MMG80C120BF_Y1

1200V 80A IGBT Module

December 2020 Version 01 RoHS Compliant

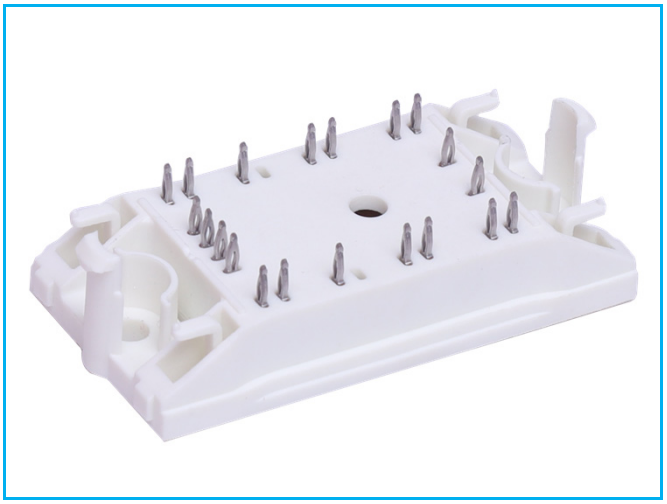
PRODUCT FEATURES

☐ Mixed voltage component topology

☐ Neutral point clamped inverter

☐ Reactive power capability

☐ Low inductance layout



APPLICATIONS

☐ Solar inverter

☐ UPS

Type	V_{CES}	I_C	T_{Jmax}	Marking	Package
MMG80C120BF_Y1	1200V	30A	175°C	MMG80C120BF_Y1	GC

Half Bridge IGBT(T1 T2)

ABSOLUTE MAXIMUM RATINGS(T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1200	V
V_{GES}	Gate Emitter Voltage		±20	
I_{CN}	Implemented Collector Current		80	A
I_C	Continuous DC Collector Current	T_C=25℃, T_{Jmax}=175℃	45	
		T_C=100℃, T_{Jmax}=175℃	30	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	160	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	277	W

Half Bridge Diode(D1 D2)

ABSOLUTE MAXIMUM RATINGS (T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
I_{FN}	Implemented Forward Current		50	A
I_F	Continuous DC Forward Current		30	
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	100	
I^2t		T_J=125℃, t=10ms, V_R=0V	295	A^2s

MacMic Science & Technology Co., Ltd.

Add：#18, Hua Shan Zhong Lu, New District, Changzhou City, Jiangsu Province, P. R .of China

Tel.：+86-519-85163708 Fax：+86-519-85162291 Post Code：213022 Website：www.macmicst.com

Half Bridge IGBT(T1 T2)

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=3.2mA		5.0	6.0	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=80A, V_{GE}=15V, T_J=25℃			1.9	2.3	
		I_C=80A, V_{GE}=15V, T_J=150℃			2.3		
		I_C=30A, V_{GE}=15V, T_J=25℃			1.36	1.65	
		I_C=30A, V_{GE}=15V, T_J=150℃			1.46		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				0		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=80A , V_{GE}=15V			0.38		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			5		nF
C_{res}	Reverse Transfer Capacitance				220		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		50		ns
			T_J=150℃		55		ns
t_r	Rise Time		T_J=25℃		22		ns
			T_J=150℃		25		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		290		ns
			T_J=150℃		380		ns
t_f	Fall Time		T_J=25℃		115		ns
			T_J=150℃		235		ns
E_{on}	Turn on Energy	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		0.75		mJ
			T_J=150℃		1.35		mJ
E_{off}	Turn off Energy		T_J=25℃		1		mJ
			T_J=150℃		1.8		mJ
I_{SC}	Short Circuit Current	tpsc≤10μs , V_{GE}=15V T_J=125℃,V_{CC}=600V			400		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.54	K /W

Half Bridge Diode(D1 D2)

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=50A , V_{GE}=0V, T_J=25℃		2.35	2.65	V
		I_F=50A , V_{GE}=0V, T_J=150℃		1.77		
		I_F=30A , V_{GE}=0V, T_J=25℃		2.06		
		I_F=30A , V_{GE}=0V, T_J=150℃		1.48		
t_{rr}	Reverse Recovery Time	I_F=30A , V_R=400V dI_F/dt=-1600A/μs T_J =150℃		125		ns
I_{RRM}	Max. Reverse Recovery Current			50		A
Q_{RR}	Reverse Recovery Charge			2.9		μC
E_{rec}	Reverse Recovery Energy			0.65		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.9	K /W

Neutral Point IGBT(T3 T4)

ABSOLUTE MAXIMUM RATINGS(T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	650	V
V_{GES}	Gate Emitter Voltage		±20	
I_{CN}	Implemented Collector Current		75	A
I_C	Continuous DC Collector Current	T_C=25℃, T_{Jmax}=175℃	60	
		T_C=100℃, T_{Jmax}=175℃	30	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	150	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	214	W

Neutral Point IGBT(T3 T4)

ELECTRICAL CHARACTERISTICS (T_C =25°C unless otherwise specified)

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	V_{CE}=V_{GE}, I_C=3.0mA		4.8	5.6	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=75A, V_{GE}=15V, T_J=25℃			1.55	1.95	
		I_C=75A, V_{GE}=15V, T_J=150℃			1.9		
		I_C=30A, V_{GE}=15V, T_J=25℃			1.17		
		I_C=30A, V_{GE}=15V, T_J=150℃			1.3		
I_{CES}	Collector Leakage Current	V_{CE}=650V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=650V, V_{GE}=0V, T_J=150℃				5	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-200		200	nA
R_{Gint}	Integrated Gate Resistor				0		Ω
Q_g	Gate Charge	V_{CE}=300V, I_C=75A , V_{GE}=15V			0.36		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			4.4		nF
C_{res}	Reverse Transfer Capacitance				200		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		10		ns
			T_J=150℃		15		ns
t_r	Rise Time		T_J=25℃		23		ns
			T_J=150℃		26		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		210		ns
			T_J=150℃		260		ns
t_f	Fall Time		T_J=25℃		100		ns
			T_J=150℃		180		ns
E_{on}	Turn on Energy	V_{CC}=400V,I_C=30A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		0.5		mJ
			T_J=150℃		1.3		mJ
E_{off}	Turn off Energy		T_J=25℃		0.95		mJ
			T_J=150℃		1.55		mJ
I_{SC}	Short Circuit Current	tpsc≤6μs , V_{GE}=15V T_J=125℃,V_{CC}=360V			395		A
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.7	K /W

Neutral Point Diode(D3 D4)

ABSOLUTE MAXIMUM RATINGS (T_C *=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	650	V
I_{FN}	Implemented Forward Current		75	A
I_F	Continuous DC Forward Current		30	
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	150	
I^2t		T_J =125℃, t=10ms, V_R=0V	310	A^2s

Neutral Point Diode(D3 D4)

ELECTRICAL CHARACTERISTICS *(T_C =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=75A , V_{GE}=0V, T_J=25℃		1.7	2.15	V
		I_F=75A , V_{GE}=0V, T_J=150℃		1.45		
		I_F=30A , V_{GE}=0V, T_J=25℃		1.42		
		I_F=30A , V_{GE}=0V, T_J=150℃		1.1		
t_{rr}	Reverse Recovery Time	I_F=30A , V_R=400V dI_F/dt=-2000A/μs T_J =150℃		95		ns
I_{RRM}	Max. Reverse Recovery Current			90		A
Q_{RR}	Reverse Recovery Charge			4.4		μC
E_{rec}	Reverse Recovery Energy			2.3		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				1.15	K /W

NTC CHARACTERISTICS *(T_C =25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
R_{25}	Resistance	T_C =25℃		22		kΩ
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\ K))]$			3950		K

MODULE CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~150	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	3000	V
Torque	to heatsink	Recommended（M4）	0.7~1.1	Nm
Weight			30	g

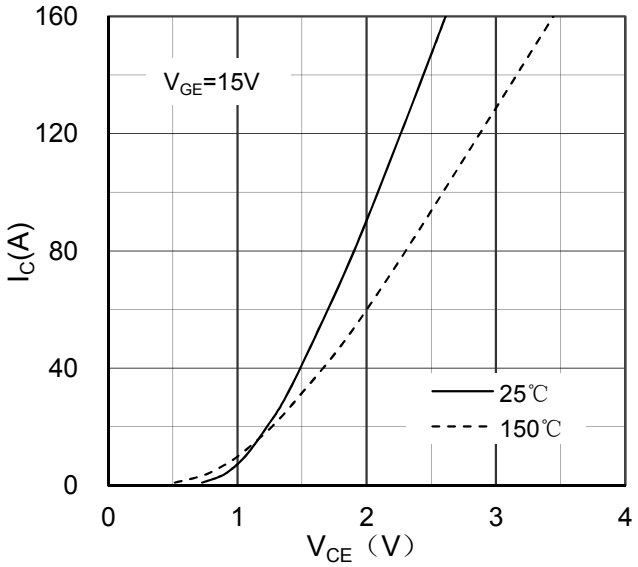


Figure 1. Typical Output Characteristics
Half Bridge IGBT

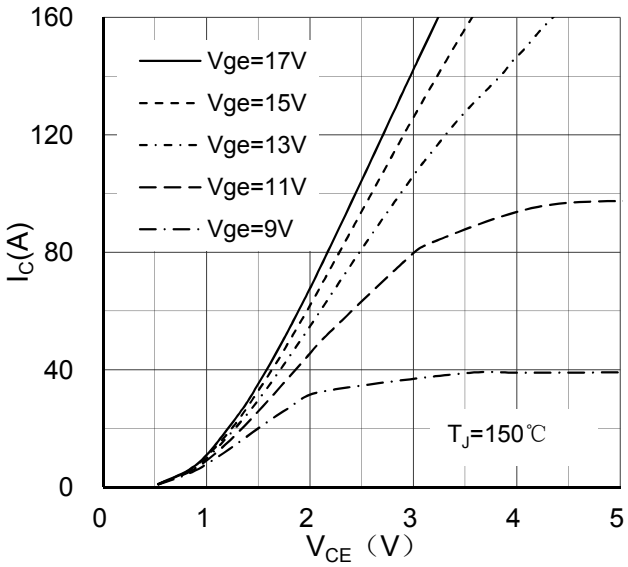


Figure 2. Typical Output Characteristics
Half Bridge IGBT

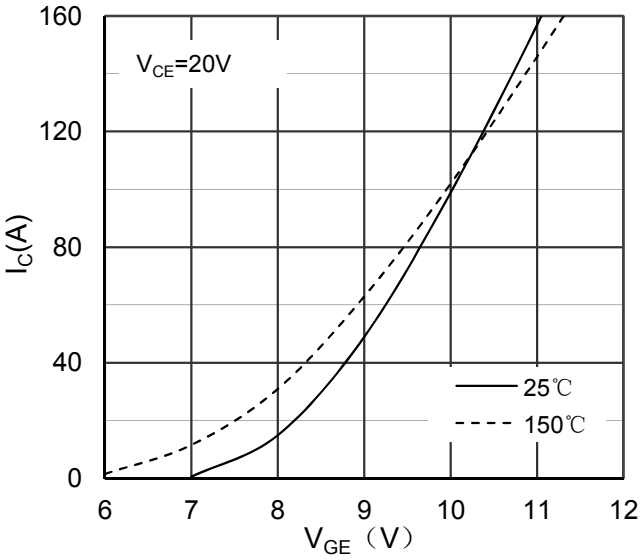


Figure 3. Typical Transfer characteristics Half Bridge IGBT

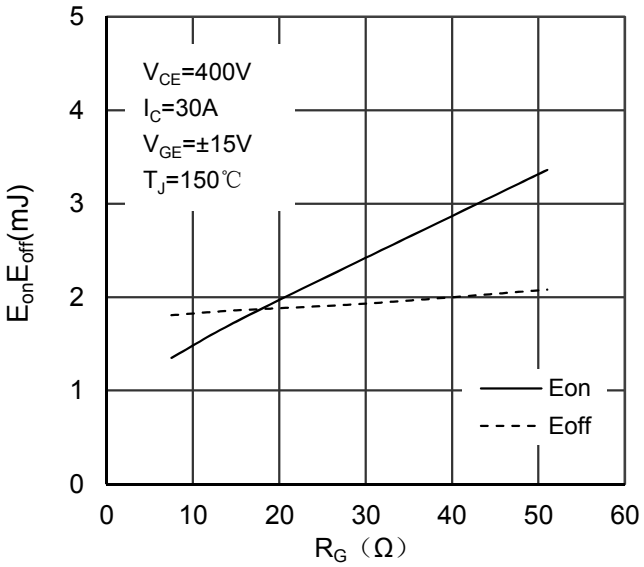


Figure 4. Switching Energy vs Gate Resistor Half Bridge IGBT

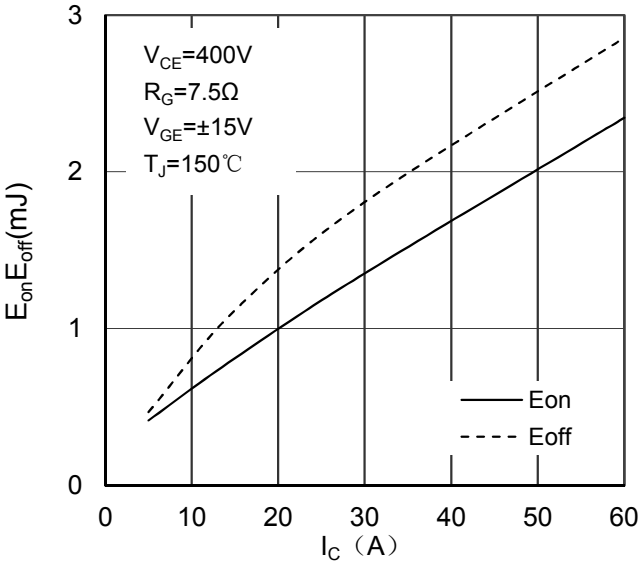


Figure 5. Switching Energy vs Collector Current Half Bridge IGBT

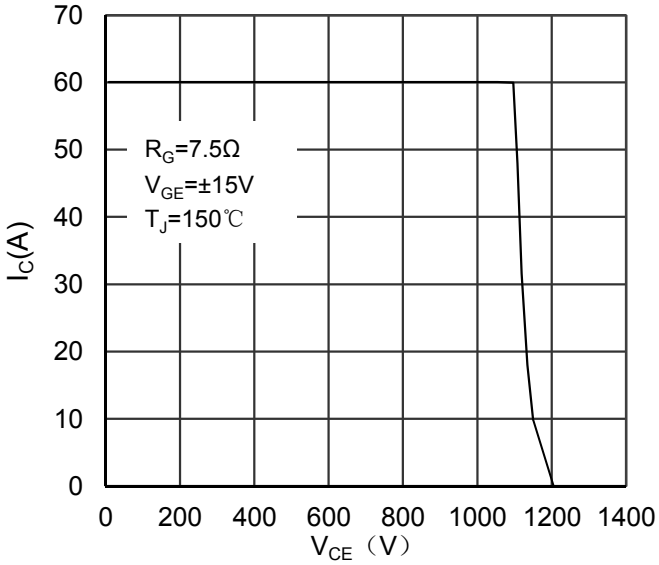


Figure 6. Reverse Biased Safe Operating Area Half Bridge IGBT

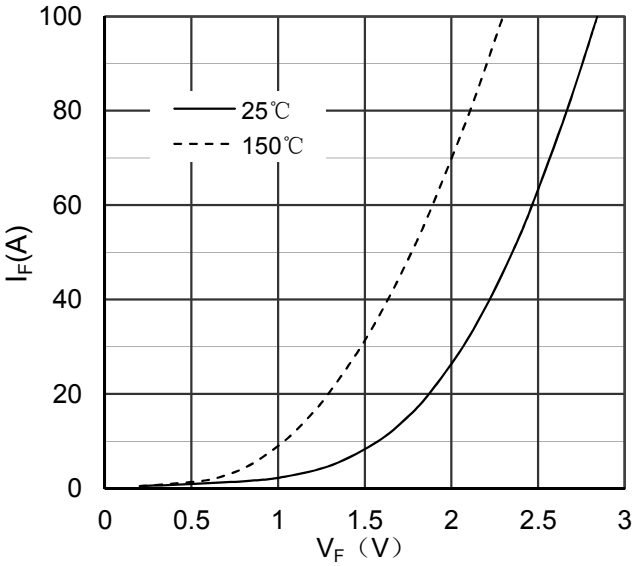


Figure 7. Diode Forward Characteristics Half Bridge Diode

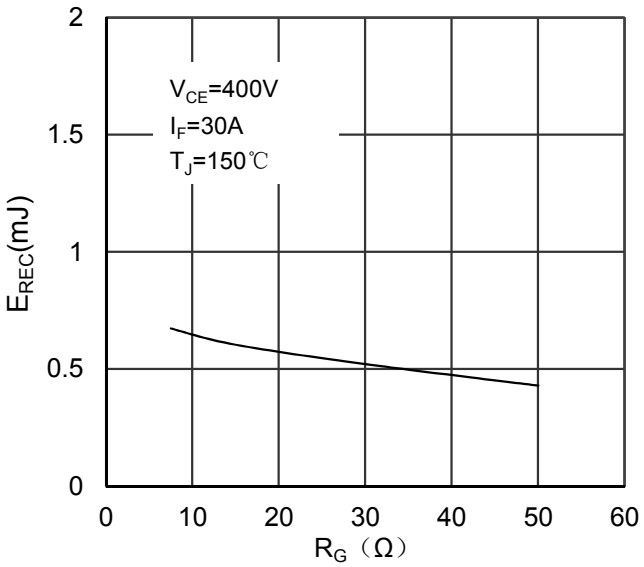


Figure 8. Switching Energy vs Gate Resistor Half Bridge Diode

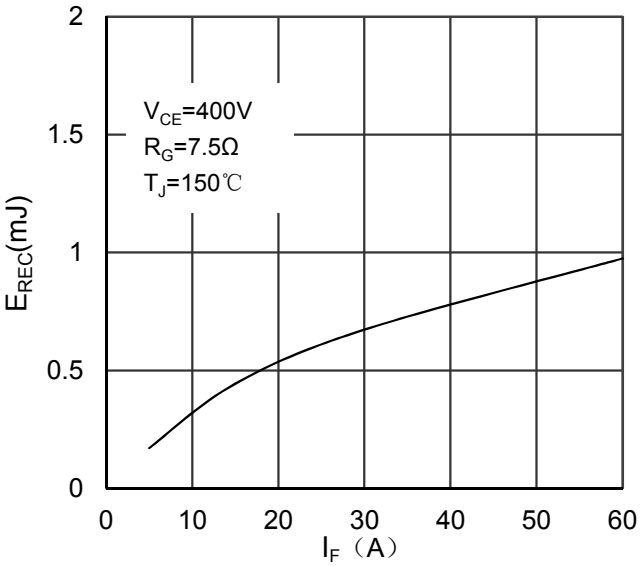


Figure 9. Switching Energy vs Forward Current Half Bridge Diode

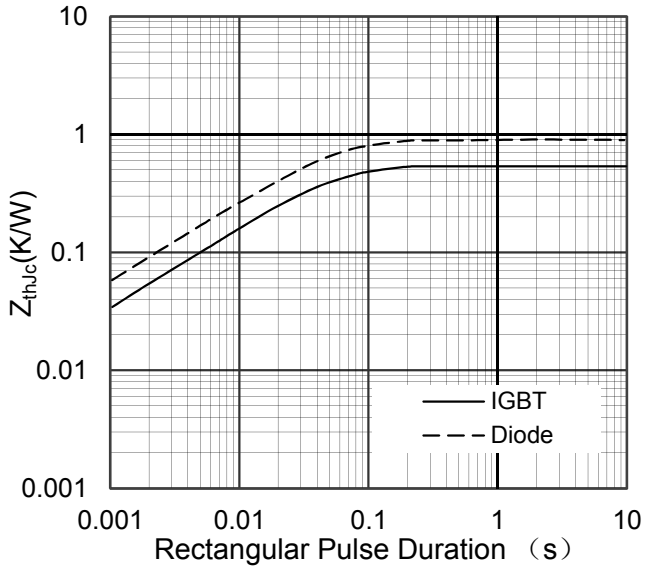


Figure 10. Transient Thermal Impedance of Half Bridge-Diode and IGBT

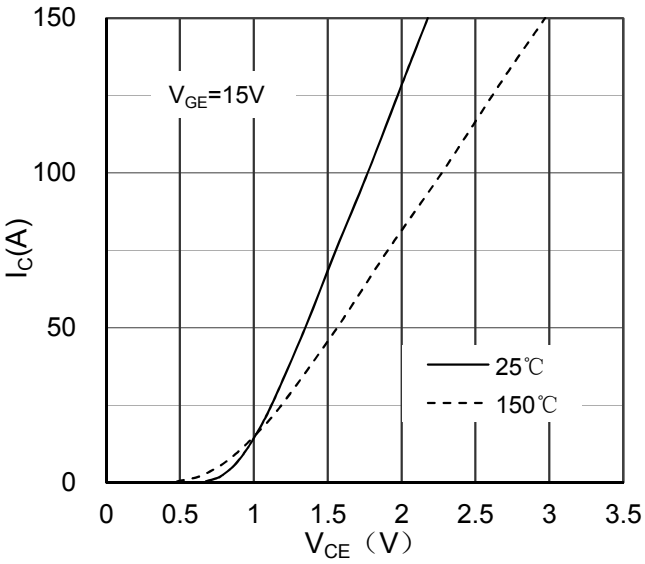


Figure 11. Typical Output Characteristics Neutral Point IGBT

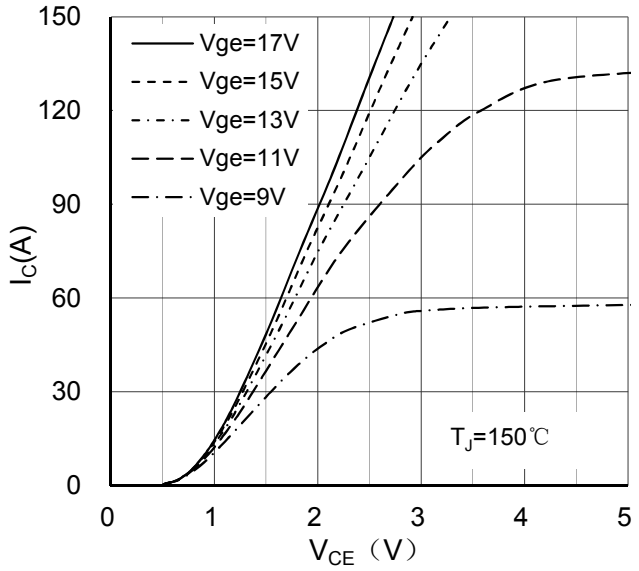


Figure 12. Typical Output Characteristics Neutral Point IGBT

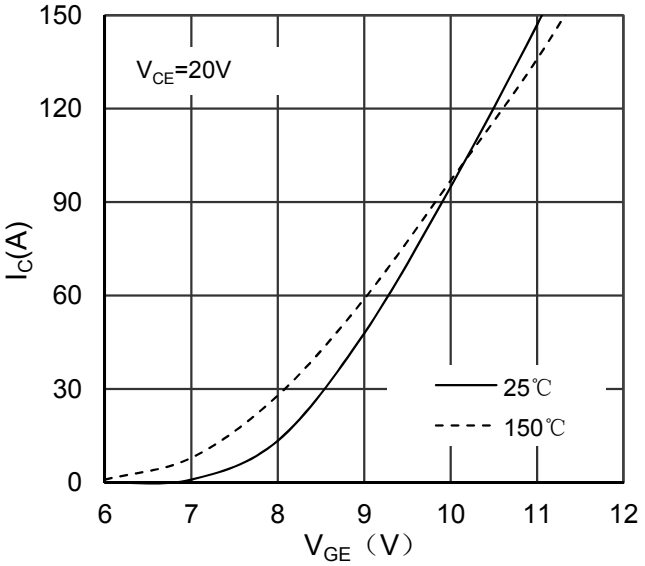


Figure 13. Typical Transfer characteristics Neutral Point IGBT

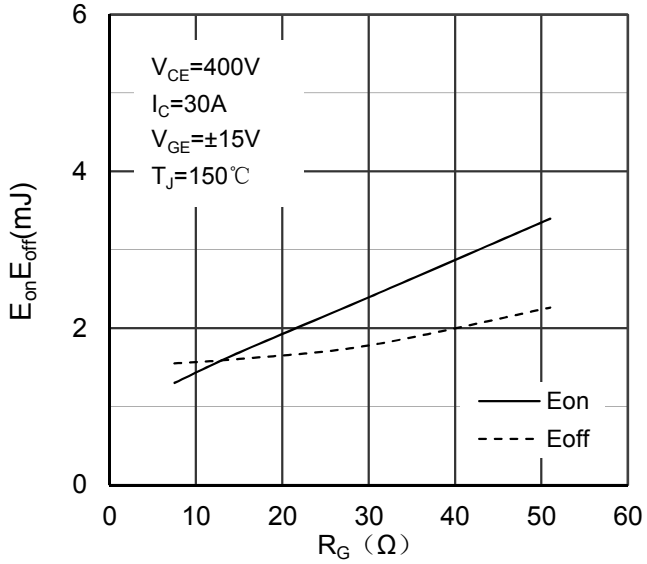


Figure 14. Switching Energy vs Gate Resistor Neutral Point IGBT

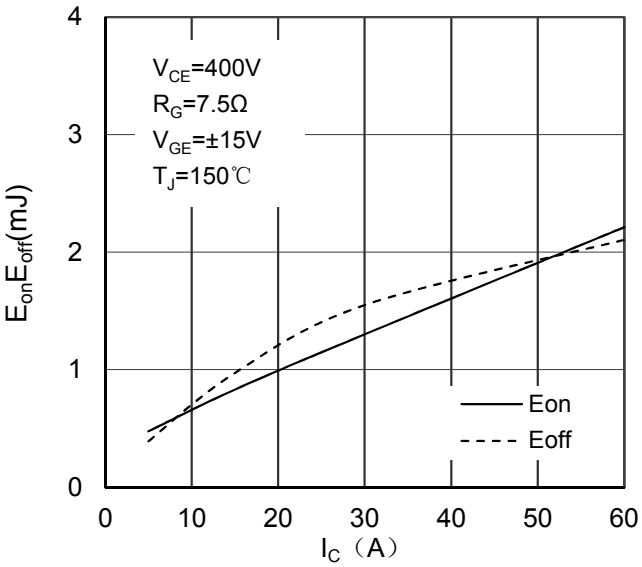


Figure 15. Switching Energy vs Collector Current Neutral Point IGBT

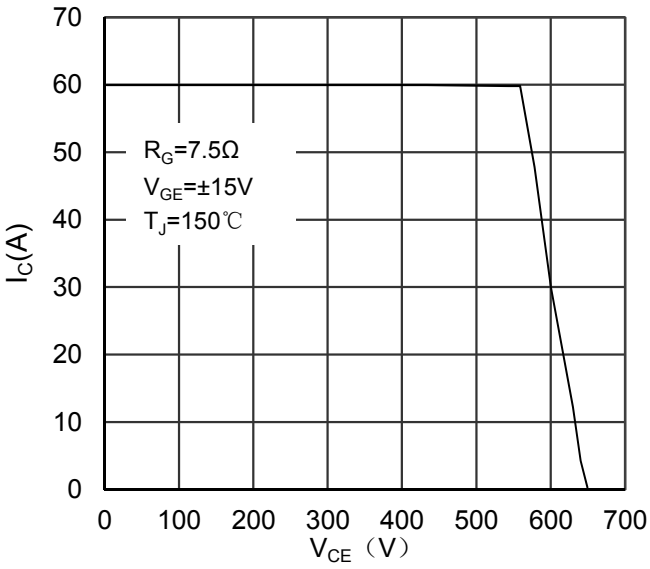


Figure 16. Reverse Biased Safe Operating Area Neutral Point IGBT

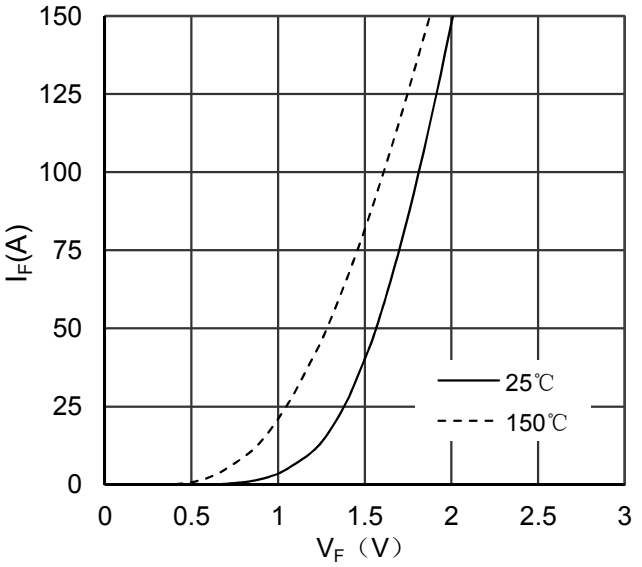


Figure 17. Diode Forward Characteristics Neutral Point Diode

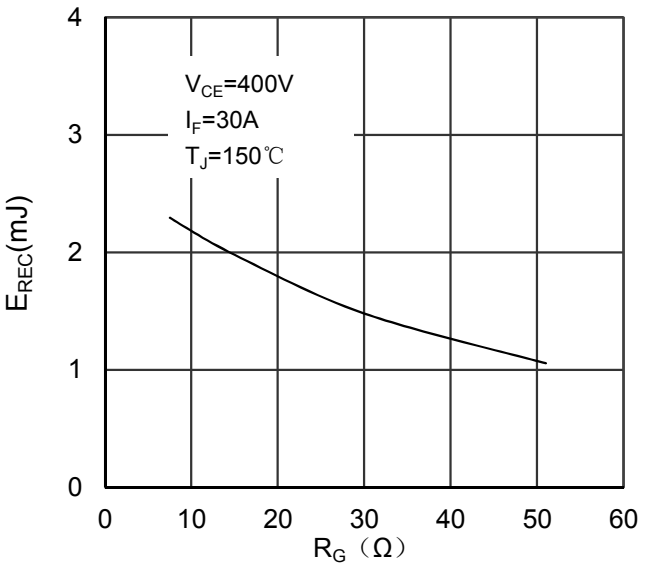


Figure 18. Switching Energy vs Gate Resistor Neutral Point Diode

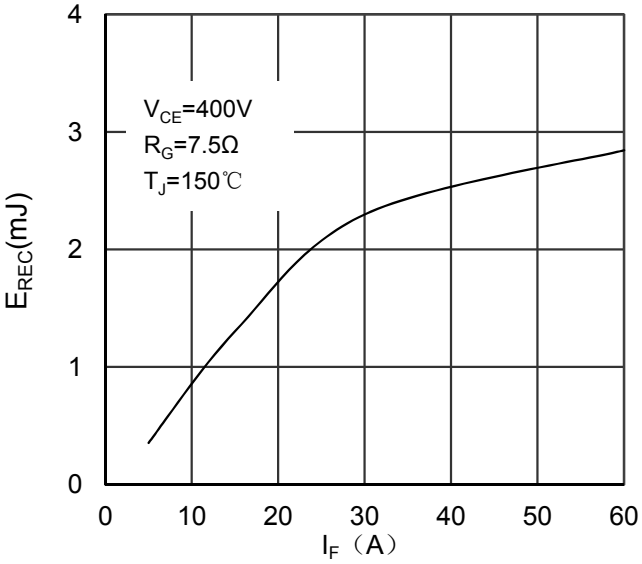


Figure 19. Switching Energy vs Forward Current Neutral Point Diode

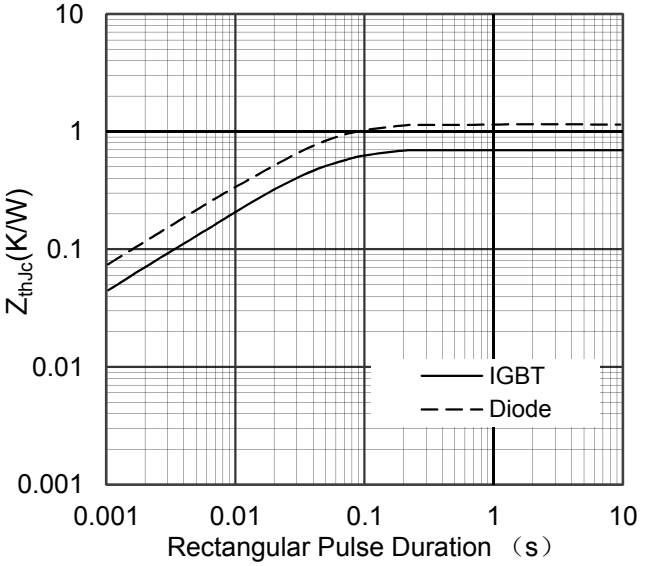


Figure 20. Transient Thermal Impedance of Neutral Point-Diode and IGBT

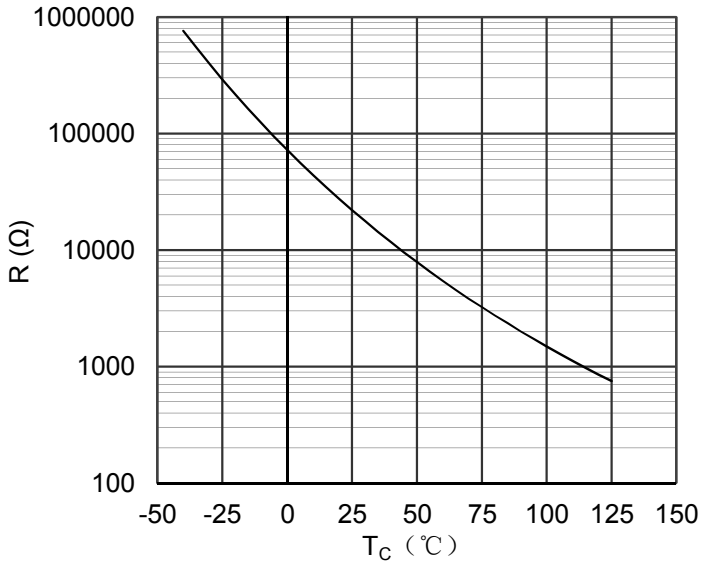


Figure 21. NTC Characteristics

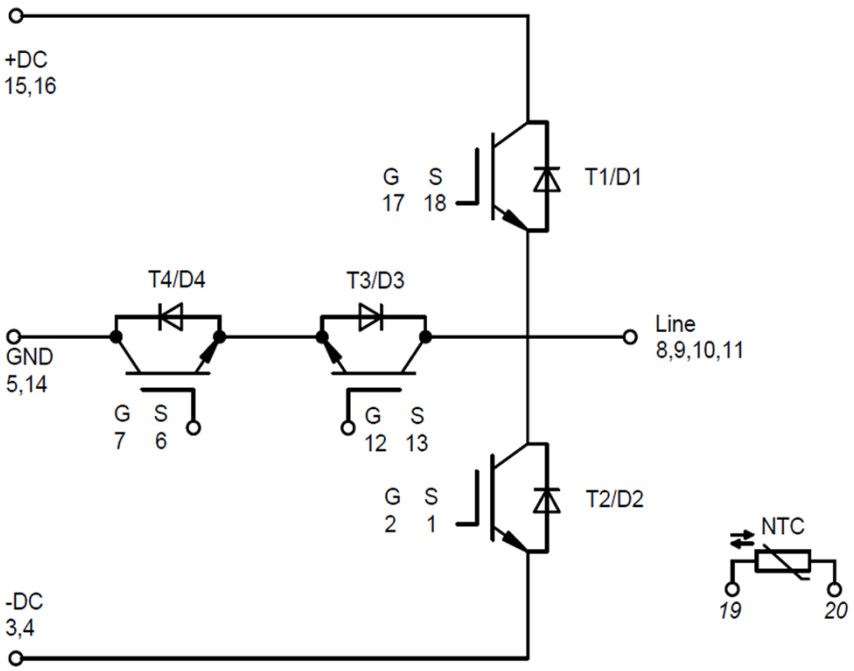
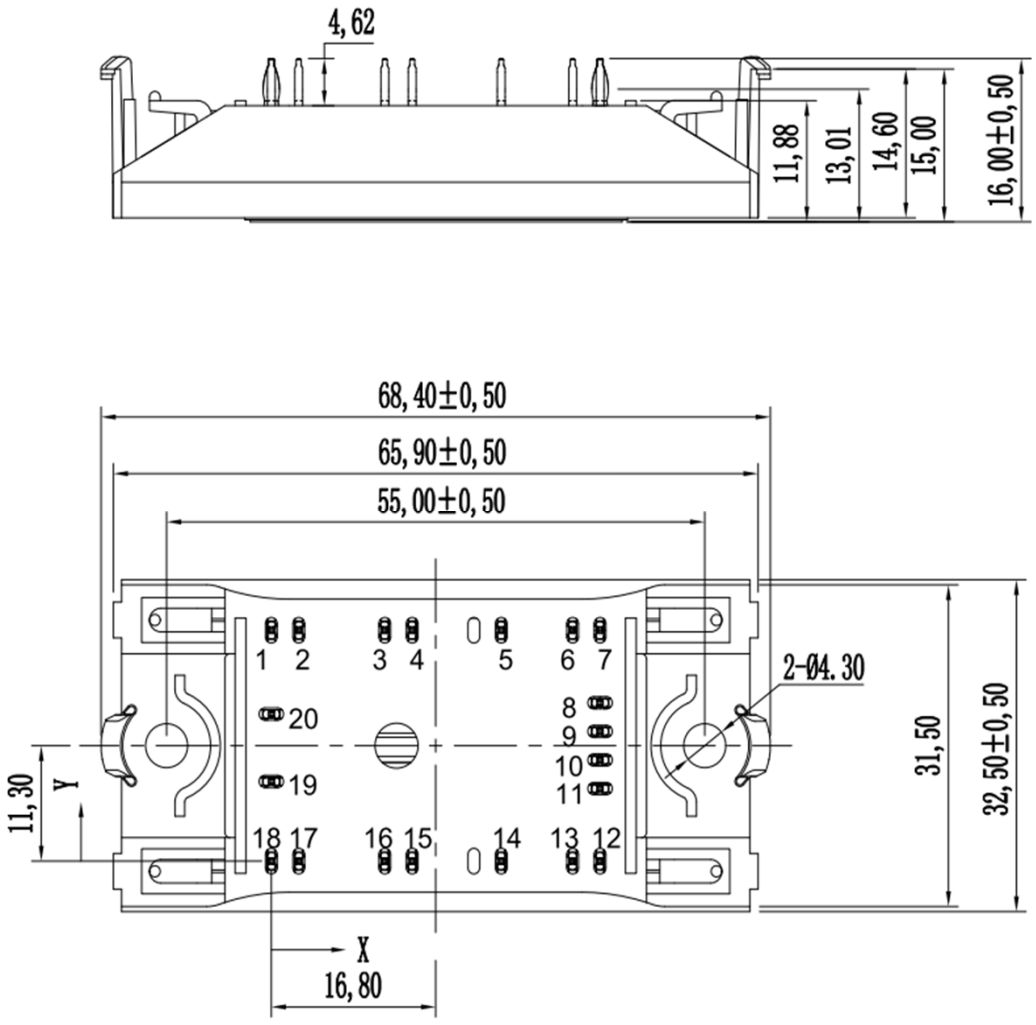


Figure 22. Circuit Diagram



Pin table		
Pin	X	Y
1	0	22.6
2	2.8	22.6
3	11.6	22.6
4	14.4	22.6
5	23.5	22.6
6	30.8	22.6
7	33.6	22.6
8	33.6	15.5
9	33.6	12.7
10	33.6	9.9
11	33.6	7.1
12	33.6	0
13	30.8	0
14	23.5	0
15	14.4	0
16	11.6	0
17	2.8	0
18	0	0
19	0	7.8
20	0	14.4

Dimensions in (mm)

Figure 23. Package Outline