# MMG150W120X6TN

**1200V 150A Six-Pack Module**

**May 2015** **Version 01** **RoHS Compliant**

## PRODUCT FEATURES

☐ IGBT Chip(IGBT$^3$ Trench+Field Stop technology)，Diode Chip(Emcon3 wheeling diode)

☐ High level of integration—only one power semiconductor module required for the whole drive

☐ Low saturation voltage and positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

☐ Industry standard package with insulated copper base plate and soldering pins for PCB mounting

☐ 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℃ | 200 | A |
| | | $T_C$=80℃ | 150 | |
| $I_{CM}$ | Repetitive Peak Collector Current | tp=1ms | 300 | |
| $P_{tot}$ | Power Dissipation Per IGBT | | 625 | 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 | $T_C$=25℃ | 150 | A |
| $I_{FRM}$ | Repetitive Peak Forward Current | tp=1ms | 300 | |
| $I^2t$ | | $T_J$=125℃, t=10ms, $V_R$=0V | 4350 | $A^2S$ |

**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 | $V_{CE}=V_{GE}$, $I_C$=6mA | | 5.0 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector Emitter Saturation Voltage | $I_C$=150A, $V_{GE}$=15V, $T_J$=25℃ | | | 1.7 | 2.15 | |
| | | $I_C$=150A, $V_{GE}$=15V, $T_J$=125℃ | | | 1.9 | | |
| $I_{CES}$ | Collector Leakage Current | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=25℃ | | | | 100 | μA |
| | | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=125℃ | | | | 10 | mA |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V,$V_{GE}$=±15V, $T_J$=25℃ | | -400 | | 400 | nA |
| $R_{gint}$ | Integrated Gate Resistor | | | | 5 | | Ω |
| $Q_g$ | Gate Charge | $V_{CE}$=600V, $I_C$=150A , $V_{GE}$=±15V | | | 1.4 | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | 10.5 | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 400 | | nF |
| $t_{d(on)}$ | Turn on Delay Time | $V_{CC}$=600V,$I_C$=150A $R_G$ =2.4Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 260 | | ns |
| | | | $T_J$=125℃ | | 290 | | ns |
| $t_r$ | Rise Time | | $T_J$=25℃ | | 30 | | ns |
| | | | $T_J$=125℃ | | 50 | | ns |
| $t_{d(off)}$ | Turn off Delay Time | $V_{CC}$=600V,$I_C$=150A $R_G$ =2.4Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 420 | | ns |
| | | | $T_J$=125℃ | | 520 | | ns |
| $t_f$ | Fall Time | | $T_J$=25℃ | | 70 | | ns |
| | | | $T_J$=125℃ | | 90 | | ns |
| $E_{on}$ | Turn on Energy | $V_{CC}$=600V,$I_C$=150A $R_G$ =2.4Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 12 | | mJ |
| | | | $T_J$=125℃ | | 16 | | mJ |
| $E_{off}$ | Turn off Energy | | $T_J$=25℃ | | 11 | | mJ |
| | | | $T_J$=125℃ | | 14.5 | | mJ |
| $I_{SC}$ | Short Circuit Current | tpsc≤10μS , $V_{GE}$=15V $T_J$=125℃,$V_{CC}$=900V | | | 600 | | A |
| $R_{thJC}$ | Junction to Case Thermal Resistance （Per IGBT） | | | | | 0.2 | 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 | $I_F$=150A , $V_{GE}$=0V, $T_J$=25℃ | | 1.65 | 2.15 | V |
| | | $I_F$=150A , $V_{GE}$=0V, $T_J$=125℃ | | 1.65 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=150A , $V_R$=600V $dI_F/dt$=-4000A/μs $T_J$ =125℃ | | 260 | | ns |
| $I_{RRM}$ | Max. Reverse Recovery Current | | | 210 | | A |
| $Q_{RR}$ | Reverse Recovery Charge | | | 30 | | μC |
| $E_{rec}$ | Reverse Recovery Energy | | | 13 | | mJ |
| $R_{thJCD}$ | Junction to Case Thermal Resistance （Per Diode） | | | | 0.36 | 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 | | 150 | ℃ |
| $T_{Jop}$ | Operating Temperature | | -40~125 | |
| $T_{stg}$ | Storage Temperature | | -40~125 | |
| $V_{isol}$ | Isolation Breakdown Voltage | AC, 50Hz(R.M.S), t=1minute | 3000 | V |
| CTI | Comparative Tracking Index | | >225 | |
| Md | Mounting Torque | Recommended（M5） | 2.5~5 | Nm |
| Weight | | | 300 | g |

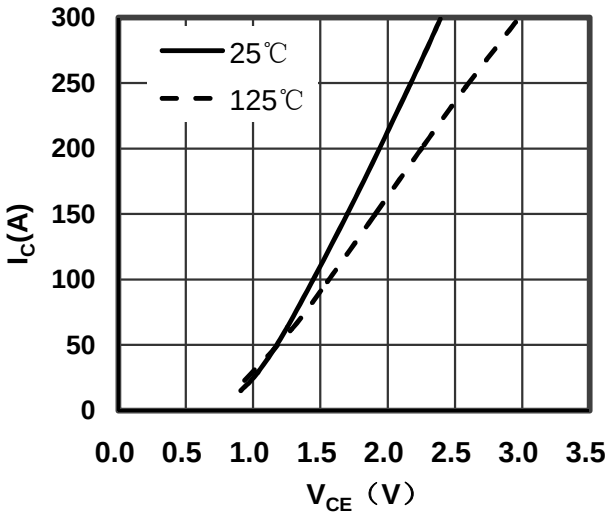



**Figure 1. Typical Output Characteristics IGBT-inverter**

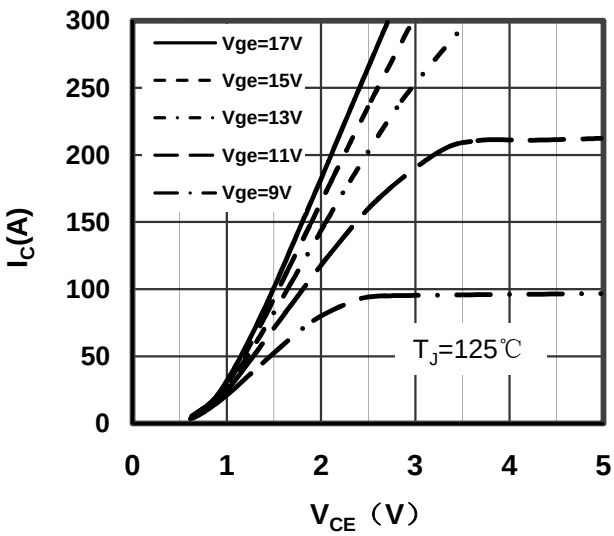



**Figure 2. Typical Output Characteristics IGBT-inverter**

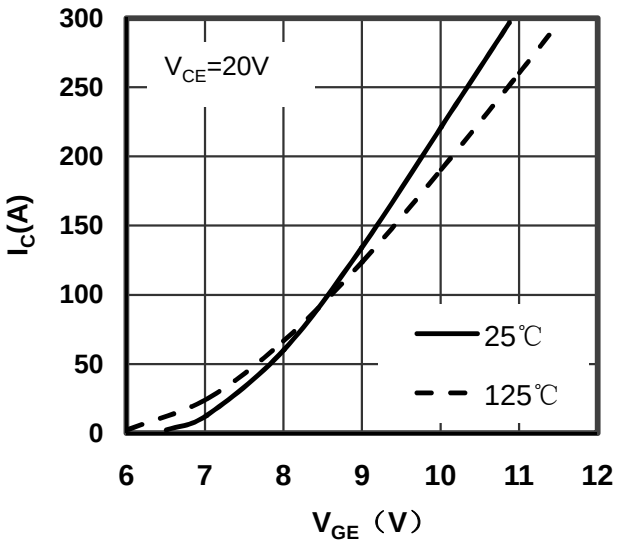



**Figure 3. Typical Transfer Characteristics IGBT-inverter**

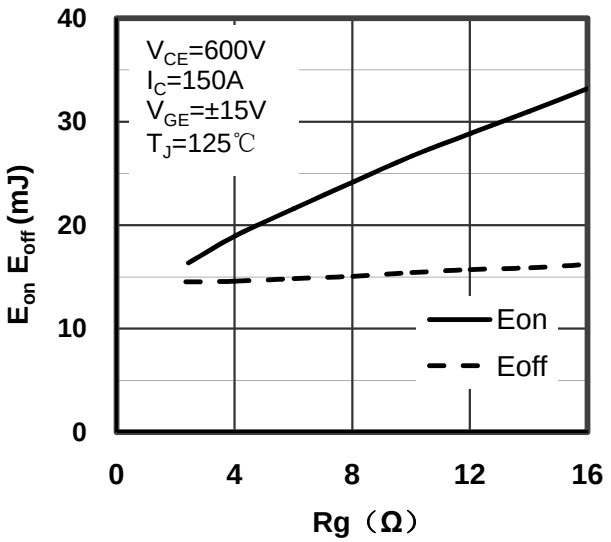



**Figure 4. Switching Energy vs Gate Resistor IGBT-inverter**

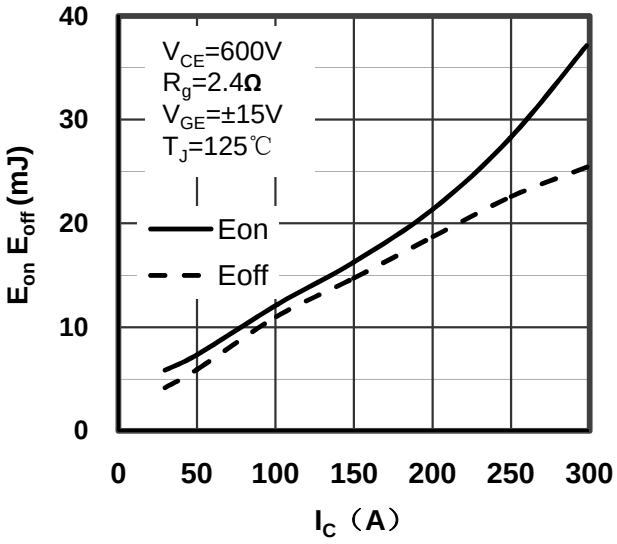



**Figure 5. Switching Energy vs Collector Current IGBT-inverter**

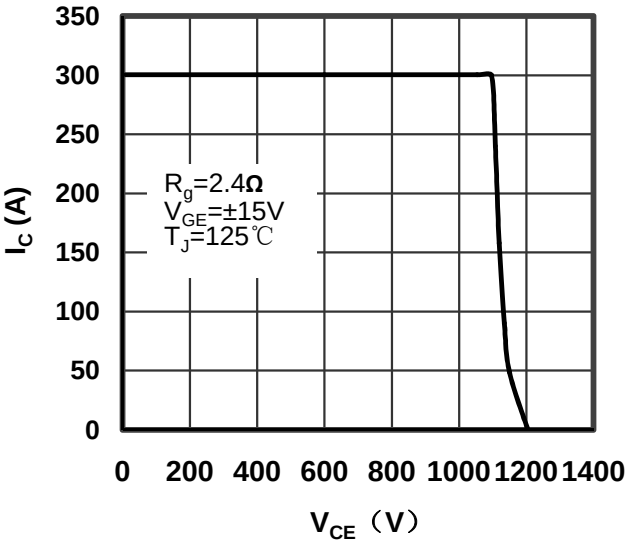



**Figure 6. Reverse Biased Safe Operating Area IGBT-inverter**

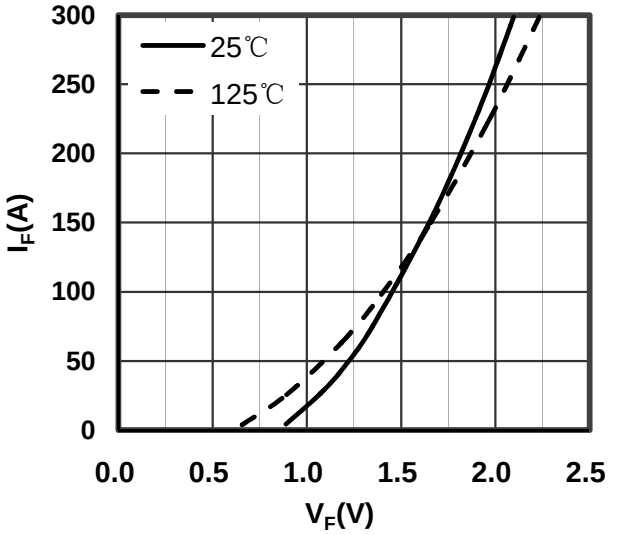



**Figure 7. Diode Forward Characteristics Diode -inverter**

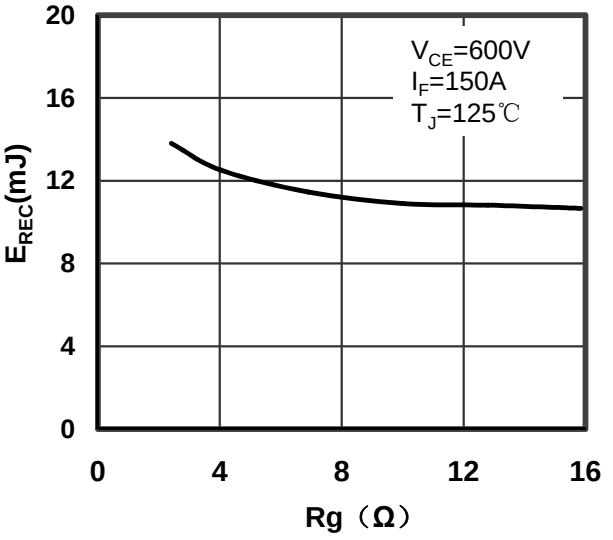



**Figure 8. Switching Energy vs Gate Resistor Diode -inverter**

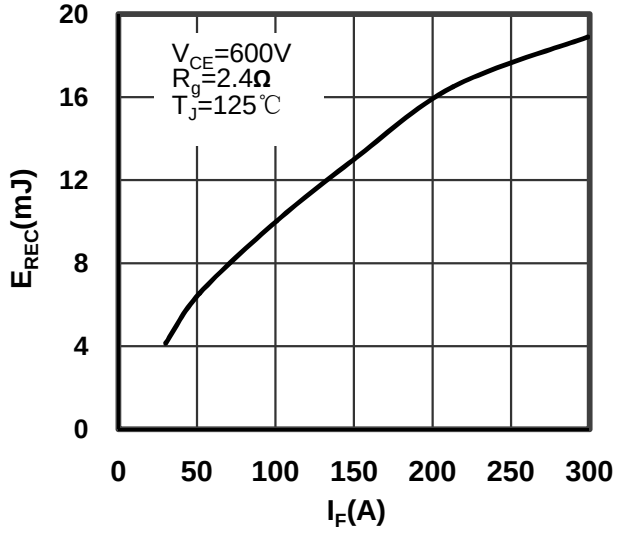



**Figure 9. Switching Energy vs Forward Current Diode-inverter**

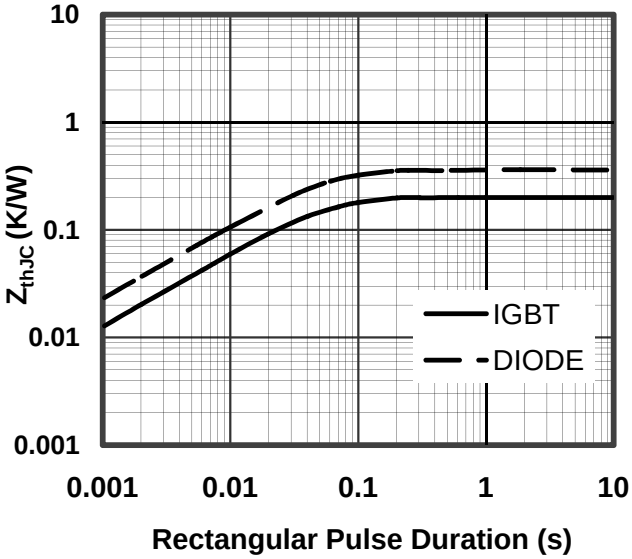



**Figure 10. Transient Thermal Impedance of Diode and IGBT-inverter**

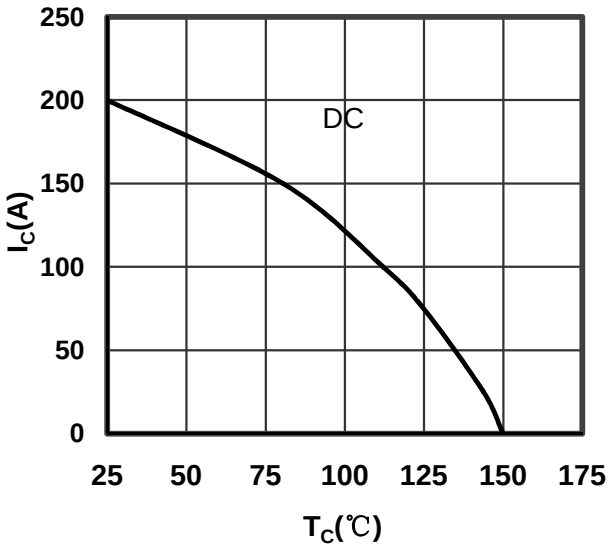



**Figure 11. Collector Current vs Case temperature IGBT -inverter**

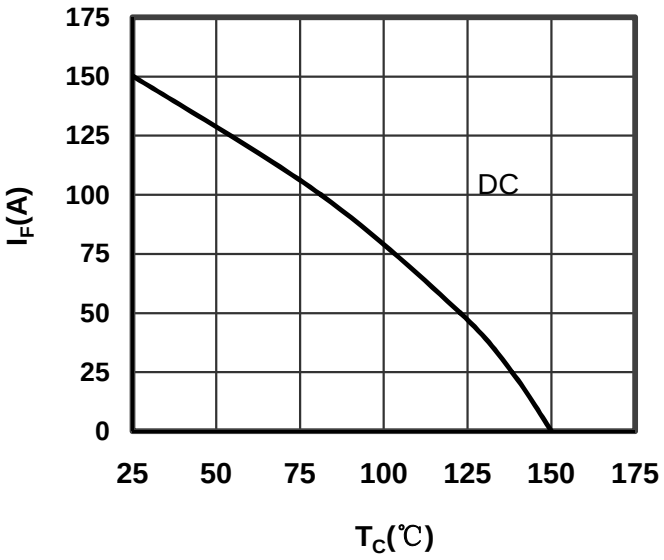



**Figure 12. Forward current vs Case temperature Diode -inverter**

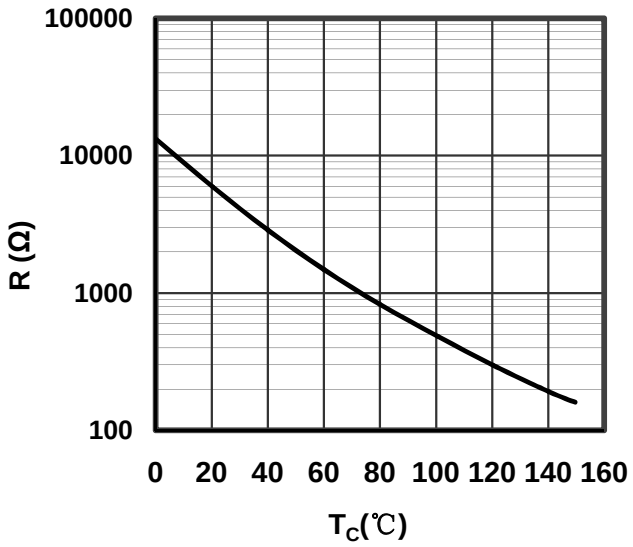



**Figure 13. NTC Characteristics**

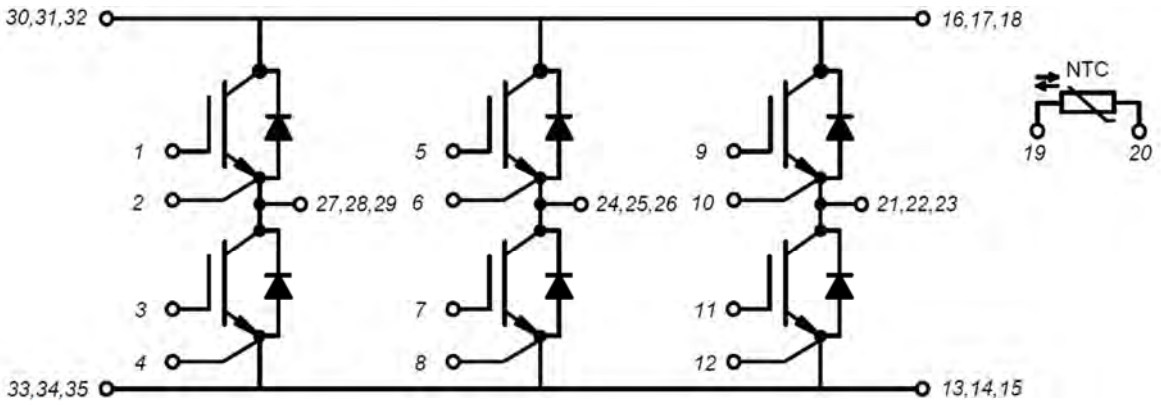
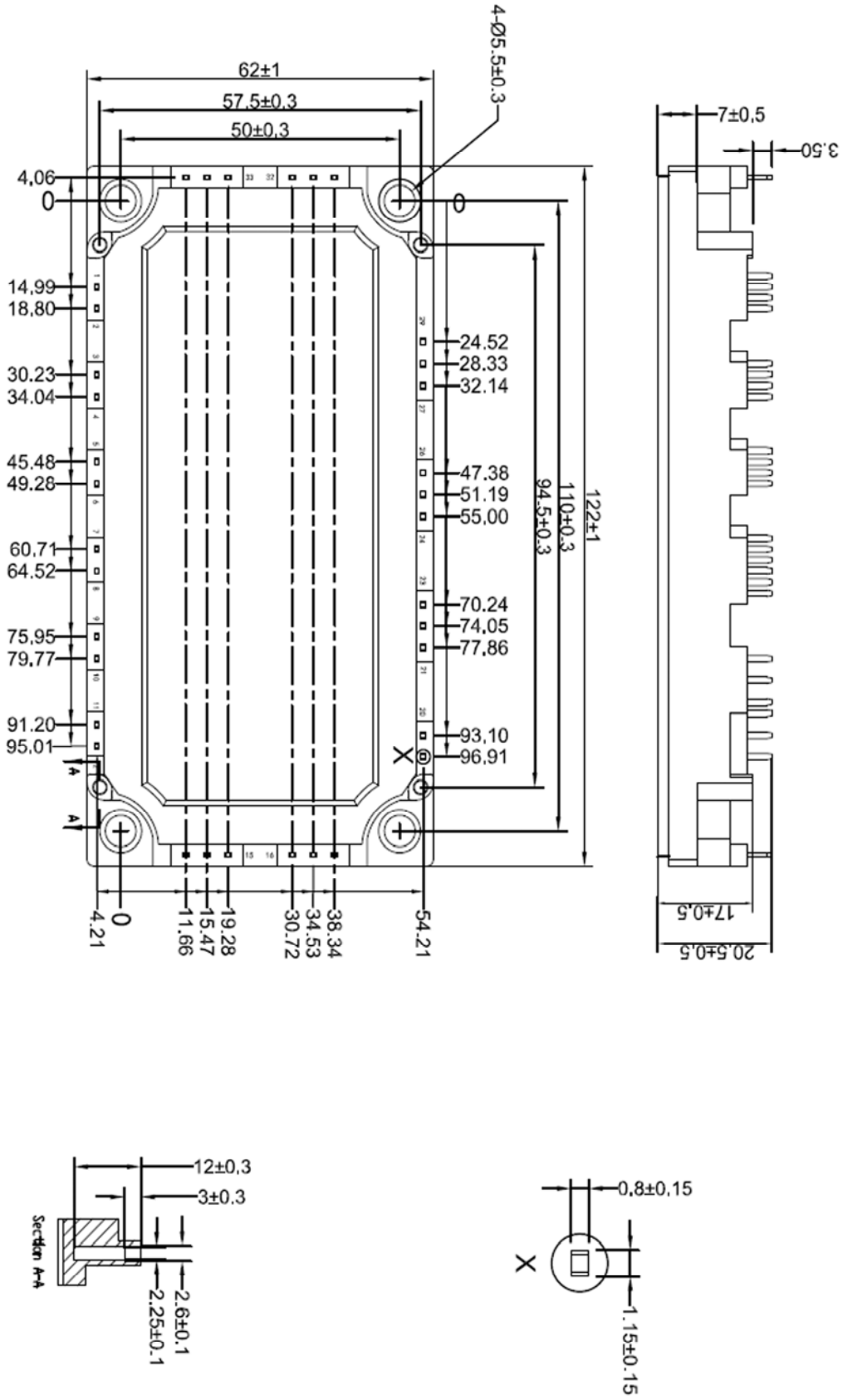



**Figure 14. Circuit Diagram**




**Dimensions in (mm)**

**Figure 15. Package Outline**