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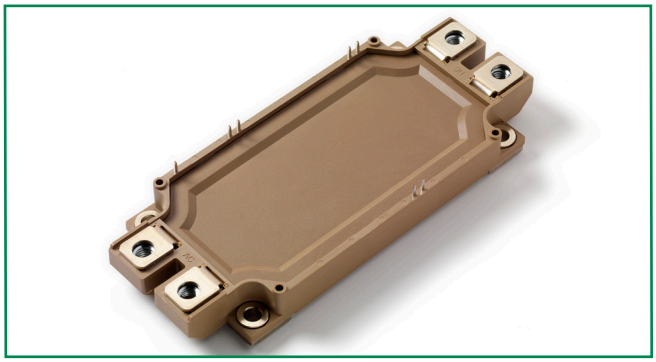
# Power Module
# 1200V 300A IGBT Module

## MG12300WB-BN2MM

RoHS



## Features

- IGBT³ CHIP(Trench+Field Stop technology)
- Low saturation voltage and positive temperature coefficient
- Fast switching and short tail current
- Free wheeling diodes with fast and soft reverse recovery
- Temperature sense included

## Applications

- AC motor control
- Motion/servo control
- Photovoltaic/Fuel cell
- Inverter and power supplies

## Module Characteristics ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $T_{J\,max}$ | Max. Junction Temperature | | | | 150 | °C |
| $T_{J\,op}$ | Operating Temperature | | -40 | | 125 | °C |
| $T_{stg}$ | Storage Temperature | | -40 | | 125 | °C |
| $V_{isol}$ | Insulation Test Voltage | AC, t=1min | | 3000 | | V |
| CTI | Comparative Tracking Index | | 210 | | | |
| Torque | Module-to-Sink | Recommended (M5) | 2.5 | | 5 | N·m |
| Torque | Module Electrodes | Recommended (M6) | 3 | | 5 | N·m |
| Weight | | | | 350 | | g |

## Absolute Maximum Ratings ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Parameters | Test Conditions | Values | Unit |
|---|---|---|---|---|
| IGBT | | | | |
| $V_{CES}$ | Collector - Emitter Voltage | $T_J$=25°C | 1200 | V |
| $V_{GES}$ | Gate - Emitter Voltage | | ±20 | V |
| $I_C$ | DC Collector Current | $T_C$=25°C | 500 | A |
| | | $T_C$=80°C | 300 | A |
| $I_{CM}$ | Repetitive Peak Collector Current | $t_p$=1ms | 600 | A |
| $P_{tot}$ | Power Dissipation Per IGBT | | 1400 | W |
| Diode | | | | |
| $V_{RRM}$ | Repetitive Reverse Voltage | $T_J$=25°C | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | $T_C$=25°C | 300 | A |
| | | $T_C$=80°C | 180 | A |
| $I_{FRM}$ | Repetitive Peak Forward Current | $t_p$=1ms | 600 | A |
| $I^2t$ | | $T_J$ =125°C, t=10ms, $V_R$=0V | 17500 | $A^2s$ |



Revised:10/05/16

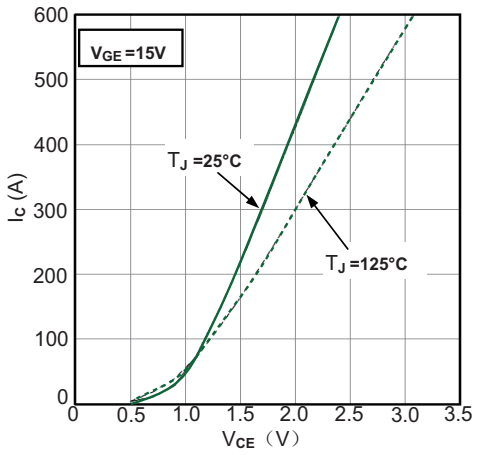
## Electrical and Thermal Specifications ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Parameters | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| IGBT | | | | | | | |
| $V_{GE(th)}$ | Gate - Emitter Threshold Voltage | $V_{CE}=V_{GE}$, $I_C$=12mA | | 5.0 | 5.8 | 6.5 | V |
| $V_{CE(sat)}$ | Collector - Emitter Saturation Voltage | $I_C$=300A, $V_{GE}$=15V, $T_J$=25°C | | | 1.7 | | V |
| | | $I_C$=300A, $V_{GE}$=15V, $T_J$=125°C | | | 2.0 | | V |
| $I_{ICES}$ | Collector Leakage Current | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=25°C | | | | 1 | mA |
| | | $V_{CE}$=1200V, $V_{GE}$=0V, $T_J$=125°C | | | | 5 | mA |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V, $V_{GE}$=±15V, $T_J$=125°C | | -400 | | 400 | nA |
| $R_{Gint}$ | Integrated Gate Resistor | | | | 2.5 | | Ω |
| $Q_{ge}$ | Gate Charge | $V_{CE}$=600V, $I_C$=300A , $V_{GE}$=±15V | | | 2.7 | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | 21 | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 1.0 | | nF |
| $t_{d(on)}$ | Turn - on Delay Time | $V_{CC}$=600V<br>$I_C$=300A<br>$R_G$ =2.4Ω<br>$V_{GE}$=±15V<br>Inductive Load | $T_J$=25°C | | 160 | | ns |
| | | | $T_J$=125°C | | 170 | | ns |
| $t_r$ | Rise Time | | $T_J$=25°C | | 45 | | ns |
| | | | $T_J$=125°C | | 50 | | ns |
| $t_{d(off)}$ | Turn - off Delay Time | | $T_J$=25°C | | 460 | | ns |
| | | | $T_J$=125°C | | 530 | | ns |
| $t_f$ | Fall Time | | $T_J$=25°C | | 100 | | ns |
| | | | $T_J$=125°C | | 150 | | ns |
| $E_{on}$ | Turn - on Energy | | $T_J$=25°C | | 13 | | mJ |
| | | | $T_J$=125°C | | 20 | | mJ |
| $E_{off}$ | Turn - off Energy | | $T_J$=25°C | | 25 | | mJ |
| | | | $T_J$=125°C | | 37 | | mJ |
| $I_{SC}$ | Short Circuit Current | $t_{psc}$≤10μS , $V_{GE}$=15V; $T_J$=125°C , $V_{CC}$=900V | | | 1200 | | A |
| $R_{thJC}$ | Junction-to-Case Thermal Resistance (Per IGBT) | | | | | 0.09 | K/W |
| Diode | | | | | | | |
| $V_F$ | Forward Voltage | $I_F$=300A, $V_{GE}$=0V, $T_J$ =25°C | | | 1.65 | | V |
| | | $I_F$=300A, $V_{GE}$=0V, $T_J$ =125°C | | | 1.6 | | V |
| $t_{RR}$ | Reverse Recovery Time | $I_F$=300A, $V_R$=600V<br>$di_F/dt$=-4800A/μs<br>$T_J$=125°C | | | 225 | | ns |
| $I_{RRM}$ | Max. Reverse Recovery Current | | | | 255 | | A |
| $E_{rec}$ | Reverse Recovery Energy | | | | 24 | | mJ |
| $R_{thJCD}$ | Junction-to-Case Thermal Resistance (Per Diode) | | | | | 0.16 | K/W |

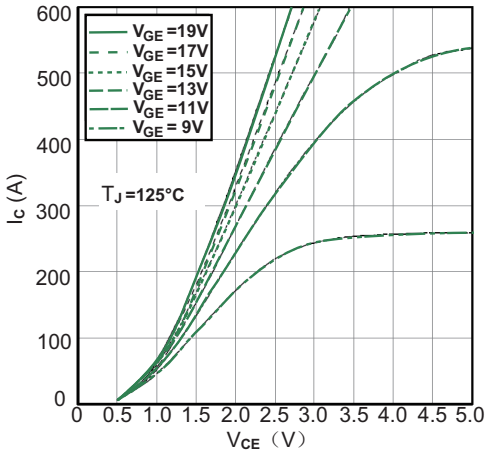
## NTC Characteristics ($T_J$ = 25°C, unless otherwise specified)

| Symbol | Parameters | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{25}$ | Resistance | $T_c$=25°C | | 5 | | KΩ |
| $B_{25/50}$ | | | | 3375 | | K |

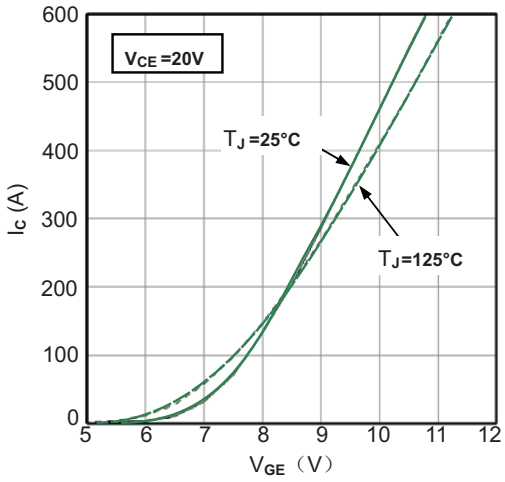
## Figure 1: Typical Output Characteristics for IGBT Inverter



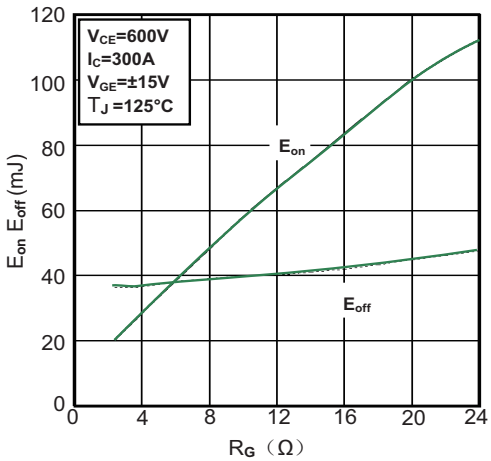

## Figure 2: Typical Output Characteristics for IGBT Inverter



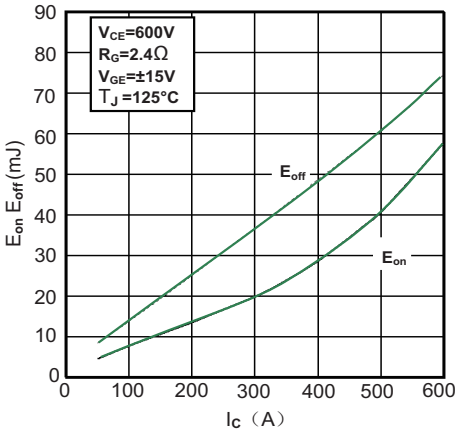

## Figure 3: Typical Transfer Characteristics for IGBT Inverter



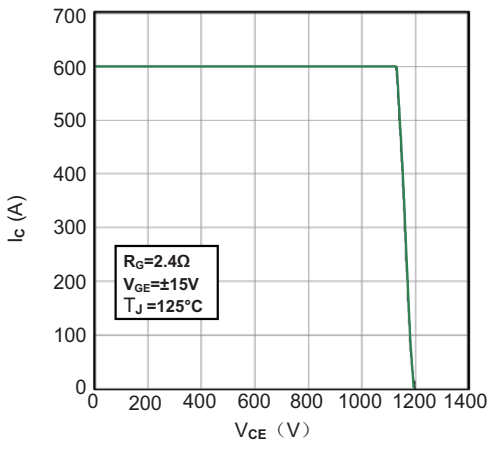

## Figure 4: Switching Energy vs. Gate Resistor for IGBT Inverter



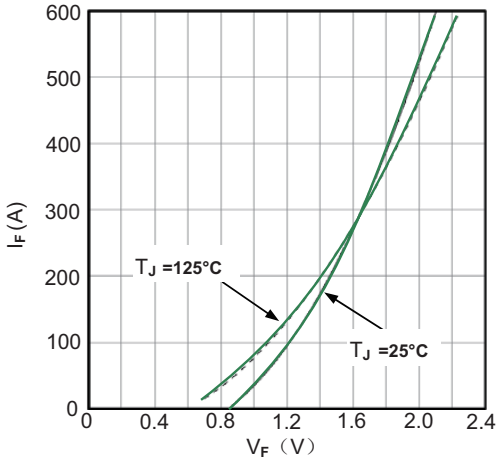

## Figure 5: Switching Energy vs. Collector Current for IGBT Inverter



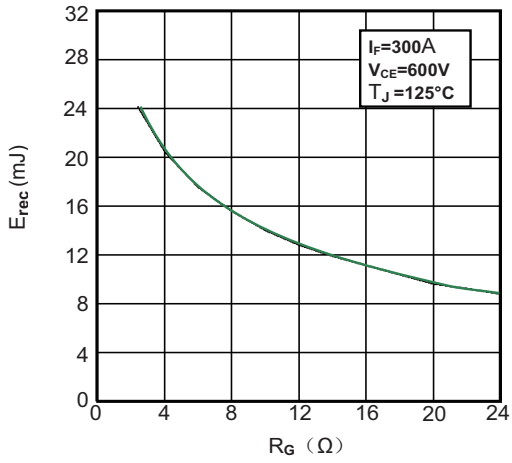

## Figure 6: Reverse Biased Safe Operating Area for IGBT Inverter



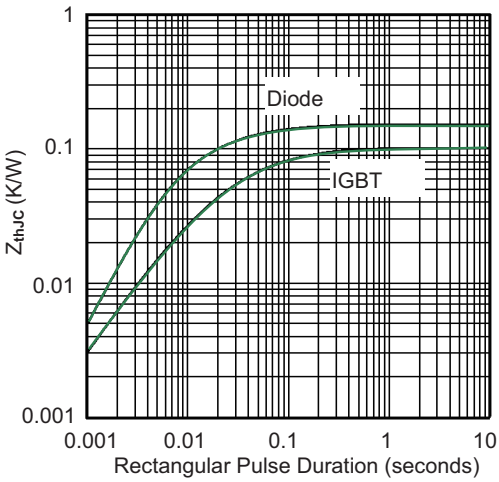
## Figure 7: Diode Forward Characteristics for Diode Inverter



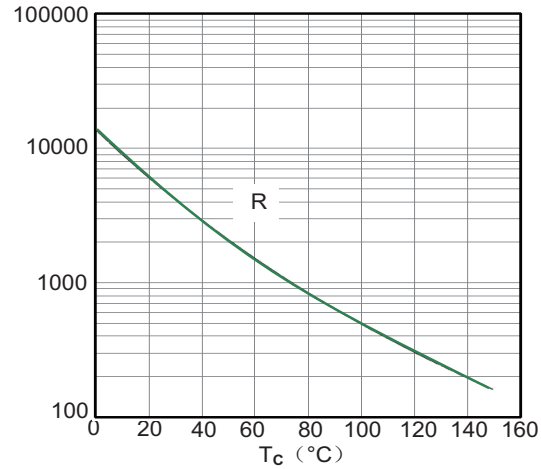

## Figure 8: Switching Energy vs. Gate Resistort for Diode Inverter



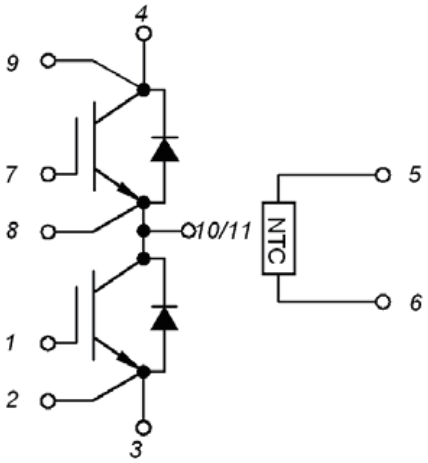

## Figure 9: Transient Thermal Impedance of Diode and IGBT Inverter




## Figure 10: NTC Characteristics

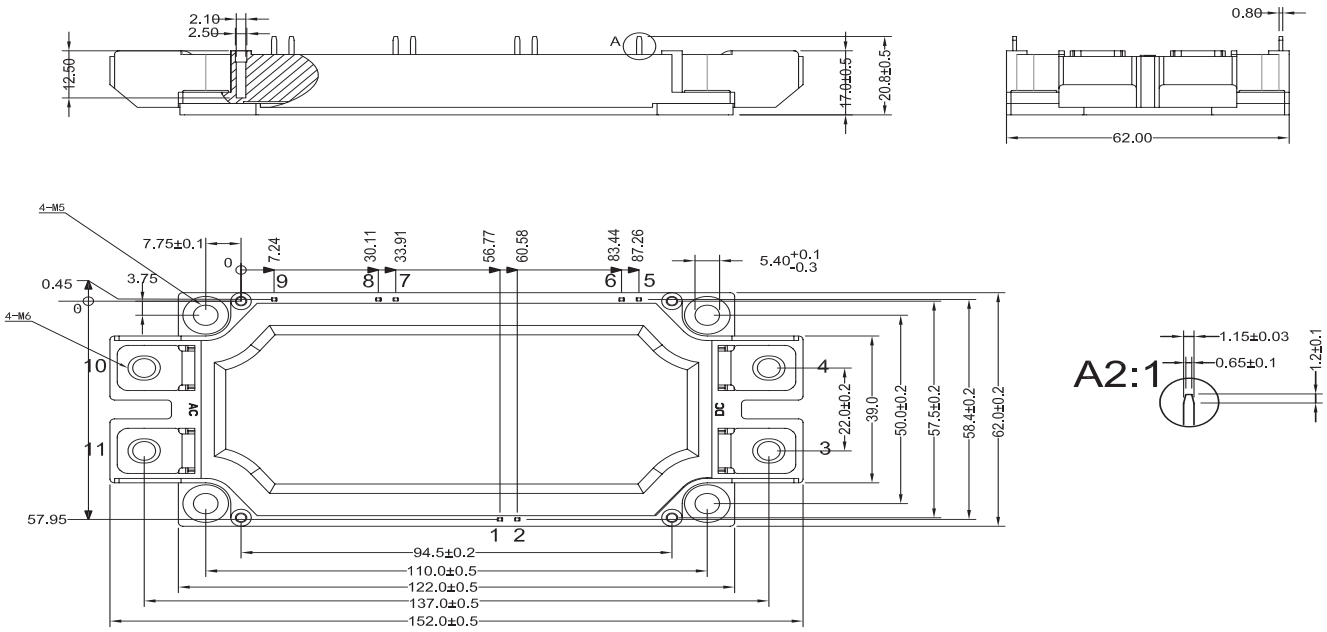



## Circuit Diagram



# Power Module
# 1200V 300A IGBT Module

## Dimensions-Package WB

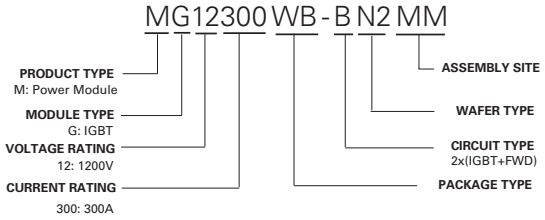



The foot pins are in gold / nickel coating

## Packing Options

| Part Number | Marking | Weight | Packing Mode | M.O.Q |
|---|---|---|---|---|
| MG12300WB-BN2MM | MG12300WB-BN2MM | 350g | Bulk Pack | 60 |

## Part Numbering System




## Part Marking System