南京银茂微电子

NJSM

GT200TL65B9H

IGBT Module

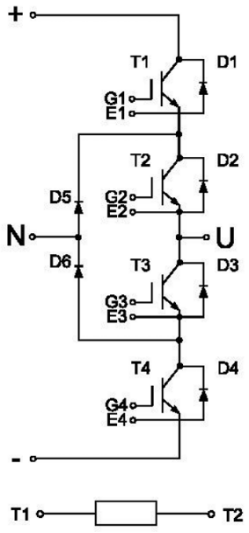
Features:

- Vces=650V Ic=200A Trench & Field Stop IGBT Module
- Short Circuit Capability
- Low Switching Loss
- 100% RBSOA Tested(2×Ic)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

Applications:

- 3-Level-Application
- Solar Inverter

Circuit Diagram





Type	Package	Marking
GT200TL65B9H	B9	GT200TL65B9H

IGBT, Buck Switch(T1/T4)

Maximum Rated Values (T_C=25℃ unless otherwise specified)

Symbol	Descripition		Value	Units
V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current, limited by T_{Jmax}	T_C=80℃	200	A
		T_C=25℃	400	A
I_{CM}	Peak Collector Current Repetitive	t_p limited by T_{Jmax}	400	A
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃,T_{Jmax}=150℃	590	W

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Electrical Characteristics of IGBT (T_C=25℃ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2mA, V_{CE}=V_{GE}		4.0	4.6	5.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=200A, V_{GE}=15V	T_J=25℃		1.37	1.64	V
			T_J=125℃		1.55		V
			T_J=150℃		1.59		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE}=650V, T_J=25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=20V, V_{CE}=0V, T_J=25℃				200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			14.6		nF
C_{oes}	Output Capacitance				2.0		nF
C_{res}	Reverse Transfer Capacitance				0.3		nF

Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, Inductive Load	T_J=25℃		100		ns
			T_J=125℃		113		
			T_J=150℃		115		
t_r	Rise Time		T_J=25℃		42.6		ns
			T_J=125℃		47.6		
			T_J=150℃		50.8		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, Inductive Load	T_J=25℃		233		ns
			T_J=125℃		257		
			T_J=150℃		261		
t_f	Fall Time		T_J=25℃		157		ns
			T_J=125℃		255		
			T_J=150℃		235		
E_{on}	Turn-on Switching Loss	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, di/dt=3150A/μs(T_J=150℃) Inductive Load	T_J=25℃		3.7		mJ
			T_J=125℃		4.6		
			T_J=150℃		4.6		

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E_{off}	Turn-off Switching Loss	V_{CC}=400V, I_C=200A, R_{Goff}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, du/dt=5140V/μs(T_J=150℃) Inductive Load	T_J=25℃		6.8		mJ
			T_J=125℃		8.7		
			T_J=150℃		9.0		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		1.10		uC
$R_{G\ (int)}$	Internal Gate Resistance		T_J=25℃		4		Ω
T_{SC}	V_{CC}=400V, V_{GE}=±15V,T_J=150℃[note1]					10	us
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.211	℃/W
$R_{\theta CS}$	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ_{grease} = 1 W/(m • K))				0.323		℃/W

note1: Short circuit withstand time cannot exceed 10us under specified condition

Buck Diode(D5/D6,SiC)

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	650	V
I_F	Diode Continuous Forward Current		100	A
I_{FM}	Diode Maximum Forward Current	t_p=1ms	300	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=100A	T_J=25℃		1.27	1.55	V
			T_J=125℃		1.43		
			T_J=150℃		1.49		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.529	℃/W
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, λ_{grease} = 1 W/(m • K))				0.807		℃/W

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IGBT, Boost Switch(T2/T3)

Maximum Rated Values (T_C=25℃ unless otherwise specified)

Symbol	Descripition		Value	Units
V_{CES}	Collector-Emitter Blocking Voltage		650	V
V_{GES}	Gate-Emitter Voltage		±20	V
I_C	Continuous Collector Current, Limited by T_{Jmax}	T_C=80℃	200	A
		T_C=25℃	400	A
I_{CM}	Peak Collector Current Repetitive	T_p limited by T_{Jmax}	400	A
P_D	Maximum Power Dissipation (IGBT)	T_C=25℃,T_{Jmax}=150℃	590	W

Electrical Characteristics of IGBT (T_C=25℃ unless otherwise specified)

Static Characteristics

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C=2mA, V_{CE}=V_{GE}		4.0	4.6	5.5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	I_C=200A, V_{GE}=15V	T_J=25℃		1.37	1.64	V
			T_J=125℃		1.55		V
			T_J=150℃		1.59		V
I_{CES}	Collector-Emitter Leakage Current	V_{GE}=0V, V_{CE}=650V, T_J=25℃				1	mA
I_{GES}	Gate-Emitter Leakage Current	V_{GE}=20V, V_{CE}=0V, T_J=25℃				200	nA
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f=100kHz			14.6		nF
C_{oes}	Output Capacitance				1.8		nF
C_{res}	Reverse Transfer Capacitance				0.3		nF

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Switching Characteristics

$t_{d(on)}$	Turn-on Delay Time	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, Inductive Load	T_J=25℃		98		ns
			T_J=125℃		107		
			T_J=150℃		115		
t_r	Rise Time		T_J=25℃		41		ns
			T_J=125℃		46		
			T_J=150℃		48		
$t_{d(off)}$	Turn-off Delay Time	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, Inductive Load	T_J=25℃		230		ns
			T_J=125℃		258		
			T_J=150℃		266		
t_f	Fall Time		T_J=25℃		134		ns
			T_J=125℃		178		
			T_J=150℃		181		
E_{on}	Turn-on Switching Loss	V_{CC}=400V, I_C=200A, R_{Gon}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, di/dt=3360A/μs(T_J=150℃) Inductive Load	T_J=25℃		2.8		mJ
			T_J=125℃		3.5		
			T_J=150℃		3.6		
E_{off}	Turn-off Switching Loss	V_{CC}=400V, I_C=200A, R_{Goff}=3.3Ω, R_{Goff}=3.3Ω V_{GE}=±15V, du/dt=5260V/μs(T_J=150℃) Inductive Load	T_J=25℃		7.3		mJ
			T_J=125℃		9.4		
			T_J=150℃		10.1		
Q_g	Total Gate Charge	V_{GE}=+15V…-15V	T_J=25℃		1.10		uC
$R_{G\ (int)}$	Internal Gate Resistance		T_J=25℃		4		Ω
T_{SC}	V_{CC}=400V, V_{GE}=±15V,T_J=150℃[note2]					10	us
$R_{\theta JC}$	IGBT Thermal Resistance: Junction-to-Case (per IGBT)					0.211	℃/W
$R_{\theta CS}$	IGBT Thermal Resistance: Case-to-Sink (per IGBT) (per IGBT, λ_{grease} = 1 W/(m • K))				0.323		℃/W

note2: Short circuit withstand time cannot exceed 10us under specified condition

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Boost Diode(D1/D4,SiC)

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	650	V
I_F	Diode Continuous Forward Current		100	A
I_{FM}	Diode Maximum Forward Current	t_p=1ms	300	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=100A	T_J=25℃		1.27	1.55	V
			T_J=125℃		1.43		
			T_J=150℃		1.49		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.529	℃/W
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, λ_{grease} = 1 W/(m • K))				0.807		℃/W

Boost Switch Inverter Diode(D2/D3)

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

V_{RRM}	Repetitive Peak Reverse Voltage	T_J=25℃	650	V
I_F	Diode Continuous Forward Current		100	A
I_{FM}	Diode Maximum Forward Current	t_p=1ms	300	A

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

Symbol	Description	Conditions		Min.	Typ.	Max.	Units
V_{FM}	Forward Voltage	I_F=100A	T_J=25℃		1.45	1.80	V
			T_J=125℃		1.42		
			T_J=150℃		1.38		
$R_{\theta JC}$	Diode Thermal Resistance: Junction-to-Case (per Diode)					0.367	℃/W
$R_{\theta CS}$	Diode Thermal Resistance: Case-to-Sink (per Diode, λ_{grease} = 1 W/(m • K))				0.560		℃/W

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Internal NTC-Thermistor Characteristics

Symbol	Conditions	Min.	Typ.	Max.	Units
R_{25}	T_C=25℃		5		kΩ
△R/R	T_C=100℃, R_{100}=465Ω	-5		+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

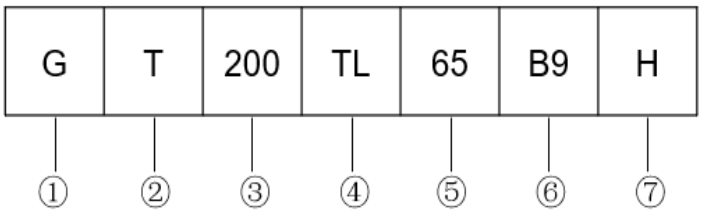
Module

Symbol	Description		Min.	Typ.	Max.	Units
V_{iso}	Isolation Voltage (All Terminals Shorted)	RMS, f=50Hz, 60s		3400		V
Internal Isolation				Al_2O_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		mm
	Clearance: Terminal to Terminal			5		mm
L_{SCE}	Stray Inductance Module			20		nH
T_J	Maximum Junction Temperature		-40		150	℃
T_{JOP}	Maximum Operating Junction Temperature Range		-40		150	℃
T_{stg}	Storage Temperature		-40		125	℃
CTI	Comparative Tracking Index			200		
T	Mounting Screw:M4		1.8		2	N·m
G	Weight			40		g

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Ordering Information Table

Device code



① - IGBT Module
② - Trench, Low Switching Losses IGBT
③ - Rated Current (200=200A)
④ - Circuit Configuration (Three Level, I Type)
⑤ - Rated Voltage (65=650V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

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Characteristic diagram

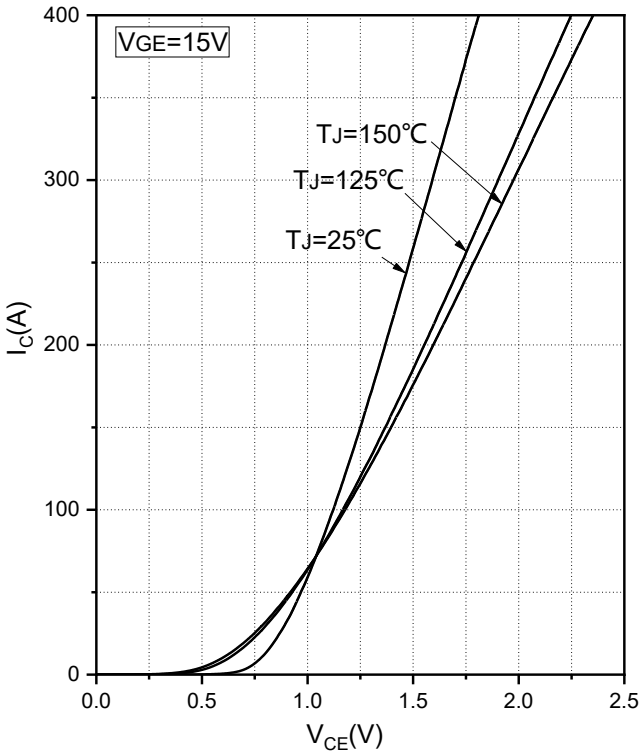


Fig.1 Typical Saturation Voltage Characteristics(T1,T4)

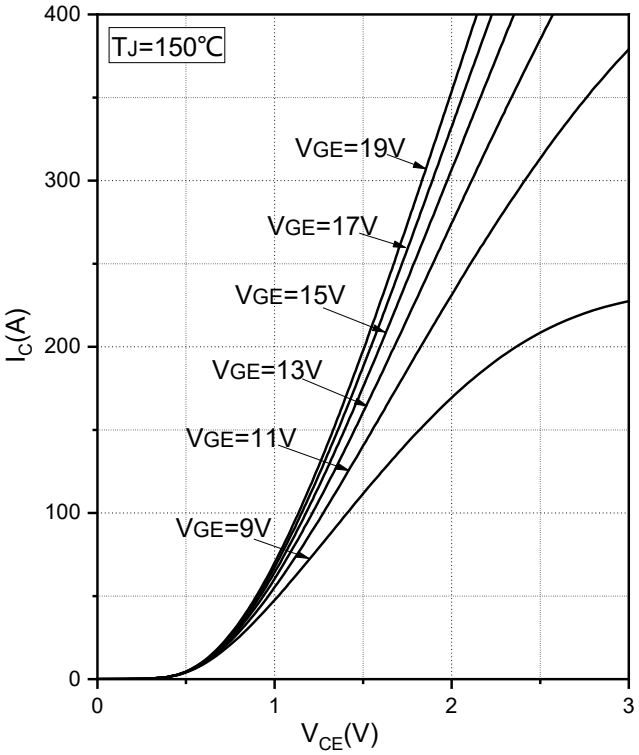


Fig.2 Typical Output Characteristics(T1,T4)

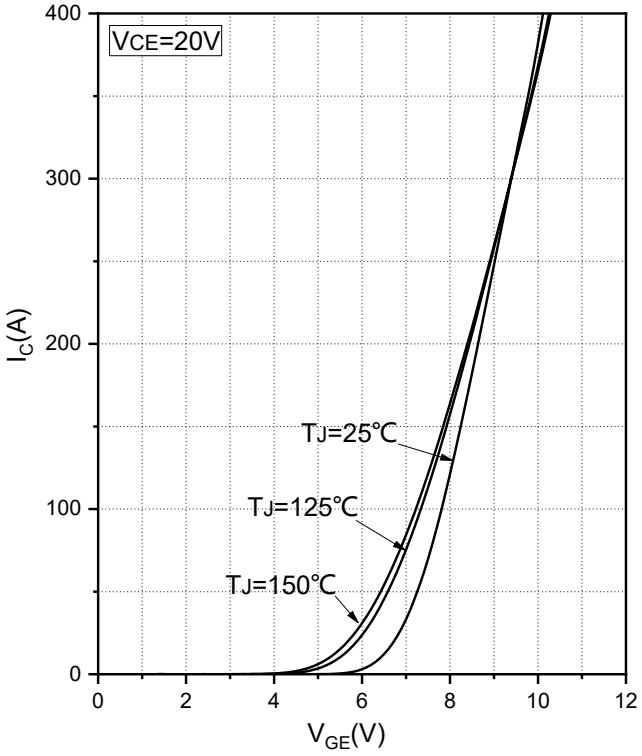


Fig.3 Transfer Characteristic(T1,T4)

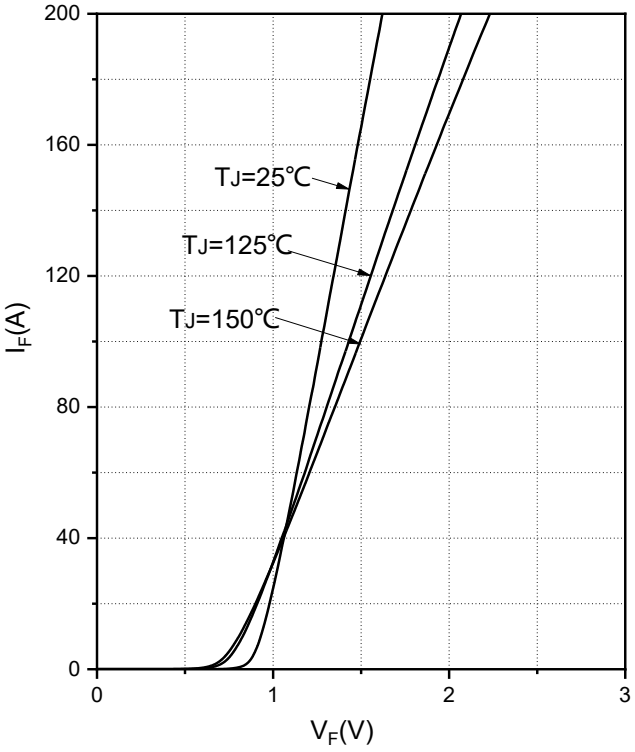


Fig.4 Forward Characteristics of Diode(D1,D4)

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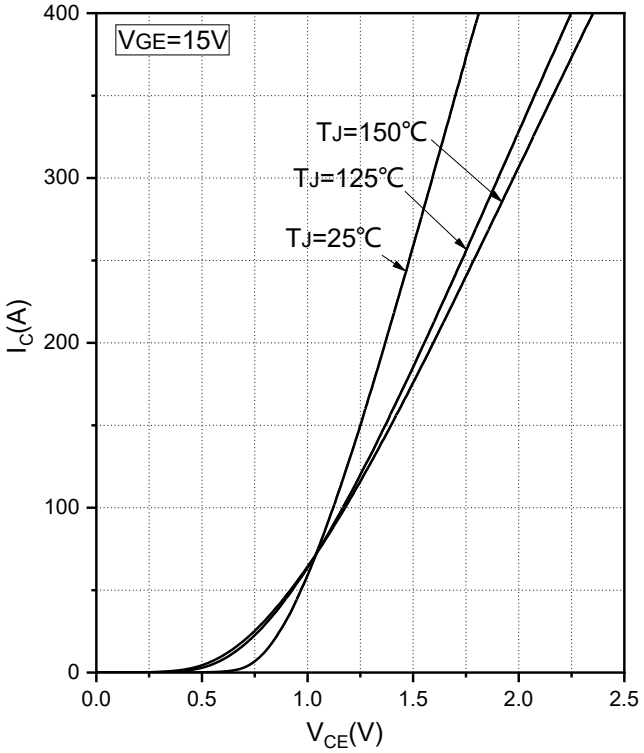


Fig.5 Typical Saturation Voltage Characteristics(T2,T3)

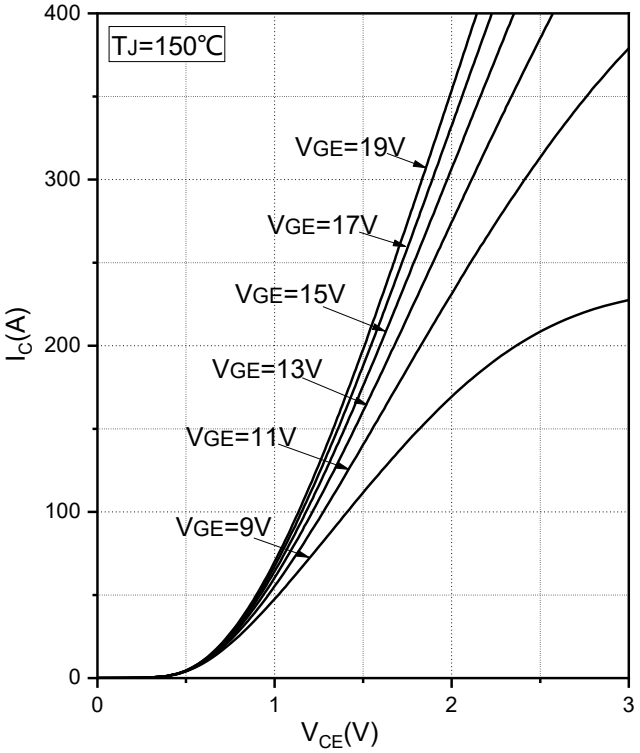


Fig.6 Typical Output Characteristics(T2,T3)

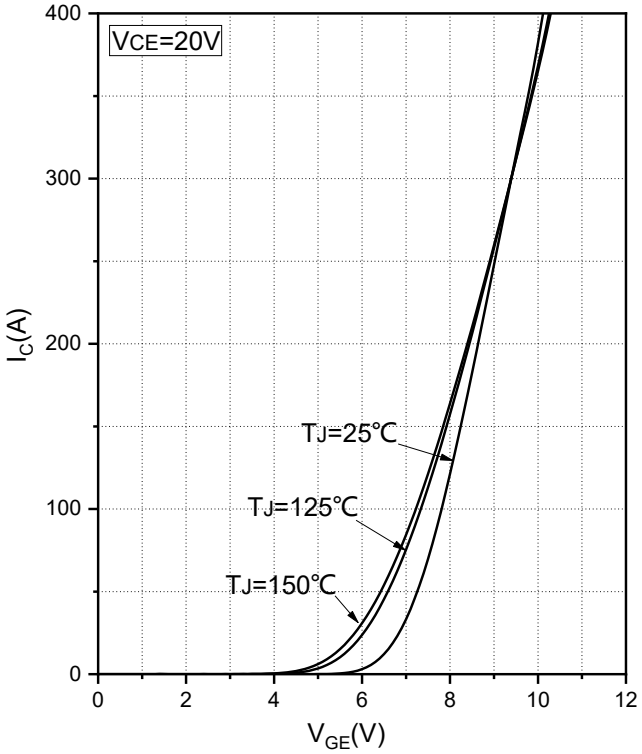


Fig.7 Transfer Characteristic(T2,T3)

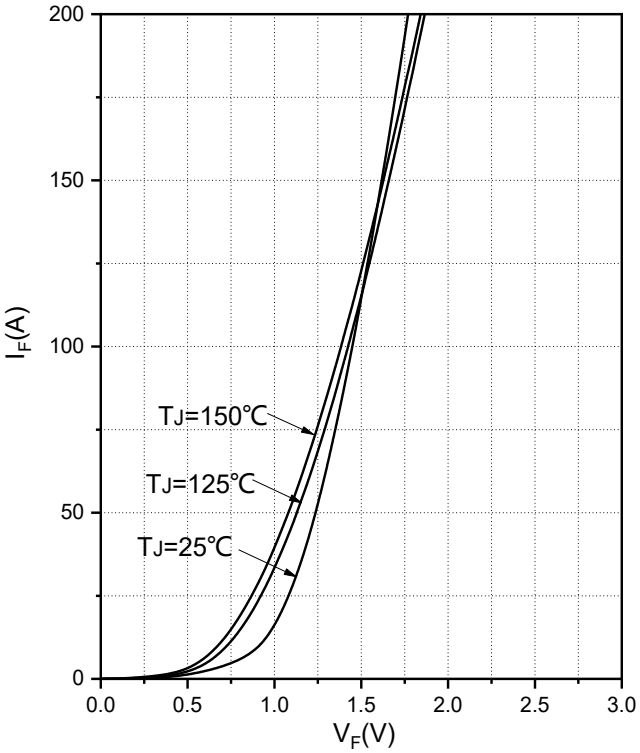


Fig.8 Forward Characteristics of Diode(D2,D3)

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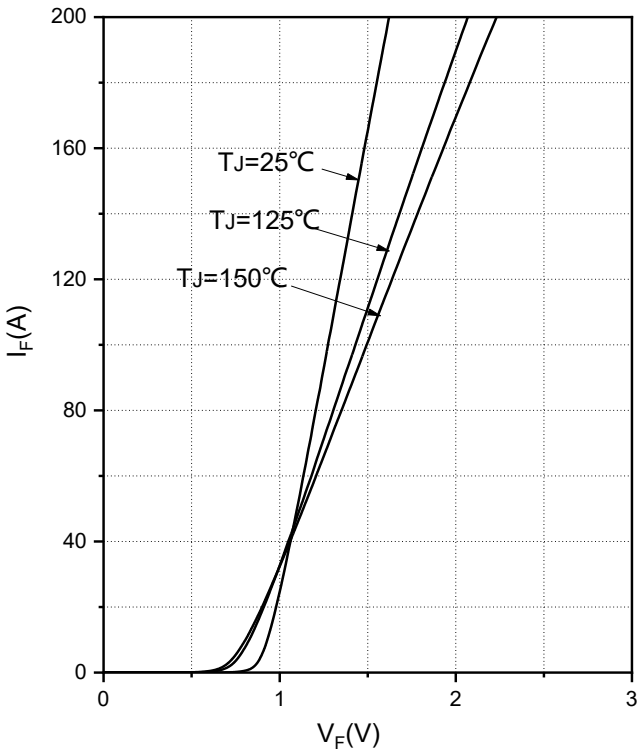


Fig.9 Forward Characteristics of Diode(D5,D6)

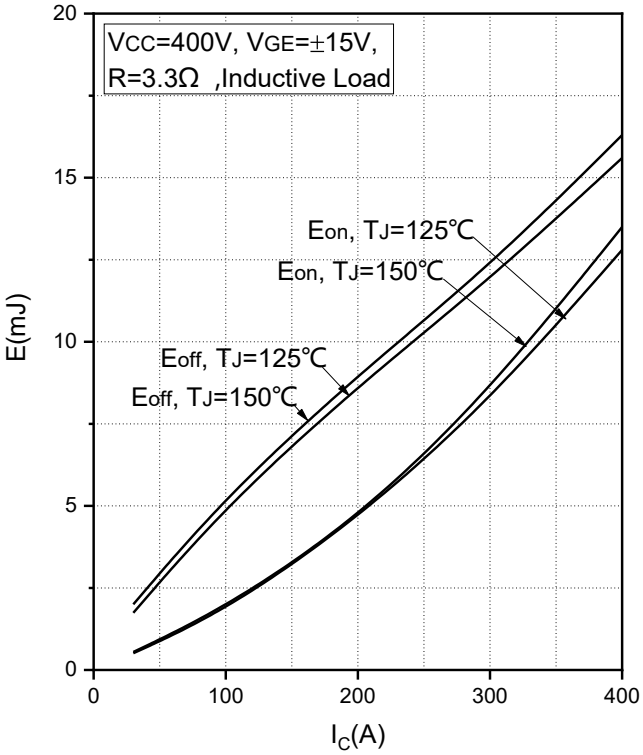


Fig.10 Typical Switching Loss vs. Collector Current(T1,T4)

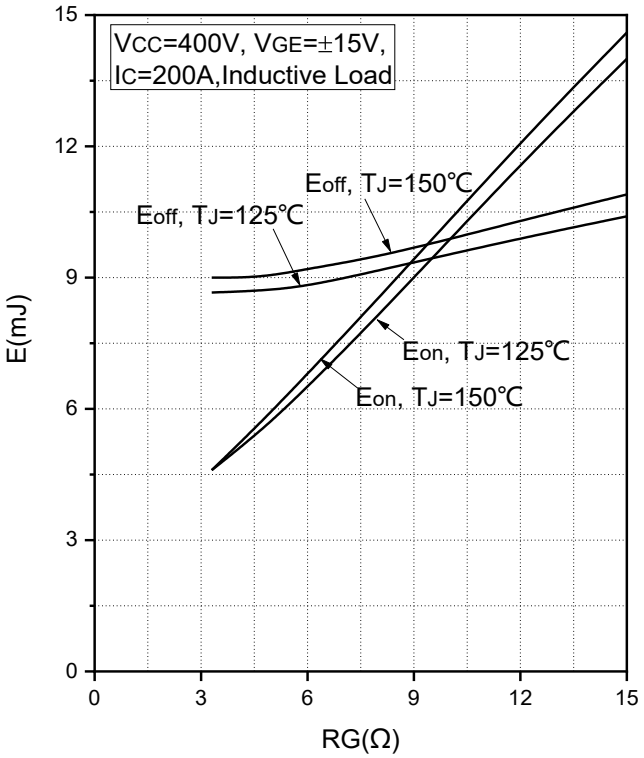


Fig.11 Typical Switching Loss vs. Gate Resistance(T1,T4)

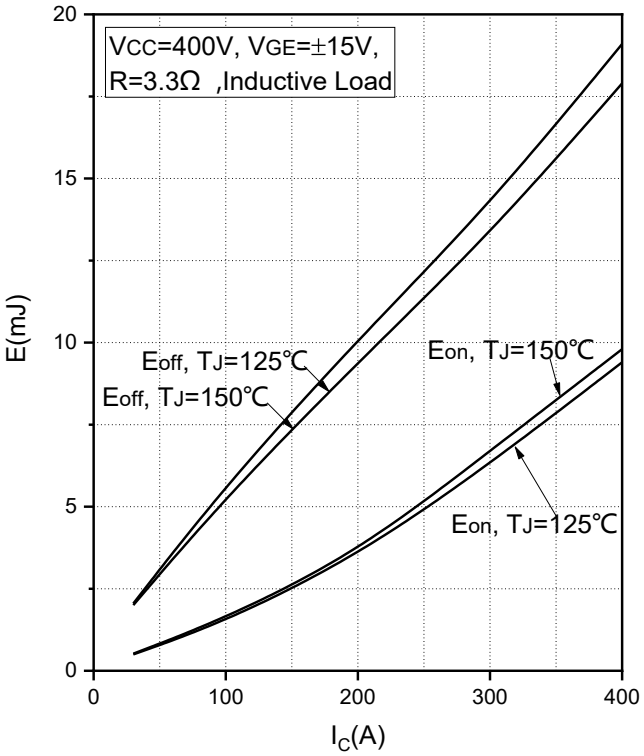


Fig.12 Typical Switching Loss vs. Collector Current(T2,T3)

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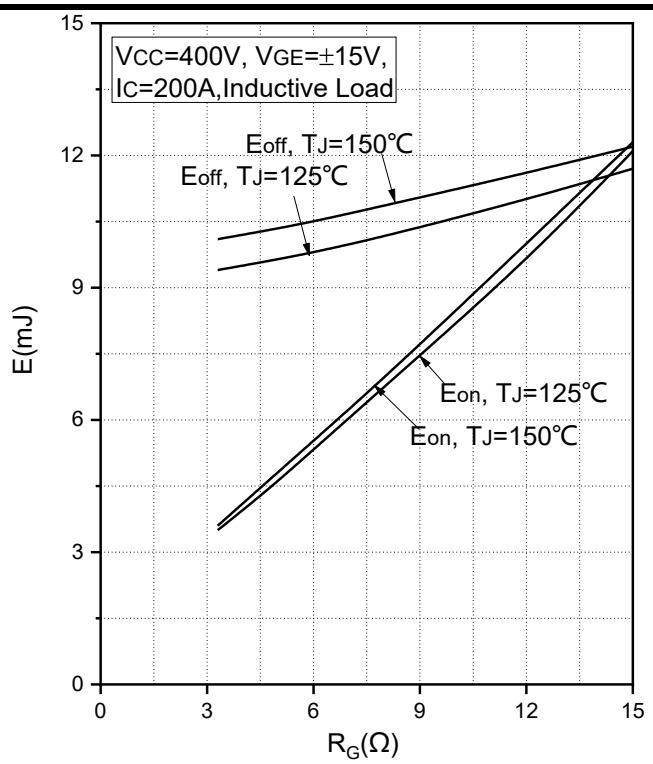


Fig.13 Typical Switching Loss vs. Gate Resistance(T2,T3)

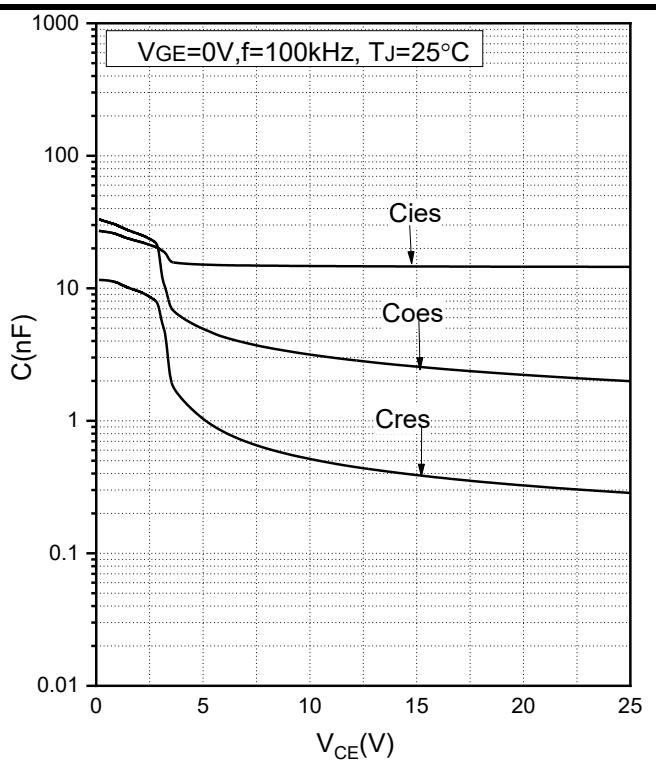


Fig.14 Capacitance Characteristics(T1,T4)

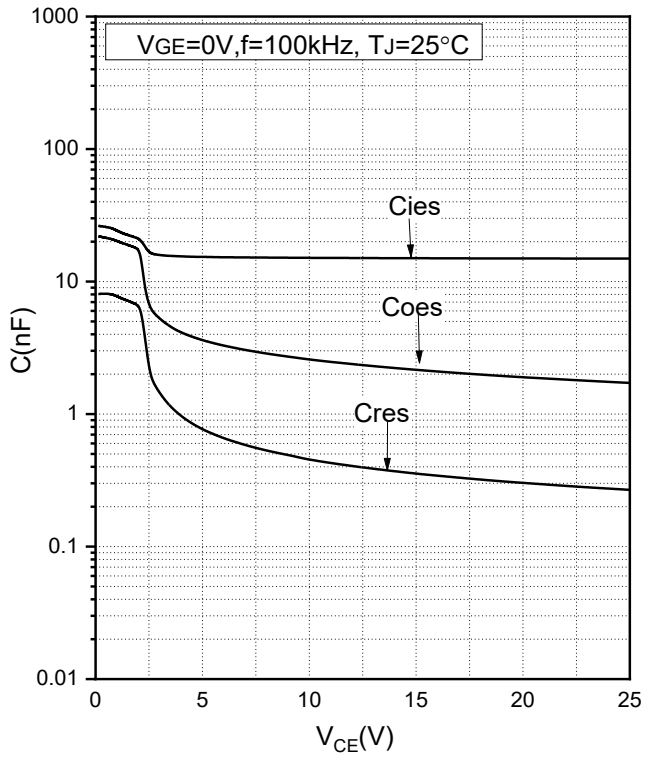


Fig.15 Capacitance Characteristics(T2,T3)

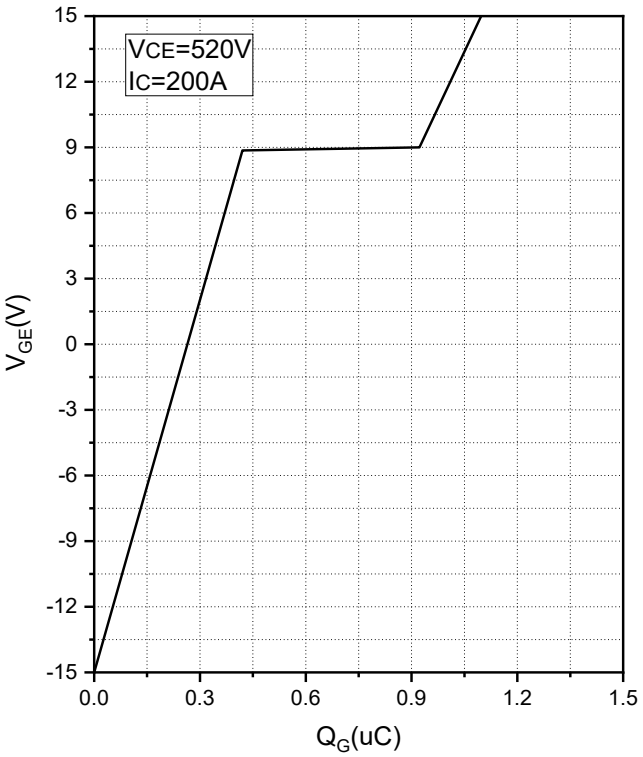


Fig.16 Gate Charge Characteristics(T1,T4)

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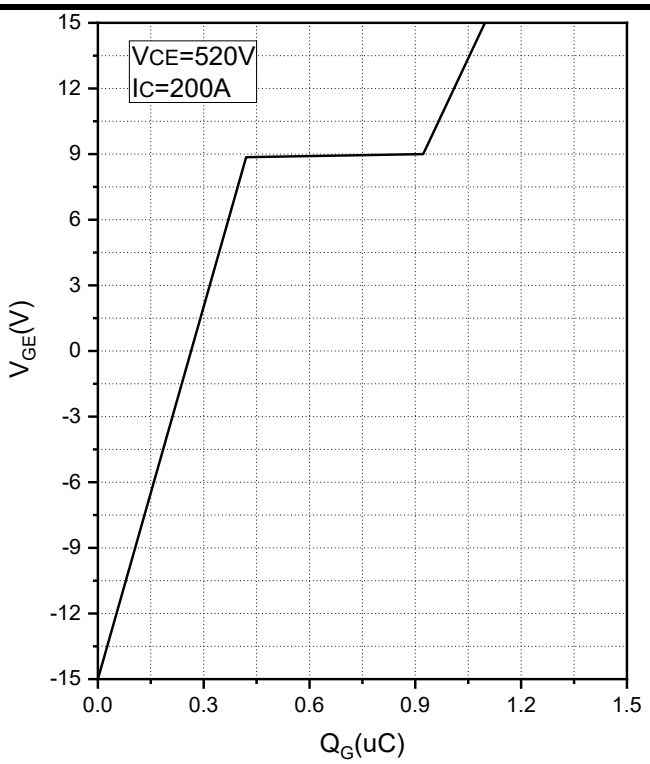


Fig.17 Gate Charge Characteristics(T2,T3)

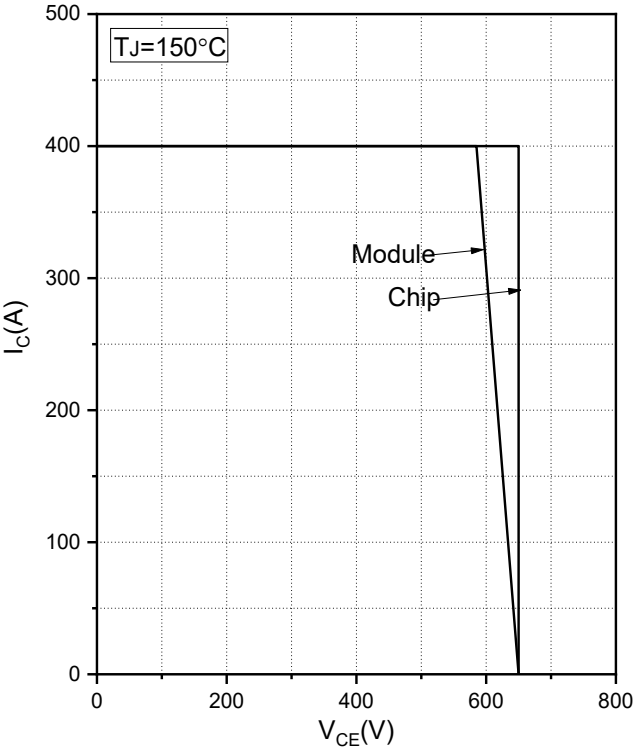


Fig.18 Reverse Bias Safe Operation Area (RBSOA)(T1,T4)

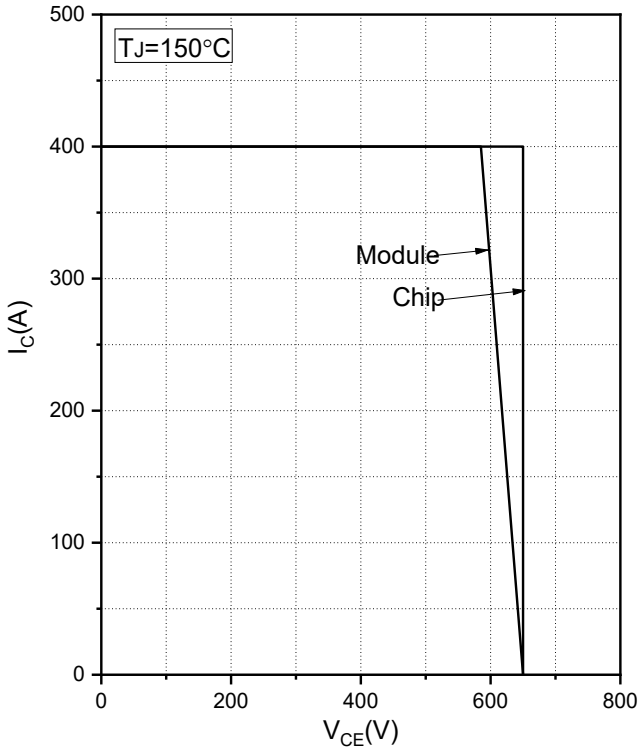


Fig.19 Reverse Bias Safe Operation Area (RBSOA)(T2,T3)

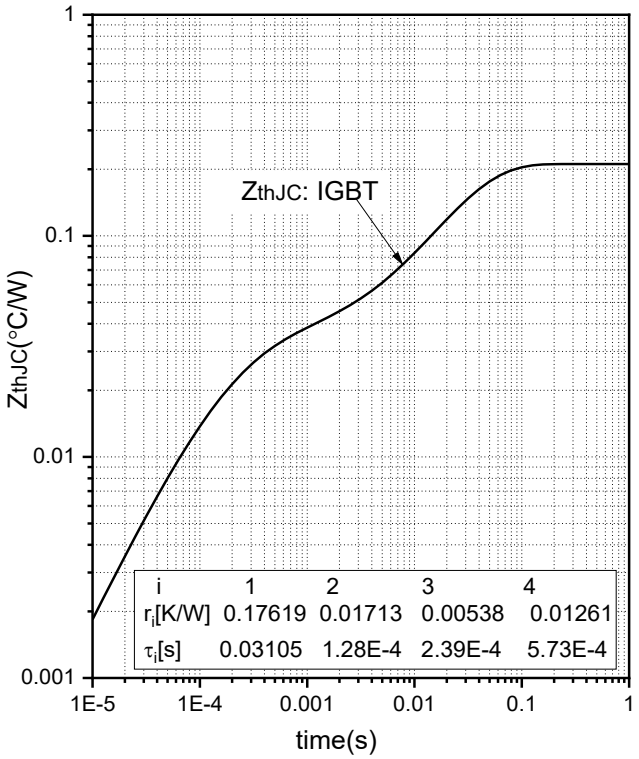


Fig.20 Transient Thermal Impedance (T1,T2,T3,T4)

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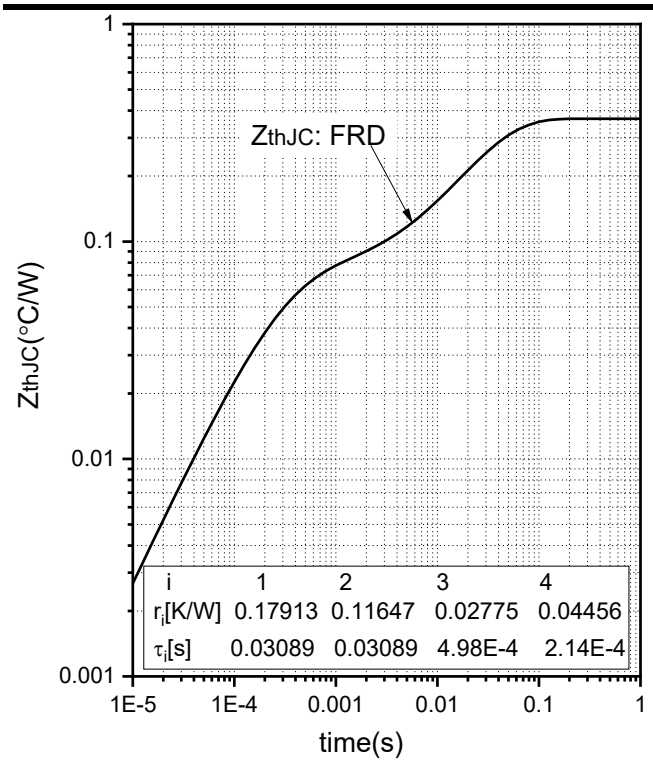


Fig.21 Transient Thermal Impedance (D2,D3)

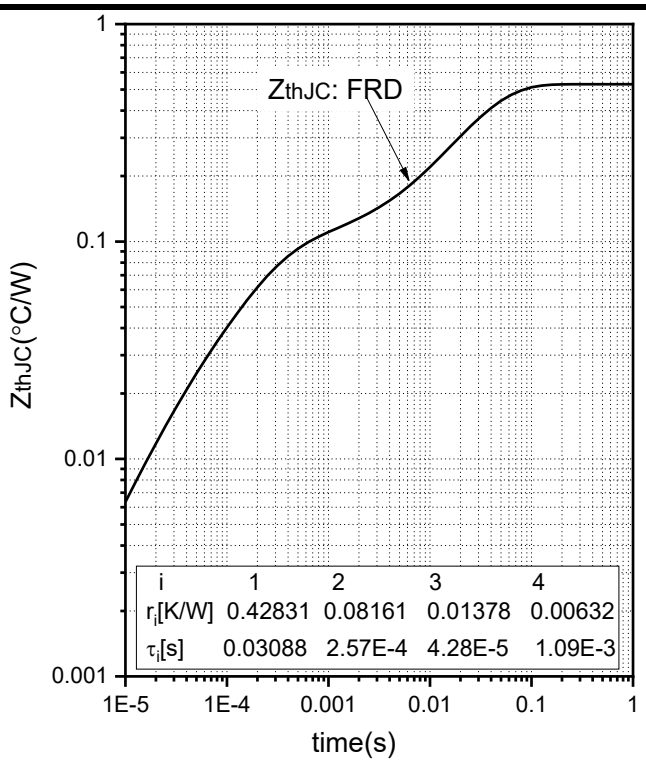


Fig.22 Transient Thermal Impedance (D1,D4,D5,D6)

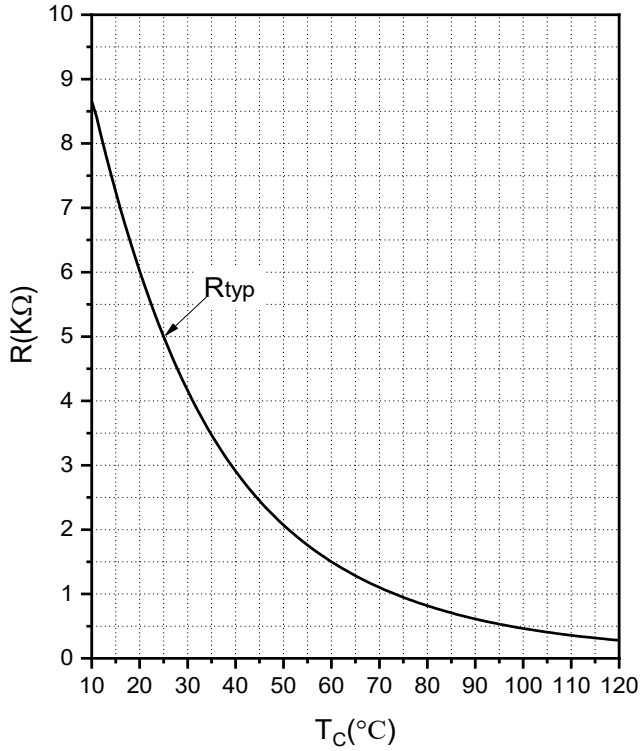
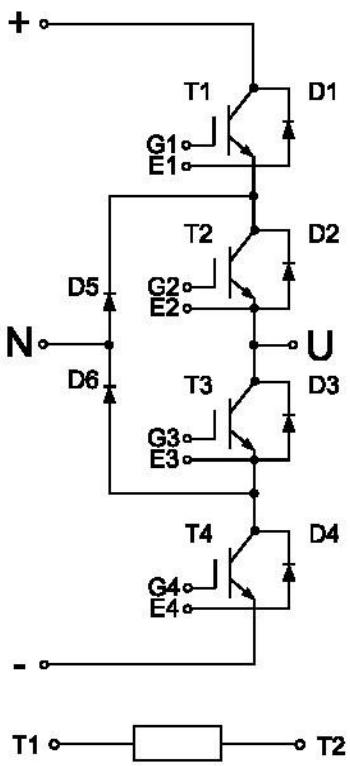


Fig.23 NTC Temperature Characteristics

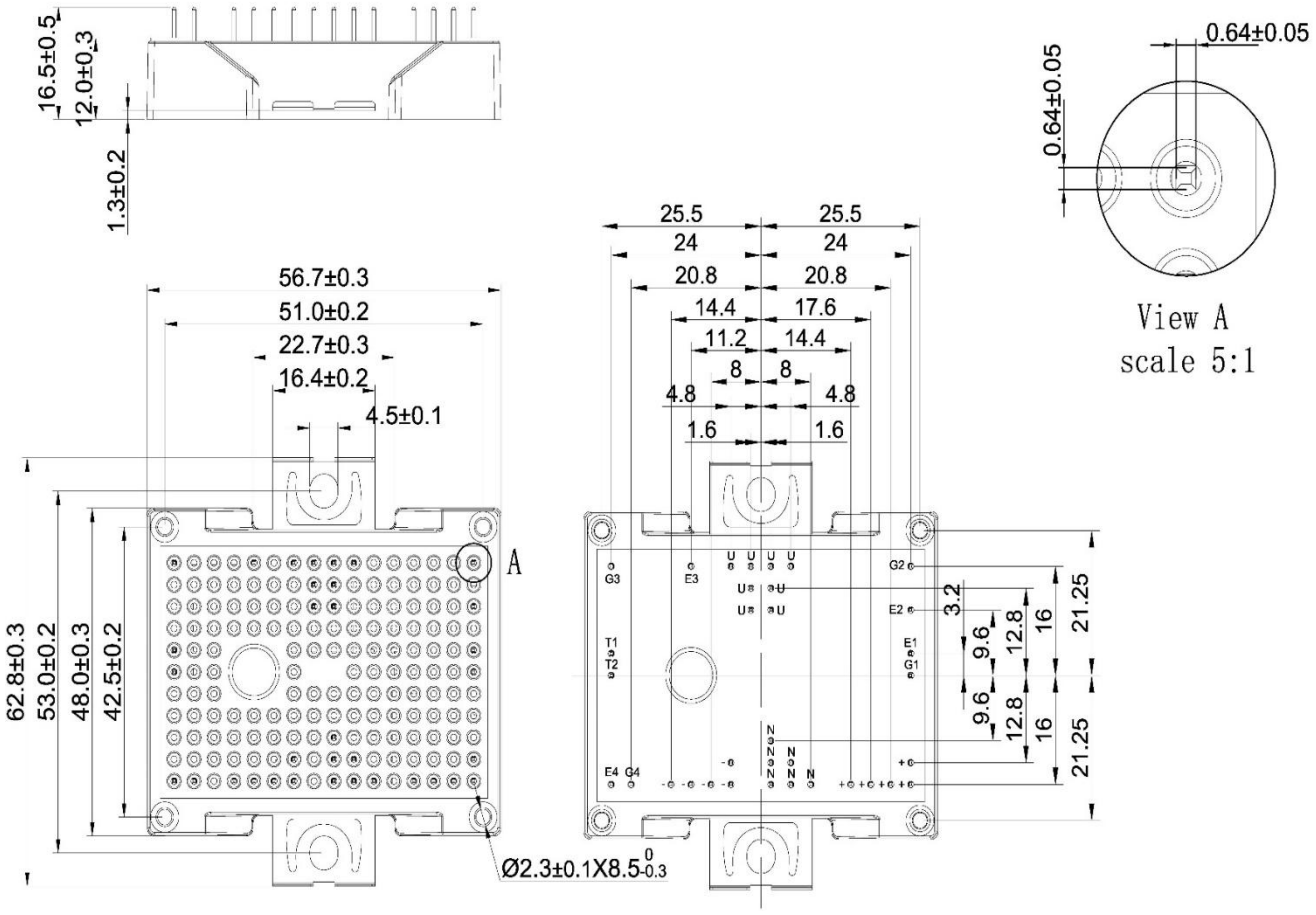
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Internal Circuit:



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Package Outline (Unit: mm):



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Revision	Notes
02	Engineering Sample Datasheet

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