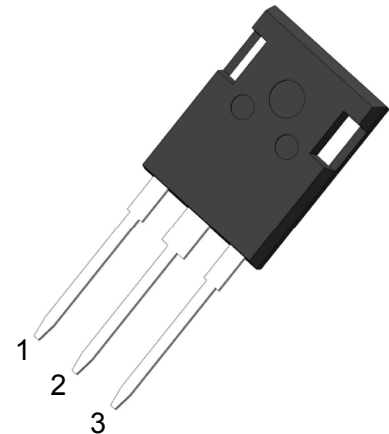


## PRODUCT FEATURES

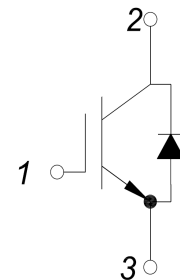
- IGBT chip in trench FS-technology
- Low switching losses
- $V_{CE(sat)}$  with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery



## APPLICATIONS

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

1.Gate  
2.Collector  
3.Emitter



Type	$V_{CES}$	$I_C$	$V_{CE(sat)}$ $T_J=25^\circ C$	$T_{Jmax}$	Marking	Package
MM50G3U120BMX	1200V	50A	1.95V	175°C	MM50G3U120BMX	TO-247 Plus

## ABSOLUTE MAXIMUM RATINGS( $T_C=25^\circ C$ unless otherwise specified)

Symbol	Parameter/Test Conditions	Values	Unit
$V_{CES}$	Collector Emitter Voltage $T_J=25^\circ C$	1200	V
$V_{GES}$	Gate Emitter Voltage	$\pm 20$	
	Transient Gate Emitter Voltage ( $t_p \leq 10\mu s, D < 0.01$ )	$\pm 30$	
$I_C$	DC Collector Current	$T_C=25^\circ C$	83
		$T_C=110^\circ C$	50
$I_{Cpuls}$	Pulsed collector current, $t_p$ limited by $T_{Jmax}$	150	A
$P_{tot}$	Power Dissipation Per IGBT	535	W
$V_{RRM}$	Repetitive Reverse Voltage $T_J=25^\circ C$	1200	V
$I_{F(AV)}$	Average Forward Current $T_C=95^\circ C$	50	A
$I_{Fpuls}$	Diode pulsed current, $t_p$ limited by $T_{Jmax}$	150	
$T_{Jmax}$	Max. Junction Temperature	175	°C
$T_{Jop}$	Operating Temperature	-40~175	
$T_{stg}$	Storage Temperature	-55~150	
Weight		8	g

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# MM50G3U120BMX

## IGBT

### ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Emitter Threshold Voltage	$V_{CE}=V_{GE}, I_C=2.0\text{mA}$	5.2	5.8	6.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.95	2.4	
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.35		
		$I_C=50\text{A}, V_{GE}=15\text{V}, T_J=150^\circ\text{C}$		2.45		
$I_{CES}$	Collector Leakage Current	$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			100	$\mu\text{A}$
		$V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			10	$\text{mA}$
$I_{GES}$	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-400		400	$\text{nA}$
$Q_g$	Gate Charge	$V_{CE}=600\text{V}, I_C=50\text{A}, V_{GE}=15\text{V}$		0.28		$\mu\text{C}$
$C_{ies}$	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		3.6		$\text{nF}$
$C_{res}$	Reverse Transfer Capacitance				160	$\text{pF}$
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=600\text{V}, I_C=50\text{A}$ $R_G=10\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		25	$\text{ns}$
			$T_J=125^\circ\text{C}$		35	$\text{ns}$
			$T_J=150^\circ\text{C}$		35	$\text{ns}$
$t_r$	Rise Time		$T_J=25^\circ\text{C}$		25	$\text{ns}$
			$T_J=125^\circ\text{C}$		30	$\text{ns}$
			$T_J=150^\circ\text{C}$		30	$\text{ns}$
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		200	$\text{ns}$	
		$T_J=125^\circ\text{C}$		245	$\text{ns}$	
		$T_J=150^\circ\text{C}$		260	$\text{ns}$	
$t_f$	Fall Time	$T_J=25^\circ\text{C}$		65	$\text{ns}$	
		$T_J=125^\circ\text{C}$		100	$\text{ns}$	
		$T_J=150^\circ\text{C}$		110	$\text{ns}$	
$E_{on}$	Turn on Energy	$T_J=125^\circ\text{C}$		5.5	$\text{mJ}$	
		$T_J=150^\circ\text{C}$		6.2	$\text{mJ}$	
$E_{off}$	Turn off Energy	$T_J=125^\circ\text{C}$		2.4	$\text{mJ}$	
		$T_J=150^\circ\text{C}$		2.6	$\text{mJ}$	
$I_{SC}$	Short Circuit Current	$t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=600\text{V}$		320		A
$R_{thJC}$	Junction to Case Thermal Resistance (Per IGBT)				0.28	$\text{K/W}$

## Anti-Parallel Diode

### ELECTRICAL CHARACTERISTICS ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter/Test Conditions		Min.	Typ.	Max.	Unit
$V_F$	Forward Voltage	$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.8	2.3	V
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.55		
		$I_F=50\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.5		
$t_{rr}$	Reverse Recovery Time	$I_F=50\text{A}, V_R=600\text{V}$ $dI_F/dt=-1300\text{A}/\mu\text{s}$ $T_J=150^\circ\text{C}$		460		$\text{ns}$
$I_{RRM}$	Max. Reverse Recovery Current			52		A
$Q_{RR}$	Reverse Recovery Charge			12		$\mu\text{C}$
$E_{rec}$	Reverse Recovery Energy			4.7		$\text{mJ}$
$R_{thJCD}$	Junction to Case Thermal Resistance (Per Diode)				0.49	$\text{K/W}$

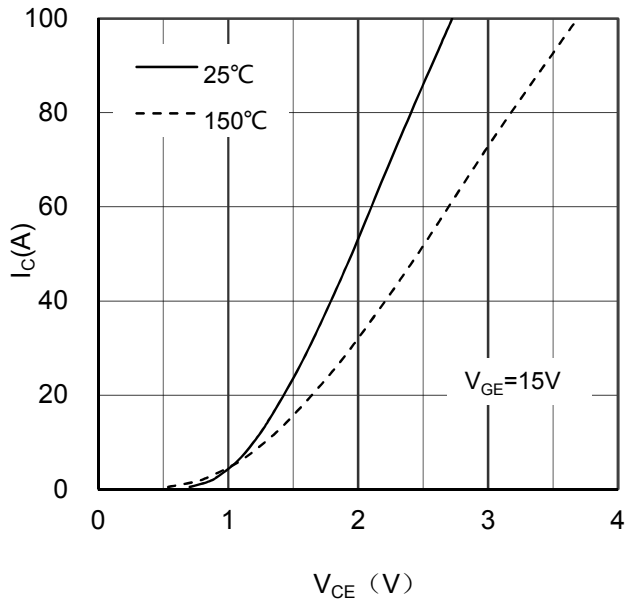


Figure 1. Typical Output Characteristics IGBT

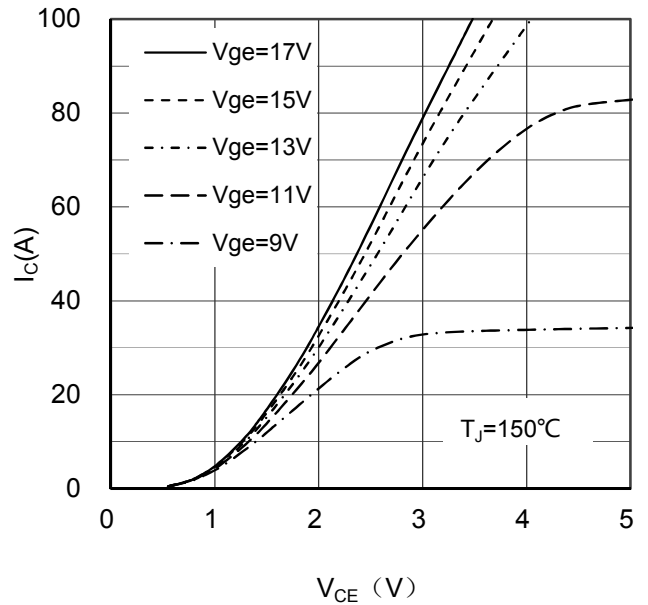


Figure 2. Typical Output Characteristics IGBT

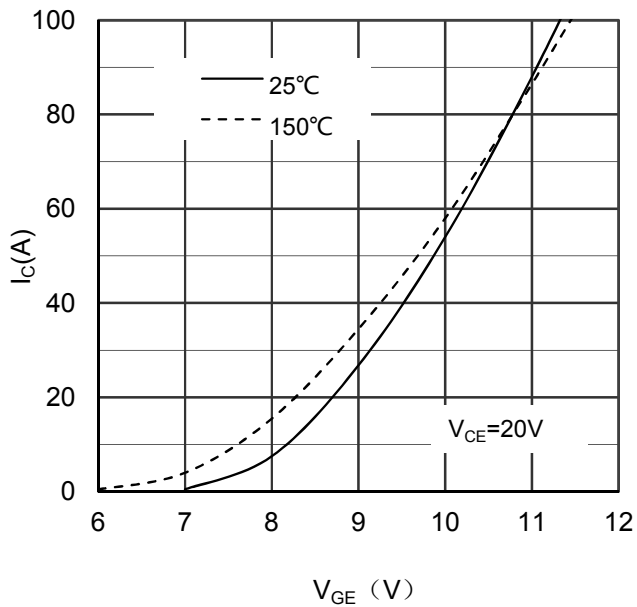


Figure 3. Typical Transfer characteristics IGBT

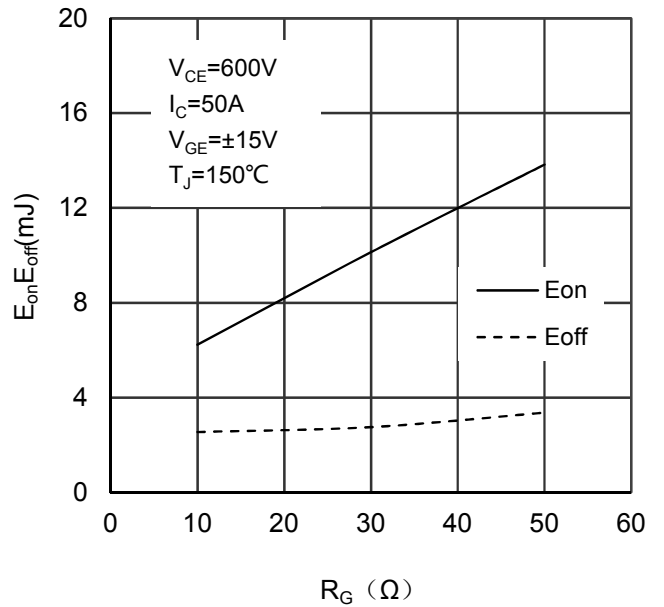


Figure 4. Switching Energy vs Gate Resistor IGBT

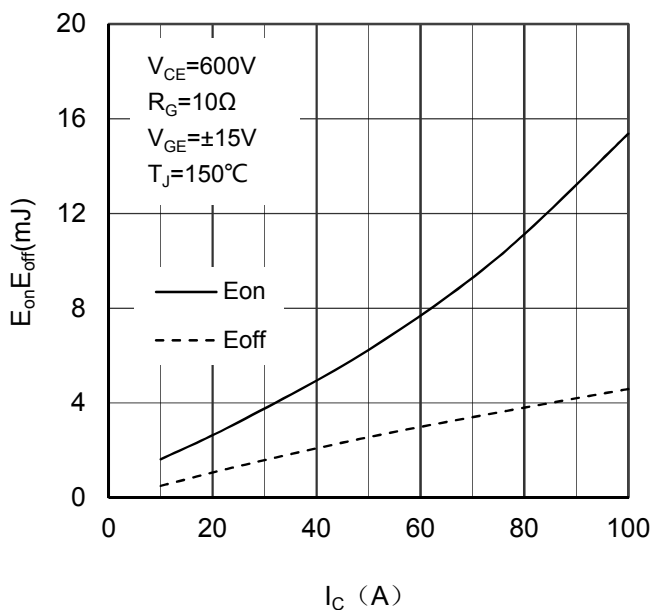


Figure 5. Switching Energy vs Collector Current IGBT

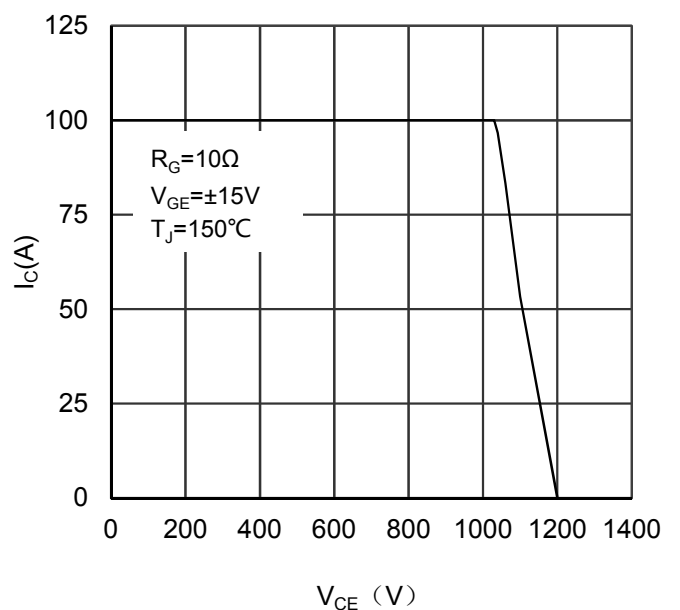


Figure 6. Reverse Biased Safe Operating Area IGBT

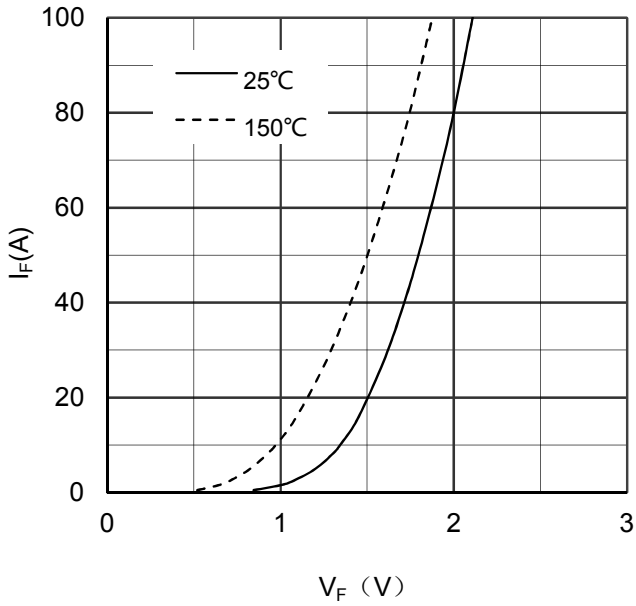


Figure 7. Diode Forward Characteristics Diode

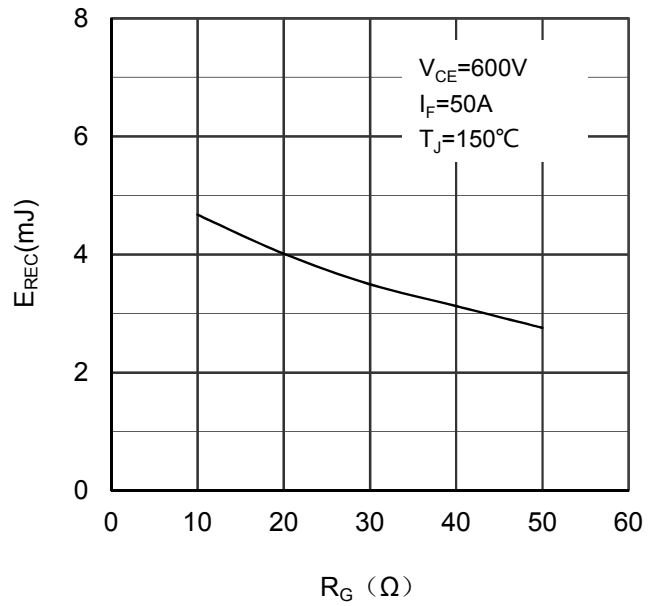


Figure 8. Switching Energy vs Gate Resistor Diode

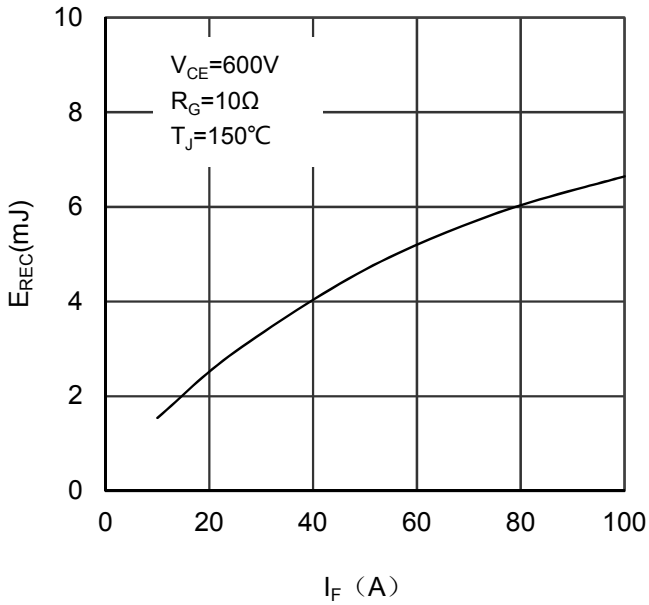


Figure 9. Switching Energy vs Forward Current Diode

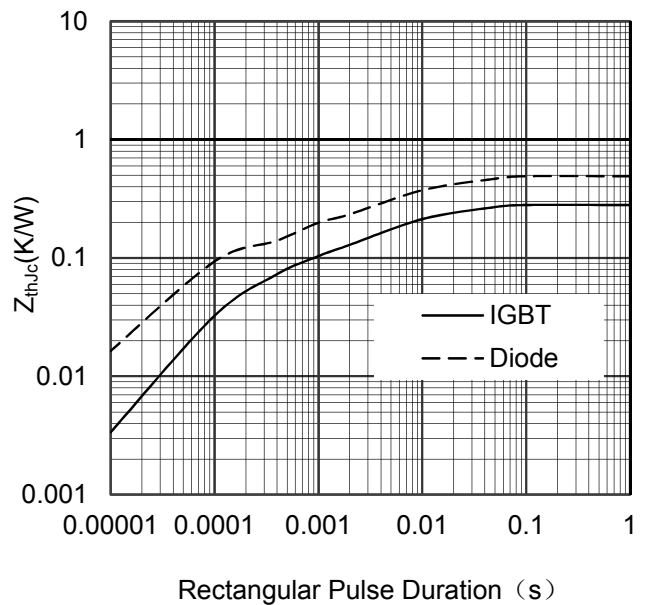
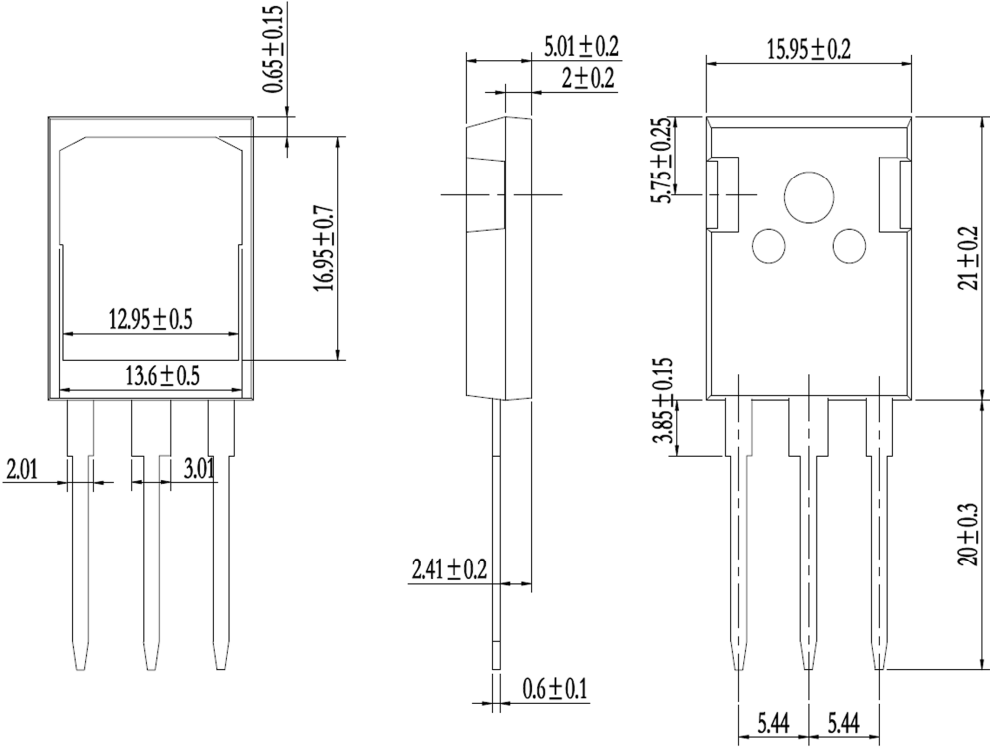


Figure 10. Transient Thermal Impedance of Diode and IGBT



Dimensions in (mm)  
Figure 11. Package Outline