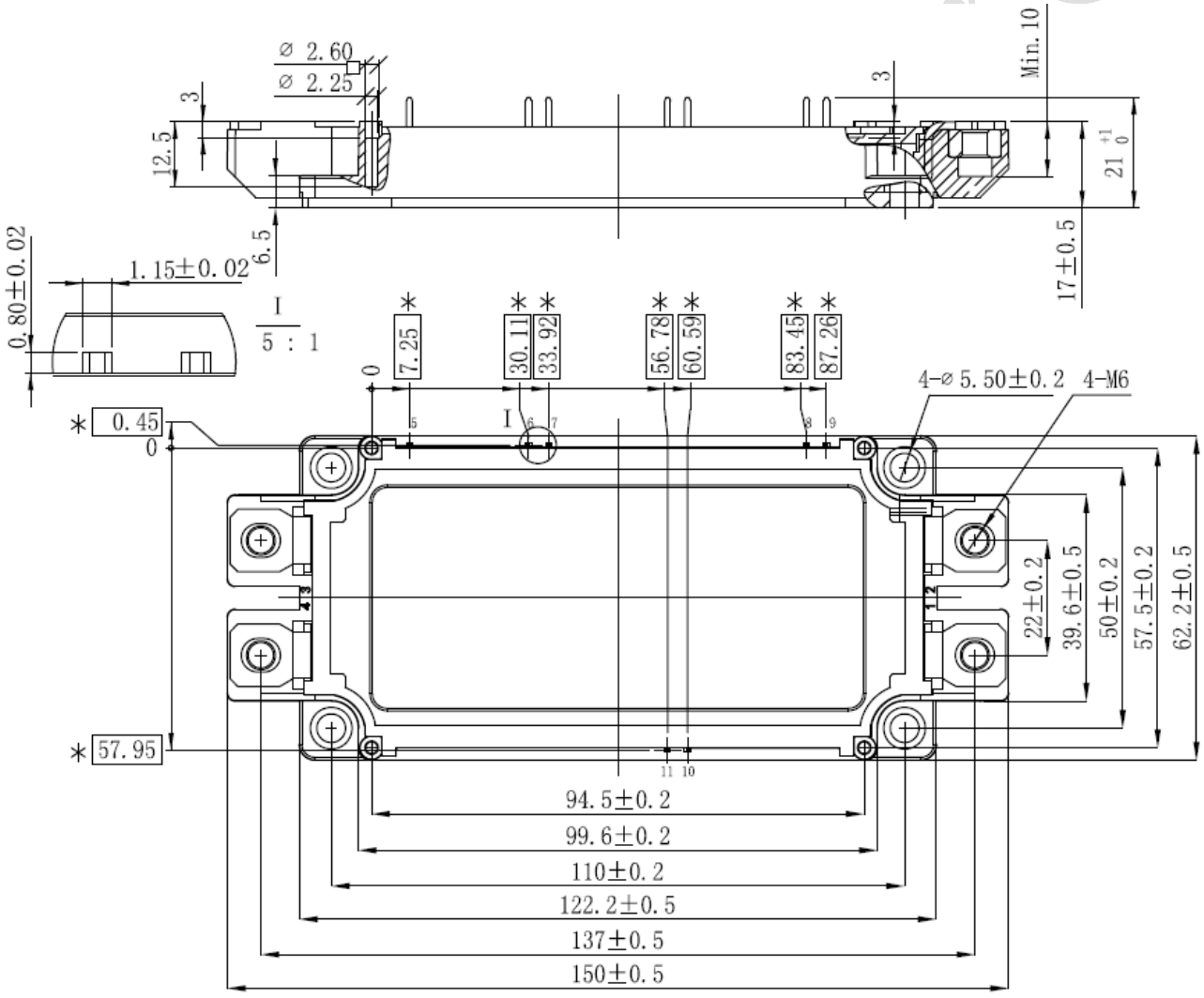


Fig.15 NTC Temperature Characteristics

Internal Circuit:



Package Outline (Unit: mm):



Date	Revision	Notes
11/29/2017	01	Initial Release
01/21/2019	02	Add Test Data @T_J=150℃
08/11/2022	A	Final Version

Announcement

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