IGBT Modules
1200V 50A

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(8us)
- Maximum junction temperature 175°C
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant (Note 1)("P" Suffix Designates RoHS Compliant. See Ordering Information)

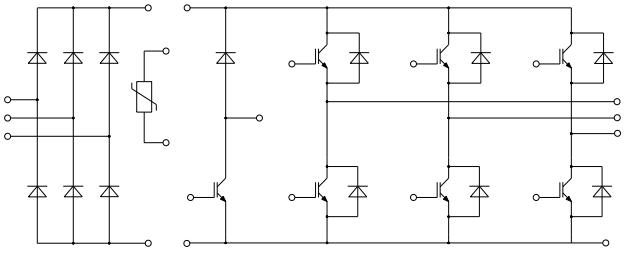
Applications

- Motor Drivers
- AC and DC Servo Drive Amplifier
- UPS (Uninterruptible Power Supplies)

Note:

1. High Temperature Solder Exemptions Applied, see EU Directive Annex 7a.

Circuit Diagram



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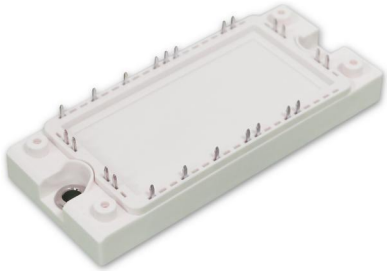
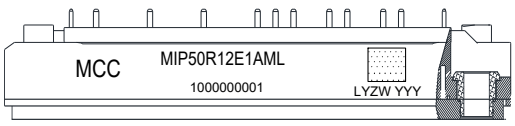
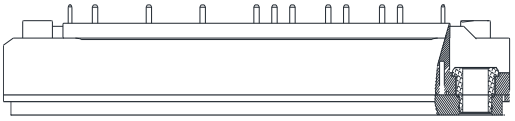
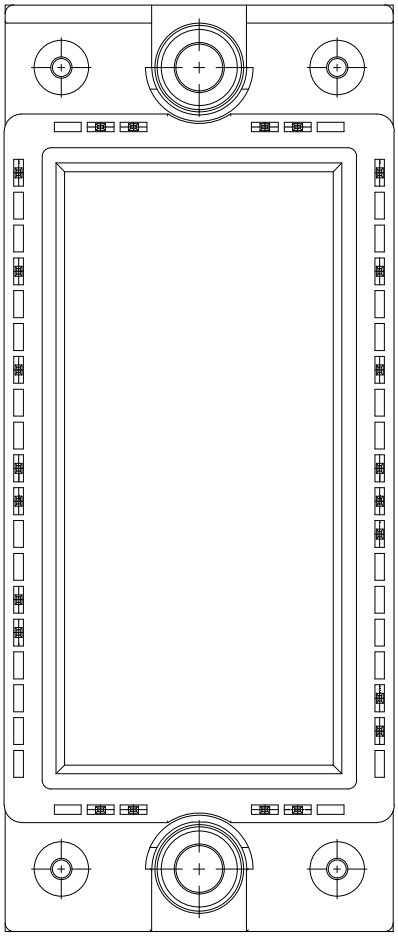




Marking Code Contents:
Logo: MCC
Product Number:MIP50R12E1AML
Trace Code: 10 Digits
2D Code format: Data Matrix

E1A





● IGBT- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE}=0V, I_C=1mA, T_{vj}=25°C	1200	V
Continuous Collector Current	I_C	T_C=100°C, T_{vjmax}=175°C	50	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	100	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25°C	±20	V
Total Power Dissipation	P_{tot}	T_C=25°C, T_{vjmax}=175°C	240	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1.7mA,T_{vj}=25°C	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, Tvj=25°C			1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=50A,V_{GE}=15V, T_{vj}=25°C		1.70		V
		I_C=50A,V_{GE}=15V, T_{vj}=125°C		1.95		
		I_C=50A,V_{GE}=15V, T_{vj}=150°C		2.05		
Gate Charge	Q_G			0.57		μC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V,f=1MHz, T_{vj}=25°C		7.29		nF
Reverse Transfer Capacitance	C_{res}			0.09		
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C			400	nA
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=50A, V_{GE}=±15V, R_G=15Ω, T_{vj}=25°C		112		ns
Rise Time	t_r			134		
Turn-Off Delay Time	$t_{d(off)}$			207		
Fall Time	t_f			230		
Turn-on Time	E_{on}			5.5		mJ
Turn-off Time	E_{off}			3.4		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=50A, V_{GE}=±15V, R_G=15Ω, T_{vj}=150°C		99		ns
Rise Time	t_r			138		
Turn-Off Delay Time	$t_{d(off)}$			241		
Fall Time	t_f			293		
Turn-On Energy	E_{on}			7.4		mJ
Turn-Off Energy	E_{off}			4.5		
SC Data	I_{SC}	t_p≤8μs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=600V,V_{CEM}≤1200V		200		A

● Diode- Inverter

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°C	1200	V
Continuous DC Forward Current	I_F		50	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	100	A

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=50A, T_{vj}=25°C		1.95	2.80	V
		I_F=50A, T_{vj}=125°C		1.85		
		I_F=50A, T_{vj}=150°C		1.80		
Recovered Charge	Q_{rr}	I_F=50A, V_R=600V, -di_F/dt=280A/μs, T_{vj}=25°C		2.9		μC
Peak Reverse Recovery Current	I_{rr}			20		A
Reverse Recovery Energy	E_{rec}			0.95		mJ
Recovered Charge	Q_{rr}	I_F=50A, V_R=600V, -di_F/dt=280A/μs, T_{vj}=150°C		6.2		μC
Peak Reverse Recovery Current	I_{rr}			28		A
Reverse Recovery Energy	E_{rec}			2.2		mJ

● IGBT- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Collector-Emitter Voltage	V_{CES}	V_{GE}=0V, I_C=1mA, T_{vj}=25°C	1200	V
Continuous Collector Current	I_C	T_C=100°C, T_{vjmax}=175°C	25	A
Repetitive Peak Collector Current	I_{CRM}	t_p=1ms	50	A
Gate-Emitter Voltage	V_{GES}	T_{vj}=25°C	±20	V
Total Power Dissipation	P_{tot}	T_C=25°C, T_{vjmax}=175°C	165	W

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Gate-Emitter Threshold Voltage	$V_{GE(th)}$	V_{GE}=V_{CE}, I_C=1.2mA,T_{vj}=25°C	5.2	5.8	6.4	V
Collector-Emitter Cut-off Current	I_{CES}	V_{CE}=1200V,V_{GE}=0V, T_{vj}=25°C			1	mA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C=25A,V_{GE}=15V, T_{vj}=25°C		1.95	2.50	V
		I_C=25A,V_{GE}=15V, T_{vj}=125°C		2.15		
		I_C=25A,V_{GE}=15V, T_{vj}=150°C		2.25		
Gate Charge	Q_G			0.20		µC
Input Capacitance	C_{ies}	V_{CE}=25V,V_{GE}=0V, f=1MHz, T_{vj}=25°C		1.67		nF
Reverse Transfer Capacitance	C_{res}			0.056		
Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=20V, T_{vj}=25°C			400	nA
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=25A, V_{GE}=±15V, R_G=20Ω, T_{vj}=25°C		10		ns
Rise Time	t_r			26		
Turn-Off Delay Time	$t_{d(off)}$			82		
Fall Time	t_f			222		
Turn-On Energy	E_{on}			2.59		mJ
Turn-Off Energy	E_{off}			1.13		
Turn-On Delay Time	$t_{d(on)}$	V_{CE}=600V, I_C=25A, V_{GE}=±15V, R_G=20Ω, T_{vj}=150°C		18		ns
Rise Time	t_r			27		
Turn-Off Delay Time	$t_{d(off)}$			89		
Fall Time	t_f			262		
Turn-On Energy	E_{on}			2.92		mJ
Turn-Off Energy	E_{off}			1.43		
SC Data	I_{SC}	t_p≤8µs,V_{GE}=15V,T_{vj}=150°C, V_{CC}=600V,V_{CEM}≤1200V		100		A

● Diode- Brake-chopper

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°C	1200	V
Continuous DC Forward Current	I_F		20	A
Repetitive Peak Forward Current	I_{FRM}	t_p=1ms	40	A

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Forward Voltage	V_F	I_F=20A, T_{vj}=25°C		2.1	2.80	V
		I_F=20A, T_{vj}=125°C		1.95		
		I_F=20A, T_{vj}=150°C		1.85		
Recovered Charge	Q_{rr}	I_F=20A, V_R=600V, -di_F/dt=1500A/µs, T_{vj}=25°C		0.65		µC
Peak Reverse Recovery Current	I_{rr}			20.0		A
Reverse Recovery Energy	E_{rec}			0.71		mJ
Recovered Charge	Q_{rr}	I_F=20A, V_R=600V, -di_F/dt=1500A/µs, T_{vj}=150°C		2.98		µC
Peak Reverse Recovery Current	I_{rr}			21		A
Reverse Recovery Energy	E_{rec}			1.25		mJ

● Diode- Rectifier

Maximum Ratings

Parameter	Symbol	Test Conditions	Rating	Unit
Repetitive Peak Reverse Voltage	V_{RRM}	T_{vj}=25°C	1600	V
Average Output Current 50/60Hz, Sine Wave	$I_{F(AV)}$	T_C=100°C	50	A
Surge Forward Current	I_{FSM}	V_R=0, t_p=10ms, T_{vj}=25°C	520	A
I^2t-value	I^2t	V_R=0, t_p=10ms, T_{vj}=25°C	1300	A^2S

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Diode Forward Voltage	V_F	I_F=50A,T_j=150℃		1.15		V
Reverse Current	I_R	T_j=150℃,V_R=1600V			1.5	mA

● NTC-Thermistor

Electrical Characteristics

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Rated Resistance	R_{25}			5		kΩ
Deviation of R100	ΔR/R	T_C=100℃,R_{100}=493.3Ω	-5		5	%
Power Dissipation	P_{25}				20	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	Test Conditions	Min	Typ	Max	Unit
Isolation voltage	V_{isol}	t=1min,f=50Hz	2500			V
Maximum Junction Temperature	T_{jmax}				175	°C
Operating Junction Temperature	$T_{vj\ op}$		-40		150	°C
Storage Temperature	T_{stg}		-40		125	°C
Stray-inductance-module	L_{SCE}			40		nH
Module lead resistance, terminals-chip	$R_{cc'+EE'}$	T_C=25°C, per switch		4		mΩ
	$R_{AA'+CC'}$			3		
Thermal Resistance Junction to Case	$R_{\theta JC}$	per IGBT-inverter			0.59	K/W
		per Diode-inverter			0.97	
		per IGBT-brake-copper			1.16	
		per Diode-chopper			0.71	
		per Diode-rectifier			0.80	
Thermal Resistance Case-to Sink	$R_{\theta CS}$	per Module		0.009		K/W
Module-to-Sink Torque	Ms		3		6	N·m
Weight of Module	G			180		g

Curve Characteristics

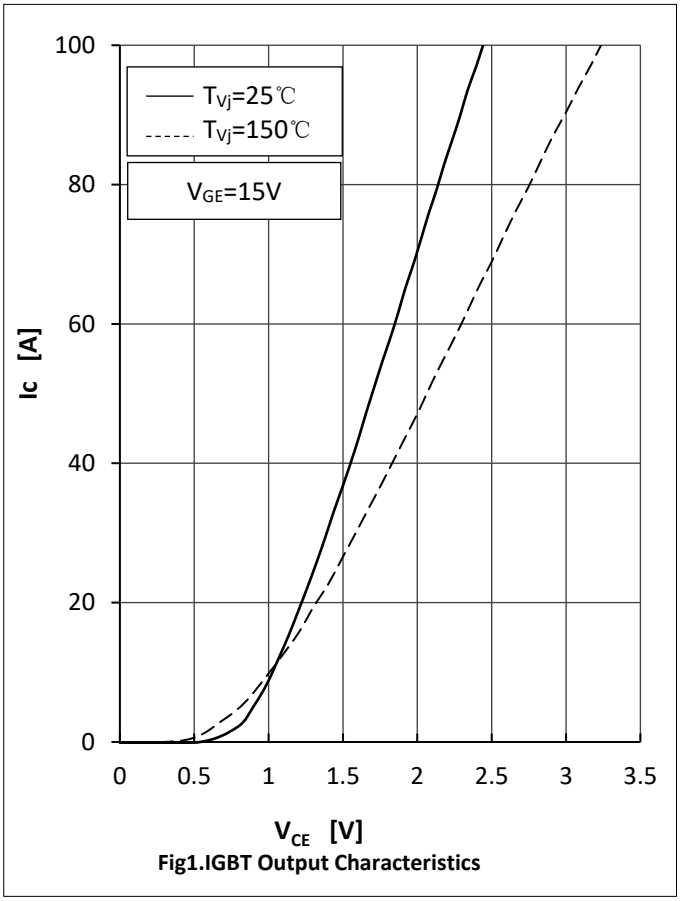


Fig1.IGBT Output Characteristics

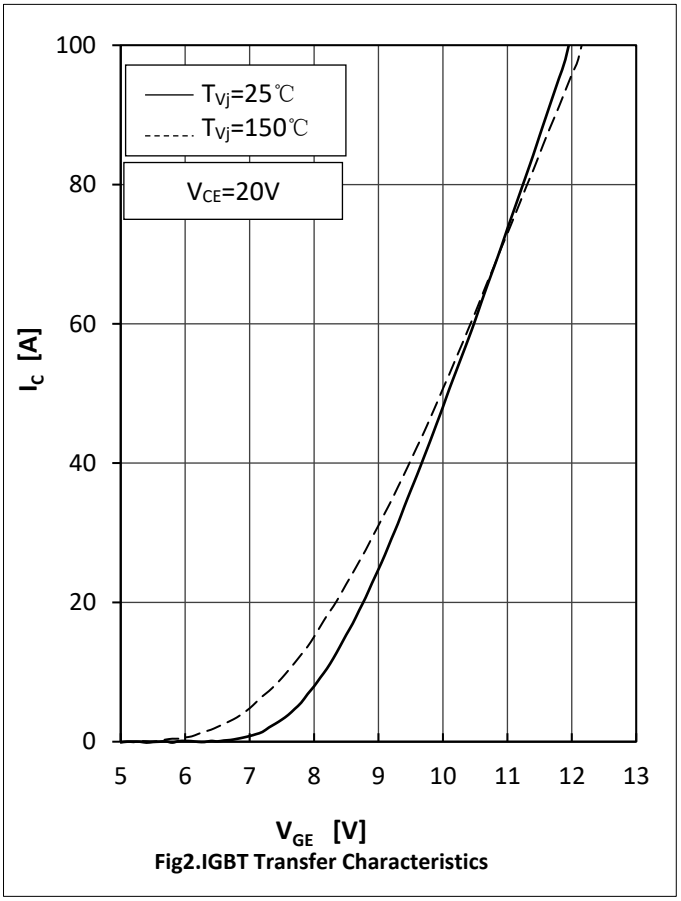


Fig2.IGBT Transfer Characteristics

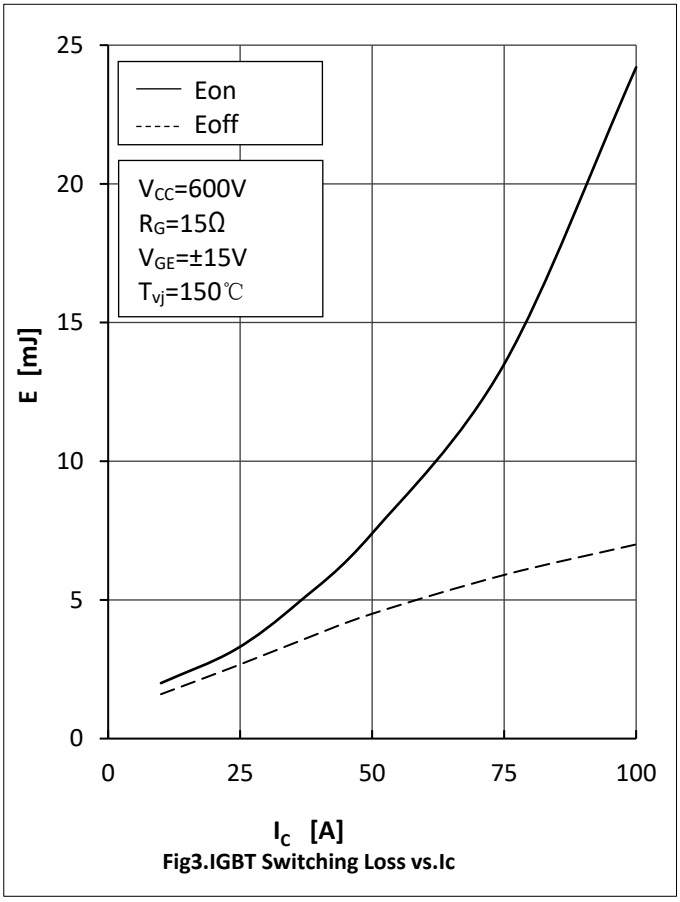


Fig3.IGBT Switching Loss vs.Ic

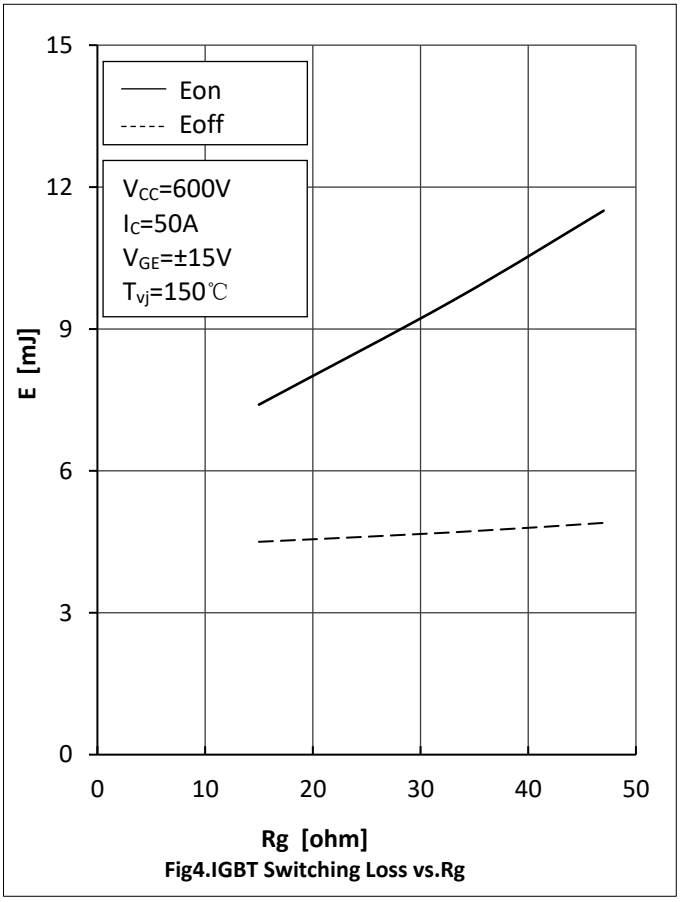


Fig4.IGBT Switching Loss vs.Rg

Curve Characteristics

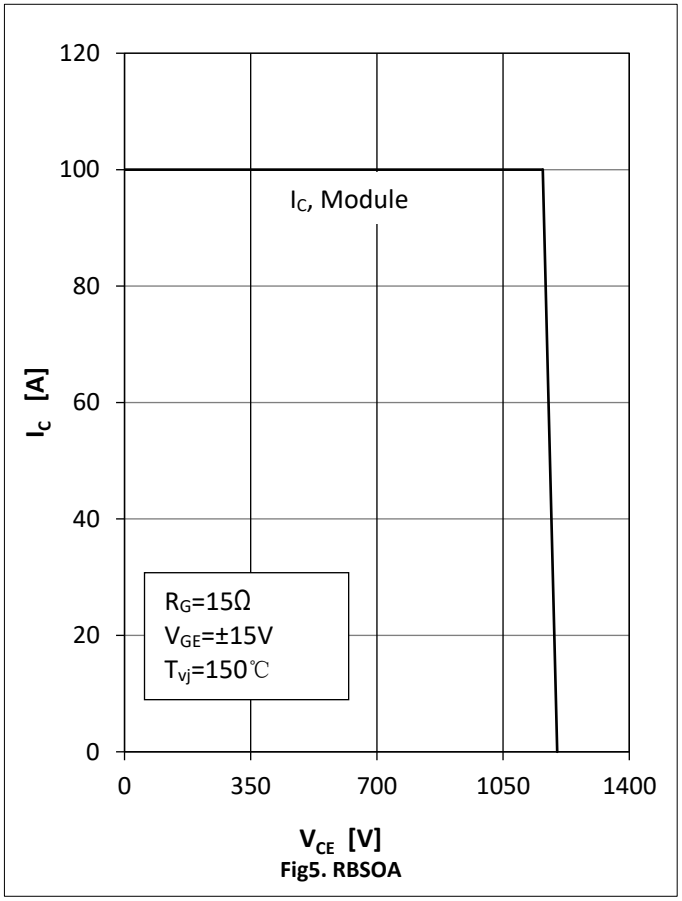


Fig5. RBSOA

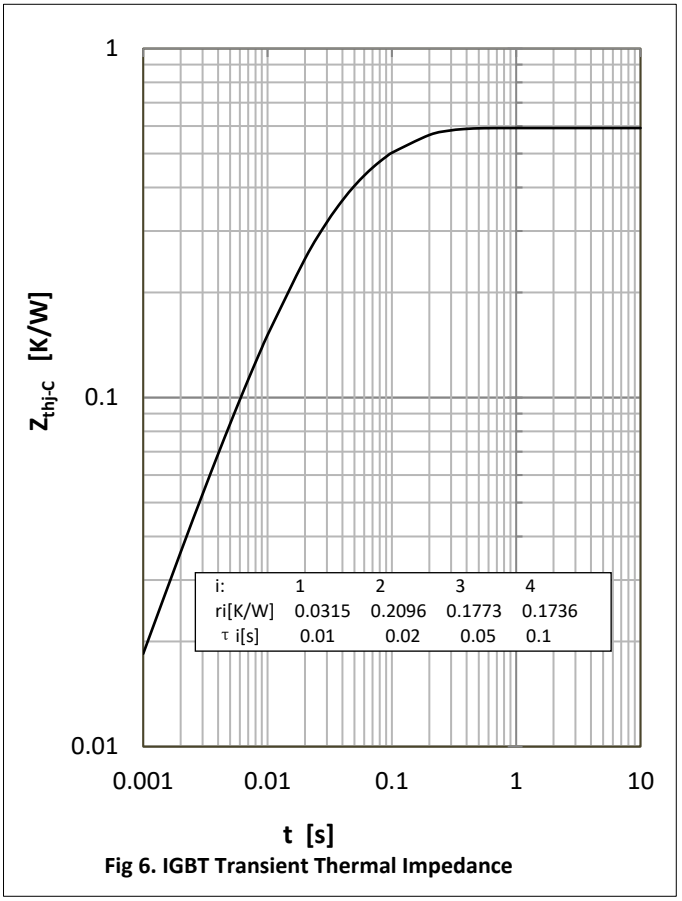


Fig 6. IGBT Transient Thermal Impedance

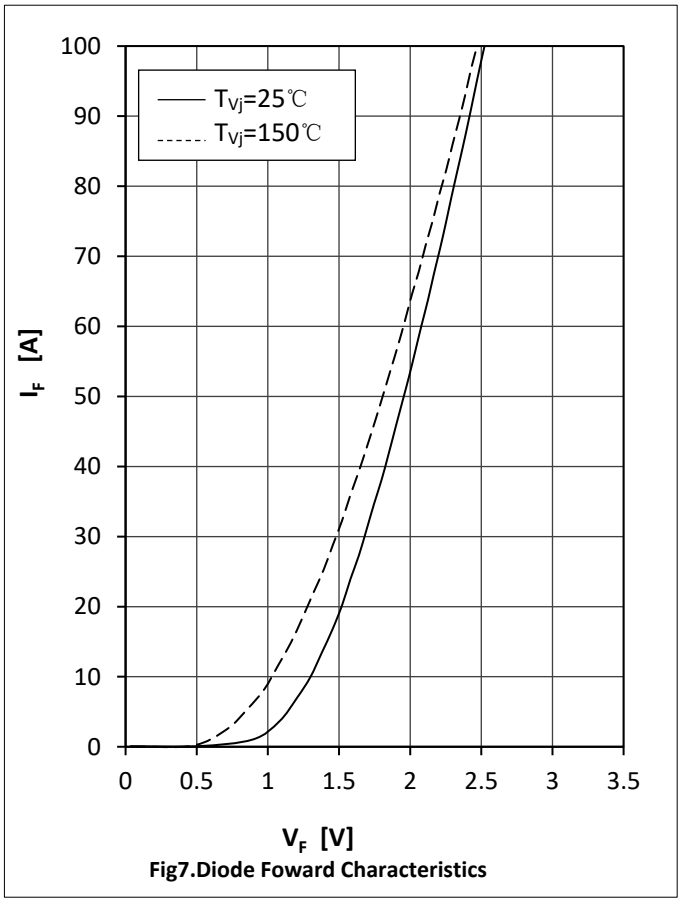


Fig7.Diode Foward Characteristics

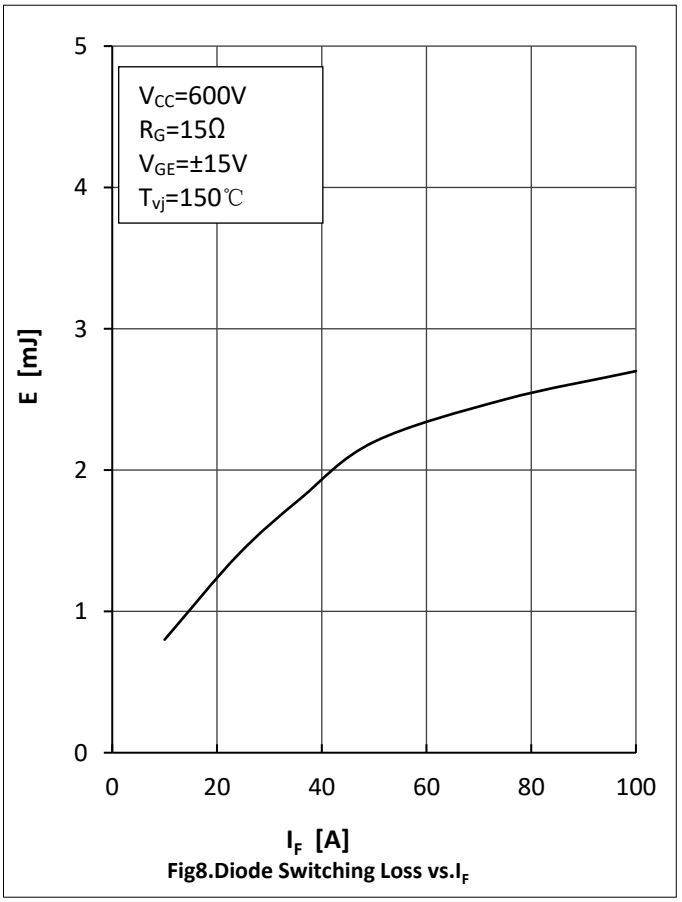


Fig8.Diode Switching Loss vs.I_F

Curve Characteristics

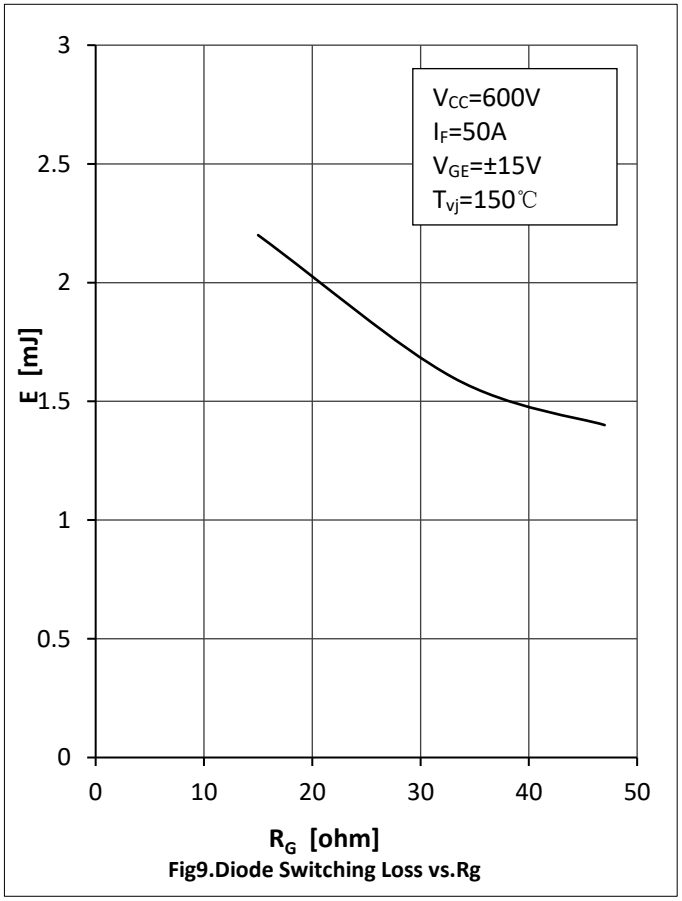


Fig9.Diode Switching Loss vs.Rg

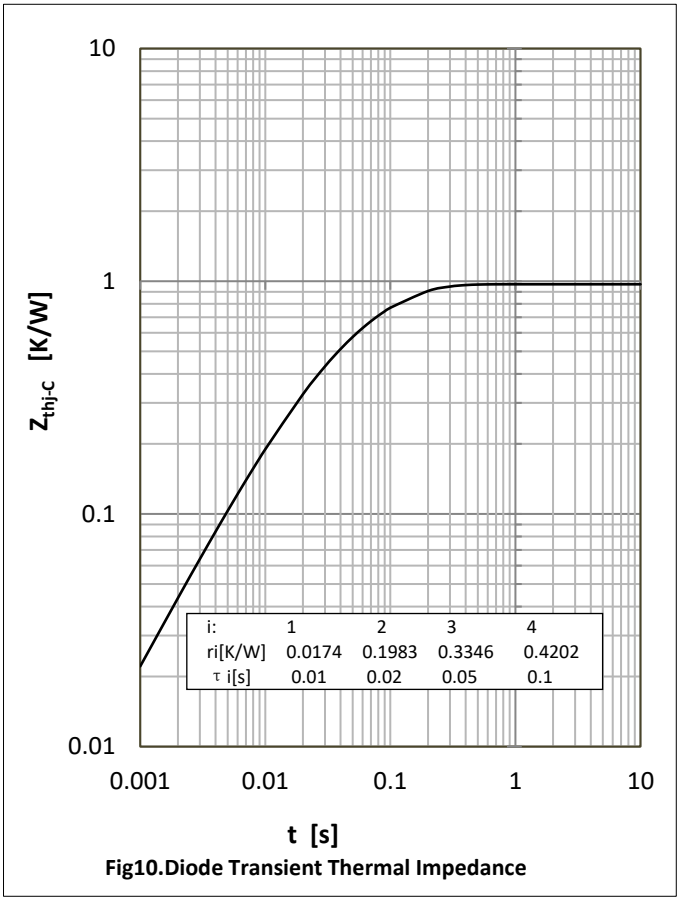


Fig10.Diode Transient Thermal Impedance

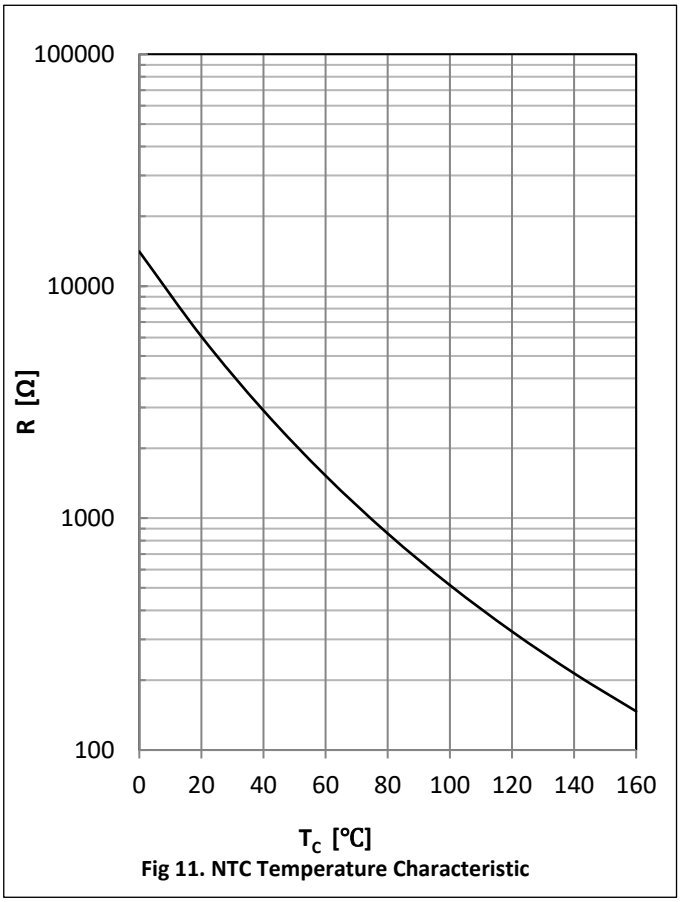


Fig 11. NTC Temperature Characteristic

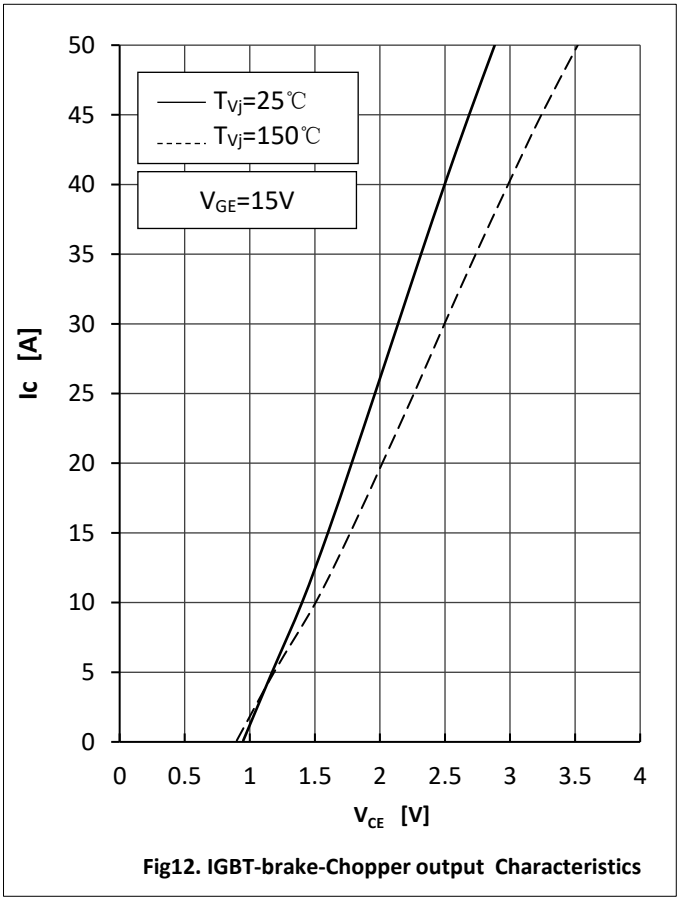


Fig12. IGBT-brake-Chopper output Characteristics

Curve Characteristics

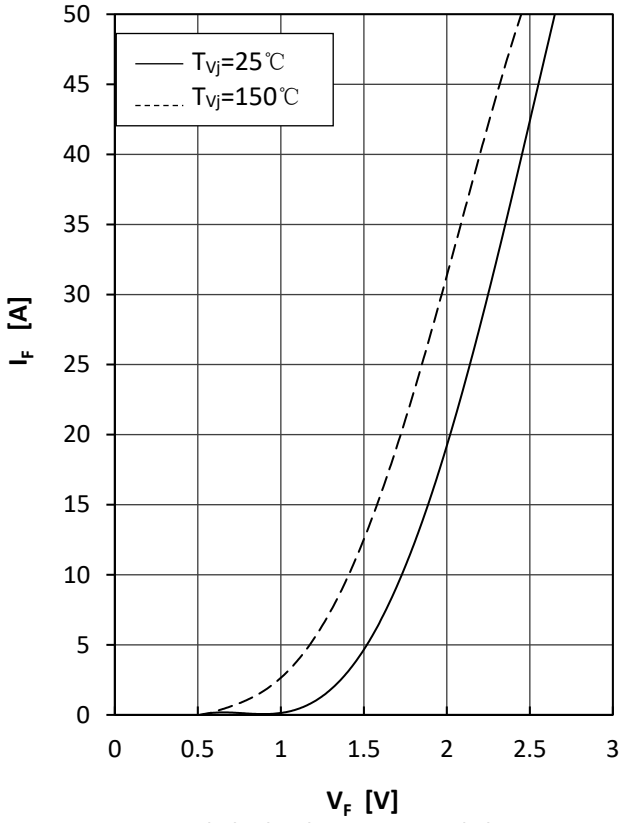
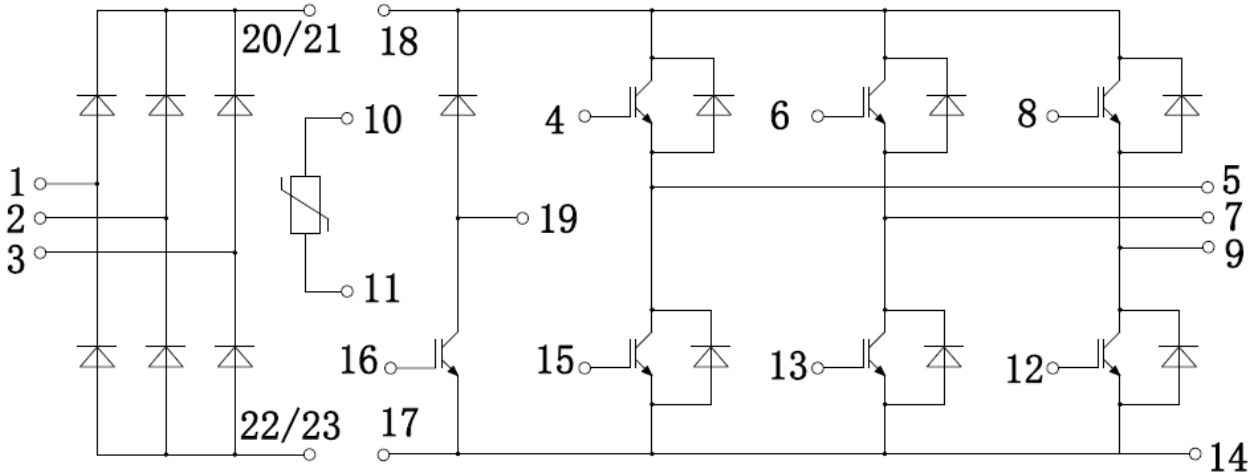


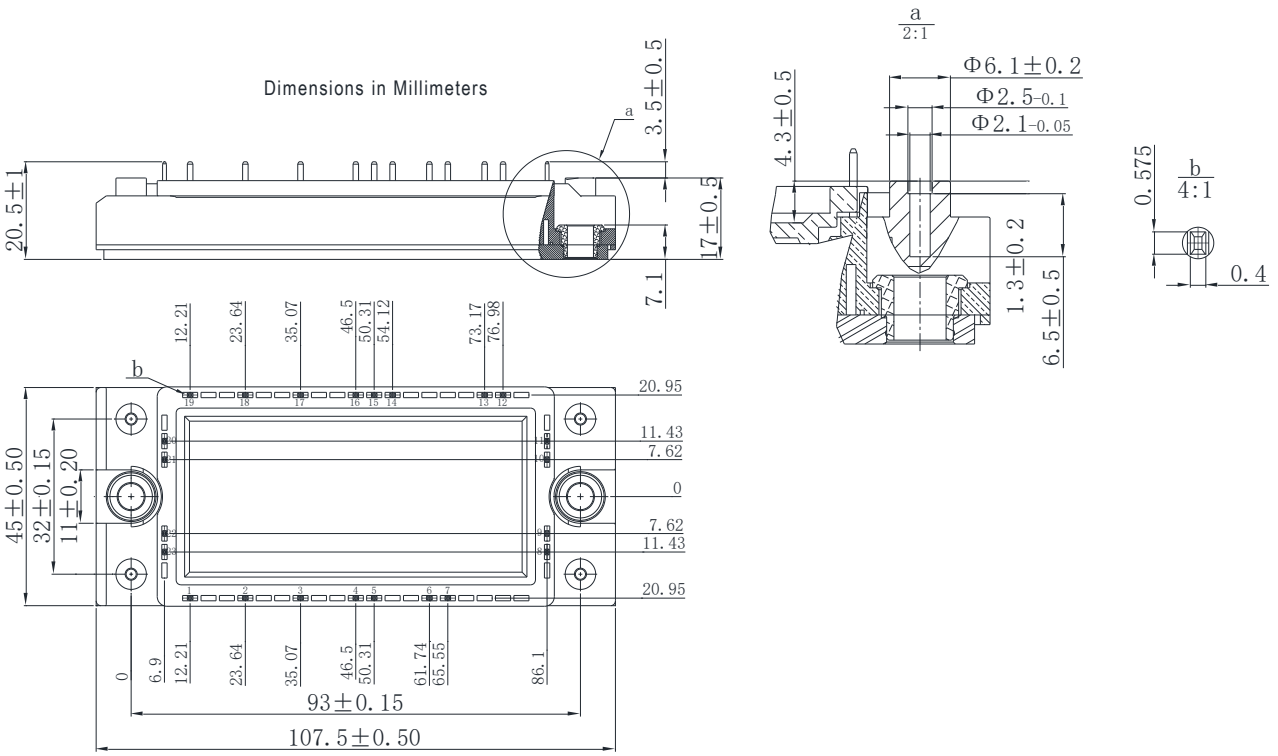
Fig13.Diode-brake-chopper Forward Characteristics

Circuit Diagram



Package Dimensions

E1A



Ordering Information

Device	Packing
Part Number-BP	Bulk: 8pcs/Box ; 48pcs/Ctn