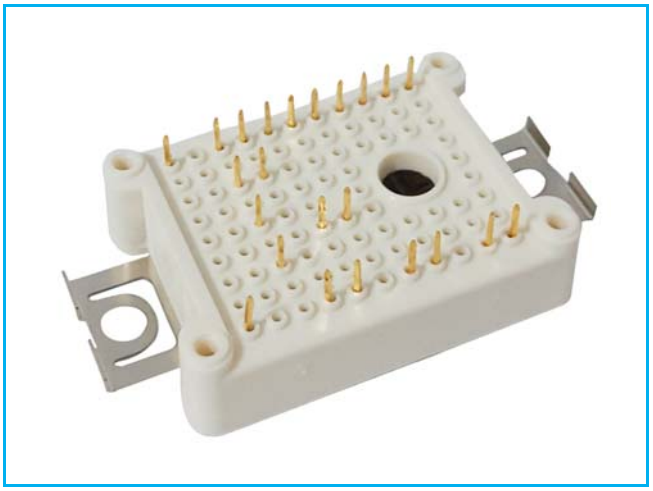
# MMG10CB120X6TC

1200V 10A Six-Pack Module

November 2019 Version 01 RoHS Compliant

## PRODUCT FEATURES



☐ IGBT CHIP(Trench+Field Stop technology)

☐ Substrate for Low Thermal Resistance

☐ Low saturation voltage and positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Solder Contact Technology, Rugged mounting due to integrated Mounting clamps

☐ Temperature sense included

## APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies

IGBT-inverter

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℃, $T_{Jmax}$=175℃ | 19 | A |
| | | $T_C$=105℃, $T_{Jmax}$=175℃ | 10 | |
| $I_{CM}$ | Repetitive Peak Collector Current | tp=1ms | 20 | |
| $P_{tot}$ | Power Dissipation Per IGBT | $T_C$=25℃, $T_{Jmax}$=175℃ | 107 | W |

Diode-inverter

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

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Reverse Voltage | $T_J$=25℃ | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | | 10 | A |
| $I_{FRM}$ | Repetitive Peak Forward Current | tp=1ms | 20 | |
| $I^2t$ | | $T_J$=125℃, t=10ms, $V_R$=0V | 18 | $A^2S$ |

MacMic Science & Technology Co., Ltd.

Add：#18, Hua Shan Zhong Lu, New District, Changzhou City, Jiangsu Province, P. R .of China

Tel.：+86-519-85163708 Fax：+86-519-85162291 Post Code：213022 Website：www.macmicst.com

IGBT-inverter

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

| Symbol | Parameter/Test Conditions | | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{GE(th)}$ | Gate Emitter Threshold Voltage | $V_{CE}=V_{GE}$, $I_C$=0.25mA | | 5.0 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C$=10A, $V_{GE}$=15V, $T_J$=25℃ | | | 1.85 | 2.25 | |
| | | $I_C$=10A, $V_{GE}$=15V, $T_J$=125℃ | | | 2.15 | | |
| | | $I_C$=10A, $V_{GE}$=15V, $T_J$=150℃ | | | 2.25 | | |
| $I_{CES}$ | Collector Leakage Current | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=25℃ | | | | 100 | μA |
| | | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=150℃ | | | | 10 | mA |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V,$V_{GE}$=±20V, $T_J$=25℃ | | -400 | | 400 | nA |
| $R_{gint}$ | Integrated Gate Resistor | | | | 0 | | Ω |
| $Q_g$ | Gate Charge | $V_{CE}$=600V, $I_C$=10A , $V_{GE}$=15V | | | 0.08 | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | 0.8 | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 35 | | pF |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CC}$=600V,$I_C$=10A $R_G$ =50Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 20 | | ns |
| | | | $T_J$=125℃ | | 25 | | ns |
| | | | $T_J$=150℃ | | 25 | | ns |
| $t_r$ | Rise Time | | $T_J$=25℃ | | 22 | | ns |
| | | | $T_J$=125℃ | | 24 | | ns |
| | | | $T_J$=150℃ | | 24 | | ns |
| $t_{d(off)}$ | Turn off Delay Time | $V_{CC}$=600V,$I_C$=10A $R_G$ =50Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 150 | | ns |
| | | | $T_J$=125℃ | | 180 | | ns |
| | | | $T_J$=150℃ | | 210 | | ns |
| $t_f$ | Fall Time | | $T_J$=25℃ | | 180 | | ns |
| | | | $T_J$=125℃ | | 215 | | ns |
| | | | $T_J$=150℃ | | 225 | | ns |
| $E_{on}$ | Turn on Energy | $V_{CC}$=600V,$I_C$=10A $R_G$ =50Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=125℃ | | 1.15 | | mJ |
| | | | $T_J$=150℃ | | 1.25 | | mJ |
| $E_{off}$ | Turn off Energy | | $T_J$=125℃ | | 0.69 | | mJ |
| | | | $T_J$=150℃ | | 0.72 | | mJ |
| $I_{SC}$ | Short Circuit Current | tpsc≤10μS , $V_{GE}$=15V $T_J$=150℃,$V_{CC}$=800V | | | 40 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance （Per IGBT） | | | | 1.25 | 1.4 | K /W |

Diode-inverter

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

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$=10A , $V_{GE}$=0V, $T_J$ =25℃ | | 1.95 | 2.45 | V |
| | | $I_F$=10A , $V_{GE}$=0V, $T_J$ =125℃ | | 1.55 | | |
| | | $I_F$=10A , $V_{GE}$=0V, $T_J$ =150℃ | | 1.5 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=10A , $V_R$=600V $dI_F/dt$=-500A/μs $T_J$ =150℃ | | 161 | | ns |
| $I_{RRM}$ | Max. Reverse Recovery Current | | | 15 | | A |
| $Q_{RR}$ | Reverse Recovery Charge | | | 1.6 | | μC |
| $E_{rec}$ | Reverse Recovery Energy | | | 0.57 | | mJ |
| $R_{thJCD}$ | Junction to Case Thermal Resistance （Per Diode） | | | 1.75 | 1.9 | 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 | | 20~50 | N |
| Weight | | | 25 | g |

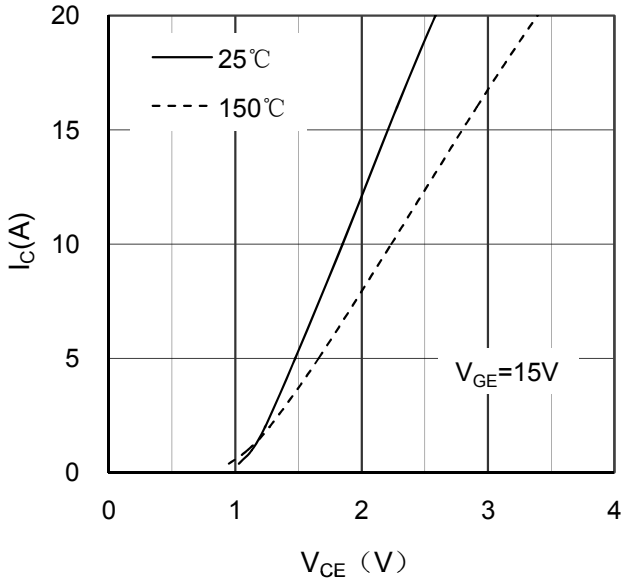



Figure 1. Typical Output Characteristics IGBT-inverter

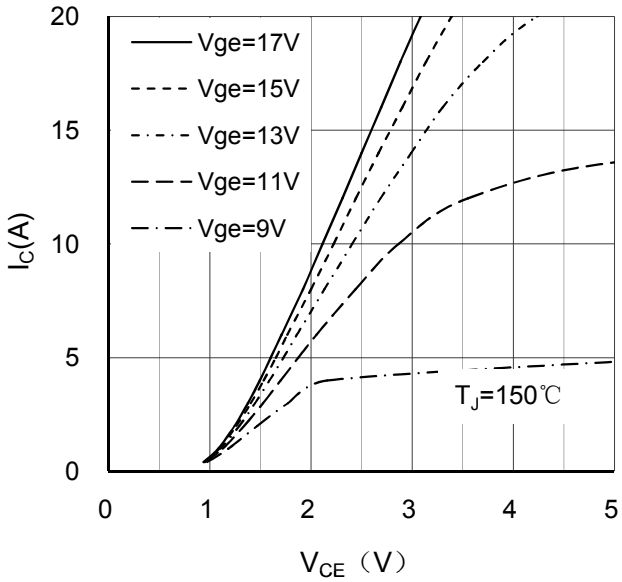



Figure 2. Typical Output Characteristics IGBT-inverter

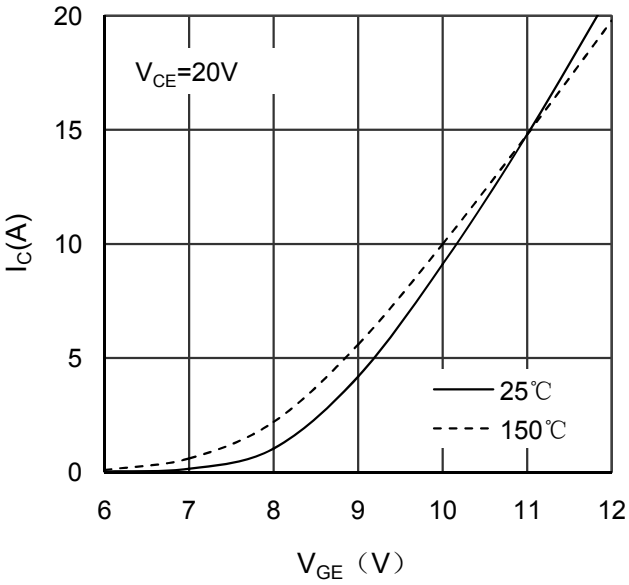



Figure 3. Typical Transfer characteristics IGBT-inverter

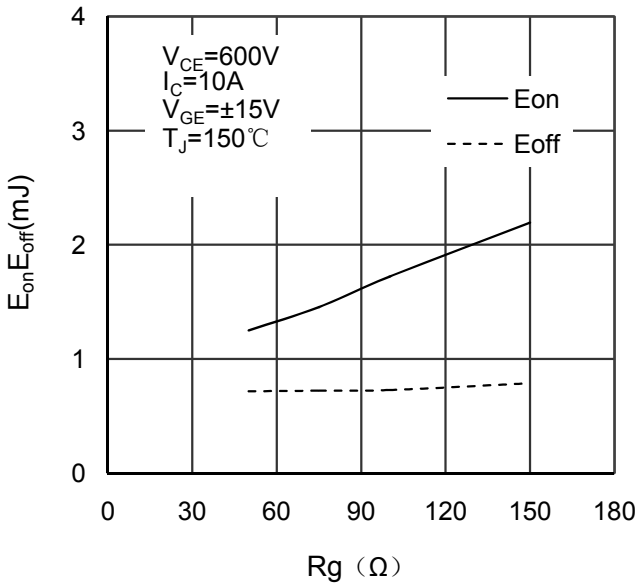



Figure 4. Switching Energy vs Gate Resistor IGBT-inverter

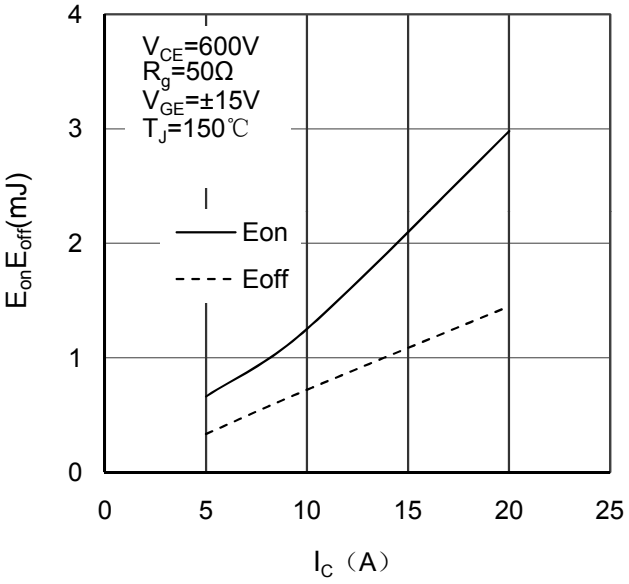



Figure 5. Switching Energy vs Collector Current IGBT-inverter

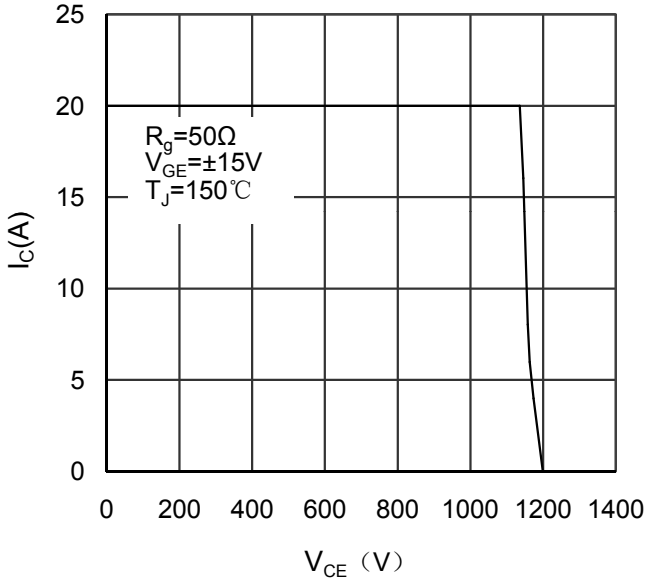



Figure 6. Reverse Biased Safe Operating Area IGBT-inverter

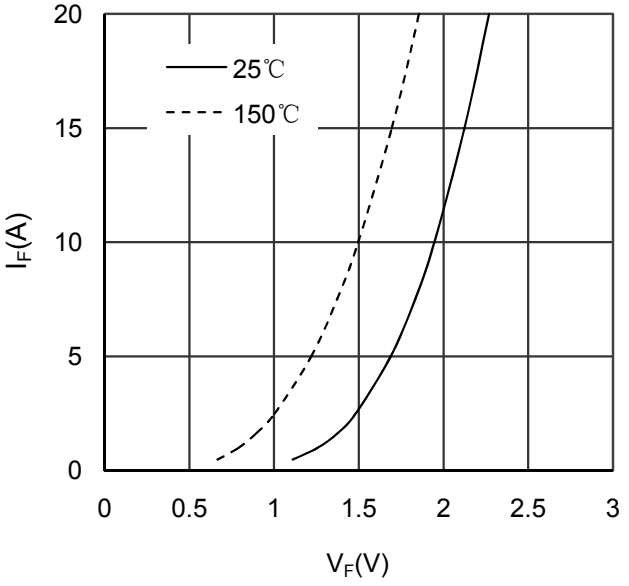



Figure 7. Diode Forward Characteristics Diode -inverter

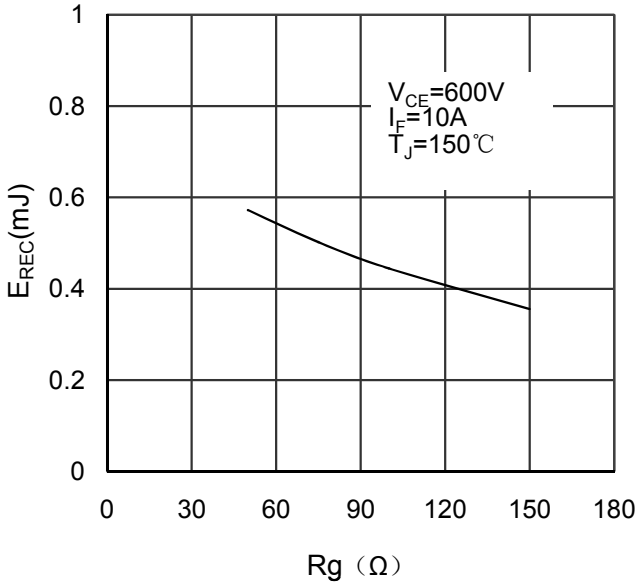



Figure 8. Switching Energy vs Gate Resistor Diode -inverter

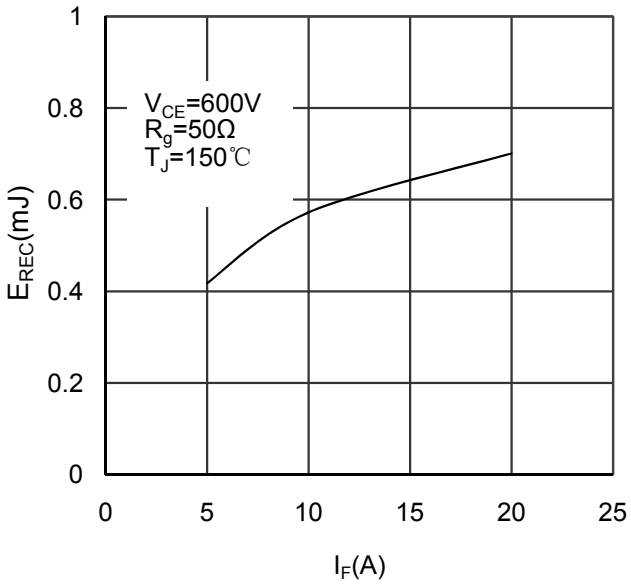



Figure 9. Switching Energy vs Forward Current Diode-inverter

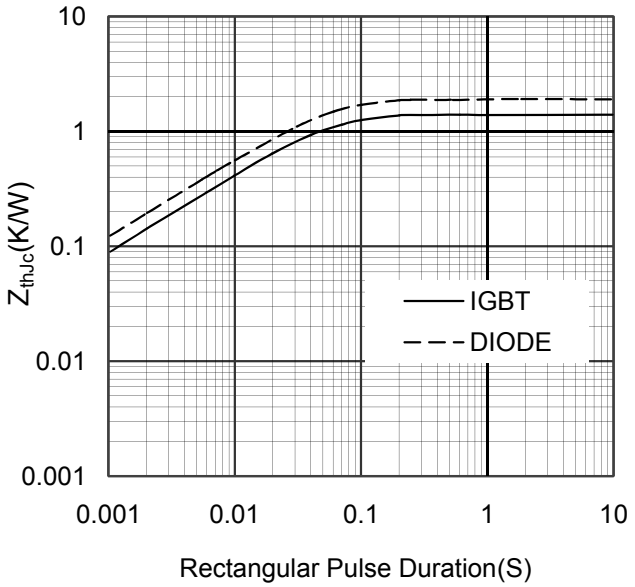



Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter

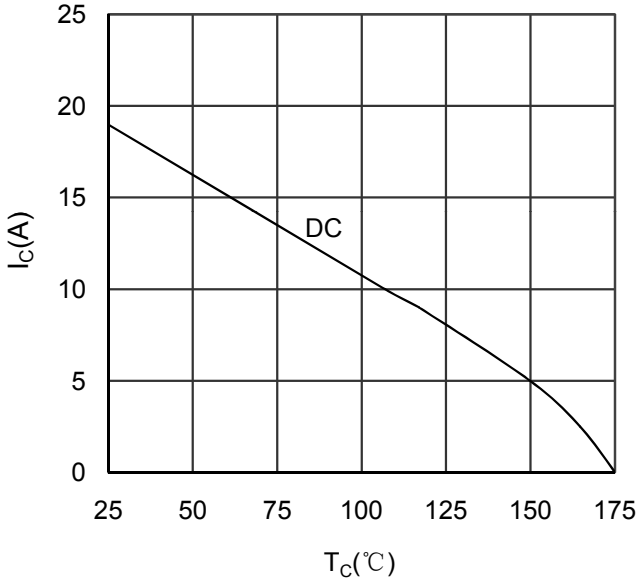



Figure 11. Collector Current vs Case temperature IGBT -inverter

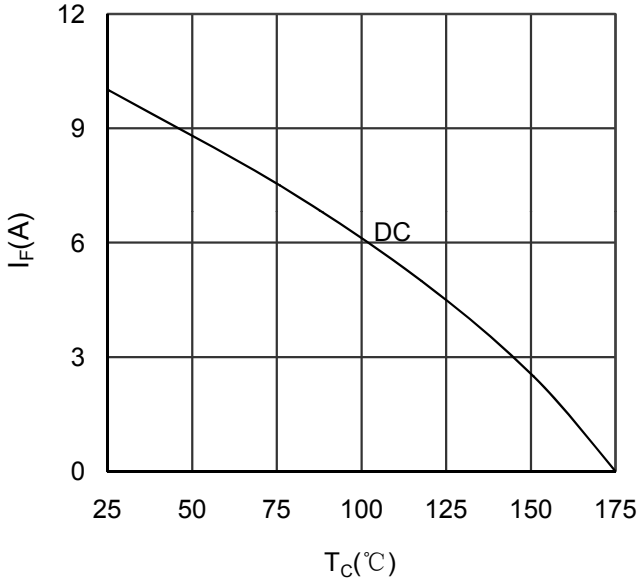



Figure 12. Forward current vs Case temperature Diode -inverter

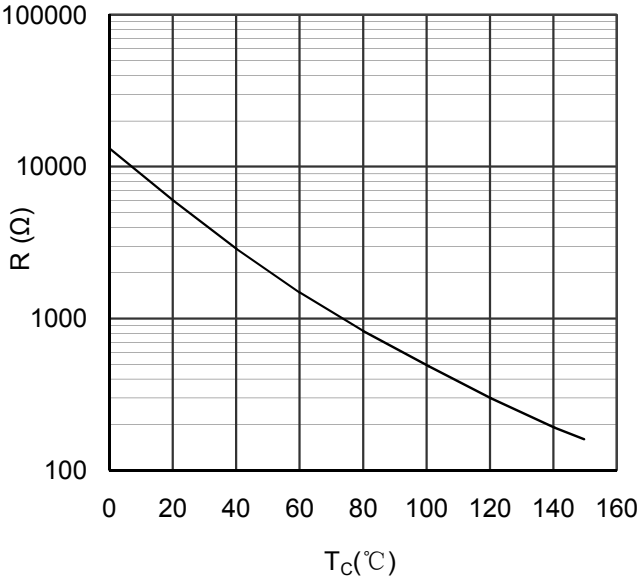



Figure 13. NTC Characteristics

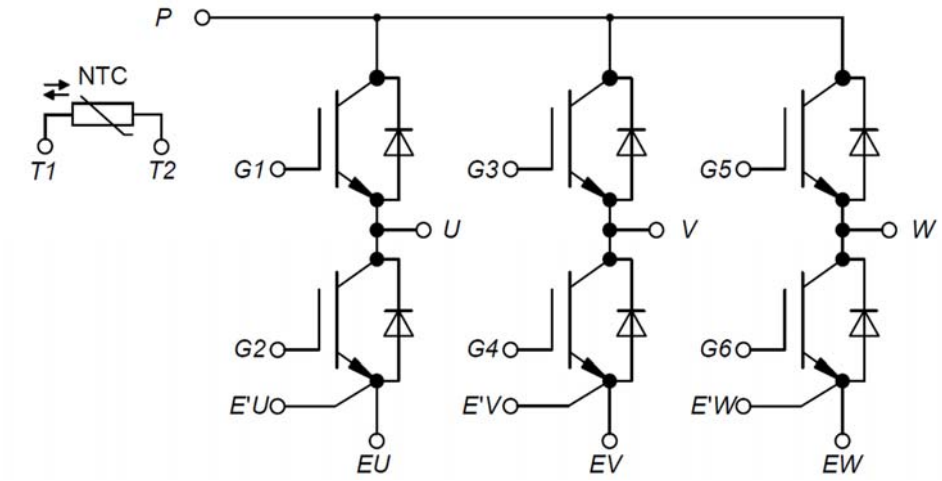
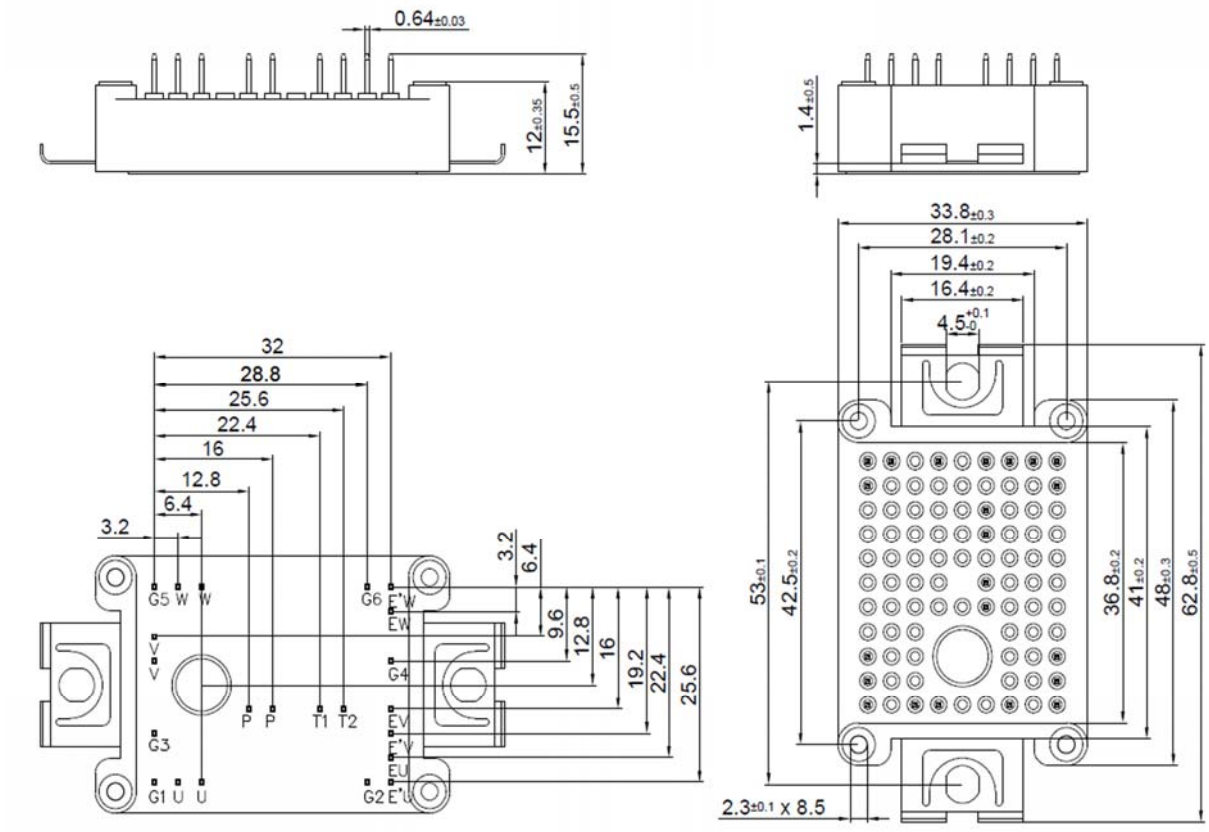



Figure 14. Circuit Diagram




Dimensions in (mm)

Figure 15. Package Outline