

FEATURES

- Ultra Low Loss
- High Ruggedness
- High Short Circuit Capability
- Positive Temperature Coefficient
- With Fast Free-Wheeling Diodes

APPLICATIONS

- Invector
- Converter
- Welder
- SMPS and UPS
- Induction Heating



ABSOLUTE MAXIMUM RATINGS

$T_C=25^{\circ}\text{C}$ unless otherwise specified

| Symbol | Parameter | Test Conditions | Values | Unit |
|----------------------------|-----------------------------|---|-------------|--------------------|
| IGBT | | | | |
| V_{CES} | Collector - Emitter Voltage | | 1200 | V |
| V_{GES} | Gate - Emitter Voltage | | ± 20 | V |
| I_C | DC Collector Current | $T_C=25^{\circ}\text{C}$ | 80 | A |
| | | $T_C=80^{\circ}\text{C}$ | 50 | A |
| I_{Cpuls} | Pulsed Collector Current | $T_C=25^{\circ}\text{C}, t_p=1\text{ms}$ | 170 | A |
| | | $T_C=80^{\circ}\text{C}, t_p=1\text{ms}$ | 110 | A |
| P_{tot} | Power Dissipation Per IGBT | | 500 | 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 |
| Free-Wheeling Diode | | | | |
| V_{RRM} | Repetitive Reverse Voltage | | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | $T_C=25^{\circ}\text{C}$ | 90 | A |
| | | $T_C=80^{\circ}\text{C}$ | 60 | A |
| $I_{F(RMS)}$ | RMS Forward Current | | 90 | A |
| I_{FSM} | Non-Repetitive Surge | $T_J=45^{\circ}\text{C}, t=10\text{ms}, \text{Sine}$ | 430 | A |
| | Forward Current | $T_J=45^{\circ}\text{C}, t=8.3\text{ms}, \text{Sine}$ | 450 | A |

MIMMG50SR120UZA

ELECTRICAL CHARACTERISTICS

T_C=25°C unless otherwise specified

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|----------------------------|--|--|------|------|------|------|
| IGBT | | | | | | |
| V _{GE(th)} | Gate - Emitter Threshold Voltage | V _{CE} =V _{GE} , I _C =2mA | 5 | 6.2 | 7 | V |
| V _{CE(sat)} | Collector - Emitter Saturation Voltage | I _C =50A, V _{GE} =15V, T _J =25°C | | 1.8 | | V |
| | | I _C =50A, V _{GE} =15V, T _J =125°C | | 2.0 | | V |
| I _{CES} | Collector Leakage Current | V _{CE} =1200V, V _{GE} =0V, T _J =25°C | | | 0.5 | mA |
| | | V _{CE} =1200V, V _{GE} =0V, T _J =125°C | | 2 | | mA |
| I _{GES} | Gate Leakage Current | V _{CE} =0V, V _{GE} =±20V | -200 | | 200 | nA |
| Q _{ge} | Gate Charge | V _{CC} =600V, I _C =50A, V _{GE} =±15V | | 611 | | nC |
| C _{ies} | Input Capacitance | V _{CE} =25V, V _{GE} =0V, f=1MHz | | 4.29 | | nF |
| C _{oes} | Output Capacitance | | | 0.30 | | nF |
| C _{res} | Reverse Transfer Capacitance | | | 0.20 | | nF |
| t _{d(on)} | Turn - on Delay Time | V _{CC} =600V, I _C =50A | | 270 | | ns |
| t _r | Rise Time | R _G = 18 Ω, V _{GE} =±15V | | 60 | | ns |
| t _{d(off)} | Turn - off Delay Time | T _J =25°C | | 480 | | ns |
| t _f | Fall Time | Inductive Load | | 60 | | ns |
| t _{d(on)} | Turn - on Delay Time | V _{CC} =600V, I _C =50A | | 290 | | ns |
| t _r | Rise Time | R _G = 18 Ω, V _{GE} =±15V | | 60 | | ns |
| t _{d(off)} | Turn - off Delay Time | T _J =125°C | | 550 | | ns |
| t _f | Fall Time | Inductive Load | | 65 | | ns |
| E _{on} | Turn - on Switching Energy | V _{CC} =600V, I _C =50A T _J =25°C | | 6.0 | | mJ |
| | | R _G = 18 Ω T _J =125°C | | 8.4 | | mJ |
| E _{off} | Turn - off Switching Energy | V _{GE} =±15V T _J =25°C | | 3.7 | | mJ |
| | | Inductive Load T _J =125°C | | 5.8 | | mJ |
| Free-Wheeling Diode | | | | | | |
| V _F | Forward Voltage | I _F =50A, V _{GE} =0V, T _J =25°C | | 1.9 | 2.3 | V |
| | | I _F =50A, V _{GE} =0V, T _J =125°C | | 1.7 | 2.1 | V |
| t _{rr} | Reverse Recovery Time | I _F =50A, V _R =800V | | 180 | | ns |
| I _{RRM} | Max. Reverse Recovery Current | di _F /dt=-1000A/μs | | 60 | | A |
| Q _{rr} | Reverse Recovery Charge | T _J =125°C | | 7.1 | | μC |

THERMAL AND MECHANICAL CHARACTERISTICS

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------------|-------------------|------|------|------|------|
| R _{thJC} | Junction-to-Case Thermal Resistance | Per IGBT | | | 0.3 | K /W |
| R _{thJCD} | Junction-to-Case Thermal Resistance | Per Inverse Diode | | | 0.6 | K /W |
| Torque | Module-to-Sink | Recommended (M6) | 3 | | 5 | N· m |
| Torque | Module Electrodes | Recommended (M5) | 2.5 | | 5 | N· m |
| Weight | | | | 150 | | g |

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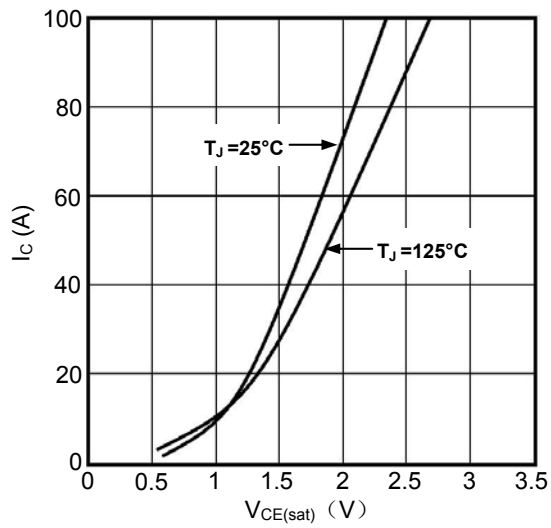


Figure1. Typical Output characteristics

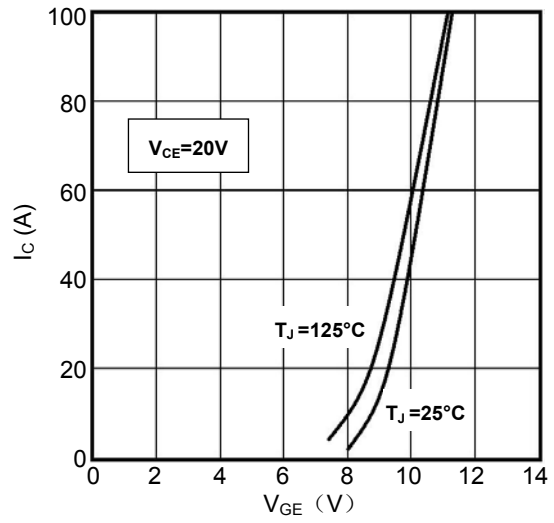


Figure2. Typical Transfer characteristics

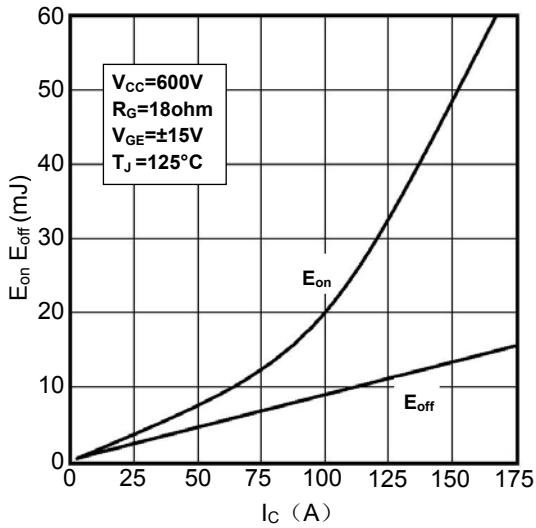


Figure3. Switching Energy vs. Collector Current

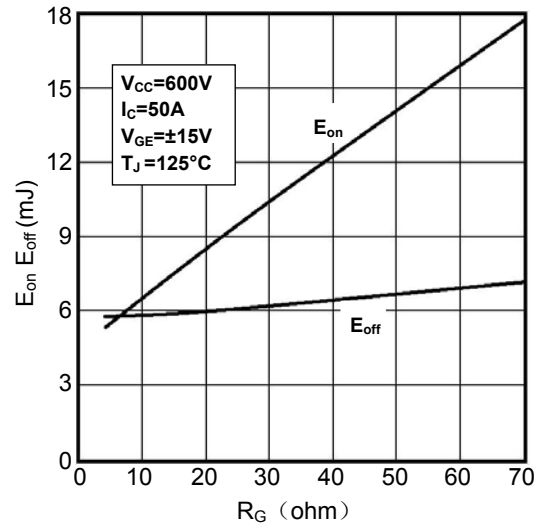


Figure4. Switching Energy vs. Gate Resistor

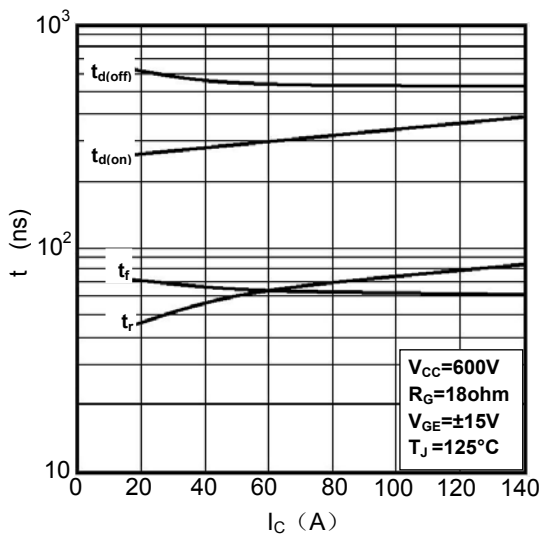


Figure5. Switching Times vs. Collector Current

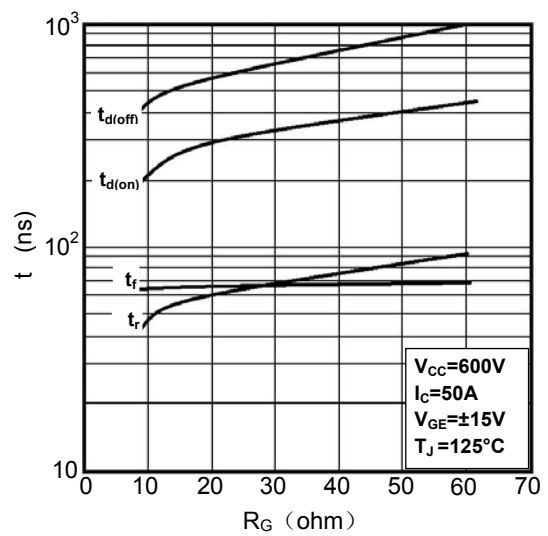


Figure6. Switching Times vs. Gate Resistor

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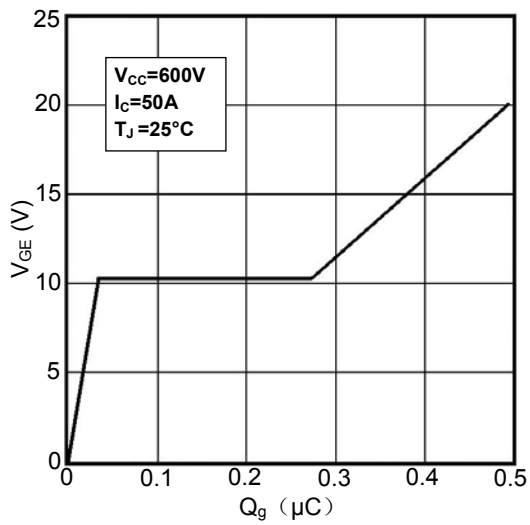


Figure7. Gate Charge characteristics

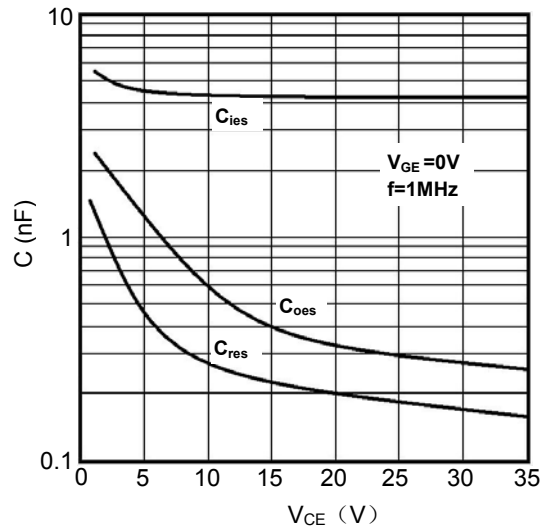


Figure8. Typical Capacitances vs. V_{CE}

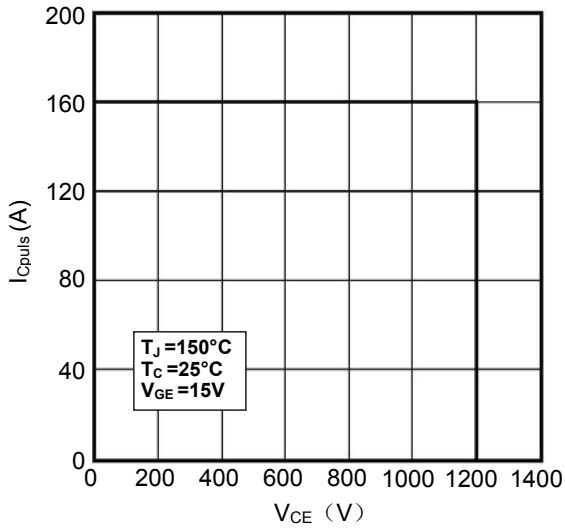


Figure9. Reverse Biased Safe Operating Area

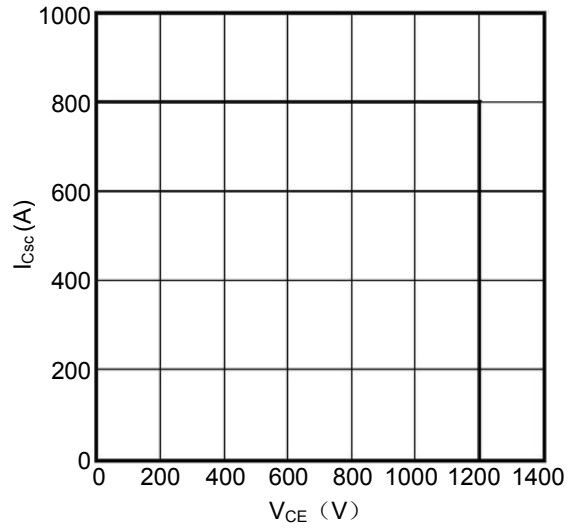


Figure10. Short Circuit Safe Operating Area

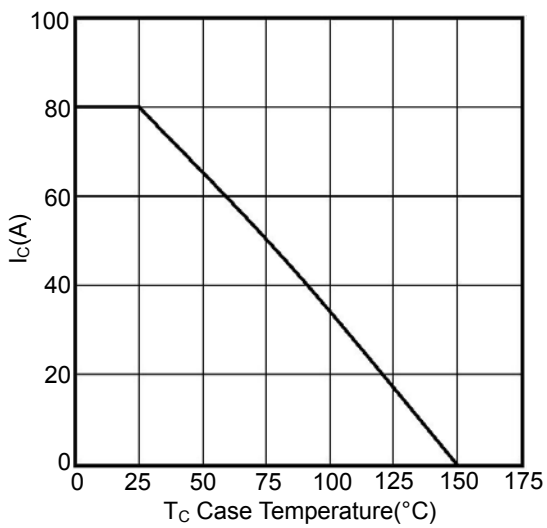


Figure11. Rated Current vs. T_C

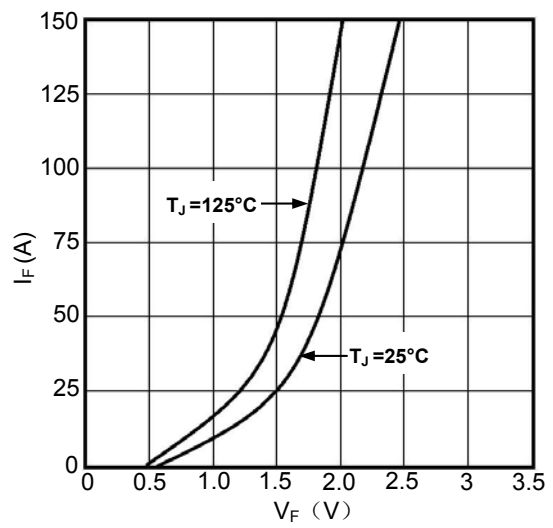
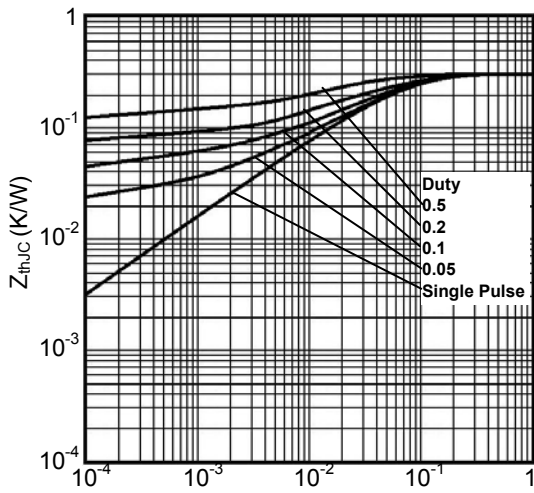
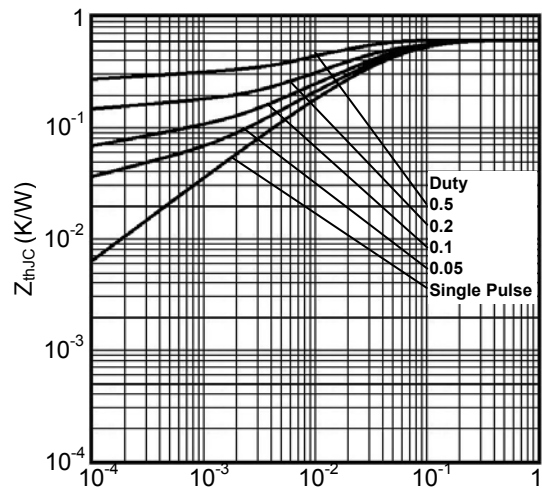


Figure12. Diode Forward Characteristics

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Rectangular Pulse Duration (seconds)
Figure13. Transient Thermal Impedance of IGBT



Rectangular Pulse Duration (seconds)
Figure14. Transient Thermal Impedance of Diode

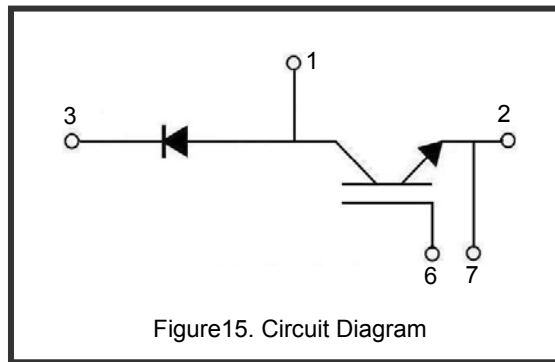


Figure15. Circuit Diagram

