# MMG100CE065PD6TC

650V 100A Three Level Inverter Module

December 2019 | Preliminary | RoHS Compliant

## PRODUCT FEATURES

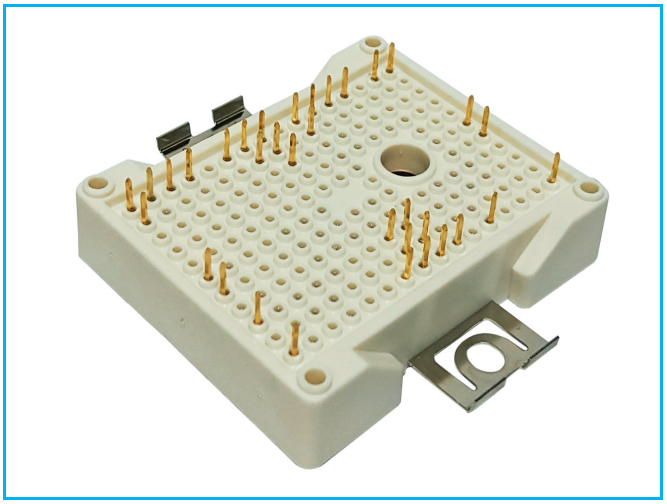
☐ 650V IGBT CHIP(Trench+Field Stop technology)

☐ Low saturation voltage and positive temperature coefficient

☐ Low switching losses and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Temperature sense included



## APPLICATIONS

☐ 3-Level-Applications

☐ Solar Applications

☐ UPS Systems

IGBT(T1、T2、T3、T4)

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 | | ±20 | |
| $I_C$ | DC Collector Current | $T_C$=25℃,$T_{Jmax}$=175℃ | 116 | A |
| | | $T_C$=58℃,$T_{Jmax}$=175℃ | 100 | |
| $I_{CM}$ | Repetitive Peak Collector Current | tp=1ms | 200 | |
| $P_{tot}$ | Power Dissipation Per IGBT | $T_C$=25℃,$T_{Jmax}$=175℃ | 300 | W |

Diode(D1、D2、D3、D4、D5、D6)

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

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Reverse Voltage | $T_J$=25℃ | 650 | V |
| $I_{F(AV)}$ | Average Forward Current | | 100 | A |
| $I_{FRM}$ | Repetitive Peak Forward Current | tp=1ms | 200 | |
| $I^2t$ | | $T_J$=125℃, t=10ms, $V_R$=0V | 1800 | $A^2S$ |

IGBT(T1、T2、T3、T4)

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 | | 4.9 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C$=100A, $V_{GE}$=15V, $T_J$=25℃ | | | 1.55 | 2 | |
| | | $I_C$=100A, $V_{GE}$=15V, $T_J$=150℃ | | | 1.8 | | |
| $I_{CES}$ | Collector Leakage Current | $V_{CE}$=650V, $V_{GE}$=0V, $T_J$=25℃ | | | | 1 | mA |
| | | $V_{CE}$=650V, $V_{GE}$=0V, $T_J$=150℃ | | | | 5 | |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V,$V_{GE}$=±20V, $T_J$=25℃ | | -400 | | 400 | nA |
| $R_{gint}$ | Integrated Gate Resistor | | | | 2 | | Ω |
| $Q_g$ | Gate Charge | $V_{CE}$=300V, $I_C$=100A , $V_{GE}$=15V | | | 0.58 | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | 6.6 | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 290 | | pF |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CC}$=300V,$I_C$=100A $R_G$ =5.1Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 30 | | ns |
| | | | $T_J$=150℃ | | 40 | | ns |
| $t_r$ | Rise Time | | $T_J$=25℃ | | 38 | | ns |
| | | | $T_J$=150℃ | | 42 | | ns |
| $t_{d(off)}$ | Turn off Delay Time | $V_{CC}$=300V,$I_C$=100A $R_G$ =5.1Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 220 | | ns |
| | | | $T_J$=150℃ | | 270 | | ns |
| $t_f$ | Fall Time | | $T_J$=25℃ | | 60 | | ns |
| | | | $T_J$=150℃ | | 80 | | ns |
| $E_{on}$ | Turn on Energy | $V_{CC}$=300V,$I_C$=100A $R_G$ =5.1Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 1.95 | | mJ |
| | | | $T_J$=150℃ | | 3.05 | | mJ |
| $E_{off}$ | Turn off Energy | | $T_J$=25℃ | | 1.75 | | mJ |
| | | | $T_J$=150℃ | | 2.4 | | mJ |
| $I_{SC}$ | Short Circuit Current | tpsc≤6μS , $V_{GE}$=15V $T_J$=125℃,$V_{CC}$=360V | | | 500 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance （Per IGBT） | | | | 0.45 | 0.5 | K /W |

Diode(D1、D2、D3、D4、D5、D6)

ELECTRICAL CHARACTERISTICS *($T_C$=25°C unless otherwise specified)*

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$=100A , $V_{GE}$=0V, $T_J$=25℃ | | 1.7 | 2.15 | V |
| | | $I_F$=100A , $V_{GE}$=0V, $T_J$=150℃ | | 1.45 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=100A , $V_R$=300V $dI_F/dt$=-3000A/μs $T_J$ =150℃ | | 110 | | ns |
| $I_{RRM}$ | Max. Reverse Recovery Current | | | 115 | | A |
| $Q_{RR}$ | Reverse Recovery Charge | | | 8.1 | | μC |
| $E_{rec}$ | Reverse Recovery Energy | | | 2.15 | | mJ |
| $R_{thJCD}$ | Junction to Case Thermal Resistance （Per Diode） | | | | 0.6 | K /W |

NTC CHARACTERISTICS *($T_C$=25°C unless otherwise specified)*

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $R_{25}$ | Resistance | $T_C$ =25℃ | | 5 | | KΩ |
| $B_{25/50}$ | $R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\ K))]$ | | | 3375 | | K |

MODULE CHARACTERISTICS *($T_C$=25°C unless otherwise specified)*

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $T_{Jmax}$ | Max. Junction Temperature | | 175 | ℃ |
| $T_{Jop}$ | Operating Temperature | | -40~150 | |
| $T_{stg}$ | Storage Temperature | | -40~125 | |
| $V_{isol}$ | Isolation Breakdown Voltage | AC, 50Hz(R.M.S), t=1minute | 3000 | V |
| CTI | Comparative Tracking Index | | > 200 | |
| F | Mounting Force Per Clamp | | 40~80 | N |
| Weight | | | 50 | g |

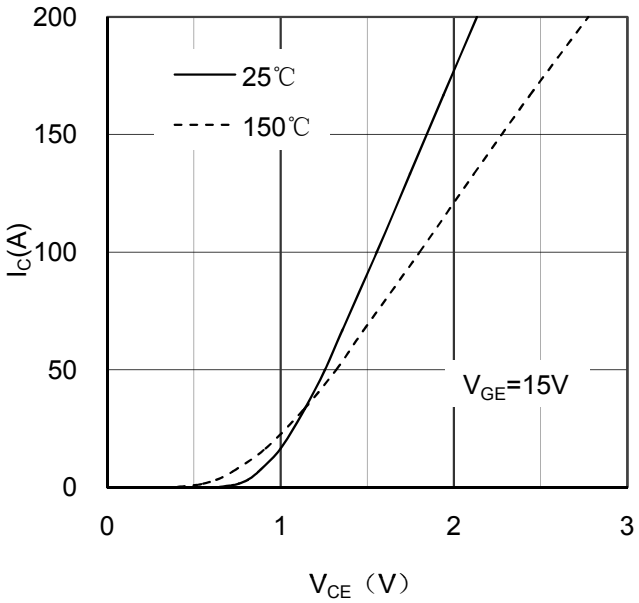



Figure 1. Typical Output Characteristics IGBT

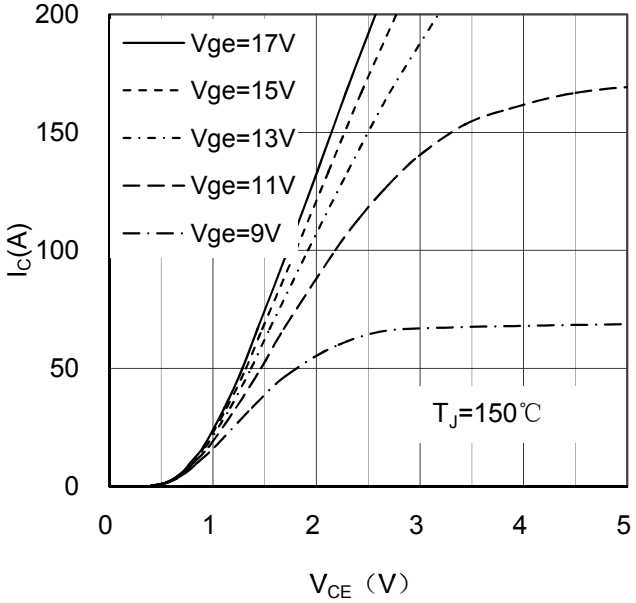



Figure 2. Typical Output Characteristics IGBT

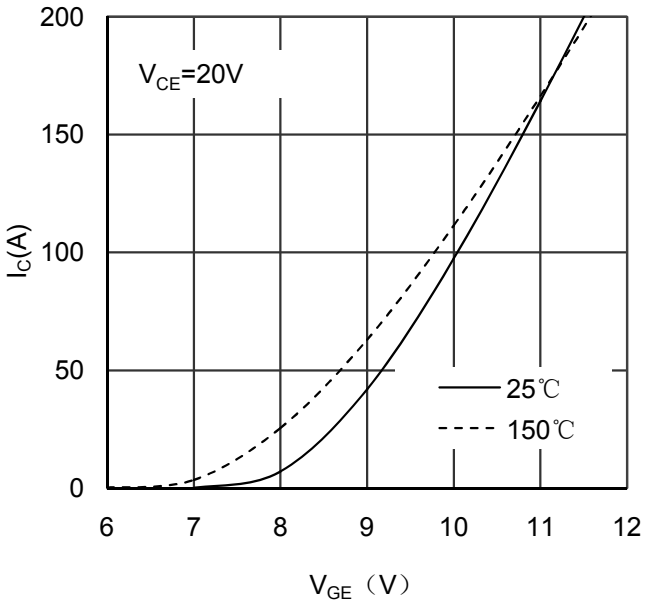



Figure 3. Typical Transfer characteristics IGBT

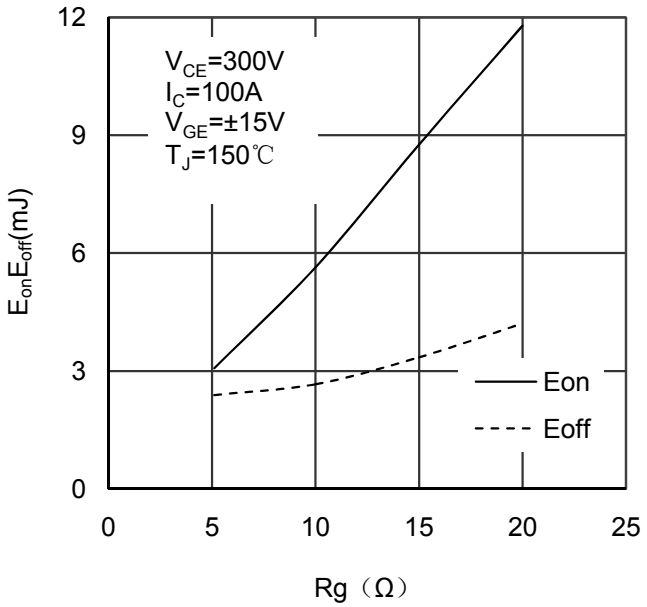



Figure 4. Switching Energy vs Gate Resistor IGBT

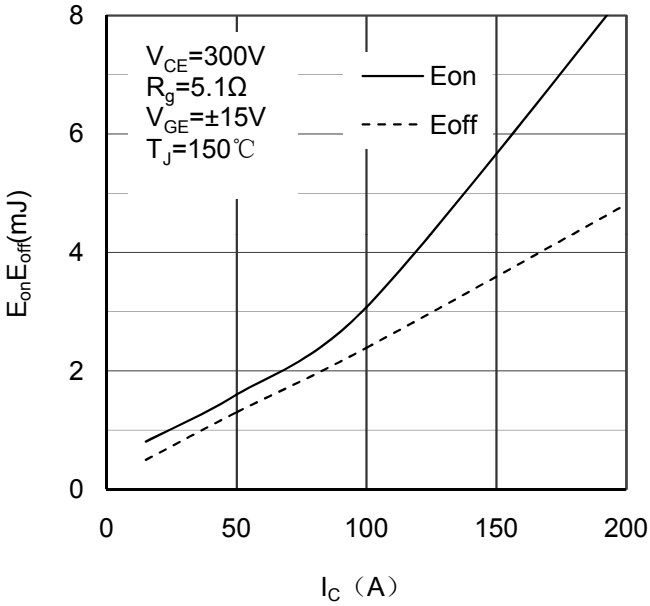



Figure 5. Switching Energy vs Collector Current IGBT

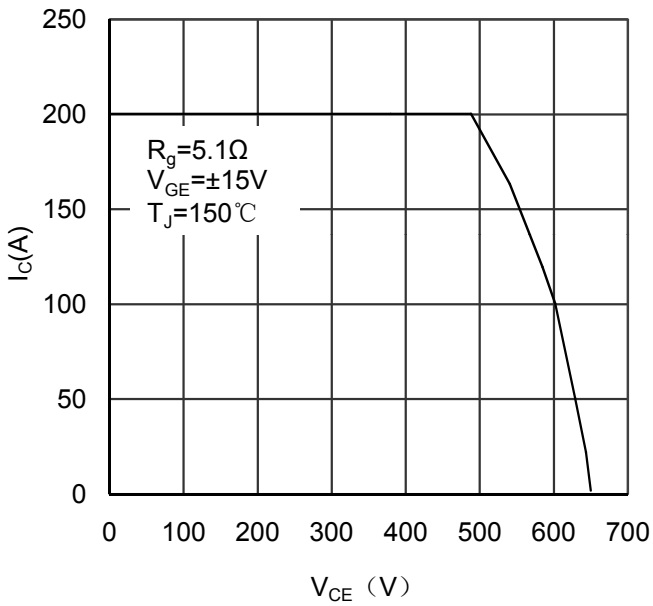



Figure 6. Reverse Biased Safe Operating Area IGBT

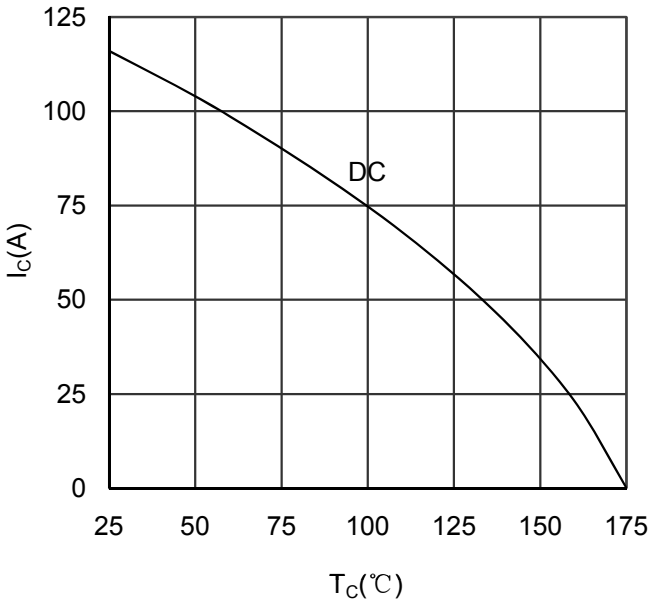



Figure 7. Collector Current vs Case temperature IGBT

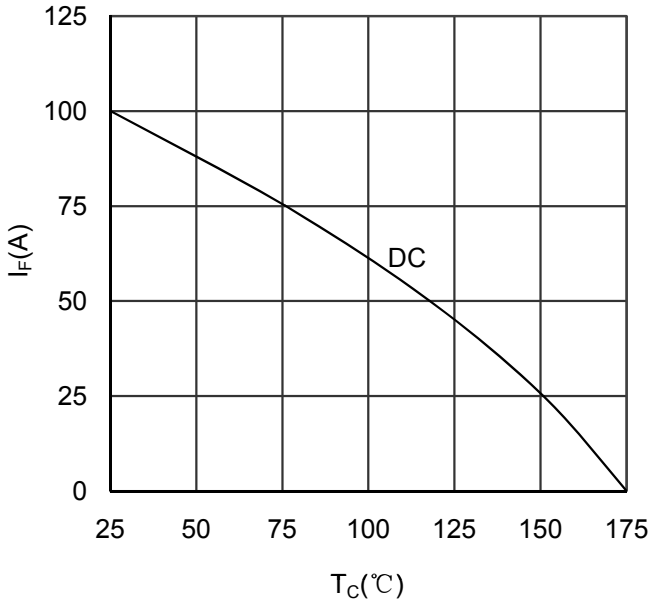



Figure 8. Forward current vs Case temperature Diode

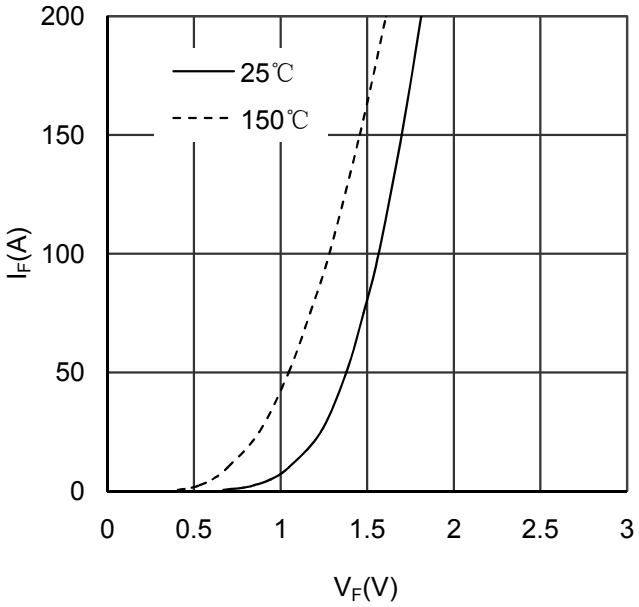



Figure 9. Diode Forward Characteristics Diode

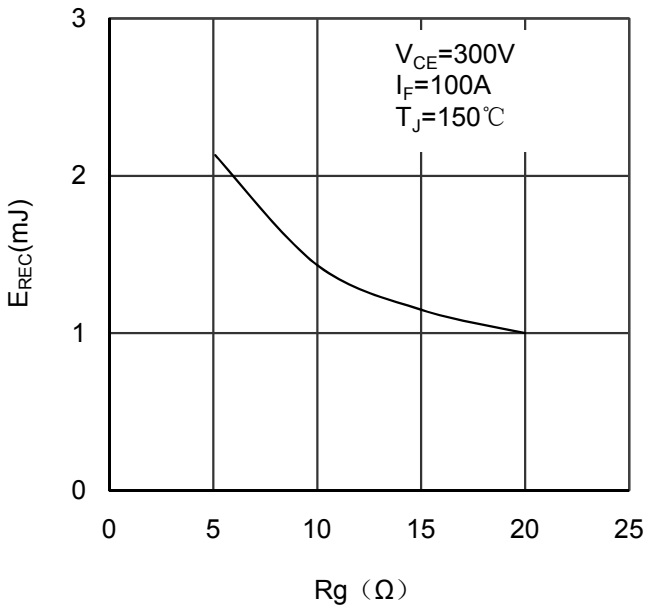



Figure 10. Switching Energy vs Gate Resistor Diode

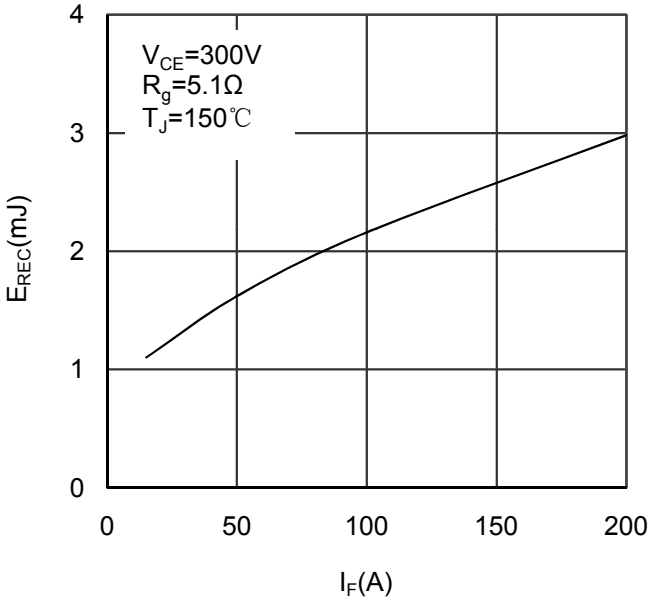



Figure 11. Switching Energy vs Forward Current Diode

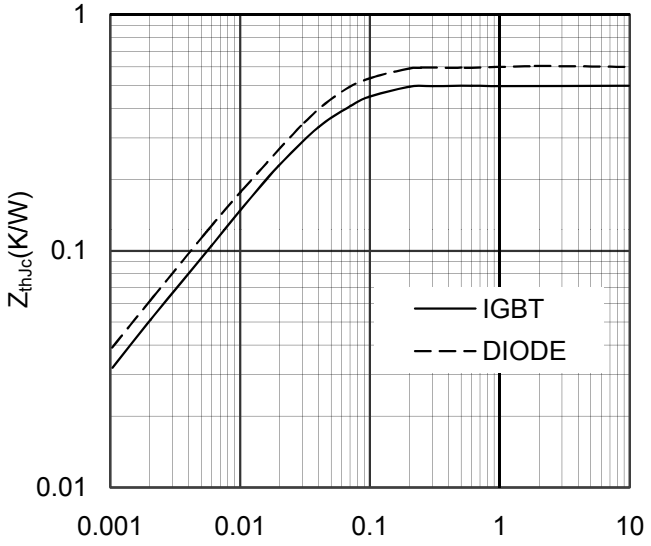



Figure 12. Transient Thermal Impedance of Diode and IGBT

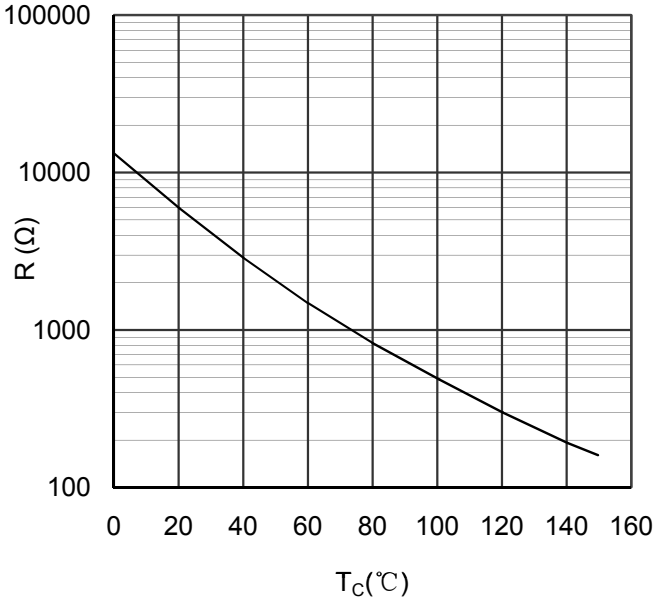



Figure 13. NTC Characteristics

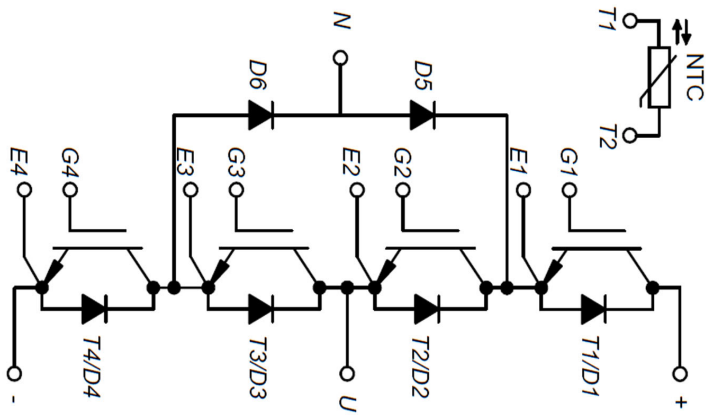
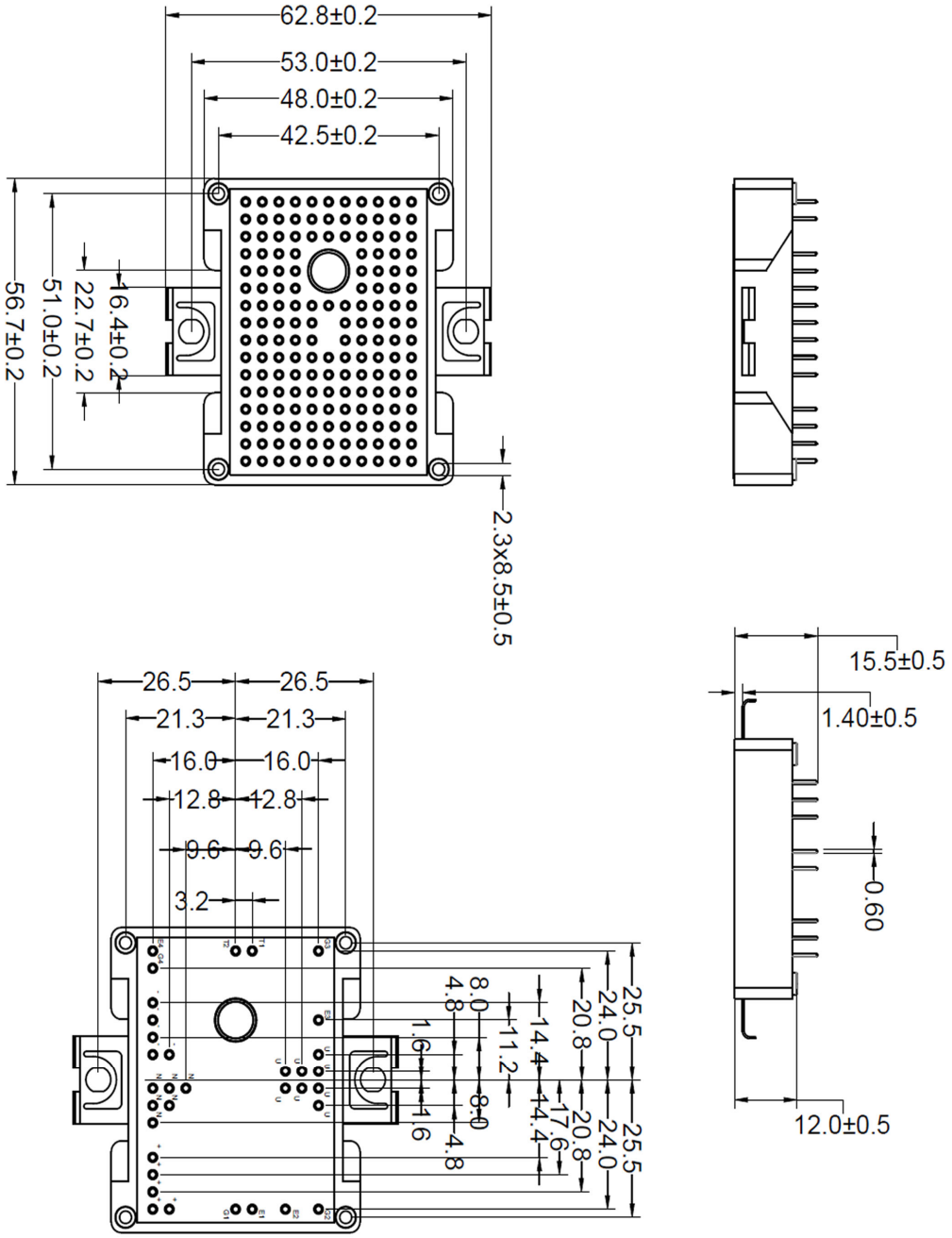



Figure 14. Circuit Diagram




Dimensions in (mm)

Figure 15. Package Outline