

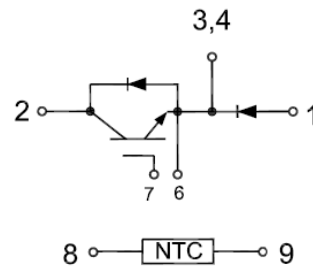
GT600CL65T9H-M

IGBT Module

Preliminary Data

Features:

- Field Stop Trench Gate IGBT
- Short Circuit Rated $> 10\mu\text{s}$
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested ($2 \times I_c$)
- Copper Wire Bonding on Power Terminal
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement



Applications:

- UPS
- Servo Applications
- High Power Converters
- Motor Drives
- Wind Turbines

IGBT, Brake-Chopper

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

V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		± 20	V
I_C	Continuous Collector Current	$T_C = 100^\circ\text{C}$	600	A
		$T_C = 25^\circ\text{C}$	1200	A
I_{CM}	Peak Collector Current Repetitive	$T_J = 175^\circ\text{C}$	1200	A
t_{SC}	Short Circuit Withstand Time		> 10	μs
P_D	Maximum Power Dissipation (IGBT)	$T_C = 25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	2450	W

Electrical Characteristics of IGBT ($T_C=25^\circ\text{C}$ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C=12\text{mA}$, $V_{CE}=V_{GE}$	5.00	5.90	6.80	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=600\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^\circ\text{C}$	1.50	1.70	V
			$T_J=125^\circ\text{C}$	1.70		V
			$T_J=150^\circ\text{C}$	1.70		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	$V_{GE}=\pm 20\text{V}$, $V_{CE}=0\text{V}$, $T_J=25^\circ\text{C}$			800	nA
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=1\text{MHz}$		44		nF
C_{oes}	output Capacitance			3.38		nF
C_{res}	Reverse Transfer Capacitance			1.81		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300\text{V}$, $I_C=600\text{A}$, $R_{Gon}=2\Omega$, $V_{GE}=\pm 15\text{V}$, Inductive Load	$T_J=25^\circ\text{C}$	0.52		μs
			$T_J=125^\circ\text{C}$	0.52		
			$T_J=150^\circ\text{C}$	0.53		
t_r	Rise Time		$T_J=25^\circ\text{C}$	0.37		μs
			$T_J=125^\circ\text{C}$	0.38		
			$T_J=150^\circ\text{C}$	0.39		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^\circ\text{C}$	0.46		μs
			$T_J=125^\circ\text{C}$	0.47		
			$T_J=150^\circ\text{C}$	0.48		
t_f	Fall Time	$T_J=25^\circ\text{C}$	0.21		μs	
		$T_J=125^\circ\text{C}$	0.24			
		$T_J=150^\circ\text{C}$	0.25			
E_{on}	Turn-on Switching Loss	$V_{CC}=300\text{V}$, $I_C=600\text{A}$, $R_{Gon}=2\Omega$, $V_{GE}=\pm 15\text{V}$, $di/dt=1350\text{A}/\mu\text{s}$ ($T_J=150^\circ\text{C}$) Inductive Load	$T_J=25^\circ\text{C}$	14.8		mJ
			$T_J=125^\circ\text{C}$	17.5		
			$T_J=150^\circ\text{C}$	18.8		

E _{off}	Turn-off Switching Loss	V _{CC} =300V, I _C =600A, R _{Goff} =2Ω, V _{GE} =±15V, du/dt=1766V/μs (T _J =150°C) Inductive Load	T _J =25°C	58.1	mJ
			T _J =125°C	62.8	
			T _J =150°C	65.6	
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C	3.77	μC
RBSOA	I _C =1200A, V _{CC} =600V, V _p =650V, R _{Goff} = 2Ω, V _{GE} =+15V to 0V, T _J =150°C			Trapezoid	
SCSOA	V _{CC} = 300V, V _{GE} = 15V, T _J = 150°C			10	μs
R _{θJC}	IGBT Thermal Resistance: Junction-To-Case(per leg)			0.061	°C/W

Diode, Reverse

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

V _{RRM}	Repetitive Peak Reverse Voltage	650	V
I _F	Diode Continuous Forward Current	450	A
I _{FM}	Diode Maximum Forward Current	900	A

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

Symbol	Description	Conditions	Min	Typ	Max	Unit	
V _{FM}	Forward Voltage	I _F =450A	T _J =25°C	1.40		V	
			T _J =125°C	1.45			
t _{rr}	Reverse Recovery Time	I _F =450A, -diF/dt =2100A/μs(T _J =125°C), V _R =300V, V _{GE} =-15V	T _J =25°C	0.21		μs	
			T _J =125°C	0.29			
I _{rr}	Peak Reverse Recovery Current		T _J =25°C	155		A	
			T _J =125°C	207			
Q _{rr}	Reverse Recovery Charge		T _J =25°C	12.8		μC	
			T _J =125°C	24.5			
E _{rec}	Reverse Recovery Energy		T _J =25°C	0.37		mJ	
			T _J =125°C	3.29			
R _{θJC}	Diode Thermal Resistance: Junction-To-Case (per leg)			0.122		°C/W	



Diode-Chopper
Maximum Rated Values of Brake-chopper Diode ($T_C=25^\circ\text{C}$ unless otherwise specified)

V_{RRM}	Repetitive Peak Reverse Voltage	650	V
I_F	Diode Continuous Forward Current	600	A
I_{FM}	Diode Maximum Forward Current	1200	A

Electrical Characteristics of Diode ($T_C=25^\circ\text{C}$ unless otherwise specified)

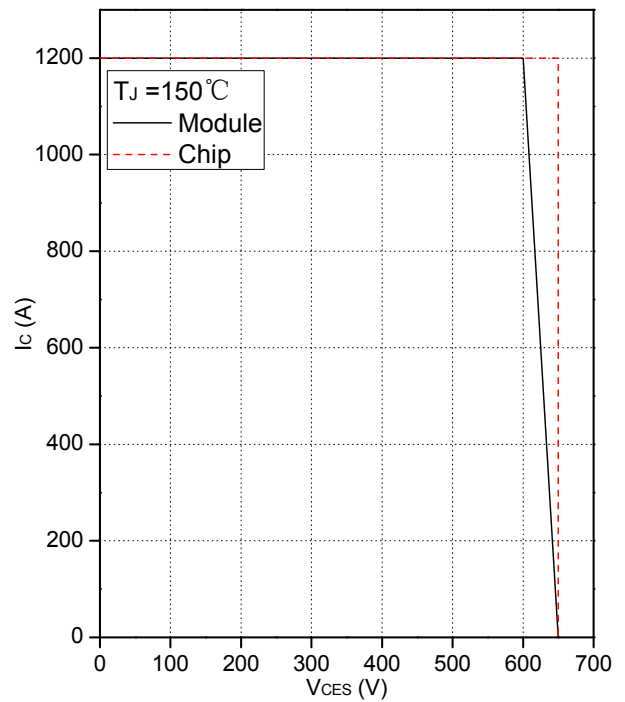
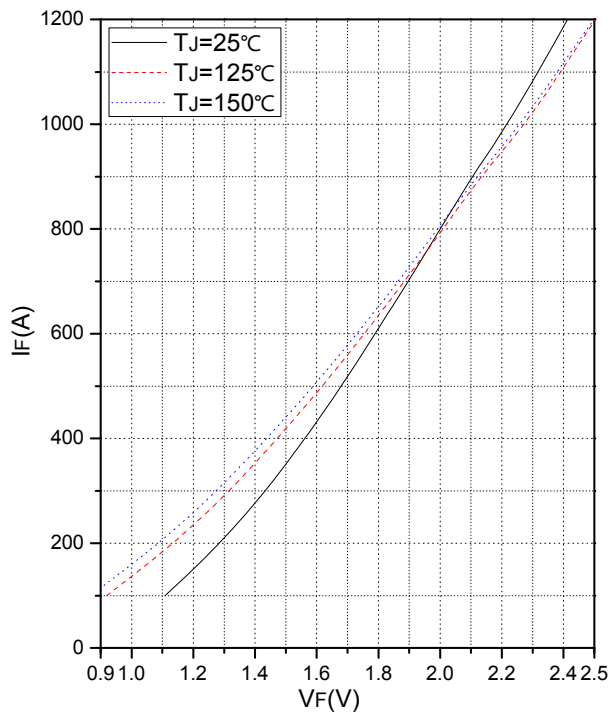
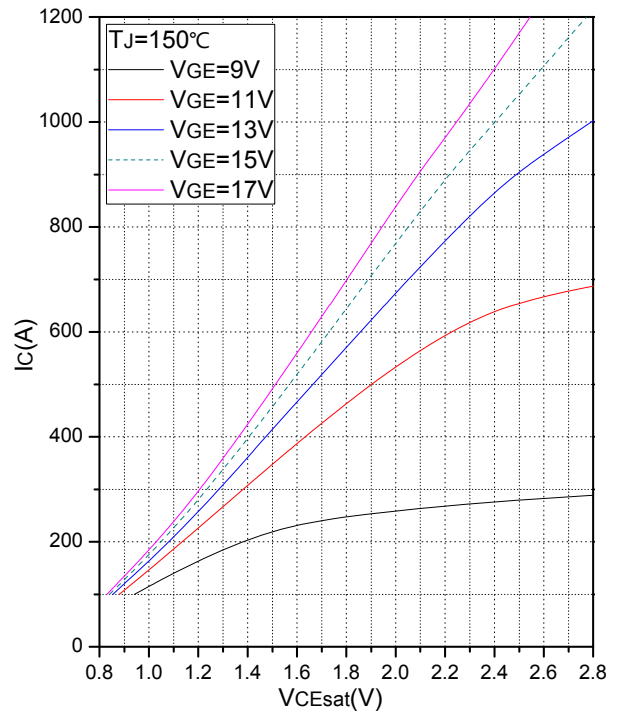
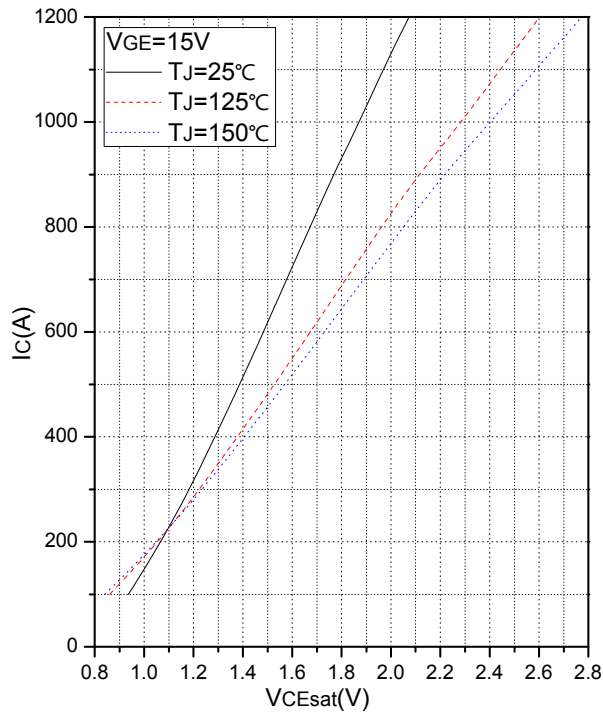
Symbol	Description	Conditions	Min	Typ	Max	Unit
V_{FM}	Forward Voltage	$I_F=600\text{A}$	$T_J=25^\circ\text{C}$	1.80		V
			$T_J=125^\circ\text{C}$	1.75		
			$T_J=150^\circ\text{C}$	1.70		
t_{rr}	Reverse Recovery Time		$T_J=25^\circ\text{C}$	0.19		μs
			$T_J=125^\circ\text{C}$	0.27		
			$T_J=150^\circ\text{C}$	0.29		
I_{rr}	Peak Reverse Recovery Current	$I_F=600\text{A}$, $-di_F/dt=1490\text{A}/\mu\text{s}(T_J=125^\circ\text{C})$, $V_R=300\text{V}$, $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$	84		A
			$T_J=125^\circ\text{C}$	155		
			$T_J=150^\circ\text{C}$	169		
Q_{rr}	Reverse Recovery Charge		$T_J=25^\circ\text{C}$	9.96		μC
			$T_J=125^\circ\text{C}$	25.58		
			$T_J=150^\circ\text{C}$	30.6		
E_{rec}	Reverse Recovery Energy	$I_F=600\text{A}$, $-di_F/dt=1490\text{A}/\mu\text{s}(T_J=125^\circ\text{C})$, $V_R=300\text{V}$, $V_{GE}=-15\text{V}$	$T_J=25^\circ\text{C}$	1.92		mJ
			$T_J=125^\circ\text{C}$	5.12		
			$T_J=150^\circ\text{C}$	6.64		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-To-Case (per leg)			0.119		$^\circ\text{C}/\text{W}$

Internal NTC- Thermistor Characteristic

R ₂₅	T _C =25°C	5		kΩ
ΔR/R	T _C =100°C, R ₁₀₀ =481Ω		±5	%
P ₂₅	T _C =25°C	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	°C
T _{JOP}	Maximum Operating Junction Temperature Range	-40		+150	°C
T _{stg}	Storage Temperature	-40		+125	°C
CTI	Comparative Tracking Index	200			V
R _{θCS}	Case-To-Sink Thermally (Conductive Grease Applied)		0.02		°C/W
M	Power Terminals Screw:M6	4.0		6.0	N·m
M	Mounting Screw:M6	4.0		6.0	N·m
G	Weight		300		g



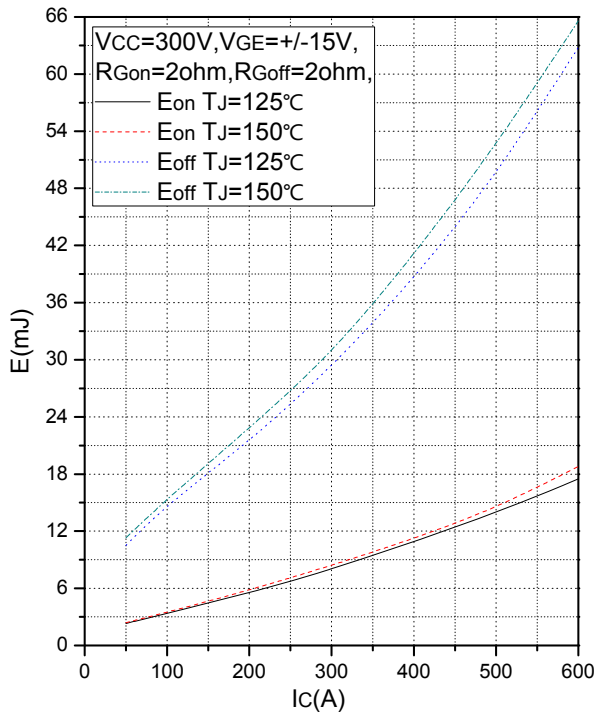


Fig.5 Typical Switching Loss vs. Collector Current

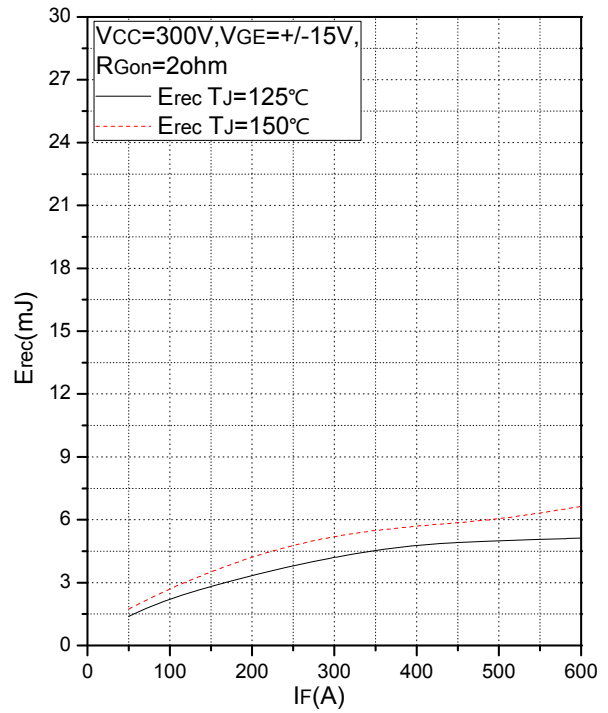


Fig.6 Typical Switching Loss vs. Forward Current

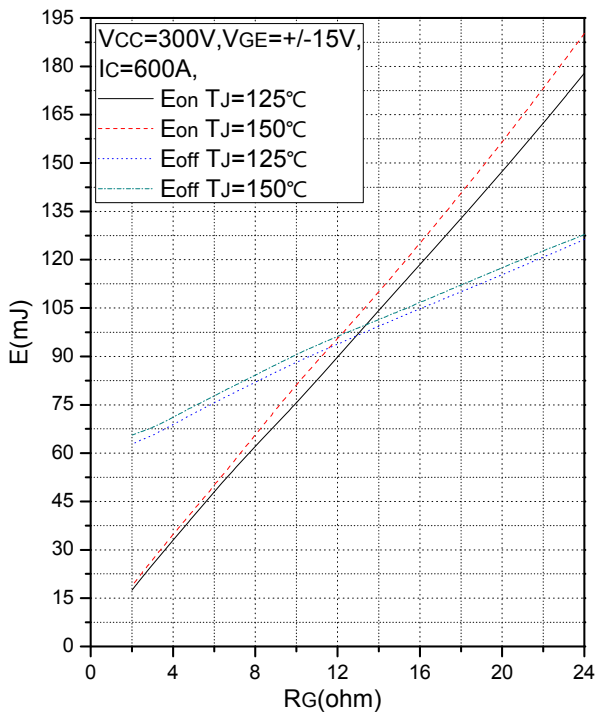


Fig.7 Typical Switching Loss vs. Gate Resistance

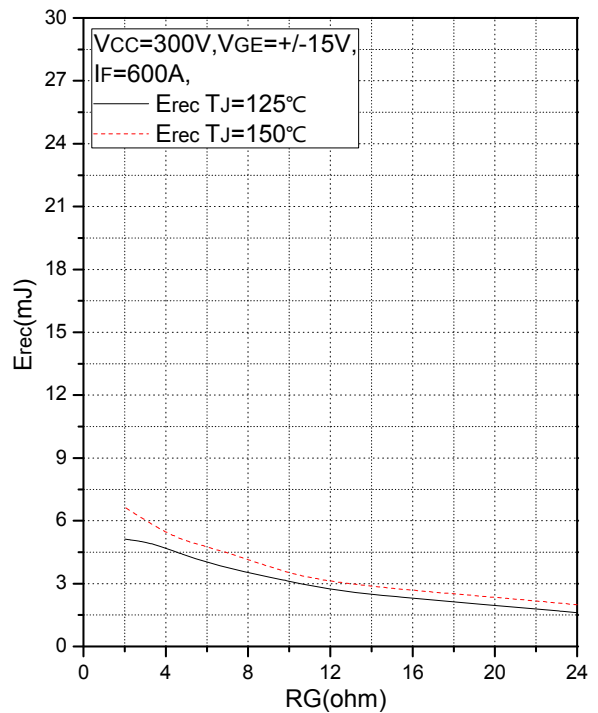


Fig.8 Typical Switching Loss vs. Gate Resistance

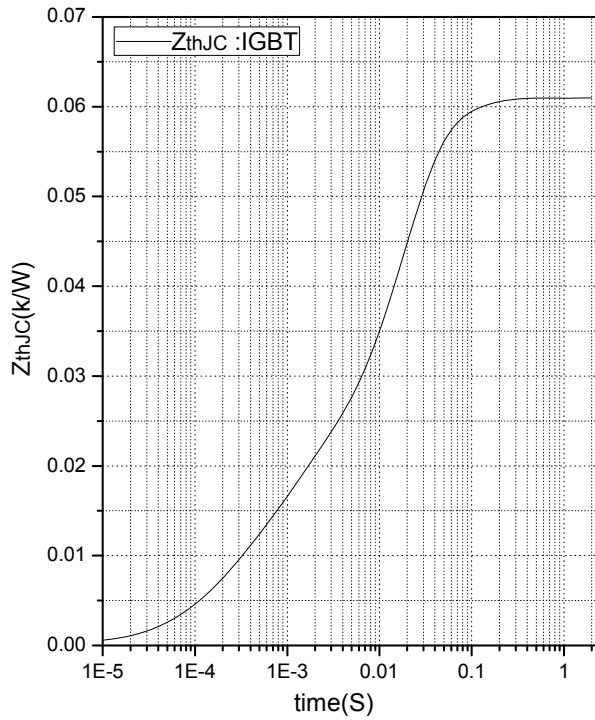


Fig.9 Transient Thermal Impedance (IGBT)

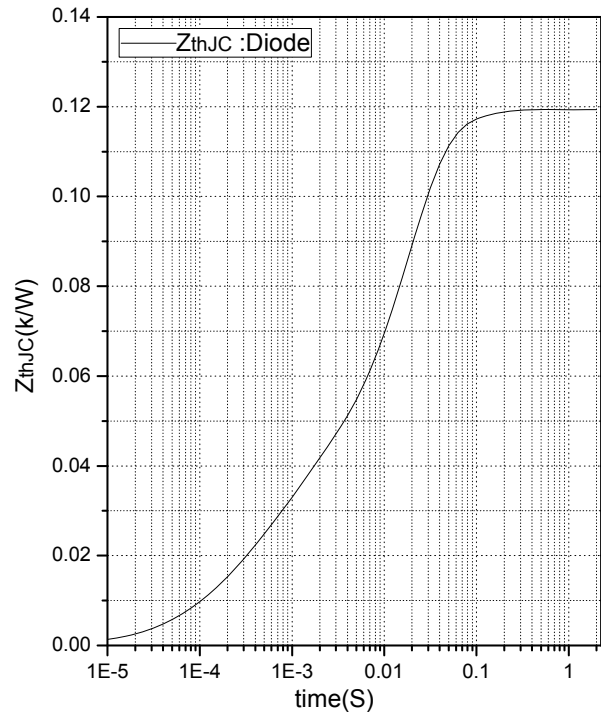


Fig.10 Transient Thermal Impedance (Chopper Diode)

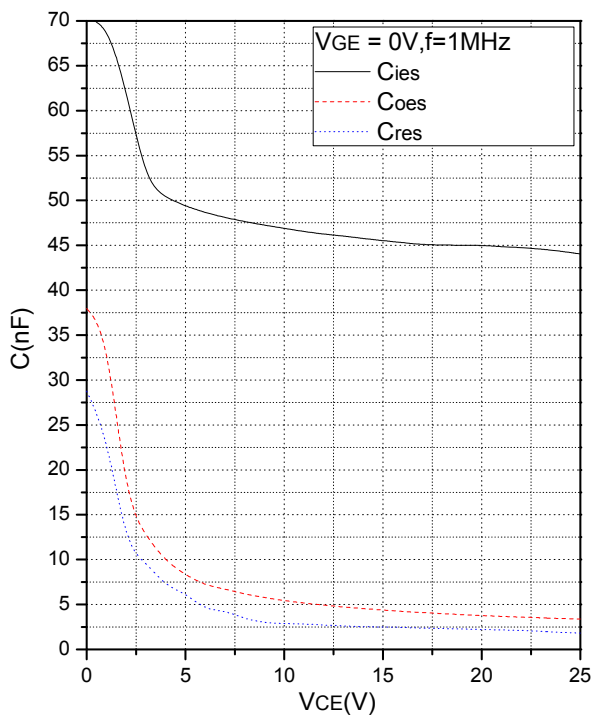


Fig.11 Capacitance Characteristics

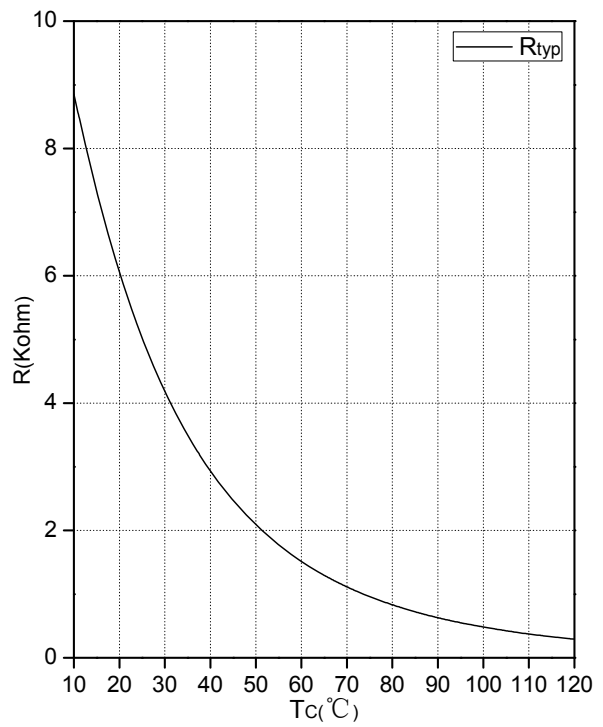


Fig.12 NTC Temperature Characteristics

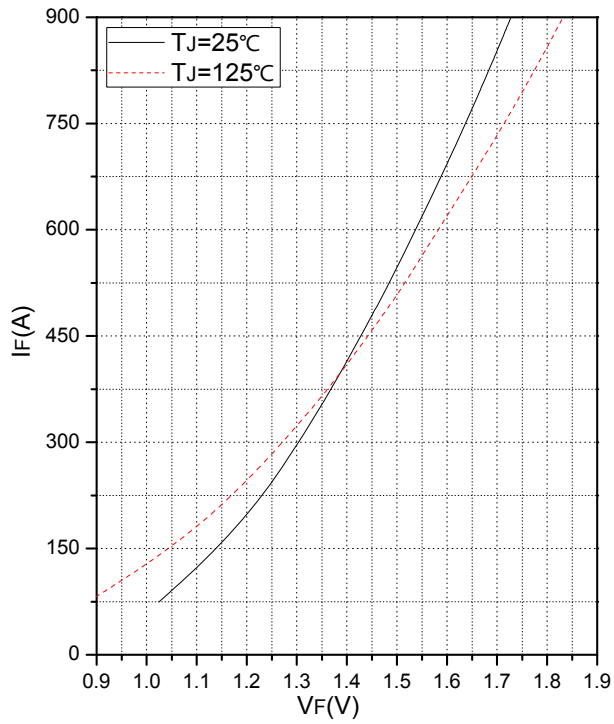
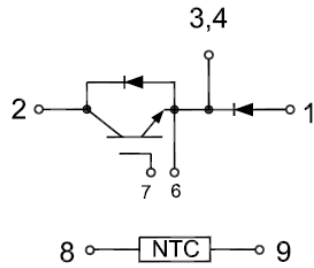
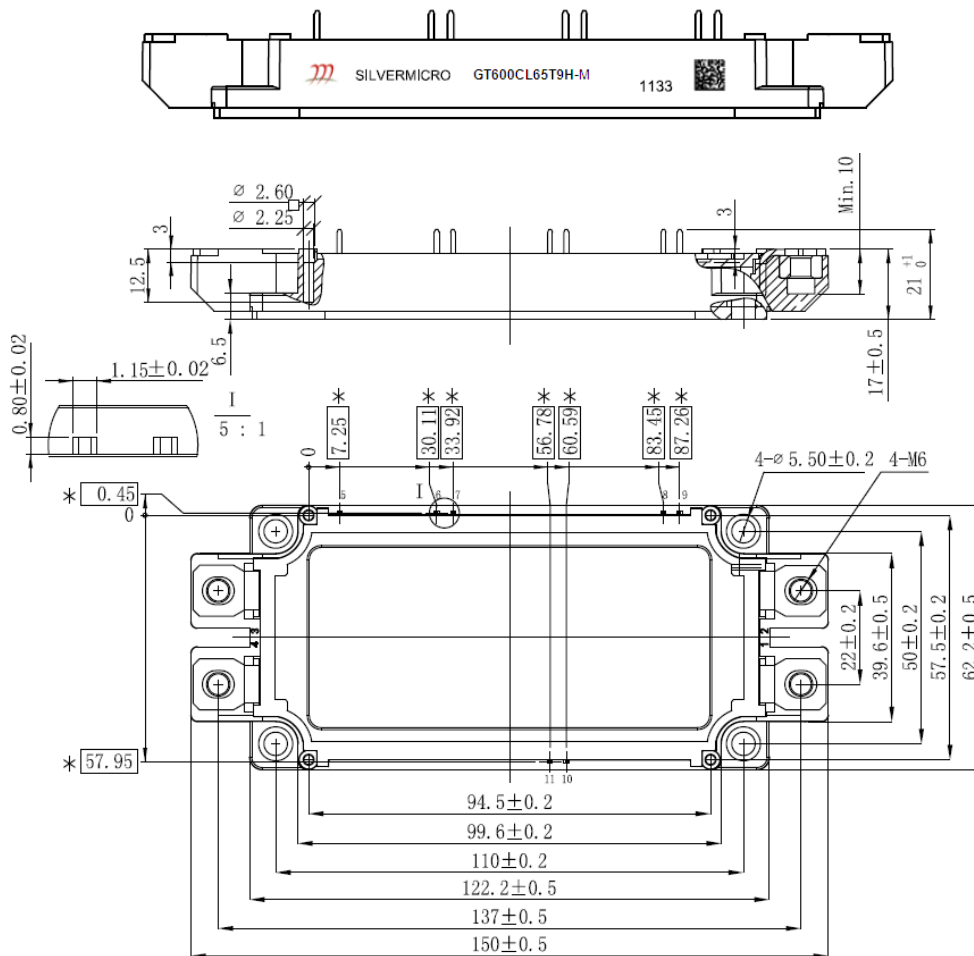


Fig.13 Forward Characteristics of Reverse Diode

Internal Circuit



Package Outline (Unit: mm):





Date	Revision	Notes
09/19/2019	01	Initial Release

Announcement

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