



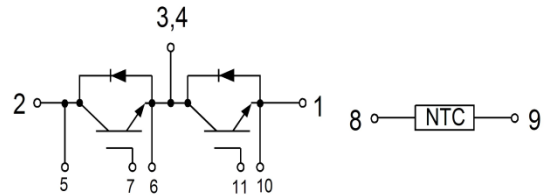
GT450HF120T9H

IGBT Module

Features:

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

Circuit Diagram



Applications:

- Hybrid Electrical Vehicles(H)EV
- Automotive Applications
- Commercial Agriculture Vehicles
- 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	$T_C=100^{\circ}\text{C}$	450	A
		$T_C=25^{\circ}\text{C}$	900	A
I_{CM}	Peak Collector Current Repetitive	$T_J=175^{\circ}\text{C}$	900	A
t_{SC}	Short Circuit Withstand Time		>10	μs
P_D	Maximum Power Dissipation (per leg)	$T_C=25^{\circ}\text{C}$ $T_{Jmax}=150^{\circ}\text{C}$	2155	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	$I_C=18\text{mA}$, $V_{CE}=V_{GE}$	5.0	6.0	6.6	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=450\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.75	2.00	V
			$T_J=125^\circ\text{C}$	2.20		V
			$T_J=150^\circ\text{C}$	2.30		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^\circ\text{C}$			1000	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		65.55		nF
C_{oes}	Output Capacitance			2.47		nF
C_{res}	Reverse Transfer Capacitance			1.28		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=600\text{V}$, $I_C=450\text{A}$, $R_{Gon}=1\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.68		μs
			$T_J=125^\circ\text{C}$	0.71		
			$T_J=150^\circ\text{C}$	0.70		
t_r	Rise Time	$V_{CC}=600\text{V}$, $I_C=450\text{A}$, $R_{Gon}=1\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.21		μs
			$T_J=125^\circ\text{C}$	0.22		
			$T_J=150^\circ\text{C}$	0.22		
$t_{d(off)}$	Turn-off Delay Time	$V_{CC}=600\text{V}$, $I_C=450\text{A}$, $R_{Goff}=1\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.62		μs
			$T_J=125^\circ\text{C}$	0.68		
			$T_J=150^\circ\text{C}$	0.68		
t_f	Fall Time	$V_{CC}=600\text{V}$, $I_C=450\text{A}$, $R_{Goff}=1\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.20		μs
			$T_J=125^\circ\text{C}$	0.22		
			$T_J=150^\circ\text{C}$	0.22		
E_{on}	Turn-on Switching Loss	$V_{CC}=600\text{V}$, $I_C=450\text{A}$, $R_{Gon}=1\Omega$, $V_{GE}=\pm 15\text{V}$, $di/dt=1730\text{A}/\mu\text{s}$ ($T_J=150^\circ\text{C}$) Inductive Load	$T_J=25^\circ\text{C}$	33.7		mJ
			$T_J=125^\circ\text{C}$	42.0		
			$T_J=150^\circ\text{C}$	47.0		



E _{off}	Turn-off Switching Loss	V _{CC} =600V, I _C =450A, R _{Goff} =1Ω, V _{GE} =±15V, du/dt=5350V/μs (T _J =150°C) Inductive Load	T _J =25°C	52.3	mJ
			T _J =125°C	57.8	
			T _J =150°C	60.2	
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C	4.35	μC
R _{g internal}	Internal Gate Resistor		T _J =25°C	1	Ω
RBSOA	I _C =900A, V _{CC} =1050V, V _p =1200V, R _G =1Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid	
SCSOA	V _{CC} =600V, V _{GE} =±15V, R _{Gon} =4.7 Ω, R _{Goff} =4.7Ω, t _p =10us, T _J =150°C			2850	A
R _{θJC}	IGBT Thermal Resistance: Junction-to-Case(per leg)				0.058 °C/W

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

V _{RRM}	Repetitive Peak Reverse Voltage		1200	V
I _F	Diode Continuous Forward Current		450	A
I _{FM}	Diode Maximum Forward Current		900	A
I ² t	I ² t - Value	V _R =0V, t _p =10ms, T _J =125°C	36500	A ² s
		V _R =0V, t _p =10ms, T _J =150°C	29000	A ² s

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

Symbol	Description	Conditions	Min.	Typ.	Max.	Units
V _{FM}	Forward Voltage	I _F =450A	T _J =25°C	1.80		V
			T _J =125°C	1.95		
			T _J =150°C	1.95		
t _{rr}	Reverse Recovery Time	I _F =450A, -di _F /dt=2030A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C	0.29		μs
			T _J =125°C	0.47		
			T _J =150°C	0.52		
I _{rr}	Peak Reverse Recovery Current	I _F =450A, -di _F /dt=2030A/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C	211		A
			T _J =125°C	263		
			T _J =150°C	277		



Q _{rr}	Reverse Recovery Charge	I _F =450A, -diF/dt=2030/μs(T _J =150°C), V _R =600V, V _{GE} =-15V	T _J =25°C		32.4		μC
			T _J =125°C		68.7		
			T _J =150°C		78.90		
E _{rec}	Reverse Recovery Energy		T _J =25°C		14.13		mJ
			T _J =125°C		33.18		
			T _J =150°C		38.30		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case (per leg)				0.086		°C/W

Internal NTC-Thermistor Characteristics

Symbol	Description		Min.	Typ.	Max.	Units.
R ₂₅	Rated Resistance	T _C =25°C		5		kΩ
ΔR/R	Deviation of R100	T _C =100°C, R ₁₀₀ =481Ω	-5		5	%
P ₂₅	Power Dissipation	T _C =25°C			10	mW
B _{25/50}	B-Value	$R_2=R_{25} \exp[B_{25/50}(1/T_2-1/(298.15K))]$		3380		K
B _{25/80}	B-Value	$R_2=R_{25} \exp[B_{25/80}(1/T_2-1/(298.15K))]$		3440		K



Module

Symbol	Description		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
Internal Isolation			Al ₂ O ₃			
Material of Module Baseplate			Copper			
L _{sCE}	Stray Inductance Module			20		nH
T _J	Maximum Junction Temperature				175	°C
T _{JOP}	Maximum Operating Junction Temperature Range		-40		+150	°C
T _{stg}	Storage Temperature		-40		+150	°C
CTI	Comparative Tracking Index		200			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)				0.02	°C/W
M	Terminals Connection Torque	Screw M6-Mounting according to valid application note	3.0		6.0	N·m
M	Mounting Torque for Module Mounting	Screw M5--Mounting according to valid application note	3.0		6.0	N·m
G	Weight			330		g

Ordering Information Table

Device code	G	T	450	HF	120	T9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench, Low Switching Losses 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)

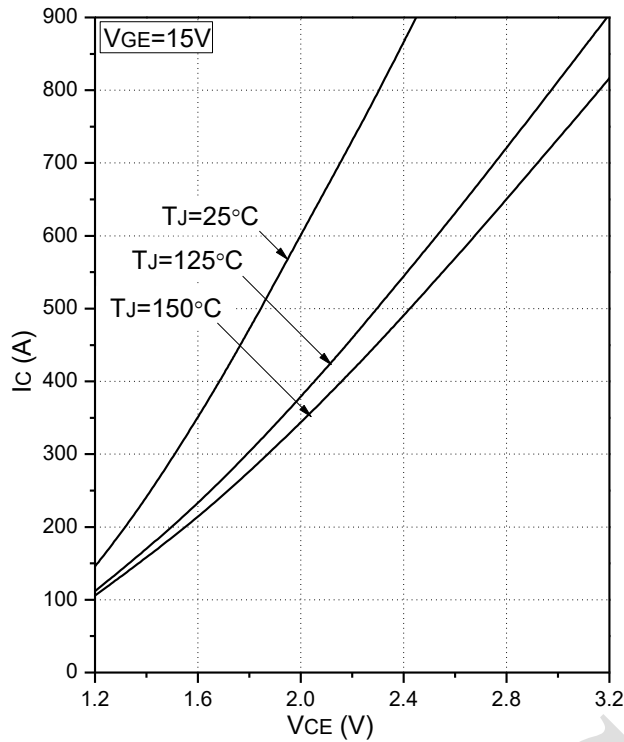


Fig.1 Typical Saturation Voltage Characteristics

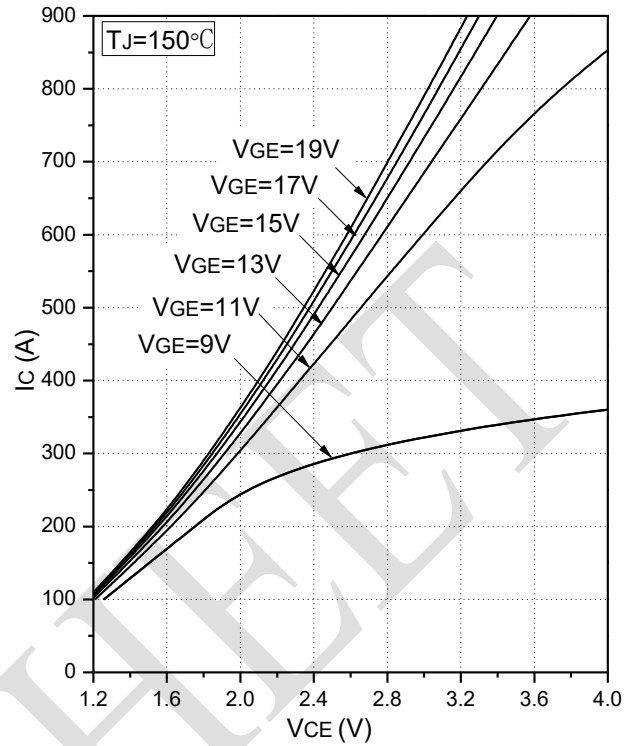


Fig.2 Typical Output Characteristics

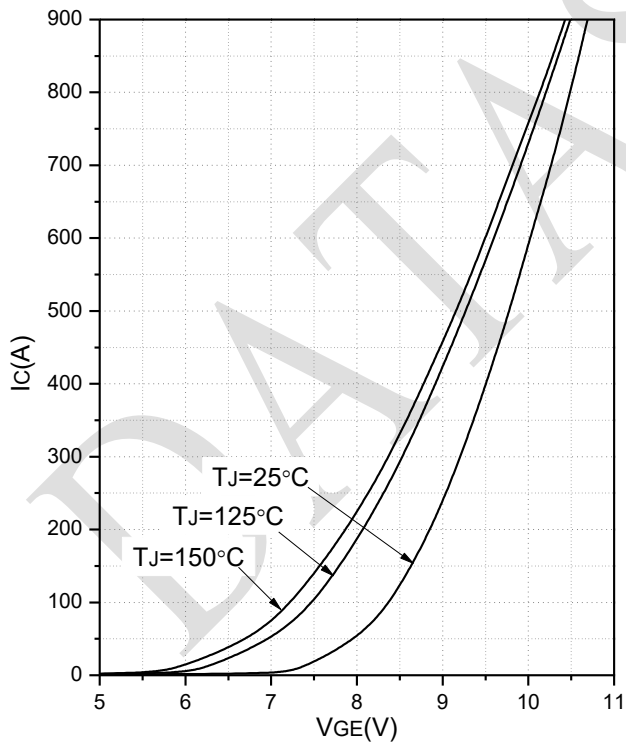


Fig.3 Transfer Characteristic

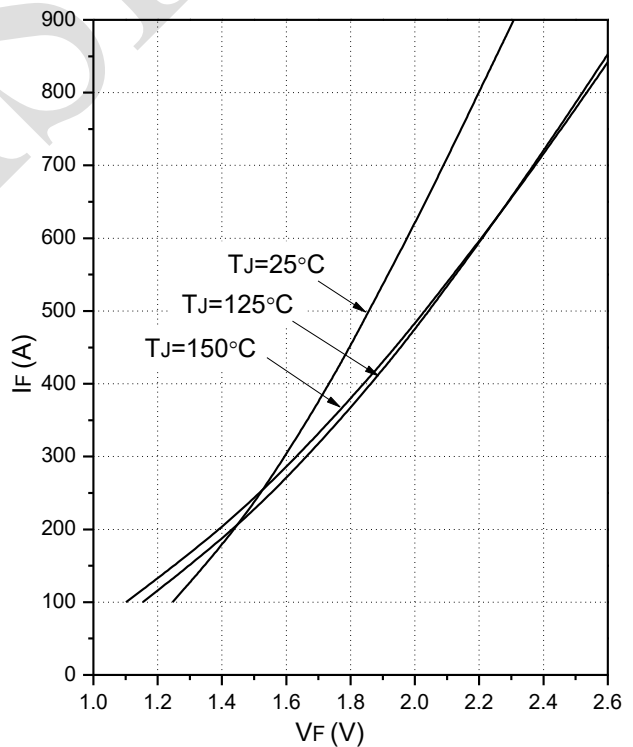


Fig.4 Forward Characteristics of Diode

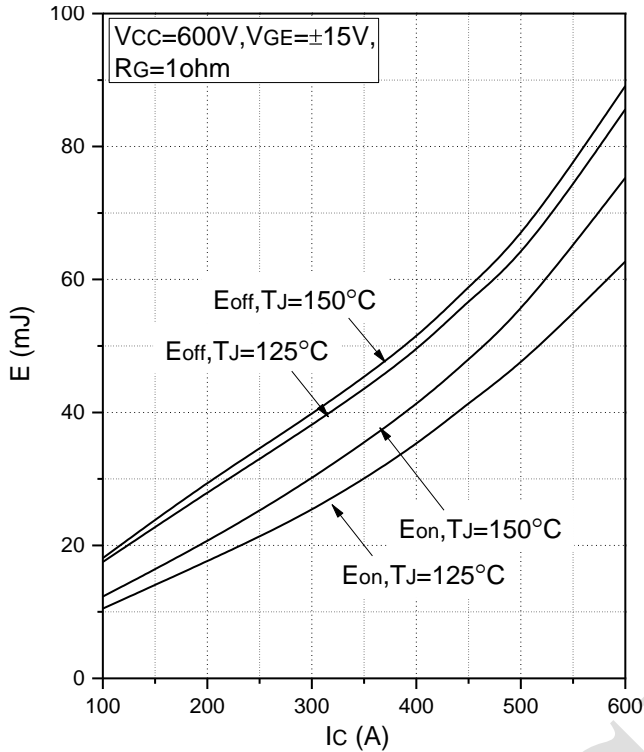


Fig.5 Typical Switching Loss vs. Collector Current

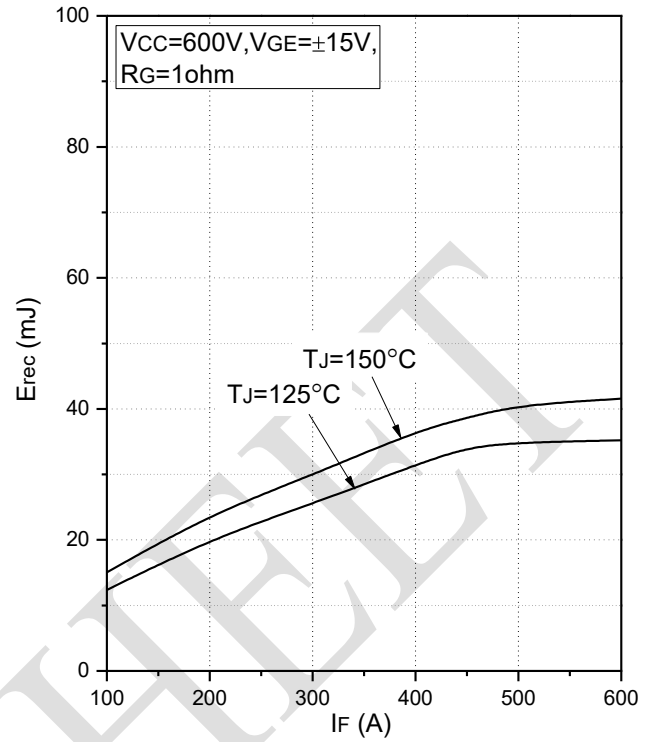


Fig.6 Typical Switching Loss vs. Forward Current

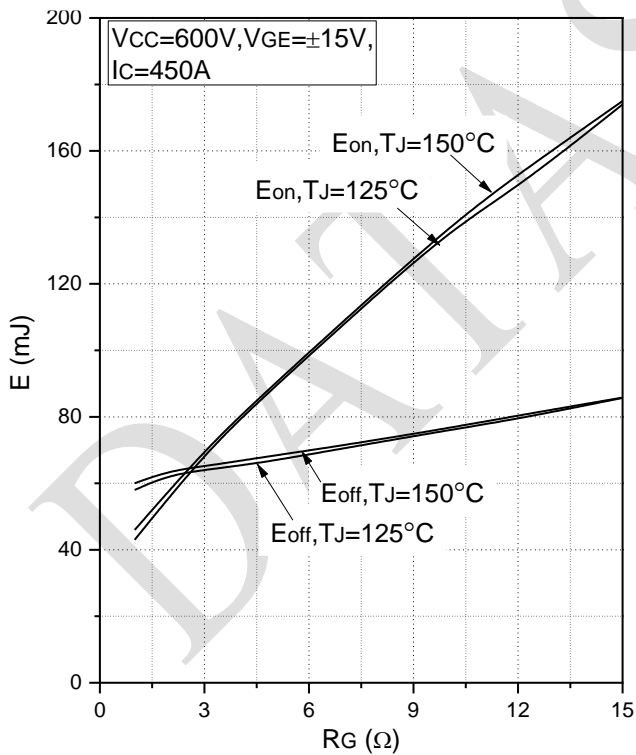


Fig.7 Typical Switching Loss vs. Gate Resistance

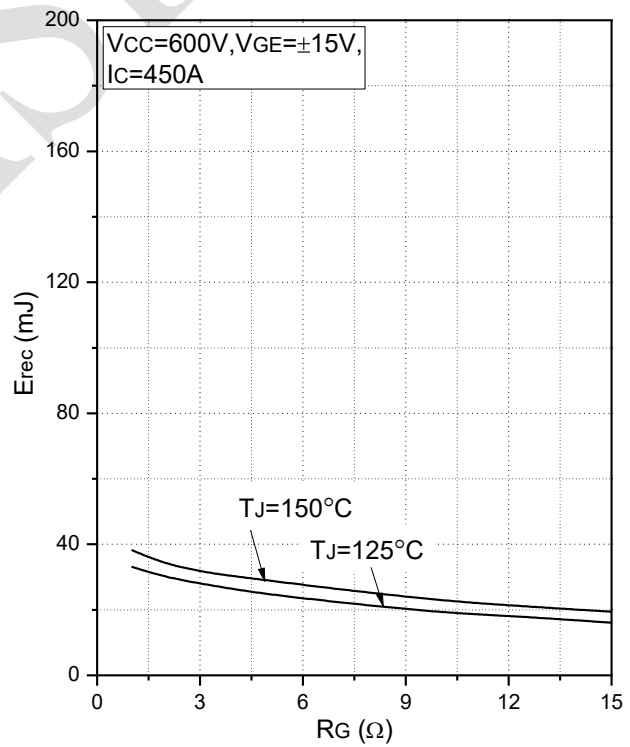
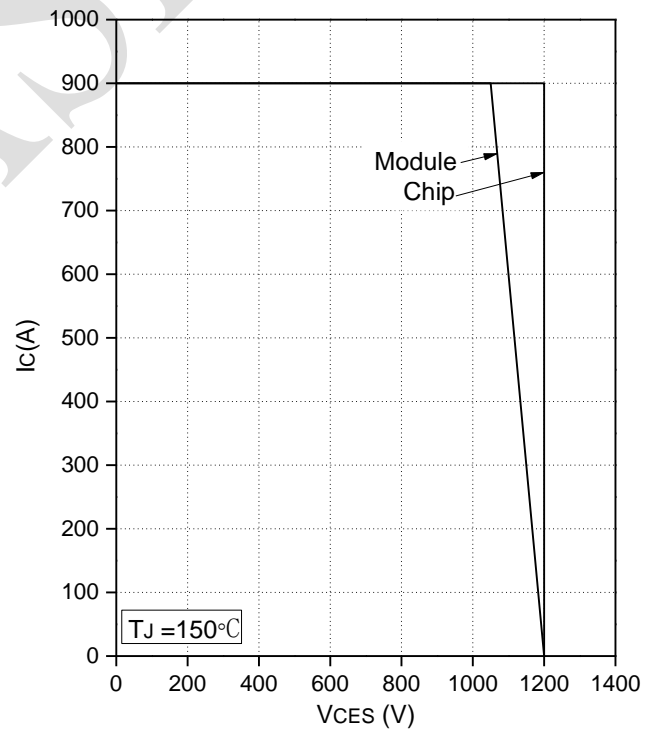
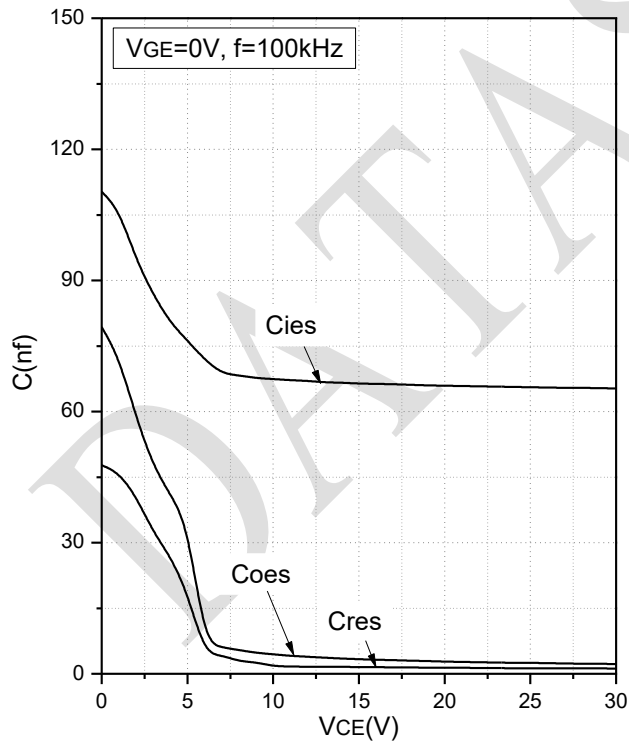
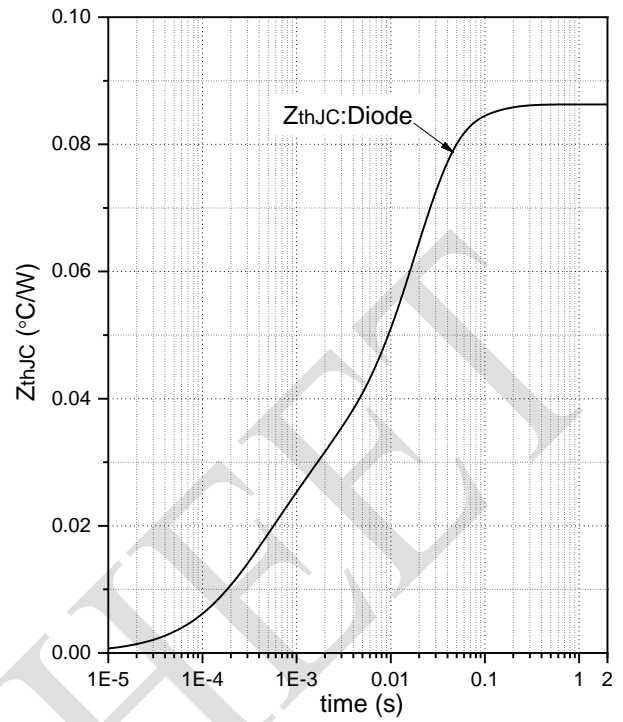
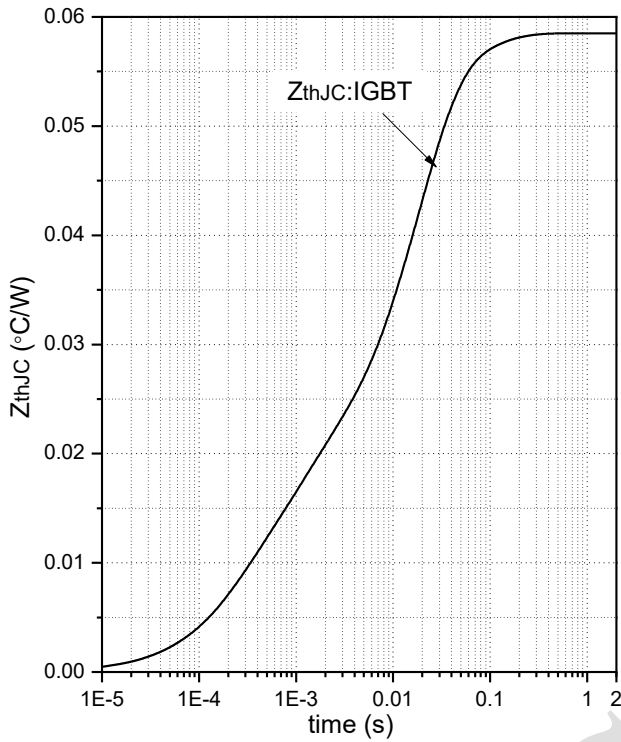


Fig.8 Typical Switching Loss vs. Gate Resistance



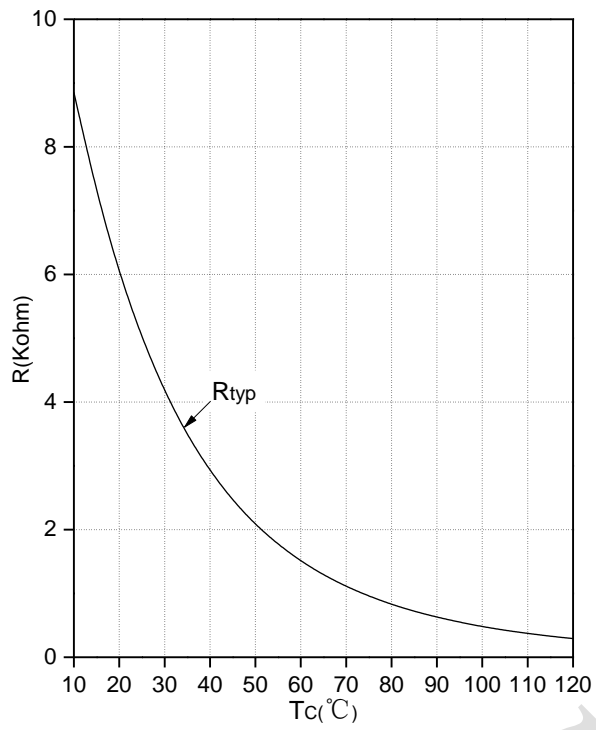
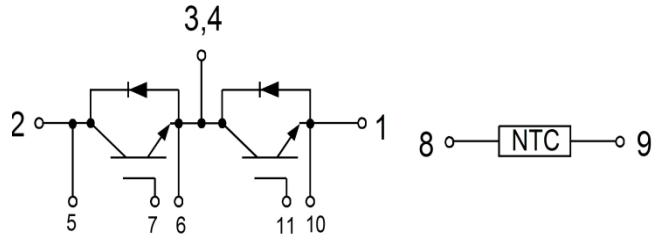


Fig.13 NTC Temperature Characteristics

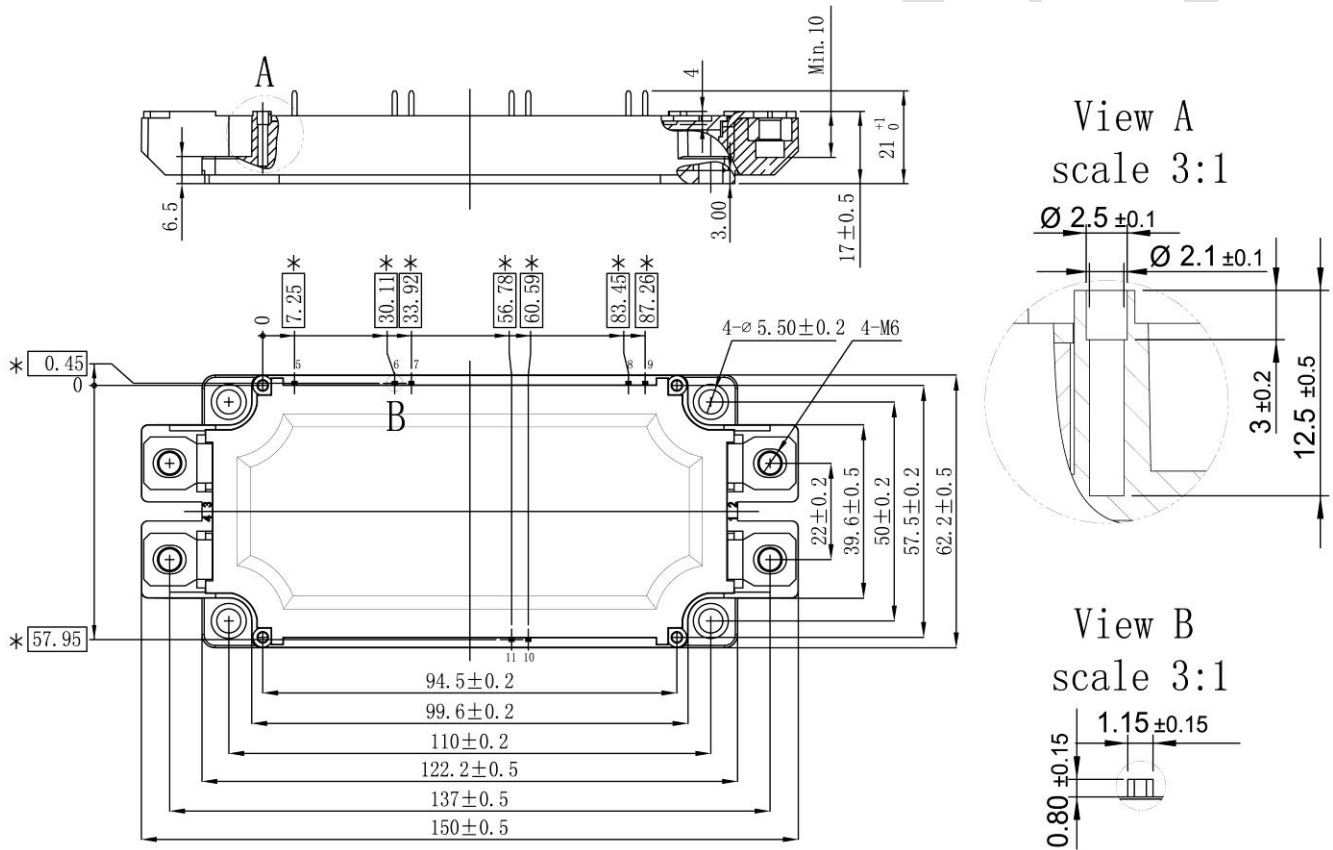
DATA SHEET



Internal Circuit:



Package Outline (Unit: mm):





Date	Revision	Notes
11/24/2022	A	Final Version
12/15/2022	B	Add '12t' Value

Announcements

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