MMG400D060B6N

600V 400A IGBT Module

July 2010 **PRELIMINARY** **RoHS Compliant**

FEATURES

- Ultra Low Loss
- High Ruggedness
- High Short Circuit Capability
- Positive Temperature Coefficient
- Integrated Gate Resistor

GD Series Module

APPLICATIONS

- Invertor
- Convertor
- Welder
- SMPS and UPS
- Induction Heating

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise specified

Symbol	Parameter	Test Conditions	Values	Unit
IGBT				
V_{CES}	Collector - Emitter Voltage		600	V
V_{GES}	Gate - Emitter Voltage		±20	V
I_C	DC Collector Current	T_C=25°C	460	A
		T_C=50°C	400	A
I_{Cpuls}	Pulsed Collector Current	T_C=25°C, t_p=1ms	920	A
		T_C=50°C, t_p=1ms	800	A
P_{tot}	Power Dissipation Per IGBT		1400	W
T_J	Junction Temperature Range		-40 to +150	°C
T_{STG}	Storage Temperature Range		-40 to +125	°C
V_{isol}	Insulation Test Voltage	AC, t=1min	3000	V
Free-Wheeling Diode				
V_{RRM}	Repetitive Reverse Voltage		600	V
$I_{F(AV)}$	Average Forward Current	T_C=25°C	400	A
		T_C=50°C	320	A
$I_{F(RMS)}$	RMS Forward Current		570	A
I_{FSM}	Non-Repetitive Surge Forward Current	T_J=45°C, t=10ms, Sine	1200	A
		T_J=45°C, t=8.3ms, Sine	1320	A

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ELECTRICAL CHARACTERISTICS

T_C=25°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=8mA	4.5	5.5	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=400A, V_{GE}=15V, T_J=25°C		1.95	2.45	V
		I_C=400A, V_{GE}=15V, T_J=125°C		2.2		V
I_{CES}	Collector Leakage Current	V_{CE}=600V, V_{GE}=0V, T_J=25°C			1	mA
		V_{CE}=600V, V_{GE}=0V, T_J=125°C		2		mA
I_{GES}	Gate Leakage Current	V_{CE}=0V, V_{GE}=±20V	-1.2		1.2	μA
R_{Gint}	Integrated Gate Resistor			2.5	3.5	Ω
Q_{ge}	Gate Charge	V_{CC}=300V, I_C=400A , V_{GE}=±15V		1780		nC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz		18		nF
C_{oes}	Output Capacitance			1.8		nF
C_{res}	Reverse Transfer Capacitance			1.6		nF
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=300V, I_C=400A		195		ns
t_r	Rise Time	R_G =3Ω , V_{GE}=±15V		65		ns
$t_{d(off)}$	Turn - off Delay Time	T_J=25°C		295		ns
t_f	Fall Time	Inductive Load		45		ns
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=300V, I_C=400A		220		ns
t_r	Rise Time	R_G =3Ω , V_{GE}=±15V		80		ns
$t_{d(off)}$	Turn - off Delay Time	T_J=125°C		350		ns
t_f	Fall Time	Inductive Load		60		ns
E_{on}	Turn - on Switching Energy	V_{CC}=300V, I_C=400A T_J=25°C		6.5		mJ
		R_G =3Ω T_J=125°C		10		mJ
E_{off}	Turn - off Switching Energy	V_{GE}=±15V T_J=25°C		9.5		mJ
		Inductive Load T_J=125°C		14.5		mJ
Free-Wheeling Diode						
V_F	Forward Voltage	I_F=400A , V_{GE}=0V, T_J=25°C		1.25	1.6	V
		I_F=400A , V_{GE}=0V, T_J=125°C		1.2		V
t_{rr}	Reverse Recovery Time	I_F=400A , V_R=300V		249		ns
I_{RRM}	Max. Reverse Recovery Current	di_F/dt=-2000A/μs		214		A
Q_{rr}	Reverse Recovery Charge	T_J=125°C		31		μC

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case Thermal Resistance	Per IGBT			0.09	K /W
R_{thJCD}	Junction-to-Case Thermal Resistance	Per Inverse Diode			0.15	K /W
Torque	Module-to-Sink	Recommended（M6）	3		5	N · m
Torque	Module Electrodes	Recommended（M6）	2.5		5	N · m
Weight				310		g

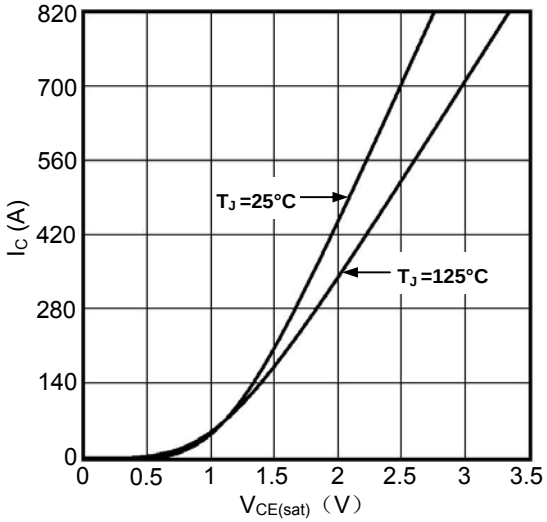


Figure1. Typical Output characteristics

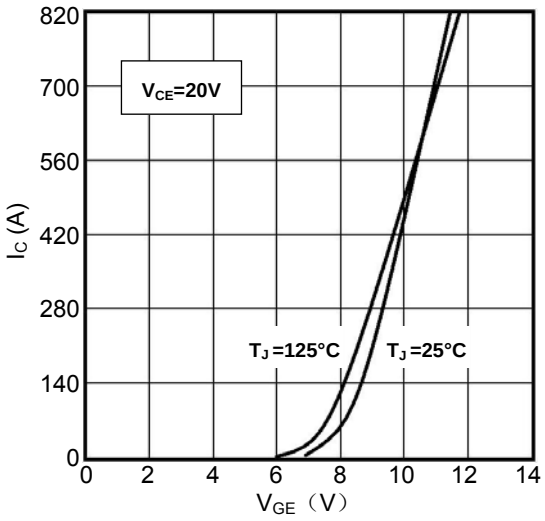


Figure2. Typical Transfer characteristics

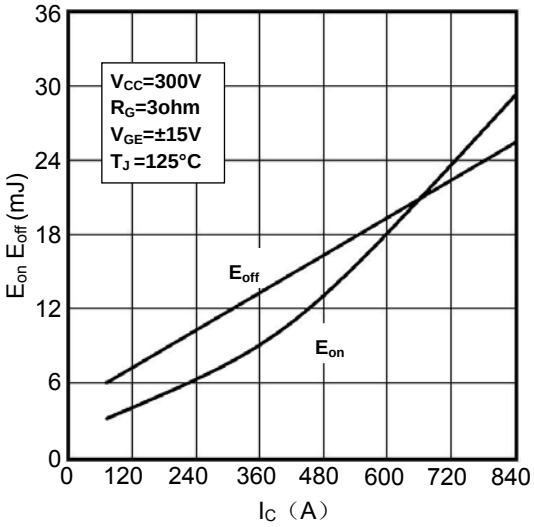


Figure3. Switching Energy vs. Collector Current

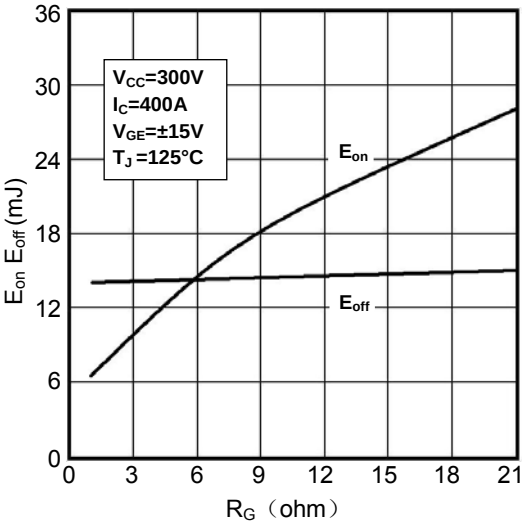


Figure4. Switching Energy vs. Gate Resistor

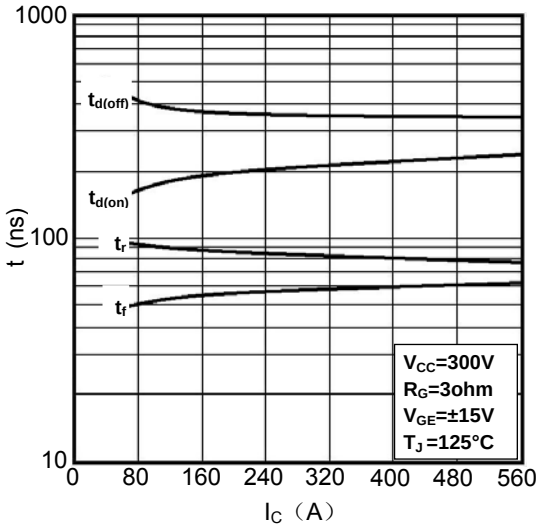


Figure5. Switching Times vs. Collector Current

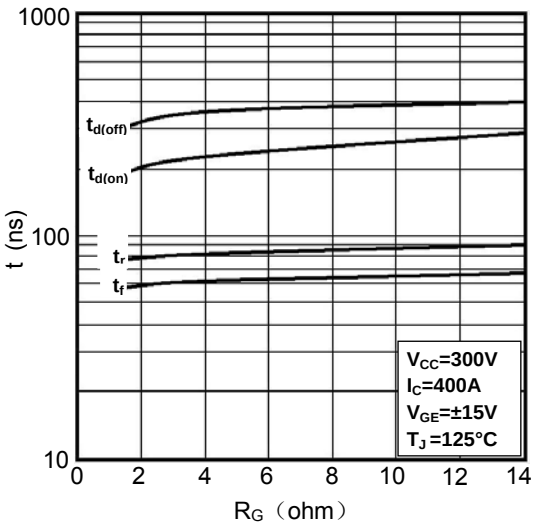


Figure6. Switching Times vs. Gate Resistor

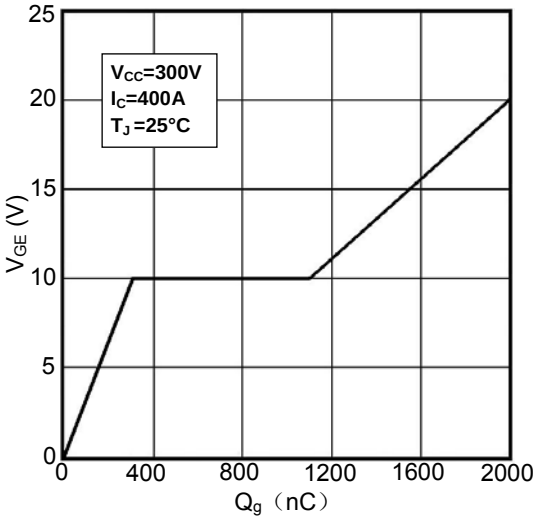


Figure7. Gate Charge characteristics

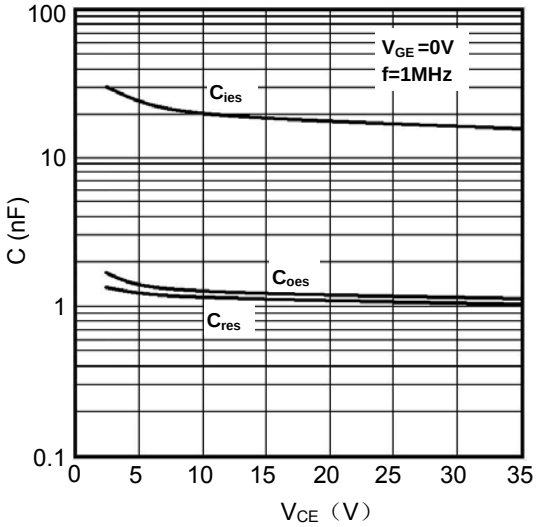


Figure8. Typical Capacitances vs. V_{CE}

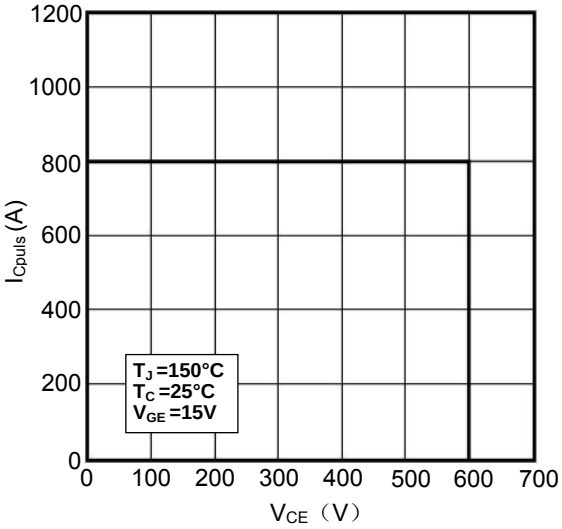


Figure9. Reverse Biased Safe Operating Area

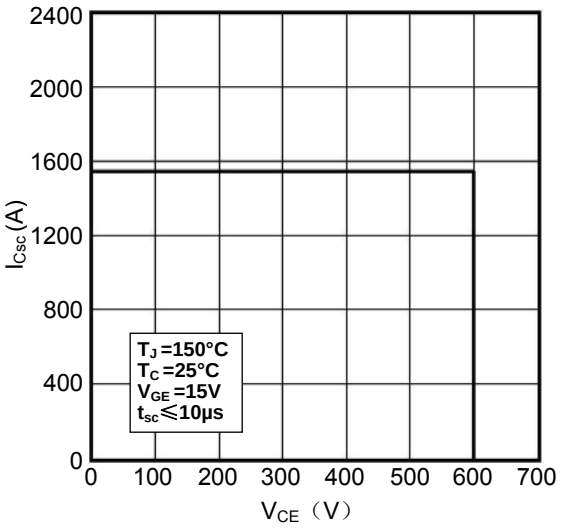


Figure10. Short Circuit Safe Operating Area

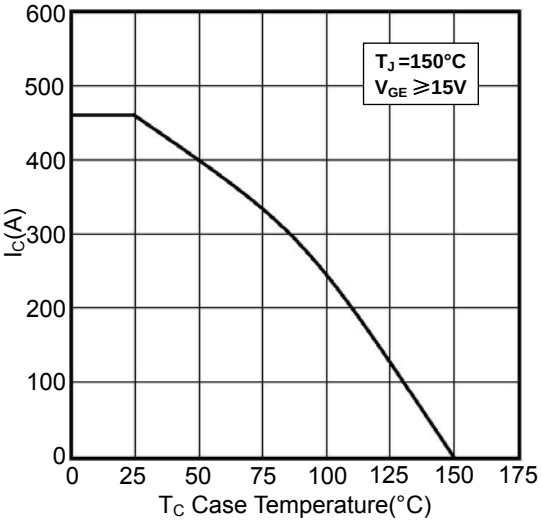


Figure11. Rated Current vs. T_C

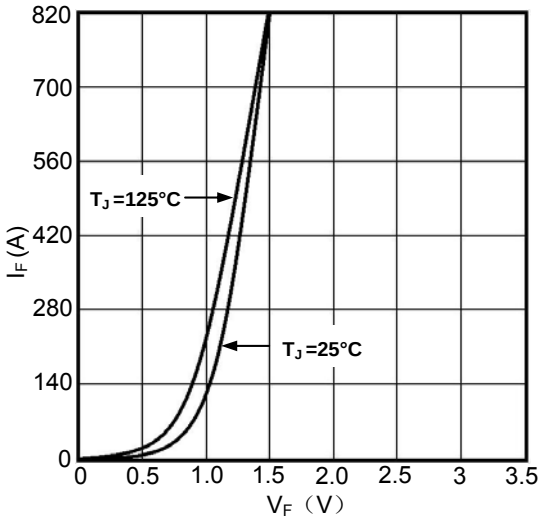


Figure12. Diode Forward Characteristics

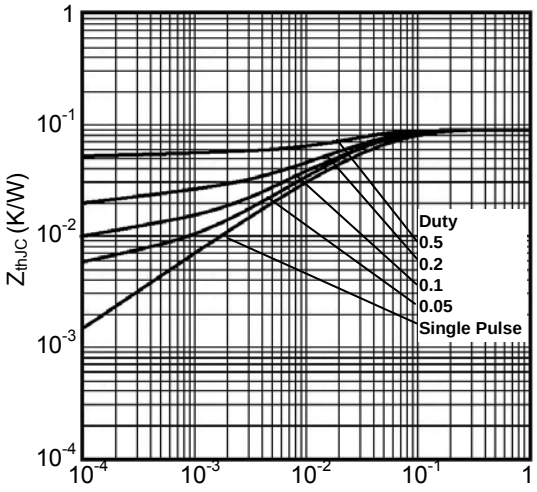


Figure13. Transient Thermal Impedance of IGBT

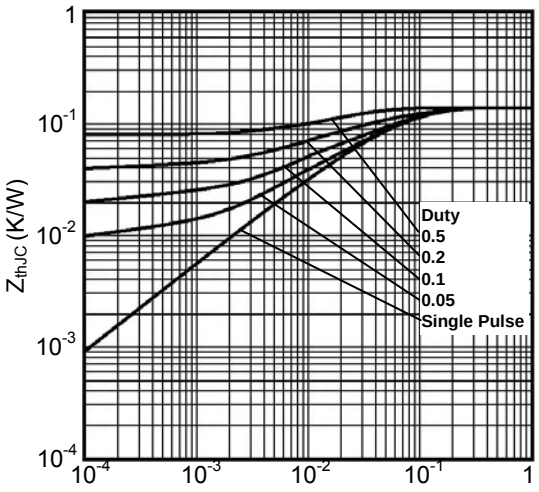


Figure14. Transient Thermal Impedance of Diode

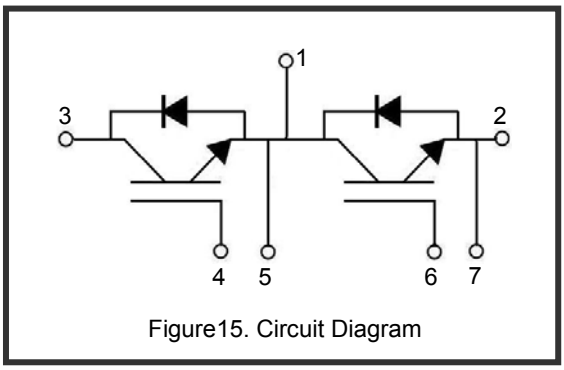
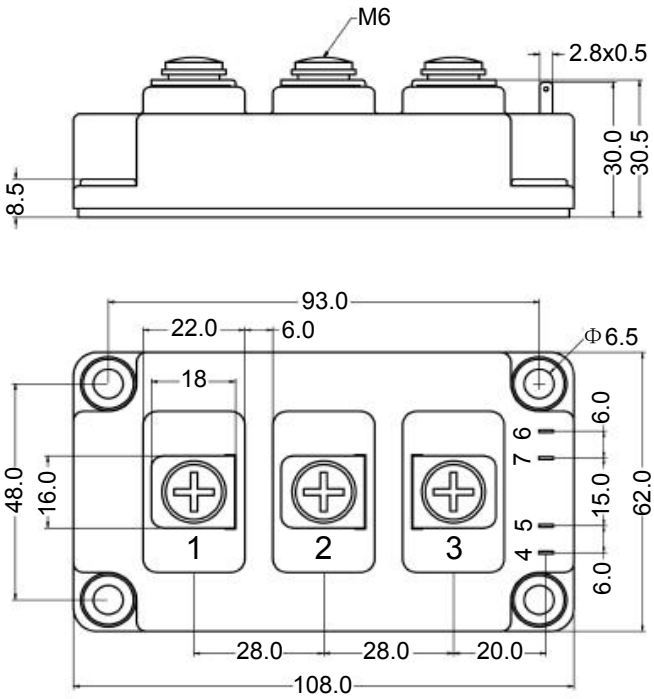


Figure15. Circuit Diagram



Dimensions in mm

Figure16. Package Outlines