MMG50S120UA6TN

1200V 50A IGBT Module

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

PRODUCT FEATURES

- ☐ IGBT^3 CHIP(Trench+Field Stop technology)
- ☐ 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

IGBT

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	1200	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=25℃	75	A
		T_C=80℃	50	
I_{CM}	Repetitive Peak Collector Current	tp=1ms	100	
P_{tot}	Power Dissipation Per IGBT		260	W

Diode

ABSOLUTE MAXIMUM RATINGS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
$I_{F(AV)}$	Average Forward Current	T_C=25℃	50	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	100	
I^2t		T_J=125℃, t=10ms, V_R=0V	680	A^2S

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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=2mA		5.0	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=50A, V_{GE}=15V, T_J=25℃			1.7	2.15	
		I_C=50A, V_{GE}=15V, T_J=125℃			1.9		
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				4		Ω
Q_g	Gate Charge	V_{CE}=600V, I_C=50A , V_{GE}=±15V			0.47		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			3.6		nF
C_{res}	Reverse Transfer Capacitance				160		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=50A R_G =18Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		90		ns
			T_J=125℃		90		ns
t_r	Rise Time		T_J=25℃		30		ns
			T_J=125℃		50		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=50A R_G =18Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		420		ns
			T_J=125℃		520		ns
t_f	Fall Time		T_J=25℃		70		ns
			T_J=125℃		90		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=50A R_G =18Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		4.9		mJ
			T_J=125℃		6.6		mJ
E_{off}	Turn off Energy		T_J=25℃		4		mJ
			T_J=125℃		4.9		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=125℃,V_{CC}=900V			200		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.48	K /W

Diode
ELECTRICAL CHARACTERISTICS

T_C =25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=50A , V_{GE}=0V, T_J=25℃		1.65	2.15	V
		I_F=50A , V_{GE}=0V, T_J=125℃		1.65		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=600V dI_F/dt=-1200A/μs T_J =125℃		360		ns
I_{RRM}	Max. Reverse Recovery Current			50		A
Q_{RR}	Reverse Recovery Charge			9.5		μC
E_{rec}	Reverse Recovery Energy			4.4		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.78	K /W

MODULE CHARACTERISTICS

T_C=25°C unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature		150	℃
T_{Jop}	Operating Temperature		-40~125	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	3000	V
CTI	Comparative Tracking Index		> 200	
Torque	to heatsink	Recommended（M6）	3~5	Nm
	to terminal	Recommended（M5）	2.5~5	Nm
Weight			160	g

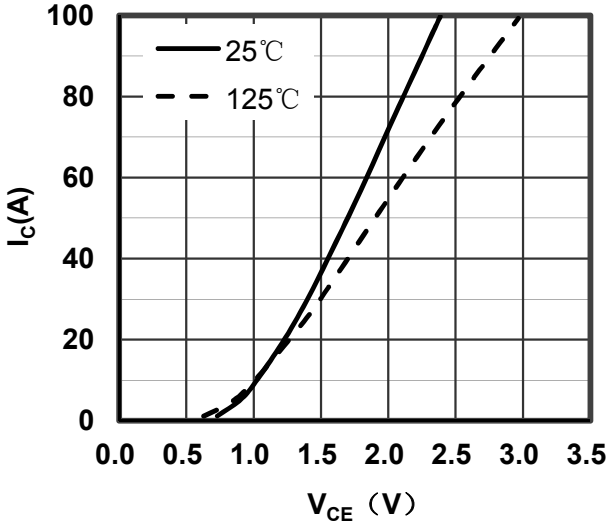


Figure 1. Typical Output Characteristics IGBT

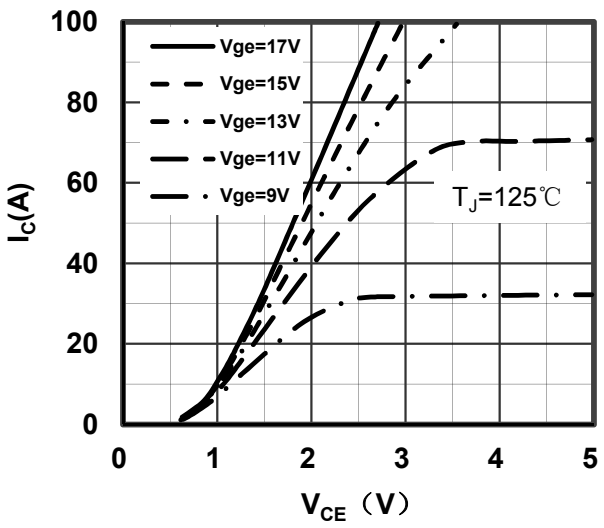


Figure 2. Typical Output Characteristics IGBT

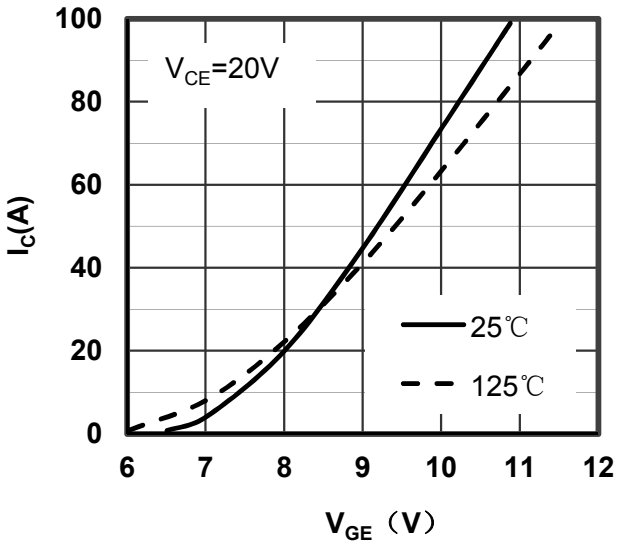


Figure 3. Typical Transfer Characteristics IGBT

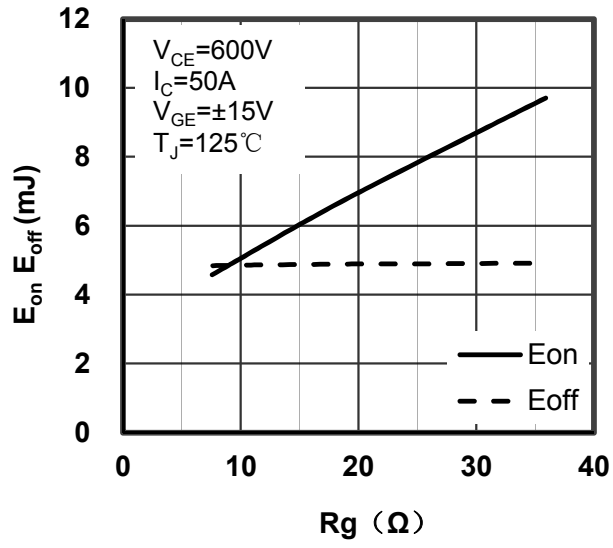


Figure 4. Switching Energy vs Gate Resistor IGBT

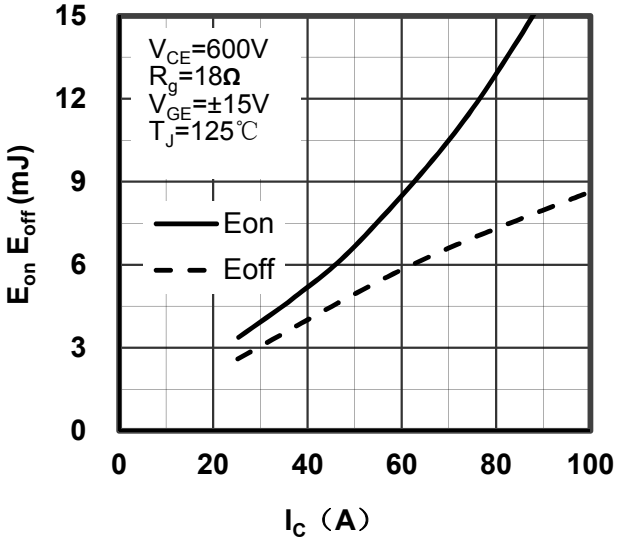


Figure 5. Switching Energy vs Collector Current
IGBT

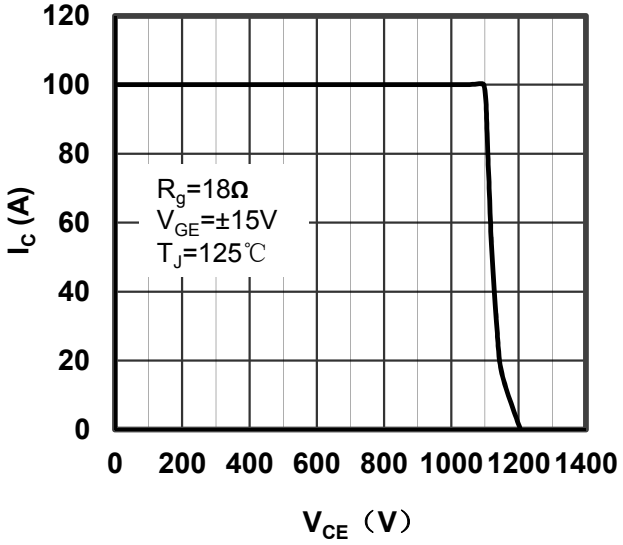


Figure 6. Reverse Biased Safe Operating Area
IGBT

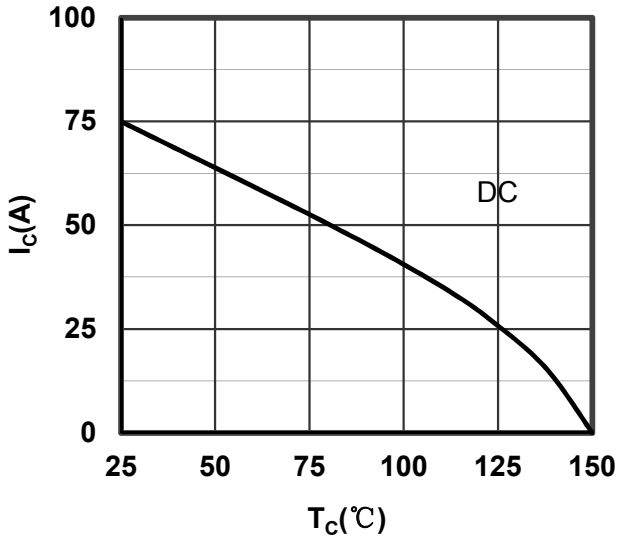


Figure 7. Collector Current vs Case temperature
IGBT

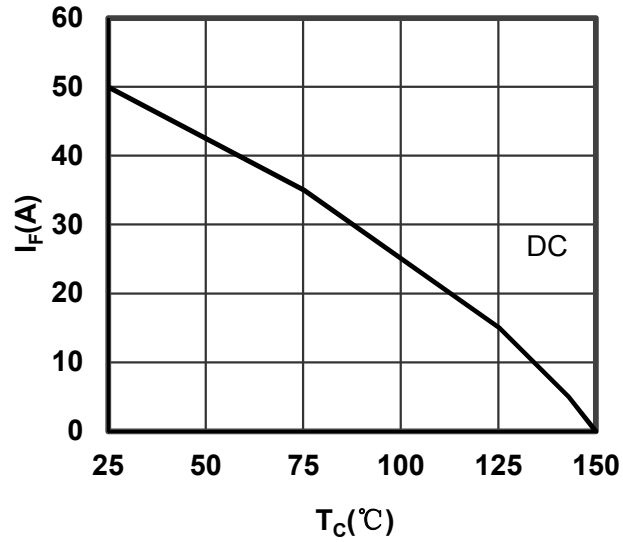


Figure 8. Forward current vs Case temperature
Diode

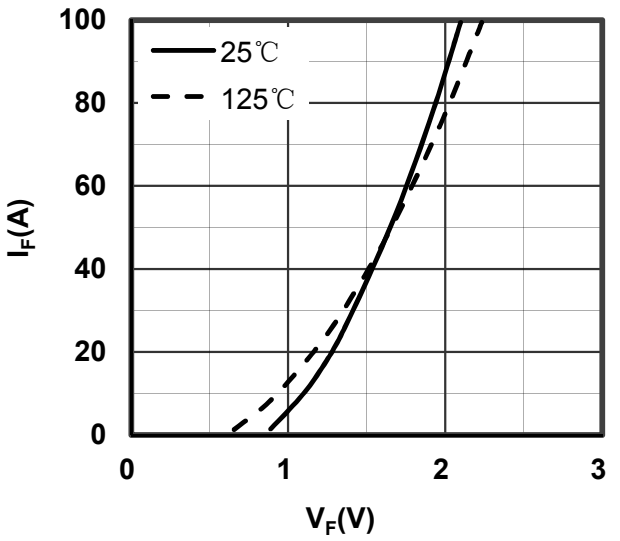


Figure 9. Diode Forward Characteristics
Diode

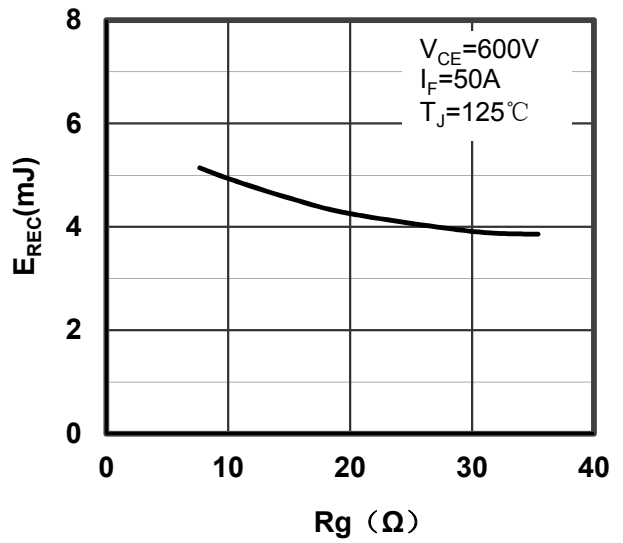


Figure 10. Switching Energy vs Gate Resistor
Diode

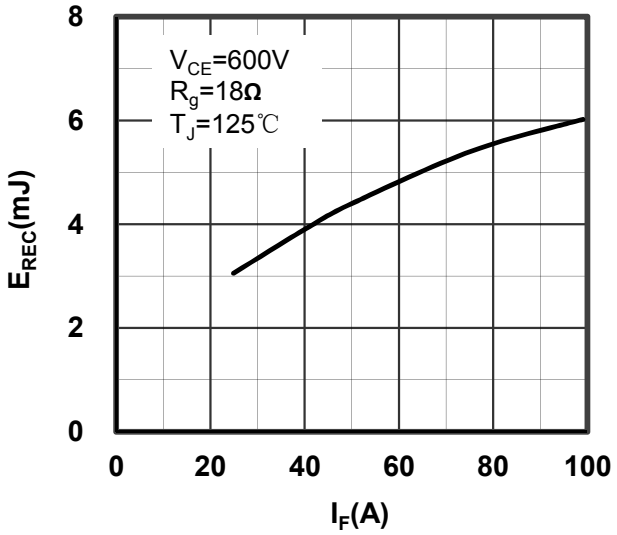


Figure 11. Switching Energy vs Forward Current Diode

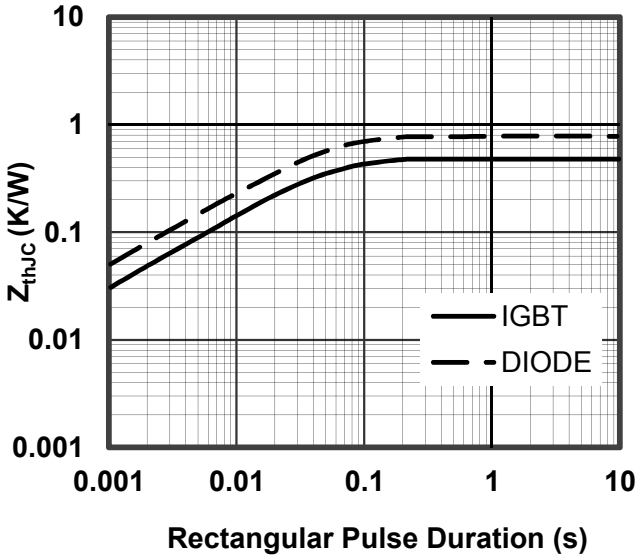


Figure 12. Transient Thermal Impedance of Diode and IGBT

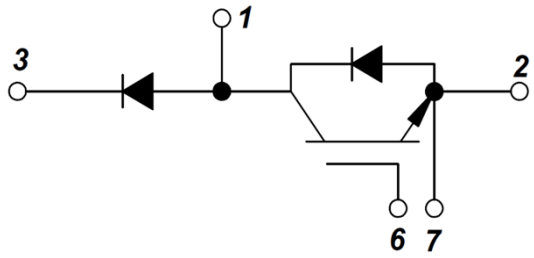
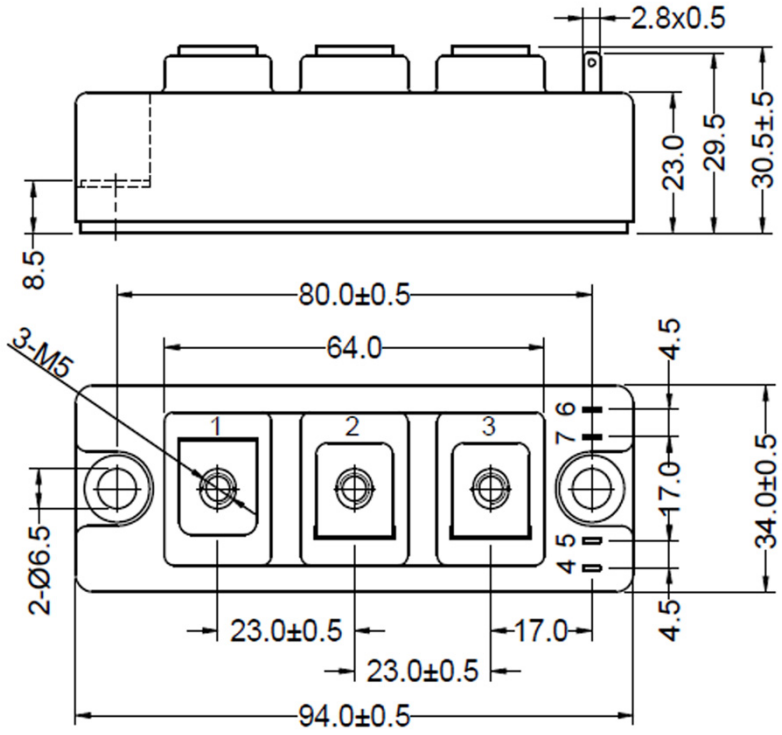


Figure 13. Circuit Diagram



Dimensions in (mm)

Figure 14. Package Outline