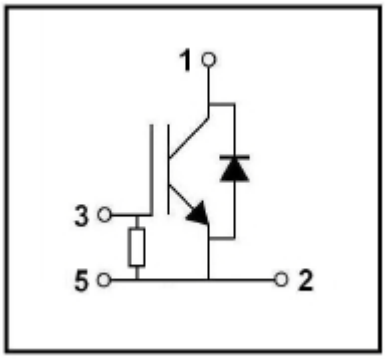
MMG400K120U6HN

1200V 400A IGBT Module

February 2012 **PRELIMINARY** **RoHS Compliant**

FEATURES

- High short circuit capability,self limiting short circuit current
- IGBT CHIP(T4 Fast Trench+Field Stop technology)
- $V_{CE(sat)}$ with positive temperature coefficient
- Free wheeling diodes with fast and soft reverse recovery
- Low switching losses
- 5K Ω Gate Protected Resistance Inside



APPLICATIONS

- Inverter
- 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		1200	V
V_{GES}	Gate - Emitter Voltage		±20	V
I_C	DC Collector Current	T_C=25°C	600	A
		T_C=80°C	400	A
I_{Cpuls}	Pulsed Collector Current	T_C=25°C, t_p=1ms	1200	A
		T_C=80°C, t_p=1ms	800	A
P_{tot}	Power Dissipation Per IGBT		2000	W
T_J	Junction Temperature Range		-40 to +175	°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		1200	V
$I_{F(AV)}$	Average Forward Current	T_C=25°C	600	A
		T_C=80°C	400	A
I_{FRM}	Repetitive Peak Forward Current	t_p=1ms	800	A
I_{FSM}	Non-Repetitive Surge Forward Current	T_{vj} =45°C , t=10ms, Sine	2500	A
		T_{vj} =45°C , t=8.3ms, Sine	2800	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=16mA	5.4	6	6.5	V
$V_{CE(sat)}$	Collector - Emitter Saturation Voltage	I_C=400A, V_{GE}=15V, T_{vj} =125°C		2.1	2.5	V
		I_C=400A, V_{GE}=15V, T_{vj} =125°C		2.5		V
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_{vj} =25°C			5	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V, V_{GE}=±20V	-400		400	nA
R_{Gint}	Integrated Gate Resistor			1.9		Ω
Q_g	Gate Charge	V_{CC}=600V, I_C=400A , V_{GE}=15V		1.9		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz		25		nF
C_{res}	Reverse Transfer Capacitance			1.4		nF
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=600V, I_C=400A		170		ns
t_r	Rise Time	R_G =1.8Ω, V_{GE}=±15V		75		ns
$t_{d(off)}$	Turn - off Delay Time	T_{vj} =25°C		450		ns
t_f	Fall Time	Inductive Load		45		ns
$t_{d(on)}$	Turn - on Delay Time	V_{CC}=600V, I_C=400A		180		ns
t_r	Rise Time	R_G =1.8Ω, V_{GE}=±15V		85		ns
$t_{d(off)}$	Turn - off Delay Time	T_{vj} =125°C		500		ns
t_f	Fall Time	Inductive Load		65		ns
E_{on}	Turn - on Switching Energy	V_{CC}=600V, I_C=400A T_{vj} =25°C		36		mJ
		R_G =1.8Ω T_{vj} =125°C		52		mJ
E_{off}	Turn - off Switching Energy	V_{GE}=±15V T_{vj} =25°C		17		mJ
		Inductive Load T_{vj} =125°C		22		mJ
Free-Wheeling Diode						
V_F	Forward Voltage	I_F=400A , V_{GE}=0V, T_{vj} =25°C		1.65		V
		I_F=400A , V_{GE}=0V, T_{vj} =125°C		1.65		V
t_{rr}	Reverse Recovery Time	I_F=400A , V_R=600V		500		ns
I_{RRM}	Max. Reverse Recovery Current	di_F/dt=-4000A/μs		290		A
E_{rec}	Reverse Recovery Energy	T_{vj} =125°C		31		mJ

THERMAL AND MECHANICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
R_{thJC}	Junction-to-Case Thermal Resistance	Per IGBT			0.075	K /W
R_{thJCD}	Junction-to-Case Thermal Resistance	Per Inverse Diode			0.12	K /W
Torque	Module-to-Sink	Recommended（M6）	3		5	N・m
Torque	Module Electrodes	Recommended（M6）	2.5		5	N・m
Torque	Module Electrodes	Recommended（M4）	0.7		1.1	N・m
Weight				325		g

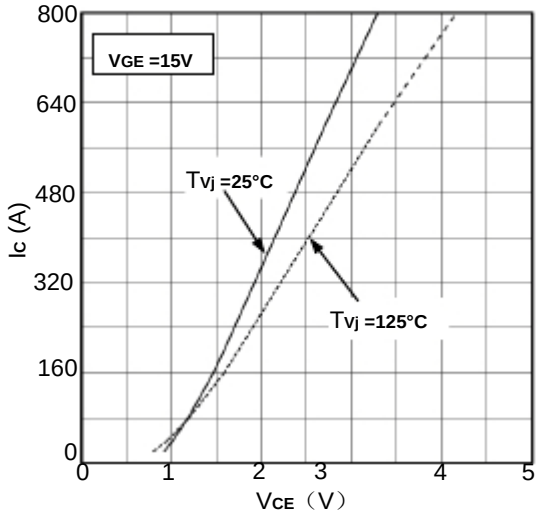


Figure1. Typical Output Characteristics

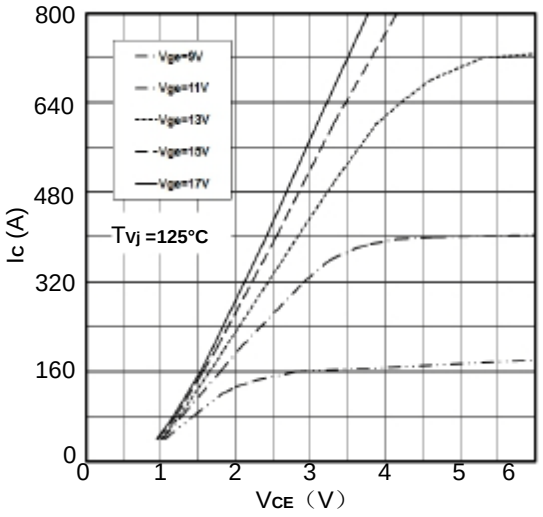


Figure2. Typical Output Characteristics

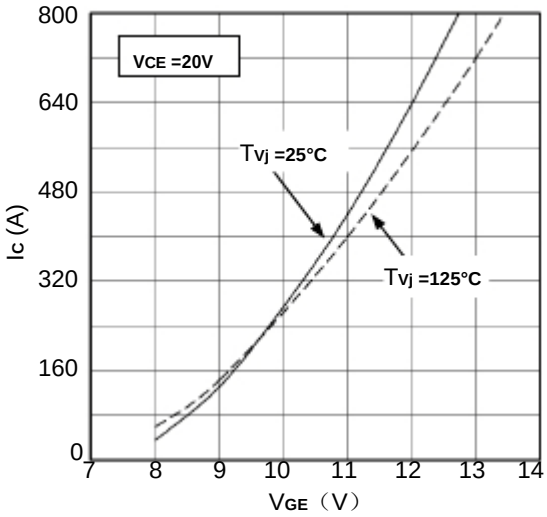


Figure3. Typical Transfer characteristics

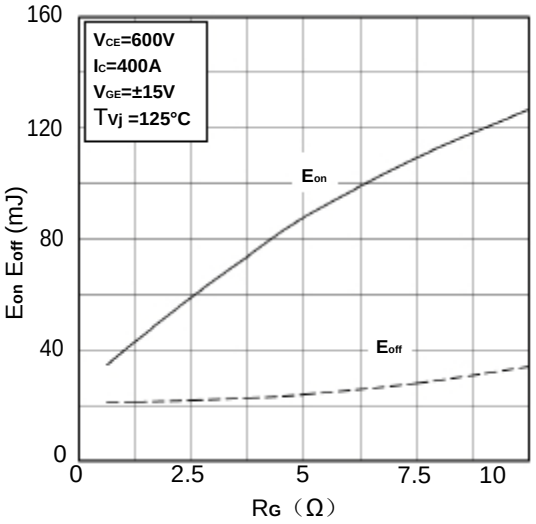


Figure4. Switching Energy vs. Gate Resistor

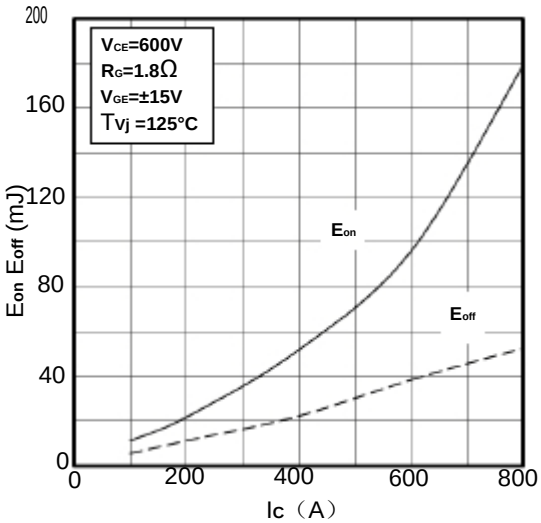


Figure5. Switching Energy vs. Collector Current

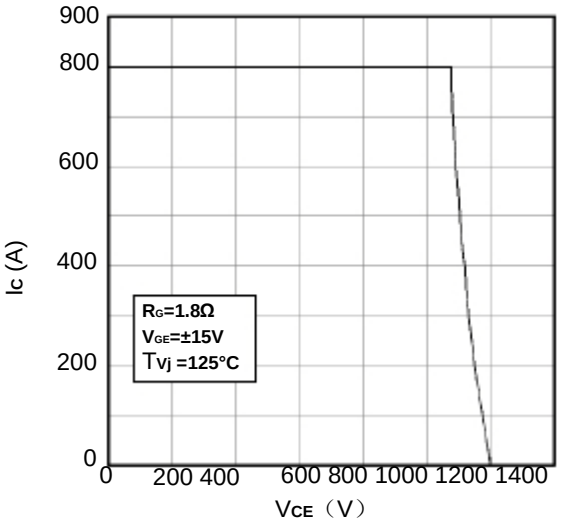


Figure6. Reverse Biased Safe Operating Area

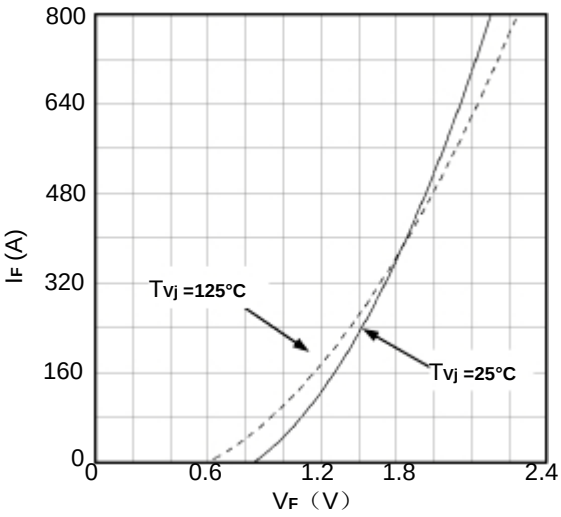


Figure7. Diode Forward Characteristics

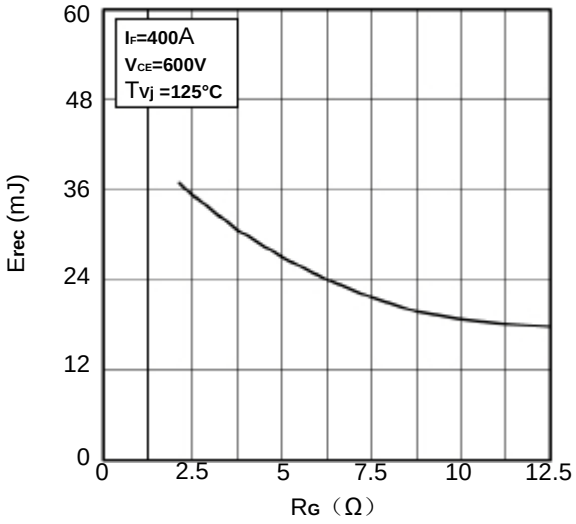


Figure8. Switching Energy vs. Gate Resistor

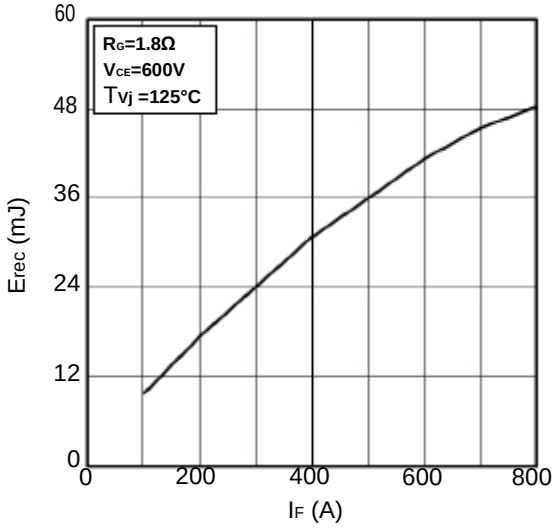


Figure9. Switching Energy vs. Forward Current

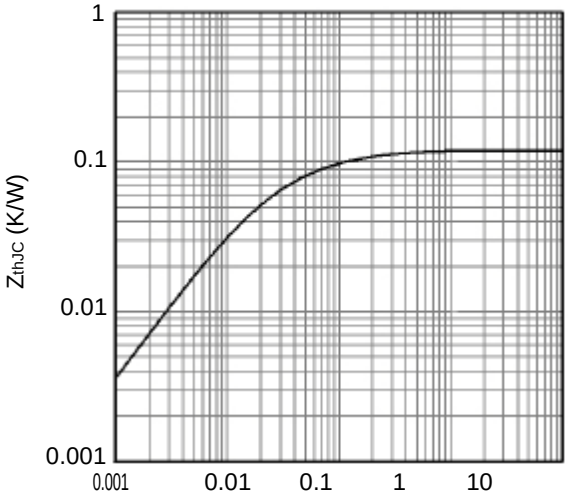


Figure10. Transient Thermal Impedance of Diode

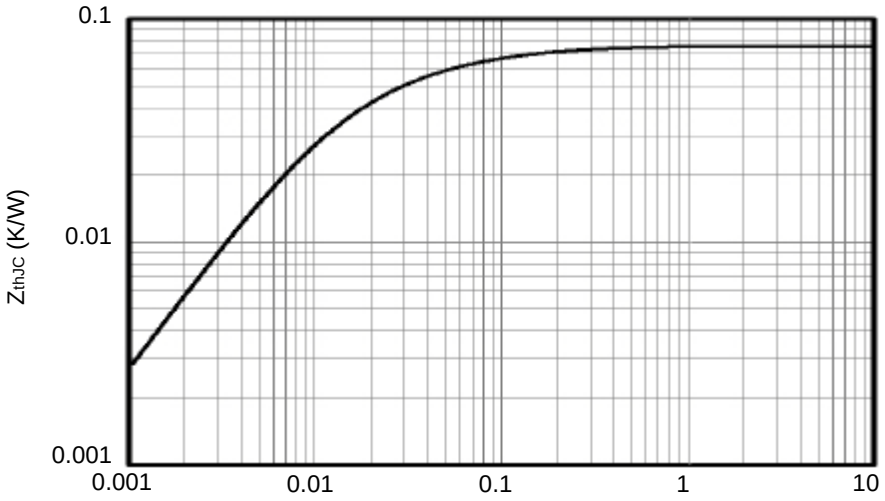
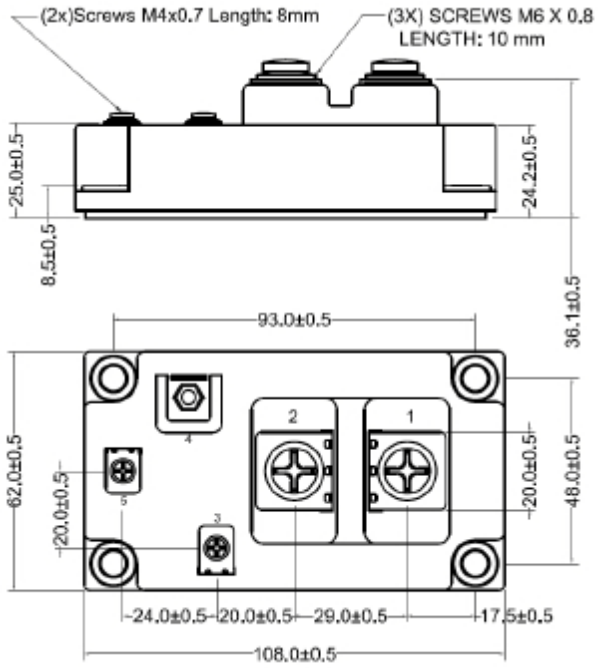


Figure11. Transient Thermal Impedance of IGBT



Dimensions in mm

Figure12. Package Outlines