



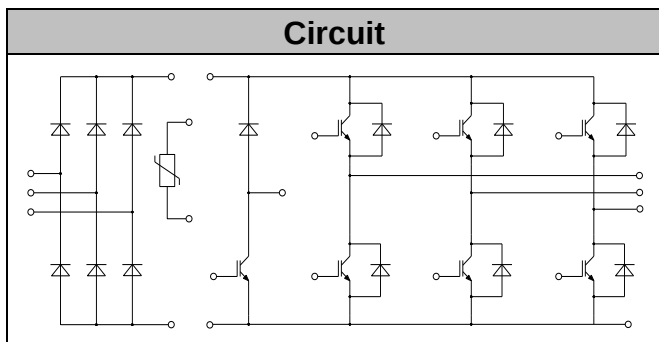
IGBT Modules

V_{CES}	1200V
I_C	150A

Applications

- Motor Drivers
- AC and DC servo drive amplifier
- UPS (Uninterruptible Power Supplies)

Circuit



Features

- Low switching losses
- Low $V_{CE(sat)}$ with positive temperature coefficient
- Including fast & soft recovery anti-parallel FWD
- Low inductance case
- High short circuit capability(10us)
- Maximum junction temperature 175°C

● IGBT- inverter

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	150	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	300	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	785	W

● IGBT- inverter

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=5mA, T_{vj}=25^{\circ}C$	5.0	5.8	6.6	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=150A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.90	2.50	V
		$I_C=150A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.25		
		$I_C=150A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.35		
Gate Charge	Q_G			1.3		uC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V, f=1MHz, T_{vj}=25^{\circ}C$		12		nF
Reverse Transfer Capacitance	C_{res}			0.5		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=150A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=25^{\circ}C$		155		ns
Rise Time	t_r			64		ns
Turn-off Delay Time	$t_{d(off)}$			435		ns
Fall Time	t_f			110		ns
Energy Dissipation During Turn-on Time	E_{on}			13.2		mJ
Energy Dissipation During Turn-off Time	E_{off}			12.7		mJ
Turn-on Delay Time	$t_{d(on)}$	$I_C=150A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=150^{\circ}C$		180		ns
Rise Time	t_r			74		ns
Turn-off Delay Time	$t_{d(off)}$			500		ns
Fall Time	t_f			203		ns
Energy Dissipation During Turn-on Time	E_{on}			18.8		mJ
Energy Dissipation During Turn-off Time	E_{off}			16.7		mJ
SC Data	I_{sc}	$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^{\circ}C, V_{CC}=900V, V_{CEM} \leq 1200V$		750		A

● Diode-inverter

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1200	V
Continuous DC Forward Current	I_F		150	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	300	A
I^2t -value	I^2t	$V_R=0V, t_p=10ms, T_{vj}=125^{\circ}C$	3500	A^2s
		$V_R=0V, t_p=10ms, T_{vj}=150^{\circ}C$	3000	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=150A, T_{vj}=25^{\circ}C$		2.20	2.80	V
		$I_F=150A, T_{vj}=125^{\circ}C$		1.90		
		$I_F=150A, T_{vj}=150^{\circ}C$		1.85		
Recovered Charge	Q_{rr}	$I_F=150A$		12.4		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1600A/\mu s$		65		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^{\circ}C$		3.98		mJ
Recovered Charge	Q_{rr}	$I_F=150A$		24.5		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1600A/\mu s$		80		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^{\circ}C$		5.25		mJ

● IGBT-brake-chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	$V_{GE}=0V, I_C=1mA, T_{vj}=25^{\circ}C$	1200	V
Continuous Collector Current	I_C	$T_C=100^{\circ}C, T_{vjmax}=175^{\circ}C$	100	A
Repetitive Peak Collector Current	I_{CRM}	$t_p=1ms$	200	A
Gate-Emitter Voltage	V_{GES}	$T_{vj}=25^{\circ}C$	± 20	V
Total Power Dissipation	P_{tot}	$T_C=25^{\circ}C$ $T_{vjmax}=175^{\circ}C$	515	W

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}, I_C=3.3mA, T_{vj}=25^{\circ}C$	5.0	5.7	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	$V_{CE}=1200V, V_{GE}=0V, T_{vj}=25^{\circ}C$			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C=100A, V_{GE}=15V, T_{vj}=25^{\circ}C$		1.85	2.50	V
		$I_C=100A, V_{GE}=15V, T_{vj}=125^{\circ}C$		2.15		
		$I_C=100A, V_{GE}=15V, T_{vj}=150^{\circ}C$		2.25		
Gate Charge	Q_G			0.78		μC
Input Capacitance	C_{ies}	$V_{CE}=25V, V_{GE}=0V,$ $f=1MHz, T_{vj}=25^{\circ}C$		6.8		nF
Reverse Transfer Capacitance	C_{res}			0.32		nF
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=20V, T_{vj}=25^{\circ}C$			400	nA
Turn-on Delay Time	$t_{d(on)}$	$I_C=100A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=25^{\circ}C$		160		ns
Rise Time	t_r			45		ns
Turn-off Delay Time	$t_{d(off)}$			215		ns
Fall Time	t_f			54		ns
Energy Dissipation During Turn-on Time	E_{on}			9.2		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.8		mJ

Turn-on Delay Time	$t_{d(on)}$	$I_C=100A$ $V_{CE}=600V$ $V_{GE}=\pm 15V$ $R_G=3.3\Omega$ $T_{vj}=150^\circ C$		180		ns
Rise Time	t_r			52		ns
Turn-off Delay Time	$t_{d(off)}$			360		ns
Fall Time	t_f			63		ns
Energy Dissipation During Turn-on Time	E_{on}			13.3		mJ
Energy Dissipation During Turn-off Time	E_{off}			9.5		mJ
SC Data	I_{sc}	$t_p \leq 10\mu s, V_{GE}=15V, T_{vj}=150^\circ C,$ $V_{CC}=600V, V_{CEM} \leq 1200V$		500		A

● Diode-Brake-Chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^\circ C$	1200	V
Continuous DC Forward Current	I_F		60	A
Repetitive Peak Forward Current	I_{FRM}	$t_p=1ms$	120	A
I^2t -value	I^2t	$V_R=0V, t_p=10ms, T_{vj}=125^\circ C$	560	A^2s
		$V_R=0V, t_p=10ms, T_{vj}=150^\circ C$	475	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	$I_F=60A, T_{vj}=25^\circ C$		1.95	2.80	V
		$I_F=60A, T_{vj}=125^\circ C$		1.70		
		$I_F=60A, T_{vj}=150^\circ C$		1.65		
Recovered Charge	Q_{rr}	$I_F=60A$		5.8		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1500A/\mu s$		56		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=25^\circ C$		1.85		mJ
Recovered Charge	Q_{rr}	$I_F=60A$		9.1		μC
Peak Reverse Recovery Current	I_{rr}	$V_R=600V$ $-di_F/dt = 1500A/\mu s$		58		A
Reverse Recovery Energy	E_{rec}	$T_{vj}=150^\circ C$		3.35		mJ

● Diode-Rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	$T_{vj}=25^{\circ}C$	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	$T_C=100^{\circ}C$	150	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	$T_C=100^{\circ}C$	150	A
Surge Forward Current	I_{FSM}	$V_R=0V, t_p=10ms, T_{vj}=25^{\circ}C$	1500	A
I^2t -value	I^2t	$V_R=0V, t_p=10ms, T_{vj}=25^{\circ}C$	11200	A^2s

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	$I_F=50A, T_{vj}=125^{\circ}C$		1.0		V
Reverse Current	I_R	$T_{vj}=125^{\circ}C, V_R=1600V$			2.0	mA

● NTC-Thermistor

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Rated Resistance	R_{25}			5.0		k Ω
Deviation of R100	$\Delta R/R$	$T_C=100, R_{100}=493.3\Omega$	-5		5	%
Power Dissipation	P_{25}				20.0	mW
B-value	$B_{25/50}$	$R_2=R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$		3375		K

● Module Characteristics

$T_C=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation voltage	V_{isol}	$t=1\text{min}, f=50\text{Hz}$	2500			V
Maximum Junction Temperature	T_{jmax}				175	$^{\circ}\text{C}$
Operating Junction Temperature	$T_{\text{vj op}}$		-40		150	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-40		125	$^{\circ}\text{C}$
Stray-inductance-module	L_{SCE}			60		nH
Module lead resistance, terminals-chip	$R_{\text{CC}'+\text{EE}'}$	$T_C=25^{\circ}\text{C}$, per switch		4.0		m Ω
	$R_{\text{AA}'+\text{CC}'}$			3.0		
Thermal Resistance Junction-to Case	$R_{\theta\text{JC}}$	per IGBT-inverter			0.19	K/W
		per Diode-inverter			0.35	
		per IGBT-brake-copper			0.29	
		per Diode-chopper			0.85	
		per Diode-rectifier			0.45	
Thermal Resistance Case-to Sink	$R_{\theta\text{CS}}$	per IGBT-inverter		0.12		K/W
		per Diode-inverter		0.20		
		per IGBT-brake-copper		0.18		
		per Diode-chopper		0.45		
		per Diode-rectifier		0.17		
		per Module		0.009		
Module-to-Sink Torque	M_s		3.0		6.0	N·m
Weight of Module	G			300		g

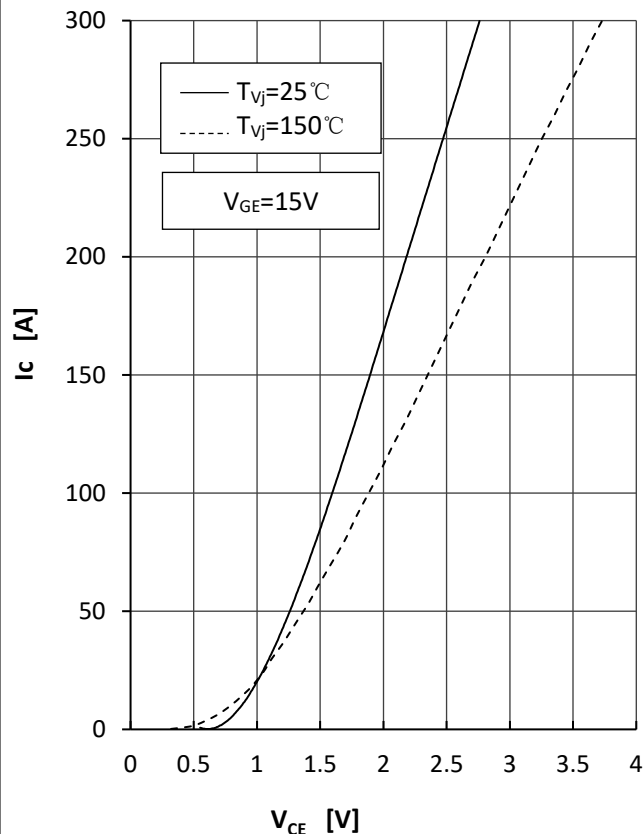


Fig1.IGBT Output Characteristics

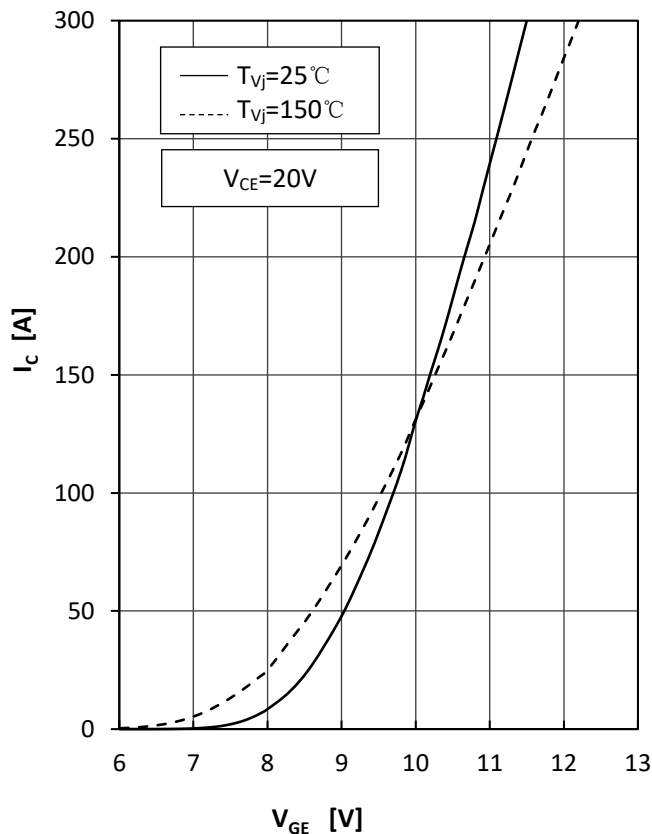


Fig2.IGBT Transfer Characteristics

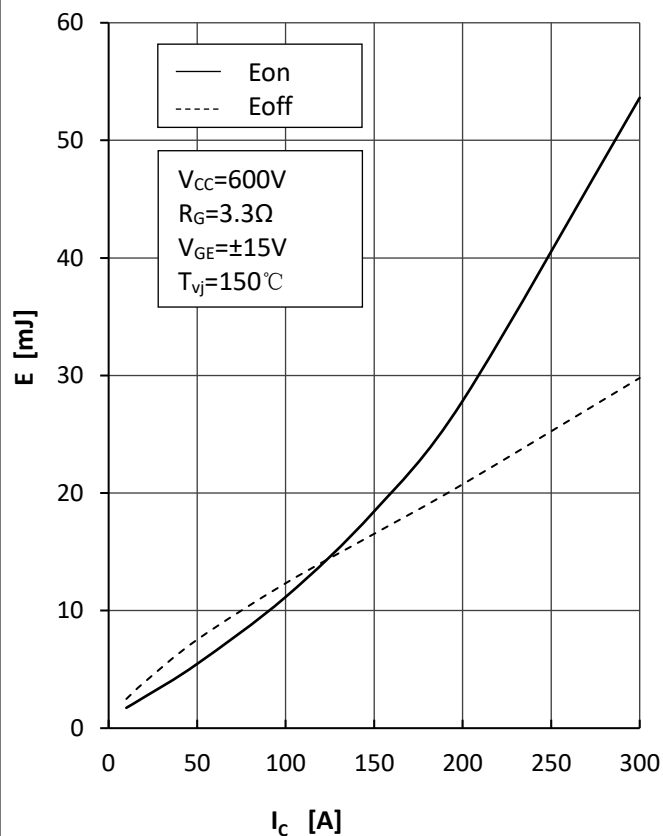


Fig3.IGBT Switching Loss vs.Ic

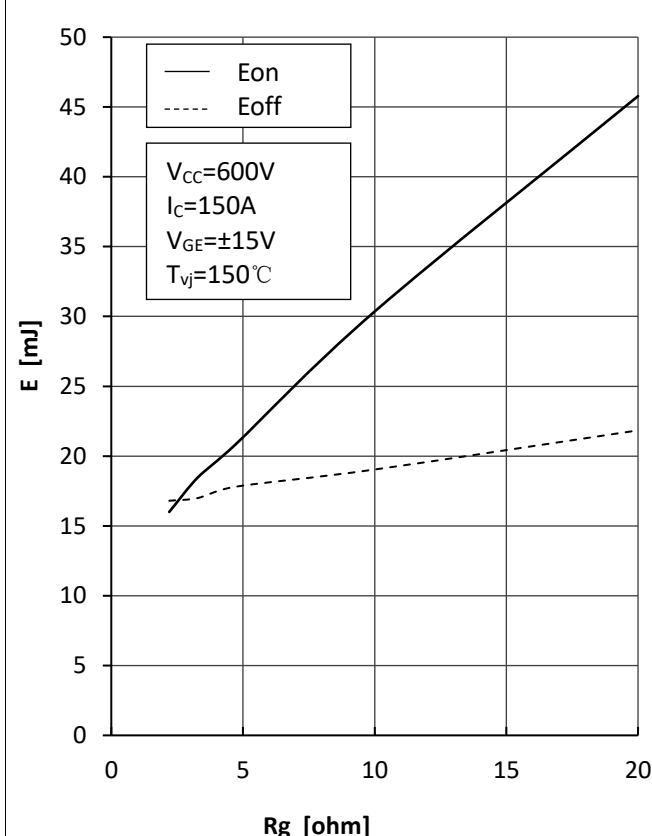
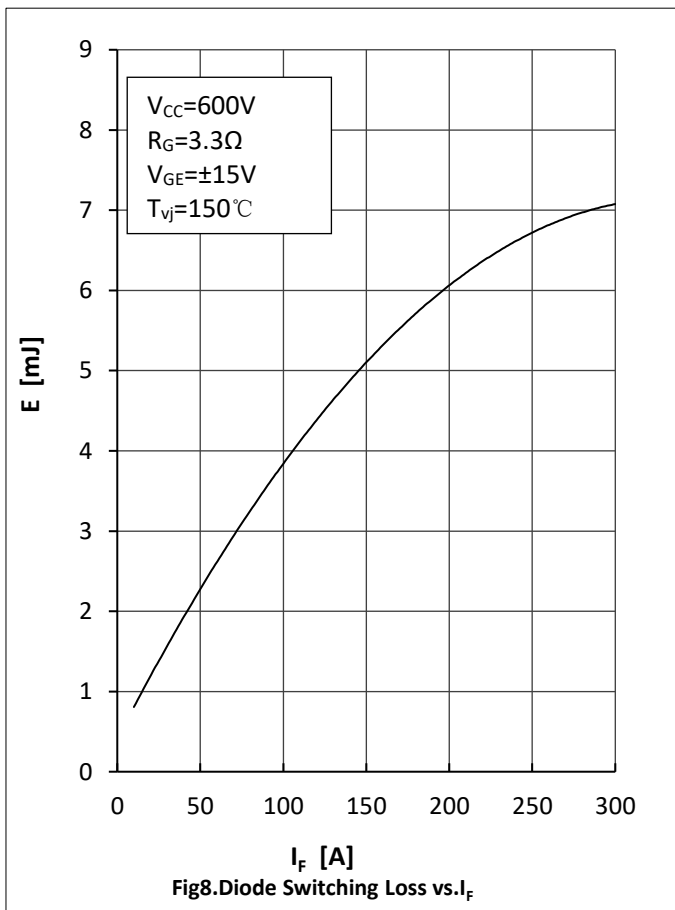
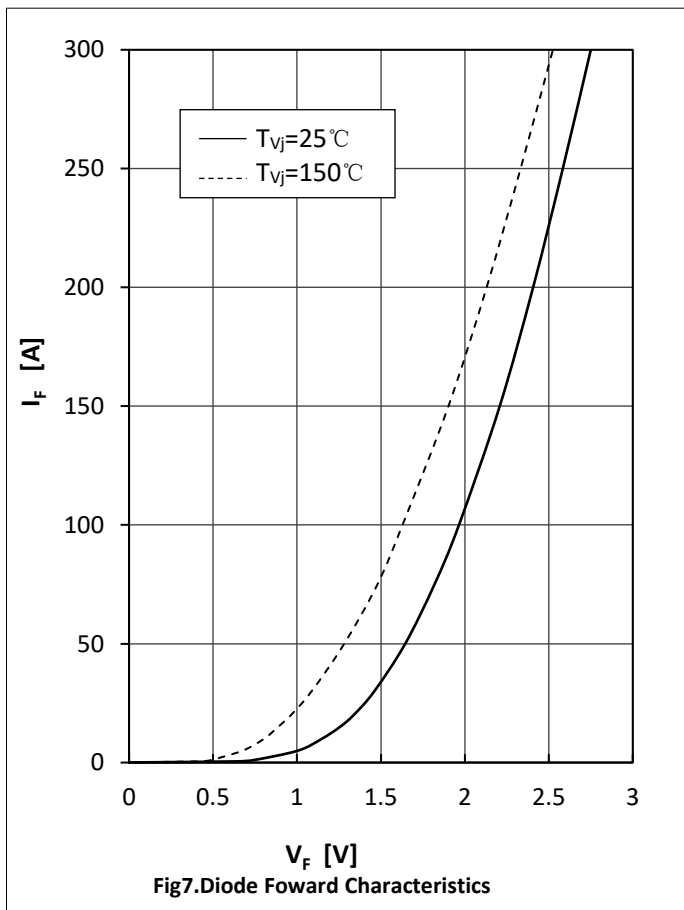
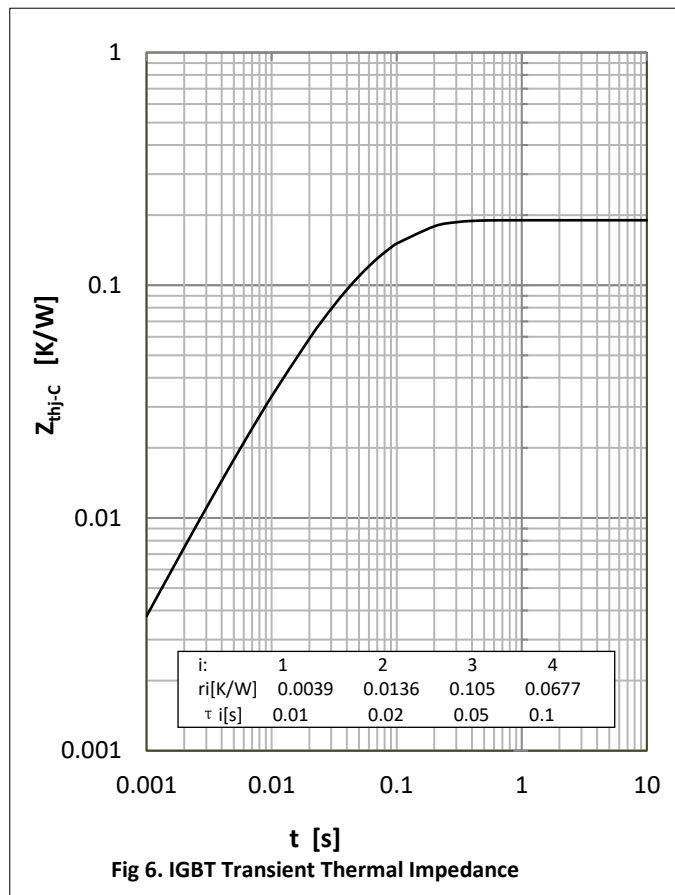
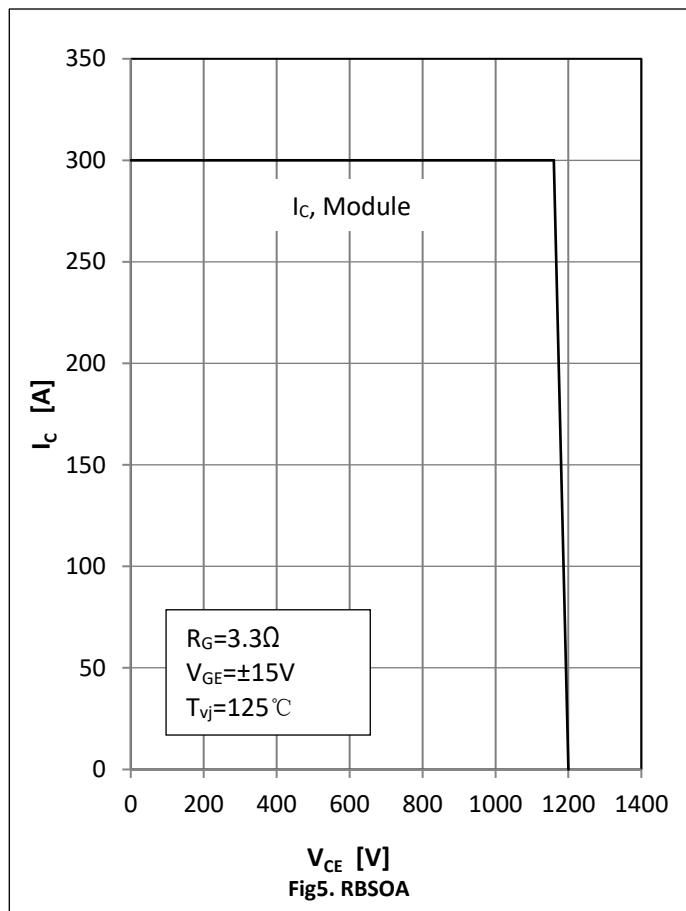
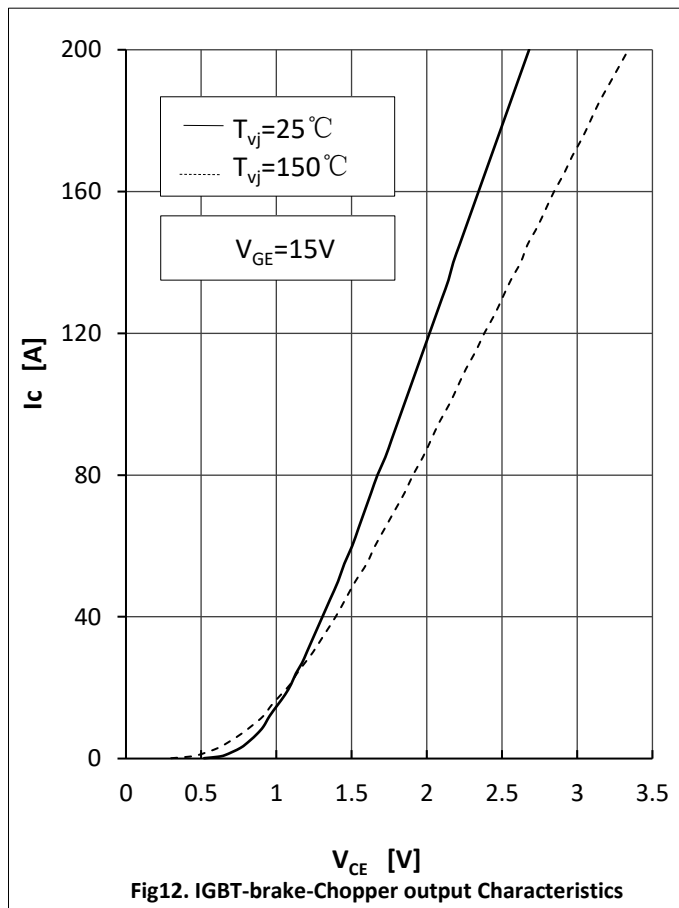
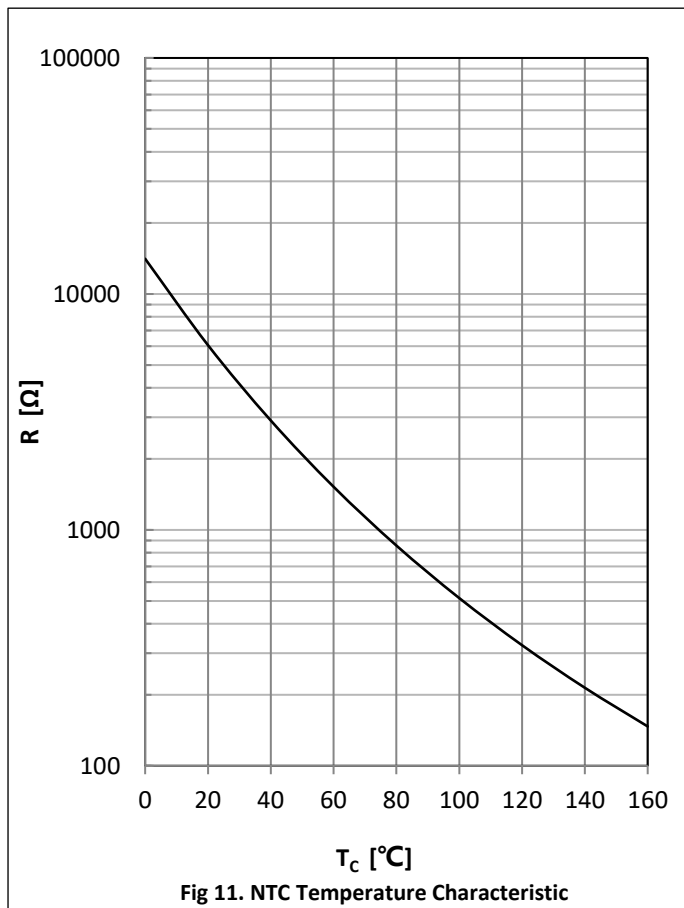
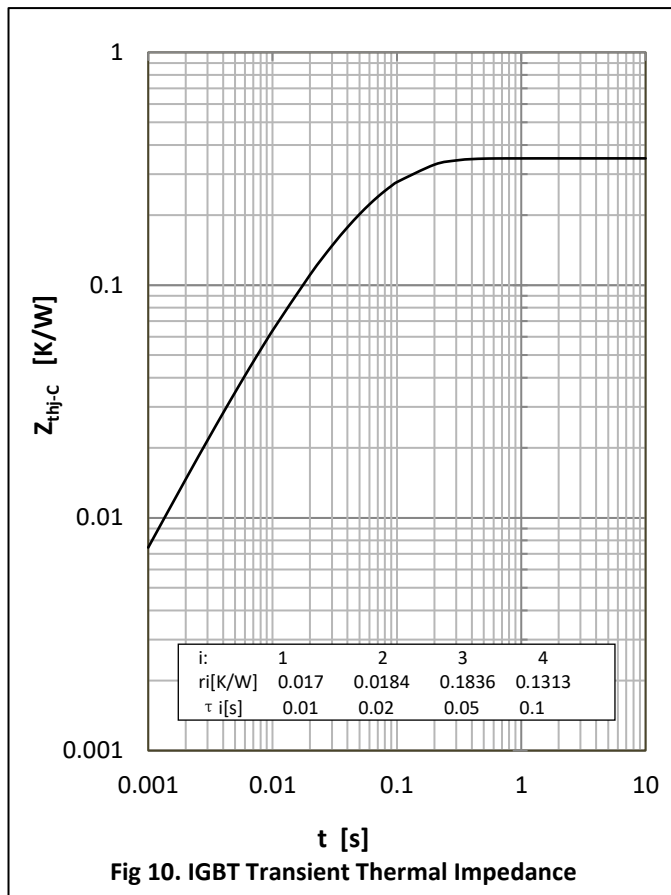
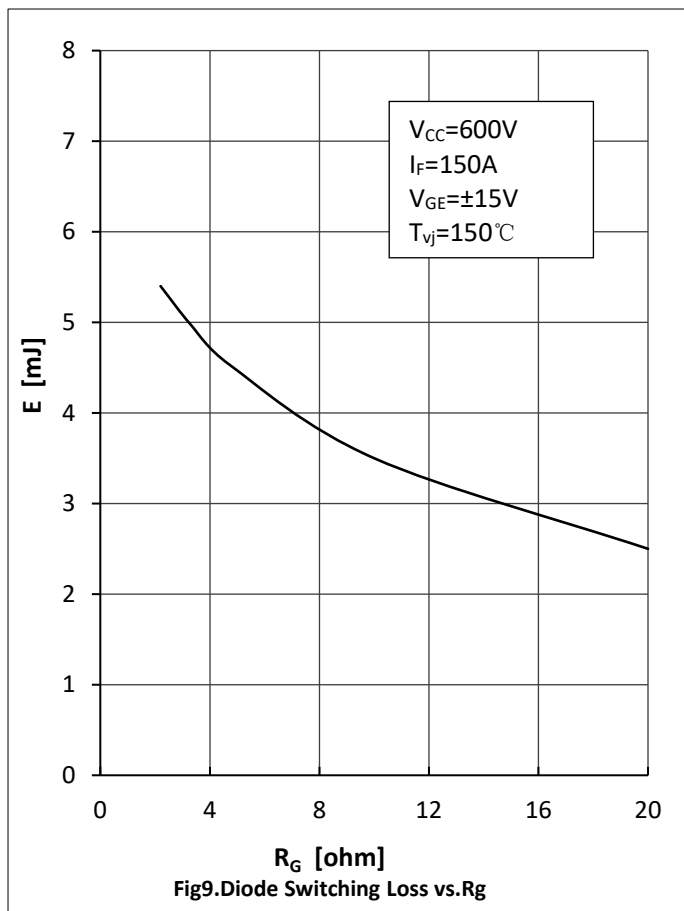
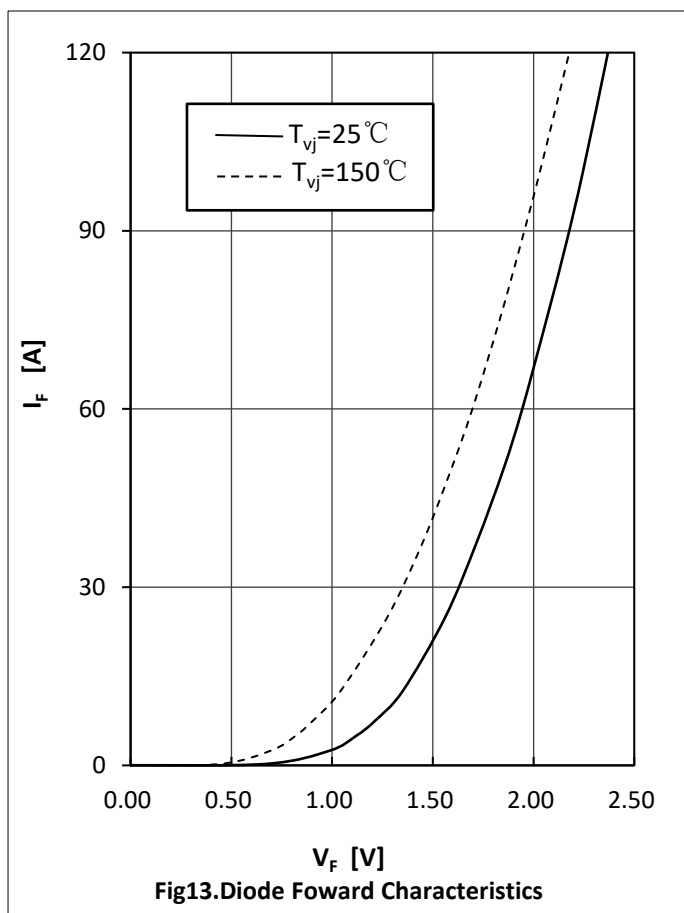


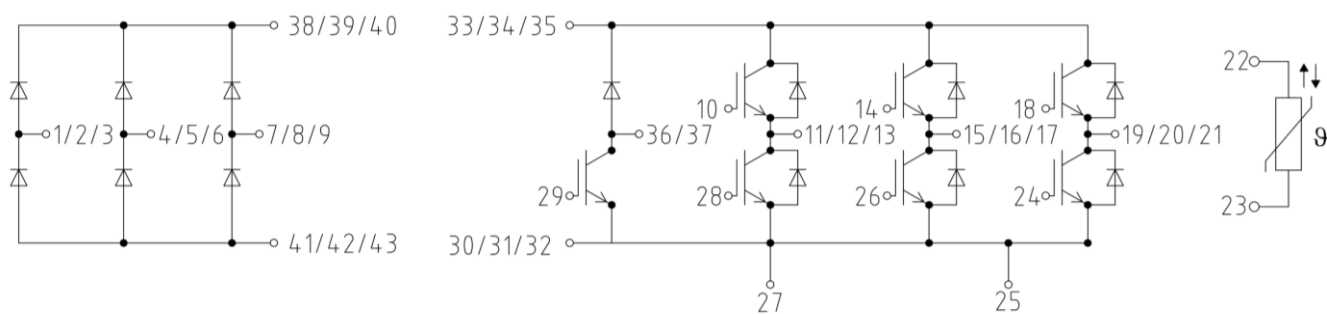
Fig4.IGBT Switching Loss vs.Rg



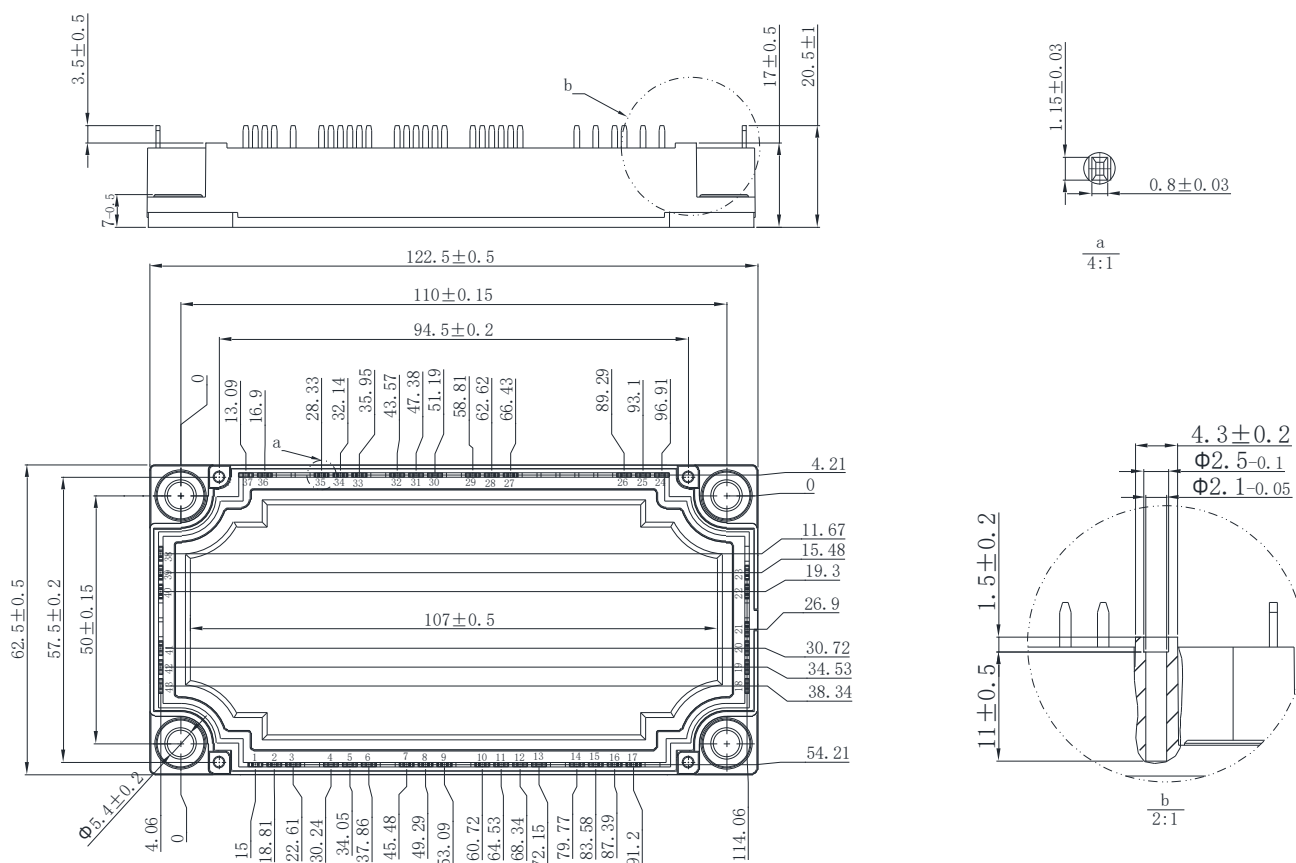




● Circuit Diagram



● Package Outline Information



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