MM50G3T120BM

1200V 50A IGBT

June 2020 Version 01 RoHS Compliant

PRODUCT FEATURES

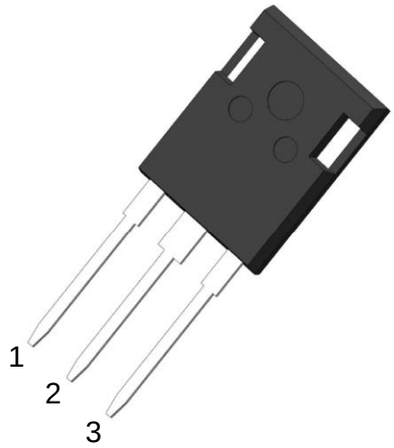
☐ IGBT chip in trench FS-technology

☐ Low switching losses

☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery



APPLICATIONS

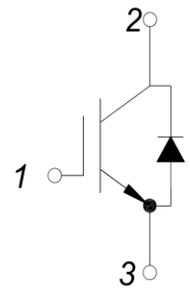
☐ High frequency switching application

☐ Medical applications

☐ Motion/servo control

☐ UPS systems

1.Gate
2.Collector
3.Emitter



Type	V_{CES}	I_C	$V_{CE(sat)}$ T_J=25°C	T_{Jmax}	Marking	Package
MM50G3T120BM	1200V	50A	1.8V	175°C	MM50G3T120BM	TO-247 Plus

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℃	83	A
		T_C=110℃	50	
I_{Cpuls}	Pulsed collector current,tp limited by T_{Jmax}		150	
P_{tot}	Power Dissipation Per IGBT		535	W
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	1200	V
$I_{F(AV)}$	Average Forward Current	T_C=95℃	50	A
I_{Fpuls}	Diode pulsed current,tp limited by T_{Jmax}		150	
T_{Jmax}	Max. Junction Temperature		175	℃
T_{Jop}	Operating Temperature		-40~175	
T_{stg}	Storage Temperature		-55~150	
Weight			8	g

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IGBT

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=2.0mA		5.2	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=50A, V_{GE}=15V, T_J=25℃			1.8	2.25	V
		I_C=50A, V_{GE}=15V, T_J=125℃			2.1		
		I_C=50A, V_{GE}=15V, T_J=150℃			2.15		
I_{CES}	Collector Leakage Current	V_{CE}=1200V, V_{GE}=0V, T_J=25℃				100	μA
		V_{CE}=1200V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-400		400	nA
Q_g	Gate Charge	V_{CE}=600V, I_C=50A , V_{GE}=15V			0.27		μC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			3.5		nF
C_{res}	Reverse Transfer Capacitance				160		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		25		ns
			T_J=125℃		30		ns
			T_J=150℃		30		ns
t_r	Rise Time		T_J=25℃		28		ns
			T_J=125℃		30		ns
			T_J=150℃		30		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		220		ns
			T_J=125℃		260		ns
			T_J=150℃		280		ns
t_f	Fall Time		T_J=25℃		100		ns
			T_J=125℃		160		ns
			T_J=150℃		180		ns
E_{on}	Turn on Energy	V_{CC}=600V,I_C=50A R_G =10Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		6.2		mJ
			T_J=150℃		7.1		mJ
E_{off}	Turn off Energy		T_J=125℃		3.9		mJ
			T_J=150℃		4.3		mJ
I_{SC}	Short Circuit Current	tpsc≤10μS , V_{GE}=15V T_J=125℃,V_{CC}=800V			210		A
R_{thJC}	Junction to Case Thermal Resistance （Per IGBT）					0.28	K /W

Anti-Parallel 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℃		1.8	2.3	V
		I_F=50A , V_{GE}=0V, T_J=125℃		1.55		
		I_F=50A , V_{GE}=0V, T_J=150℃		1.5		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=600V dI_F/dt=-1300A/μs T_J =150℃		470		ns
I_{RRM}	Max. Reverse Recovery Current			58		A
Q_{RR}	Reverse Recovery Charge			12.4		μC
E_{rec}	Reverse Recovery Energy			4.5		mJ
R_{thJCD}	Junction to Case Thermal Resistance （Per Diode）				0.49	K /W

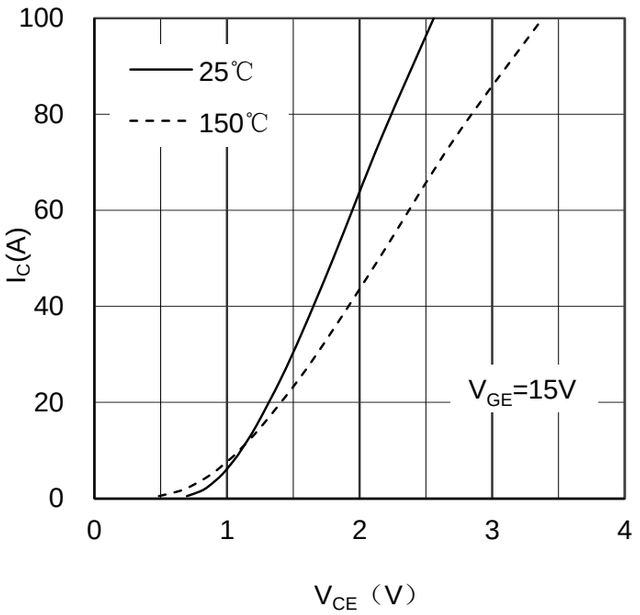


Figure 1. Typical Output Characteristics IGBT

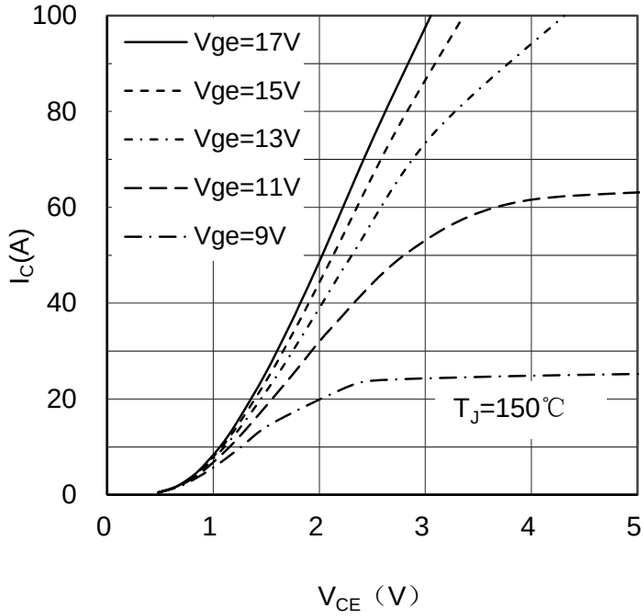


Figure 2. Typical Output Characteristics IGBT

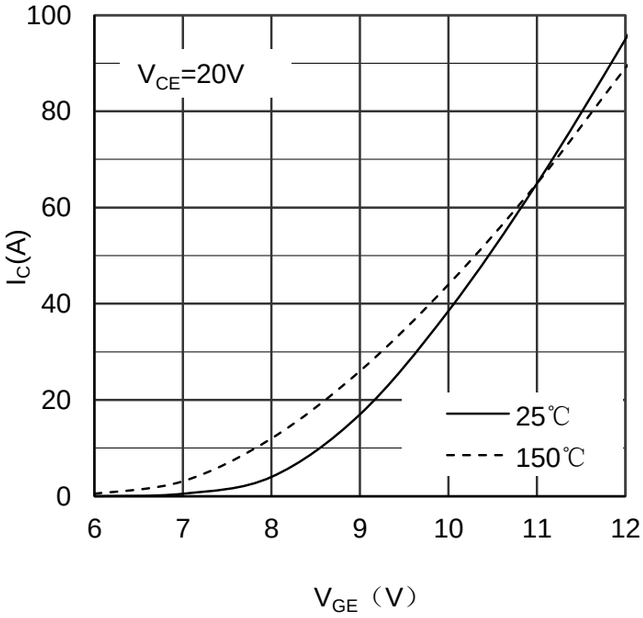


Figure 3. Typical Transfer characteristics IGBT

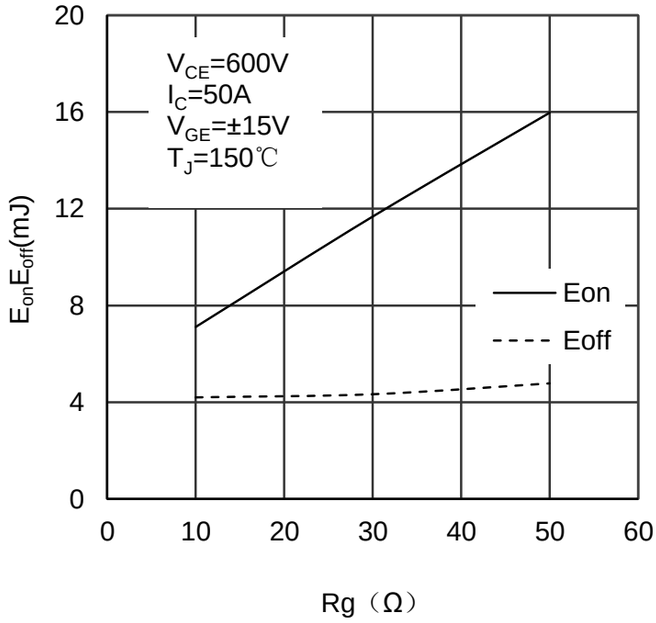


Figure 4. Switching Energy vs Gate Resistor IGBT

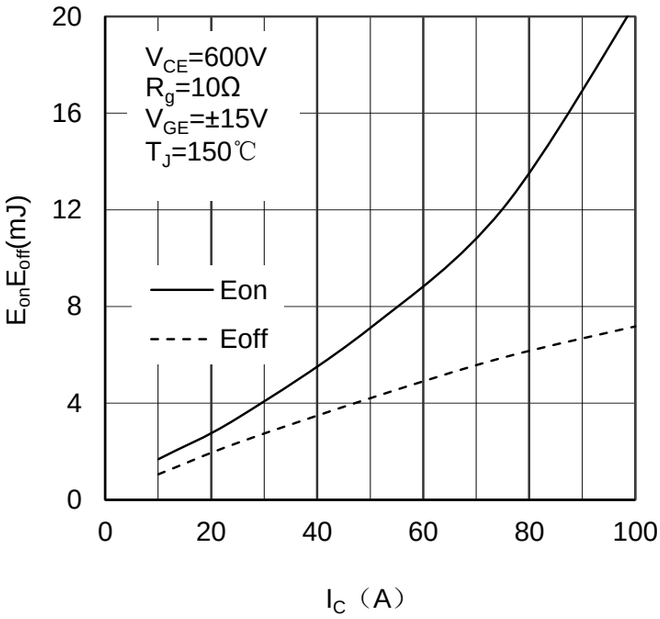


Figure 5. Switching Energy vs Collector Current IGBT

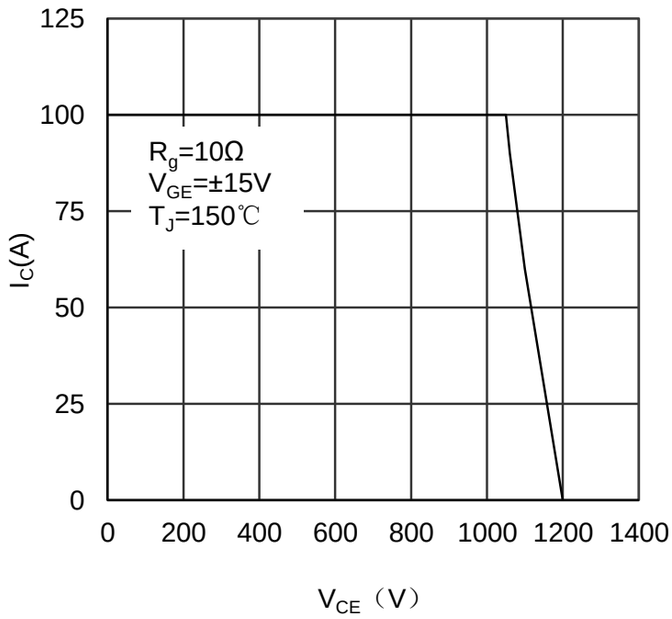


Figure 6. Reverse Biased Safe Operating Area IGBT

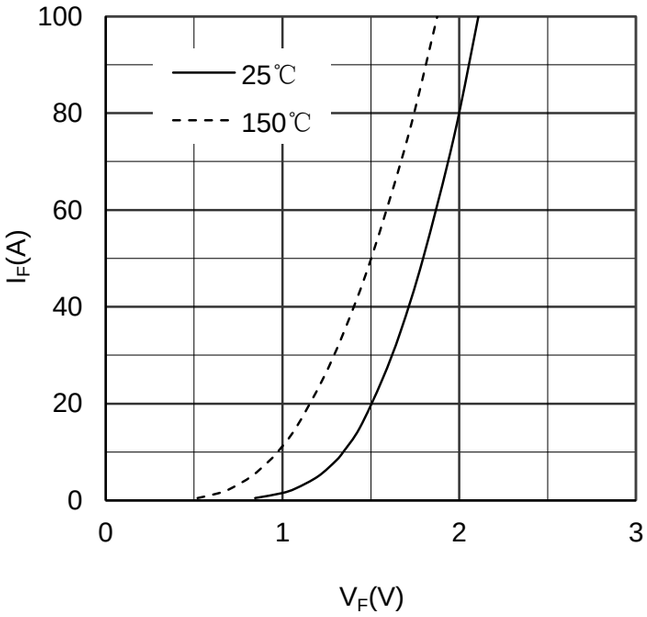


Figure 7. Diode Forward Characteristics Diode

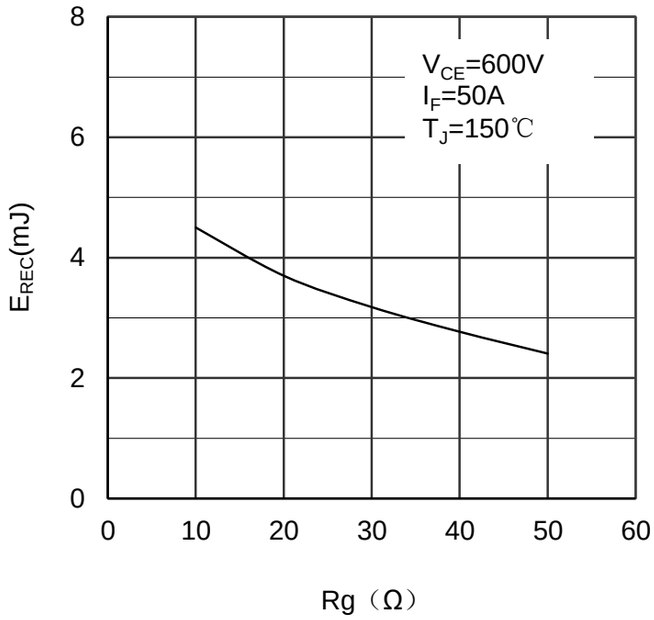


Figure 8. Switching Energy vs Gate Resistor Diode

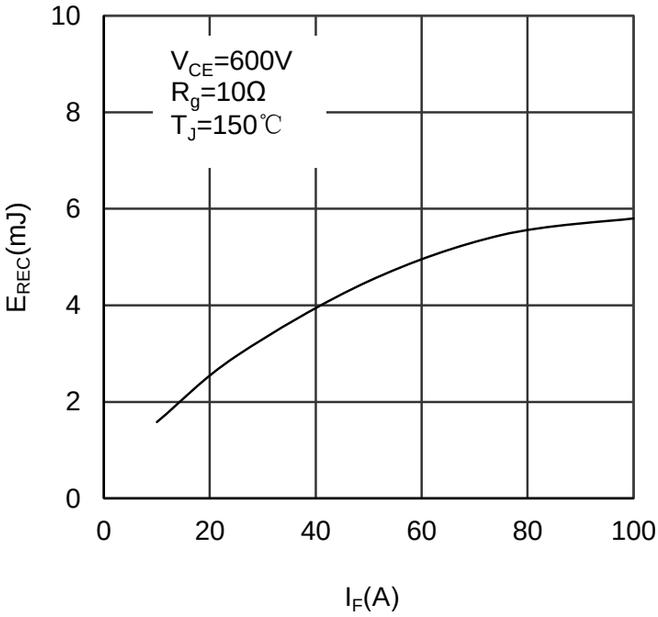


Figure 9. Switching Energy vs Forward Current Diode

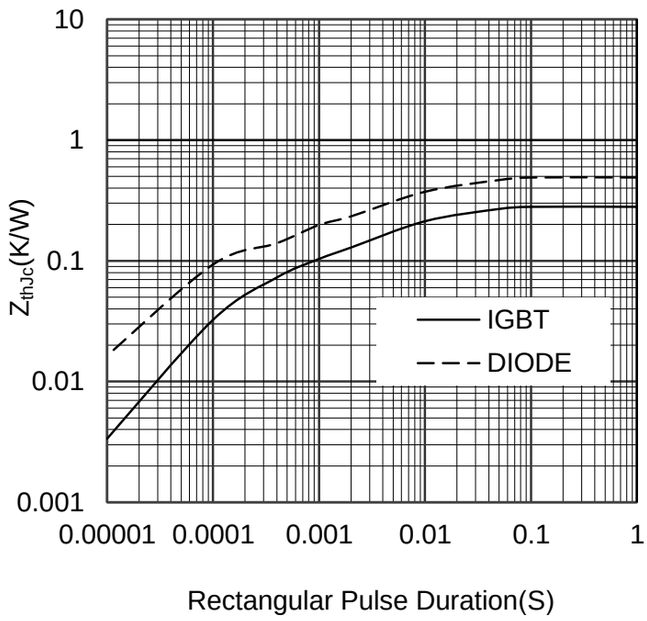
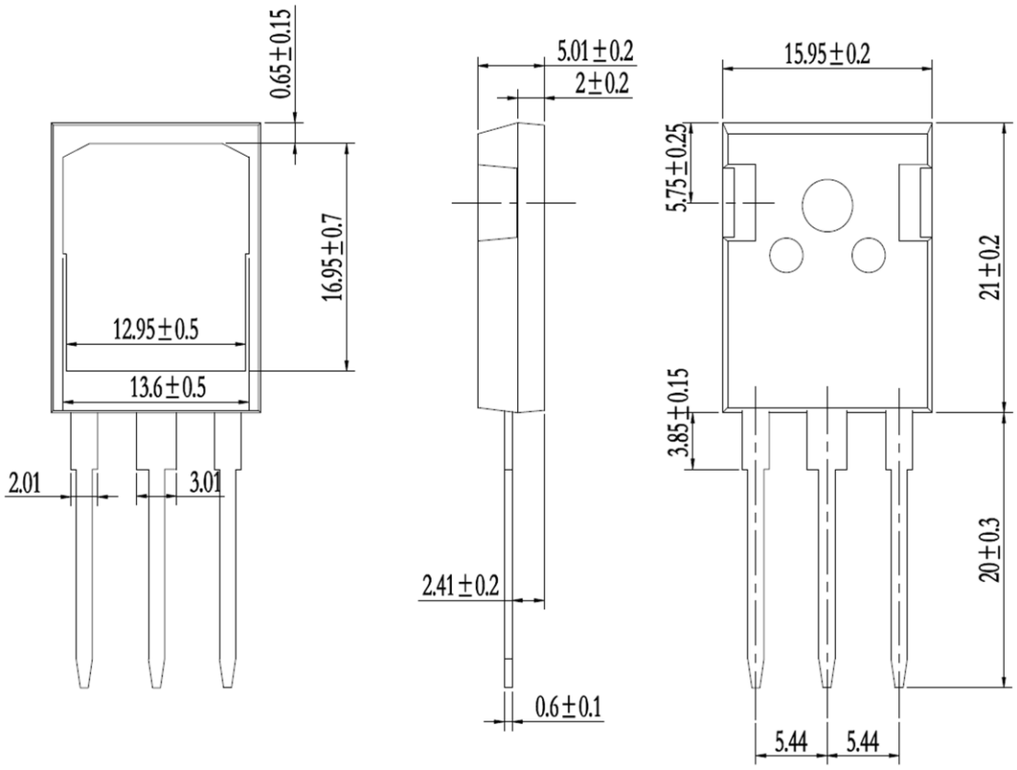


Figure 10. Transient Thermal Impedance of Diode and IGBT



Dimensions in (mm)

Figure 11. Package Outline