



MACMIC

March 2013

PRELIMINARY

MMG200S060B6R

600V 200A IGBT Module

RoHS Compliant

FEATURES

- High short circuit capability, self limiting short circuit current
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses

APPLICATIONS

- High frequency switching application
- Medical applications
- Motion/servo control
- UPS systems



ABSOLUTE MAXIMUM RATINGS

T_c=25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V_{CES}	Collector - Emitter Voltage	$T_{vj}=25^{\circ}C$	600	V
V_{GES}	Gate - Emitter Voltage		± 20	V
I_c	DC Collector Current	$T_c=25^{\circ}C$	250	A
		$T_c=70^{\circ}C$	200	A
I_{CM}	Repetitive Peak Collector Current	$t_p=1ms$	400	A
P_{tot}	Power Dissipation Per IGBT		690	W
Diode				
V_{RRM}	Repetitive Reverse Voltage	$T_{vj}=25^{\circ}C$	600	V
$I_{F(AV)}$	Average Forward Current	$T_c=25^{\circ}C$	200	A
I_{FRM}	Repetitive Peak Forward Current	$t_p=1ms$	400	A
I^2t		$T_{vj}=125^{\circ}C, t=10ms, V_R=0V$	2600	A ² s

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ELECTRICAL AND THERMAL CHARACTERISTICS $T_C=25^\circ\text{C}$ unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
IGBT						
$V_{GE(th)}$	Gate - Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=3.2\text{mA}$	4.2	4.8	5.4	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	$I_C=200\text{A}, V_{GE}=15\text{V}, T_{Vj}=25^\circ\text{C}$		1.95	2.25	V
		$I_C=200\text{A}, V_{GE}=15\text{V}, T_{Vj}=125^\circ\text{C}$		2.25		V
I_{CES}	Collector Leakage Current	$V_{CE}=600\text{V}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$			1	mA
		$V_{CE}=600\text{V}, V_{GE}=0\text{V}, T_{Vj}=125^\circ\text{C}$			5	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE} \pm 15\text{V}, T_{Vj}=125^\circ\text{C}$	-400		400	nA
R_{Gint}	Integrated Gate Resistor			1.1		Ω
Q_{ge}	Gate Charge	$V_{CE}=400\text{V}, I_C=200\text{A}, V_{GE}=\pm 15\text{V}$		1.8		μC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		11.5		nF
C_{res}	Reverse Transfer Capacitance			0.35		nF
$t_{d(on)}$	Turn - on Delay Time	$V_{CC}=300\text{V}, I_C=200\text{A}, T_{Vj}=25^\circ\text{C}$		70		ns
		$R_G=10\ \Omega, T_{Vj}=125^\circ\text{C}$		80		ns
t_r	Rise Time	$V_{GE}=\pm 15\text{V}, T_{Vj}=25^\circ\text{C}$		80		ns
		Inductive Load $T_{Vj}=125^\circ\text{C}$		100		ns
$t_{d(off)}$	Turn - off Delay Time	$V_{CC}=300\text{V}, I_C=200\text{A}, T_{Vj}=25^\circ\text{C}$		420		ns
		$R_G=10\ \Omega, T_{Vj}=125^\circ\text{C}$		450		ns
t_f	Fall Time	$V_{GE}=\pm 15\text{V}, T_{Vj}=25^\circ\text{C}$		50		ns
		Inductive Load $T_{Vj}=125^\circ\text{C}$		60		ns
E_{on}	Turn - on Energy	$V_{CC}=300\text{V}, I_C=200\text{A}, T_{Vj}=25^\circ\text{C}$		1.6		mJ
		$R_G=10\ \Omega, T_{Vj}=125^\circ\text{C}$		2.1		mJ
E_{off}	Turn - off Energy	$V_{GE}=\pm 15\text{V}, T_{Vj}=25^\circ\text{C}$		7		mJ
		Inductive Load $T_{Vj}=125^\circ\text{C}$		8		mJ
I_{sc}	Short Circuit Current	$t_{psc} \leq 10\ \mu\text{s}, V_{GE}=15\text{V}$ $T_{Vj}=125^\circ\text{C}, V_{CC}=360\text{V}$		900		A
R_{thJC}	Junction-to-Case Thermal Resistance (Per IGBT)				0.18	K/W
Diode						
V_F	Forward Voltage	$I_F=200\text{A}, V_{GE}=0\text{V}, T_{Vj}=25^\circ\text{C}$		1.90	2.10	V
		$I_F=200\text{A}, V_{GE}=0\text{V}, T_{Vj}=125^\circ\text{C}$		1.85		V
I_{RRM}	Max. Reverse Recovery Current	$I_F=200\text{A}, V_R=300\text{V}$		100		A
Q_{rr}	Reverse Recovery Charge	$di_F/dt=-1600\text{A}/\mu\text{s}$		12		μC
E_{rec}	Reverse Recovery Energy	$T_{Vj}=125^\circ\text{C}$		2.9		mJ
R_{thJCD}	Junction-to-Case Thermal Resistance (Per Diode)				0.35	K/W

MODULE CHARACTERISTICS

T_C=25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
T _{Vj max}	Max. Junction Temperature				150	°C
T _{Vj op}	Operating Temperature		-40		125	°C
T _{stg}	Storage Temperature		-40		125	°C
V _{isol}	Insulation Test Voltage	AC, t=1min		3000		V
CTI	Comparative Tracking Index		350			
Torque	Module-to-Sink	Recommended (M6)	3		5	N · m
Torque	Module Electrodes	Recommended (M5)	2.5		5	N · m
Weight				160		g

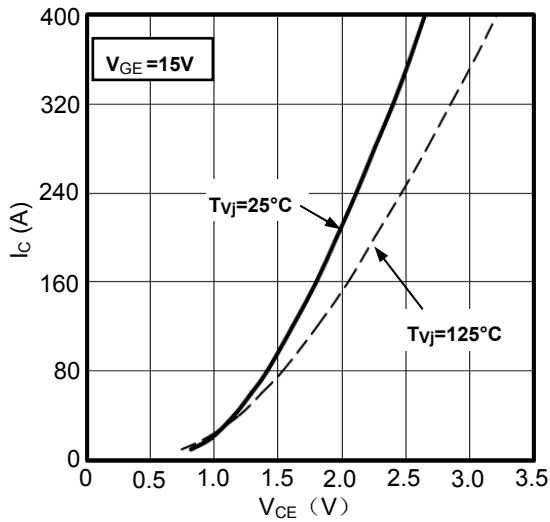


Figure1. Typical Output characteristics

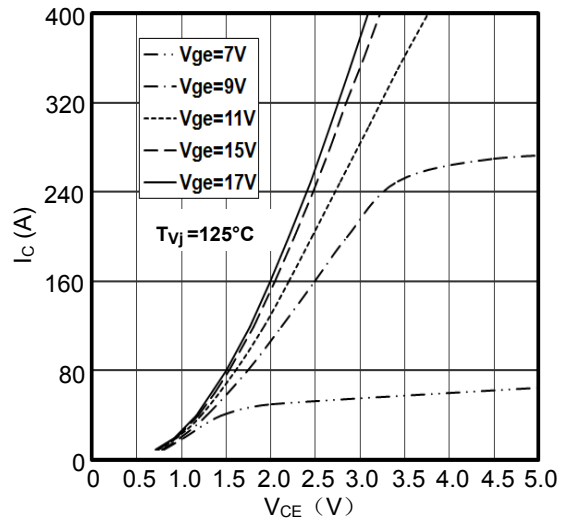


Figure2. Typical Output characteristics

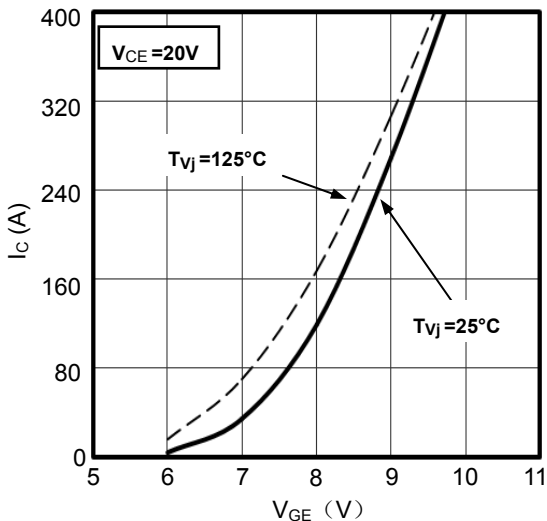


Figure3. Typical Transfer characteristics

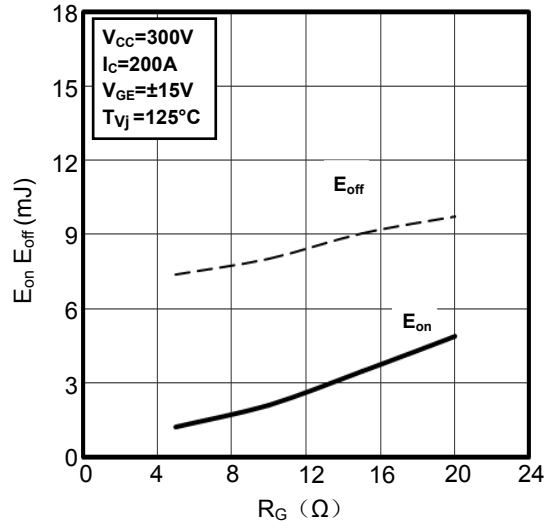


Figure4. Switching Energy vs. Gate Resistor

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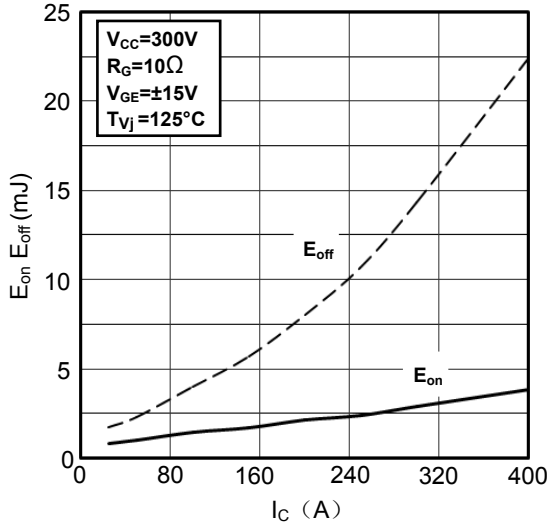


Figure 5. Switching Energy vs. Collector Current

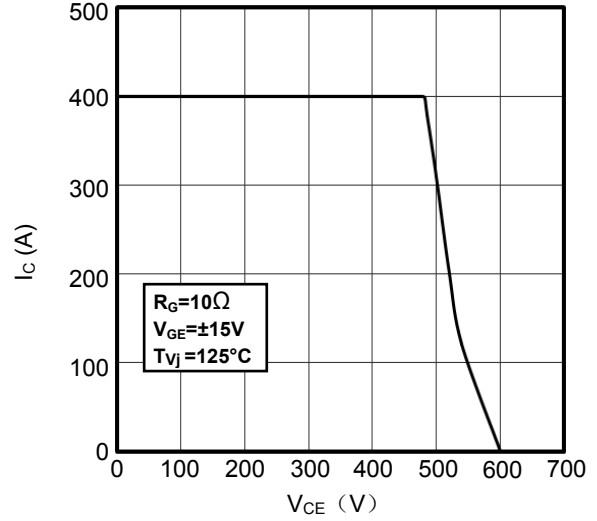


Figure 6. Reverse Biased Safe Operating Area

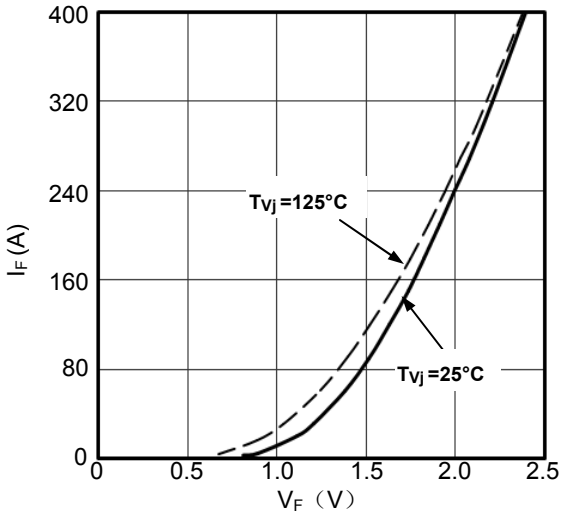


Figure 7. Diode Forward Characteristics

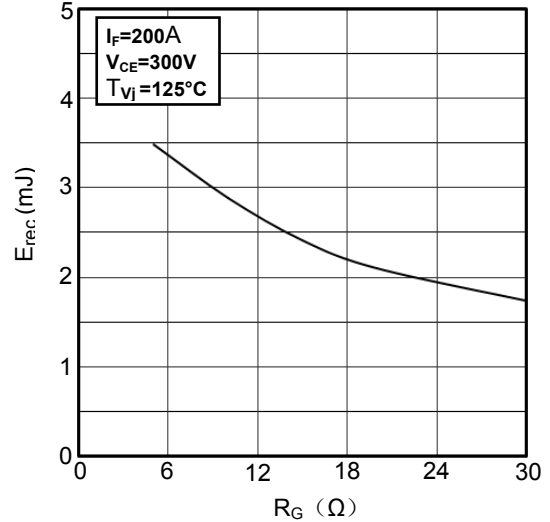


Figure 8. Switching Energy vs. Gate Resistor

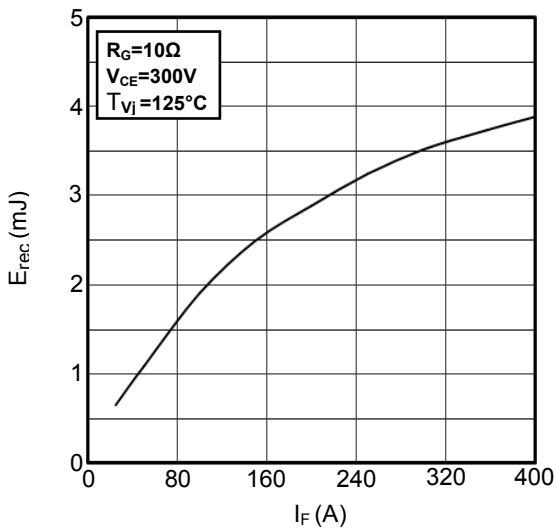


Figure 9. Switching Energy vs. Forward Current

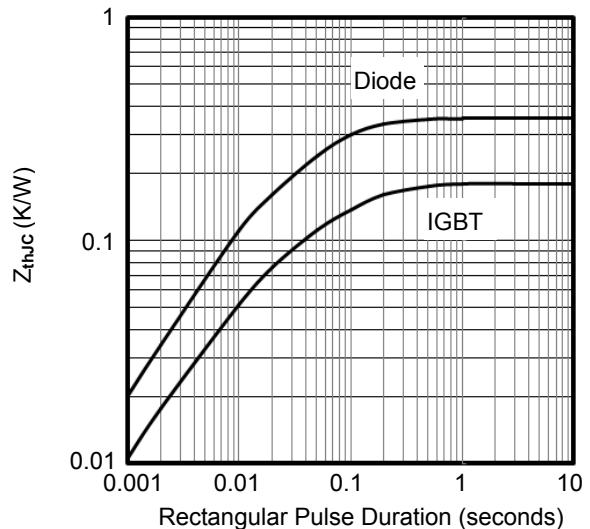


Figure 10. Transient Thermal Impedance

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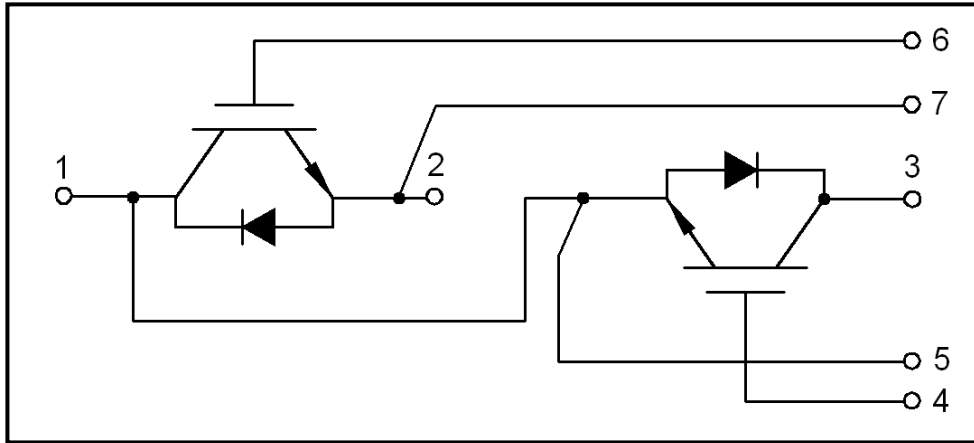
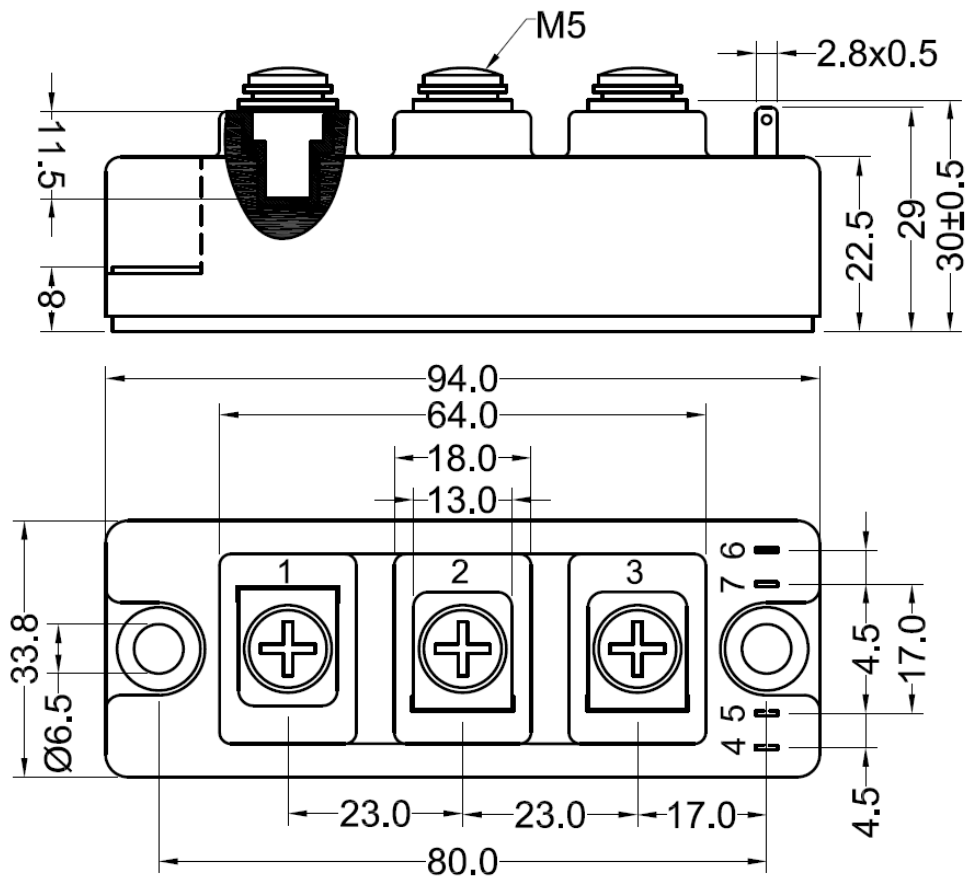


Figure11. Circuit Diagram



Dimensions (mm)
Figure12. Package Outline