

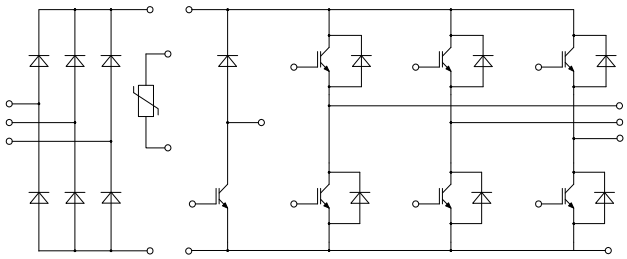
IGBT Modules

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)
- 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℃	130	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	5.9	6.8	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℃		1.9	2.5	V
		I_C=15A,V_{GE}=15V, T_{vj}=125℃		2.1		
		I_C=15A,V_{GE}=15V, T_{vj}=150℃		2.2		
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℃		61		ns
Rise Time	t_r			29		ns
Turn-off Delay Time	$t_{d(off)}$			89		ns
Fall Time	t_f			311		ns
Energy Dissipation During Turn-on Time	E_{on}			1.98		mJ
Energy Dissipation During Turn-off Time	E_{off}			0.99		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE}=±15V R_G=39Ω T_{vj}=150℃		60		ns
Rise Time	t_r			32		ns
Turn-off Delay Time	$t_{d(off)}$			89		ns
Fall Time	t_f			319		ns
Energy Dissipation During Turn-on Time	E_{on}			2.15		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.13		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	2.80	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℃		0.45		uC
Peak Reverse Recovery Current	I_{rr}			13		A
Reverse Recovery Energy	E_{rec}			0.49		mJ
Recovered Charge	Q_{rr}	I_F=15A V_R=600V -di_F/dt =600A/us T_{vj}=150℃		0.54		uC
Peak Reverse Recovery Current	I_{rr}			14		A
Reverse Recovery Energy	E_{rec}			0.68		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℃	130	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	5.9	6.5	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℃		1.9	2.5	V
		I_C=15A,V_{GE}=15V, T_{vj}=125℃		2.1		
		I_C=15A,V_{GE}=15V, T_{vj}=150℃		2.2		
Gate Charge	Q_G			0.09		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℃		61		ns
Rise Time	t_r			29		ns
Turn-off Delay Time	$t_{d(off)}$			89		ns
Fall Time	t_f			311		ns
Energy Dissipation During Turn-on Time	E_{on}			1.98		mJ
Energy Dissipation During Turn-off Time	E_{off}			0.99		mJ

Turn-on Delay Time	$t_{d(on)}$	I_C=15A V_{CE}=600V V_{GE}=±15V R_G=39Ω T_{vj}=150℃		60		ns
Rise Time	t_r			32		ns
Turn-off Delay Time	$t_{d(off)}$			89		ns
Fall Time	t_f			319		ns
Energy Dissipation During Turn-on Time	E_{on}			2.15		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.13		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	2.80	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 =500A/us T_{vj}=25℃		0.26		uC
Peak Reverse Recovery Current	I_{rr}			11		A
Reverse Recovery Energy	E_{rec}			0.25		mJ
Recovered Charge	Q_{rr}	I_F=10A V_R=600V -di_F/dt =500A/us T_{vj}=150℃		0.49		uC
Peak Reverse Recovery Current	I_{rr}			13		A
Reverse Recovery Energy	E_{rec}			0.50		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}=25℃	330	A
		V_R=0V,t_p=10ms,T_{vj}=150℃	280	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=25℃	520	A^2s
		V_R=0V,t_p=10ms,T_{vj}=150℃	390	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}			60		nH
Module lead resistance, terminals-chip	$R_{CC'+EE'}$	T_C=25℃, per switch		4.0		mΩ
	$R_{AA'+CC'}$			3.0		
Thermal Resistance Junction to Case	$R_{\theta JC}$	per IGBT-inverter			1.15	K/W
		per Diode-inverter			1.80	
		per IGBT-brake-copper			1.15	
		per Diode-chopper			2.15	
		per Diode-rectifier			1.40	
Thermal Resistance Case to Sink	$R_{\theta CS}$	per IGBT-inverter		0.41		K/W
		per Diode-inverter		0.51		
		per IGBT-brake-copper		0.51		
		per Diode-chopper		0.77		
		per Diode-rectifier		1.02		
		per Module		0.02		
Module-to-Sink Torque	Ms		3.0		6.0	N·m
Weight of Module	G			180		g

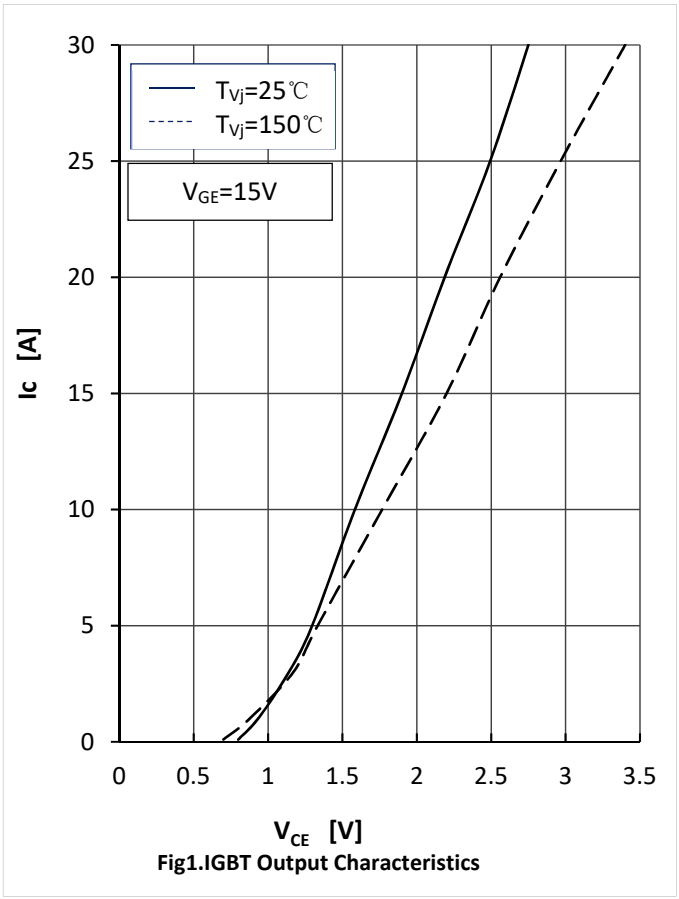


Fig1.IGBT Output Characteristics

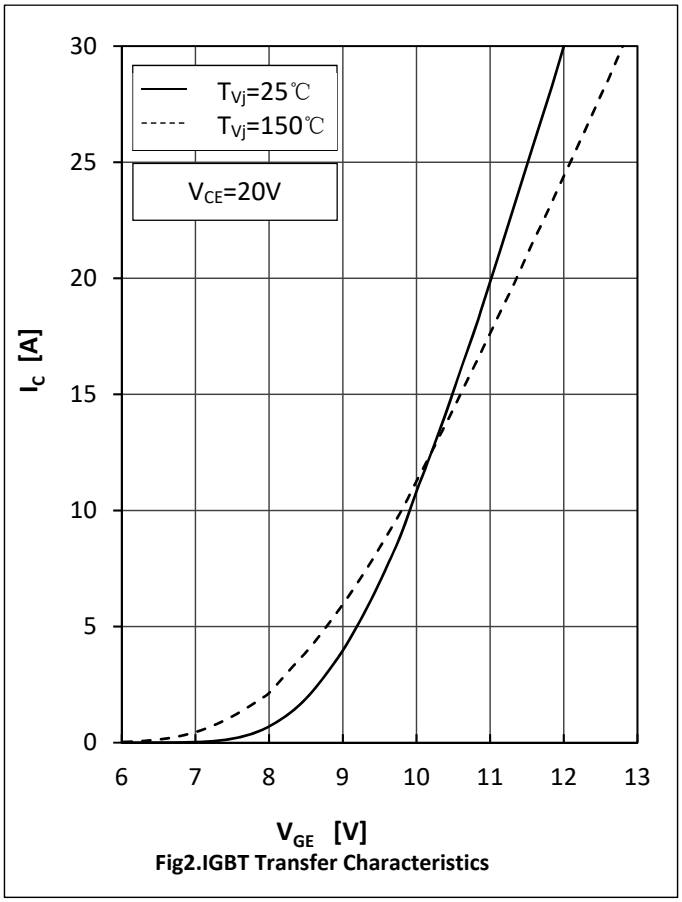


Fig2.IGBT Transfer Characteristics

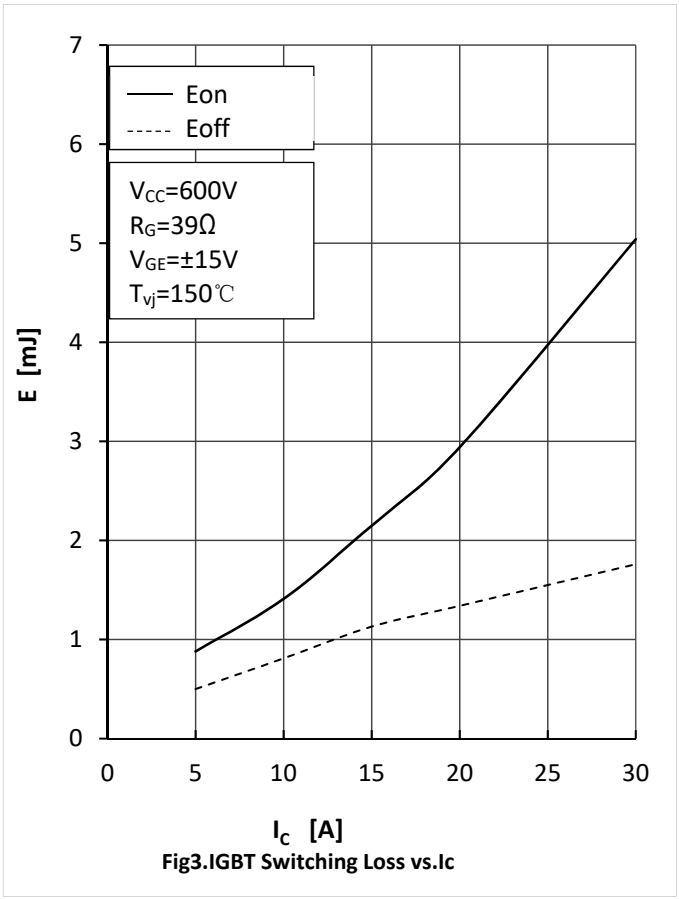


Fig3.IGBT Switching Loss vs.Ic

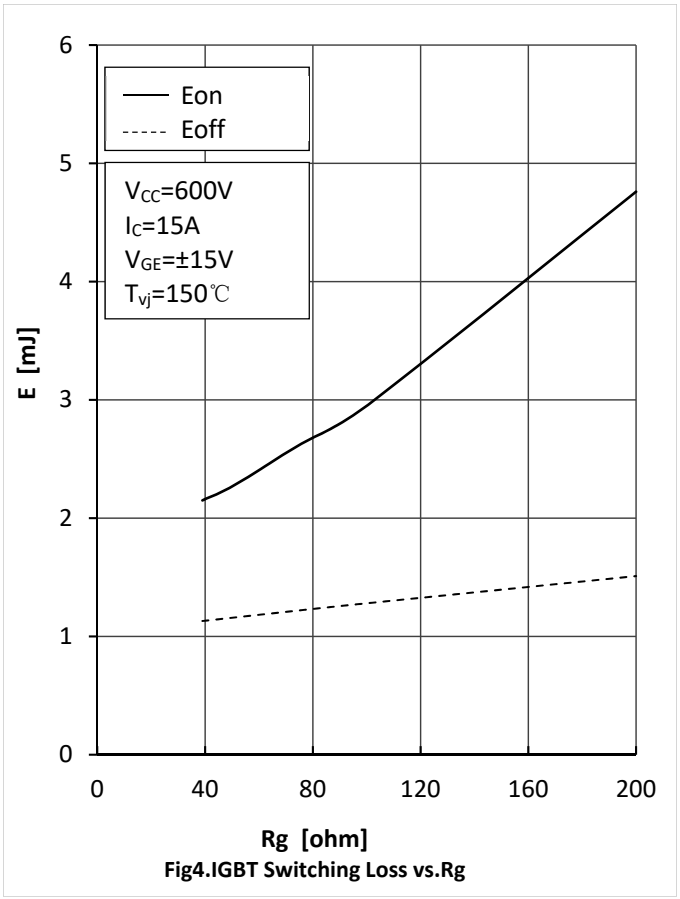


Fig4.IGBT Switching Loss vs.Rg

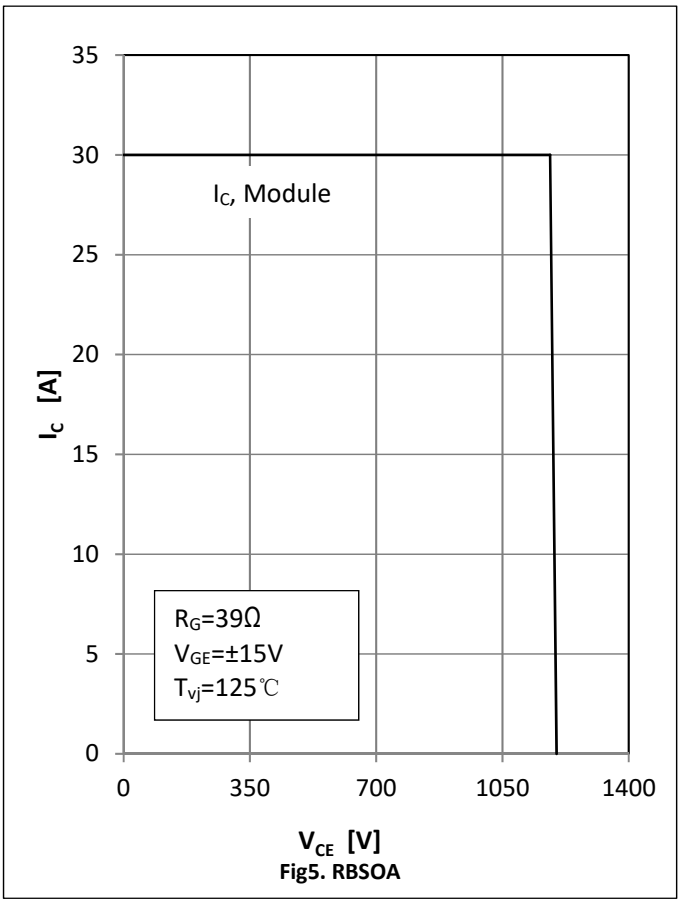


Fig5. RBSOA

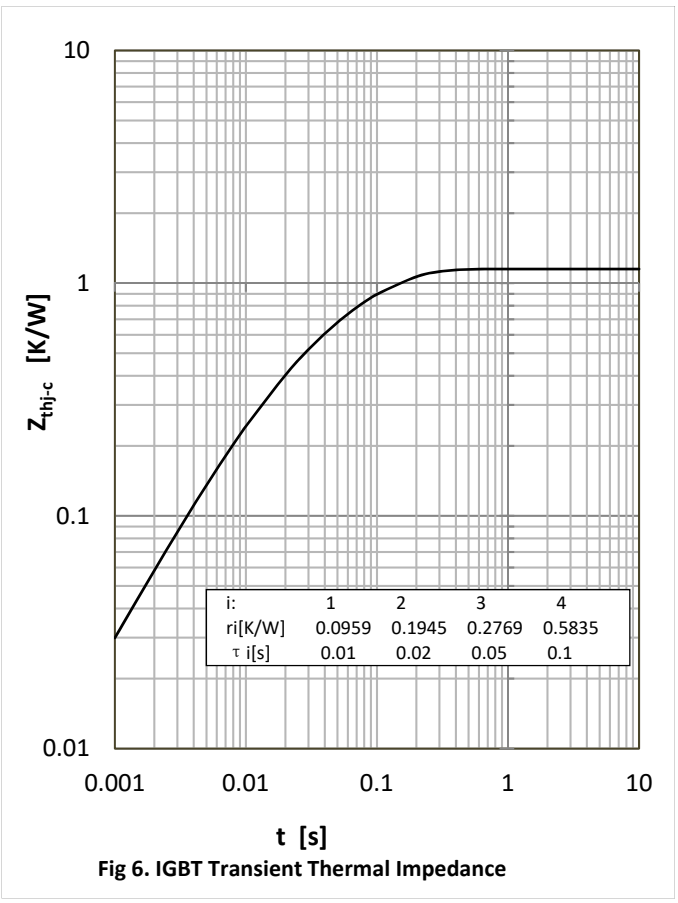


Fig 6. IGBT Transient Thermal Impedance

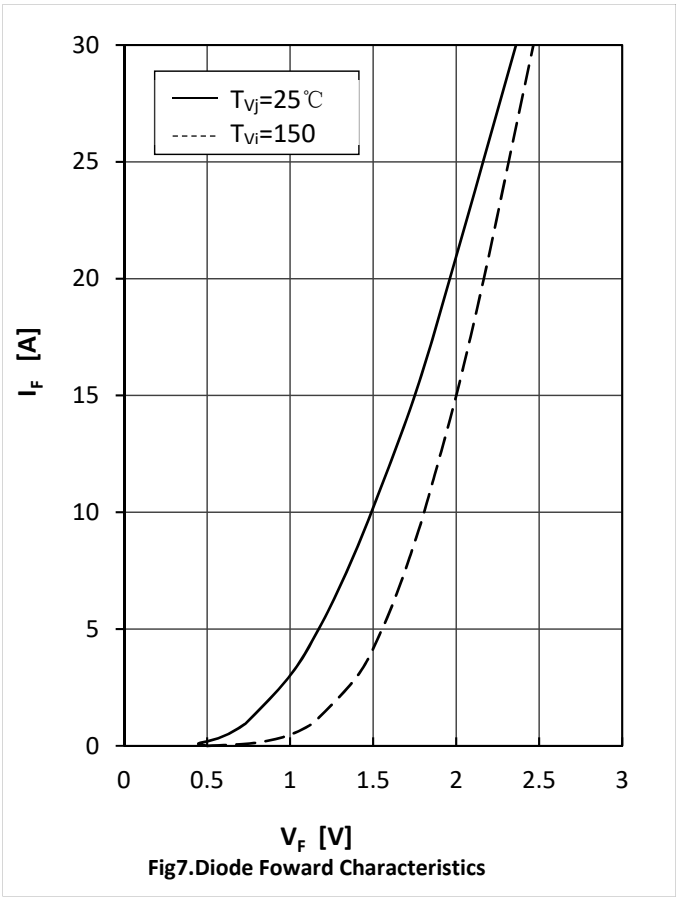


Fig7.Diode Foward Characteristics

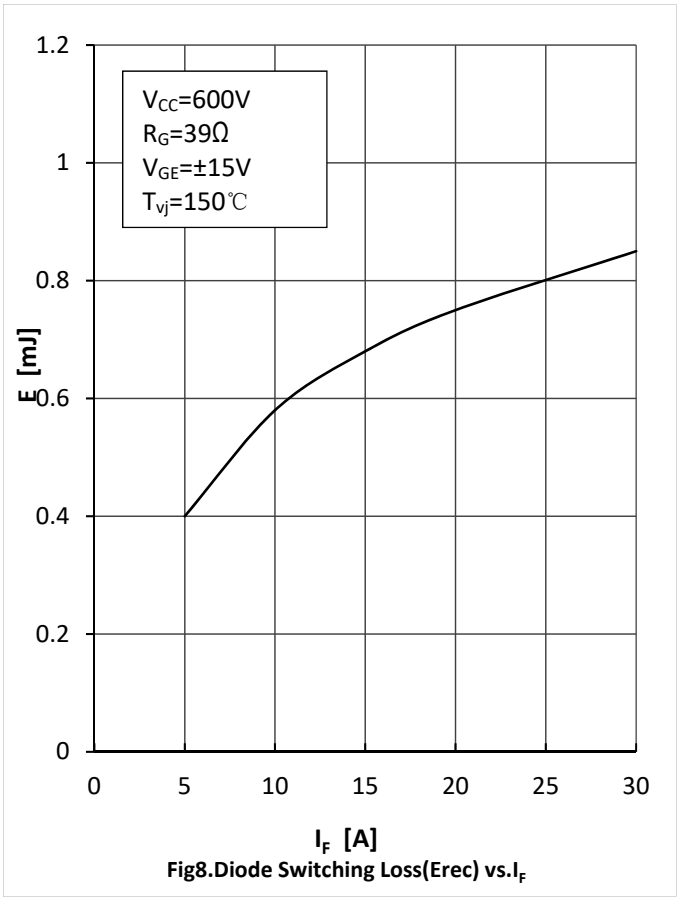


Fig8.Diode Switching Loss(Erec) vs.I_F

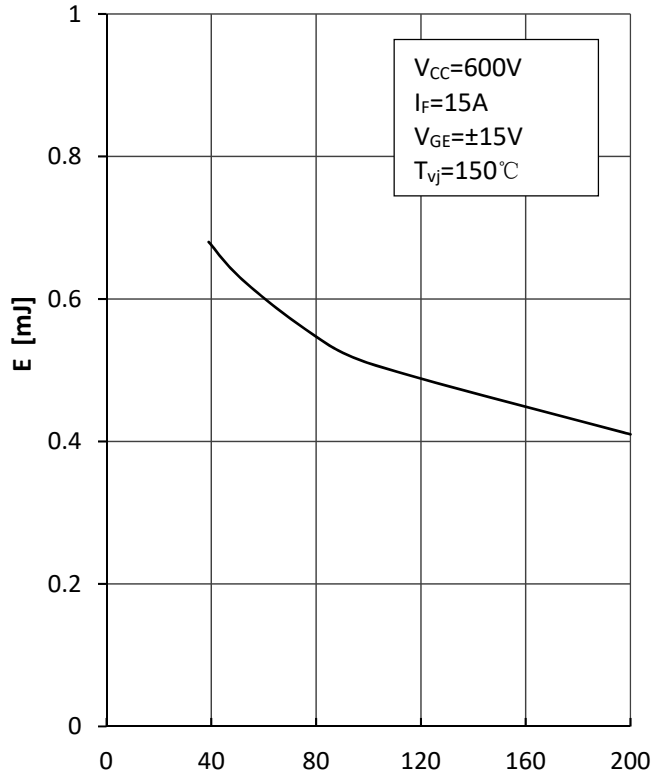


Fig9.Diode Switching Loss(Erec) vs.Rg

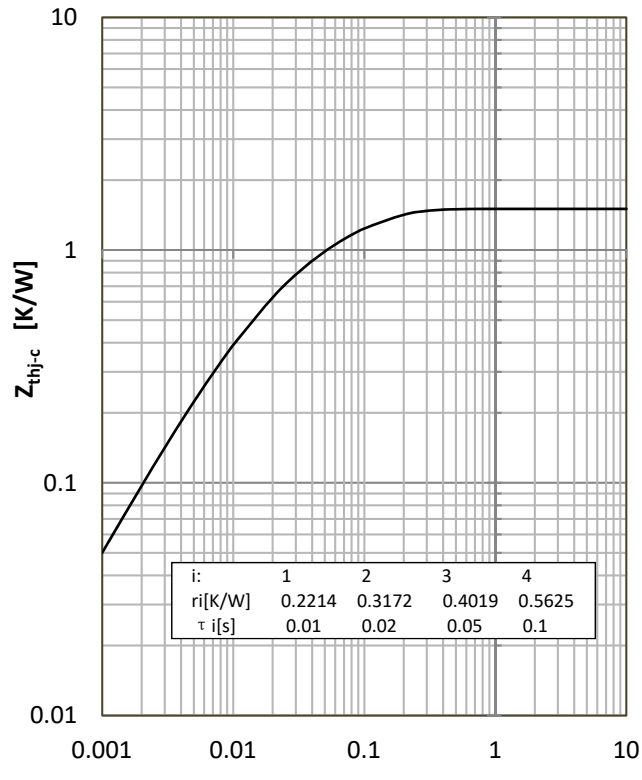


Fig10.Diode Transient Thermal Impedance

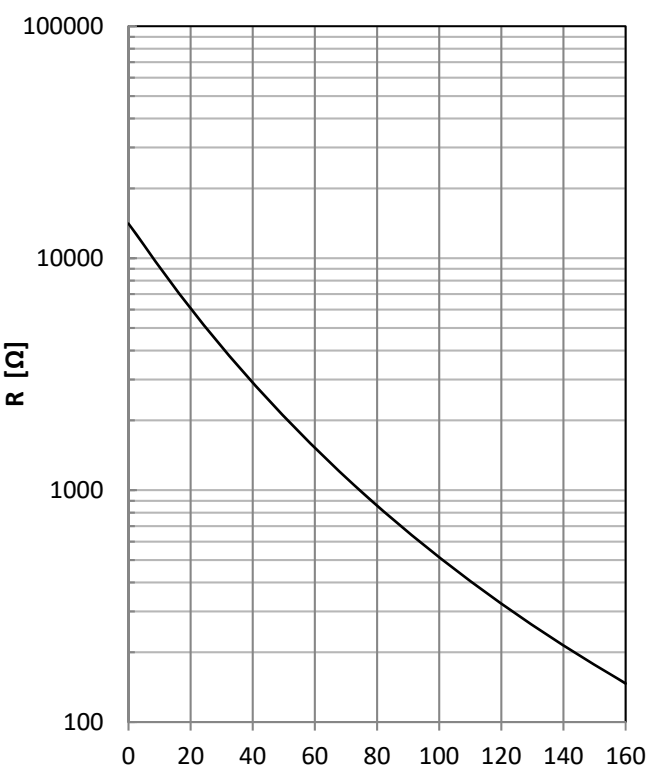


Fig 11. NTC Temperature Characteristic

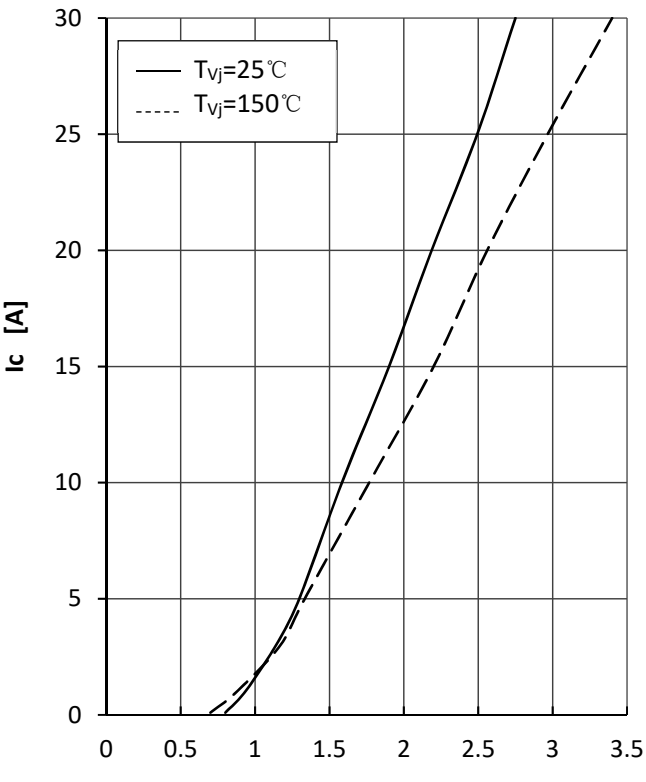


Fig12. IGBT-brake-Chopper output Characteristics

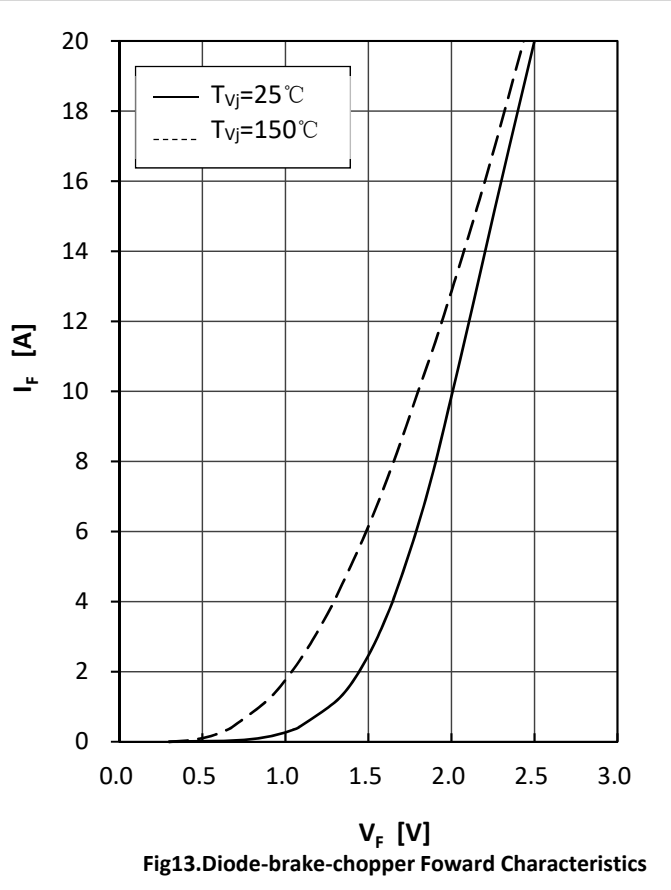
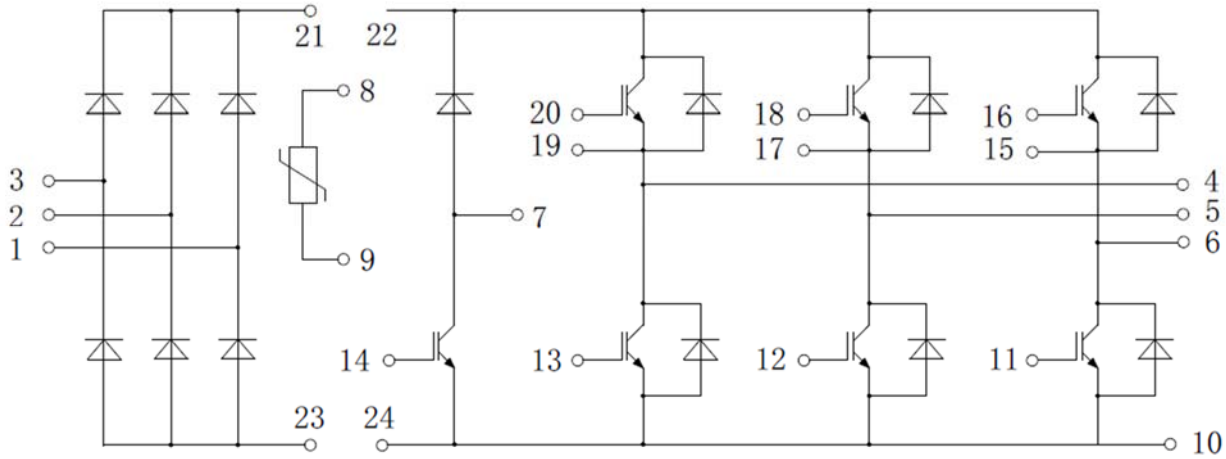
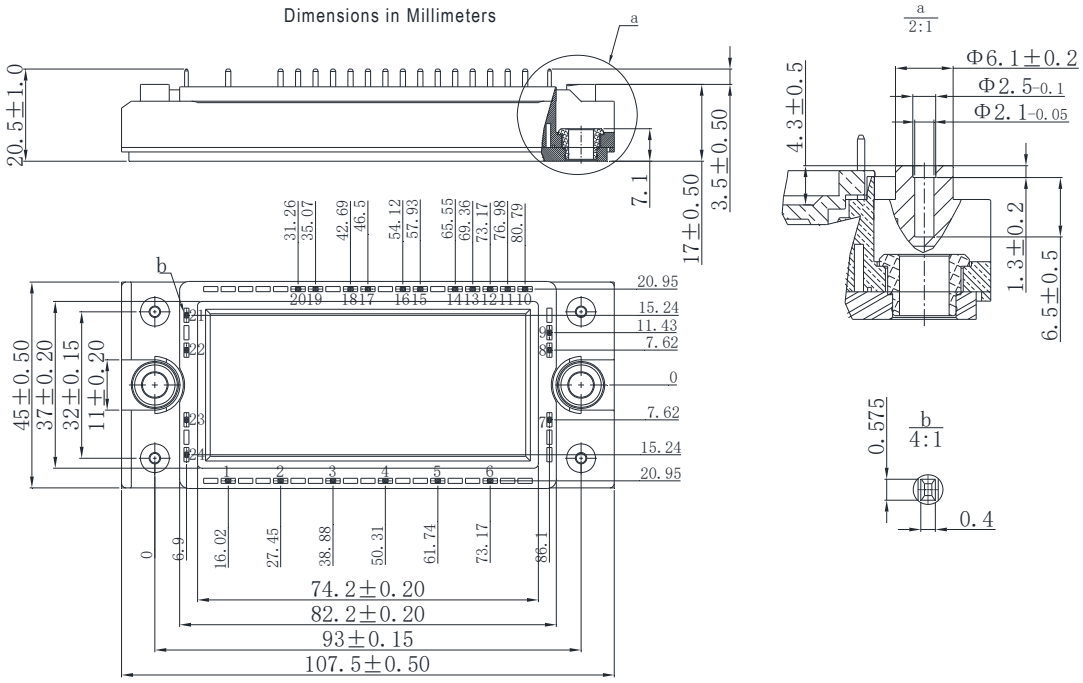


Fig13.Diode-brake-chopper Foward Characteristics

- Circuit Diagram



- Package Dimensions



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