

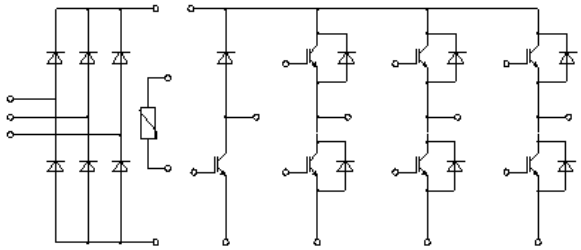
IGBT Modules

V_{CES}	1200V
I_C	15A

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)
- Isolated heatsink using DBC technology
- Maximum junction temperature 175℃

IGBT- inverter

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE}=0V, I_C =1mA, T_{vj}=25℃	1200	V
Continuous Collector Current	I_C	T_C=100℃, T_{vjmax}=175℃	15	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	30	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_C=25℃ T_{vjmax}=175℃	165	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 =0.5mA,T_{vj}=25℃	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=15A,V_{GE}=15V, T_{vj}=25℃		1.90		V
		I_C=15A,V_{GE}=15V, T_{vj}=125℃		2.10		
		I_C=15A,V_{GE}=15V, T_{vj}=150℃		2.20		
Gate Charge	Q_G			0.15		uC
Input Capacitance	C_{ies}	V_{CE}=25V, V_{GE} =0V, f=1MHz, T_{vj}=25℃		0.98		nF
Reverse Transfer Capacitance	C_{res}			0.034		nF
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj} = 25℃			400	nA
Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE} =±15V R_G=39Ω T_{vj}=25℃		63		ns
Rise Time	t_r			31		ns
Turn-off Delay Time	$t_{d(off)}$			87		ns
Fall Time	t_f			305		ns
Energy Dissipation During Turn-on Time	E_{on}			2.03		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.05		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE} =±15V R_G=39Ω T_{vj}=150℃		64		ns
Rise Time	t_r			35		ns
Turn-off Delay Time	$t_{d(off)}$			92		ns
Fall Time	t_f			324		ns
Energy Dissipation During Turn-on Time	E_{on}			2.23		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.19		mJ
SC Data	I_{SC}	t_p≤10us,V_{GE}=15V,T_{vj}=150℃, V_{CC}=900V,V_{CEM}≤1200V		55		A

Diode-inverter

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	1200	V
Continuous DC Forward Current	I_F		15	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	30	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=125℃	16.0	A^2s
		V_R=0V,t_p=10ms,T_{vj}=150℃	14.0	

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=15A,T_{vj}=25℃		2.00		V
		I_F=15A,T_{vj}=125℃		1.80		
		I_F=15A,T_{vj}=150℃		1.75		
Recovered Charge	Q_{rr}	I_F=15A V_R=600V -di_F/dt=600A/us T_{vj}=25℃		0.48		uC
Peak Reverse Recovery Current	I_{rr}			13		A
Reverse Recovery Energy	E_{rec}			0.48		mJ
Recovered Charge	Q_{rr}	I_F=15A V_R=600V -di_F/dt=600A/us T_{vj}=150℃		0.62		uC
Peak Reverse Recovery Current	I_{rr}			14		A
Reverse Recovery Energy	E_{rec}			0.7		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℃	1200	V
Continuous Collector Current	I_C	T_C=100℃, T_{vjmax}=175℃	15	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	30	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_C=25℃, T_{vjmax}=175℃	165	W

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C =0.5mA,T_{vj}=25℃	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=15A,V_{GE}=15V, T_{vj}=25℃		1.90		V
		I_C=15A,V_{GE}=15V, T_{vj}=125℃		2.10		
		I_C=15A,V_{GE}=15V, T_{vj}=150℃		2.20		
Gate Charge	Q_G			0.15		uC
Input Capacitance	C_{ies}	V_{CE}=25V, V_{GE} =0V, f=1MHz, T_{vj}=25℃		0.98		nF
Reverse Transfer Capacitance	C_{res}			0.034		nF
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20 V,T_{vj} = 25℃			400	nA
Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE} =±15V R_G=39Ω T_{vj}=25℃		63		ns
Rise Time	t_r			31		ns
Turn-off Delay Time	$t_{d(off)}$			87		ns
Fall Time	t_f			305		ns
Energy Dissipation During Turn-on Time	E_{on}			2.03		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.05		mJ

Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE} =±15V R_G=39Ω T_{vj}=150℃		64		ns
Rise Time	t_r			35		ns
Turn-off Delay Time	$t_{d(off)}$			92		ns
Fall Time	t_f			324		ns
Energy Dissipation During Turn-on Time	E_{on}			2.23		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.19		mJ
SC Data	I_{SC}	t_p≤10us,V_{GE}=15V,T_{vj}=150℃, V_{CC}=900V,V_{CEM}≤1200V		55		A

● Diode-brake-chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	1200	V
Continuous DC Forward Current	I_F		10	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	20	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=125℃	16.0	A^2s
		V_R=0V,t_p=10ms,T_{vj}=150℃	14.0	

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=10A,T_{vj}=25℃		2.00		V
		I_F=10A,T_{vj}=125℃		1.85		
		I_F=10A,T_{vj}=150℃		1.80		
Recovered Charge	Q_{rr}	I_F=10A V_R=600V -di_F/dt=600A/us T_{vj}=25℃		0.26		uC
Peak Reverse Recovery Current	I_{rr}			11		A
Reverse Recovery Energy	E_{rec}			0.28		mJ
Recovered Charge	Q_{rr}	I_F=10A V_R=600V -di_F/dt=600A/us T_{vj}=150℃		0.37		uC
Peak Reverse Recovery Current	I_{rr}			12		A
Reverse Recovery Energy	E_{rec}			0.65		mJ

Diode-rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	1600	V
Average output Current 50/60Hz, sine wave	$I_{F(AV)}$	T_C=100℃	20	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_C=100℃	40	A
Surge Forward Current	I_{FSM}	V_R=0V,t_p=10ms,T_{vj}=45℃	270	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=45℃	360	A^2s

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	I_F=15A,T_{vj}=150℃		0.96		V
Reverse Current	I_R	T_{vj}=150℃,V_R=1600V			1.0	mA

NTC-Thermistor

Characteristic Values

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

Module Characteristics

T_C=25°C unless otherwise specified

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Isolation Voltage	V_{isol}	t=1min,f=50Hz	2500			V
Maximum Junction Temperature	T_{jmax}				175	℃
Operating Junction Temperature	$T_{vj\ op}$		-40		150	℃
Storage Temperature	T_{stg}		-40		125	℃
Stray-inductance-module	L_{SCE}			30		nH
Module lead resistance, terminals-chip	$R_{CC'+EE'}$	T_C=25℃, per switch		5.00		mΩ
	$R_{AA'+CC'}$			6.00		
Thermal Resistance Junction-to Case	$R_{\theta JC}$	per IGBT-inverter		0.90		K/W
		per Diode-inverter		1.30		
		per IGBT-brake-chopper		0.90		
		per Diode-chopper		1.70		
		per Diode-rectifier		1.03		
Thermal Resistance Case-to Sink	$R_{\theta CS}$	per IGBT-inverter		0.95		K/W
		per Diode-inverter		1.05		
		per IGBT-brake-chopper		0.95		
		per Diode-chopper		1.30		
		per Diode-rectifier		1.17		
		per Module		0.037		
Mounting Force Per Clamp	F		30		80	N
Weight of Module	G			45		g

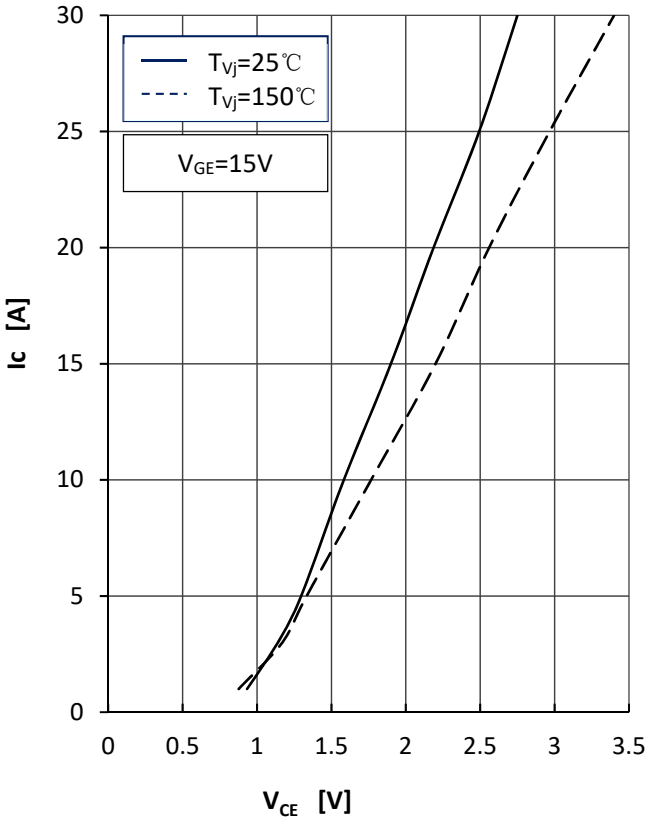


Fig1.IGBT Output Characteristics

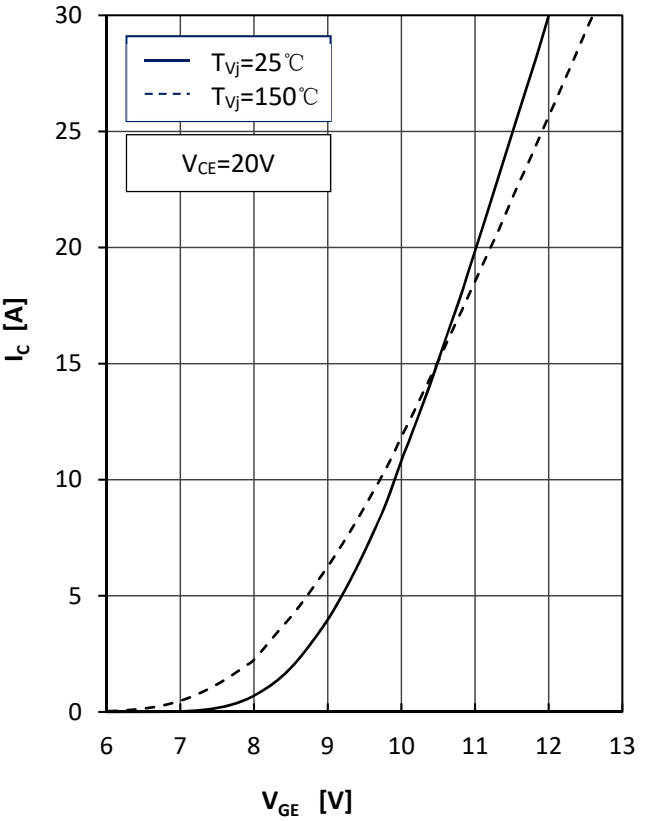


Fig2.IGBT Transfer Characteristics

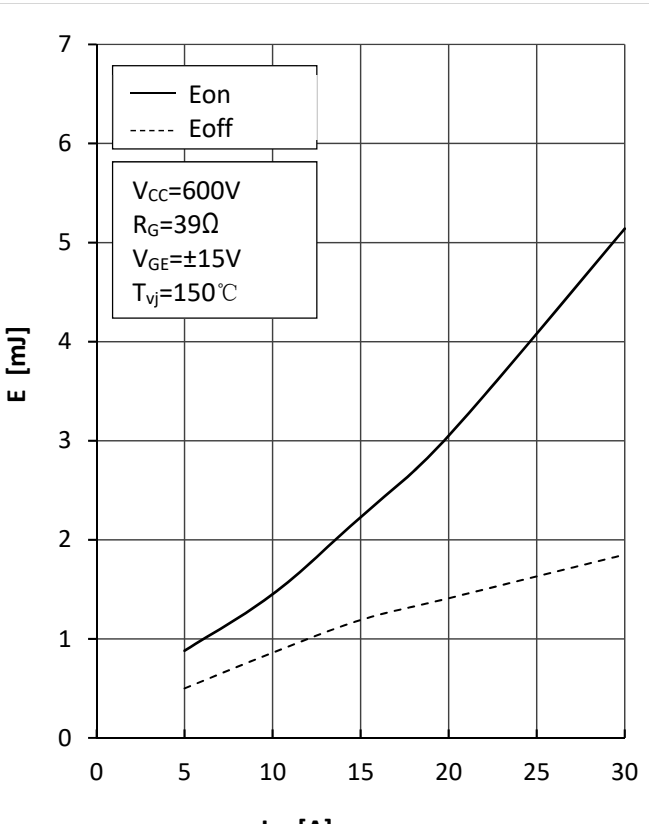


Fig3.IGBT Switching Loss vs.Ic

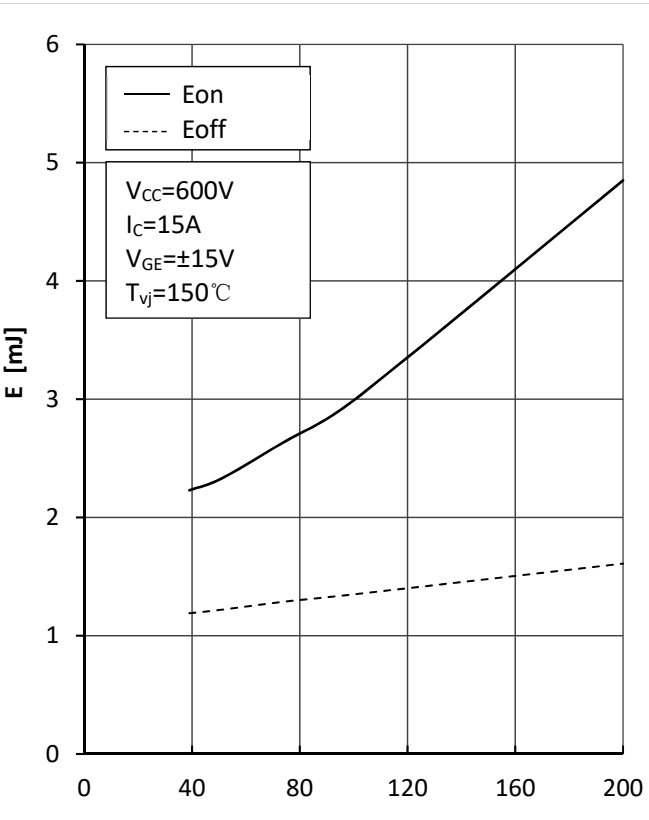


Fig4.IGBT Switching Loss vs.Rg

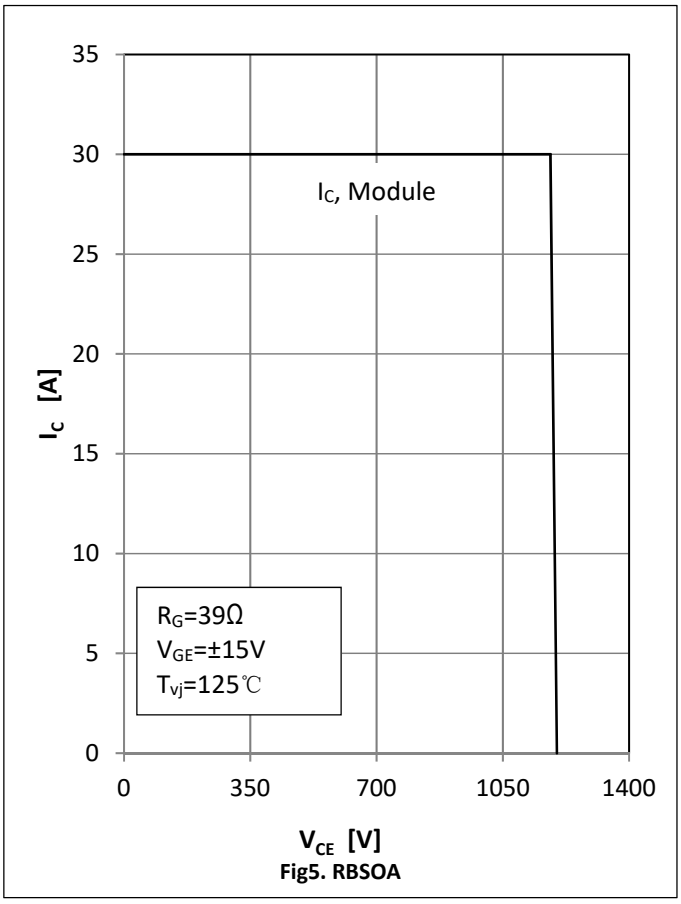


Fig5. RBSOA

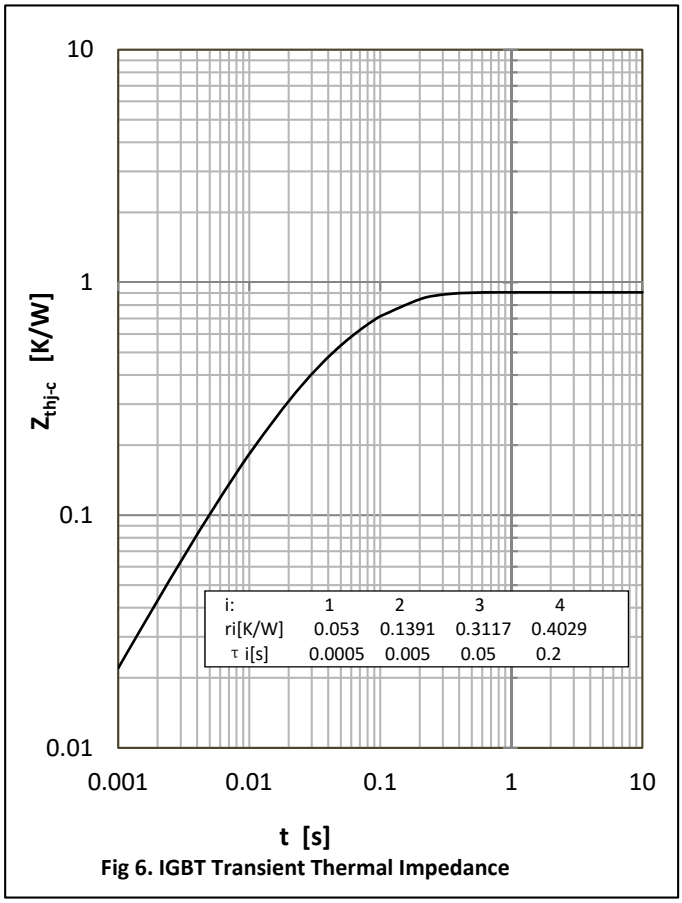


Fig 6. IGBT Transient Thermal Impedance

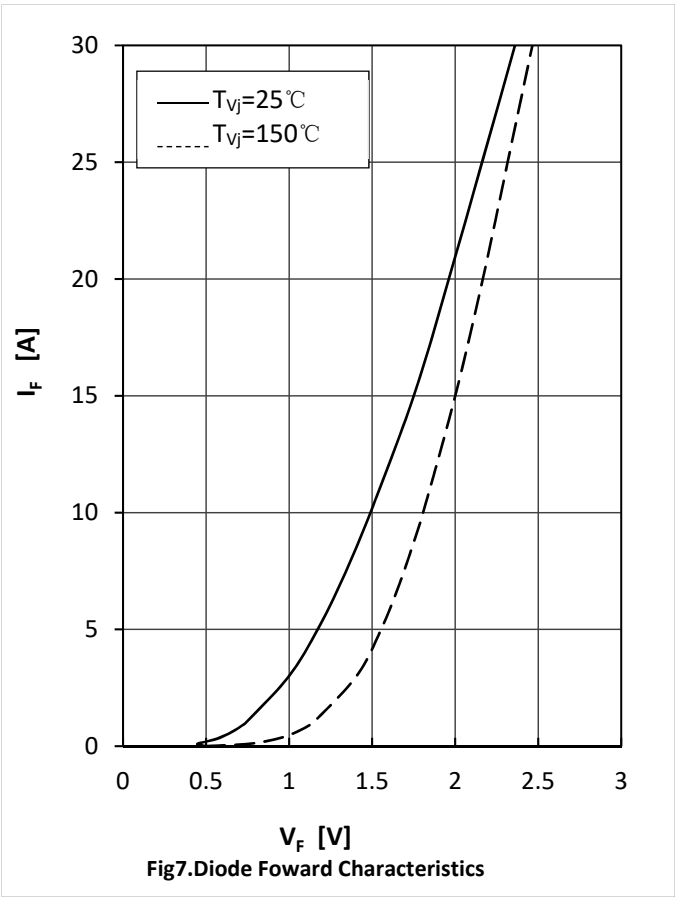


Fig7.Diode Foward Characteristics

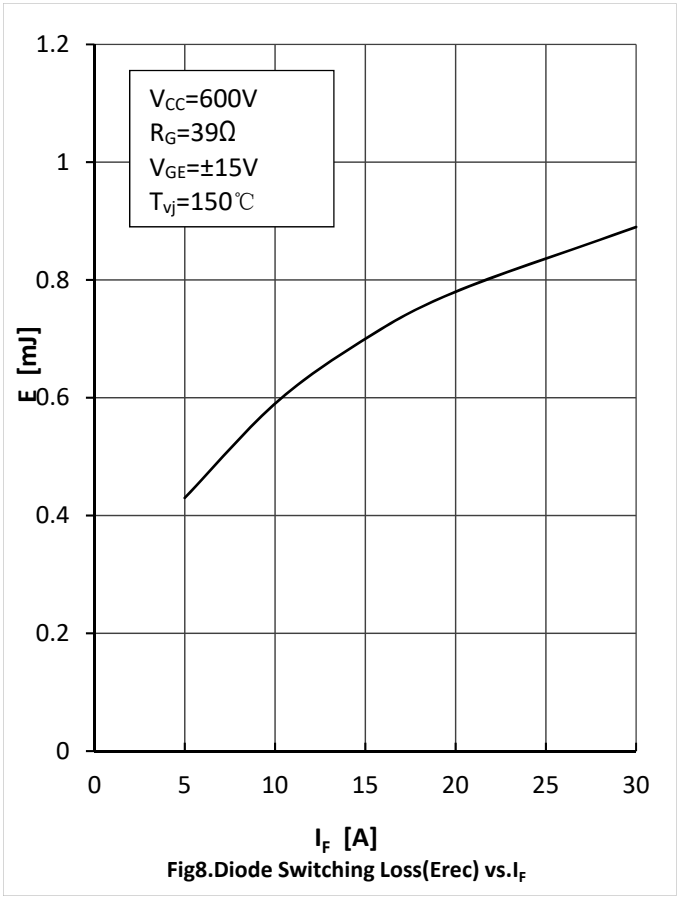


Fig8.Diode Switching Loss(Erec) vs.I_F

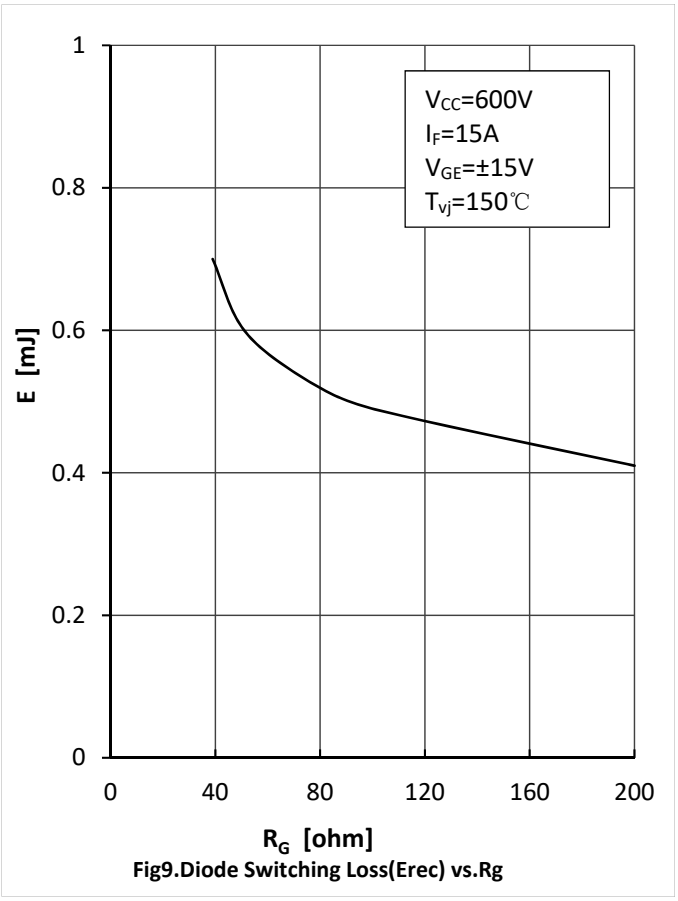


Fig9.Diode Switching Loss(Erec) vs.Rg

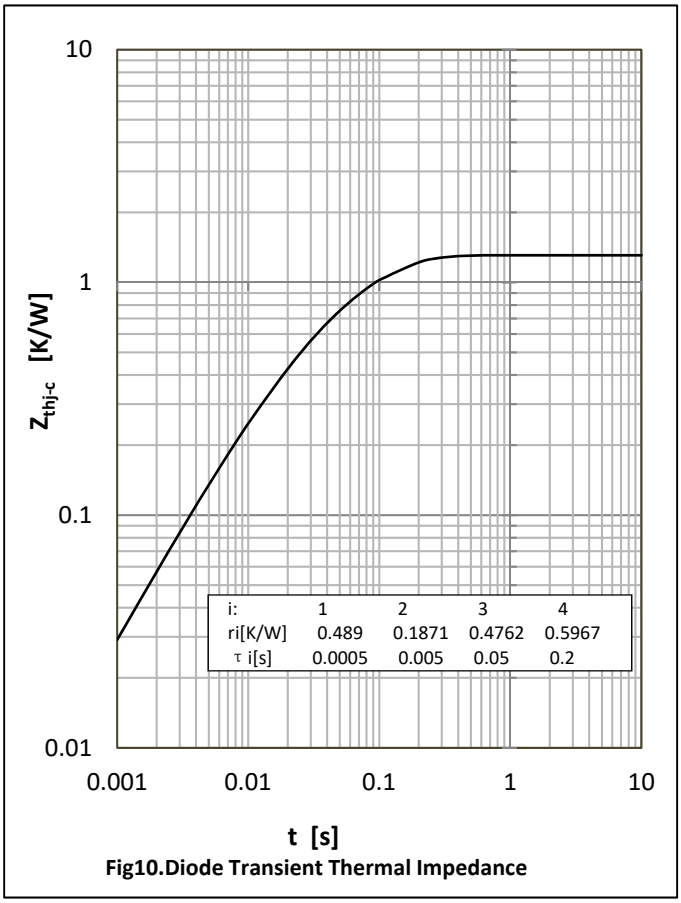


Fig10.Diode Transient Thermal Impedance

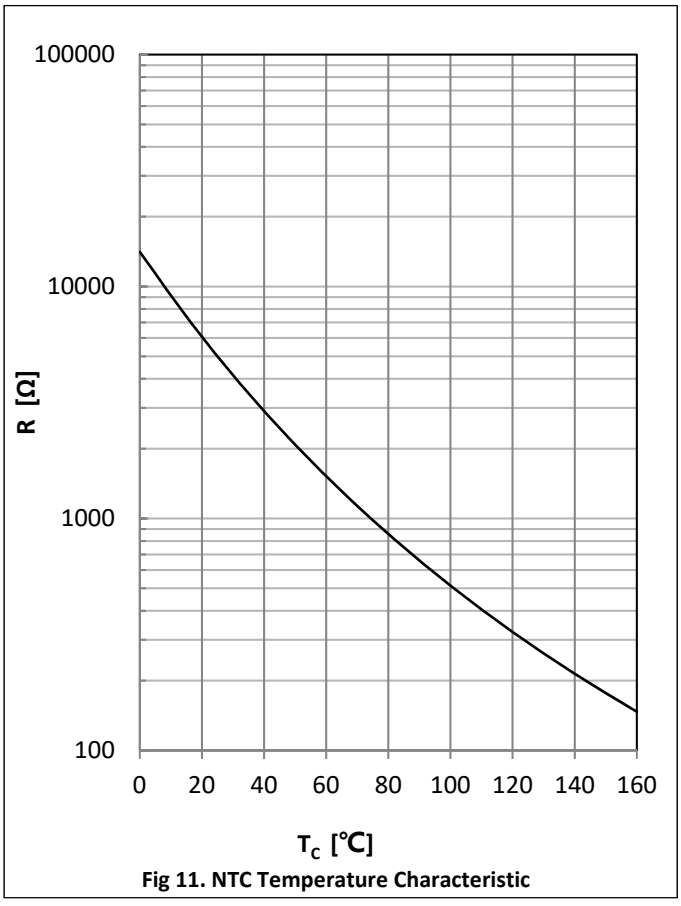


Fig 11. NTC Temperature Characteristic

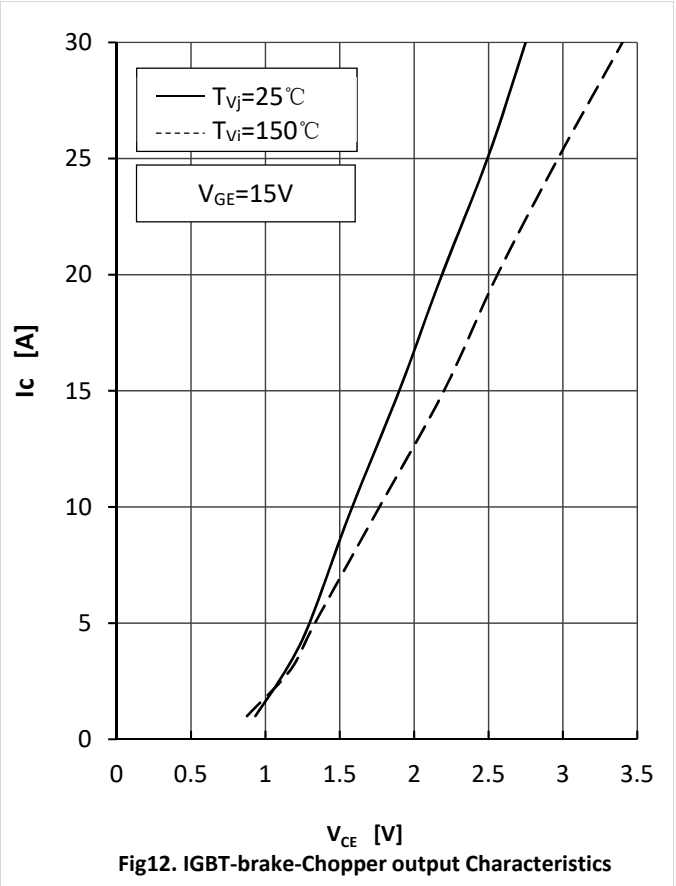


Fig12. IGBT-brake-Chopper output Characteristics

s

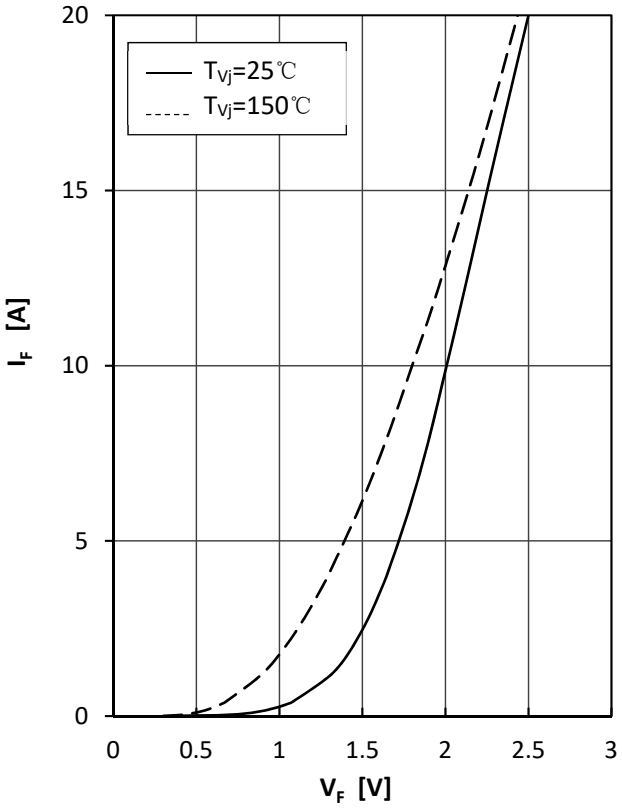
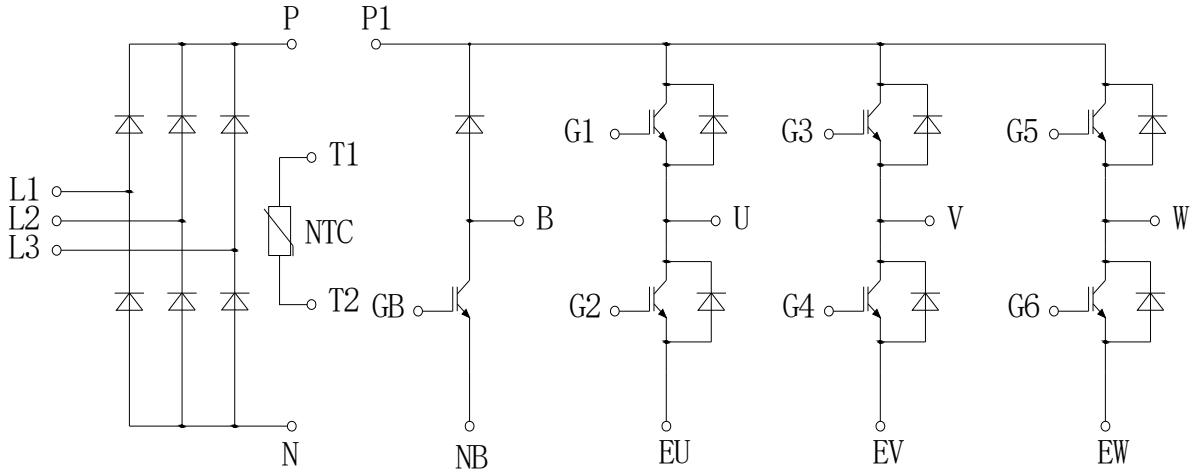
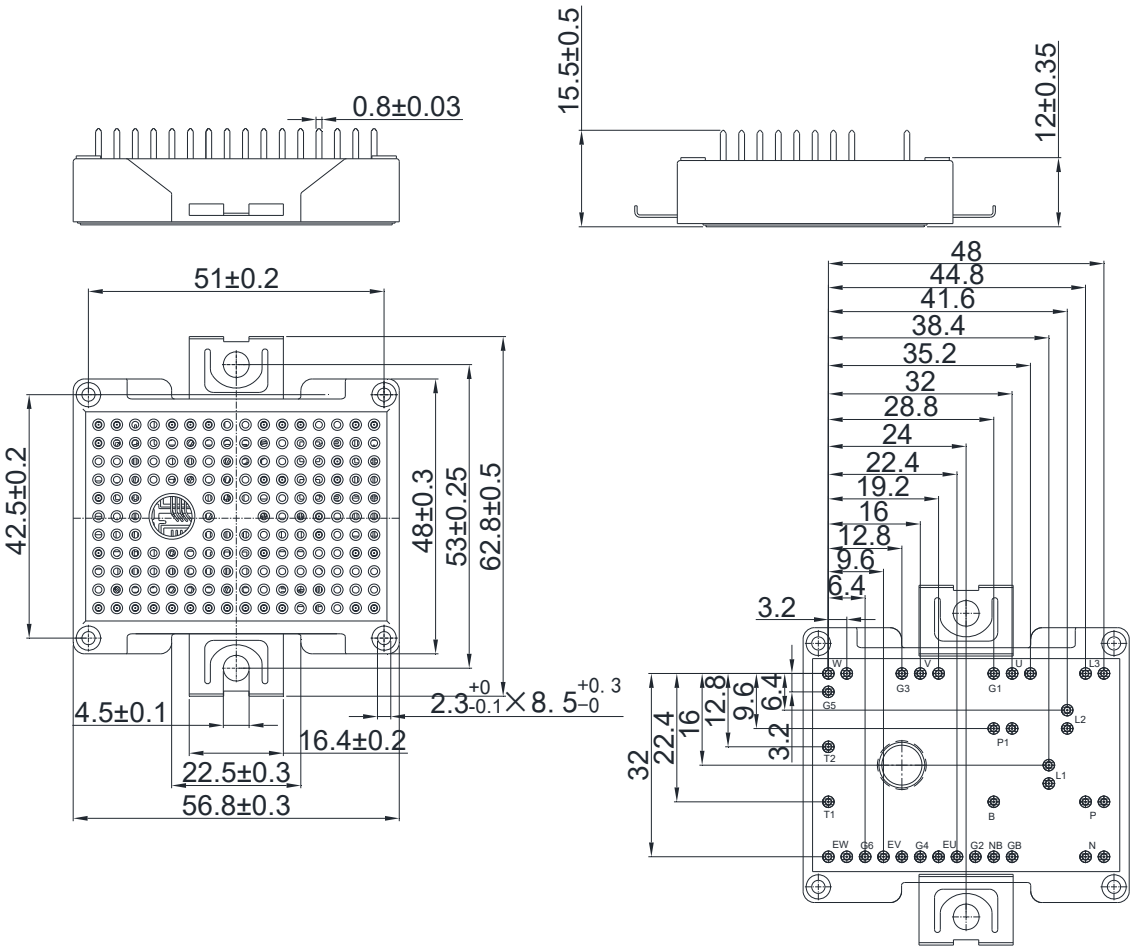


Fig13.Diode-brake-chopper Forward Characteristics

Circuit Diagram



- Package Dimensions



Notice

All products, product specifications and data are subject to change without notice to improve reliability, function or design or otherwise.Information contained herein is intended to provide a product description only. No license, express or implied, to any intellectual property rights is granted by this document. Except as provided in STARSEA's terms and conditions of sale for such products, STARSEA assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of STARSEA products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.