MMG600WB170B6T6

1700V 600A IGBT Module

December 2024 | Preliminary | RoHS Compliant

PRODUCT FEATURES

☐ IGBT CHIP(Trench+FS)

☐ Low saturation voltage and positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Temperature sense included

APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies

☐ Photovoltaic/Fuel cell

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℃	1700	V
V_{GES}	Gate Emitter Voltage		±20	
I_C	DC Collector Current	T_C=110℃, T_{Jmax}=175℃	600	A
I_{CM}	Repetitive Peak Collector Current	tp limited by T_{Jmax}	1200	
P_{tot}	Power Dissipation Per IGBT	T_C=25℃, T_{Jmax}=175℃	3846	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℃	1700	V
$I_{F(AV)}$	Average Forward Current		600	A
I_{FRM}	Repetitive Peak Forward Current	tp=1ms	1200	
I^2t		T_J=125℃, t=10ms, V_R=0V	33800	A^2s

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IGBT-inverter

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=9mA		5.5	6.2	6.9	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=600A, V_{GE}=15V, T_J=25℃			1.7	2.4	
		I_C=600A, V_{GE}=15V, T_J=125℃			2		
		I_C=600A, V_{GE}=15V, T_J=150℃			2.1		
		I_C=600A, V_{GE}=15V, T_J=175℃			2.15		
I_{CES}	Collector Leakage Current	V_{CE}=1700V, V_{GE}=0V, T_J=25℃				3	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
R_{Gint}	Integrated Gate Resistor				1.5		Ω
Q_g	Gate Charge	V_{GE}=0V...15V			4.2		µC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			107		nF
C_{oes}	Output Capacitance				3.1		nF
C_{res}	Reverse Transfer Capacitance				0.44		nF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=900V,I_C=600A R_G =1Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		300		ns
			T_J=125℃		330		ns
			T_J=150℃		340		ns
			T_J=175℃		360		ns
t_r	Rise Time		T_J=25℃		90		ns
			T_J=125℃		98		ns
			T_J=150℃		100		ns
			T_J=175℃		110		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=900V,I_C=600A R_G =1Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		780		ns
			T_J=125℃		840		ns
			T_J=150℃		860		ns
			T_J=175℃		870		ns
t_f	Fall Time		T_J=25℃		600		ns
			T_J=125℃		710		ns
			T_J=150℃		770		ns
			T_J=175℃		780		ns
E_{on}	Turn on Energy	V_{CC}=900V,I_C=600A R_G =1Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		210		mJ
			T_J=125℃		263		mJ
			T_J=150℃		290		mJ
			T_J=175℃		306		mJ
E_{off}	Turn off Energy		T_J=25℃		198		mJ
			T_J=125℃		223		mJ
			T_J=150℃		240		mJ
			T_J=175℃		245		mJ
I_{SC}	Short Circuit Current	tpsc≤10µs , V_{GE}=15V T_J=150℃,V_{CC}=1000V			2000		A
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.039	K /W

Diode-inverter

ELECTRICAL CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions			Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F=600A , V_{GE}=0V, T_J=25℃			1.75	2.2	V
		I_F=600A , V_{GE}=0V, T_J=125℃			1.85		
		I_F=600A , V_{GE}=0V, T_J=150℃			1.9		
		I_F=600A , V_{GE}=0V, T_J=175℃			1.93		
t_{rr}	Reverse Recovery Time	I_F=600A , V_R=900V （dI_F/dt=-2900A/μs，T_J=175℃）	T_J=25℃		935		ns
			T_J=125℃		1285		
			T_J=150℃		1325		
			T_J=175℃		1661		
I_{RRM}	Max. Reverse Recovery Current		T_J=25℃		416		A
			T_J=125℃		384		
			T_J=150℃		380		
			T_J=175℃		378		
Q_{RR}	Reverse Recovery Charge		T_J=25℃		155		μC
			T_J=125℃		215		
			T_J=150℃		238		
			T_J=175℃		265		
E_{rec}	Reverse Recovery Energy		T_J=25℃		92		mJ
			T_J=125℃		129		
			T_J=150℃		136		
			T_J=175℃		151		
R_{thJCD}	Junction to Case Thermal Resistance （ Per Diode）					0.074	K /W

NTC CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
R_{25}	Resistance	T_C =25℃		5		kΩ
△R/R	Deviation of R100	T_C =100℃，R_{100}=493Ω	-5		5	%
$B_{25/50}$	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\ K))]$			3375		K

MODULE CHARACTERISTICS *(T_C=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~175	
T_{stg}	Storage Temperature		-40~125	
V_{isol}	Isolation Breakdown Voltage	AC, 50Hz(R.M.S), t=1minute	4100	V
CTI	Comparative Tracking Index		＞200	
Torque	to heatsink	Recommended（M5）	2.5~5	Nm
	to terminal	Recommended（M6）	3~5	Nm
Weight			350	g

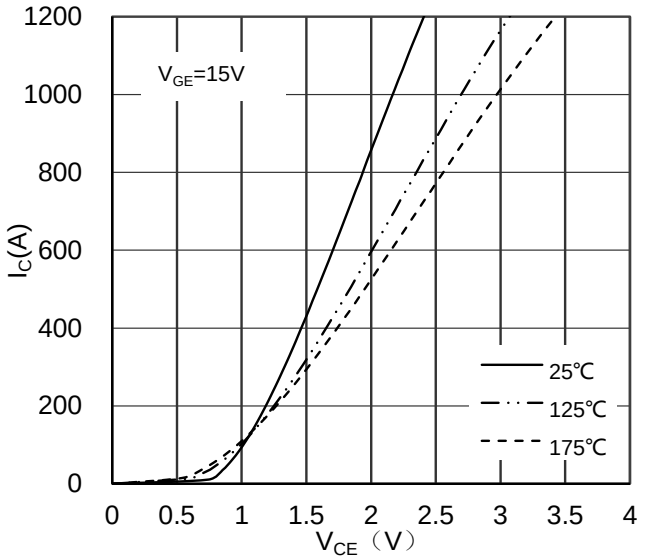


Figure 1. Typical Output Characteristics IGBT

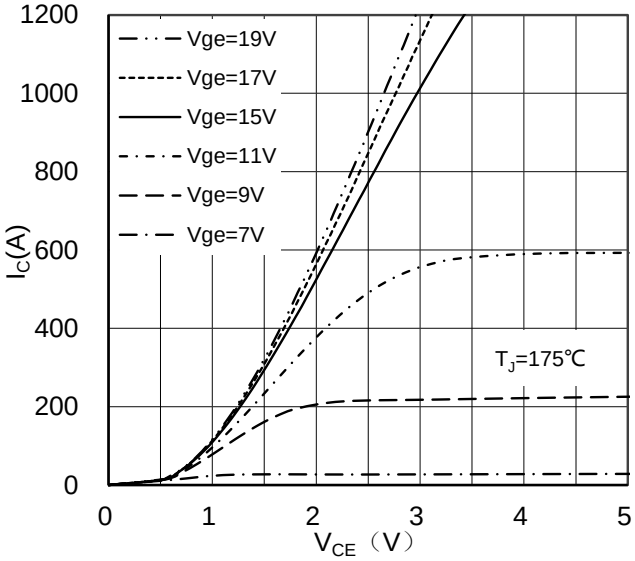


Figure 2. Typical Output Characteristics IGBT

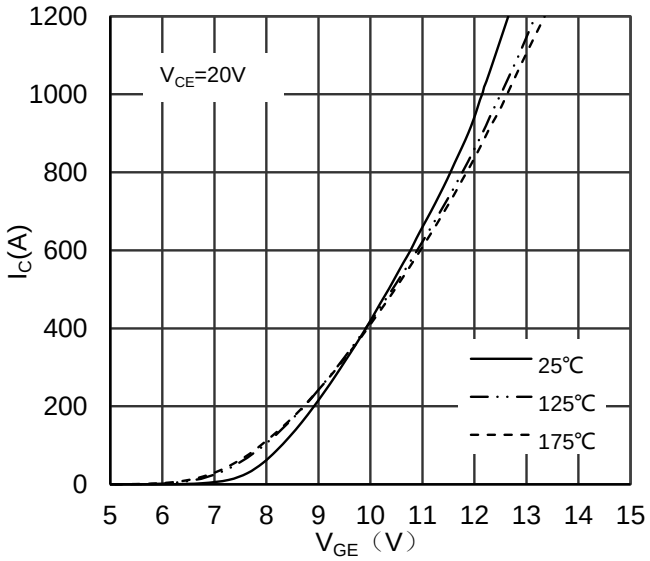


Figure 3. Typical Transfer characteristics IGBT

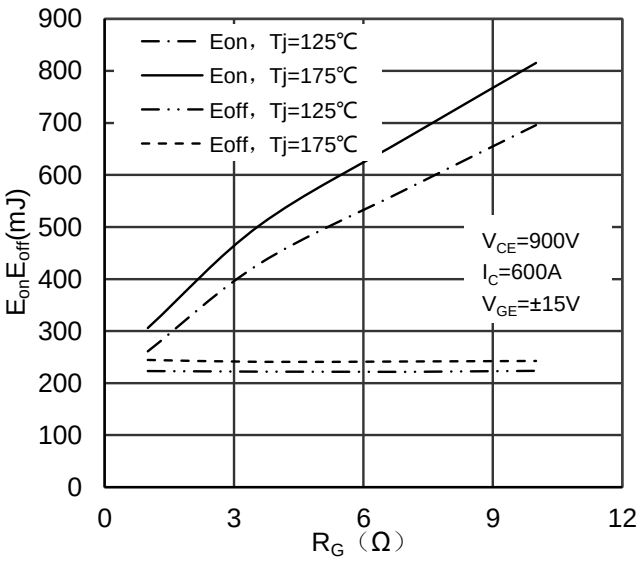


Figure 4. Switching Energy vs Gate Resistor IGBT

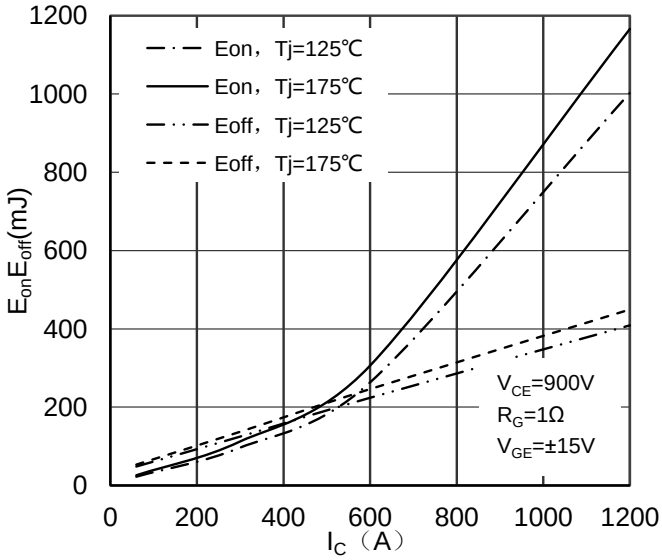


Figure 5. Switching Energy vs Collector Current IGBT

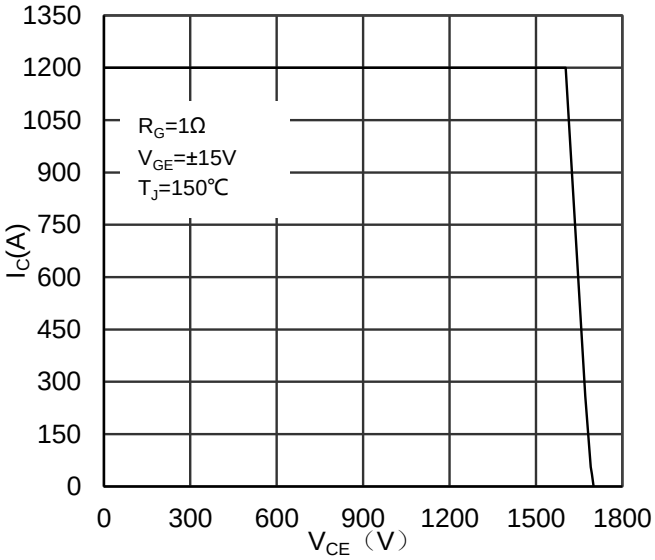


Figure 6. Reverse Biased Safe Operating Area IGBT

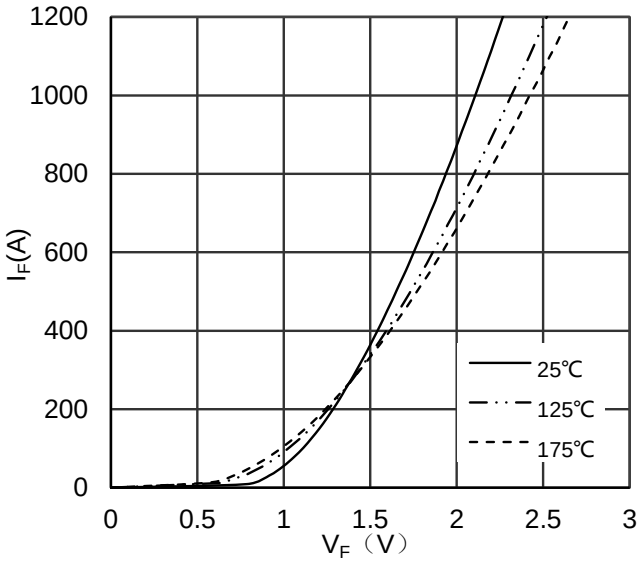


Figure 7. Diode Forward Characteristics Diode

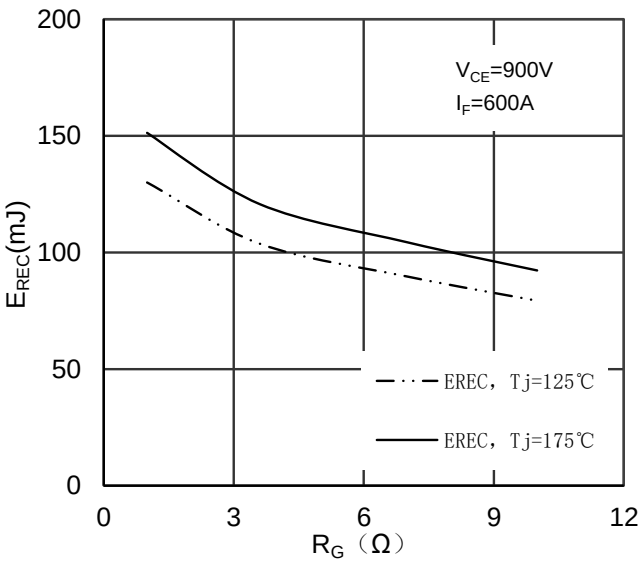


Figure 8. Switching Energy vs Gate Resistor Diode

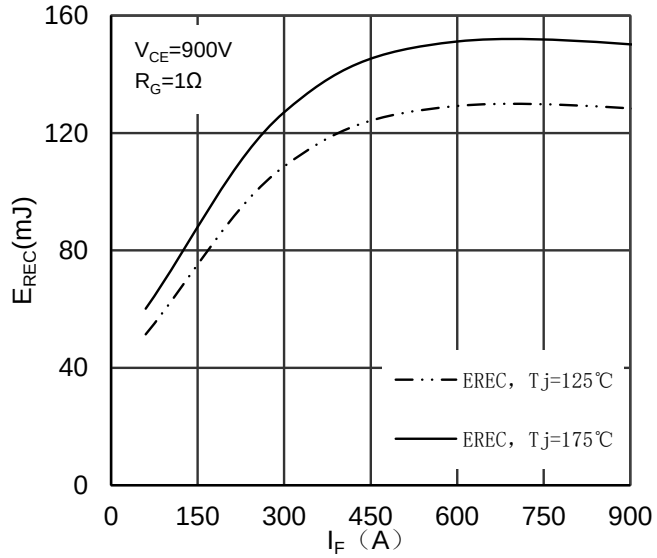


Figure 9. Switching Energy vs Forward Current Diode

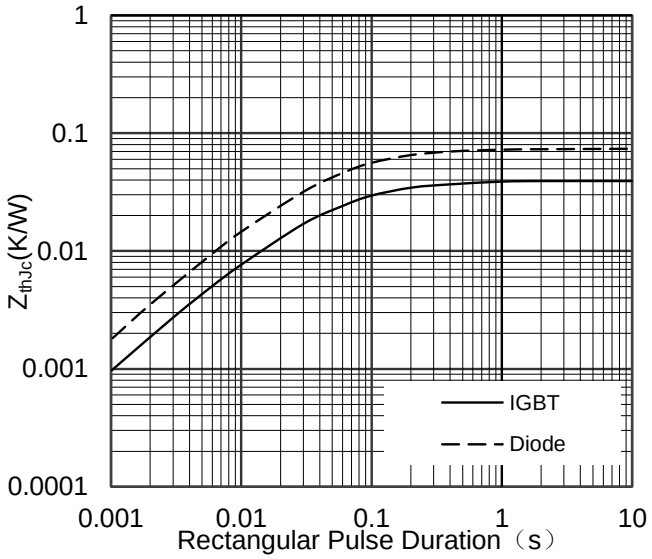


Figure 10. Transient Thermal Impedance of Diode and IGBT

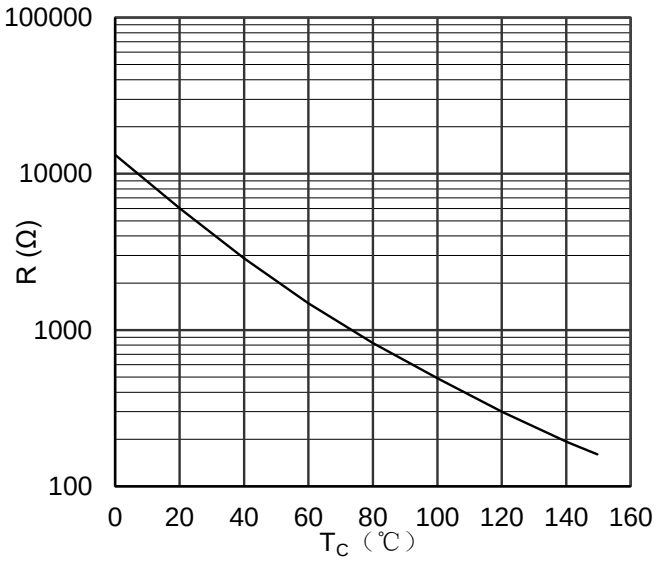


Figure 11. NTC Characteristics

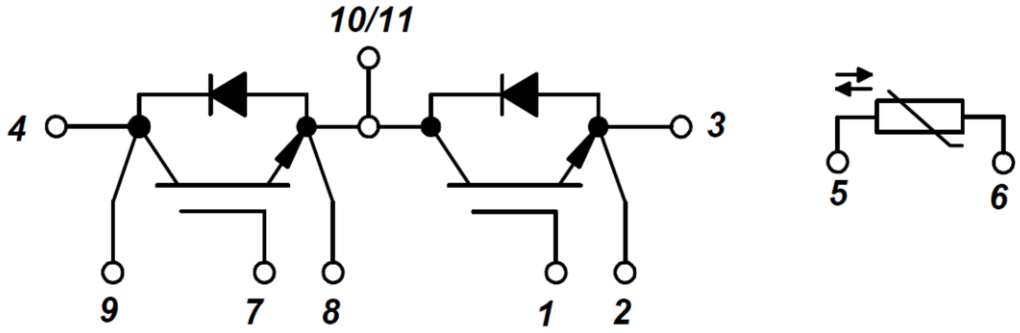
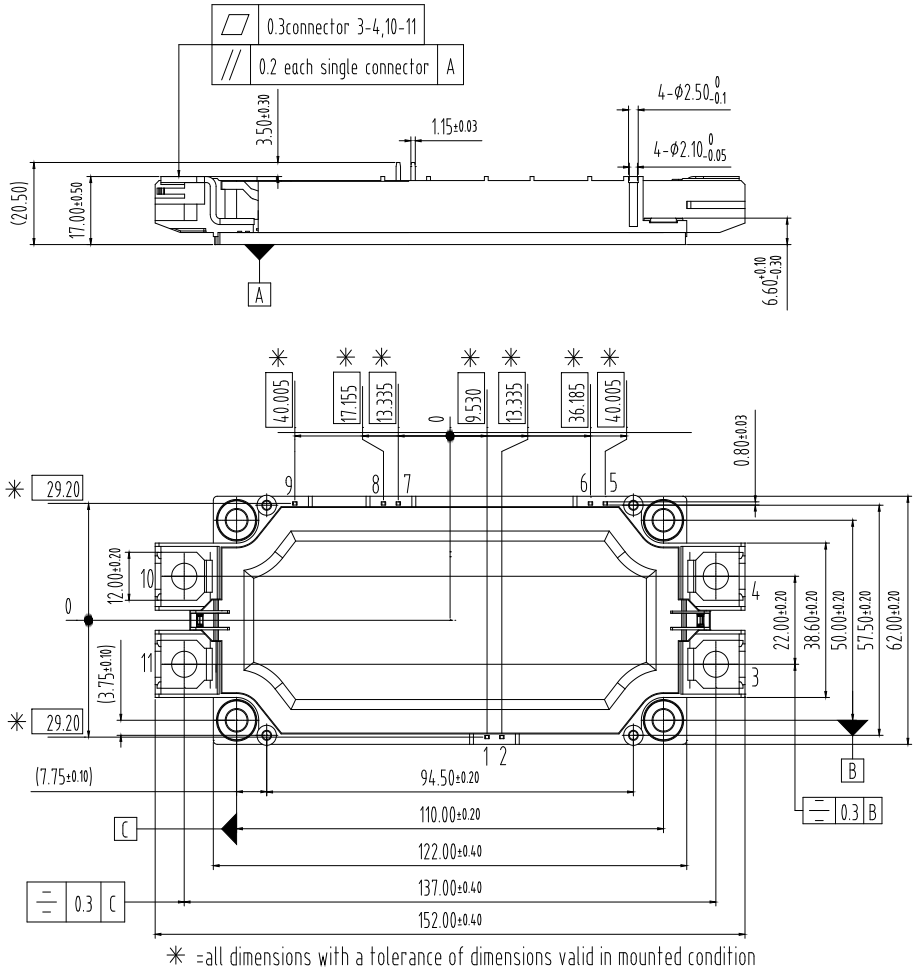


Figure 12. Circuit Diagram



Dimensions in (mm)

Figure 13. Package Outline