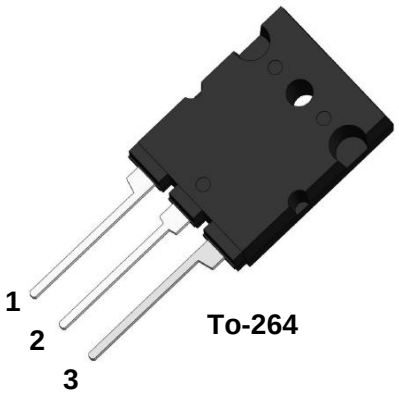
# MM50GTU120L

1200V 50A IGBT

December 2016 Version 0 RoHS Compliant

## PRODUCT FEATURES

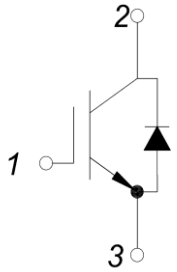
- ☐ IGBT chip in trench FS-technology
- ☐ Low switching losses
- ☐ $V_{CE(sat)}$ with positive temperature coefficient
- ☐ Fast switching and short tail current
- ☐ Free wheeling diodes with fast and soft reverse recovery




## 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°C | $T_{Jmax}$ | Marking | Package |
|---|---|---|---|---|---|---|
| MM50GTU120L | 1200V | 50A | 2.4V | 150°C | MM50GTU120L | TO-264 |

## ABSOLUTE MAXIMUM RATINGS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector Emitter Voltage | $T_J$=25℃ | 1200 | V |
| $V_{GES}$ | Gate Emitter Voltage | | ±20 | |
| $I_C$ | DC Collector Current | $T_C$=25℃ | 75 | A |
| | | $T_C$=100℃ | 50 | |
| $I_{Cpuls}$ | Pulsed collector current,tp limited by $T_{Jmax}$ | | 100 | |
| $P_{tot}$ | Power Dissipation Per IGBT | | 415 | W |
| $V_{RRM}$ | Repetitive Reverse Voltage | $T_J$=25℃ | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | $T_C$=80℃ | 35 | A |
| $I_{Fpuls}$ | Diode pulsed current,tp limited by $T_{Jmax}$ | | 70 | |
| $T_{Jmax}$ | Max. Junction Temperature | | 150 | ℃ |
| $T_{Jop}$ | Operating Temperature | | -40~150 | |
| $T_{stg}$ | Storage Temperature | | -55~125 | |
| Torque | to heatsink | Recommended（M3） | 1.1 | Nm |
| Weight | | | 10 | g |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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 | $V_{CE}=V_{GE}$, $I_C$=1.6mA | | 5.0 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C$=50A, $V_{GE}$=15V, $T_J$=25℃ | | | 2.4 | 2.75 | |
| | | $I_C$=50A, $V_{GE}$=15V, $T_J$=125℃ | | | 2.75 | | |
| $I_{CES}$ | Collector Leakage Current | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=25℃ | | | | 100 | μA |
| | | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=125℃ | | | | 1 | mA |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V,$V_{GE}$=±15V, $T_J$=25℃ | | -200 | | 200 | nA |
| $Q_g$ | Gate Charge | $V_{CE}$=600V, $I_C$=50A , $V_{GE}$=15V | | | 0.27 | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | 5.3 | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 60 | | pF |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CC}$=600V,$I_C$=50A $R_G$ =18Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 95 | | ns |
| | | | $T_J$=125℃ | | 105 | | ns |
| $t_r$ | Rise Time | | $T_J$=25℃ | | 40 | | ns |
| | | | $T_J$=125℃ | | 45 | | ns |
| $t_{d(off)}$ | Turn off Delay Time | $V_{CC}$=600V,$I_C$=50A $R_G$ =18Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 280 | | ns |
| | | | $T_J$=125℃ | | 310 | | ns |
| $t_f$ | Fall Time | | $T_J$=25℃ | | 60 | | ns |
| | | | $T_J$=125℃ | | 80 | | ns |
| $E_{on}$ | Turn on Energy | $V_{CC}$=600V,$I_C$=50A $R_G$ =18Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 4 | | mJ |
| | | | $T_J$=125℃ | | 6.2 | | mJ |
| $E_{off}$ | Turn off Energy | | $T_J$=25℃ | | 1.9 | | mJ |
| | | | $T_J$=125℃ | | 2.4 | | mJ |
| $I_{SC}$ | Short Circuit Current | tpsc≤10μS , $V_{GE}$=15V $T_J$=125℃,$V_{CC}$=600V | | | 160 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance （Per IGBT） | | | | | 0.3 | 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 | $I_F$=35A , $V_{GE}$=0V, $T_J$=25℃ | | 1.65 | 2.15 | V |
| | | $I_F$=35A , $V_{GE}$=0V, $T_J$=125℃ | | 1.65 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=35A , $V_R$=600V $dI_F/dt$=-1000A/μs $T_J$ =125℃ | | 185 | | ns |
| $I_{RRM}$ | Max. Reverse Recovery Current | | | 54 | | A |
| $Q_{RR}$ | Reverse Recovery Charge | | | 6.5 | | μC |
| $E_{rec}$ | Reverse Recovery Energy | | | 2.1 | | mJ |
| $R_{thJCD}$ | Junction to Case Thermal Resistance （Per Diode） | | | | 0.6 | K /W |

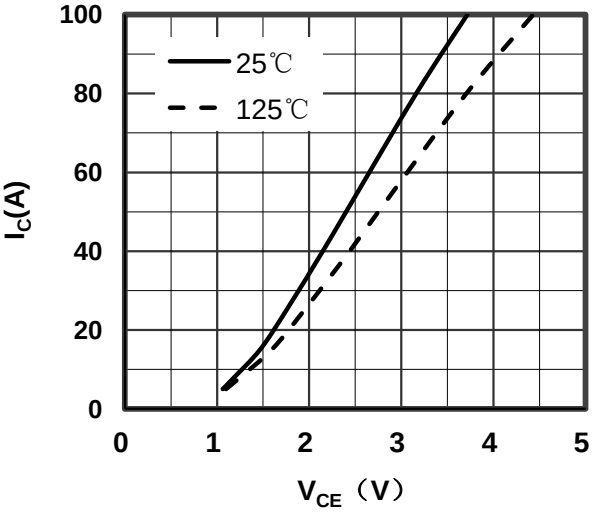



**Figure 1. Typical Output Characteristics IGBT**

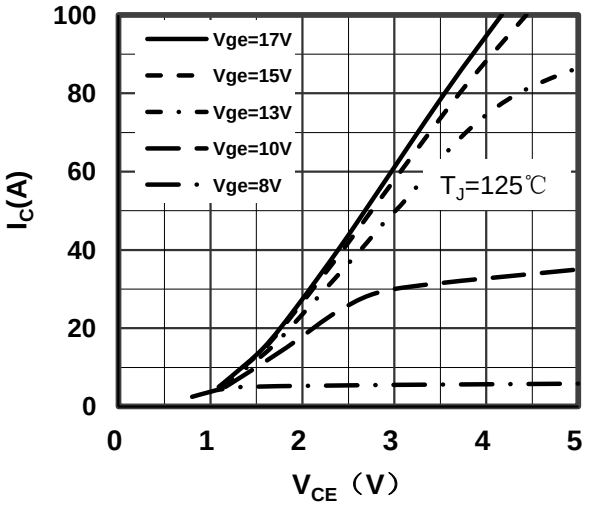



**Figure 2. Typical Output Characteristics IGBT**

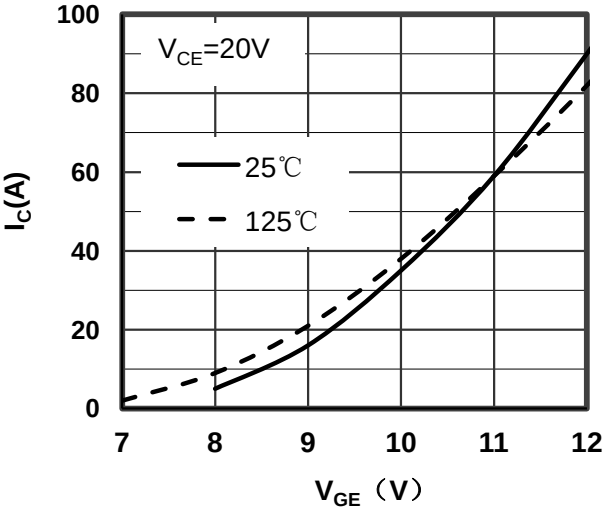



**Figure 3. Typical Transfer characteristics IGBT**

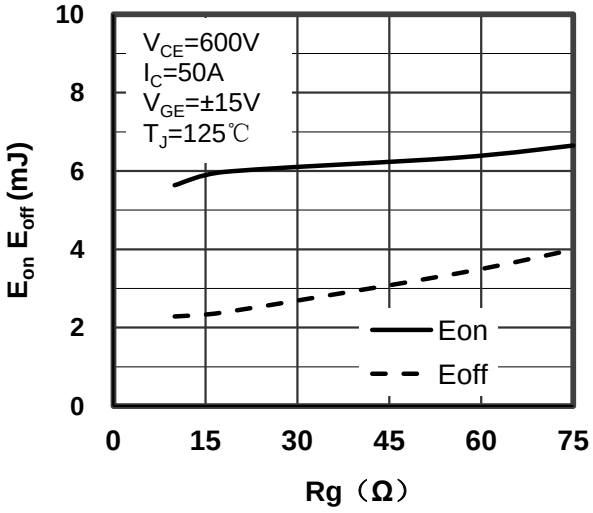



**Figure 4. Switching Energy vs Gate Resistor IGBT**

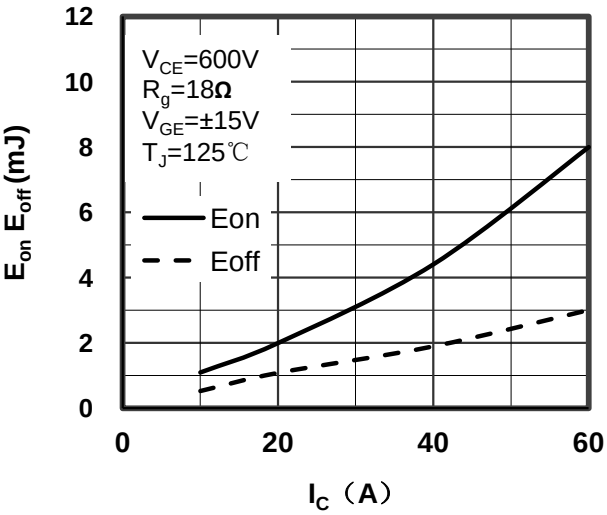



**Figure 5. Switching Energy vs Collector Current IGBT**

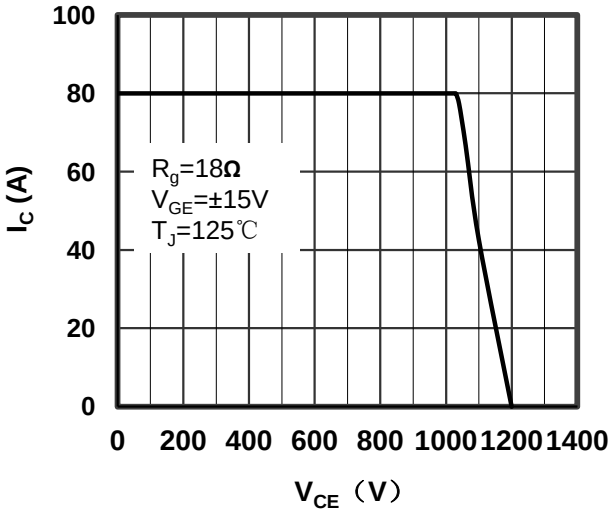



**Figure 6. Reverse Biased Safe Operating Area IGBT**

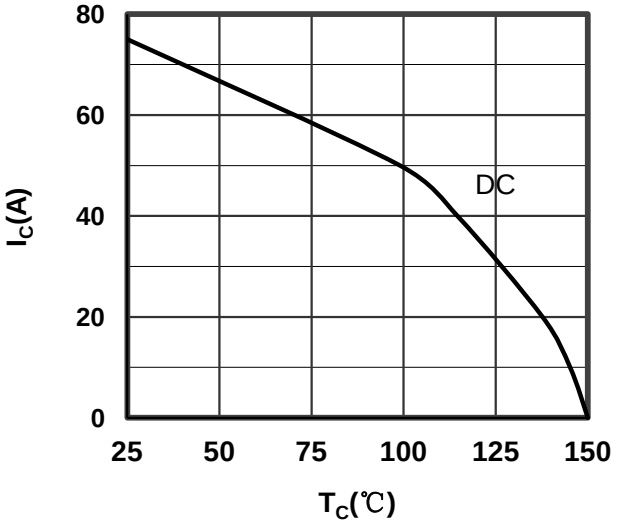



**Figure 7. Collector Current vs Case temperature IGBT**

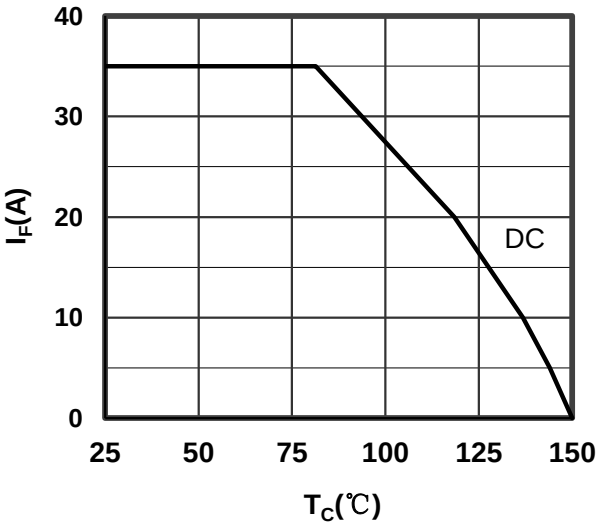



**Figure 8. Forward current vs Case temperature Diode**

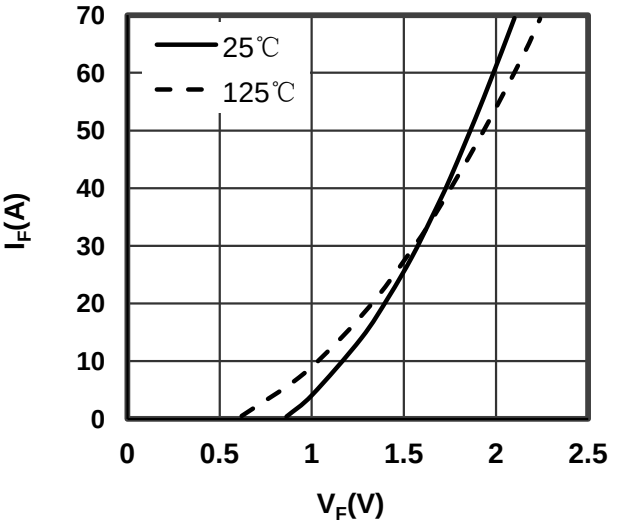



**Figure 9. Diode Forward Characteristics Diode**

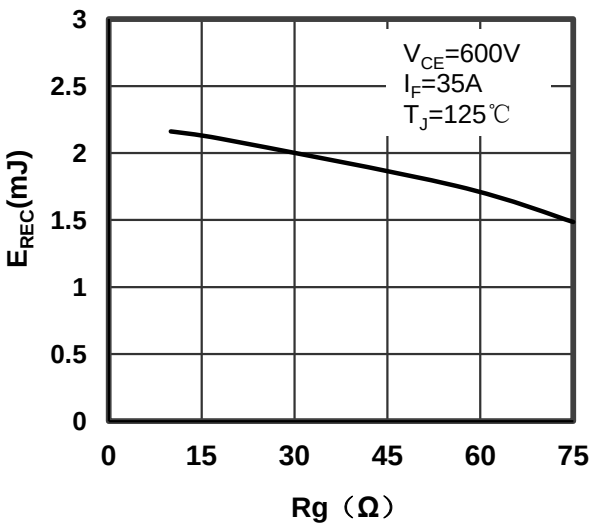



**Figure 10. Switching Energy vs Gate Resistor Diode**

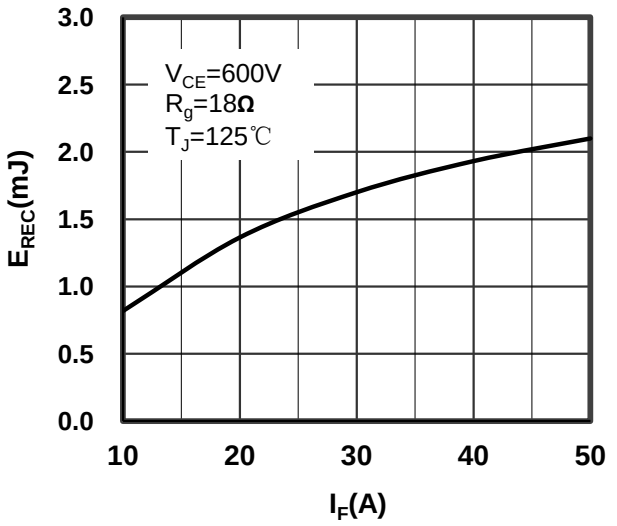



**Figure 11. Switching Energy vs Forward Current Diode**

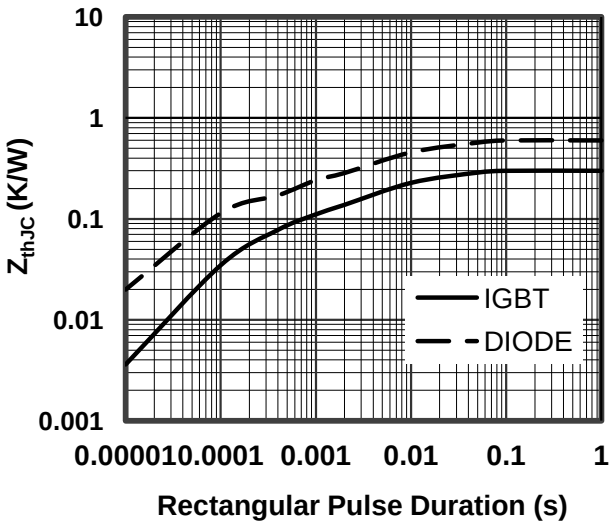
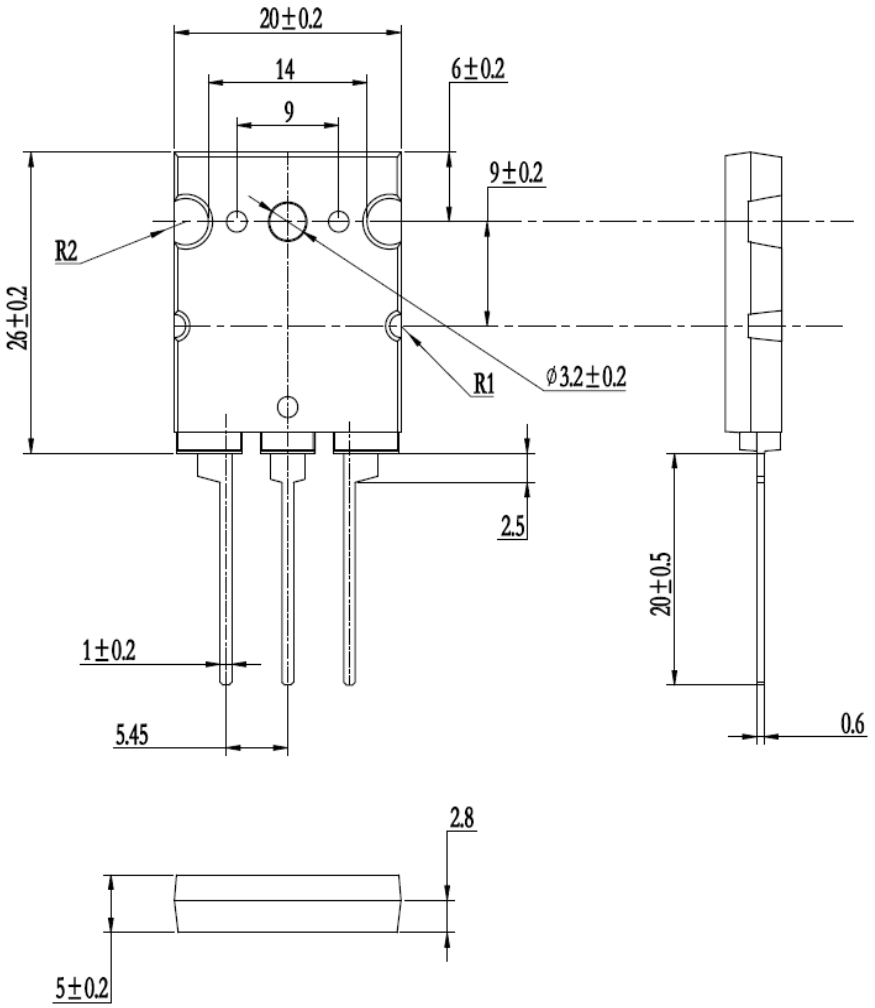



**Figure 12. Transient Thermal Impedance of Diode and IGBT**




**Dimensions in (mm)**
**Figure 13. Package Outline**