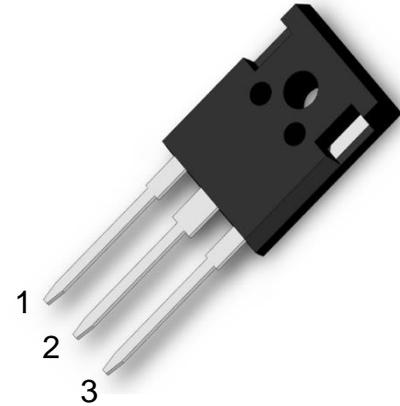


PRODUCT FEATURES

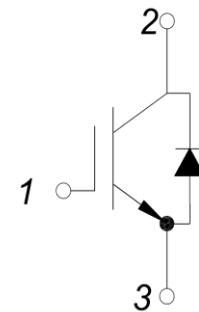
- 650V IGBT chip in trench FS-technology
- Low switching losses
- $V_{CE(sat)}$ with positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery



APPLICATIONS

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

1.Gate
2.Collector
3.Emmitter



Type	V_{CES}	I_C	$V_{CE(sat)}$ $T_J=25^\circ C$	T_{Jmax}	Marking	Package
MM40G3U65B	650V	40A	1.75V	175°C	MM40G3U65B	TO-247

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

Symbol	Parameter/Test Conditions	Values	Unit	
V_{CES}	Collector Emitter Voltage	$T_J=25^\circ C$	V	
V_{GES}	Gate Emitter Voltage			
I_C	DC Collector Current	$T_C=25^\circ C$	A	
		$T_C=100^\circ C$		
I_{Cpuls}	Pulsed collector current, tp limited by T_{Jmax}	120		
P_{tot}	Power Dissipation Per IGBT	230	W	
V_{RRM}	Repetitive Reverse Voltage	$T_J=25^\circ C$	V	
$I_{F(AV)}$	Average Forward Current	$T_C=25^\circ C$	A	
I_{Fpuls}	Diode pulsed current, tp limited by T_{Jmax}	80		
T_{Jmax}	Max. Junction Temperature	175	°C	
T_{Jop}	Operating Temperature	-40~175		
T_{stg}	Storage Temperature	-55~150		
Torque	to heatsink	Recommended (M3)	1.1	Nm
Weight			8	g

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MM40G3U65B

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	5.2	6.0	V
$V_{CE(sat)}$	Collector Emitter Saturation Voltage	$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$		1.75	2.25	
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$		2.1		
		$I_C=40\text{A}, V_{GE}=15\text{V}, T_J=150^\circ\text{C}$		2.15		
I_{CES}	Collector Leakage Current	$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$			100	μA
		$V_{CE}=650\text{V}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$			10	mA
I_{GES}	Gate Leakage Current	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}, T_J=25^\circ\text{C}$	-200		200	nA
R_{gint}	Integrated Gate Resistor			2		Ω
Q_g	Gate Charge	$V_{CE}=300\text{V}, I_C=40\text{A}, V_{GE}=15\text{V}$		180		nC
C_{ies}	Input Capacitance	$V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$		1.8		nF
C_{res}	Reverse Transfer Capacitance				95	
$t_{d(on)}$	Turn on Delay Time	$V_{CC}=400\text{V}, I_C=40\text{A}$ $R_G=20\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load	$T_J=25^\circ\text{C}$		20	ns
			$T_J=125^\circ\text{C}$		25	ns
			$T_J=150^\circ\text{C}$		25	ns
t_r	Rise Time		$T_J=25^\circ\text{C}$		35	ns
			$T_J=125^\circ\text{C}$		40	ns
			$T_J=150^\circ\text{C}$		40	ns
$t_{d(off)}$	Turn off Delay Time	$T_J=25^\circ\text{C}$		200	ns	
		$T_J=125^\circ\text{C}$		230	ns	
		$T_J=150^\circ\text{C}$		240	ns	
t_f	Fall Time	$T_J=25^\circ\text{C}$		30	ns	
		$T_J=125^\circ\text{C}$		35	ns	
		$T_J=150^\circ\text{C}$		35	ns	
E_{on}	Turn on Energy	$T_J=125^\circ\text{C}$		1.75	mJ	
		$T_J=150^\circ\text{C}$		1.87	mJ	
E_{off}	Turn off Energy	$T_J=125^\circ\text{C}$		0.85	mJ	
		$T_J=150^\circ\text{C}$		0.9	mJ	
I_{SC}	Short Circuit Current	$tpsc \leq 6\mu\text{s}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=360\text{V}$		230		A
R_{thJC}	Junction to Case Thermal Resistance (Per IGBT)				0.65	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	$I_F=40\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$		2.15	2.6	V
		$I_F=40\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$		1.85		
		$I_F=40\text{A}, V_{GE}=0\text{V}, T_J=150^\circ\text{C}$		1.75		
t_{rr}	Reverse Recovery Time	$I_F=40\text{A}, V_R=400\text{V}$ $di_F/dt=-800\text{A}/\mu\text{s}$ $T_J=150^\circ\text{C}$		180		ns
I_{RRM}	Max. Reverse Recovery Current			25		A
Q_{RR}	Reverse Recovery Charge			2.1		μC
E_{rec}	Reverse Recovery Energy			0.42		mJ
R_{thJCD}	Junction to Case Thermal Resistance (Per Diode)				1.5	K/W

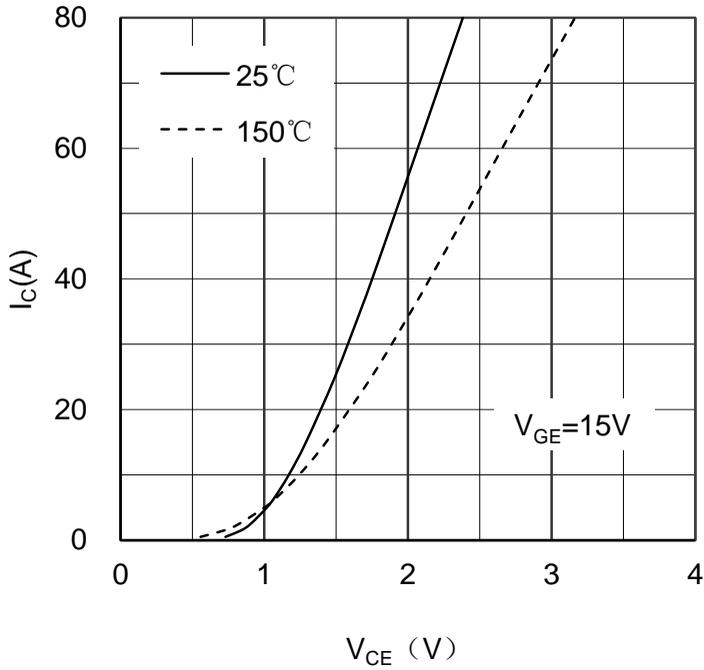


Figure 1. Typical Output Characteristics IGBT

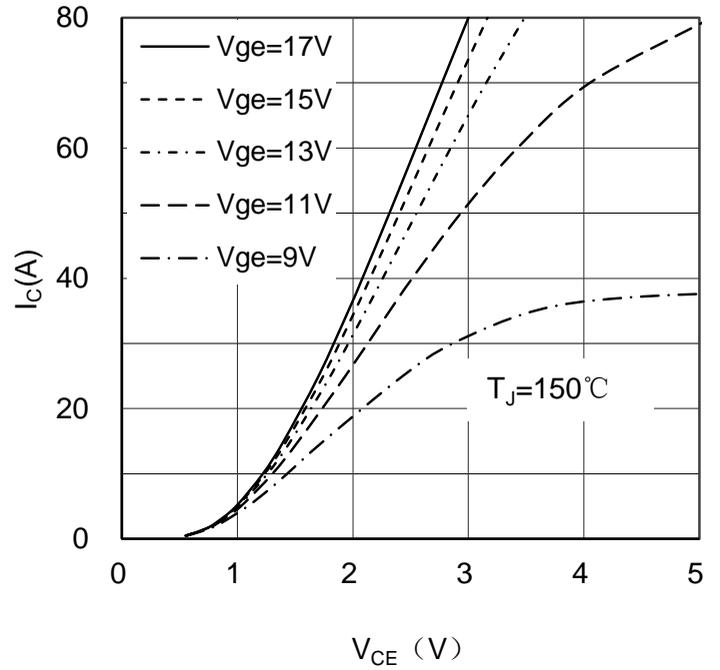


Figure 2. Typical Output Characteristics IGBT

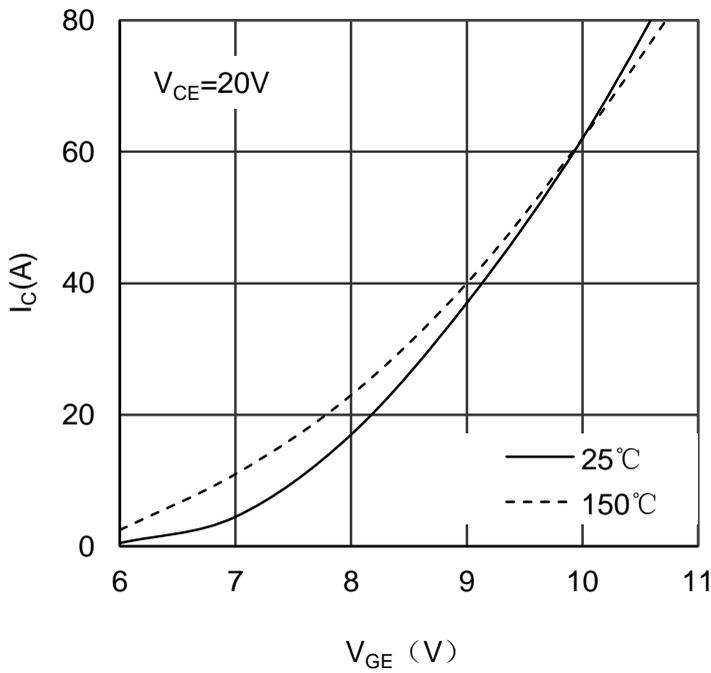


Figure 3. Typical Transfer characteristics IGBT

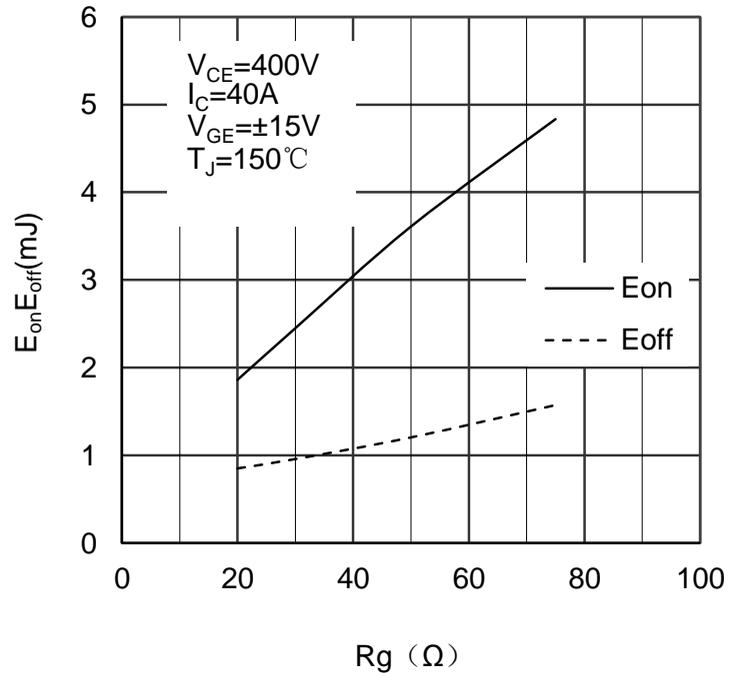


Figure 4. Switching Energy vs Gate Resistor IGBT

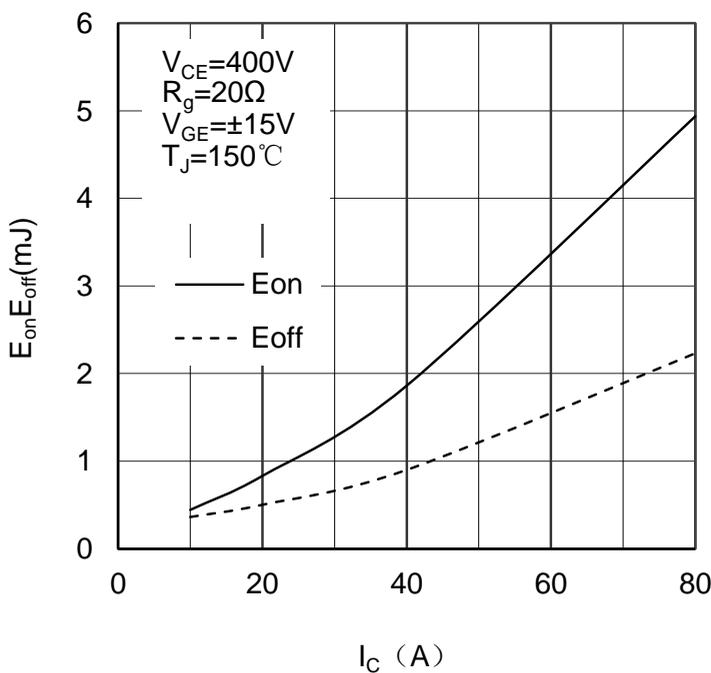


Figure 5. Switching Energy vs Collector Current IGBT

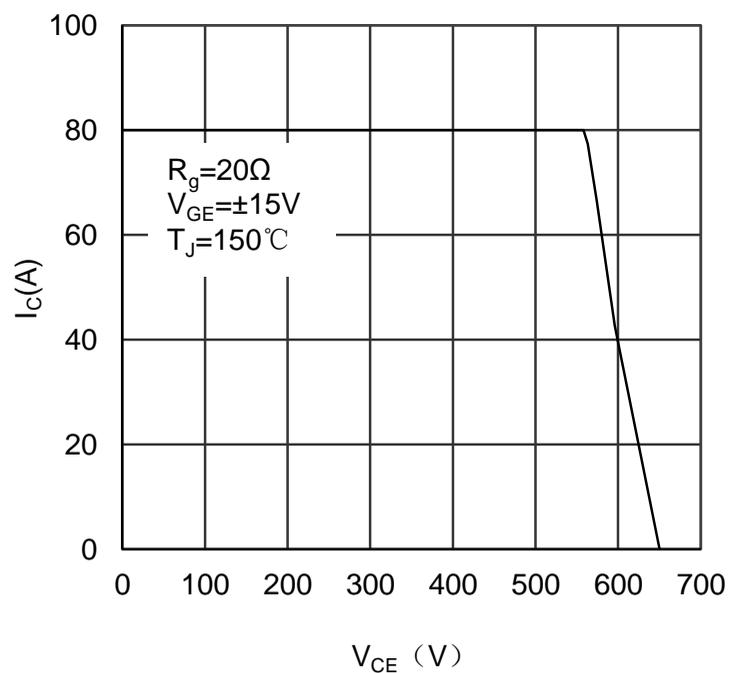


Figure 6. Reverse Biased Safe Operating Area IGBT

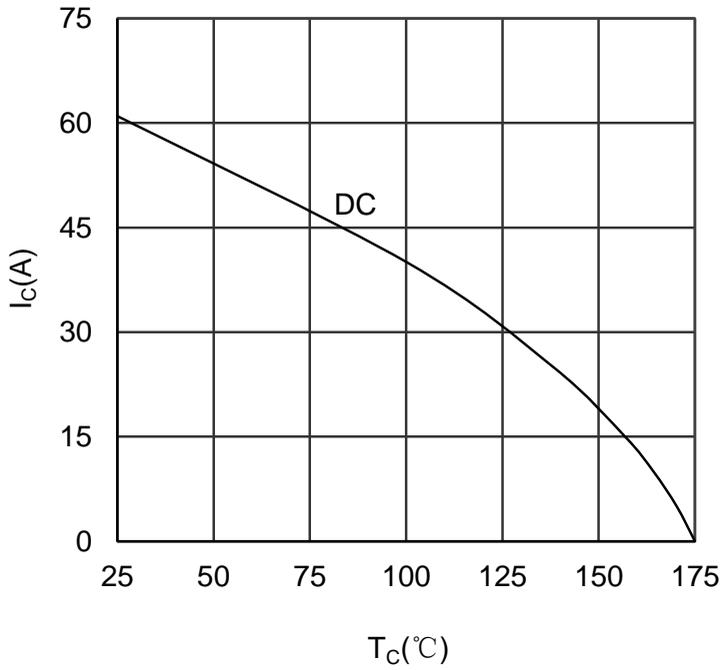


Figure 7. Collector Current vs Case temperature IGBT

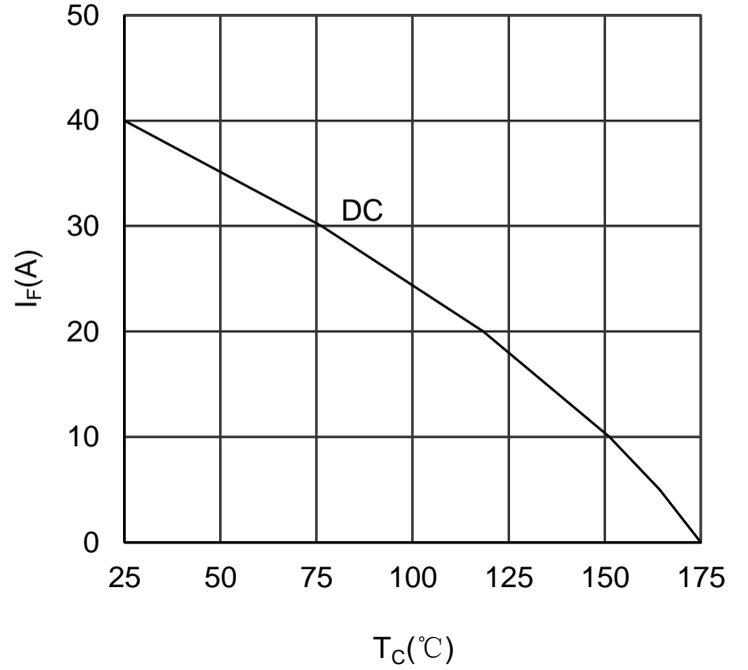


Figure 8. Forward current vs Case temperature Diode

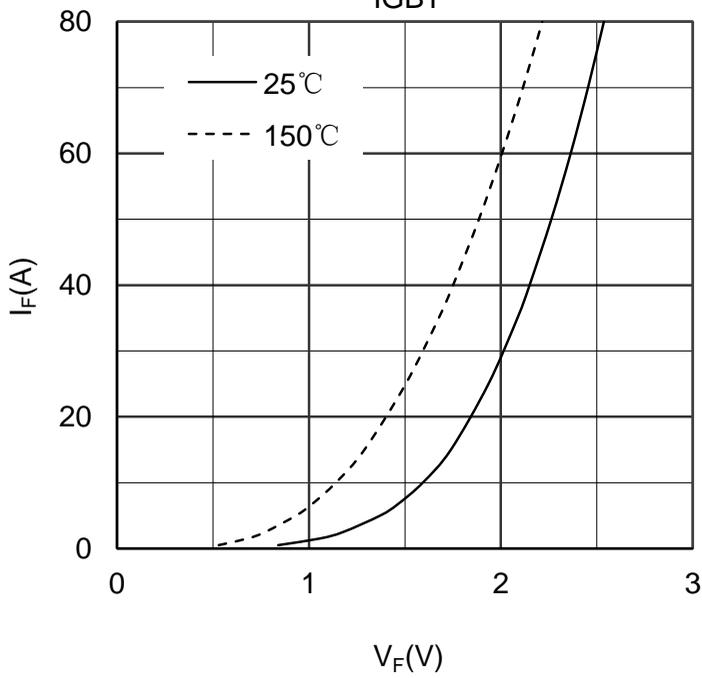


Figure 9. Diode Forward Characteristics Diode

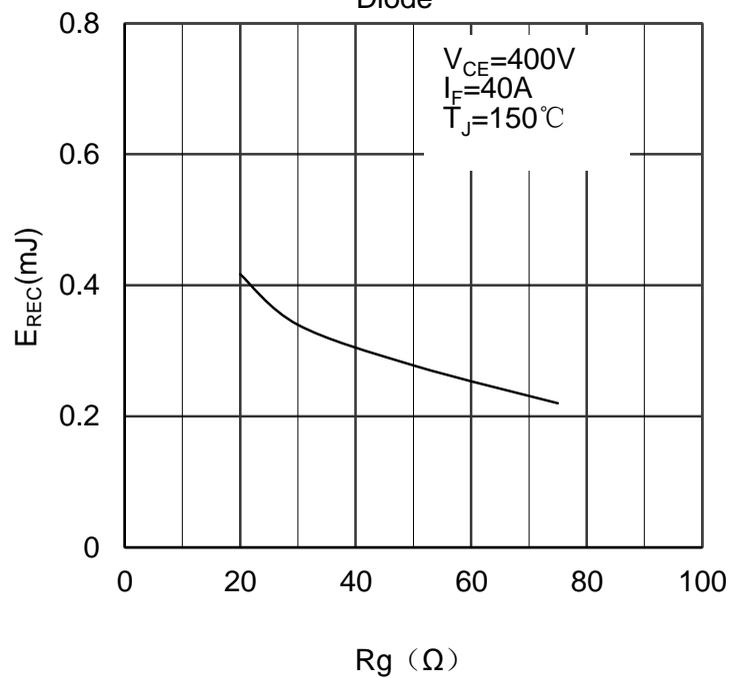


Figure 10. Switching Energy vs Gate Resistor Diode

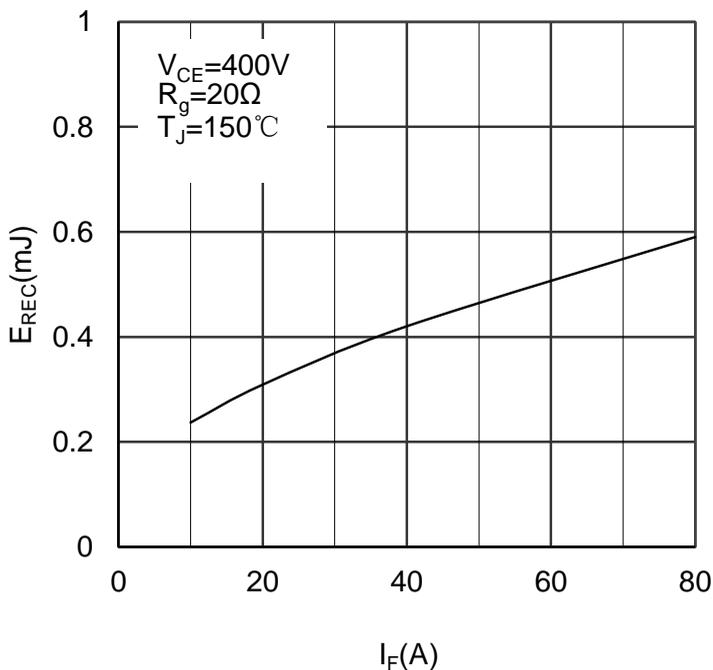


Figure 11. Switching Energy vs Forward Current Diode

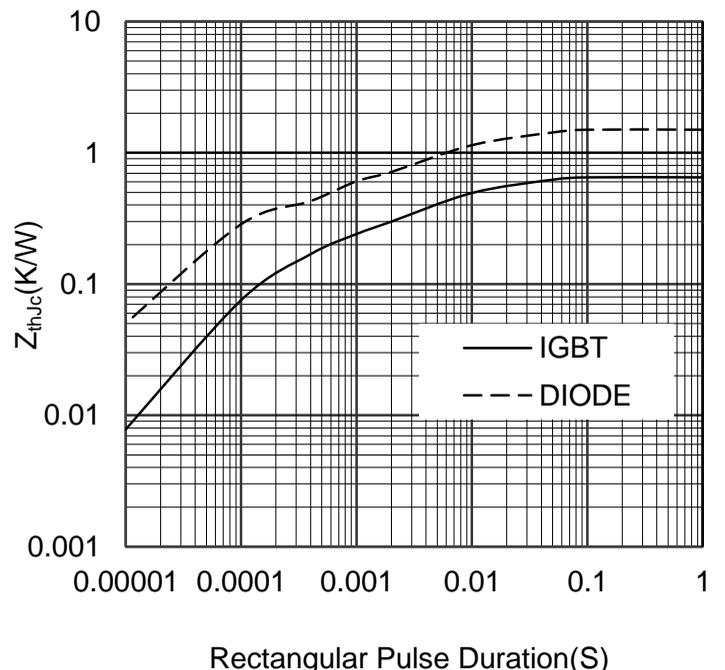
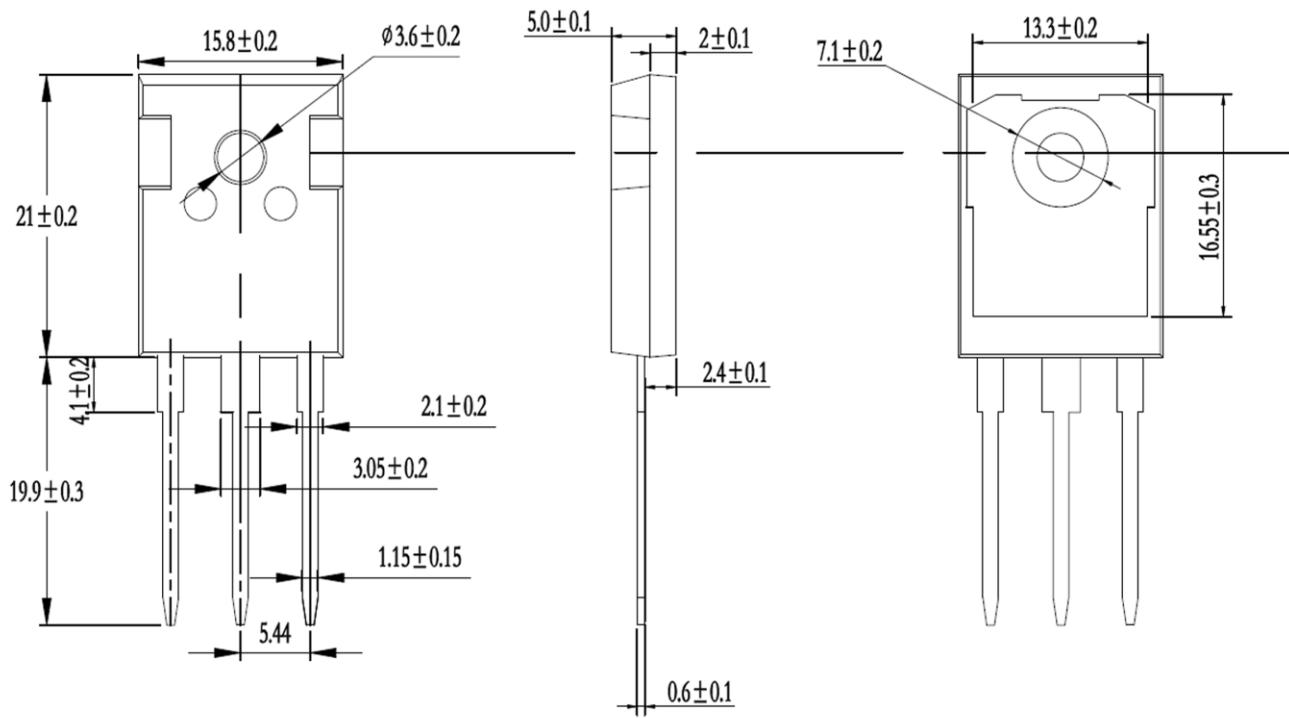


Figure 12. Transient Thermal Impedance of Diode and IGBT



Dimensions in (mm)
Figure 13. Package Outline