MMG600K120U6HN

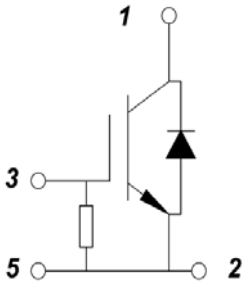
1200V 600A IGBT Module

June 2015 **Version 01** **RoHS Compliant**

PRODUCT 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
- ☐ Fast switching and short tail current
- ☐ Free wheeling diodes with fast and soft reverse recovery
- ☐ Low switching losses
- ☐ 5K Ω Gate Protected Resistance Inside

APPLICATIONS



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

IGBT-inverter

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise spe

Symbol	Parameter/Test Conditions		Values	t
V_{CES}	Collector Emitter Voltage	T_J=25℃	1200	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃	800	A
		T_C=80℃	600	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	1200	
P_{tot}	Power Dissipation Per IGBT		3300	W

Reverse-Diode

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise spe

Symbol	Parameter/Test Conditions		Values	t
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
$I_{F(AV)}$	Average Forward Current	T_C=25℃	600	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	1200	
I^2t		T_J=125℃, t=10ms, V_R=0V	45000	A^2S

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IGBT-inverter
ELECTRICAL CHARACTERISTICS

T_C=25°C unless otherwise spe

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	t
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}$, I_C=24mA		5.4	6.0	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			2.1	2.5	
		I_C=600A, V_{GE}=15V, T_J=125℃			2.5		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				1	mA
		V_{CE}=1200V, V_{GE}=0V, T_J=125℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±15V, T_J=125℃		-400		400	nA
R_{gint}	Integrated Gate Resistor				1.3		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=600A , V_{GE}=15V			2.8		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			35		nF
C_{res}	Reverse Transfer Capacitance				2		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=600A R_G =1.3Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		250		ns
			T_J=125℃		320		ns
			T_J=150℃		340		ns
t_r	Rise Time		T_J=25℃		90		ns
			T_J=125℃		95		ns
			T_J=150℃		100		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=600A R_G =1.3Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		550		ns
			T_J=125℃		650		ns
			T_J=150℃		700		ns
t_f	Fall Time		T_J=25℃		60		ns
			T_J=125℃		80		ns
			T_J=150℃		90		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=600A R_G =1.3Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		48		mJ
			T_J=150℃		53		mJ
E_{off}	Turn off Energy		T_J=125℃		37		mJ
			T_J=150℃		40		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=125℃,V_{CC}=600V			2400		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.045	K/W

Reverse-Diode
ELECTRICAL CHARACTERISTICS

T_C=25°C unless otherwise spe

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	t
V_F	Forward Voltage	I_F=600A , V_{GE}=0V, T_J=25℃		2.05	2.4	V
		I_F=600A , V_{GE}=0V, T_J=125℃		2.0		
t_{rr}	Reverse Recovery Time	I_F=600A , V_R=600V dI_F/dt=-6000A/μs T_J =125℃		400		ns
I_{RRM}	Max. Reverse Recovery Current			500		A
Q_{RR}	Reverse Recovery Charge			48		μC
E_{rec}	Reverse Recovery Energy			31		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.085	K/W

MODULE CHARACTERISTICS

T_C=25°C unless otherwise sp

Symbol	Parameter/Test Conditions		Values	t
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（M6）	3~5	Nm
	to terminal	Recommended（M6）	2.5~5	Nm
	to terminal	Recommended（M4）	0.7~1.1	Nm
Weight			330	g

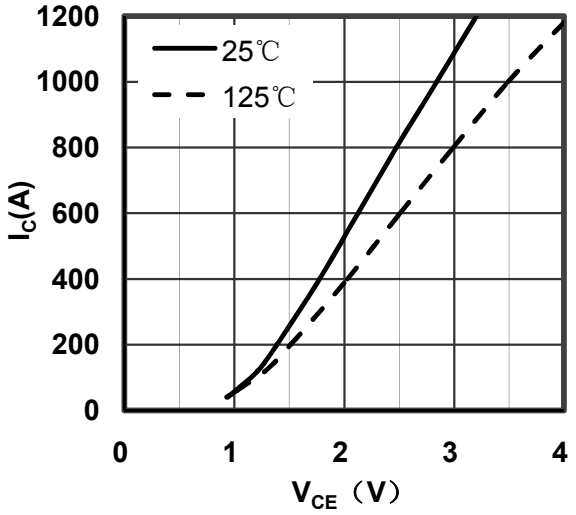


Figure 1. Typical Output Characteristics IGBT-inverter

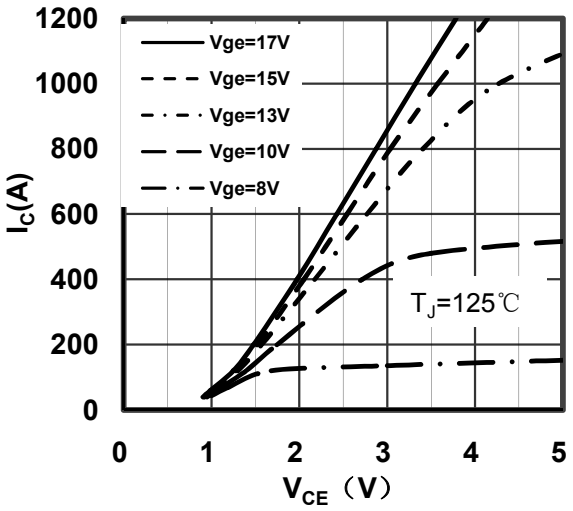


Figure 2. Typical Output Characteristics IGBT-inverter

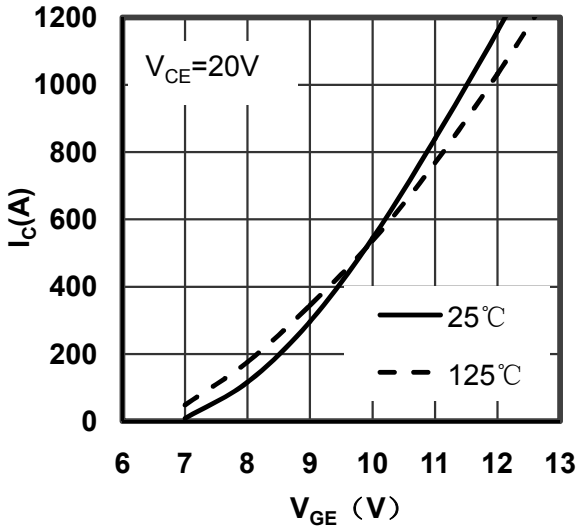


Figure 3. Typical Transfer Characteristics IGBT-inverter

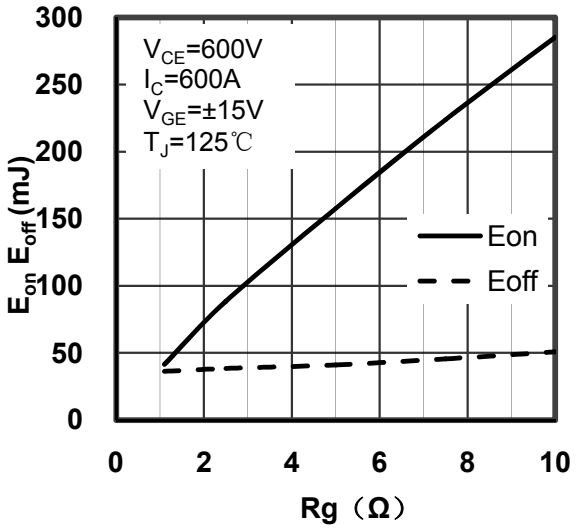


Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

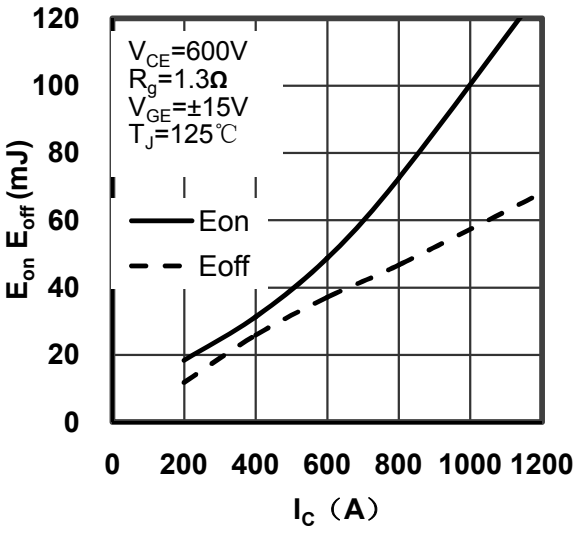


Figure 5. Switching Energy vs Collector Current IGBT-inverter

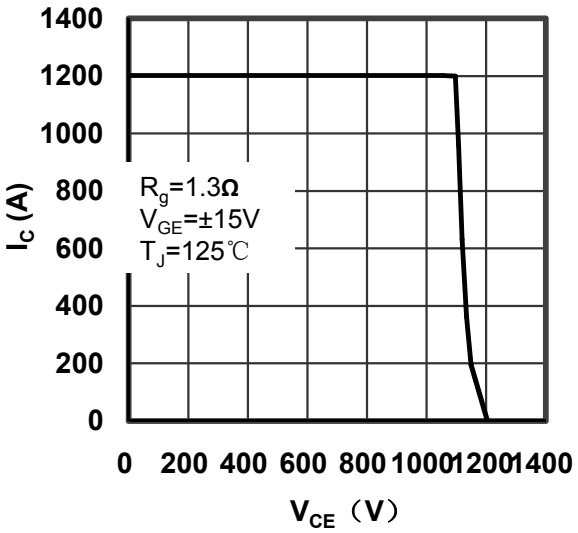


Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

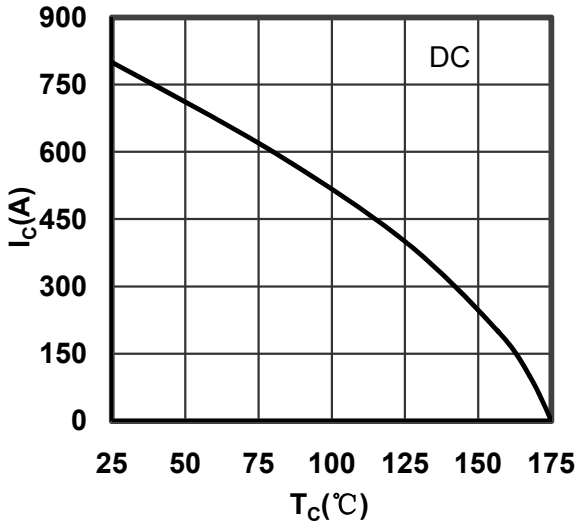


Figure 7. Collector Current vs Case temperature IGBT -inverter

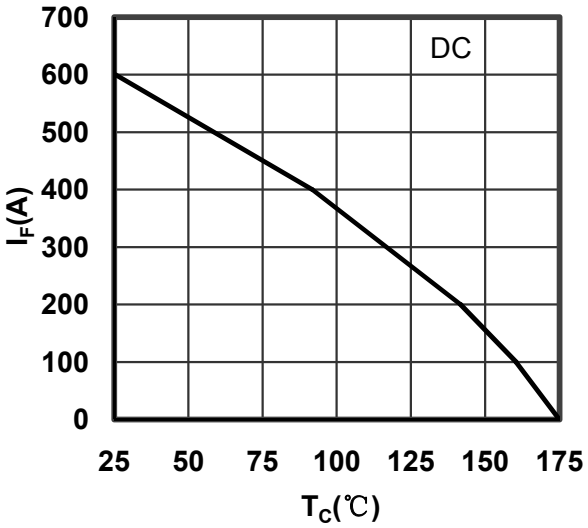


Figure 8. Forward current vs Case temperature

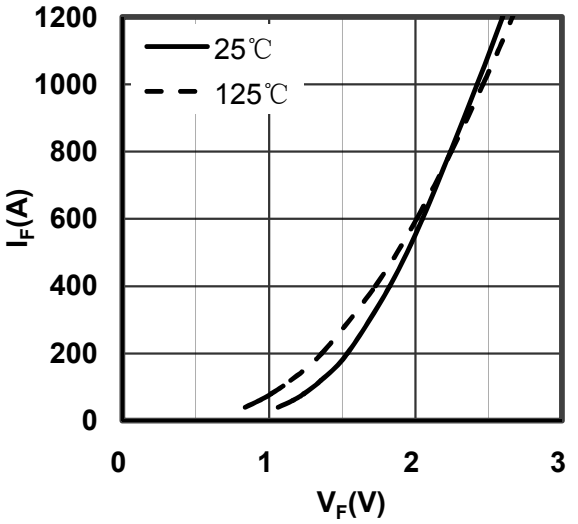


Figure 9. Diode Forward Characteristics Reverse-Diode

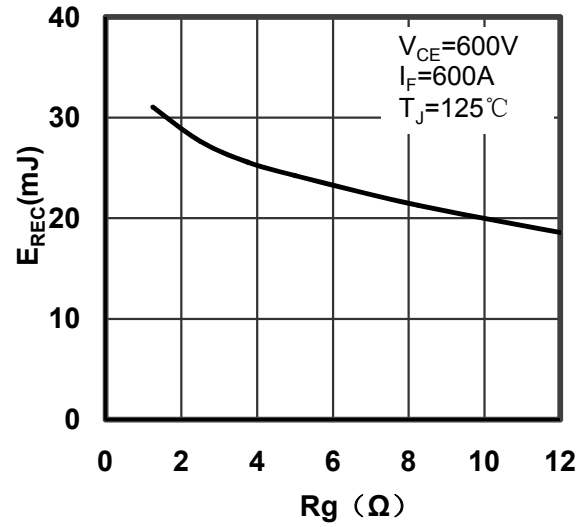


Figure 10. Switching Energy vs Gate Resistor Reverse-Diode

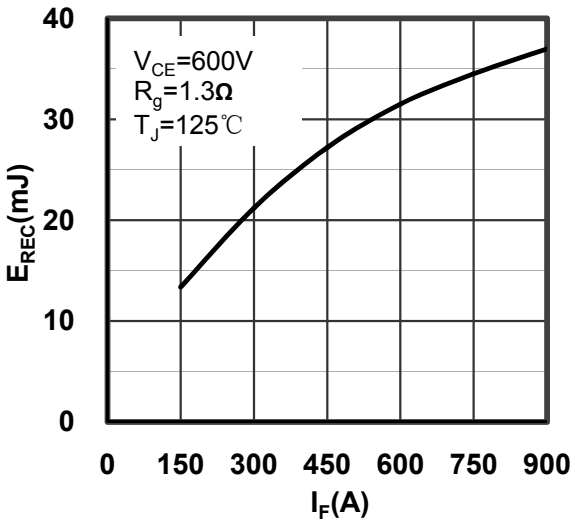


Figure 11. Switching Energy vs Forward Current Reverse-Diode

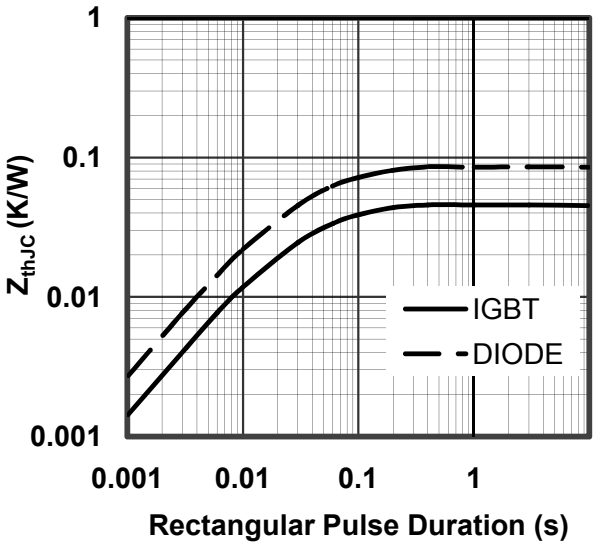
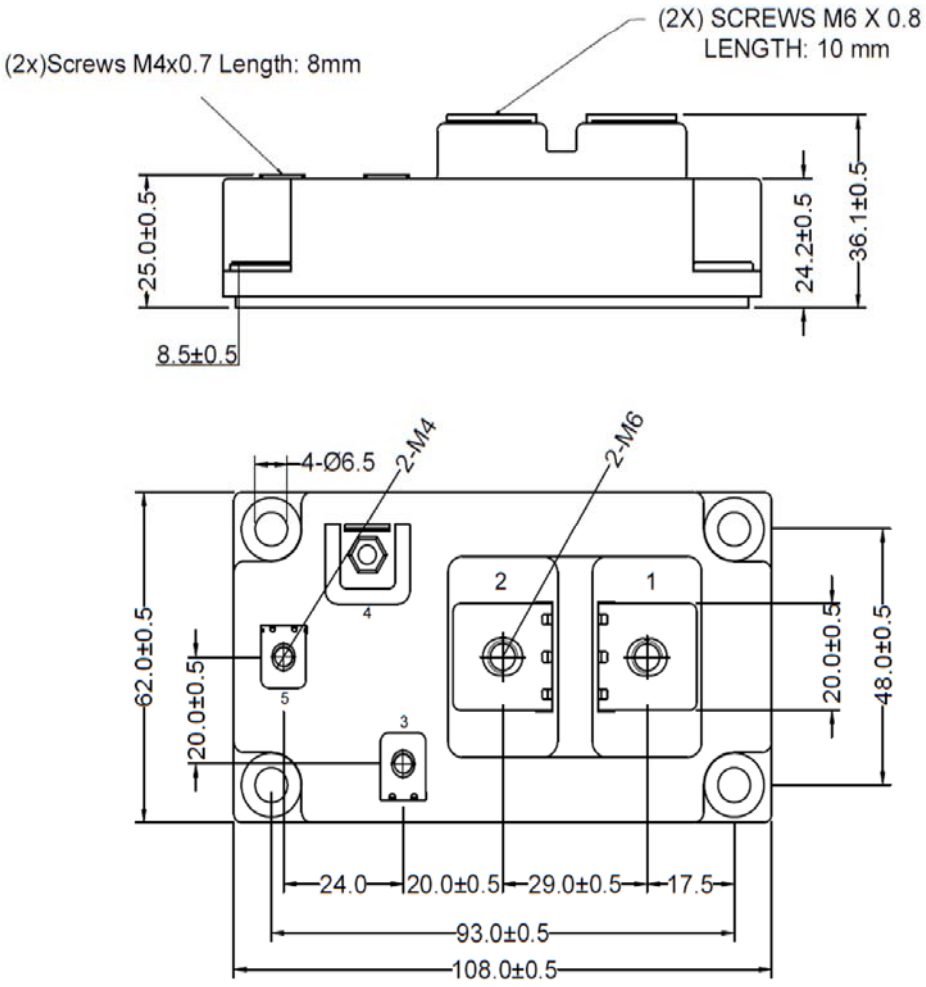


Figure 12. Transient Thermal Impedance of Reverse-Diode and IGBT-inverter



Dimensions in (mm)

Figure 13. Package Outline