MG100P12E2

RoHS COMPLIANT

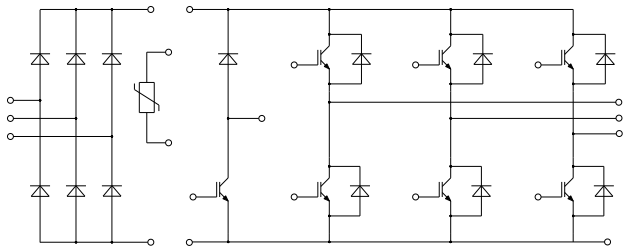
IGBT Modules

VCES	1200V
IC	100A

Applications

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

Circuit



Features

- Low $V_{ce(sat)}$ with Planner technology
- 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 150℃

● 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=80℃, T_{vjmax}=150℃	100	A
Repetitive Peak Collector Current	I_{CRM}	tp=1ms	200	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_c=25℃,T_{vjmax}=175℃	625	W

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$, I_C =4mA,T_{vj}=25℃	5.0	5.8	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
		V_{CE}=1200V,V_{GE}=0V, T_{vj}=125℃			5.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	Ic=100A,V_{GE}=15V, T_{vj}=25℃		1.95	2.25	V
		Ic=100A,V_{GE}=15V, T_{vj}=125℃		2.15		
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE} =0V, f=1MHz, T_{vj}=25℃		5.80		nF
Output Capacitance	C_{oes}			0.60		nF
Reverse Transfer Capacitance	C_{res}			0.40		nF
Internal Gate Resistance	R_{gint}			2.5		Ω
Gate-Emitter leakage current	I_{GES}	V_{CE}=0 V, V_{GE}=20 V,T_{vj} = 25℃			400	nA
Turn-on Delay Time	$t_{d(on)}$	I_C =100 A V_{CE} = 600 V V_{GE} = ±15V R_G =5.1Ω T_{vj}=25℃		240		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			395		ns
Fall Time	t_f			178		ns
Energy Dissipation During Turn-on Time	E_{on}			4.1		mJ
Energy Dissipation During Turn-off Time	E_{off}			7.3		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C =150 A V_{CE} = 600 V V_{GE} = ±15V R_G =5.1Ω T_{vj}=125℃		260		ns
Rise Time	t_r			68		ns
Turn-off Delay Time	$t_{d(off)}$			420		ns
Fall Time	t_f			280		ns
Energy Dissipation During Turn-on Time	E_{on}			5.3		mJ
Energy Dissipation During Turn-off Time	E_{off}			9.1		mJ
SC Data	I_{sc}	T_p≤10us,V_{GE}=15V, Tvj=150℃,V_{cc}=600V, V_{CEM}≤1200V		700		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		100	A
Repetitive Peak Forward Current	I_{FRM}	tp=1ms	200	A

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=100A,T_{vj}=25℃		1.80	2.00	V
		I_F=100A,T_{vj}=125℃		1.85		
Recovered Charge	Q_{rr}	I_F =100 A V_R=600V -di$_F$/dt =2300A/us T_{vj}=25℃		4.5		uC
Peak Reverse Recovery Current	I_{rr}			80		A
Reverse Recovery Time	t_{rr}			85		ns
Reverse Recovery Energy	E_{rec}			2.5		mJ
Recovered Charge	Q_{rr}	I_F =100 A V_R=600V -di$_F$/dt =2300A/us T_{vj}=125℃		9.2		uC
Peak Reverse Recovery Current	I_{rr}			95		A

● 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=80℃, T_{vjmax}=150℃	50	A
Repetitive Peak Collector Current	I_{CRM}	tp=1ms	100	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_c=25℃, T_{vjmax}=150℃	222	W

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C =1.2mA,T_{vj}=25℃	5.0	6.2	7.0	V
Collector-Emitter Cut-offCurrent	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	Ic=50A,V_{GE}=15V, T_{vj}=25℃		1.85	2.35	V
		Ic=50A,V_{GE}=15V, T_{vj}=125℃		2.05		
		Ic=50A,V_{GE}=15V, T_{vj}=150℃		2.10		
Gate Charge	Q_G			0.54		uC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE} =0V, f=1MHz, T_{vj}=25℃		4.30		nF
Reverse Transfer Capacitance	C_{res}			0.20		nF
Gate-Emitter leakage current	I_{GES}	V_{CE}=0 V, V_{GE}=20 V,T_{vj} = 25℃			400	nA
Turn-on Delay Time	$t_{d(on)}$	I_C =50 A V_{CE} = 600 V V_{GE} = ±15V R_G = 15Ω T_{vj}=25℃		390		ns
Rise Time	t_r			75		ns
Turn-off Delay Time	$t_{d(off)}$			384		ns
Fall Time	t_f			86		ns
Energy Dissipation During Turn-on Time	E_{on}			6.3		mJ
Energy Dissipation During Turn-off Time	E_{off}			3.2		mJ

Turn-on Delay Time	$t_{d(on)}$	I_C =50 A V_{CE} = 600 V V_{GE} = ±15V R_G = 15Ω T_{vj}=125℃		410		ns
Rise Time	t_r			76		ns
Turn-off Delay Time	$t_{d(off)}$			410		ns
Fall Time	t_f			95		ns
Energy Dissipation During Turn-on Time	E_{on}			7.3		mJ
Energy Dissipation During Turn-off Time	E_{off}			5.7		mJ
SC Data	I_{sc}	T_p≤10us,V_{GE}=15V,T_{vj}=150℃, V_{cc}=900V,V_{CEM}≤1200V		274		A

● Diode-Brake-Chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_j=25℃	1200	V
Continuous DC Forward Current	I_F		50	A
Repetitive Peak Forward Current	I_{FRM}	tp=1ms	100	A
I^2t-value	I^2t	V_R=0,t_p=10ms,T_j=125℃	1550	A^2s
		V_R=0,t_p=10ms,T_j=150℃	1500	

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=50A,T_{vj}=25℃		1.95	2.25	V
		I_F=50A,T_{vj}=125℃		2.05		
		I_F=50A,T_{vj}=150℃		2.10		
Recovered Charge	Q_{rr}	I_F =50 A V_R=600V -di$_F$/dt =900A/us T_{vj}=25℃		3.5		uC
Peak Reverse Recovery Current	I_{rr}			40		A
Reverse Recovery Energy	E_{rec}			1.4		mJ

Recovered Charge	Q_{rr}	I_F =50 A V_R=600V -di_F/dt =900A/us T_{vj}=125℃		6.5		uC
Peak Reverse Recovery Current	I_{rr}			50		A
Reverse Recovery Energy	E_{rec}			2.0		mJ

● Diode-Rectifier

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_j=25℃	1600	V
Average On-state Current 50/60Hz, sine wave	$I_{F(AV)}$	T_c=80℃	100	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_c=80℃	150	A
Surge Forward Current	I_{FSM}	V_R=0,t_p=10ms,T_j=25℃	1150	A
I^2t-value	I^2t	V_R=0,t_p=10ms,T_j=25℃	6600	A^2s

Characteristic values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	I_F=100A,T_j=150℃		1.0		V
Reverse Current	I_R	T_j=125℃,V_R=1600V			2.0	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}=493.3 Ω	-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°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}	Inverter, brake			150	℃
		rectifier			125	
Operating Junction Temperature	$T_{vj\ op}$		-40		125	℃
Storage Temperature	T_{stg}		-40		125	℃
Stray Inductance	L_{CE}			40		nH
Module Lead Resistance ,Terminal to Chip	$R_{cc'+EE'}$	T_C=25℃, per switch		4.0		m Ω
	$R_{AA'+CC'}$			3.0		
Thermal Resistance Junction-to Case	$R_{\theta jc}$	per IGBT-inverter			0.200	K/W
		per Diode-inverter			0.360	
		per IGBT-brake-copper			0.321	
		per Diode-chopper			0.563	
		per Diode-rectifier			0.318	
Thermal Resistance Case-to Sink	$R_{\theta CS}$	per IGBT-inverter		0.104		K/W
		per Diode-inverter		0.190		
		per IGBT-brake-copper		0.177		
		per Diode-chopper		0.310		
		per Diode-rectifier		0.175		
		per Module		0.009		
Module-to-Sink Torque	M_s		3.0		6.0	N·m
Weight of Module	G			300		g

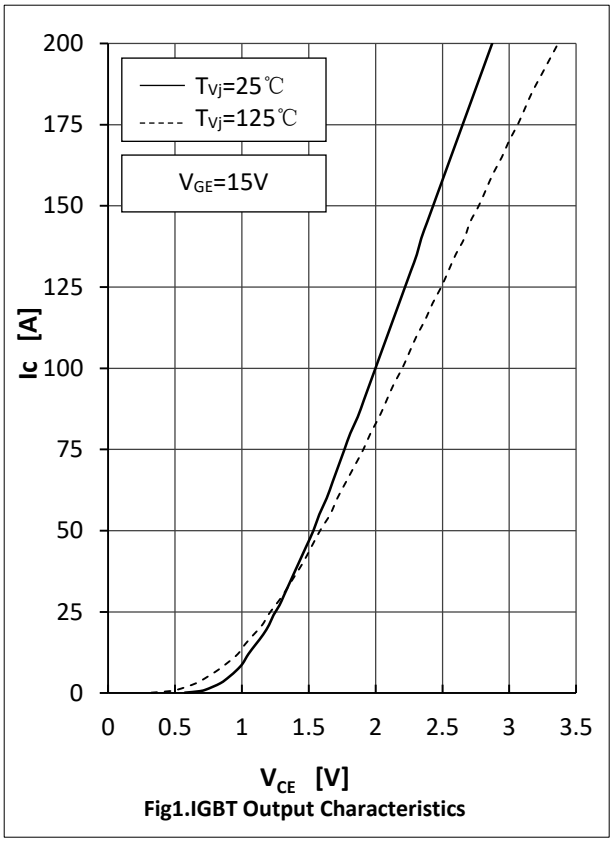


Fig1.IGBT Output Characteristics

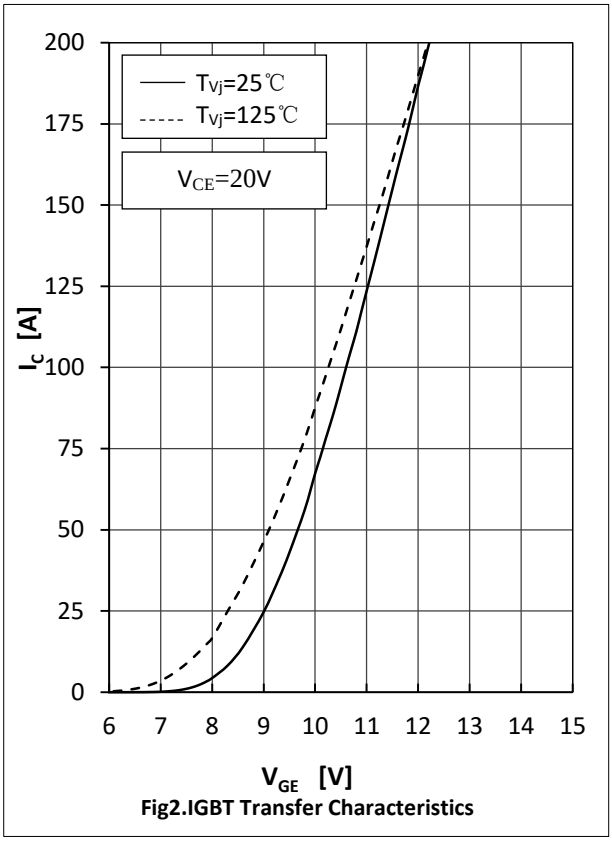


Fig2.IGBT Transfer Characteristics

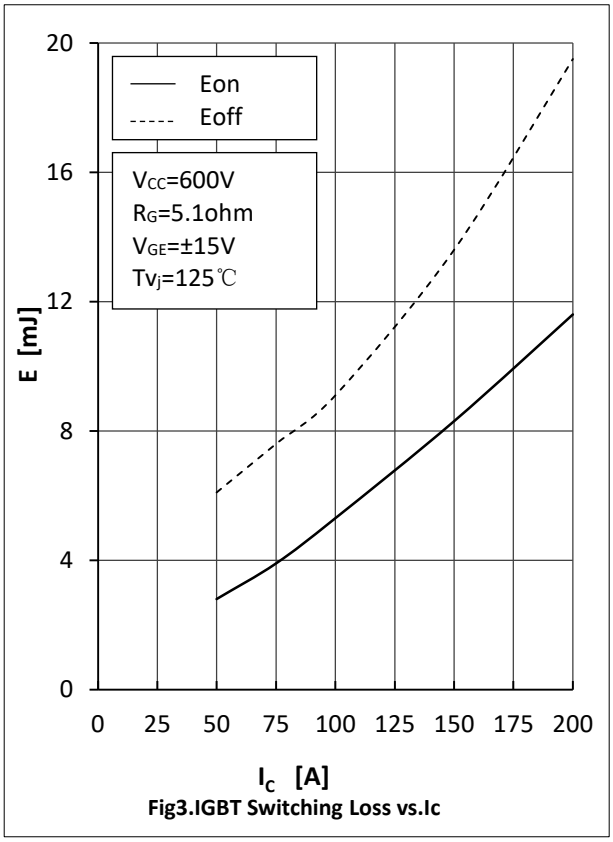


Fig3.IGBT Switching Loss vs.Ic

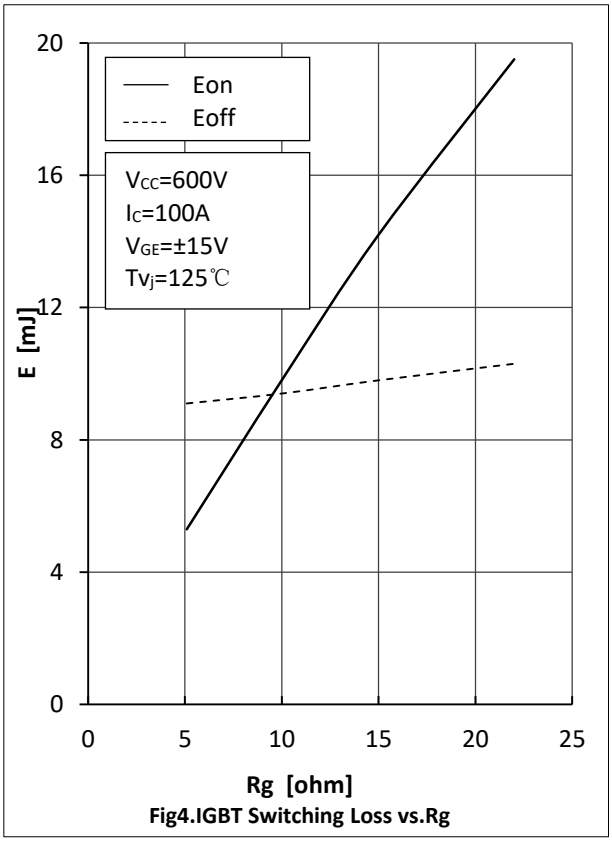


Fig4.IGBT Switching Loss vs.Rg

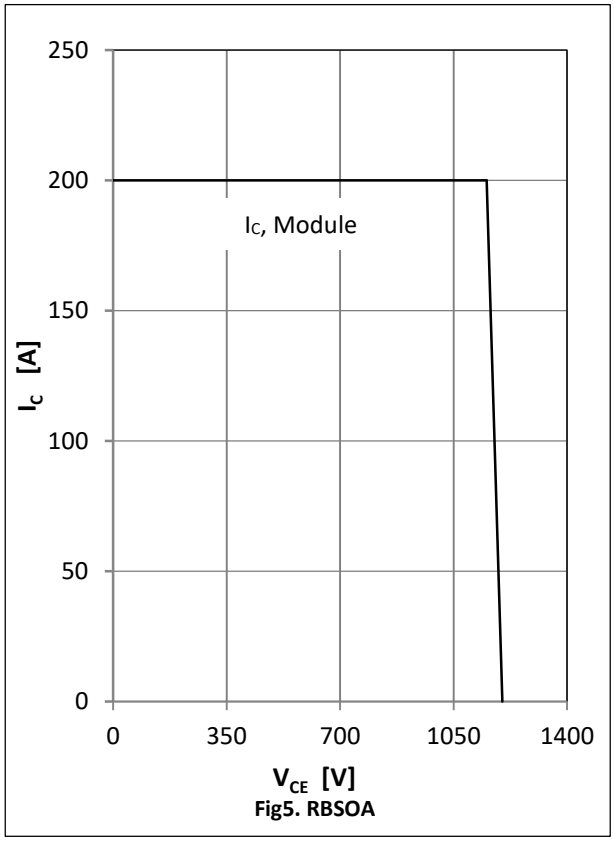


Fig5. RBSOA

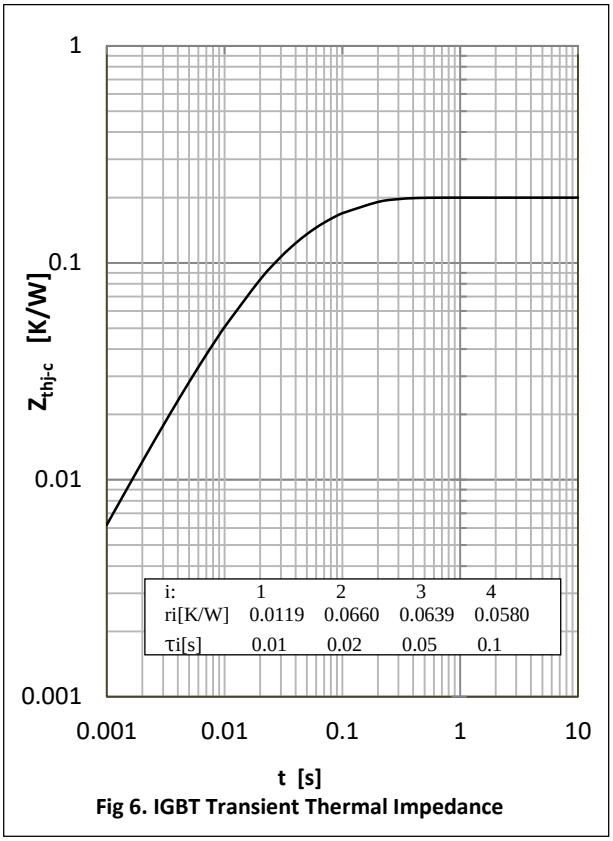


Fig 6. IGBT Transient Thermal Impedance

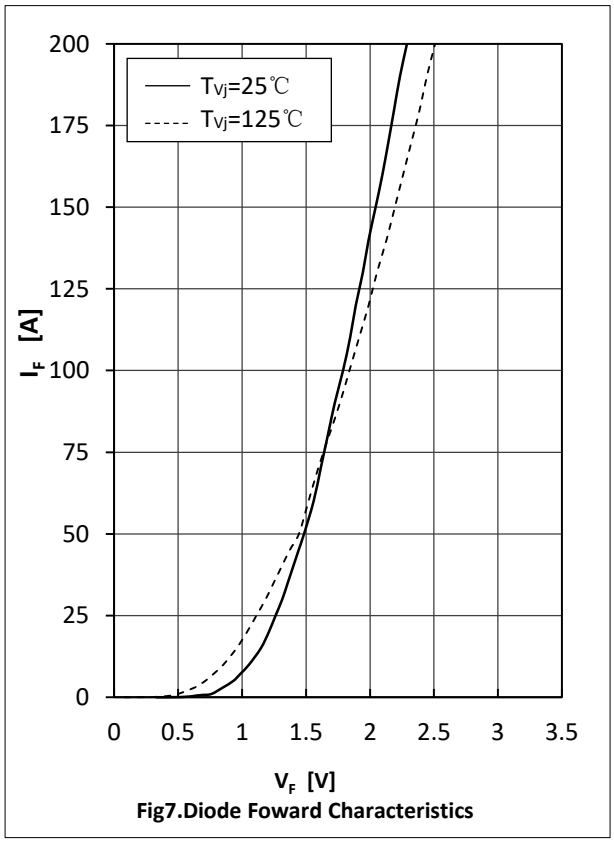


Fig7.Diode Foward Characteristics

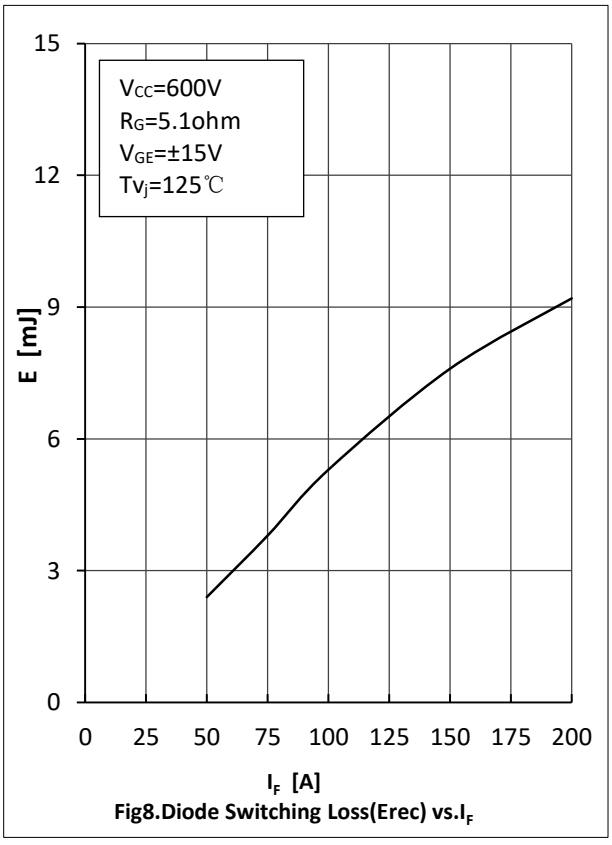


Fig8.Diode Switching Loss(Erec) vs.I_F

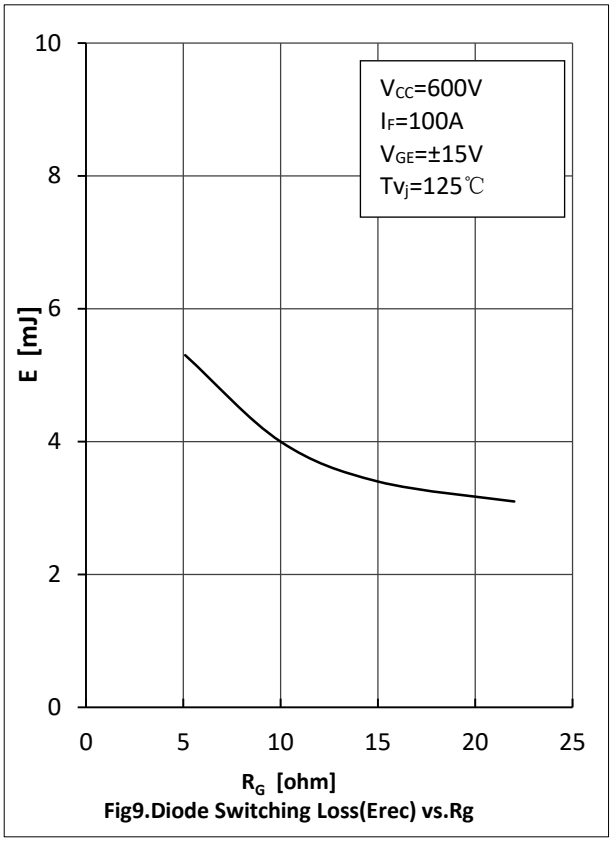


Fig9.Diode Switching Loss(Erec) vs.Rg

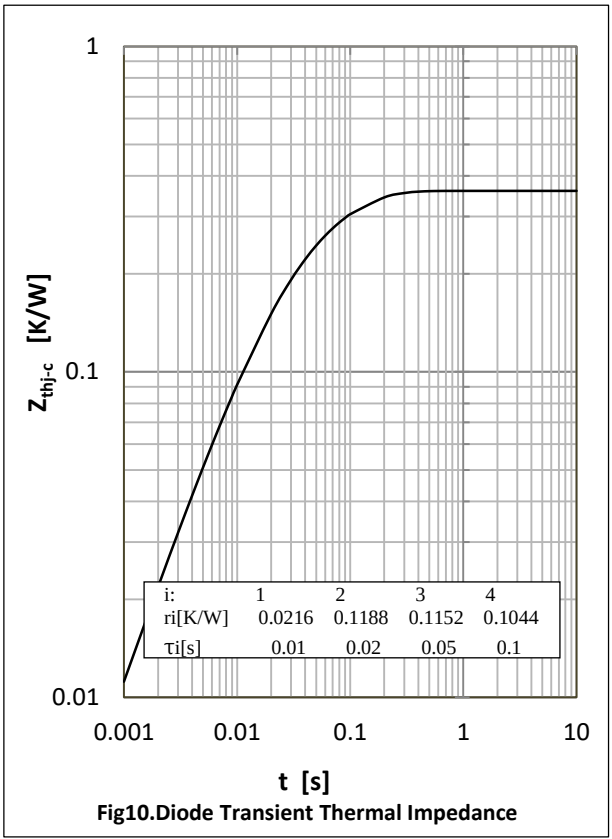


Fig10.Diode Transient Thermal Impedance

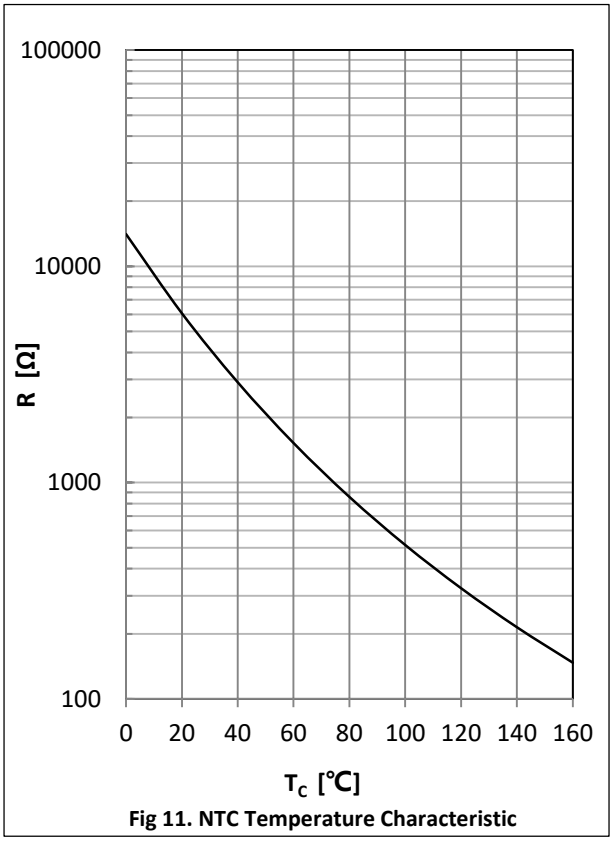


Fig 11. NTC Temperature Characteristic

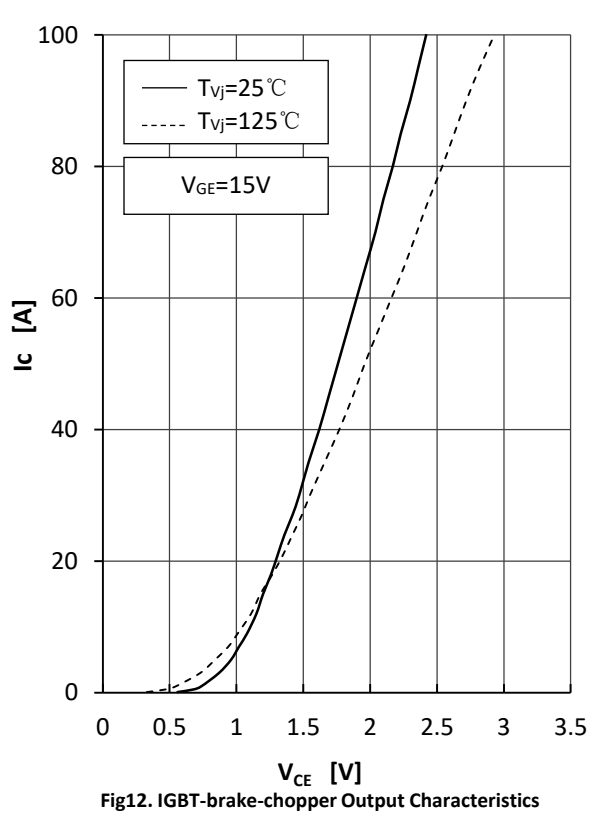


Fig12. IGBT-brake-chopper Output Characteristics

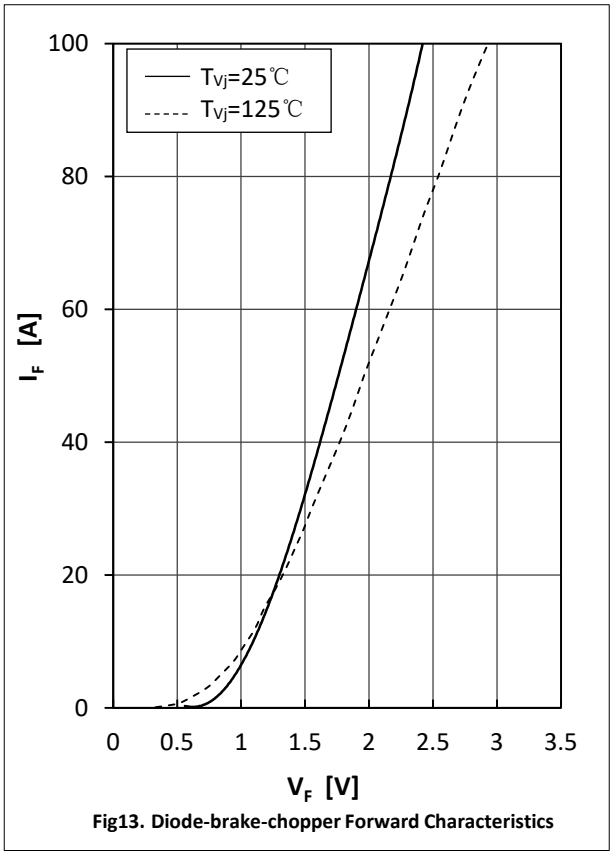
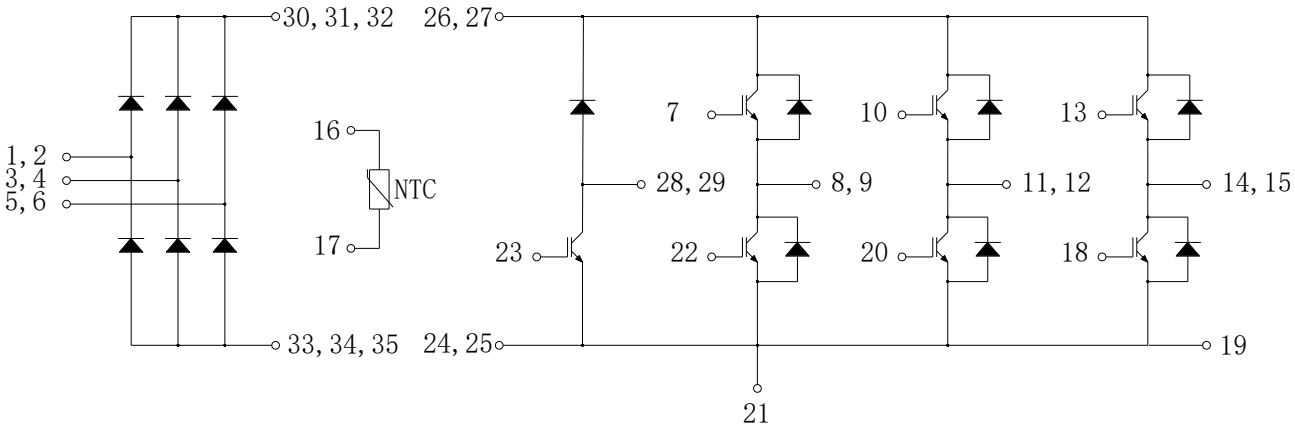


Fig13. Diode-brake-chopper Forward Characteristics

Circuit Diagram



Package Dimensions