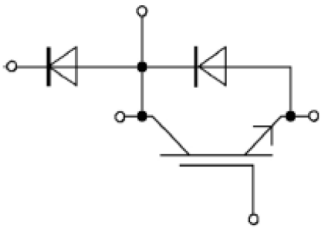
# MS KM101ZD12
## Technical Information
### IGBT Power Module

**Key Parameters**

| | |
|---|---|
| $V_{CE}$ | = 1200V |
| $I_C$ | = 100A |

## Features
- Low $V_{ce(sat)}$
- Fast switching
- High short circuit capability (10μs)
- Low inductance module structure

## Applications
- Inverter for motor drive
- AC and DC servo drive amplifier
- UPS
- Soft switching welding machine
- Solar Inverters
- Medical Equipment's
- Pumps, Fans



Equivalent Circuit Schematic

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**Absolute Maximum Ratings**

| Symbol | Characteristic | Value | Unit |
|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | 1200 | V |
| $I_{CDC}$ | Continuous DC Collector Current ($T_c$=100°C, $T_j$=175°C) | 100 | A |
| $I_{CRM}$ | Peak Collector Current (tp=1ms) | 200 | A |
| $V_{GES}$ | Gate-Emitter Voltage | ±20 | V |

**IGBT Characteristics**

| Symbol | Characteristic | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $BV_{CES}$ | Collector-Emitter breakdown Voltage | $V_{GE}$=0V, $I_C$ =250μA,$T_{vj}$=25°C | 1200 | | | V |
| $I_{CES}$ | Collector-Emitter leakage Current | $V_{CE}$=1200V,$V_{GE}$=0V, $T_{vj}$=25°C | | | 5.0 | mA |
| $I_{GES}$ | Gate-Emitter leakage Current | $V_{CE}$=0V,$V_{GE}$=±20V, $T_{vj}$=25°C | | | 400 | ηA |
| $V_{GE(th)}$ | Gate-emitter Threshold Voltage | $V_{GE}$=$V_{CE}$, $I_C$ =1.5mA,$T_{vj}$=25°C | 5.5 | 6.5 | 7.5 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | Ic=100A,$V_{GE}$=15V, $T_{vj}$=25°C | | 1.65 | 2.00 | V |
| | | Ic=100A,$V_{GE}$=15V, $T_{vj}$=125°C | | 2.1 | | V |
| | | Ic=100A,$V_{GE}$=15V, $T_{vj}$=150°C | | 2.2 | | V |
| $Q_G$ | Gate Charge | $V_{CC}$=600V, $V_{GE}$=0/15V, $I_C$=100A $T_{vj}$=25°C | | 480 | | nC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$ =0V, f=1MHz, $T_{vj}$=25°C | | 9.6 | | ηF |
| $C_{oes}$ | Output Capacitance | | | 0.4 | | ηF |
| $C_{res}$ | Reverse Transfer Capacitance | | | 0.1 | | ηF |
| $R_{gint}$ | Internal Gate Resistance | | | 4.0 | | Ω |
| $t_{d(on)}$ | Turn-on Delay Time | $I_C$ =100 A<br>$V_{CE}$ = 600 V<br>$V_{GE}$ = 0/15V<br>$R_G$ = 2.0Ω<br>$T_{vj}$=25°C , $L_{load}$ =0.82mH<br>Energy loss include tail and diode reverse recovery | | 80 | | ηs |
| $t_r$ | Rise Time | | | 32 | | ηs |
| $t_{d(off)}$ | Turn-off Delay Time | | | 316 | | ηs |
| $t_f$ | Fall Time | | | 116 | | ηs |
| $E_{on}$ | Energy Dissipation During Turn-on Time | | | 3.5 | | mJ |
| $E_{off}$ | Energy Dissipation During Turn-off Time | | | 5.2 | | mJ |
| $t_{d(on)}$ | Turn-on Delay Time | $I_C$ =100 A<br>$V_{CE}$ = 600 V<br>$V_{GE}$ = 0/15V<br>$R_G$ = 2.0Ω<br>$T_{vj}$=150°C , $L_{load}$ =0.82mH<br>Energy loss include tail and diode reverse recovery | | 85 | | ηs |
| $t_r$ | Rise Time | | | 38 | | ηs |
| $t_{d(off)}$ | Turn-off Delay Time | | | 400 | | ηs |
| $t_f$ | Fall Time | | | 190 | | ηs |
| $E_{on}$ | Energy Dissipation During Turn-on Time | | | 6.5 | | mJ |
| $E_{off}$ | Energy Dissipation During Turn-off Time | | | 7.7 | | mJ |
| $I_{SC}$ | SC Data | $t_{sc}$≤10μs,$V_{GE}$=15V, $Tv_j$=25°C,$V_{cc}$=600V, | | 480 | | A |

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## Diode (Brake-Chopper) Characteristics

| Symbol | Characteristic | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $I_F$ | Diode DC Forward Current | | | 100 | | A |
| $I_{FRM}$ | Diode Peak Forward Current | tp=1ms | | 200 | | A |
| $V_F$ | Forward Voltage | $I_F$=100A,$T_{vj}$=25°C | | 1.95 | 2.4 | V |
| | | $I_F$=100A,$T_{vj}$=125°C | | 1.80 | | V |
| | | $I_F$=100A,$T_{vj}$=150°C | | 1.75 | | V |
| $Q_{rr}$ | Recovered Charge | $I_F$ =100 A<br>$V_R$=600V<br>-$di_F$/dt =2500A/µs<br>$T_{vj}$=25°C | | 4.8 | | µC |
| $I_{rr}$ | Peak Reverse Recovery Current | | | 126 | | A |
| $E_{rec}$ | Reverse Recovery Energy | | | 1.8 | | mJ |

## Diode (Reverse) Characteristics

| Symbol | Characteristic | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $I_F$ | Diode DC Forward Current | | | 100 | | A |
| $I_{FRM}$ | Diode Peak Forward Current | tp=1ms | | 200 | | A |
| $V_F$ | Forward Voltage | $I_F$=100A,$T_{vj}$=25°C | | 1.95 | 2.4 | V |
| | | $I_F$=100A,$T_{vj}$=125°C | | 1.80 | | V |
| | | $I_F$=100A,$T_{vj}$=150°C | | 1.75 | | V |
| $Q_{rr}$ | Recovered Charge | $I_F$ =100 A<br>$V_R$=600V<br>-$di_F$/dt =2500A/µs<br>$T_{vj}$=25°C | | 4.8 | | µC |
| $I_{rr}$ | Peak Reverse Recovery Current | | | 126 | | A |
| $E_{rec}$ | Reverse Recovery Energy | | | 1.8 | | mJ |

## Module Characteristics

| Symbol | Characteristic | Conditions | Value | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{isol}$ | Isolation voltage | t=1min,f=50Hz | 2500 | | | V |
| $T_{jmax}$ | Maximum Junction Temperature | | | | 175 | °C |
| $T_{vj\ op}$ | Operating Junction Temperature | | -40 | | 150 | °C |
| $T_{stg}$ | Storage Temperature | | -40 | | 125 | °C |
| $R_{CC'+EE'}$ | Module lead resistance terminal to chip | | | 0.65 | | mΩ |
| $L_{SCE}$ | Stray Inductance, Module | | | 30 | | nH |
| $R_{\theta jc}$ | Junction-to Case | per IGBT-Brake chopper | | 0.24 | | °C/W |
| | | per Diode- Brake chopper | | 0.46 | | °C/W |
| | | per Diode-Reverse | | 0.46 | | C/W |
| $R_{\theta cs}$ | Case to Sink | per IGBT-Brake chopper | | 0.08 | | °C/W |
| | | per Diode- Brake chopper | | 0.15 | | °C/W |
| | | per Diode-Reverse | | 0.15 | | C/W |
| | | Conductive grease applied | | 0.05 | | C/W |
| $M_t$ | Module Electrodes Torque | Recommended(M5) | 2.5 | | 5.0 | N·m |
| $M_s$ | Module-to-Sink Torque | Recommended(M6) | 3.0 | | 6.0 | N·m |
| G | Weight of Module | | | 160 | | g |

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## • Typical Electrical Characteristics

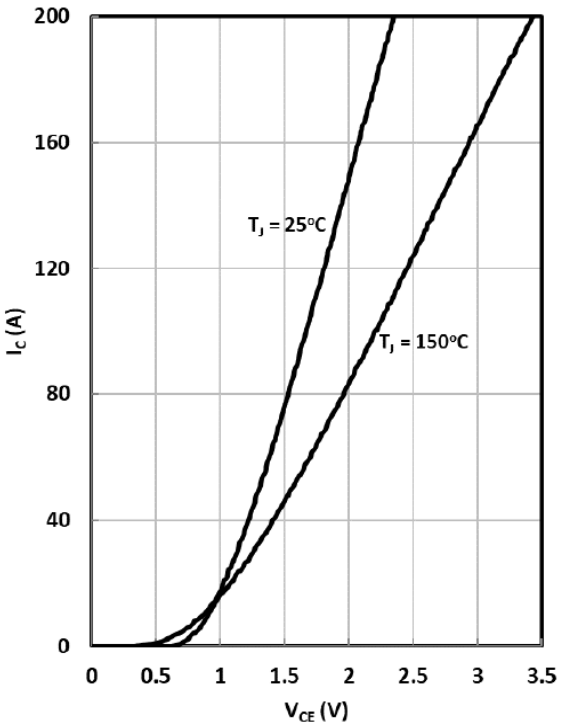


Fig. 1 IGBT (Brake-Chopper) output characteristics

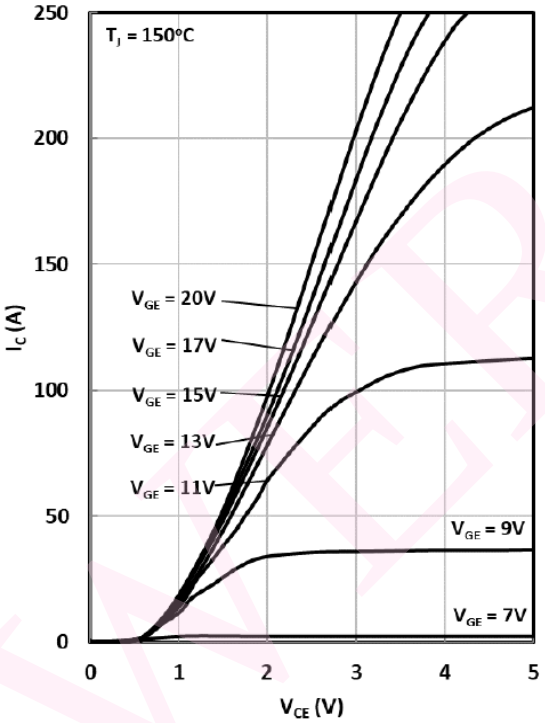


Fig. 2 IGBT (Brake-Chopper) output characteristics

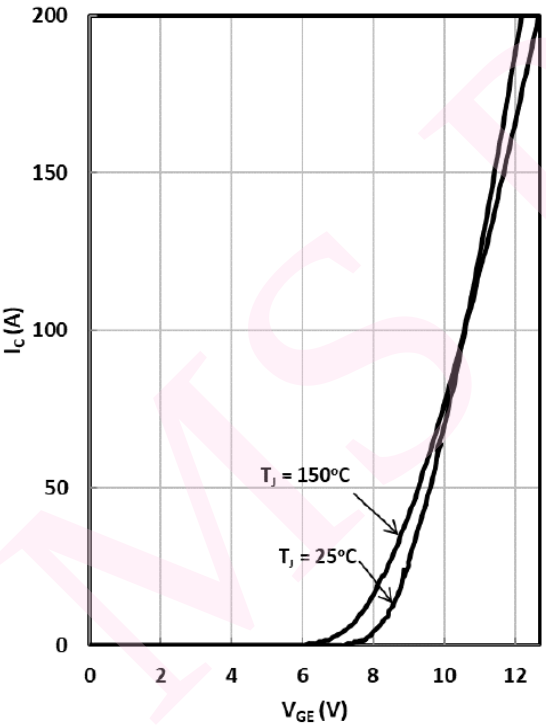


Fig. 3 IGBT (Brake-Chopper) transfer characteristics

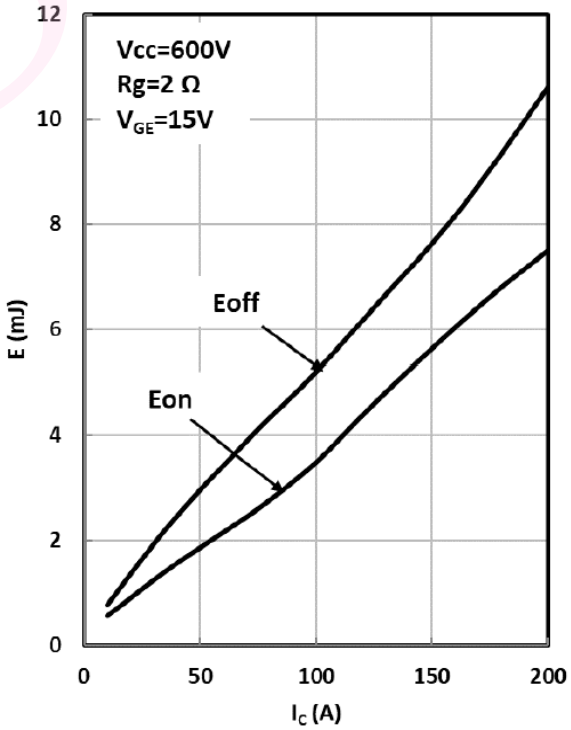


Fig. 4 IGBT (Brake-Chopper) switching loss vs. Ic

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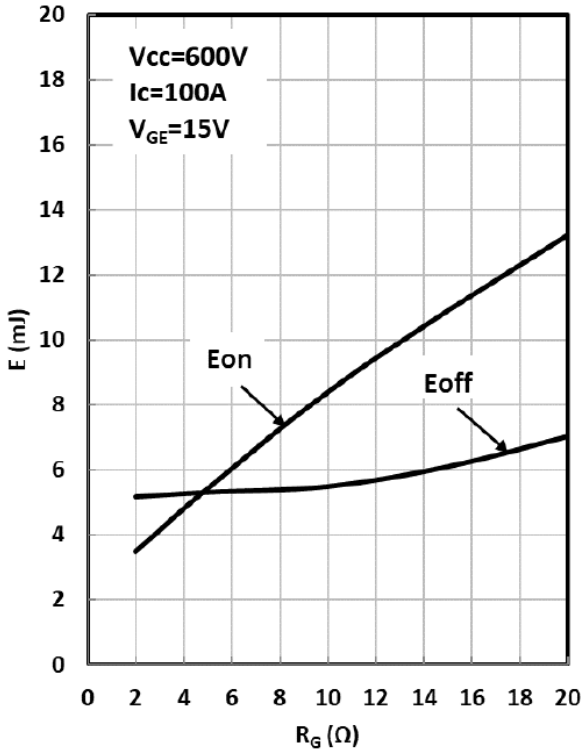


Fig. 5 IGBT (Brake-Chopper) switching loss vs. $R_G$

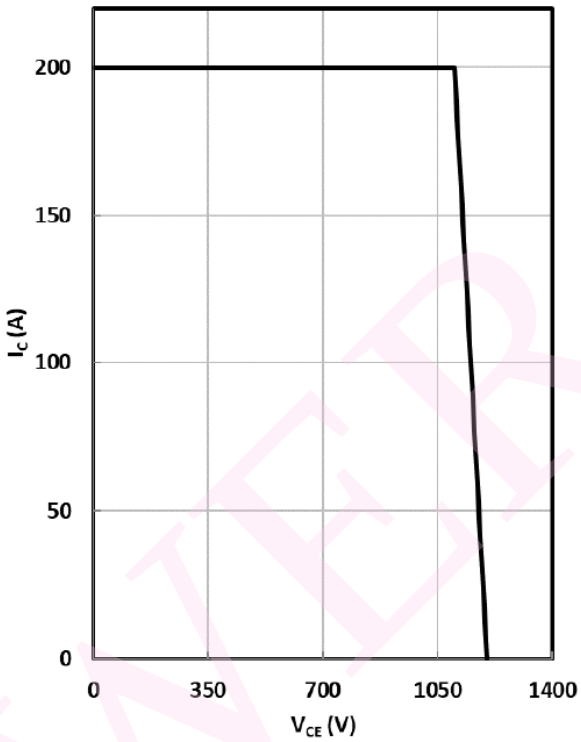


Fig. 6 RBSOA

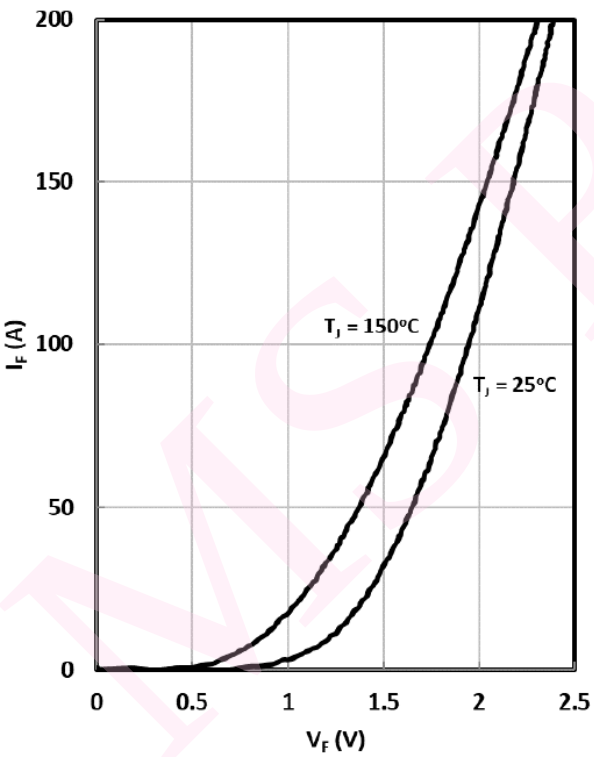


Fig. 7 Diode (Brake-Chopper) forward characteristics

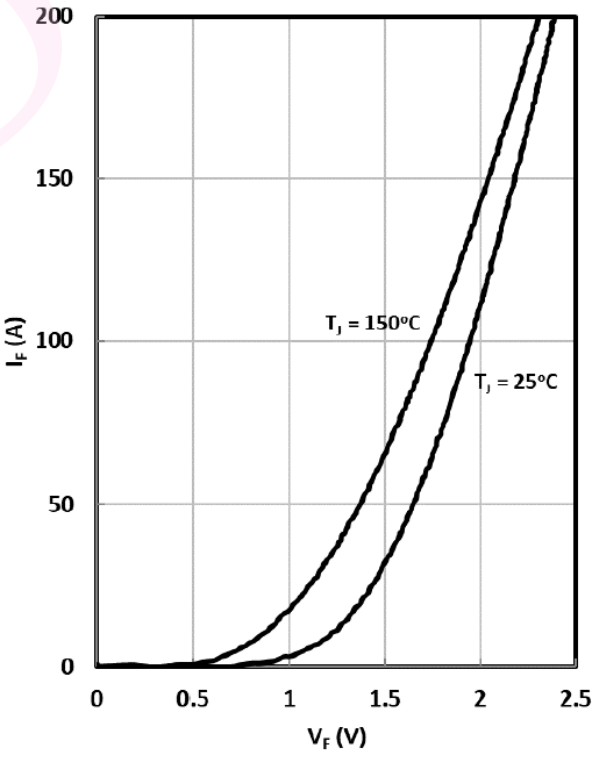


Fig. 8 Diode (Reverse) forward characteristics

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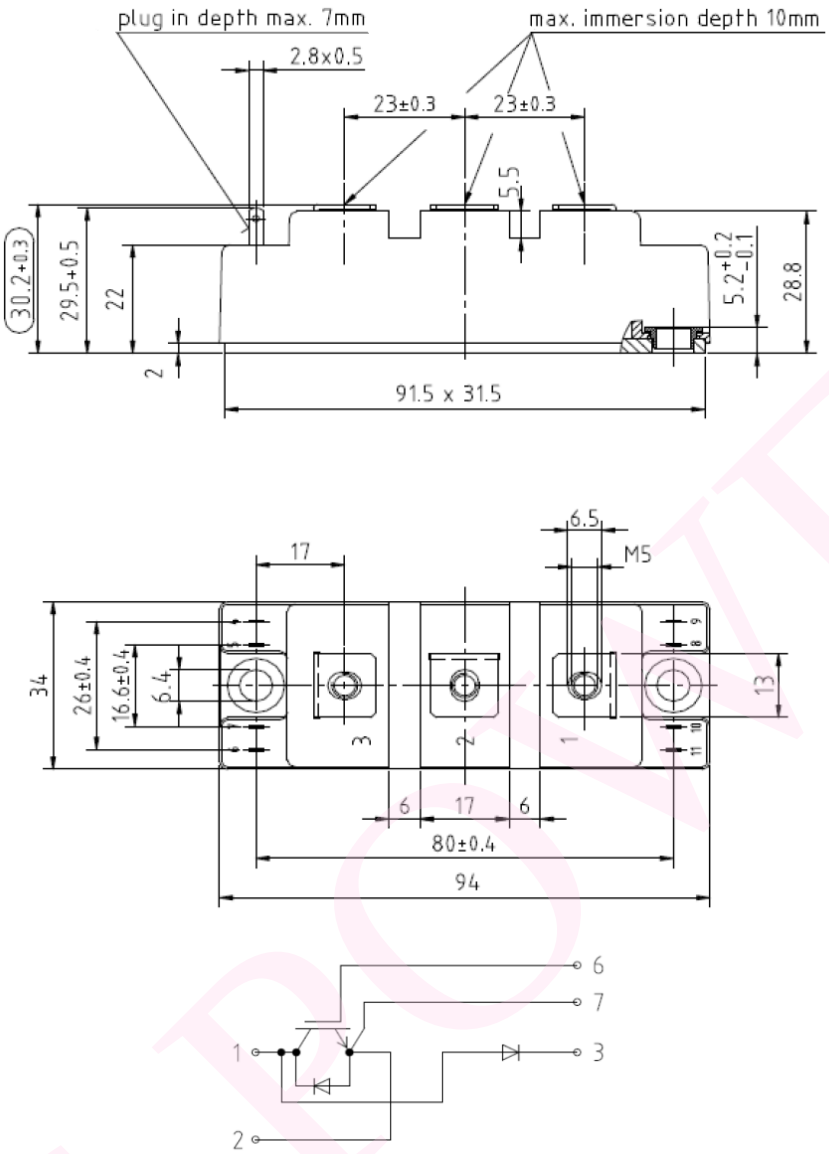


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