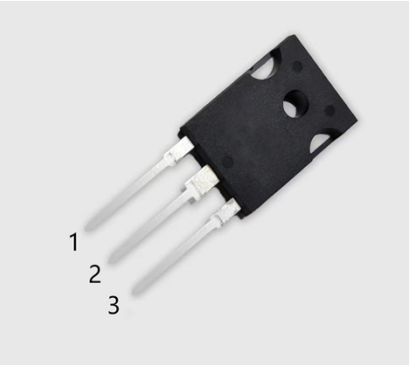
MM50GBU65B

650V 50A IGBT

September 2022 Version 04 RoHS Compliant

PRODUCT FEATURES

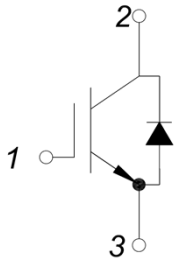
- ☐ 650V IGBT chip in trench FS-technology
- ☐ Low switching losses
- ☐ $V_{CE(sat)}$ with positive temperature coefficient
- ☐ Fast switching and short tail current
- ☐ Free wheeling diodes with fast and soft reverse recovery



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
MM50GBU65B	650V	50A	1.5V	175°C	MM50GBU65B	TO-247

ABSOLUTE MAXIMUM RATINGS(T_C *=25°C unless otherwise specified)*

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	T_J=25℃	650	V
V_{GES}	Gate Emitter Voltage		±25*	
	Transient Gate Emitter Voltage（tp≤10μs,D<0.01）		±30	
I_C	DC Collector Current	T_C=25℃	80	A
		T_C=100℃	60	
I_{Cpuls}	Pulsed collector current,tp limited by T_{Jmax}		150	
P_{tot}	Power Dissipation Per IGBT		357	W
V_{RRM}	Repetitive Reverse Voltage	T_J=25℃	650	V
$I_{F(AV)}$	Average Forward Current	T_C=25℃	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	
Torque	to heatsink	Recommended（M3）	1.1	Nm
Weight			8	g

* not exceed 20V in application

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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		5.0	6.0	7.0	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	I_C=50A, V_{GE}=15V, T_J=25℃			1.5	1.85	
		I_C=50A, V_{GE}=15V, T_J=125℃			1.7		
		I_C=50A, V_{GE}=15V, T_J=150℃			1.8		
I_{CES}	Collector Leakage Current	V_{CE}=650V, V_{GE}=0V, T_J=25℃				100	μA
		V_{CE}=650V, V_{GE}=0V, T_J=150℃				10	mA
I_{GES}	Gate Leakage Current	V_{CE}=0V,V_{GE}=±20V, T_J=25℃		-200		200	nA
Q_G	Gate Charge	V_{CE}=400V, I_C=50A , V_{GE}=15V			280		nC
C_{ies}	Input Capacitance	V_{CE}=25V, V_{GE}=0V, f =1MHz			5.3		nF
C_{res}	Reverse Transfer Capacitance				140		pF
$t_{d(on)}$	Turn on Delay Time	V_{CC}=400V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		30		ns
			T_J=125℃		35		ns
			T_J=150℃		35		ns
t_r	Rise Time		T_J=25℃		25		ns
			T_J=125℃		28		ns
			T_J=150℃		28		ns
$t_{d(off)}$	Turn off Delay Time	V_{CC}=400V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=25℃		210		ns
			T_J=125℃		230		ns
			T_J=150℃		240		ns
t_f	Fall Time		T_J=25℃		150		ns
			T_J=125℃		210		ns
			T_J=150℃		220		ns
E_{on}	Turn on Energy	V_{CC}=400V,I_C=50A R_G =7.5Ω, V_{GE}=±15V, Inductive Load	T_J=125℃		1.55		mJ
			T_J=150℃		1.6		mJ
E_{off}	Turn off Energy		T_J=125℃		1.85		mJ
			T_J=150℃		1.9		mJ
R_{thJC}	Junction to Case Thermal Resistance （ Per IGBT）					0.42	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℃		1.85	2.35	V
		I_F=50A , V_{GE}=0V, T_J =125℃		1.65		
		I_F=50A , V_{GE}=0V, T_J =150℃		1.55		
t_{rr}	Reverse Recovery Time	I_F=50A , V_R=400V dI_F/dt=-2000A/μs T_J =150℃		120		ns
I_{RRM}	Max. Reverse Recovery Current			50		A
Q_{RR}	Reverse Recovery Charge			3.3		μC
E_{rec}	Reverse Recovery Energy			1		mJ
R_{thJCD}	Junction to Case Thermal Resistance （ Per Diode）				0.75	K /W

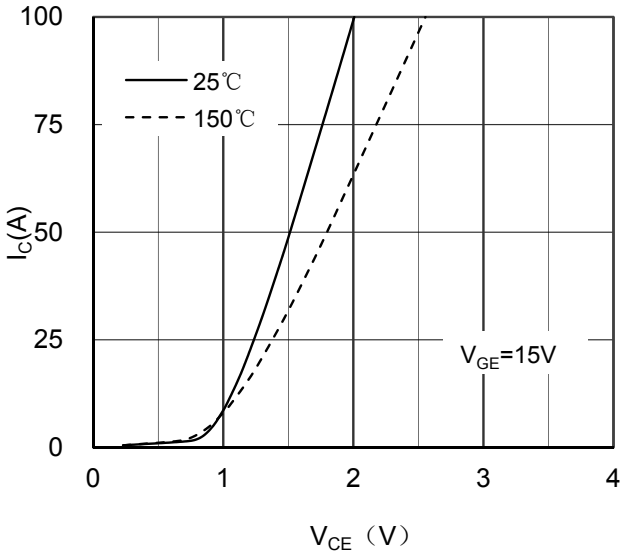


Figure 1. Typical Output Characteristics IGBT

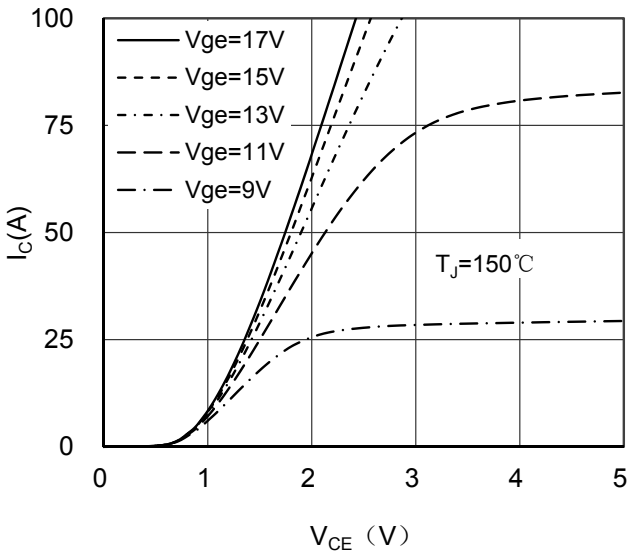


Figure 2. Typical Output Characteristics IGBT

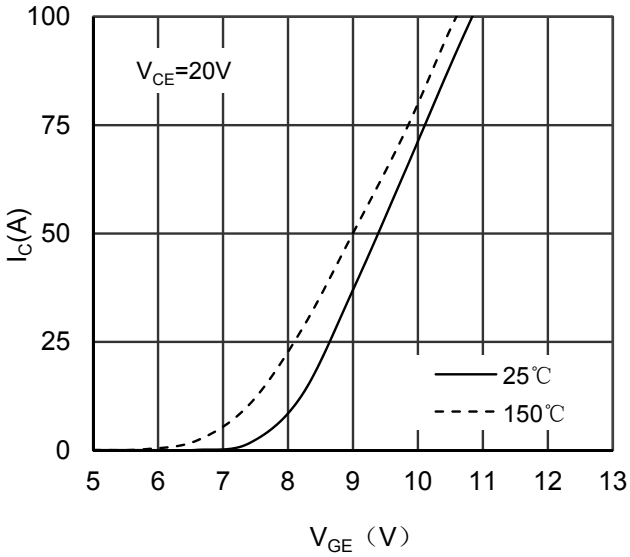


Figure 3. Typical Transfer characteristics IGBT

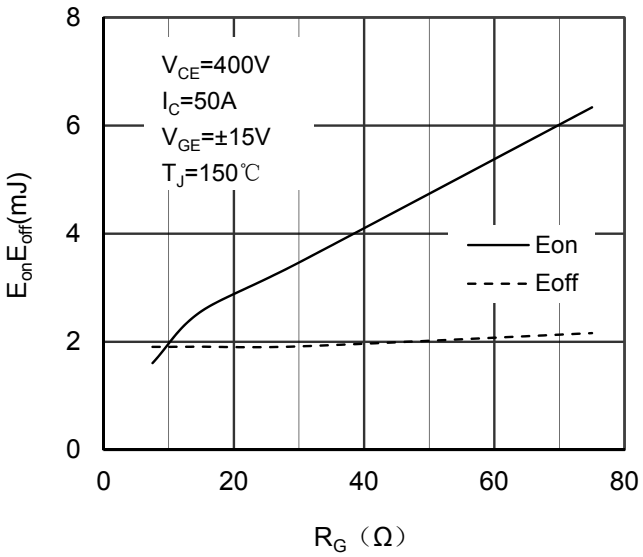


Figure 4. Switching Energy vs Gate Resistor IGBT

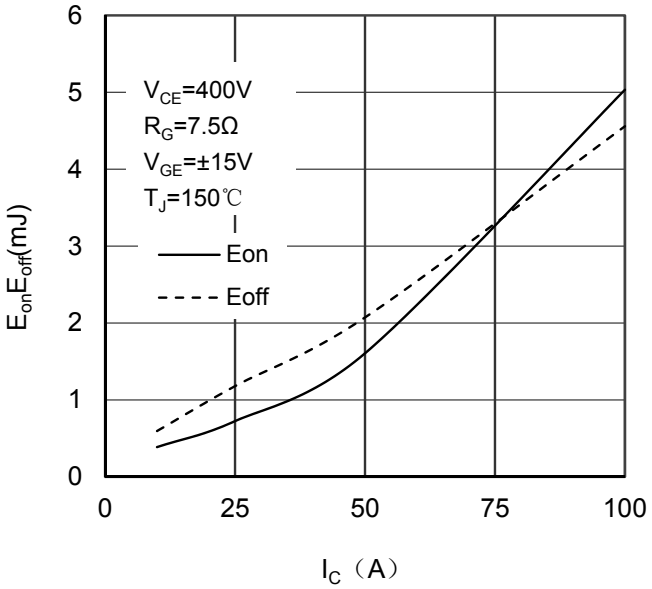


Figure 5. Switching Energy vs Collector Current IGBT

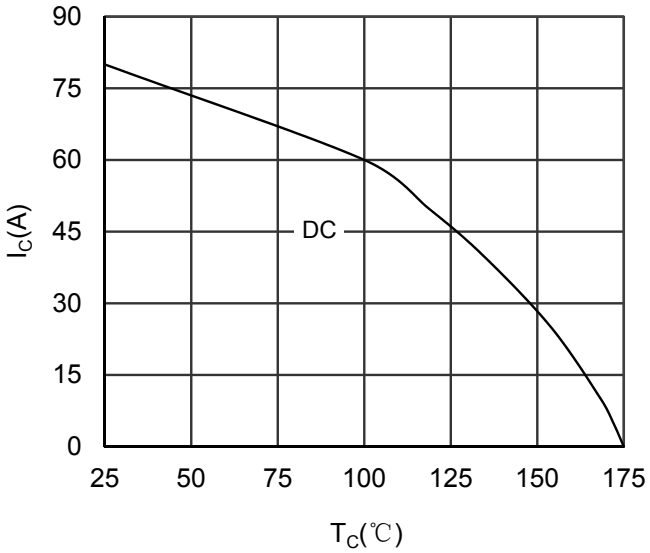


Figure 6. Collector Current vs Case temperature IGBT

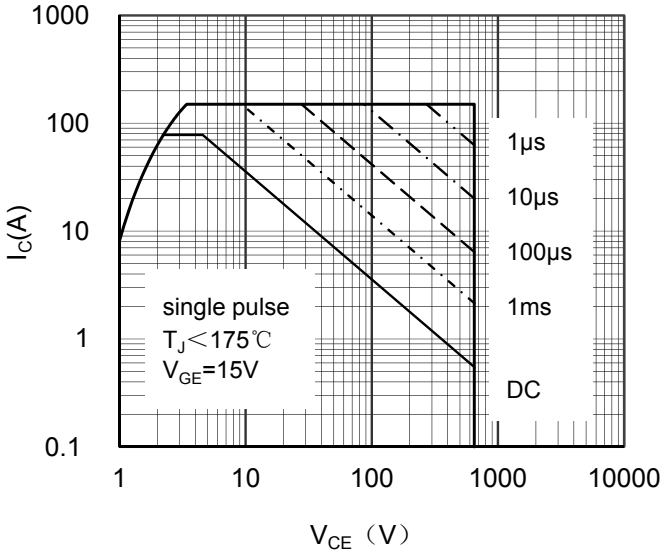


Figure 7. Forward Biased Safe Operating Area

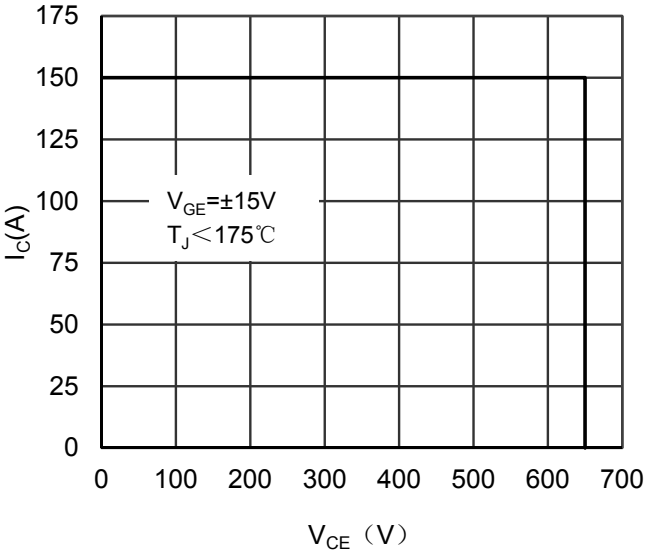


Figure 8. Reverse Biased Safe Operating Area IGBT

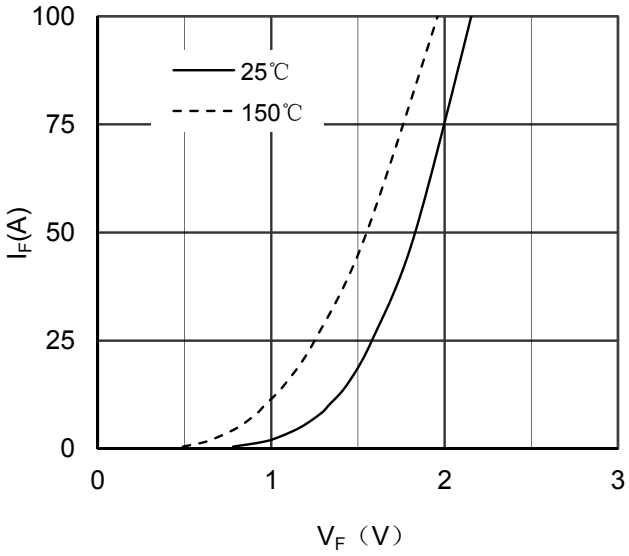


Figure 9. Diode Forward Characteristics Diode

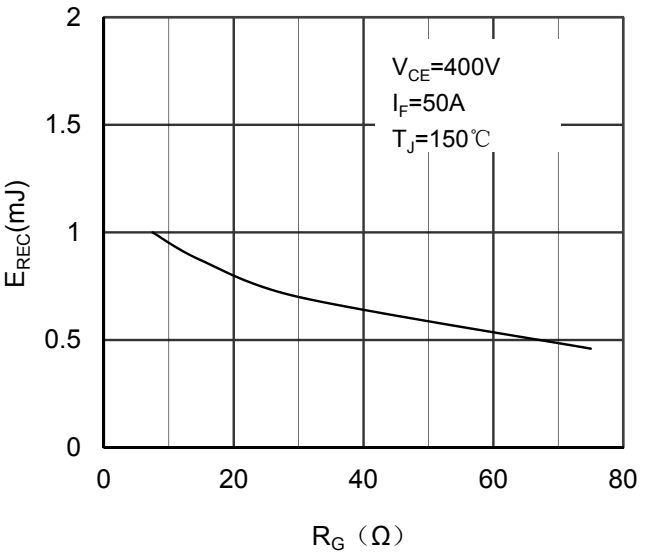


Figure 10. Switching Energy vs Gate Resistor Diode

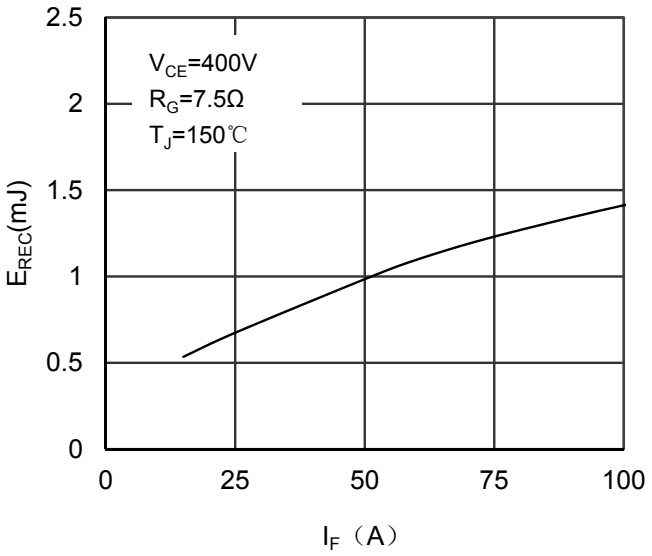


Figure 11. Switching Energy vs Forward Current Diode

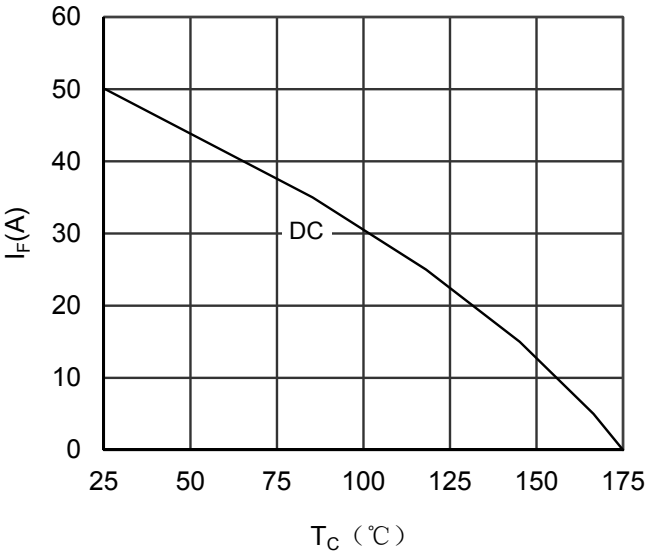


Figure 12. Forward current vs Case temperature Diode

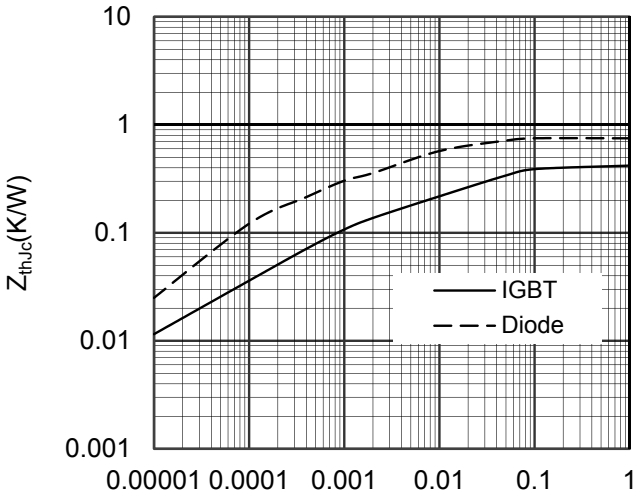
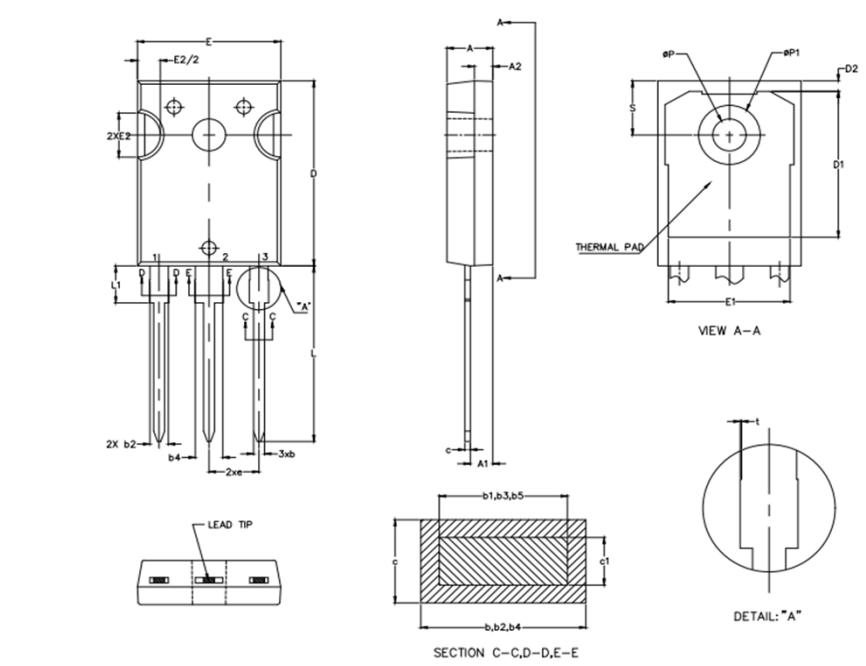


Figure 13. Transient Thermal Impedance of Diode and IGBT



SYMBOL	DIMENSIONS			
	mm		inch	
	MIN.	MAX.	MIN.	MAX.
A	4.90	5.10	0.193	0.201
A1	2.31	2.51	0.091	0.099
A2	1.90	2.10	0.075	0.083
b	1.16	1.26	0.046	0.050
b1	1.15	1.22	0.045	0.048
b2	1.96	2.06	0.077	0.081
b3	1.95	2.02	0.077	0.080
b4	2.96	3.06	0.117	0.120
b5	2.95	3.02	0.116	0.119
c	0.59	0.66	0.023	0.026
c1	0.58	0.62	0.023	0.024
D	20.90	21.10	0.823	0.831
D1	16.25	16.85	0.640	0.663
D2	1.05	1.35	0.041	0.053
E	15.75	15.90	0.620	0.626
E1	13.26	—	0.552	—
E2	4.90	5.10	0.193	0.201
e	5.44BSC		0.214BSC	
L	19.80	20.10	0.780	0.791
L1	—	4.30	—	0.169
øP	3.50	3.70	0.138	0.146
øP1	—	7.40	—	0.291
S	6.05	6.25	0.238	0.246
t	0.00	0.15	0.000	0.006

Dimensions in (mm)

Figure 14. Package Outline