MACMIC

MMG200D170B6EN

1700V 200A IGBT Module

April 2015 **Version 01** **RoHS Compliant**

PRODUCT FEATURES

☐ IGBT3 CHIP(1700V Trench+Field Stop technology)

☐ Low turn-off losses, short tail current

☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ DIODE CHIP(1700V EMCON 3 technology)

☐ Free wheeling diodes with fast and soft reverse recovery

APPLICATIONS

☐ High frequency switching application

☐ Medical applications

☐ Motion/servo control

☐ UPS systems

IGBT-inverter

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1700	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃	300	A
		T_C=95℃	200	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	400	
P_{tot}	Power Dissipation Per IGBT		1500	W

Diode-inverter

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1700	V
$I_{F(AV)}$	Average Forward Current	T_C=25℃	200	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	400	
I^2t		T_J=125℃, t=10ms, V_R=0V	6500	A^2S

IGBT-inverter
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=8mA		5.2	5.8	6.4	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=200A, V_{GE}=15V, T_J=25℃			2	2.45	
		I_C=200A, V_{GE}=15V, T_J=125℃			2.4		
I_{CES}	Collector Leakage Current	V_{CE}=1700V, V_{GE}=0V, T_J=25℃				3	mA
		V_{CE}=1700V, V_{GE}=0V, T_J=125℃				20	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=25℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				3.8		Ω
Q_g	Gate Charge	V_{CE}=900V, I_C=200A , V_{GE}=±15V			2.4		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			18		nF
C_{res}	Reverse Transfer Capacitance				600		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=900V,I_C=200A R_G =6.8Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		280		ns
			T_J=125℃		380		ns
t_r	Rise Time		T_J=25℃		80		ns
			T_J=125℃		100		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=900V,I_C=200A R_G =6.8Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		800		ns
			T_J=125℃		1000		ns
t_f	Fall Time		T_J=25℃		120		ns
			T_J=125℃		200		ns
E_{on}	Turn on Energy	V_{CC}=900V,I_C=200A R_G =6.8Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		58		mJ
			T_J=125℃		78		mJ
E_{off}	Turn off Energy		T_J=25℃		43		mJ
			T_J=125℃		63		mJ
I_{SC}	Short Circuit Current	tpsc⩽10μS , V_{GE}=15V T_J=125℃,V_{CC}=1000V			800		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.1	K /W

Diode-inverter
ELECTRICAL CHARACTERISTICS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=200A , V_{GE}=0V, T_J=25℃		1.8	2.2	V
		I_F=200A , V_{GE}=0V, T_J=125℃		1.9		
t_{rr}	Reverse Recovery Time	I_F=200A , V_R=900V dI_F/dt=-2700A/μs T_J =125℃		750		ns
I_{RRM}	Max. Reverse Recovery Current			230		A
Q_{RR}	Reverse Recovery Charge			85		μC
E_{rec}	Reverse Recovery Energy			48		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.16	K /W

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	4000	V
CTI	Comparative Tracking Index		＞225	
Torque	to heatsink	Recommended（M6）	3~5	Nm
	to terminal	Recommended（M6）	2.5~5	Nm
Weight			300	g

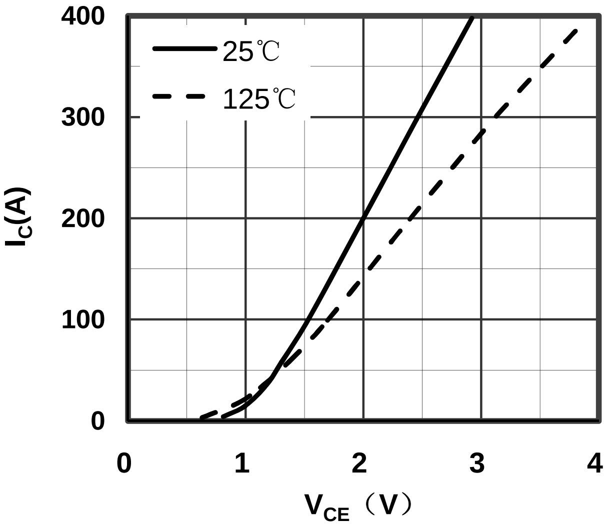


Figure 1. Typical Output Characteristics IGBT-inverter

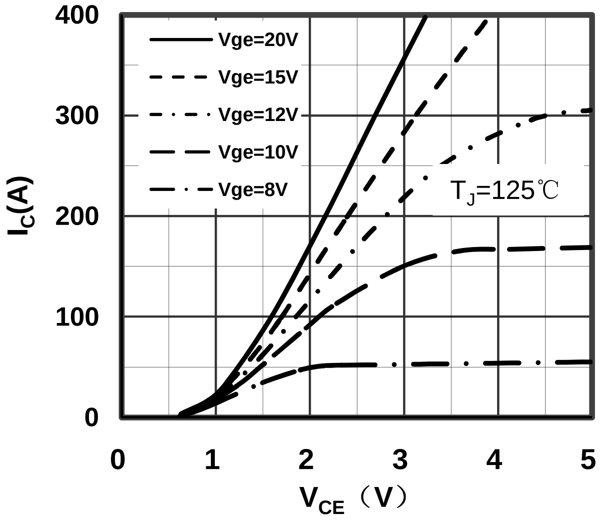


Figure 2. Typical Output Characteristics IGBT-inverter

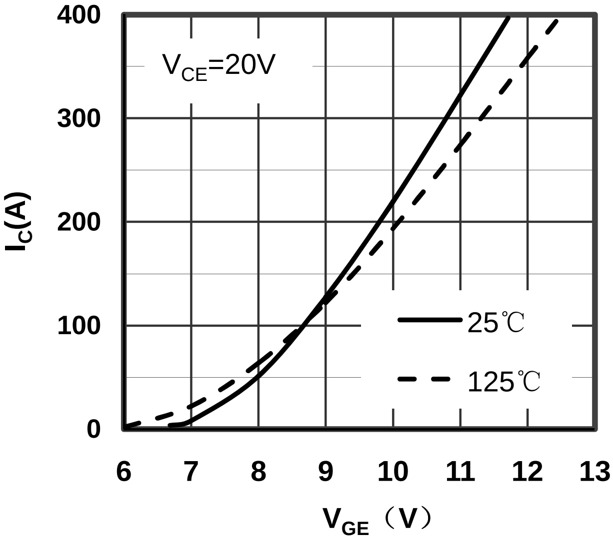


Figure 3. Typical Transfer Characteristics IGBT-inverter

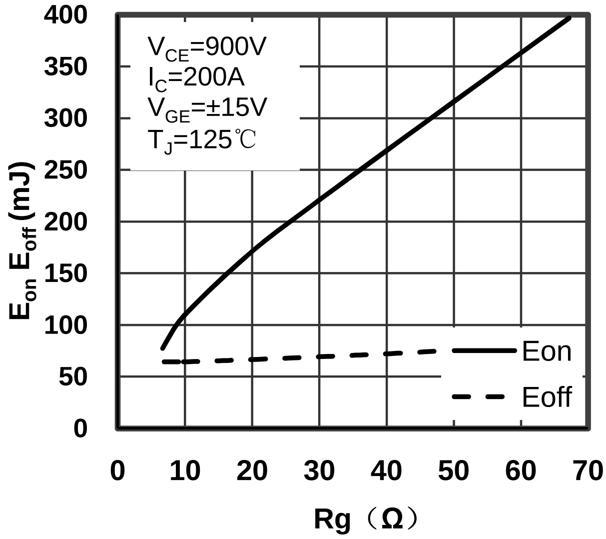


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

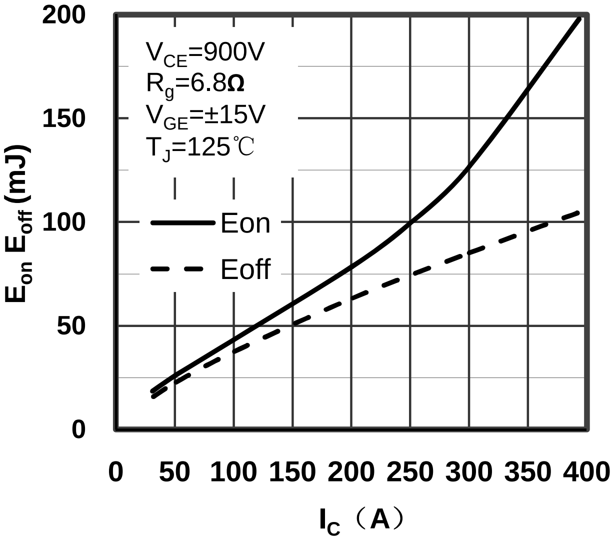


Figure 5. Switching Energy vs Collector Current IGBT-inverter

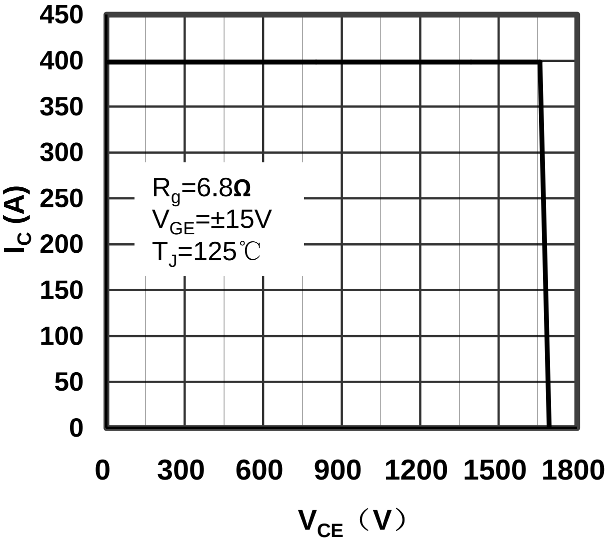


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

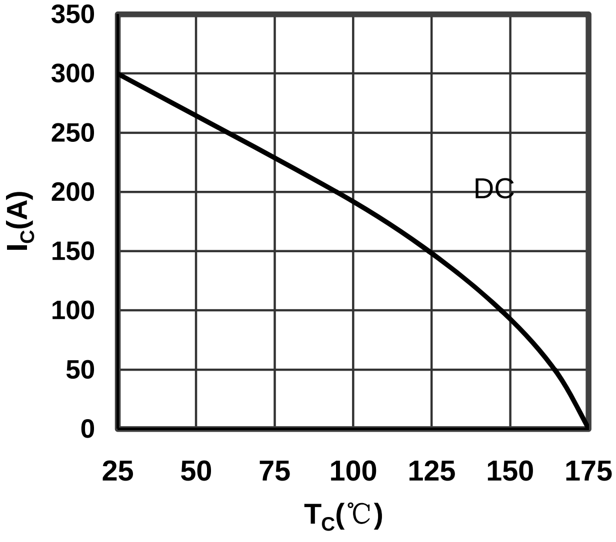


Figure 7. Collector Current vs Case temperature IGBT -inverter

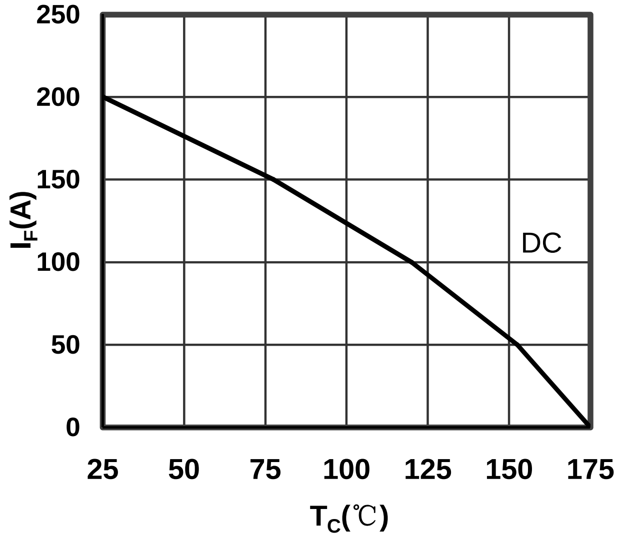


Figure 8. Forward current vs Case temperature Diode -inverter

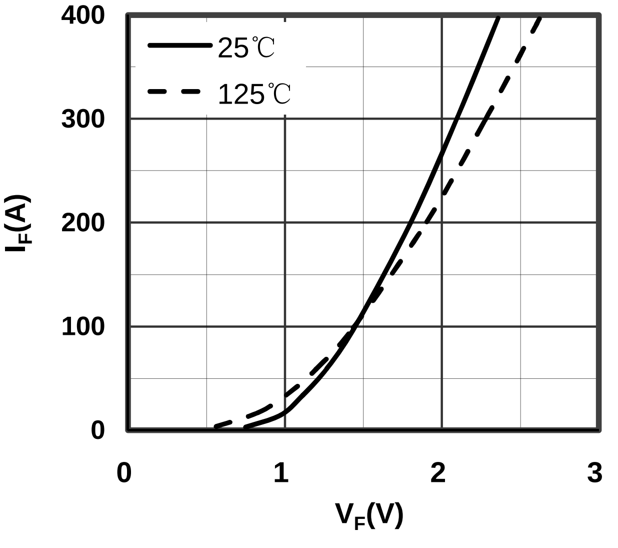


Figure 9. Diode Forward Characteristics Diode -inverter

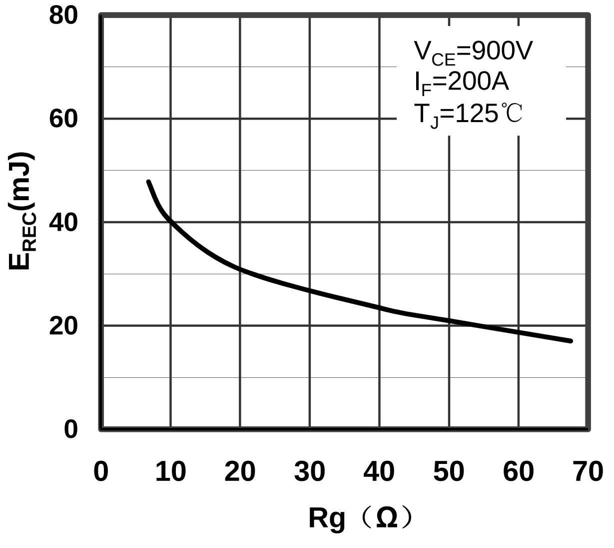


Figure 10. Switching Energy vs Gate Resistor Diode -inverter

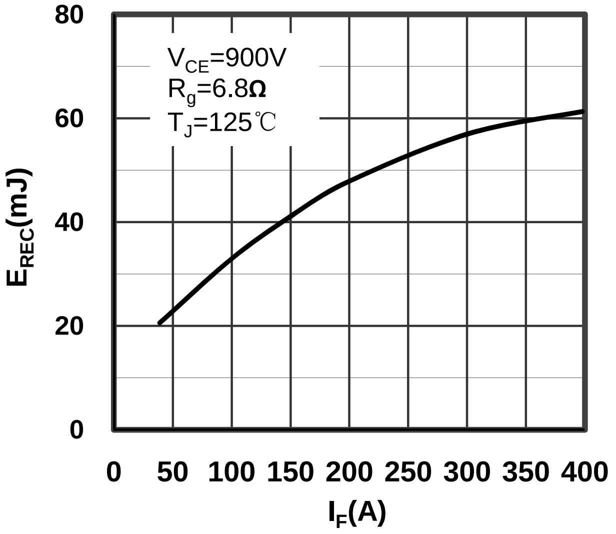


Figure 11. Switching Energy vs Forward Current Diode-inverter

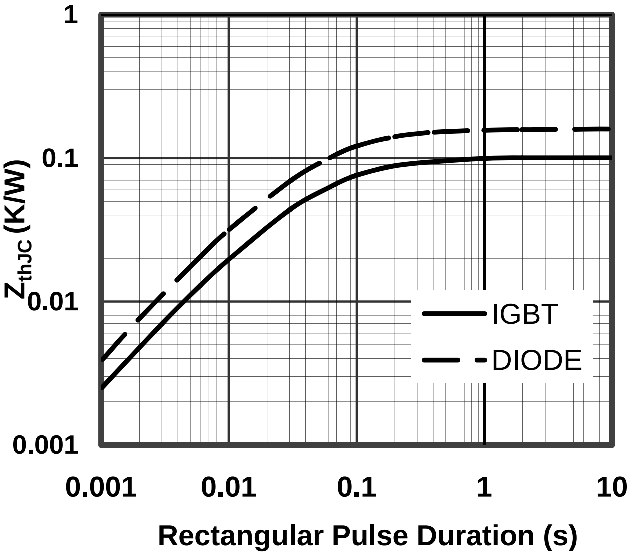


Figure 12. Transient Thermal Impedance of Diode and IGBT-inverter

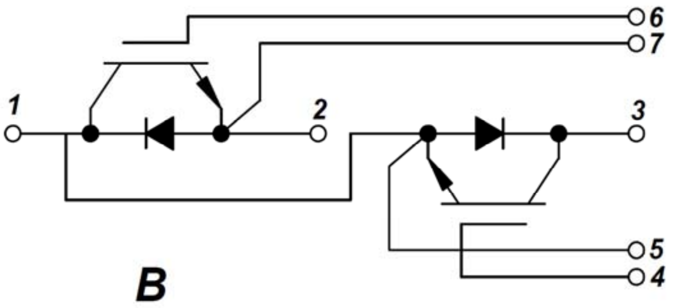
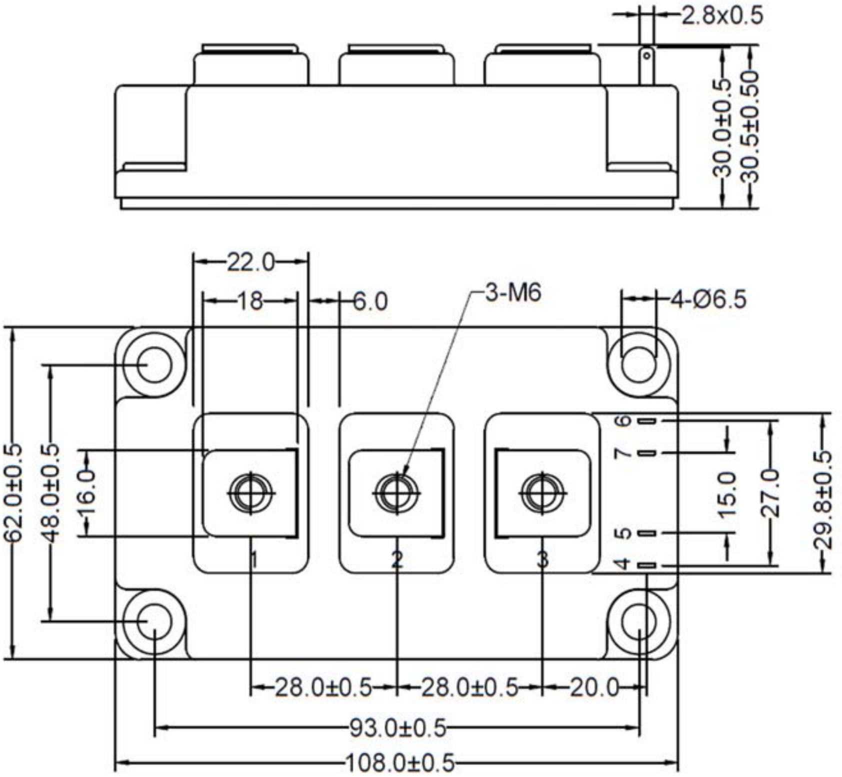


Figure 13. Circuit Diagram



Dimensions in (mm)
Figure 14. Package Outline