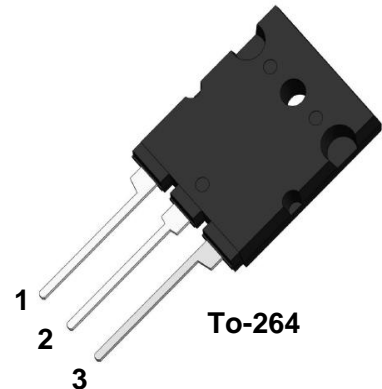


PRODUCT FEATURES

- 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 recov

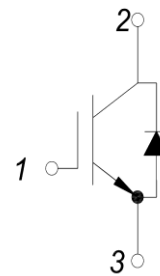


To-264

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 |
|-------------|-----------|-------|--------------------------------|------------|-------------|---------|
| MM60GTU120L | 1200V | 60A | 2.4V | 150°C | MM60GTU120L | TO-264 |

ABSOLUTE MAXIMUM RATINGS

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

| Symbol | Parameter/Test Conditions | | Values | t |
|---------------|--|-------------------|----------|----|
| V_{CES} | Collector Emitter Voltage | $T_J=25^\circ C$ | 1200 | V |
| V_{GES} | Gate Emitter Voltage | | ± 20 | |
| I_C | DC Collector Current | $T_C=25^\circ C$ | 75 | A |
| | | $T_C=100^\circ C$ | 60 | |
| I_{Cpuls} | Pulsed collector current, tp limited by | | 120 | |
| P_{tot} | Power Dissipation Per IGBT | | 500 | W |
| V_{RRM} | Repetitive Reverse Voltage | $T_J=25^\circ C$ | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | $T_C=80^\circ C$ | 35 | A |
| I_{Fpuls} | Diode pulsed current, tp limited by T_{Jmax} | | 70 | |
| 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 | | | 10 | g |

MM60GTU120L

IGBT ELECTRICAL CHARACTERISTICS

$T_C=25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | t |
|---------------|--|---|-------------------------|------|------|---------------|
| $V_{GE(th)}$ | Gate Emitter Threshold Voltage | $V_{CE}=V_{GE}, I_C=1.9\text{mA}$ | 5.0 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C=60\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$ | | 2.4 | 2.75 | |
| | | $I_C=60\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$ | | 2.75 | | |
| I_{CES} | Collector Leakage Current | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$ | | | 100 | μA |
| | | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$ | | | 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 | $V_{CE}=600\text{V}, I_C=60\text{A}, V_{GE}=15\text{V}$ | | 0.28 | | μC |
| C_{ies} | Input Capacitance | $V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$ | | 7.2 | | nF |
| C_{res} | Reverse Transfer Capacitance | | | 80 | | pF |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CC}=600\text{V}, I_C=60\text{A}$ $R_G=15\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load | $T_J=25^\circ\text{C}$ | | 100 | ns |
| | | | $T_J=125^\circ\text{C}$ | | 110 | ns |
| t_r | Rise Time | Inductive Load | $T_J=25^\circ\text{C}$ | | 55 | ns |
| | | | $T_J=125^\circ\text{C}$ | | 60 | ns |
| $t_{d(off)}$ | Turn off Delay Time | $V_{CC}=600\text{V}, I_C=60\text{A}$ $R_G=15\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load | $T_J=25^\circ\text{C}$ | | 280 | ns |
| | | | $T_J=125^\circ\text{C}$ | | 310 | ns |
| t_f | Fall Time | Inductive Load | $T_J=25^\circ\text{C}$ | | 80 | ns |
| | | | $T_J=125^\circ\text{C}$ | | 120 | ns |
| E_{on} | Turn on Energy | $V_{CC}=600\text{V}, I_C=60\text{A}$ $R_G=15\Omega,$ $V_{GE}=\pm 15\text{V},$ Inductive Load | $T_J=25^\circ\text{C}$ | | 5.6 | mJ |
| | | | $T_J=125^\circ\text{C}$ | | 7.2 | mJ |
| E_{off} | Turn off Energy | Inductive Load | $T_J=25^\circ\text{C}$ | | 3.8 | mJ |
| | | | $T_J=125^\circ\text{C}$ | | 4.5 | mJ |
| I_{sc} | Short Circuit Current | $t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}$ $T_J=125^\circ\text{C}, V_{CC}=600\text{V}$ | | 160 | | A |
| R_{thJC} | Junction to Case Thermal Resistance (Per IGBT) | | | | 0.25 | K/W |

Anti-Parallel Diode ELECTRICAL CHARACTERISTICS

$T_C=25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | t |
|-------------|---|---|------|------|------|---------------|
| V_F | Forward Voltage | $I_F=35\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$ | | 1.65 | 2.15 | V |
| | | $I_F=35\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$ | | 1.65 | | |
| t_{rr} | Reverse Recovery Time | $I_F=35\text{A}, V_R=600\text{V}$ | | 170 | | ns |
| I_{RRM} | Max. Reverse Recovery Current | $di_F/dt=-1100\text{A}/\mu\text{s}$ | | 55 | | A |
| Q_{RR} | Reverse Recovery Charge | $T_J=125^\circ\text{C}$ | | 6 | | μC |
| E_{rec} | Reverse Recovery Energy | | | 2 | | mJ |
| R_{thJCD} | Junction to Case Thermal Resistance (Per Diode) | | | | 0.6 | K/W |

MM60GTU120L

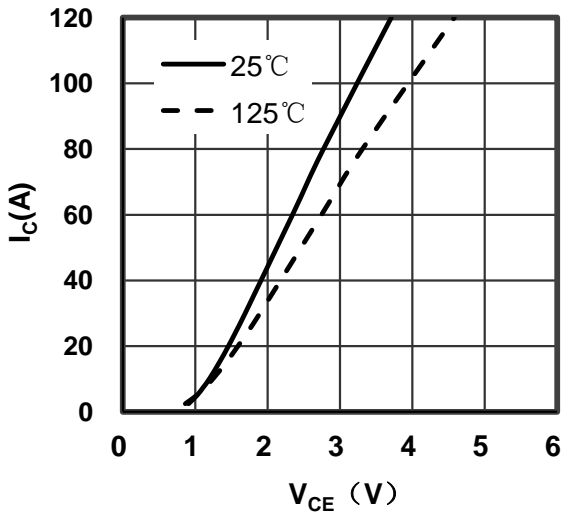


Figure 1. Typical Output Characteristics IGBT

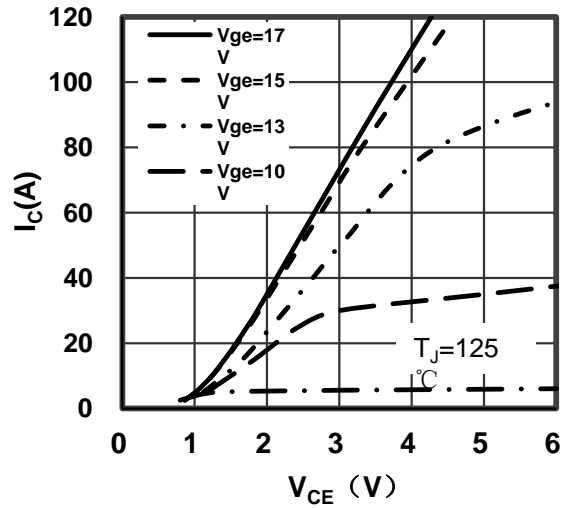


Figure 2. Typical Output Characteristics IGBT

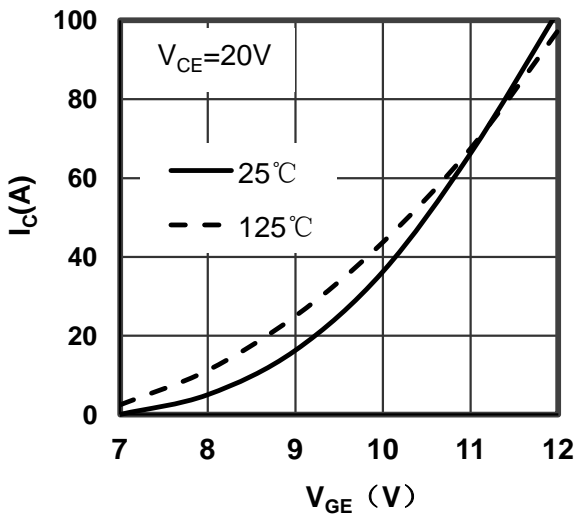


Figure 3. Typical Transfer characteristics IGBT

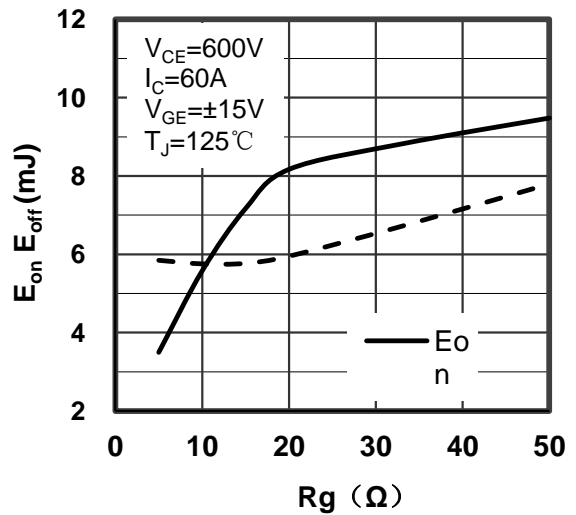


Figure 4. Switching Energy vs Gate Resistor IGBT

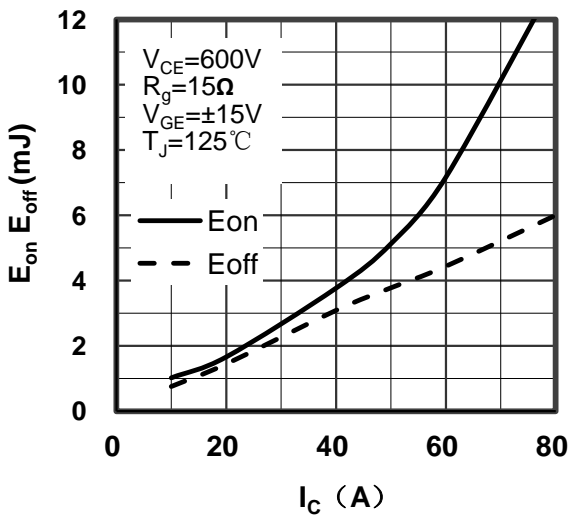


Figure 5. Switching Energy vs Collector Current

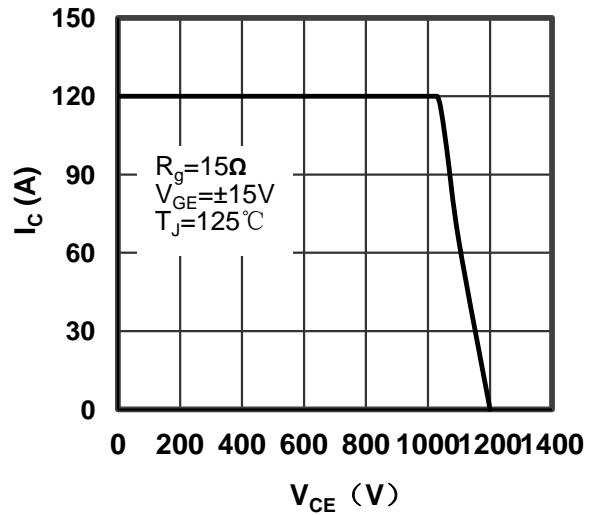


Figure 6. Reverse Biased Safe Operating Area

MM60GTU120L

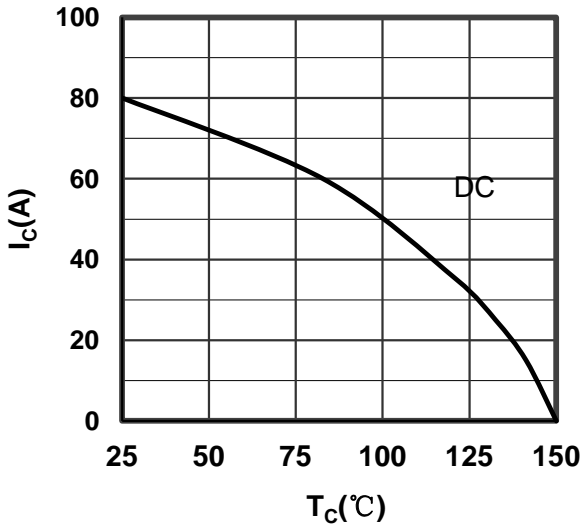


Figure 7. Collector Current vs Case temperature

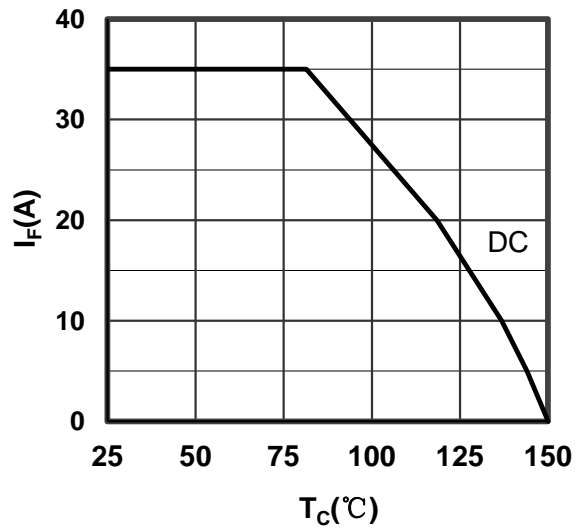


Figure 8. Forward current vs Case temperature

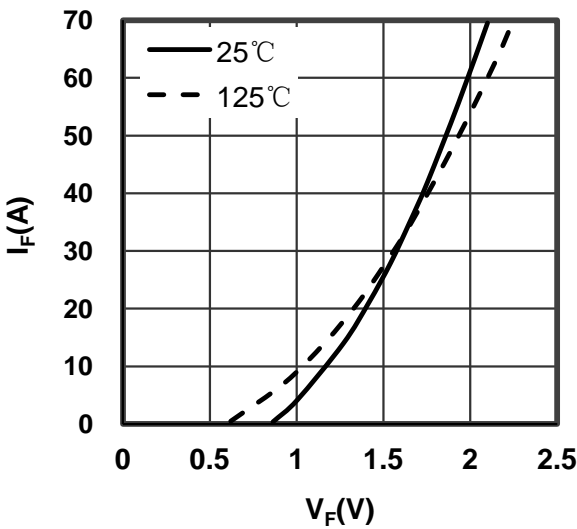


Figure 9. Diode Forward Characteristics Diode

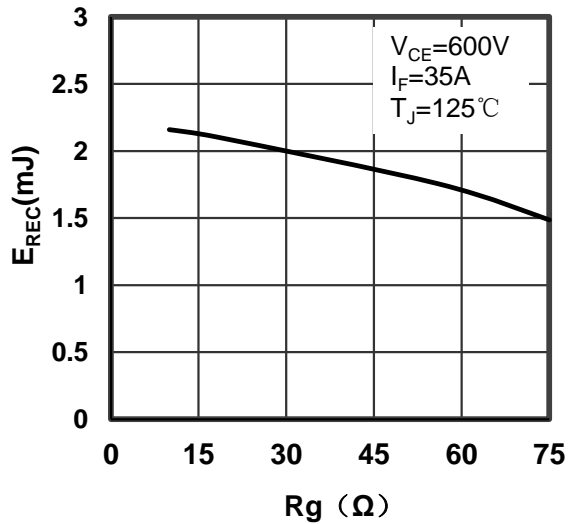


Figure 10. Switching Energy vs Gate Resistor

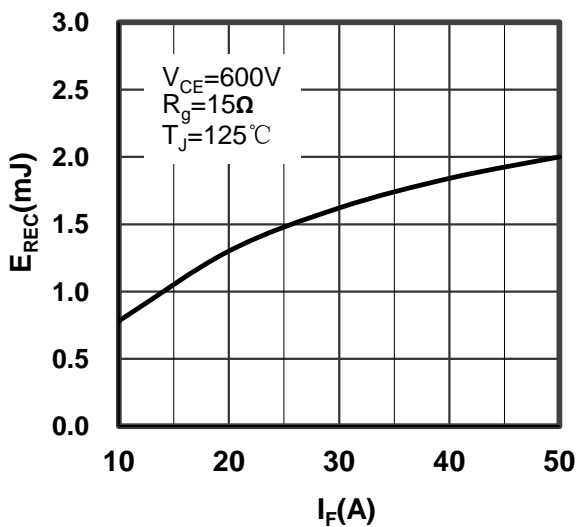


Figure 11. Switching Energy vs Forward Current

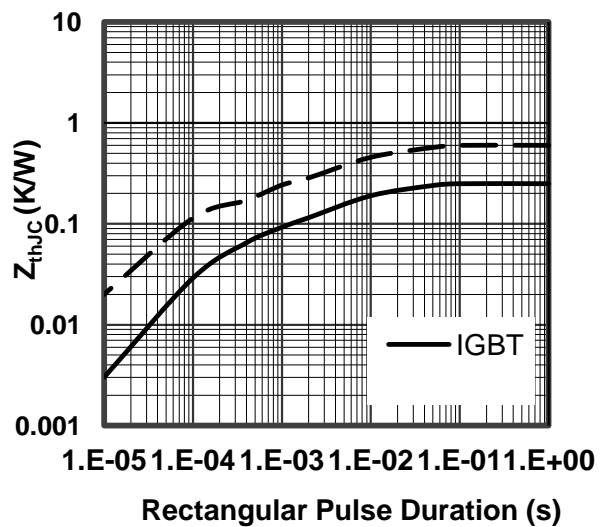
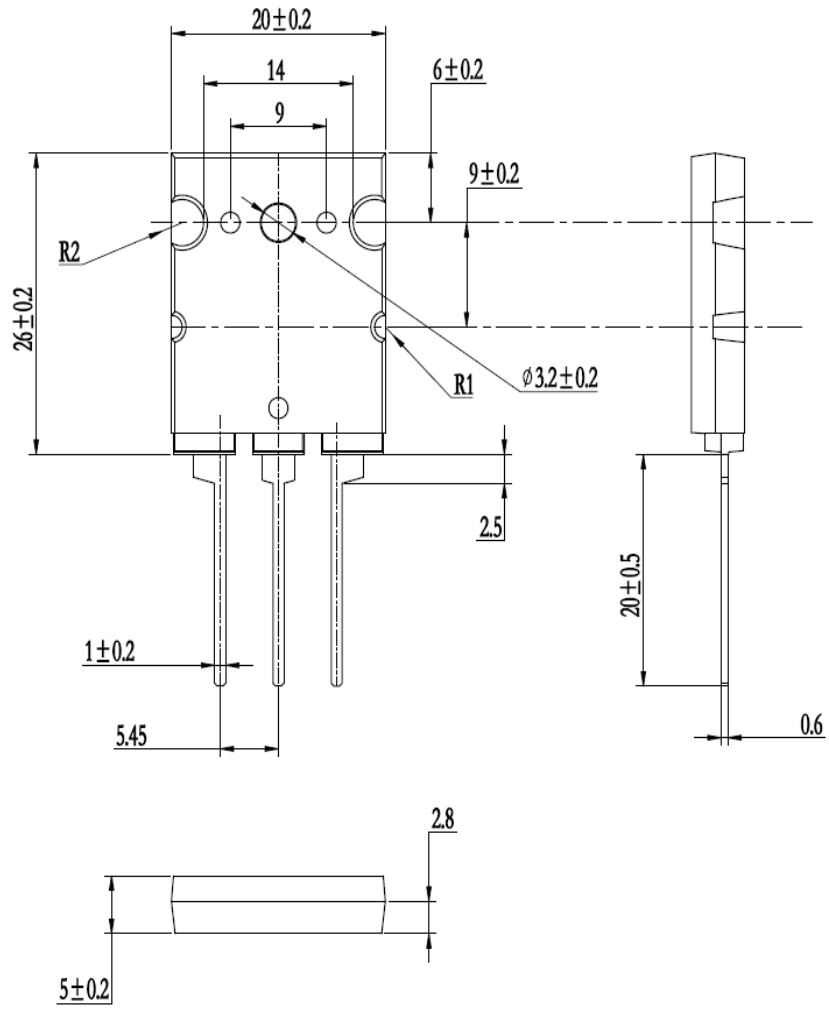


Figure 12. Transient Thermal Impedance of Diode and IGBT



Dimensions in (mm)
Figure 13. Package Outline