

### MG12100D-BA1MM



#### Agency Approvals

| AGENCY                                                                            | AGENCY FILE NUMBER |
|-----------------------------------------------------------------------------------|--------------------|
|  | E71639             |

#### Features

- Ultra low loss
- High ruggedness
- High short circuit capability
- Positive temperature coefficient
- With fast free-wheeling diodes

#### Applications

- Inverter
- Converter
- Welder
- SMPS and UPS
- Induction heating

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

| Symbol     | Parameters                          | Test Conditions   | Min | Typ | Max  | Unit |
|------------|-------------------------------------|-------------------|-----|-----|------|------|
| $R_{thJC}$ | Junction-to-Case Thermal Resistance | Per IGBT          |     |     | 0.15 | K/W  |
| $R_{thJD}$ |                                     | Per Inverse Diode |     |     | 0.30 | K/W  |
| Torque     | Module-to-Sink                      | Recommended (M6)  | 3   |     | 5    | N·m  |
| Torque     | Module Electrodes                   | Recommended (M5)  | 2.5 |     | 5    | N·m  |
| Weight     |                                     |                   |     | 285 |      | g    |

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

| Symbol       | Parameters                           | Test Conditions                                   | Values      | Unit             |
|--------------|--------------------------------------|---------------------------------------------------|-------------|------------------|
| <b>IGBT</b>  |                                      |                                                   |             |                  |
| $V_{CES}$    | Collector - Emitter Voltage          |                                                   | 1200        | V                |
| $V_{GES}$    | Gate - Emitter Voltage               |                                                   | $\pm 20$    | V                |
| $I_c$        | DC Collector Current                 | $T_c = 25^\circ\text{C}$                          | 160         | A                |
|              |                                      | $T_c = 80^\circ\text{C}$                          | 100         | A                |
| $I_{Cpuls}$  | Pulsed Collector Current             | $T_c = 25^\circ\text{C}, t_p = 1\text{ms}$        | 340         | A                |
|              |                                      | $T_c = 80^\circ\text{C}, t_p = 1\text{ms}$        | 220         |                  |
| $P_{tot}$    | Power Dissipation Per IGBT           |                                                   | 1000        | W                |
| $T_J$        | Junction Temperature Range           |                                                   | -40 to +150 | $^\circ\text{C}$ |
| $T_{STG}$    | Storage Temperature Range            |                                                   | -40 to +125 | $^\circ\text{C}$ |
| $V_{isol}$   | Insulation Test Voltage              | AC, $t = 1\text{min}$                             | 3000        | V                |
| <b>Diode</b> |                                      |                                                   |             |                  |
| $V_{RRM}$    | Repetitive Reverse Voltage           |                                                   | 1200        | V                |
| $I_{F(AV)}$  | Average Forward Current              | $T_c = 25^\circ\text{C}$                          | 180         | A                |
|              |                                      | $T_c = 80^\circ\text{C}$                          | 120         | A                |
| $I_{F(RMS)}$ | RMS Forward Current                  |                                                   | 180         | A                |
| $I_{FSM}$    | Non-Repetitive Surge Forward Current | $T_J = 45^\circ\text{C}, t = 10\text{ms}$ , Sine  | 860         | A                |
|              |                                      | $T_J = 45^\circ\text{C}, t = 8.3\text{ms}$ , Sine | 900         |                  |

Life Support Note:

#### Not Intended for Use in Life Support or Life Saving Applications

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

MG12100D-BA1MM

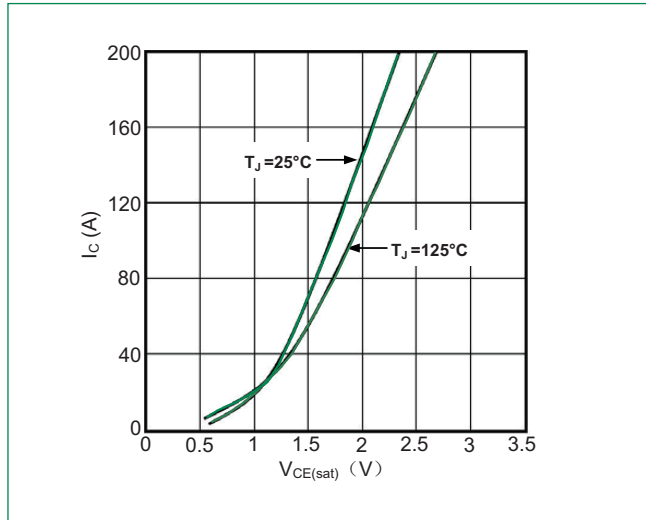
# Power Module

## 1200V 100A IGBT Module

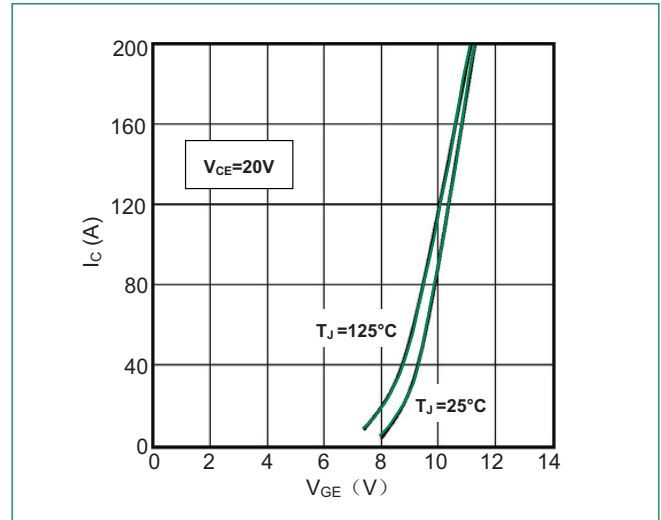
### Electrical and Thermal Specifications ( $T_c = 25^\circ\text{C}$ , unless otherwise specified)

| Symbol               | Parameters                             | Test Conditions                                                                                                                |                       | Min  | Typ  | Max | Unit |
|----------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------|-----|------|
| IGBT                 |                                        |                                                                                                                                |                       |      |      |     |      |
| V <sub>GE(th)</sub>  | Gate - Emitter Threshold Voltage       | V <sub>CE</sub> =V <sub>GE</sub> , I <sub>C</sub> =4mA                                                                         |                       | 5.0  | 6.2  | 7.0 | V    |
| V <sub>CE(sat)</sub> | Collector - Emitter Saturation Voltage | I <sub>C</sub> =100A, V <sub>GE</sub> =15V, T <sub>J</sub> =25°C                                                               |                       |      | 1.8  |     | V    |
|                      |                                        | I <sub>C</sub> =100A, V <sub>GE</sub> =15V, T <sub>J</sub> =125°C                                                              |                       |      | 2.0  |     | V    |
| I <sub>CES</sub>     | Collector Leakage Current              | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V, T <sub>J</sub> =25°C                                                              |                       |      |      | 1   | mA   |
|                      |                                        | V <sub>CE</sub> =1200V, V <sub>GE</sub> =0V, T <sub>J</sub> =125°C                                                             |                       |      | 4    |     | mA   |
| I <sub>GES</sub>     | Gate Leakage Current                   | V <sub>CE</sub> =0V,V <sub>GE</sub> =±20V                                                                                      |                       | -400 |      | 400 | nA   |
| Q <sub>ge</sub>      | Gate Charge                            | V <sub>CC</sub> =600V, I <sub>C</sub> =100A , V <sub>GE</sub> =±15V                                                            |                       |      | 1200 |     | nC   |
| C <sub>ies</sub>     | Input Capacitance                      | V <sub>CE</sub> =25V, V <sub>GE</sub> =0V, f =1MHz                                                                             |                       |      | 8.58 |     | nF   |
| C <sub>oes</sub>     | Output Capacitance                     |                                                                                                                                |                       |      | 0.6  |     |      |
| C <sub>res</sub>     | Reverse Transfer Capacitance           |                                                                                                                                |                       |      | 0.4  |     |      |
| t <sub>d(on)</sub>   | Turn - on Delay Time                   | V <sub>CC</sub> =600V<br><br>I <sub>C</sub> =100A<br><br>R <sub>G</sub> =9Ω<br><br>V <sub>GE</sub> =±15V<br><br>Inductive Load | T <sub>J</sub> =25°C  |      | 270  |     | ns   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 290  |     | ns   |
| t <sub>r</sub>       | Rise Time                              |                                                                                                                                | T <sub>J</sub> =25°C  |      | 60   |     | ns   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 60   |     | ns   |
| t <sub>d(off)</sub>  | Turn - off Delay Time                  |                                                                                                                                | T <sub>J</sub> =25°C  |      | 480  |     | ns   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 550  |     | ns   |
| t <sub>f</sub>       | Fall Time                              |                                                                                                                                | T <sub>J</sub> =25°C  |      | 60   |     | ns   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 65   |     | ns   |
| E <sub>on</sub>      | Turn - on Energy                       |                                                                                                                                | T <sub>J</sub> =25°C  |      | 12   |     | mJ   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 16.8 |     | mJ   |
| E <sub>off</sub>     | Turn - off Energy                      |                                                                                                                                | T <sub>J</sub> =25°C  |      | 7.4  |     | mJ   |
|                      |                                        |                                                                                                                                | T <sub>J</sub> =125°C |      | 11.6 |     | mJ   |
| Diode                |                                        |                                                                                                                                |                       |      |      |     |      |
| V <sub>F</sub>       | Forward Voltage                        | I <sub>F</sub> =100A , V <sub>GE</sub> =0V, T <sub>J</sub> =25°C                                                               |                       |      | 1.9  | 2.3 | V    |
|                      |                                        | I <sub>F</sub> =100A , V <sub>GE</sub> =0V, T <sub>J</sub> =125°C                                                              |                       |      | 1.7  | 2.1 | V    |
| t <sub>rr</sub>      | Reverse Recovery Time                  | I <sub>F</sub> =100A , V <sub>R</sub> =800V<br>di <sub>F</sub> /dt=-1000A/μs<br>T <sub>J</sub> =125°C                          |                       |      | 230  |     | ns   |
| I <sub>RRM</sub>     | Max. Reverse Recovery Current          |                                                                                                                                |                       |      | 80   |     | A    |
| Q <sub>rr</sub>      | Reverse Recovery Charge                |                                                                                                                                |                       |      | 9.7  |     | μC   |

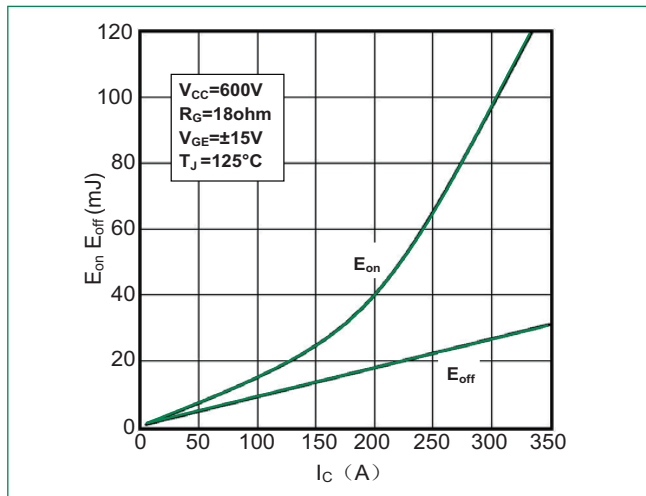
**Figure 1: Typical Output Characteristics**



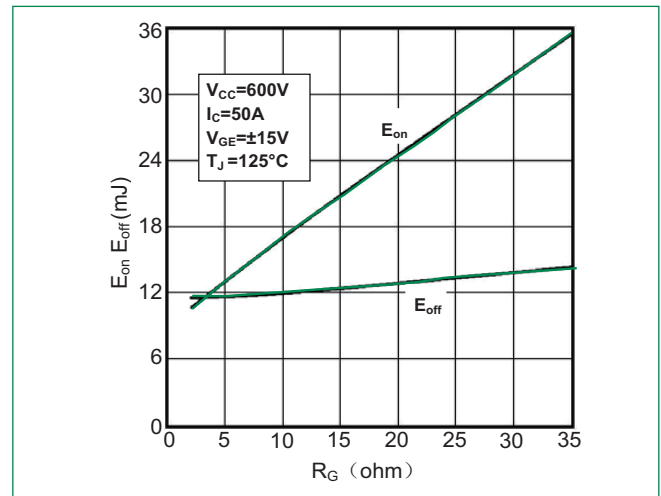
**Figure 2: Typical Transfer characteristics**



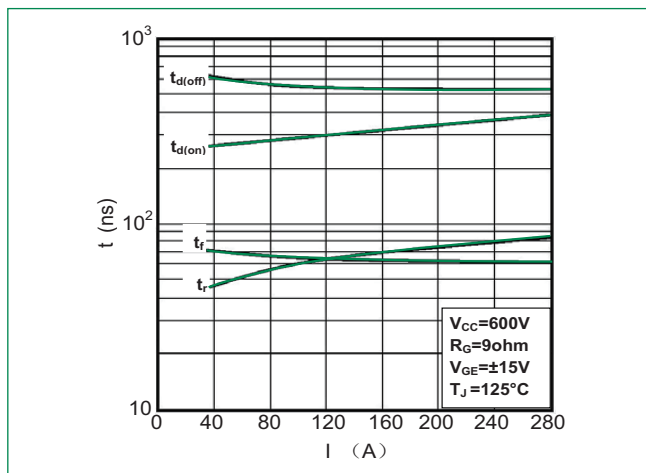
**Figure 3: Switching Energy vs. Collector Current**



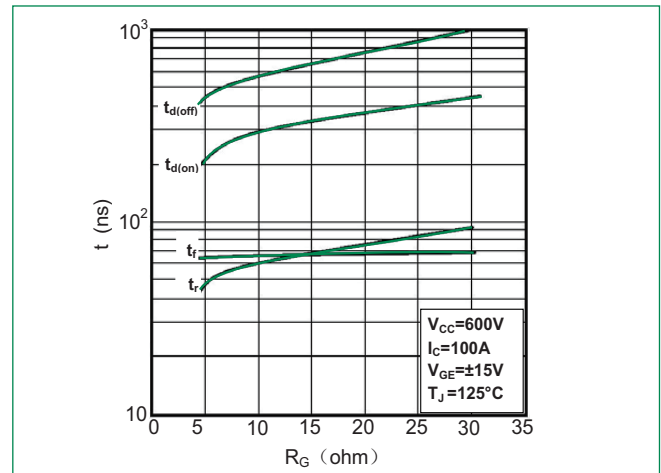
**Figure 4: Switching Energy vs. Gate Resistor**



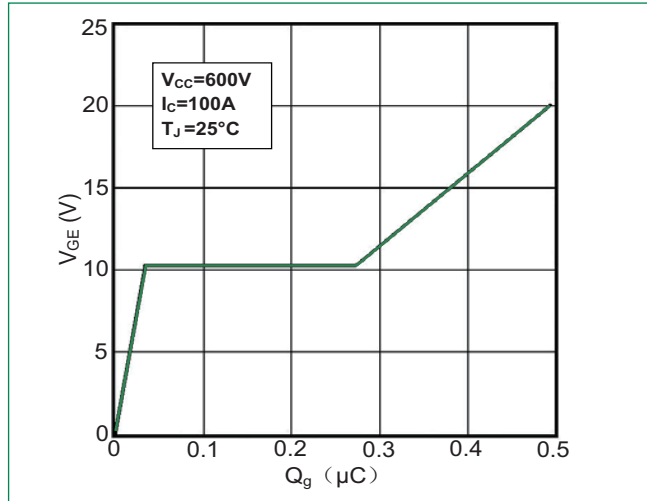
**Figure 5: Switching Times vs. Collector Current**



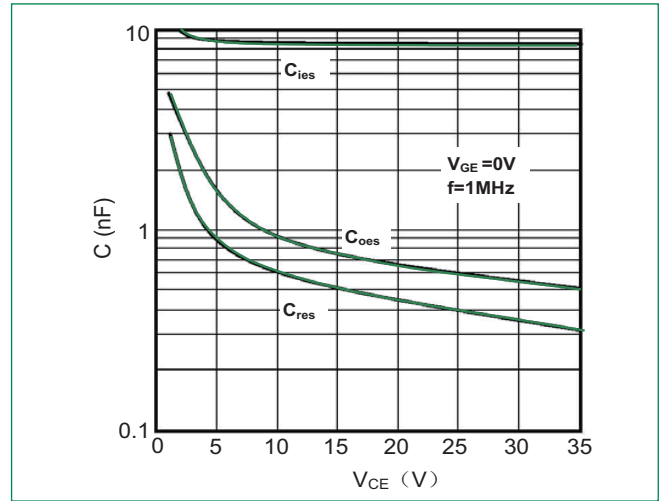
**Figure 6: Switching Times vs. Gate Resistor**



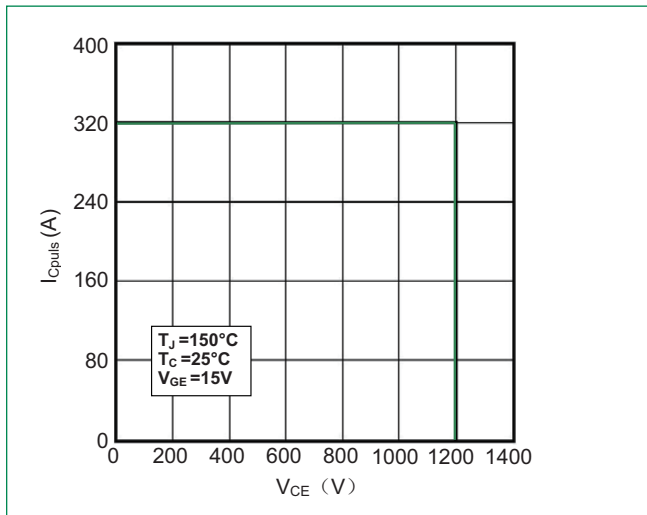
**Figure 7: Gate Charge characteristics**



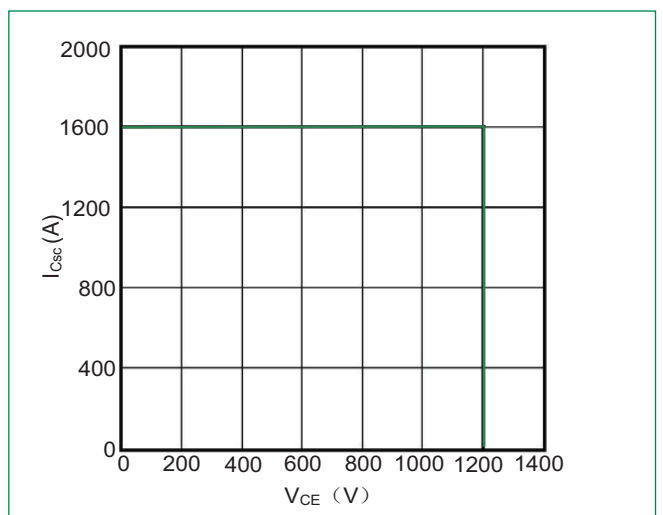
**Figure 8: Typical Capacitances vs.  $V_{CE}$**



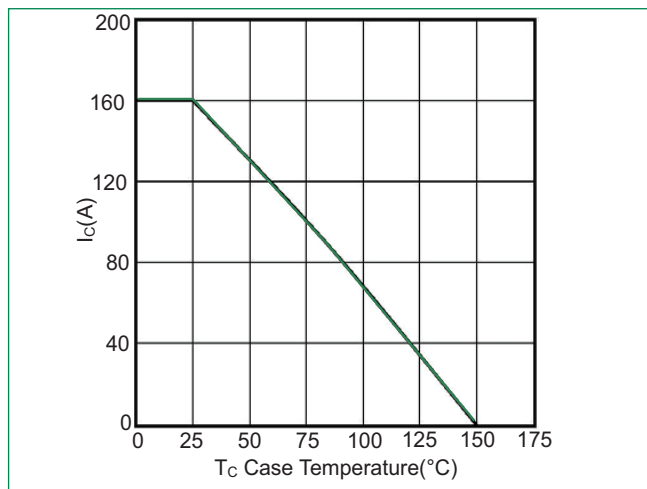
**Figure 9: Reverse Biased Safe Operating Area**



**Figure 10: Short Circuit Safe Operating Area**



**Figure 11: Rated Current vs.  $T_C$**



**Figure 12: Diode Forward Characteristics**

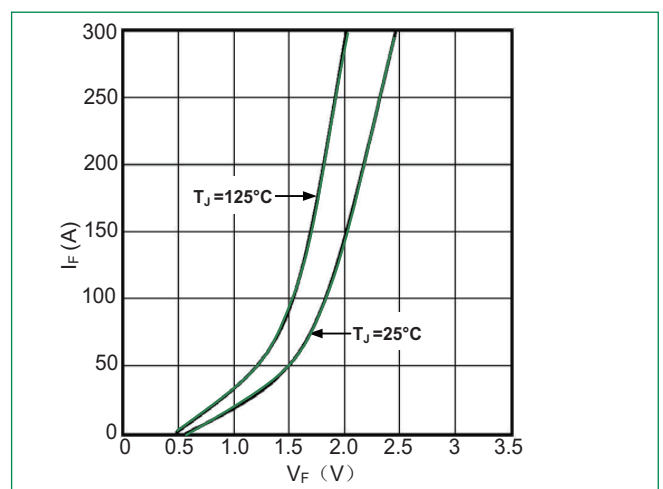


Figure 13: Transient Thermal Impedance of IGBT

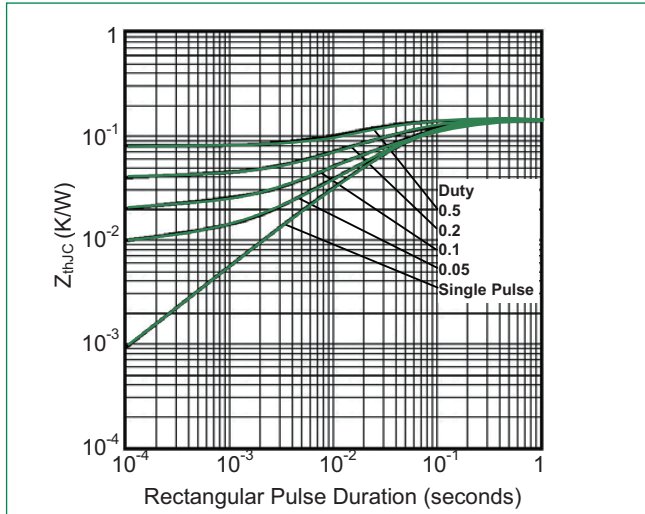
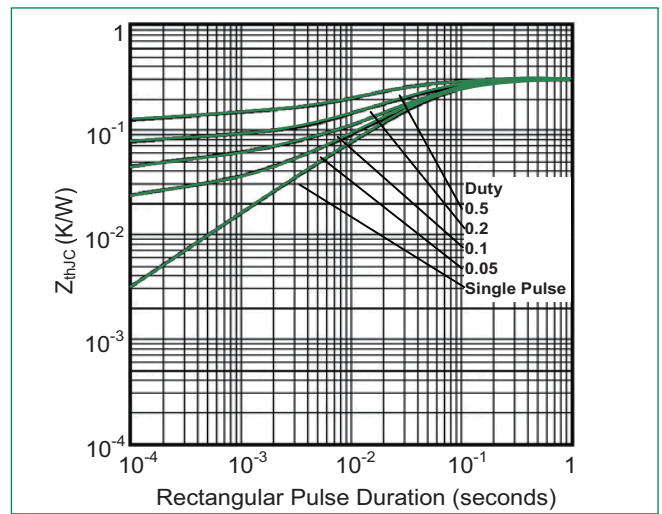
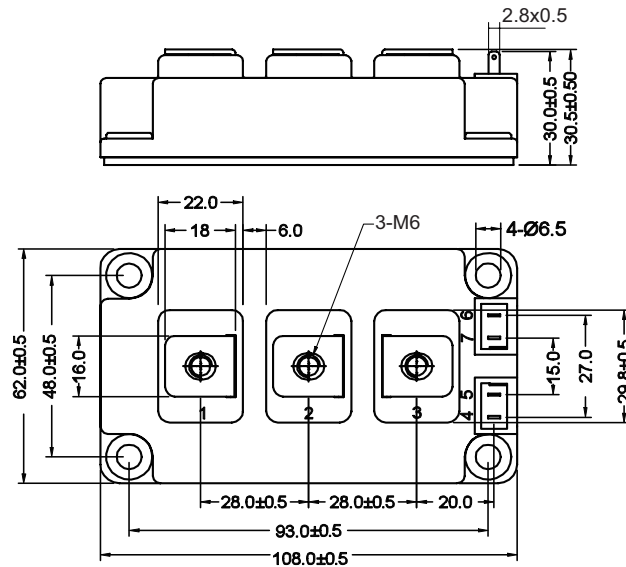


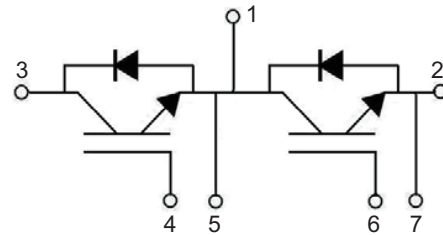
Figure 14: Transient Thermal Impedance of Diode



Dimensions-Package D



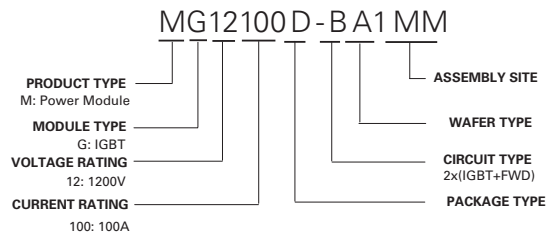
Circuit Diagram



### Packing Options

| Part Number    | Marking        | Weight | Packing Mode | M.O.Q |
|----------------|----------------|--------|--------------|-------|
| MG12100D-BA1MM | MG12100D-BA1MM | 285g   | Bulk Pack    | 60    |

### Part Numbering System



### Part Marking System

