



GT200TL65B9H

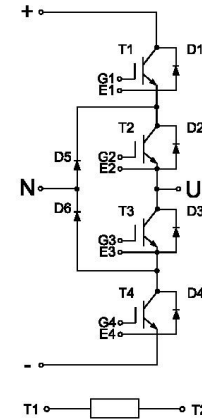
IGBT Module

Preliminary Data

Features:

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

Circuit Diagram



Application:

- 3-Level-Applications

IGBT, Inverter (T1,T2,T3,T4)

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	$T_c=100^\circ\text{C}$	200	A
		$T_c=25^\circ\text{C}$	400	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1\text{ms}$	400	A
P_D	Maximum Power Dissipation per IGBT	$T_c=25^\circ\text{C}$ $T_{Jmax}=175^\circ\text{C}$	699	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	$I_C=2\text{mA}$, $V_{CE}=V_{GE}$	4.0	4.4	6.0	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C=200\text{A}$, $V_{GE}=15\text{V}$	$T_J=25^{\circ}\text{C}$	1.50	1.80	V
			$T_J=125^{\circ}\text{C}$	1.70		V
			$T_J=150^{\circ}\text{C}$	1.75		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	$V_{CE}=25\text{V}$, $V_{GE}=0\text{V}$, $f=100\text{kHz}$		14.4		nF
C_{oes}	Output Capacitance			0.83		nF
C_{res}	Reveres Transfer Capacitance			0.29		nF

Switching Characteristics

Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time	$V_{CC}=300V, I_C=200A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ Inductive Load	$T_J=25^{\circ}C$		171		ns
			$T_J=125^{\circ}C$		177		
			$T_J=150^{\circ}C$		185		
t_r	Rise Time		$T_J=25^{\circ}C$		83		ns
			$T_J=125^{\circ}C$		84		
			$T_J=150^{\circ}C$		91		
$t_{d(off)}$	Turn-off Delay Time		$T_J=25^{\circ}C$		181		ns
			$T_J=125^{\circ}C$		184		
			$T_J=150^{\circ}C$		189		
t_f	Fall Time	$T_J=25^{\circ}C$		48		ns	
		$T_J=125^{\circ}C$		53			
		$T_J=150^{\circ}C$		56			
E_{on}	Turn-on Switching Loss	$V_{CC}=300V, I_C=200A,$ $R_{Gon}=4.7\Omega, V_{GE}=\pm 15V,$ $di/dt=813A/\mu s(T_J=150^{\circ}C),$ Inductive Load	$T_J=25^{\circ}C$		3.0		mJ
			$T_J=125^{\circ}C$		3.3		
			$T_J=150^{\circ}C$		3.5		



E _{off}	Turn-off Switching Loss	V _{CC} =300V, I _C =200A, R _{Goff} =4.7Ω, V _{GE} =±15V, du/dt=2124V/μs(T _J =150°C), Inductive Load	T _J =25°C		5.4		mJ
			T _J =125°C		6.0		
			T _J =150°C		6.2		
Q _g	Total Gate Charge	V _{GE} =+15V...-15V	T _J =25°C		988		nC
R _{g internal}	Internal Gate Resistor				0		Ω
I _{SC}	V _{CC} =300V, V _{GE} =+/-15V, t=10μs, T _J =150°C				1200		A
R _{θJC}	Thermal Resistance: Junction-to-Case (per IGBT)					0.21	°C/W

Diode, Inverter (D1,D2,D3,D4)

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _F	Diode Continuous Forward Current	T _C =100°C	200	A
I _{FM}	Diode Maximum Forward Current	t _p =1ms	400	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Unit
V _{FM}	Forward Voltage	I _F =200A	T _J =25℃		1.65		V
			T _J =125℃		1.70		
			T _J =150℃		1.70		
t _{rr}	Reverse Recovery Time	I _F =200A, -di _F /dt=1170A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		123		ns
			T _J =125℃		167		
			T _J =150℃		179		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		74		A
			T _J =125℃		97		
			T _J =150℃		105		



Q _{rr}	Reverse Recovery Charge	I _F =200A, -di _F /dt=1170A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		5.44		μC
			T _J =125℃		10.03		
			T _J =150℃		11.66		
E _{rec}	Reverse Recovery Energy		T _J =25℃		0.96		mJ
			T _J =125℃		2.04		
			T _J =150℃		2.39		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case					0.30	℃/W

Diode, 3-Level (D5,D6)

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

V _{RRM}	Repetitive Peak Reverse Voltage	T _J =25°C	650	V
I _F	Diode Continuous Forward Current	T _C =100°C	200	A
I _{FM}	Diode Maximum Forward Current	tp=1ms	400	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 =200A	T _J =25℃		1.65		V
			T _J =125℃		1.70		
			T _J =150℃		1.70		
t _{rr}	Reverse Recovery Time	I _F =200A, -di _F /dt=1170A/μs(T _J =150℃), V _R =300V, V _{GE} =-15V	T _J =25℃		123		ns
			T _J =125℃		167		
			T _J =150℃		179		
I _{rr}	Peak Reverse Recovery Current		T _J =25℃		74		A
			T _J =125℃		97		
			T _J =150℃		105		
Q _{rr}	Reverse Recovery Charge		T _J =25℃		5.44		μC
			T _J =125℃		10.03		
			T _J =150℃		11.66		



E _{rec}	Reverse Recovery Energy	I _F =200A, -di _F /dt=1170A/μs(T _J =150°C), V _R =300V, V _{GE} =-15V	T _J =25°C		0.96		mJ
			T _J =125°C		2.04		
			T _J =150°C		2.39		
R _{θJC}	Diode Thermal Resistance: Junction-to-Case					0.30	°C/W

Internal NTC- Thermistor Characteristic

Symbol	Description	Min.	Typ.	Max.	Units
R ₂₅	T _C =25°C		5		kΩ
△R/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		Min.	Typ.	Max.	Units
V _{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 1minute	2500			V
Internal Isolation			Al ₂ O ₃			
d _{creep}	Creepage Distance: Terminal to Heatsink			11.5		mm
	Creepage Distance: Terminal to Terminal			6.3		mm
d _{clear}	Clearance: Terminal to Heatsink			10.0		mm
	Clearance: Terminal to Terminal			5.0		mm
L _{SCE}	Stray Inductance Module			15		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			
R _{θCS}	Case-to-Sink Thermally (Conductive Grease Applied)			0.05	°C/W
T	Mounting Screw:M4	1.8		2.0	N·m
G	Weight		40		g

Ordering Information Table

Device code	G	T	200	TL	65	B9	H
	①	②	③	④	⑤	⑥	⑦

- ① - IGBT Module
- ② - Trench & Field Stop IGBT
- ③ - Rated Current (200=200A)
- ④ - Circuit Configuration: TL (Three Level)
- ⑤ - Rated Voltage (65=650V)
- ⑥ - Package Type
- ⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

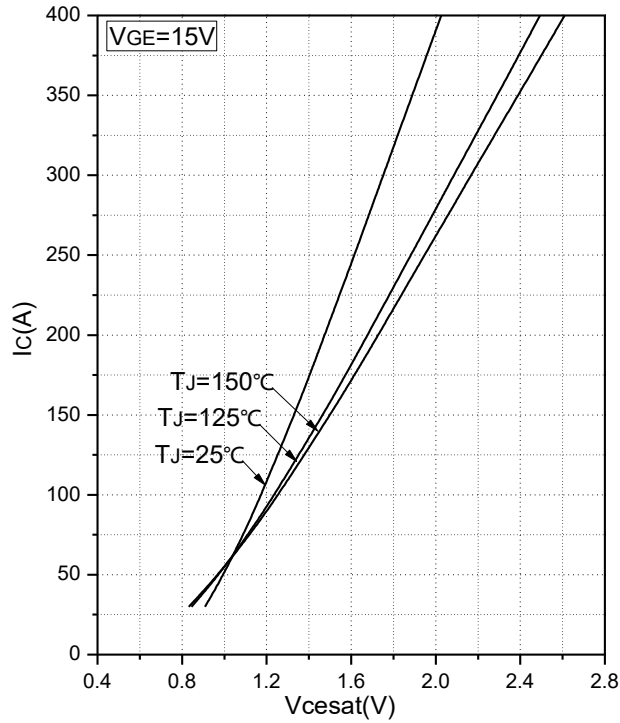


Fig.1 Typical Saturation Voltage Characteristics

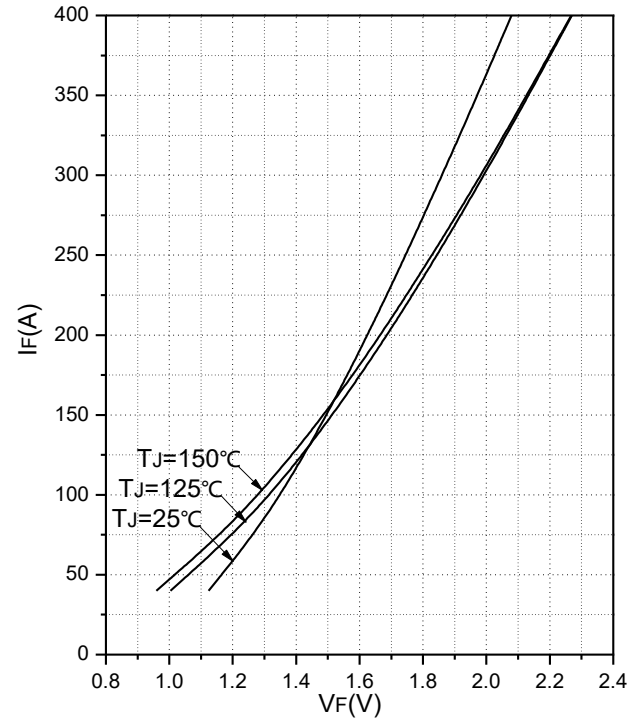


Fig.2 Forward Characteristics of Diode

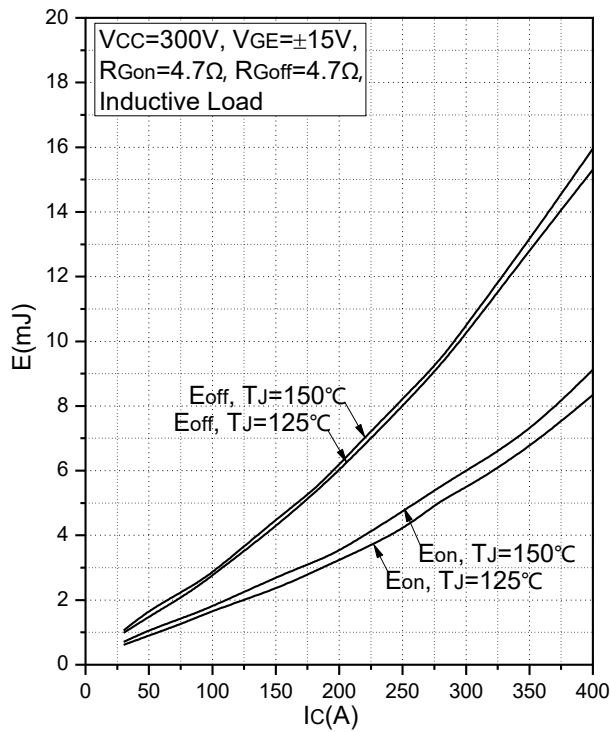


Fig.3 Typical Switching Loss vs. Collector Current

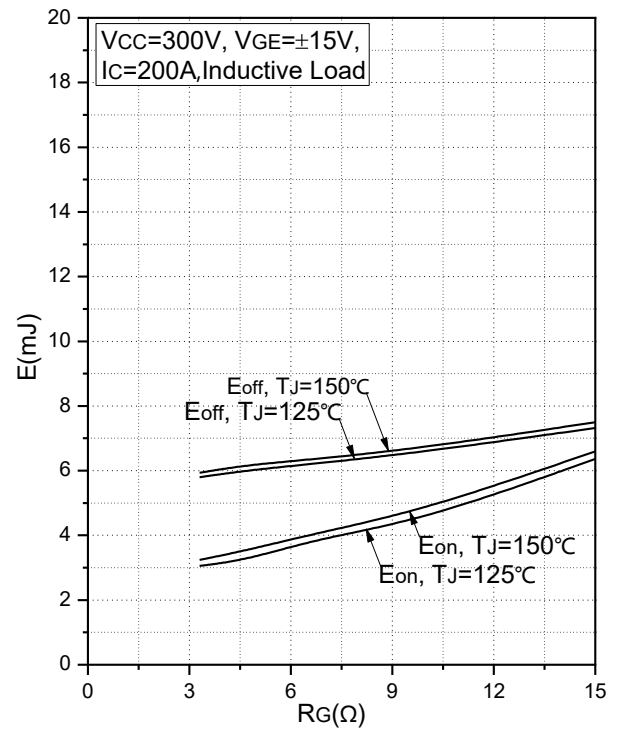


Fig.4 Typical Switching Loss vs. Gate Resistance

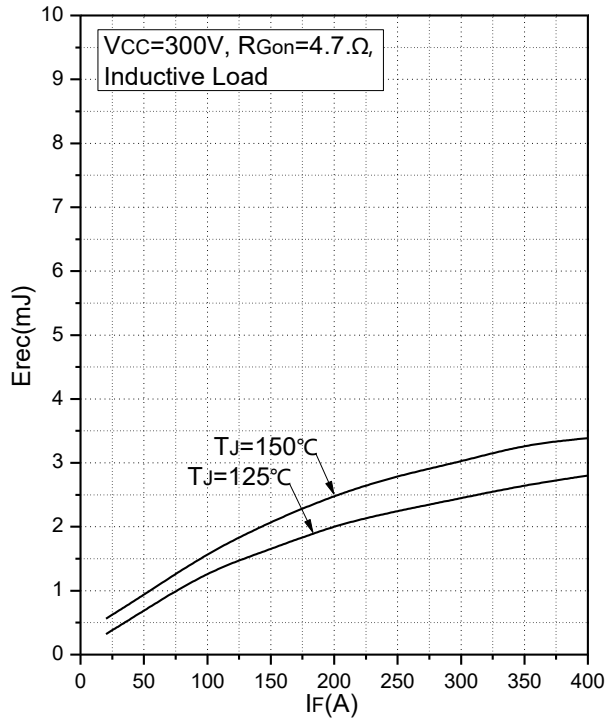


Fig.5 Typical Switching Loss vs. Forward Current

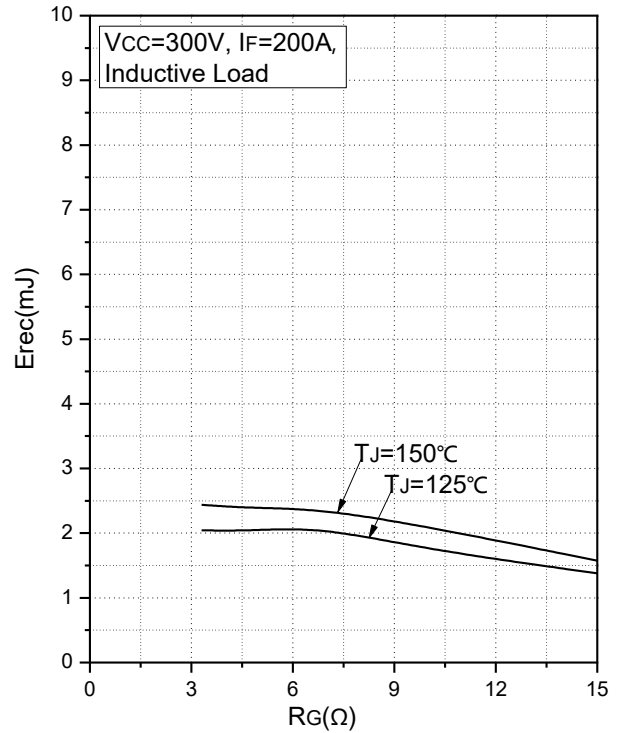


Fig.6 Typical Switching Loss vs. Gate Resistance

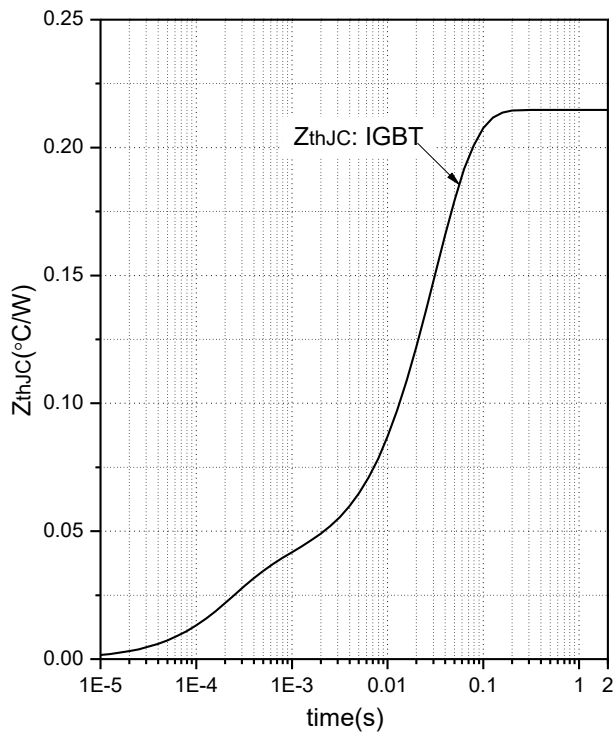


Fig.7 Transient Thermal Impedance (IGBT)

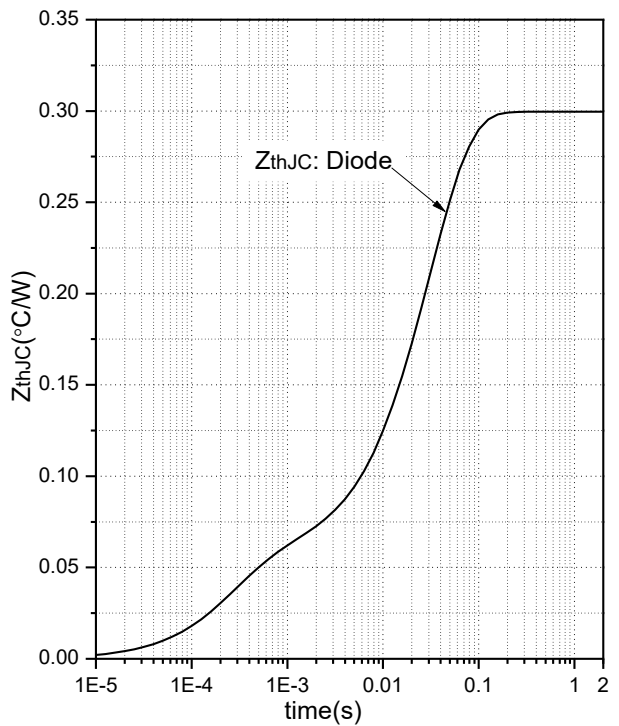


Fig.8 Transient Thermal Impedance (Reverse Diode)

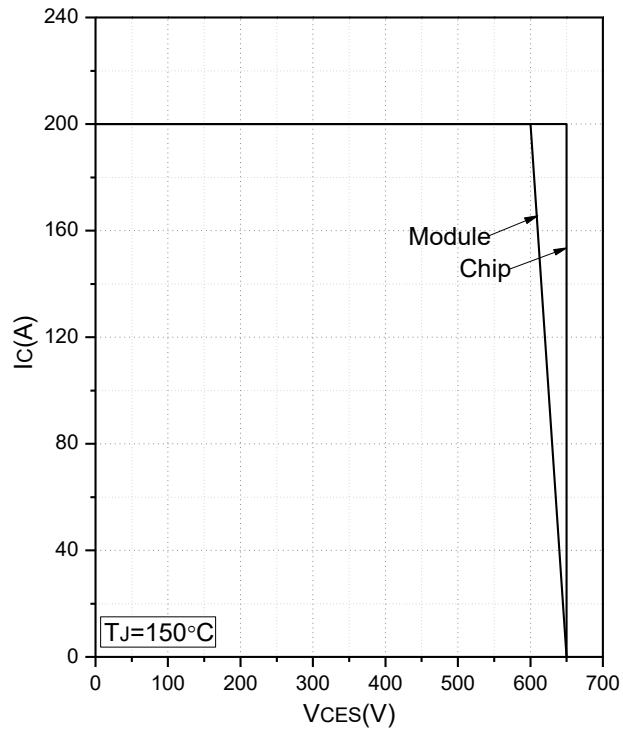


Fig.9 Reverse Bias Safe Operation Area (RBSOA)

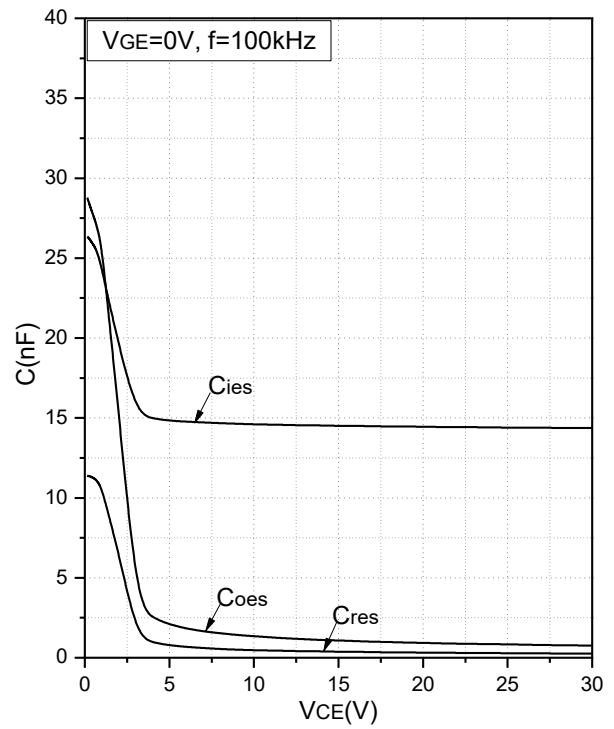
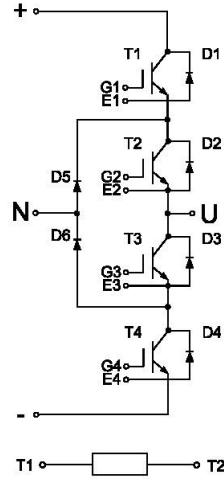


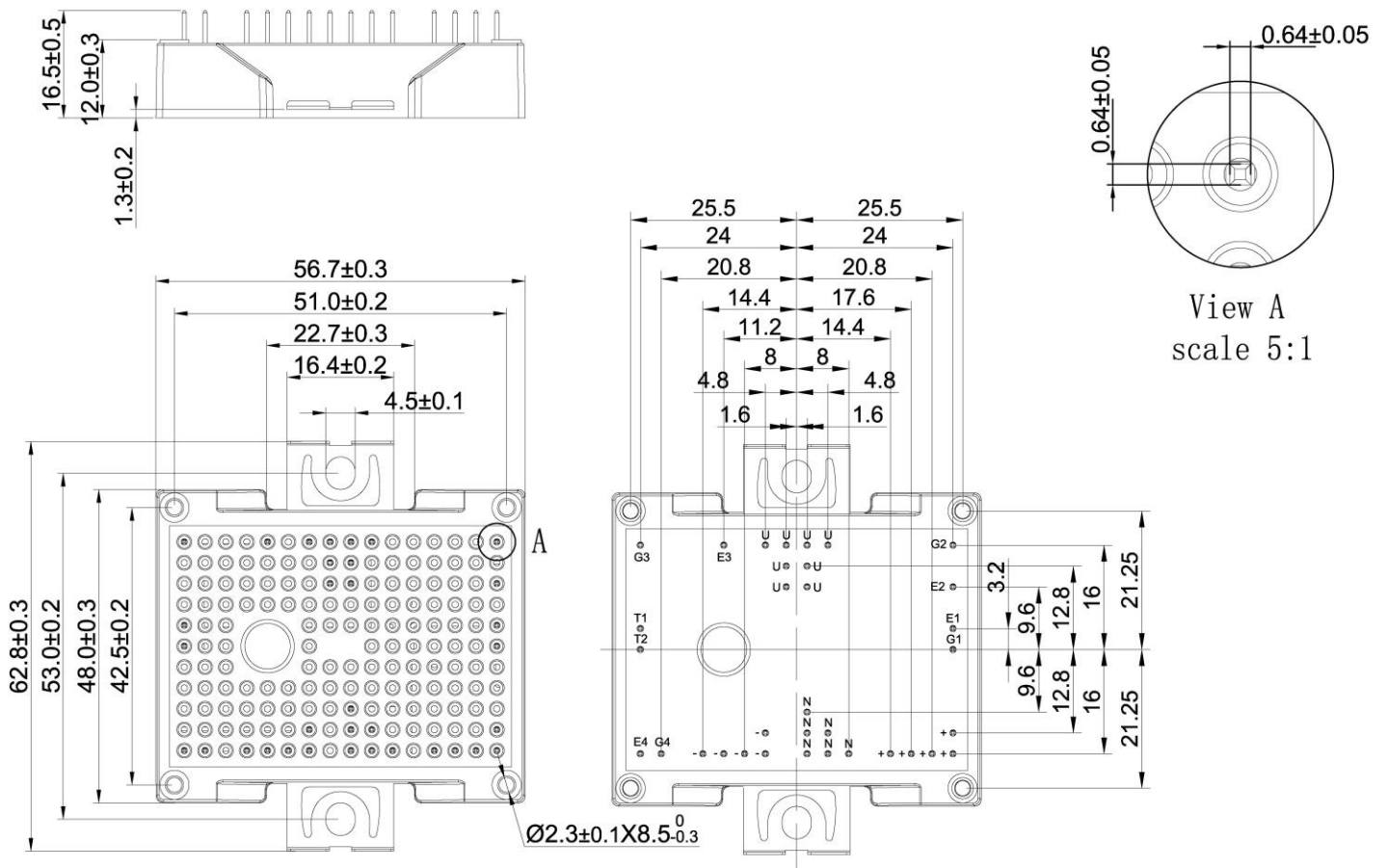
Fig.10 Capacitance Characteristics



Internal Circuit



Package Outline (Unit: mm):





Revision	Notes
01	Initial Release

Announcement

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