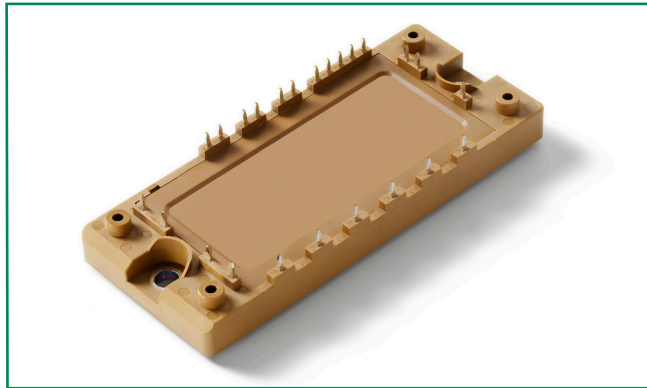


### MG1215H-XBN2MM

RoHS



#### Features

- 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

#### Module Characteristics ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol            | Parameters                 | Test Conditions     | Min | Typ  | Max | Unit             |
|-------------------|----------------------------|---------------------|-----|------|-----|------------------|
| $T_{j\max}$       | Max. Junction Temperature  |                     |     |      | 150 | $^\circ\text{C}$ |
| $T_{j\text{op}}$  | Operating Temperature      |                     | -40 |      | 125 | $^\circ\text{C}$ |
| $T_{\text{stg}}$  | Storage Temperature        |                     | -40 |      | 125 | $^\circ\text{C}$ |
| $V_{\text{isol}}$ | Insulation Test Voltage    | AC, $t=1\text{min}$ |     | 3000 |     | V                |
| CTI               | Comparative Tracking Index |                     | 250 |      |     |                  |
| $M_d$             | Mounting Torque            | Recommended (M5)    | 2.5 |      | 5   | N·m              |
| Weight            |                            |                     |     | 180  |     | g                |

#### Absolute Maximum Ratings ( $T_j = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol             | Parameters                        | Test Conditions   | Values   | Unit                 |
|--------------------|-----------------------------------|---|----------|----------------------|
| <b>IGBT</b>        |                                   |   |          |                      |
| $V_{\text{CES}}$   | Collector - Emitter Voltage       | $T_j=25^\circ\text{C}$                                      | 1200     | V                    |
| $V_{\text{GES}}$   | Gate - Emitter Voltage            |   | $\pm 20$ | V                    |
| $I_C$              | DC Collector Current              | $T_c=25^\circ\text{C}$                                      | 25       | A                    |
|                    |                                   | $T_c=80^\circ\text{C}$                                      | 15       | A                    |
| $I_{\text{CM}}$    | Repetitive Peak Collector Current | $t_p=1\text{ms}$  | 30       | A                    |
| $P_{\text{tot}}$   | Power Dissipation Per IGBT        |   | 105      | W                    |
| <b>Diode</b>       |                                   |   |          |                      |
| $V_{\text{RRM}}$   | Repetitive Reverse Voltage        | $T_j=25^\circ\text{C}$                                      | 1200     | V                    |
| $I_{\text{F(AV)}}$ | Average Forward Current           | $T_c=25^\circ\text{C}$                                      | 15       | A                    |
| $I_{\text{FRM}}$   | Repetitive Peak Forward Current   | $t_p=1\text{ms}$  | 30       | A                    |
| $I^2t$             |                                   | $T_j=125^\circ\text{C}$ , $t=10\text{ms}$ , $V_R=0\text{V}$ | 60       | $\text{A}^2\text{s}$ |

### Electrical and Thermal Specifications ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol        | Parameters                                      | Test Conditions   | Min                     | Typ  | Max  | Unit          |
|---------------|---|---|-------------------------|------|------|---------------|
| <b>IGBT</b>   |   |   |                         |      |      |               |
| $V_{GE(th)}$  | Gate - Emitter Threshold Voltage                | $V_{CE}=V_{GE}, I_C=0.6\text{mA}$   | 5.0                     | 5.8  | 6.5  | V             |
| $V_{CE(sat)}$ | Collector - Emitter                             | $I_C=15\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$   |                         | 1.7  | 2.15 | V             |
|               | Saturation Voltage                              | $I_C=15\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$  |                         | 1.9  |      | V             |
| $I_{ICES}$    | Collector Leakage Current                       | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$   |                         |      | 0.1  | mA            |
|               |   | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$  |                         |      | 1    | mA            |
| $I_{GES}$     | Gate Leakage Current                            | $V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=125^\circ\text{C}$  | -400                    |      | 400  | nA            |
| $R_{Gint}$    | Integrated Gate Resistor                        |   |                         | 0    |      | $\Omega$      |
| $Q_{ge}$      | Gate Charge                                     | $V_{CE}=600\text{V}, I_C=15\text{A}, V_{GE}=\pm 15\text{V}$   |                         | 0.15 |      | $\mu\text{C}$ |
| $C_{ies}$     | Input Capacitance                               | $V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$  |                         | 1.1  |      | nF            |
| $C_{res}$     | Reverse Transfer Capacitance                    |   |                         |      | 0.04 |               |
| $t_{d(on)}$   | Turn - on Delay Time                            | $V_{CC}=600\text{V}$<br>$I_C=15\text{A}$<br>$R_G=75\Omega$<br>$V_{GE}=\pm 15\text{V}$<br>Inductive Load | $T_J=25^\circ\text{C}$  |      | 90   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 90   | ns            |
| $t_r$         | Rise Time                                       |   | $T_J=25^\circ\text{C}$  |      | 30   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 50   | ns            |
| $t_{d(off)}$  | Turn - off Delay Time                           |   | $T_J=25^\circ\text{C}$  |      | 420  | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 520  | ns            |
| $t_f$         | Fall Time                                       |   | $T_J=25^\circ\text{C}$  |      | 70   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 90   | ns            |
| $E_{on}$      | Turn - on Energy                                |   | $T_J=25^\circ\text{C}$  |      | 1.5  | mJ            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 2.1  | mJ            |
| $E_{off}$     | Turn - off Energy                               | $T_J=25^\circ\text{C}$  |                         | 1.1  | mJ   |               |
|               |   | $T_J=125^\circ\text{C}$   |                         | 1.3  | mJ   |               |
| $I_{SC}$      | Short Circuit Current                           | $t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}, V_{CC}=900\text{V}$              |                         | 60   |      | A             |
| $R_{thJC}$    | Junction-to-Case Thermal Resistance (Per IGBT)  |   |                         |      | 1.2  | K/W           |
| <b>Diode</b>  |   |   |                         |      |      |               |
| $V_F$         | Forward Voltage                                 | $I_F=15\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$  |                         | 1.65 | 2.15 | V             |
|               |   | $I_F=15\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$   |                         | 1.65 |      | V             |
| $t_{RR}$      | Reverse Recovery Time                           | $I_F=15\text{A}, V_R=600\text{V}$<br>$di_p/dt=-400\text{A}/\mu\text{s}$<br>$T_J=125^\circ\text{C}$      |                         | 150  |      | ns            |
| $I_{RRM}$     | Max. Reverse Recovery Current                   |   |                         | 16   |      | A             |
| $E_{rec}$     | Reverse Recovery Energy                         |   |                         | 1.1  |      | mJ            |
| $R_{thJCD}$   | Junction-to-Case Thermal Resistance (Per Diode) |   |                         |      | 1.5  | K/W           |

### Diode-Rectifier Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol       | Parameters                           | Test Conditions                                      | Values | Unit                 |
|--------------|--------------------------------------|--|--------|----------------------|
| $V_{RRM}$    | Repetitive Reverse Voltage           | $T_J = 25^\circ\text{C}$                             | 1600   | V                    |
| $I_{F(RMS)}$ | R.M.S. Forward Current Per Diode     | $T_C = 80^\circ\text{C}$                             | 50     | A                    |
| $I_{FSM}$    | Non-Repetitive Surge Forward Current | $T_J = 45^\circ\text{C}$ , $t = 10\text{ms}$ , 50Hz  | 320    | A                    |
|              |                                      | $T_J = 45^\circ\text{C}$ , $t = 8.3\text{ms}$ , 60Hz | 360    | A                    |
| $I^2t$       |                                      | $T_J = 45^\circ\text{C}$ , $t = 10\text{ms}$ , 50Hz  | 512    | $\text{A}^2\text{s}$ |
|              |                                      | $T_J = 45^\circ\text{C}$ , $t = 8.3\text{ms}$ , 60Hz | 537    | $\text{A}^2\text{s}$ |

### Diode-Rectifier Electrical and Thermal Specifications ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol      | Parameters                                      | Test Conditions   | Min | Typ | Max  | Unit          |
|-------------|---|---|-----|-----|------|---------------|
| $V_F$       | Forward Voltage                                 | $I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$ , $T_J = 25^\circ\text{C}$  |     | 1.0 |      | V             |
|             |   | $I_F = 15\text{A}$ , $V_{GE} = 0\text{V}$ , $T_J = 125^\circ\text{C}$ |     | 0.9 |      | V             |
| $I_R$       | Reverse Leakage Current                         | $V_R = 1600\text{V}$ , $T_J = 25^\circ\text{C}$                       |     |     | 50   | $\mu\text{A}$ |
|             |   | $V_R = 1600\text{V}$ , $T_J = 125^\circ\text{C}$                      |     |     | 1    | mA            |
| $R_{thJCD}$ | Junction-to-Case Thermal Resistance (Per Diode) |   |     |     | 1.05 | $\text{K/W}$  |

### Brake-Chopper Absolute Maximum Ratings ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol       | Parameters                        | Test Conditions   | Values   | Unit                 |
|--------------|-----------------------------------|---|----------|----------------------|
| <b>IGBT</b>  |                                   |   |          |                      |
| $V_{CES}$    | Collector - Emitter Voltage       | $T_J = 25^\circ\text{C}$  | 1200     | V                    |
| $V_{GES}$    | Gate - Emitter Voltage            |   | $\pm 20$ | V                    |
| $I_C$        | DC Collector Current              | $T_C = 25^\circ\text{C}$  | 25       | A                    |
|              |                                   | $T_C = 80^\circ\text{C}$  | 15       | A                    |
| $I_{CM}$     | Repetitive Peak Collector Current | $t_p = 1\text{ms}$  | 30       | A                    |
| $P_{tot}$    | Power Dissipation Per IGBT        |   | 105      | W                    |
| <b>Diode</b> |                                   |   |          |                      |
| $V_{RRM}$    | Repetitive Reverse Voltage        | $T_J = 25^\circ\text{C}$  | 1200     | V                    |
| $I_{F(AV)}$  | Average Forward Current           | $T_C = 25^\circ\text{C}$  | 15       | A                    |
| $I_{FRM}$    | Repetitive Peak Forward Current   | $t_p = 1\text{ms}$  | 30       | A                    |
| $I^2t$       |                                   | $T_J = 125^\circ\text{C}$ , $t = 10\text{ms}$ , $V_R = 0\text{V}$ | 60       | $\text{A}^2\text{s}$ |

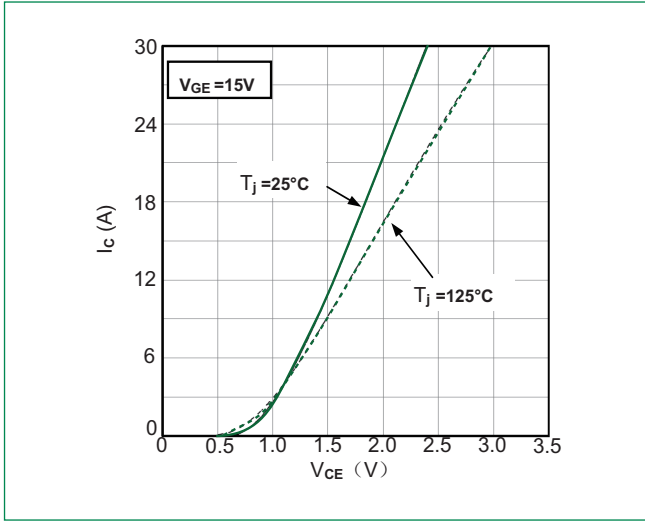
### Brake-Chopper Electrical and Thermal Specifications ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol        | Parameters                                      | Test Conditions   | Min                     | Typ  | Max  | Unit          |
|---------------|---|---|-------------------------|------|------|---------------|
| <b>IGBT</b>   |   |   |                         |      |      |               |
| $V_{GE(th)}$  | Gate - Emitter Threshold Voltage                | $V_{CE}=V_{GE}, I_C=0.6\text{mA}$   | 5.0                     | 5.8  | 6.5  | V             |
| $V_{CE(sat)}$ | Collector - Emitter                             | $I_C=15\text{A}, V_{GE}=15\text{V}, T_J=25^\circ\text{C}$   |                         | 1.7  | 2.15 | V             |
|               | Saturation Voltage                              | $I_C=15\text{A}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}$  |                         | 1.9  |      | V             |
| $I_{ICES}$    | Collector Leakage Current                       | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$   |                         |      | 50   | $\mu\text{A}$ |
|               |   | $V_{CE}=1200\text{V}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$  |                         |      | 1    | mA            |
| $I_{GES}$     | Gate Leakage Current                            | $V_{CE}=0\text{V}, V_{GE}=\pm 15\text{V}, T_J=125^\circ\text{C}$  | -400                    |      | 400  | nA            |
| $R_{Gint}$    | Integrated Gate Resistor                        |   |                         | 0    |      | $\Omega$      |
| $Q_{ge}$      | Gate Charge                                     | $V_{CE}=600\text{V}, I_C=15\text{A}, V_{GE}=\pm 15\text{V}$   |                         | 0.15 |      | $\mu\text{C}$ |
| $C_{ies}$     | Input Capacitance                               | $V_{CE}=25\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$  |                         | 1.1  |      | nF            |
| $C_{res}$     | Reverse Transfer Capacitance                    |   |                         |      | 0.04 |               |
| $t_{d(on)}$   | Turn - on Delay Time                            | $V_{CC}=600\text{V}$<br>$I_C=15\text{A}$<br>$R_G=75\Omega$<br>$V_{GE}=\pm 15\text{V}$<br>Inductive Load | $T_J=25^\circ\text{C}$  |      | 90   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 90   | ns            |
| $t_r$         | Rise Time                                       |   | $T_J=25^\circ\text{C}$  |      | 30   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 50   | ns            |
| $t_{d(off)}$  | Turn - off Delay Time                           |   | $T_J=25^\circ\text{C}$  |      | 420  | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 520  | ns            |
| $t_f$         | Fall Time                                       |   | $T_J=25^\circ\text{C}$  |      | 70   | ns            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 90   | ns            |
| $E_{on}$      | Turn - on Energy                                |   | $T_J=25^\circ\text{C}$  |      | 1.5  | mJ            |
|               |   |   | $T_J=125^\circ\text{C}$ |      | 2.1  | mJ            |
| $E_{off}$     | Turn - off Energy                               | $T_J=25^\circ\text{C}$  |                         | 1.1  | mJ   |               |
|               |   | $T_J=125^\circ\text{C}$   |                         | 1.3  | mJ   |               |
| $I_{SC}$      | Short Circuit Current                           | $t_{psc} \leq 10\mu\text{s}, V_{GE}=15\text{V}, T_J=125^\circ\text{C}, V_{CC}=900\text{V}$              |                         | 60   |      | A             |
| $R_{thJC}$    | Junction-to-Case Thermal Resistance (Per IGBT)  |   |                         |      | 1.2  | K/W           |
| <b>Diode</b>  |   |   |                         |      |      |               |
| $V_F$         | Forward Voltage                                 | $I_F=15\text{A}, V_{GE}=0\text{V}, T_J=25^\circ\text{C}$  |                         | 1.65 | 2.15 | V             |
|               |   | $I_F=15\text{A}, V_{GE}=0\text{V}, T_J=125^\circ\text{C}$   |                         | 1.65 |      | V             |
| $t_{RR}$      | Reverse Recovery Time                           | $I_F=15\text{A}, V_R=600\text{V}$<br>$di_p/dt=-400\text{A}/\mu\text{s}$<br>$T_J=125^\circ\text{C}$      |                         | 150  |      | ns            |
| $I_{RRM}$     | Max. Reverse Recovery Current                   |   |                         | 16   |      | A             |
| $E_{rec}$     | Reverse Recovery Energy                         |   |                         | 1.1  |      | mJ            |
| $R_{thJCD}$   | Junction-to-Case Thermal Resistance (Per Diode) |   |                         |      | 1.5  | K/W           |

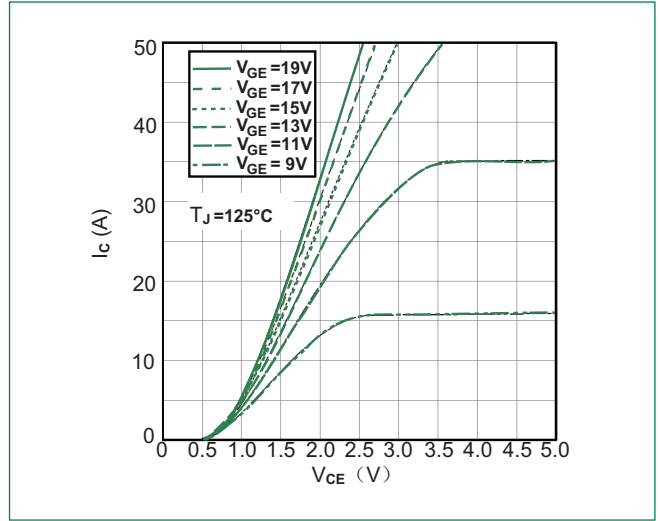
### NTC Characteristics ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol      | Parameters | Test Conditions        | Min | Typ  | Max | Unit       |
|-------------|------------|------------------------|-----|------|-----|------------|
| $R_{25}$    | Resistance | $T_c=25^\circ\text{C}$ |     | 5    |     | K $\Omega$ |
| $B_{25/50}$ |            |                        |     | 3375 |     | K          |

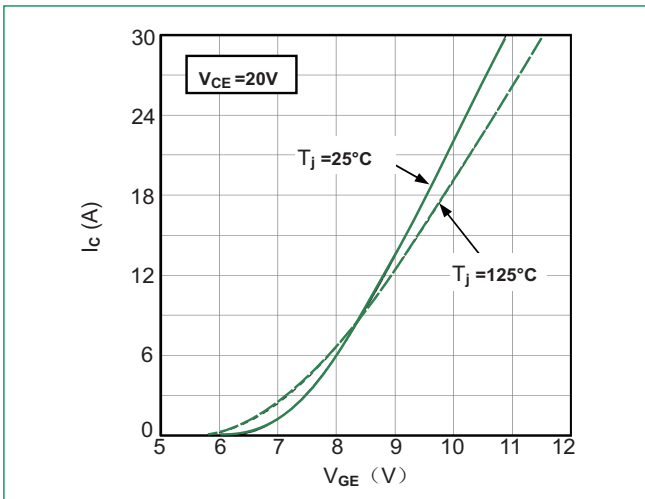
**Figure 1: Typical Output Characteristics for IGBT Inverter**



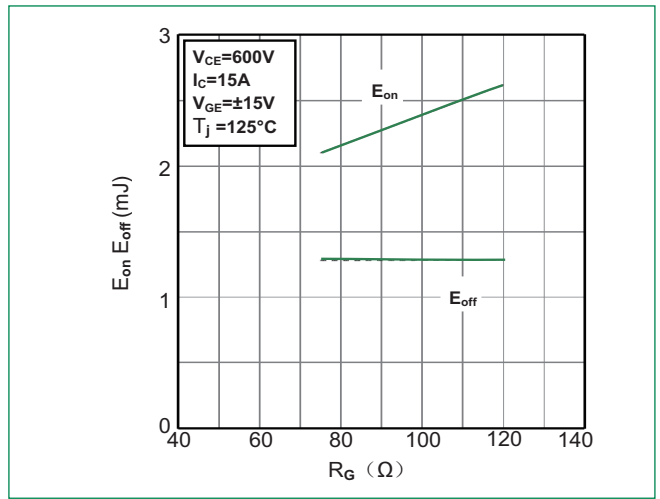
**Figure 2: Typical Output Characteristics for IGBT Inverter**



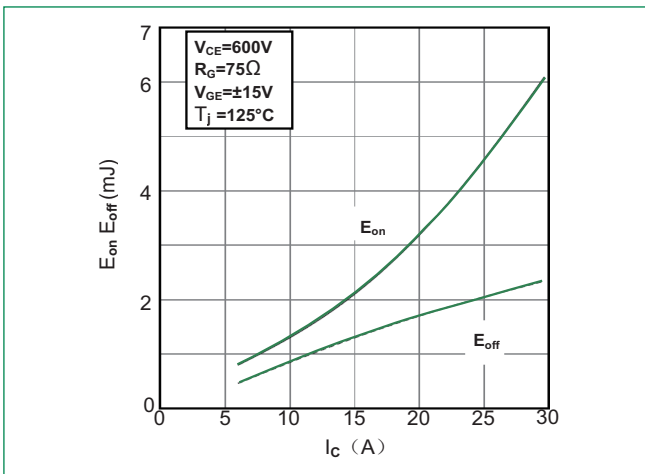
**Figure 3: Typical Transfer Characteristics for IGBT Inverter**



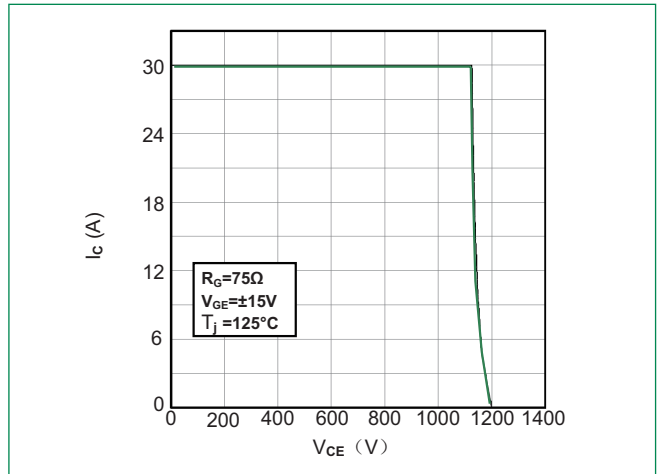
**Figure 4: Switching Energy vs. Gate Resistor for IGBT Inverter**



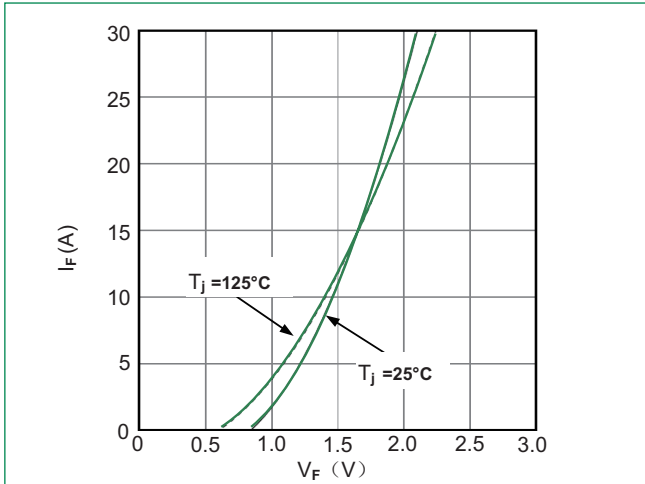
**Figure 5: Switching Energy vs. Collector Current for IGBT Inverter**



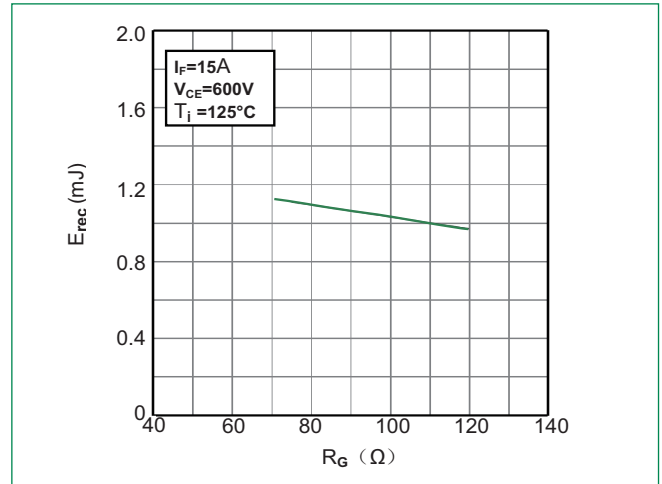
**Figure 6: Reverse Biased Safe Operating Area for IGBT Inverter**



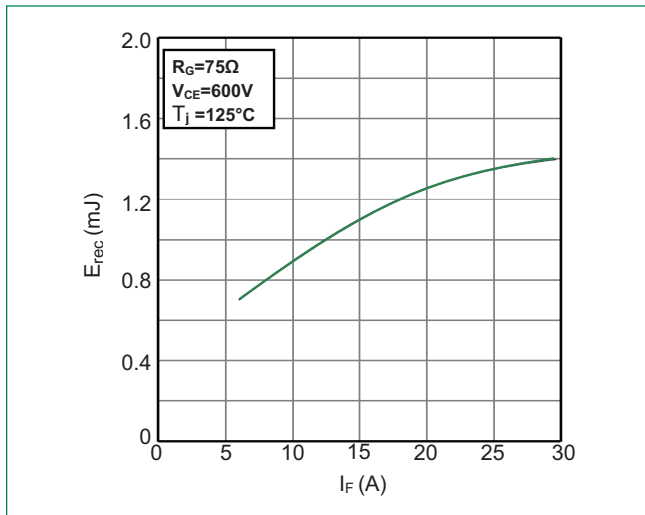
**Figure 7: Diode Forward Characteristics for Diode Inverter**



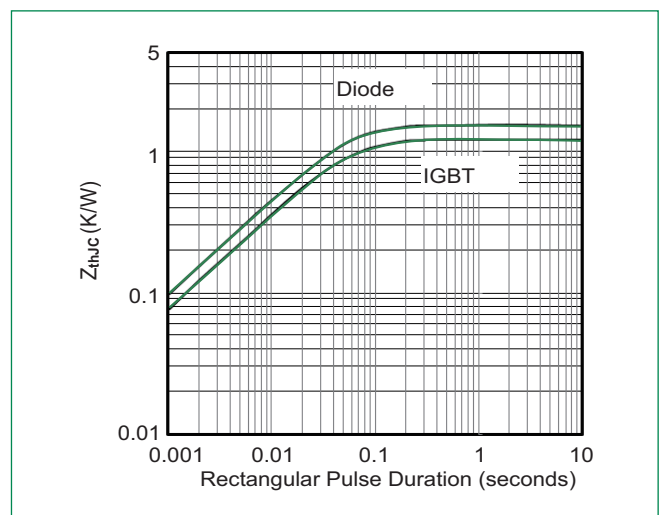
**Figure 8: Switching Energy vs. Gate Resistort for Diode Inverter**



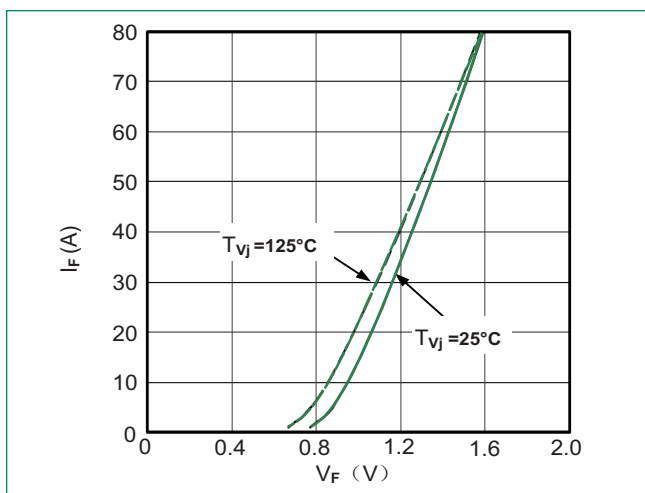
**Figure 9: Switching Energy vs. Forward Current Diode-inverter**



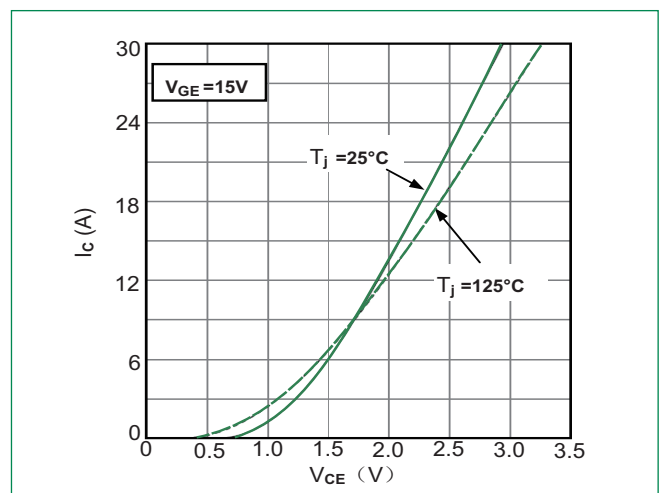
**Figure 10: Transient Thermal Impedance of Diode and IGBT-inverter**



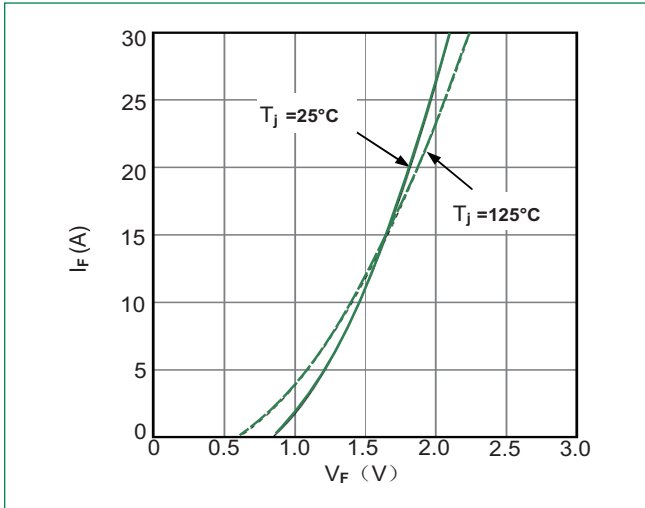
**Figure 11: Diode Forward Characteristics Diode-rectifier**



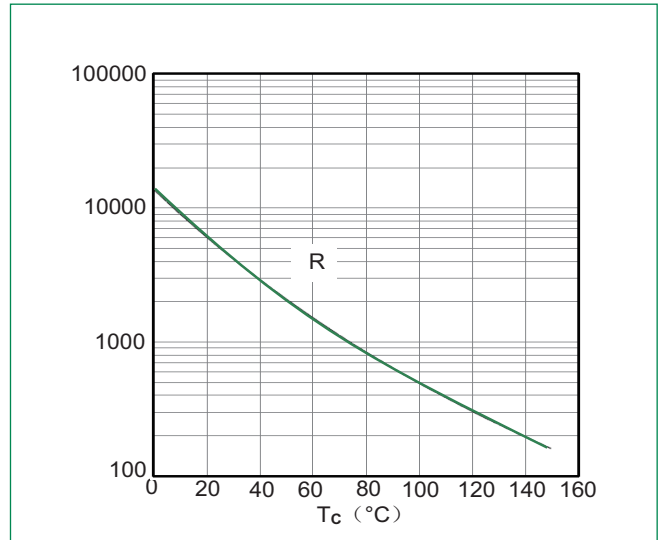
**Figure 12: Typical Output Characteristics IGBT- brake chopper**



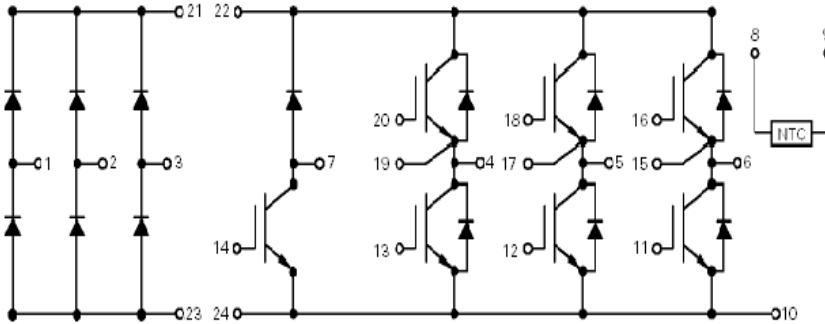
**Figure 13: Diode Forward Characteristics**  
Diode - brake chopper



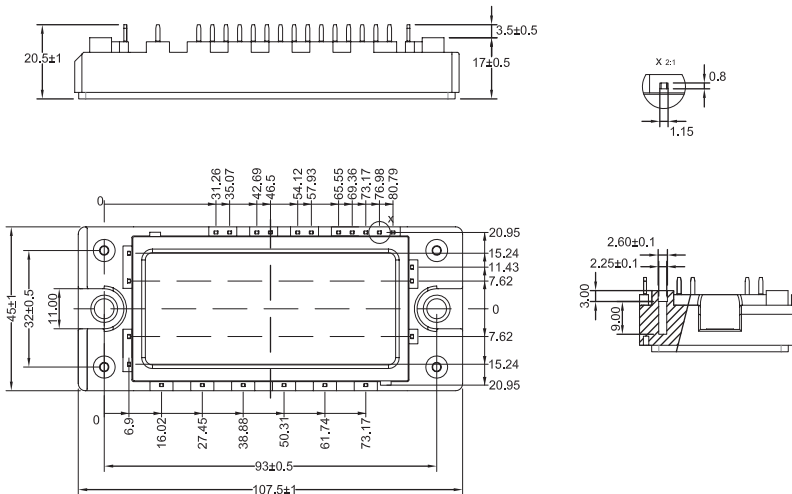
**Figure 14: NTC Characteristics**



### Circuit Diagram



### Dimensions-Package H

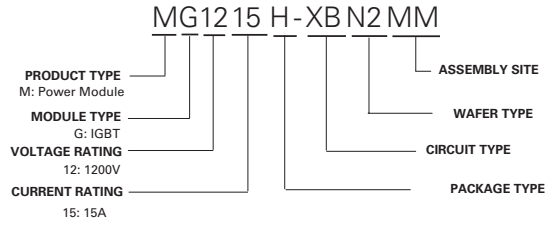


The foot pins are in gold / nickel coating

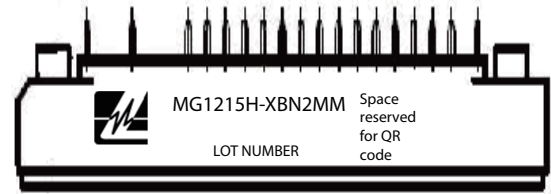
### Packing Options

| Part Number    | Marking        | Weight | Packing Mode | M.O.Q |
|----------------|----------------|--------|--------------|-------|
| MG1215H-XBN2MM | MG1215H-XBN2MM | 180g   | Bulk Pack    | 40    |

### Part Numbering System



### Part Marking System





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[DF400R07PE4R\\_B6](#) [BSM75GB120DN2\\_E3223c-Se](#) [F3L300R12ME4\\_B22](#) [F3L75R07W2E3\\_B11](#) [F4-50R12KS4\\_B11](#)  
[F475R07W1H3B11ABOMA1](#) [FD1400R12IP4D](#) [FD200R12PT4\\_B6](#) [FD800R33KF2C-K](#) [FF1200R17KP4\\_B2](#) [FF300R17KE3\\_S4](#)  
[FF300R17ME4\\_B11](#) [FF401R17KF6C\\_B2](#) [FF650R17IE4D\\_B2](#) [FF900R12IP4D](#) [FF900R12IP4DV](#) [STGIF7CH60TS-L](#) [FP50R07N2E4\\_B11](#)  
[FS100R07PE4](#) [FS150R07N3E4\\_B11](#) [FS150R17N3E4](#) [FS150R17PE4](#)