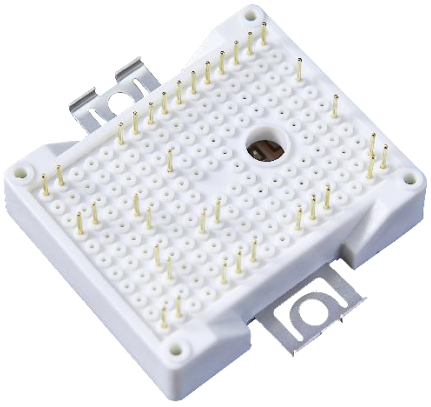
MG50P065MLP3

RoHS COMPLIANT



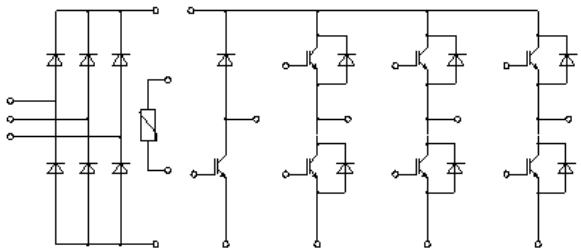
IGBT Modules

V_{CES}	650V
I_C	50A

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(5us)
- 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℃	650	V
Continuous Collector Current	I_C	T_C=100℃, T_{vjmax}=175℃	50	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	100	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_C=25℃,T_{vjmax}=175℃	150	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=1mA,T_{vj}=25℃	4.0	5.1	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=650V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A,V_{GE}=15V, T_{vj}=25℃		1.65		V
		I_C=50A,V_{GE}=15V, T_{vj}=150℃		1.90		
		I_C=50A,V_{GE}=15V, T_{vj}=175℃		2.10		
Gate Charge	Q_G			0.25		uC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,		2.52		nF
Reverse Transfer Capacitance	C_{res}	f=1MHz, T_{vj}=25℃		0.05		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=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=25℃		23		ns
Rise Time	t_r			56		ns
Turn-off Delay Time	$t_{d(off)}$			87		ns
Fall Time	t_f			139		ns
Energy Dissipation During Turn-on Time	E_{on}			1.06		mJ
Energy Dissipation During Turn-off Time	E_{off}			0.89		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=150℃		22		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			101		ns
Fall Time	t_f			180		ns
Energy Dissipation During Turn-on Time	E_{on}			1.51		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.1		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=175℃		22		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			103		ns
Fall Time	t_f			192		ns
Energy Dissipation During Turn-on Time	E_{on}			1.61		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.2		mJ
SC Data	I_{SC}	t_p≤5us,V_{GE}=15V,T_{vj}=175℃, V_{CC}=300V,V_{CEM}≤650V		200		A

Diode-inverter

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	650	V
Continuous DC Forward Current	I_F		50	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	100	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=50A,T_{vj}=25℃		1.75		V
		I_F=50A,T_{vj}=150℃		1.50		
		I_F=50A,T_{vj}=175℃		1.45		
Recovered Charge	Q_{rr}	I_F=50A V_R=300V -di$_F$/dt =700A/us T_{vj}=25℃		1.28		uC
Peak Reverse Recovery Current	I_{rr}			21		A
Reverse Recovery Energy	E_{rec}			0.22		mJ
Recovered Charge	Q_{rr}	I_F=50A V_R=300V -di$_F$/dt =700A/us T_{vj}=150℃		2.84		uC
Peak Reverse Recovery Current	I_{rr}			31		A
Reverse Recovery Energy	E_{rec}			0.5		mJ
Recovered Charge	Q_{rr}	I_F=50A V_R=300V -di$_F$/dt =700A/us T_{vj}=175℃		3.25		uC
Peak Reverse Recovery Current	I_{rr}			33		A
Reverse Recovery Energy	E_{rec}			0.57		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℃	650	V
Continuous Collector Current	I_C	T_C=100℃, T_{vjmax}=175℃	50	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	100	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25℃	±20	V
Total Power Dissipation	P_{tot}	T_C=25℃,T_{vjmax}=175℃	150	W

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1mA,T_{vj}=25℃	4.0	5.2	6.5	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=650V,V_{GE}=0V, T_{vj}=25℃			1.0	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A,V_{GE}=15V, T_{vj}=25℃		1.65		V
		I_C=50A,V_{GE}=15V, T_{vj}=150℃		1.90		
		I_C=50A,V_{GE}=15V, T_{vj}=175℃		2.10		
Gate Charge	Q_G			0.25		uC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f=1MHz, T_{vj}=25℃		2.52		nF
Reverse Transfer Capacitance	C_{res}			0.05		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=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=25℃		23		ns
Rise Time	t_r			56		ns
Turn-off Delay Time	$t_{d(off)}$			87		ns
Fall Time	t_f			139		ns
Energy Dissipation During Turn-on Time	E_{on}			1.06		mJ
Energy Dissipation During Turn-off Time	E_{off}			0.89		mJ

Turn-on Delay Time	$t_{d(on)}$	I_C=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=150℃		22		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			101		ns
Fall Time	t_f			180		ns
Energy Dissipation During Turn-on Time	E_{on}			1.51		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.1		mJ
Turn-on Delay Time	$t_{d(on)}$	I_C=50A V_{CE}=300V V_{GE}=±15V R_G=8.2Ω T_{vj}=175℃		22		ns
Rise Time	t_r			55		ns
Turn-off Delay Time	$t_{d(off)}$			103		ns
Fall Time	t_f			192		ns
Energy Dissipation During Turn-on Time	E_{on}			1.61		mJ
Energy Dissipation During Turn-off Time	E_{off}			1.2		mJ
SC Data	I_{SC}	t_p≤5us,V_{GE}=15V,T_{vj}=175℃, V_{CC}=300V,V_{CEM}≤650V		200		A

Diode-brake-chopper

Absolute Maximum Ratings

Parameter	Symbol	Conditions	Value	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25℃	650	V
Continuous DC Forward Current	I_F		30	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	60	A

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Forward Voltage	V_F	I_F=30A,T_{vj}=25℃		2.20		V
		I_F=30A,T_{vj}=150℃		1.95		
		I_F=30A,T_{vj}=175℃		1.85		
Recovered Charge	Q_{rr}	I_F =30A V_R=300V -di_F/dt =600A/us T_{vj}=25℃		0.37		uC
Peak Reverse Recovery Current	I_{rr}			10		A
Reverse Recovery Energy	E_{rec}			0.10		mJ
Recovered Charge	Q_{rr}	I_F =30A V_R=300V -di_F/dt =600A/us T_{vj}=150℃		1.1		uC
Peak Reverse Recovery Current	I_{rr}			15		A
Reverse Recovery Energy	E_{rec}			0.15		mJ
Recovered Charge	Q_{rr}	I_F =30A V_R=300V -di_F/dt =600A/us T_{vj}=175℃		1.33		uC
Peak Reverse Recovery Current	I_{rr}			17		A
Reverse Recovery Energy	E_{rec}			0.20		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℃	35	A
Maximum RMS Current at Rectifier Output	I_{RMSM}	T_C=100℃	60	A
Surge Forward Current	I_{FSM}	V_R=0V,t_p=10ms,T_{vj}=25℃	420	A
		V_R=0V,t_p=10ms,T_{vj}=150℃	350	A
I^2t-value	I^2t	V_R=0V,t_p=10ms,T_{vj}=25℃	880	A^2s
		V_R=0V,t_p=10ms,T_{vj}=150℃	610	A^2s

Characteristic Values

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_F	I_F=50A,T_{vj}=150℃		1.1		V
Reverse Current	I_R	T_{vj}=150℃,V_R=1600V			2	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			1.00	K/W
		per Diode-inverter			1.28	
		per IGBT-brake-chopper			1.00	
		per Diode-chopper			1.65	
		per Diode-rectifier			0.86	
Thermal Resistance Case to Sink	$R_{\theta CS}$	per Module		0.037		K/W
Mounting Force Per Clamp	F		30		80	N
Weight of Module	G			45		g

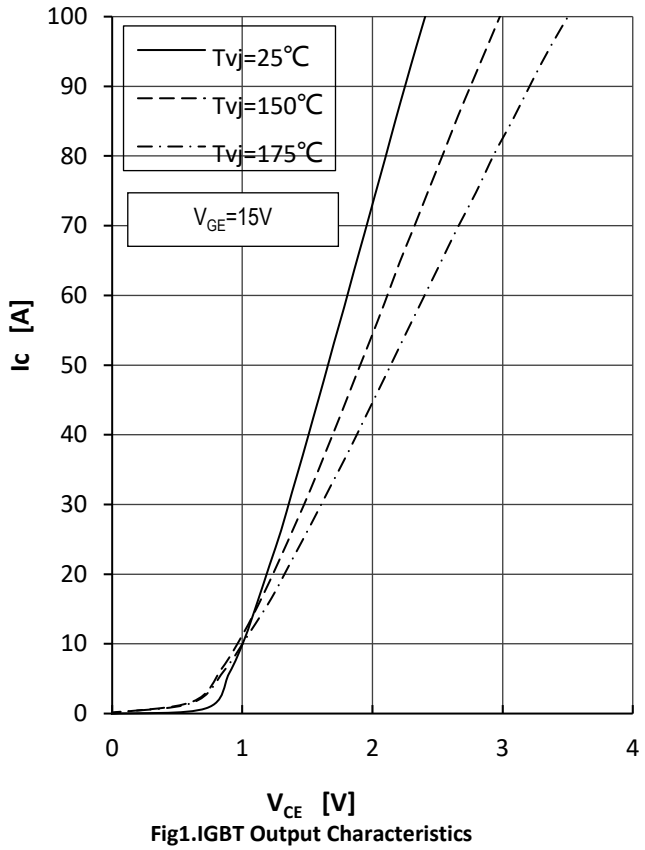


Fig1.IGBT Output Characteristics

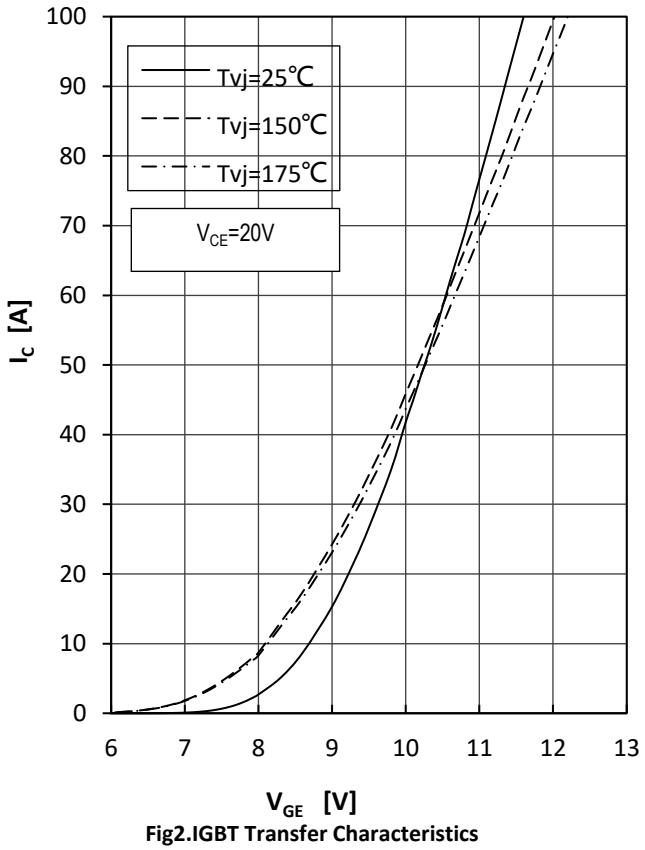


Fig2.IGBT Transfer Characteristics

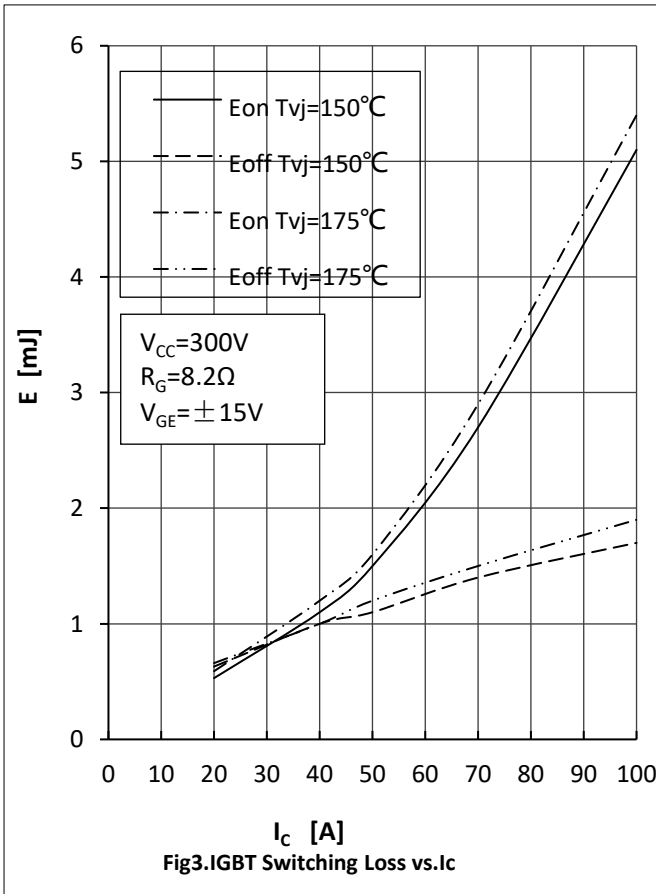


Fig3.IGBT Switching Loss vs.Ic

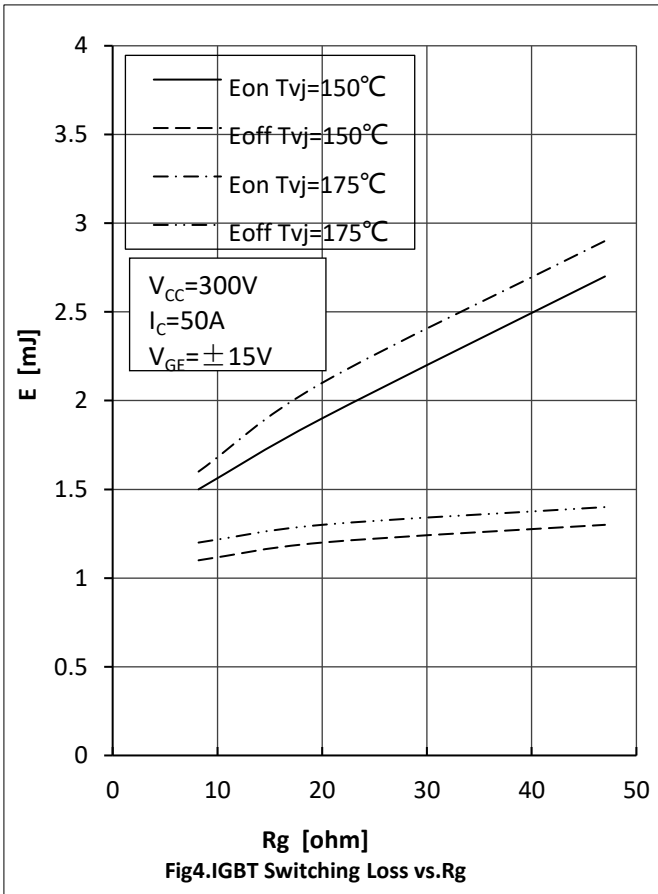


Fig4.IGBT Switching Loss vs.Rg

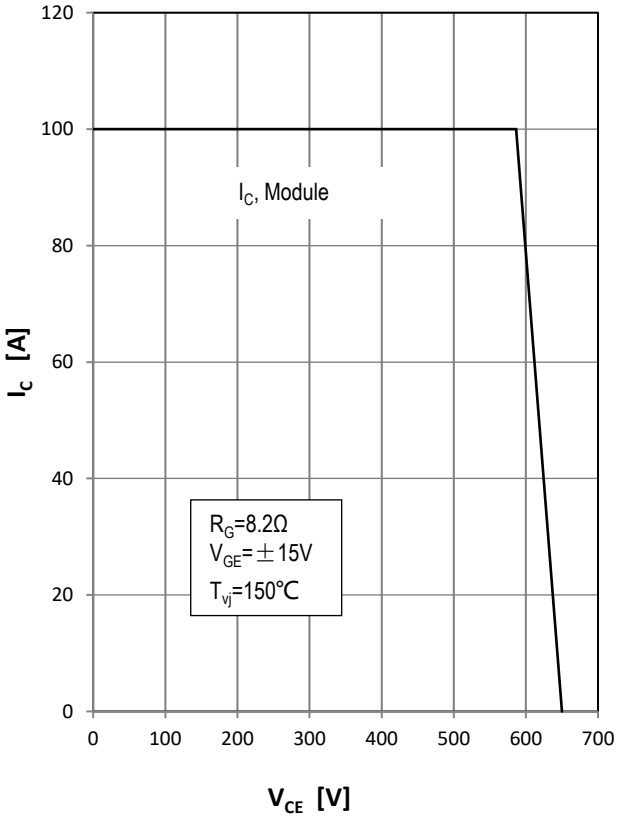


Fig5. RBSOA

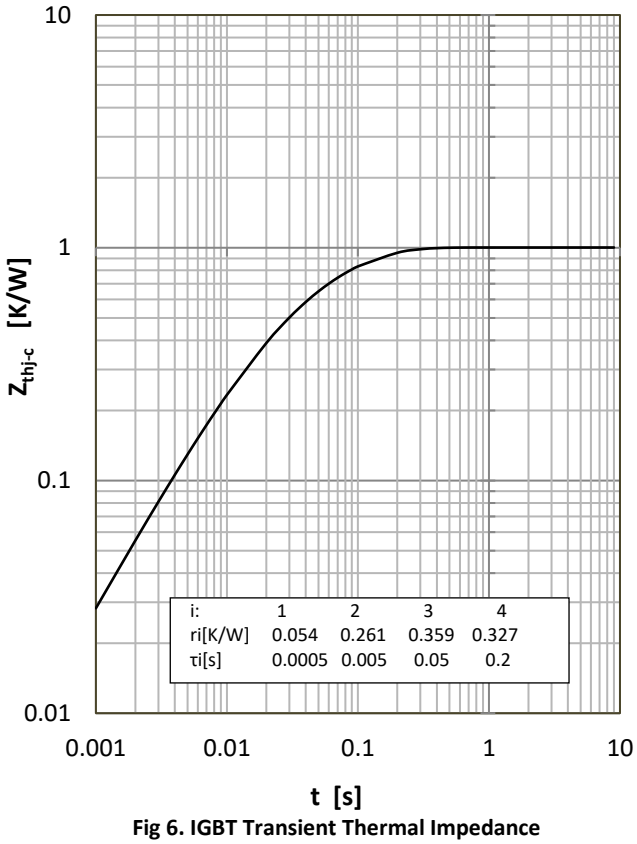


Fig 6. IGBT Transient Thermal Impedance

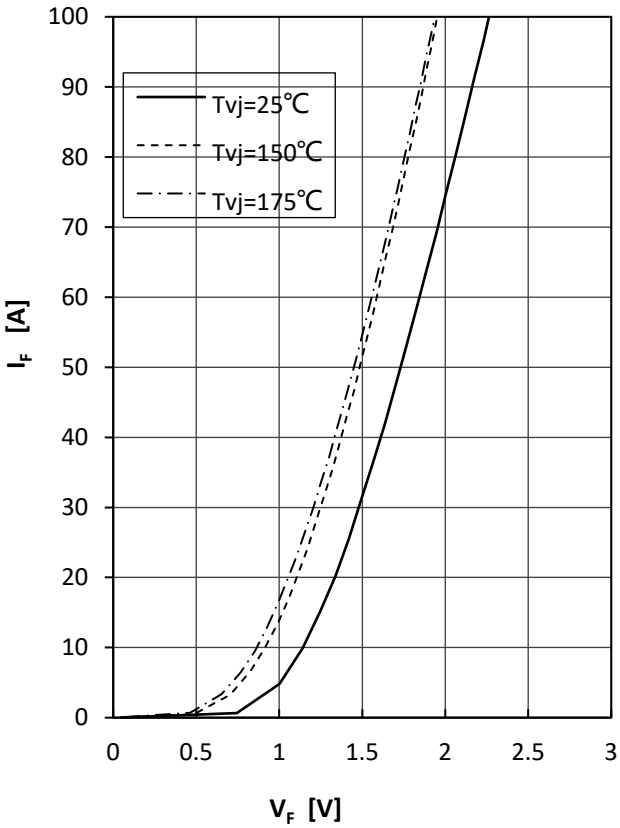


Fig6.Diode Foward Characteristics

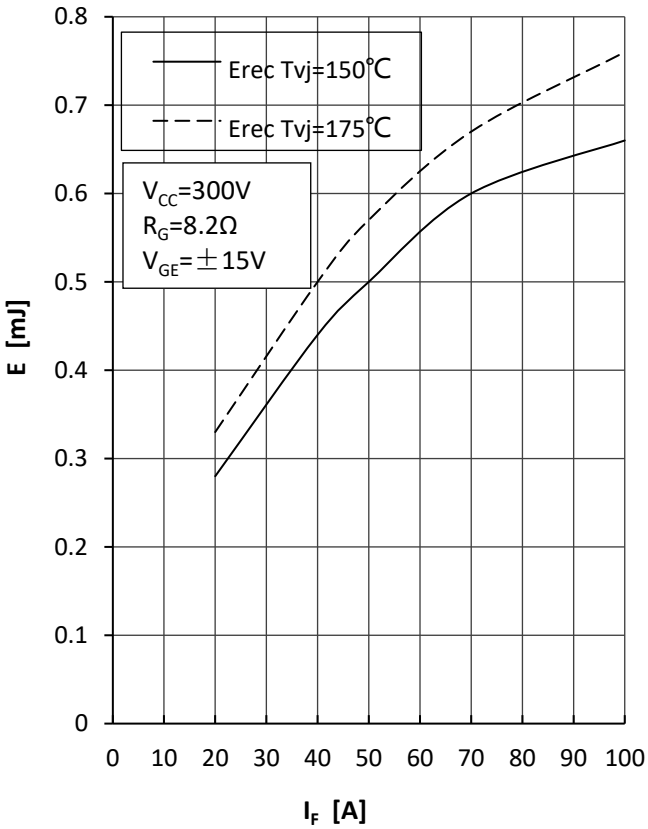


Fig8.Diode Switching Loss(Erec) vs.I_F

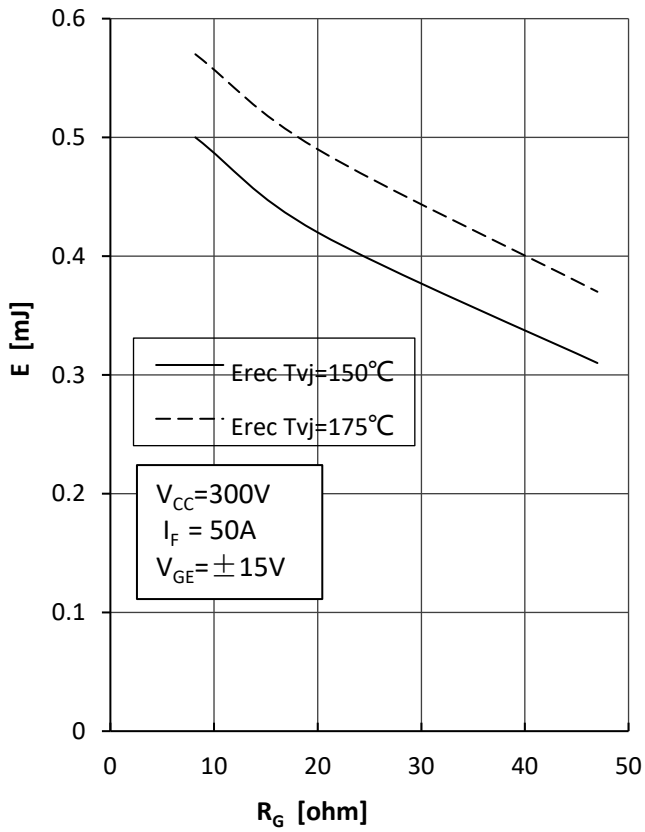


Fig9.Diode Switching Loss(Erec) vs.Rg

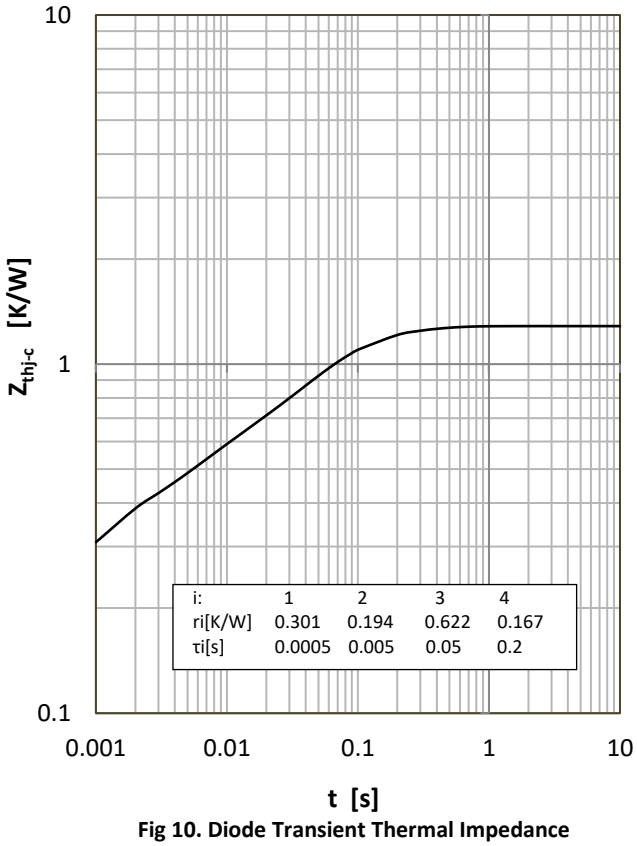


Fig 10. Diode Transient Thermal Impedance

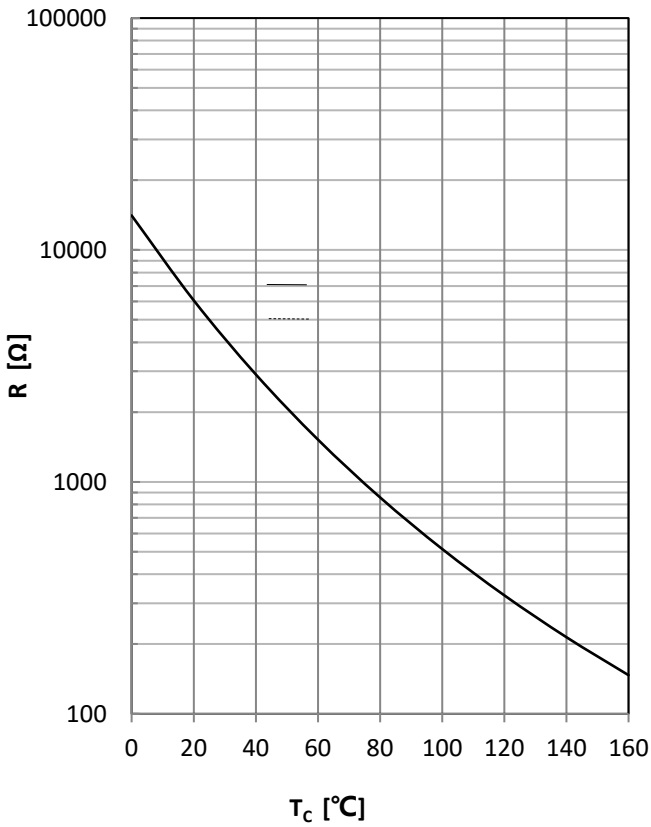


Fig 11. NTC Temperature Characteristic

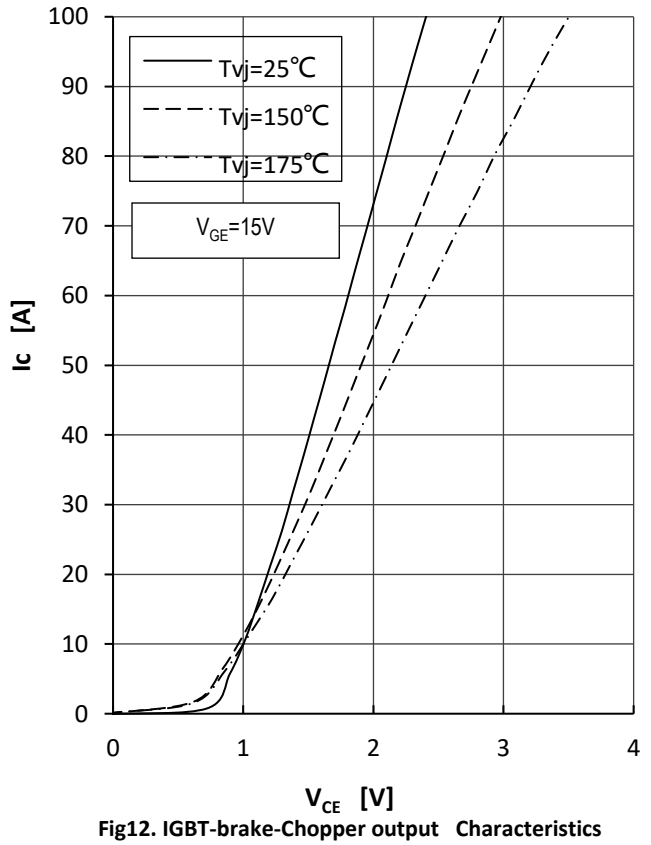


Fig12. IGBT-brake-Chopper output Characteristics

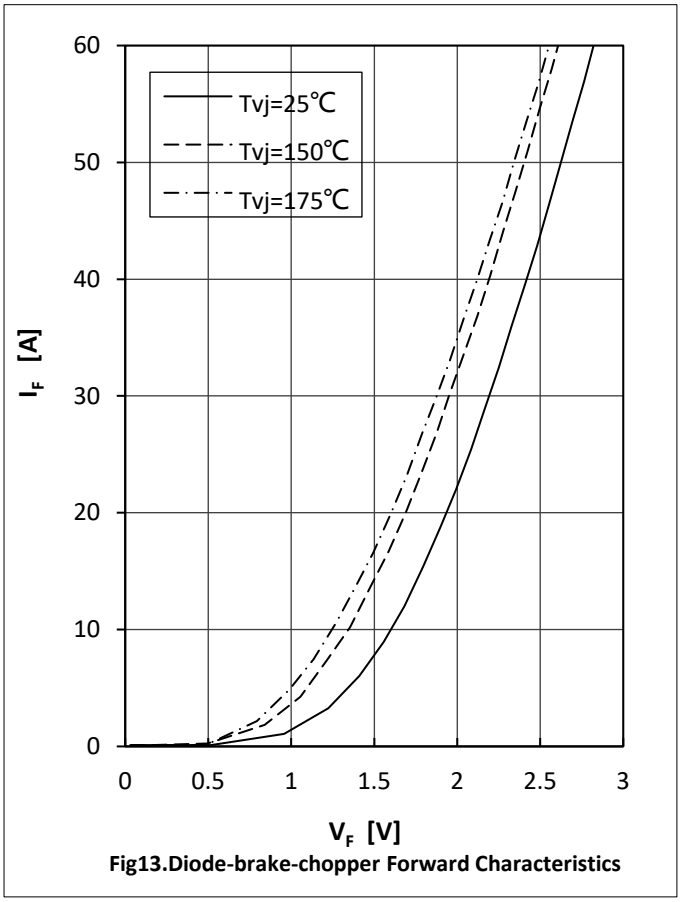
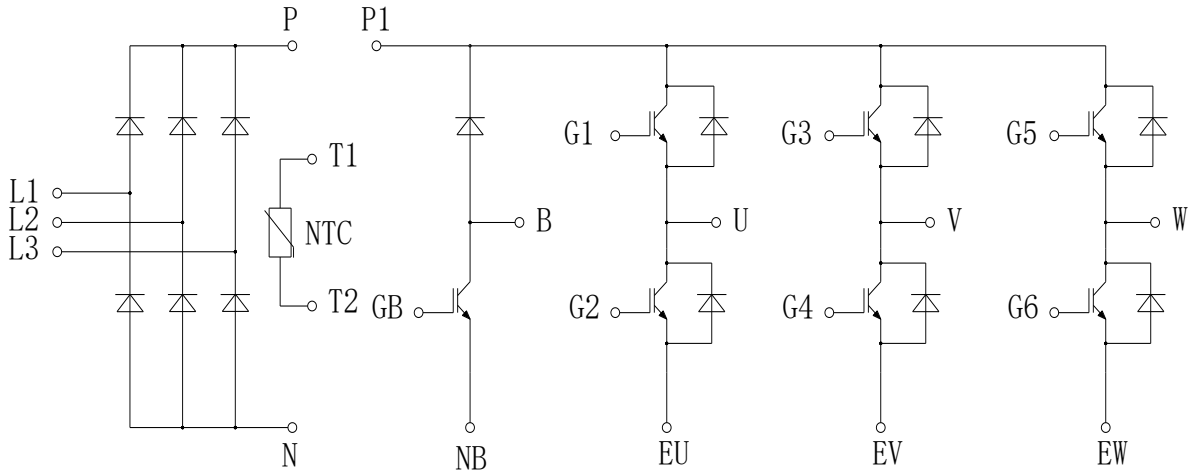
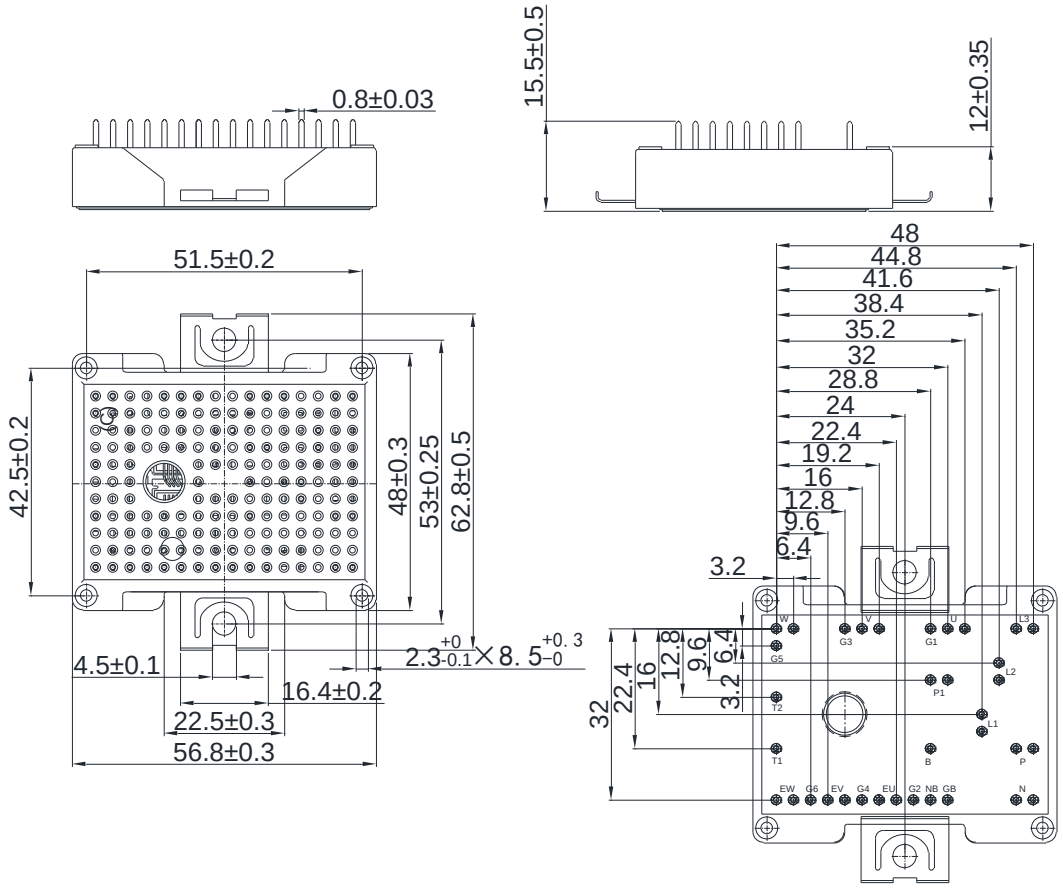


Fig13.Diode-brake-chopper Forward Characteristics

Circuit Diagram



- **Package Dimensions**



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