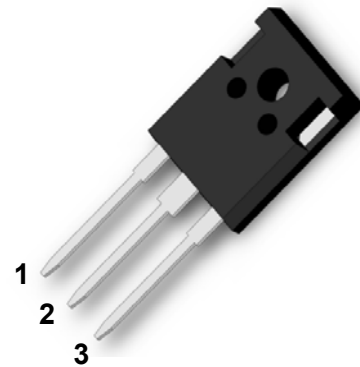


PRODUCT FEATURES

- 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
MM40GTU60B	600V	40A	2.6V	150°C	MM40GTU60B	TO-247

ABSOLUTE MAXIMUM RATINGS

$T_C=25^\circ C$ unless otherwise specified

Symbol	Parameter/Test Conditions		Values	Unit
V_{CES}	Collector Emitter Voltage	$T_J=25^\circ C$	600	V
V_{GES}	Gate Emitter Voltage		± 20	
I_C	DC Collector Current	$T_C=25^\circ C$	60	A
		$T_C=80^\circ C$	40	
I_{Cpuls}	Pulsed collector current, tp limited by T_{Jmax}		80	
P_{tot}	Power Dissipation Per IGBT		270	W
V_{RRM}	Repetitive Reverse Voltage	$T_J=25^\circ C$	600	V
$I_{F(AV)}$	Average Forward Current	$T_C=100^\circ C$	30	A
I_{Fpuls}	Diode pulsed current, tp limited by T_{Jmax}		60	
T_{Jmax}	Max. Junction Temperature		150	°C
T_{Jop}	Operating Temperature		-40~150	
T_{stg}	Storage Temperature		-55~125	
Torque	to heatsink	Recommended (M3)	1.1	Nm
Weight			6	g

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	$V_{CE}=V_{GE}, I_C=1.6\text{mA}$	4.5	5.0	5.5	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		2.6	2.9	
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		3.0		
I_{CES}	Collector Leakage Current	$V_{CE}=600\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			100	μA
		$V_{CE}=600\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$			1	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=25^\circ\text{C}$	-200		200	nA
Q_g	Gate Charge	$V_{CE}=300\text{V}, I_C=40\text{A}, V_{GE}=15\text{V}$		115		nC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		2.2		nF
C_{res}	Reverse Transfer Capacitance				55	pF
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=300\text{V}, I_C=40\text{A}$ $R_G=33\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		50	ns
			$T_J=125^\circ\text{C}$		60	ns
t_r	Rise Time		$T_J=25^\circ\text{C}$		70	ns
			$T_J=125^\circ\text{C}$		80	ns
$t_{d(off)}$	Turn off Delay Time	$V_{CC}=300\text{V}, I_C=40\text{A}$ $R_G=33\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		160	ns
			$T_J=125^\circ\text{C}$		170	ns
t_f	Fall Time		$T_J=25^\circ\text{C}$		30	ns
			$T_J=125^\circ\text{C}$		40	ns
E_{on}	Turn on Energy	$V_{CC}=300\text{V}, I_C=40\text{A}$ $R_G=33\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		0.8	mJ
			$T_J=125^\circ\text{C}$		1.1	mJ
E_{off}	Turn off Energy		$T_J=25^\circ\text{C}$		0.4	mJ
			$T_J=125^\circ\text{C}$		0.45	mJ
I_{sc}	Short Circuit Current	$t_{psc}\leq 5\mu\text{s}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=360\text{V}$		160		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.55	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	$I_F=30\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		1.75	2.1	V
		$I_F=30\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.55		
t_{rr}	Reverse Recovery Time	$I_F=30\text{A}, V_R=300\text{V}$		80		ns
I_{RRM}	Max. Reverse Recovery Current	$di_F/dt=-700\text{A}/\mu\text{s}$		18		A
Q_{RR}	Reverse Recovery Charge	$T_J=125^\circ\text{C}$		800		nC
E_{rec}	Reverse Recovery Energy			0.1		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				0.85	K/W

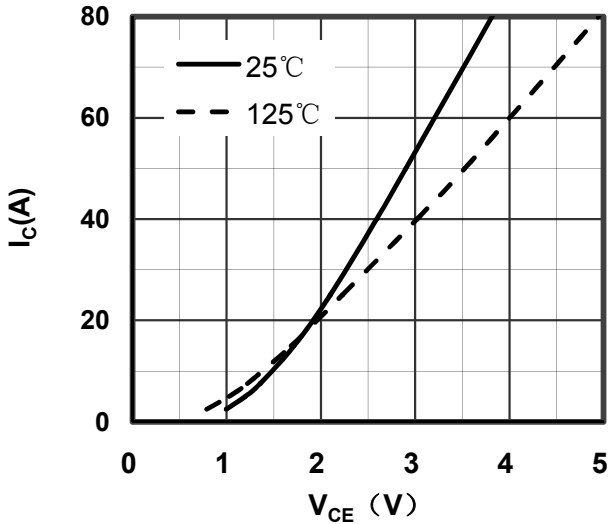


Figure 1. Typical Output Characteristics IGBT

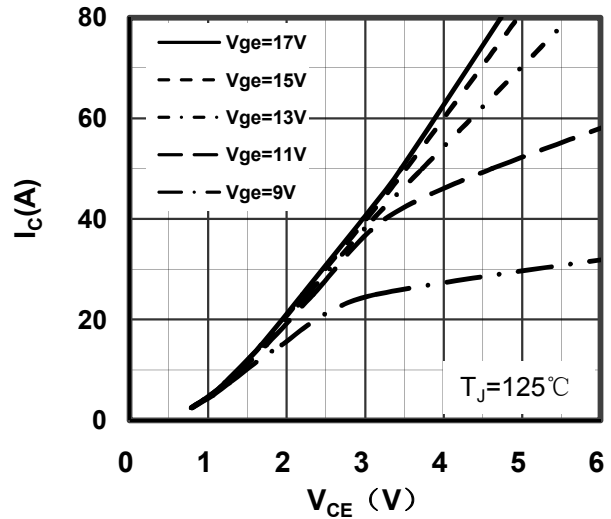


Figure 2. Typical Output Characteristics IGBT

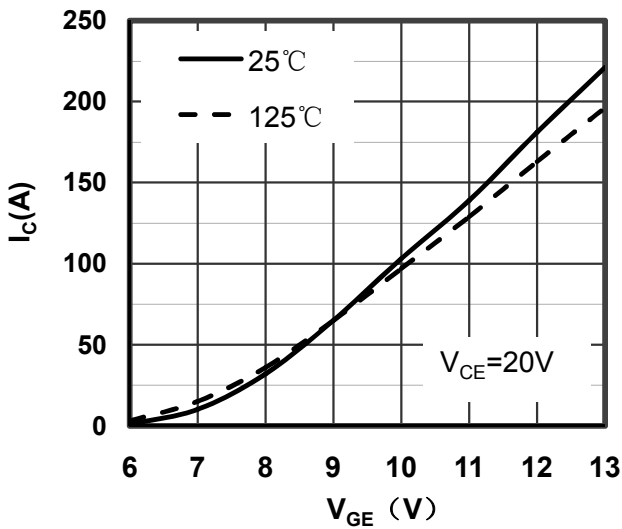


Figure 3. Typical Transfer characteristics IGBT

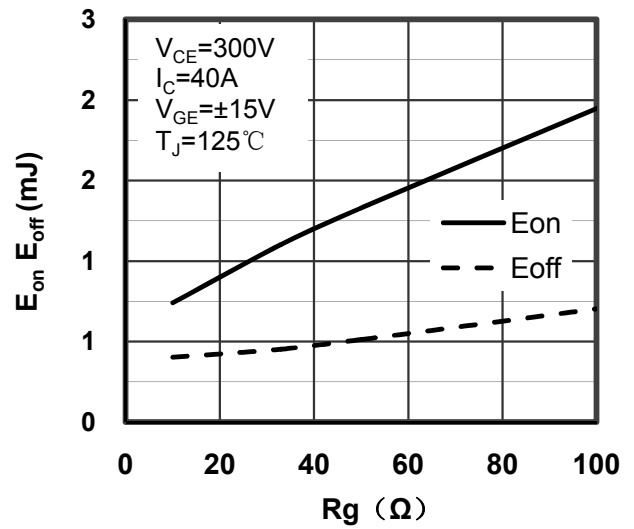


Figure 4. Switching Energy vs Gate Resistor IGBT

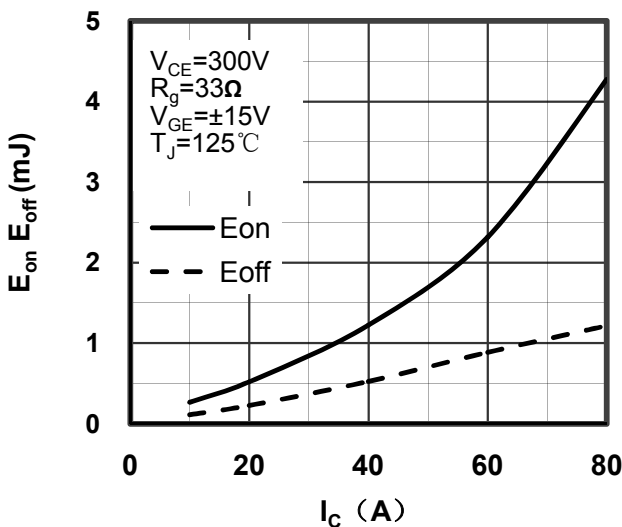


Figure 5. Switching Energy vs Collector Current IGBT

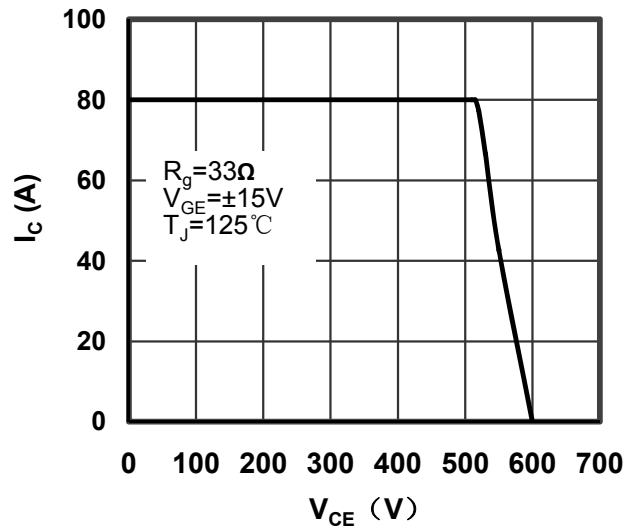


Figure 6. Reverse Biased Safe Operating Area IGBT

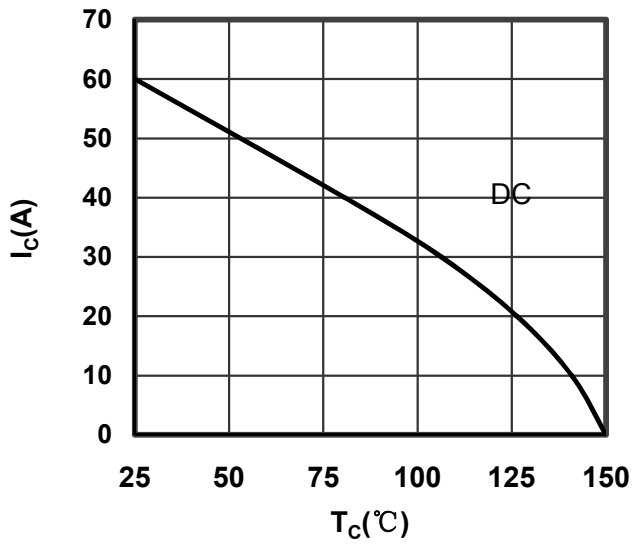


Figure 7. Collector Current vs Case temperature IGBT

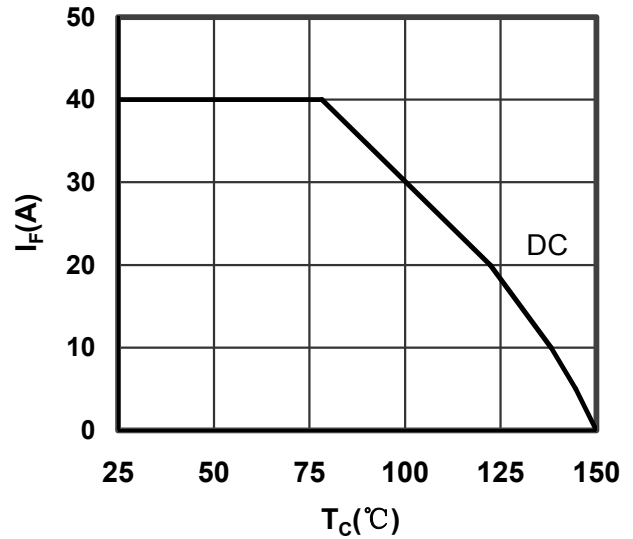


Figure 8. Forward current vs Case temperature Diode

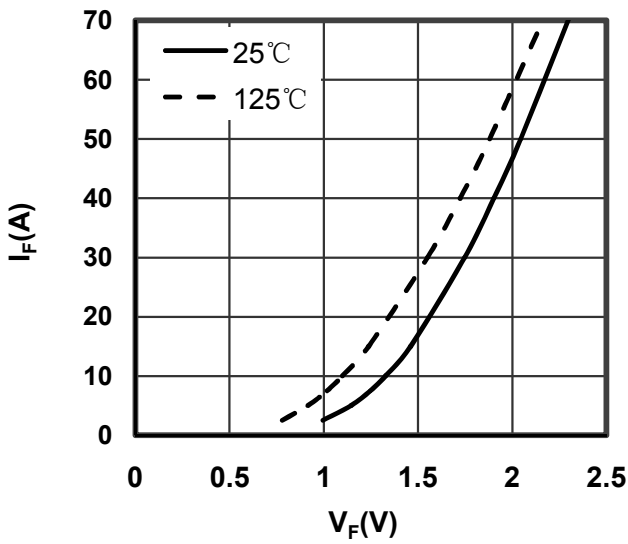


Figure 9. Diode Forward Characteristics Diode

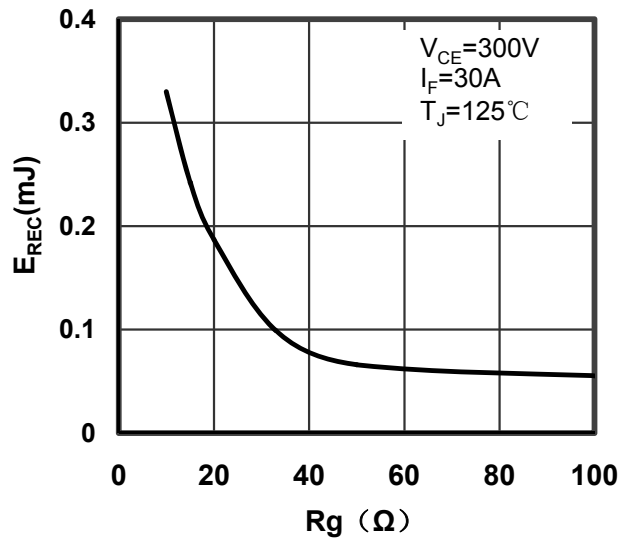


Figure 10. Switching Energy vs Gate Resistor Diode

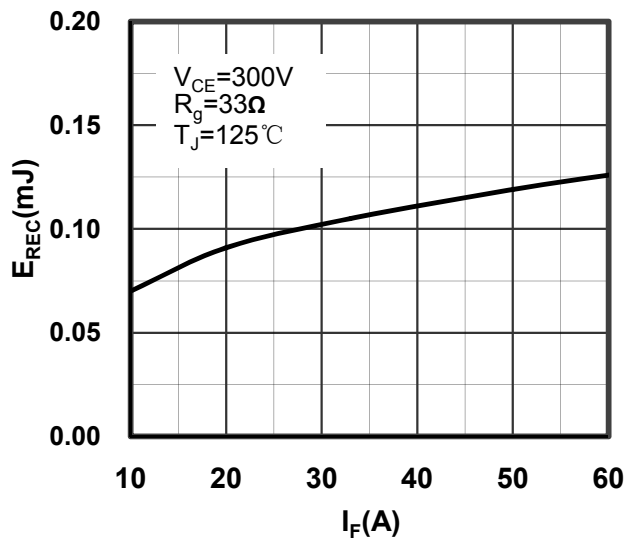


Figure 11. Switching Energy vs Forward Current Diode

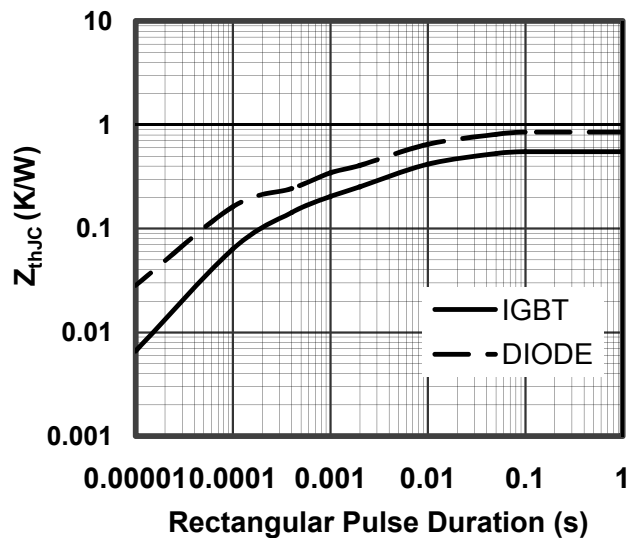


Figure 12. Transient Thermal Impedance of Diode and IGBT

