## PRODUCT FEATURES

☐ IGBT CHIP(1200V NPT technology)

☐ Low switching losses

☐ $V_{CE(sat)}$ with positive temperature coefficient

☐ Fast switching and short tail current

☐ Free wheeling diodes with fast and soft reverse recovery

GA Series Module

## APPLICATIONS

☐ AC motor control

☐ Motion/servo control

☐ Inverter and power supplies

## IGBT-inverter

### ABSOLUTE MAXIMUM RATINGS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector - Emitter Voltage | $T_j$=25°C | 1200 | V |
| $V_{GES}$ | Gate - Emitter Voltage | | ±20 | |
| $I_C$ | DC Collector Current | $T_C$=25°C | 75 | A |
| | | $T_C$=80°C | 50 | |
| $I_{CM}$ | Repetitive Peak Collector Current | tp=1ms | 100 | |
| $P_{tot}$ | Power Dissipation Per IGBT | | | W |

## Diode-inverter

### ABSOLUTE MAXIMUM RATINGS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | Values | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Reverse Voltage | $T_j$=25°C | 1200 | V |
| $I_{F(AV)}$ | Average Forward Current | $T_C$=25°C | 50 | A |
| $I_{FRM}$ | Repetitive Peak Forward Current | tp=1ms | 100 | |
| $I^2t$ | | $T_j$=125°C, t=10ms, $V_R$=0V | 170 | $A^2S$ |

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## IGBT-inverter
## ELECTRICAL CHARACTERISTICS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| $V_{GE(th)}$ | Gate - Emitter Threshold Voltage | $V_{CE}=V_{GE}$, $I_C$=2.0mA | | 4.6 | 5.4 | 6.2 | V |
| $V_{CE(sat)}$ | Collector - Emitter Saturation Voltage (terminal) | $I_C$=50A, $V_{GE}$=15V, $T_j$=25°C | | | 2.4 | 3 | |
| | | $I_C$=50A, $V_{GE}$=15V, $T_j$=125°C | | | 2.70 | | |
| $I_{CES}$ | Collector Leakage Current | $V_{CE}$=1200V, $V_{GE}$=0V, $T_j$=25°C | | | | 100 | μA |
| | | $V_{CE}$=1200V, $V_{GE}$=0V, $T_j$=125°C | | | | 1 | mA |
| $I_{GES}$ | Gate Leakage Current | $V_{CE}$=0V,$V_{GE}$=±15V, $T_j$=125°C | | -200 | | 200 | nA |
| $Q_g$ | Gate Charge | $V_{CE}$=600V, $I_C$=50A , $V_{GE}$=15V | | | | | μC |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f =1MHz | | | | | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | | | | | nF |
| $t_{d(on)}$ | Turn - on Delay Time | $V_{CC}$=600V,$I_C$=50A, $R_G$ =20Ω, $V_{GE}$=±15V, Inductive Load | Tj=25°C | | 40 | | ns |
| | | | Tj=125°C | | 35 | | ns |
| $t_r$ | Rise Time | | Tj=25°C | | 40 | | ns |
| | | | Tj=125°C | | 50 | | ns |
| $t_{d(off)}$ | Turn - off Delay Time | $V_{CC}$=600V,$I_C$=50A, $R_G$ =20Ω, $V_{GE}$=±15V, Inductive Load | Tj=25°C | | 350 | | ns |
| | | | Tj=125°C | | 400 | | ns |
| $t_f$ | Fall Time | | Tj=25°C | | 60 | | ns |
| | | | Tj=125°C | | 100 | 200 | ns |
| $E_{on}$ | Turn - on Energy | $V_{CC}$=600V,$I_C$=50A, $R_G$ =20Ω, $V_{GE}$=±15V, Inductive Load | Tj=25°C | | 3.2 | | mj |
| | | | Tj=125°C | | 4 | | mj |
| $E_{off}$ | Turn - off Energy | | Tj=25°C | | 2.3 | | mj |
| | | | Tj=125°C | | 3.5 | | mj |
| $t_{pSC}$ | IGBT Short Circuit SOA | $V_{GE}\leqslant$15V,$V_{CC}$=800V $T_j\leqslant$125°C,$V_{CEM}\leqslant$1200V | | | | 10 | μs |
| $R_{thJC}$ | Junction-to-Case Thermal Resistance （Per IGBT） | | | | | 0.36 | K /W |

## Diode-inverter
## ELECTRICAL CHARACTERISTICS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$=50A , $V_{GE}$=0V, $T_j$=25°C | | 1.65 | 2.15 | V |
| | | $I_F$=50A , $V_{GE}$=0V, $T_j$=125°C | | 1.65 | | |
| $I_{RRM}$ | Max. Reverse Recovery Current | $I_F$=50A , $V_R$=600V diF/dt=-1400A/μs Tj =125°C | | | | A |
| $Q_{RR}$ | Reverse Recovery Charge | | | | | μC |
| $E_{rec}$ | Reverse Recovery Energy | | | | | mj |
| $R_{thJCD}$ | Junction-to-Case Thermal Resistance （Per Diode） | | | | 1.5 | K /W |

## MODULE CHARACTERISTICS

*$T_C$=25°C unless otherwise specified*

| Symbol | Parameter/Test Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $T_{j\ max}$ | Max. Junction Temperature | | | | 150 | °C |
| $T_{j\ op}$ | Operating Temperature | | -40 | | 125 | |
| $T_{stg}$ | Storage Temperature | | -40 | | 125 | |
| $V_{isol}$ | Isolation Breakdown Voltage | AC, 50Hz(R.M.S), t=1minute | | | 3000 | V |
| Torque | to heatsink | Recommended（M6） | 3 | | 5 | N•m |
| | to terminal | Recommended（M5） | 2.5 | | 5 | N•m |
| Weight | | | | 102 | | g |

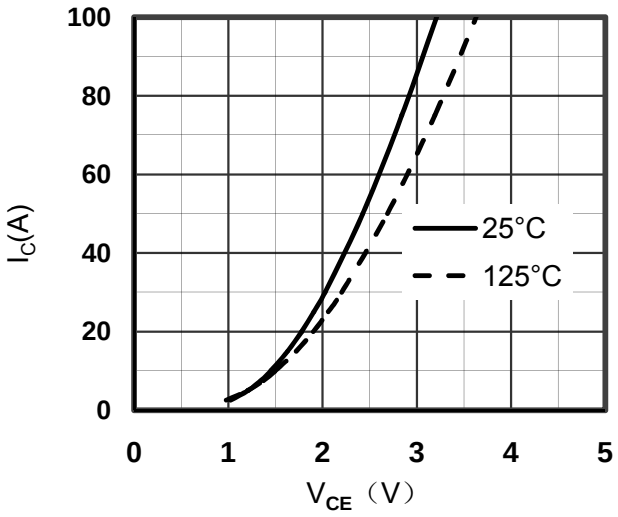



**Figure1. Typical Output Characteristics IGBT-inverter**

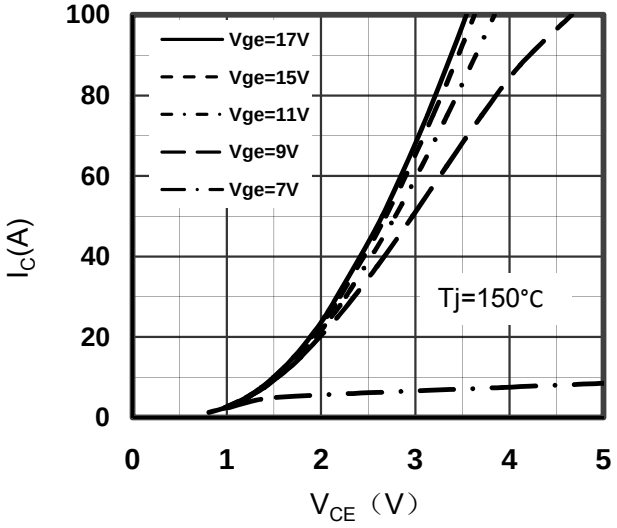



**Figure2. Typical Output Characteristics IGBT-inverter**

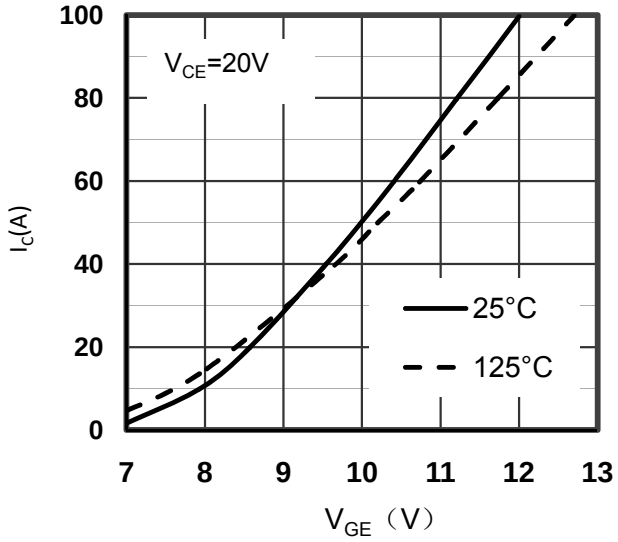



**Figure3. Typical Transfer characteristics IGBT-inverter**

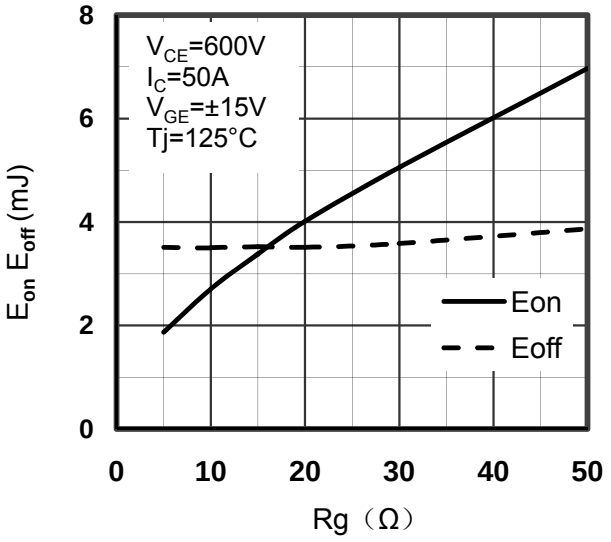



**Figure4. Switching Energy vs. Gate Resistor IGBT-inverter**

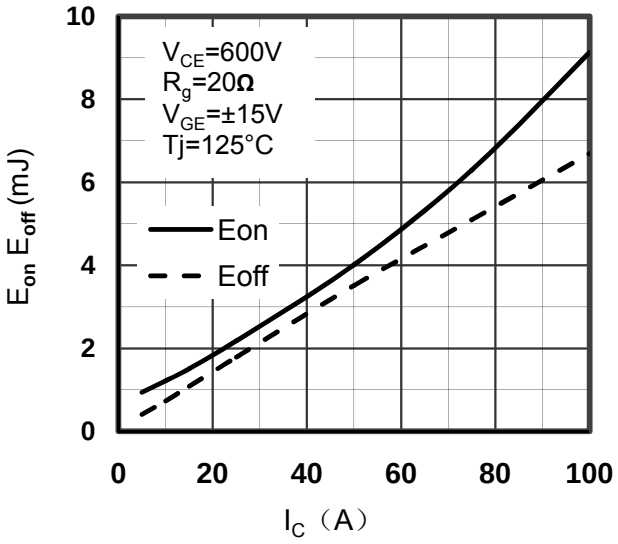



**Figure5. Switching Energy vs. Collector Current IGBT-inverter**

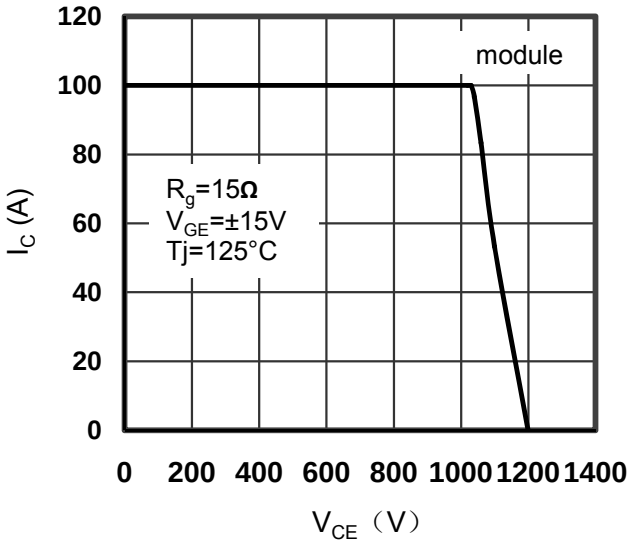



**Figure6. Reverse Biased Safe Operating Area IGBT-inverter**

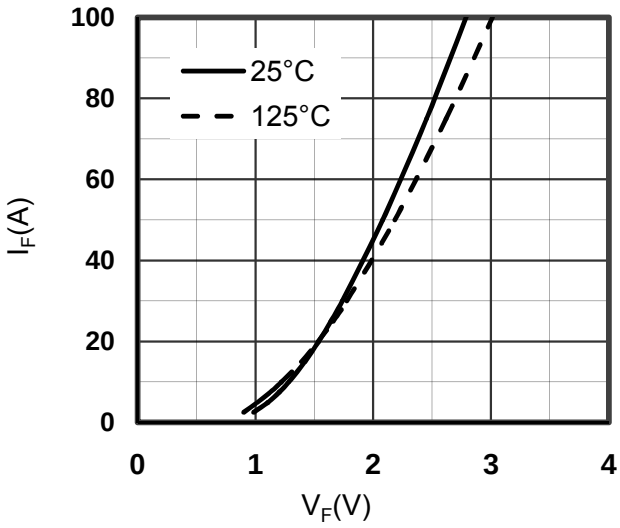



**Figure7. Diode Forward Characteristics Diode -inverter**

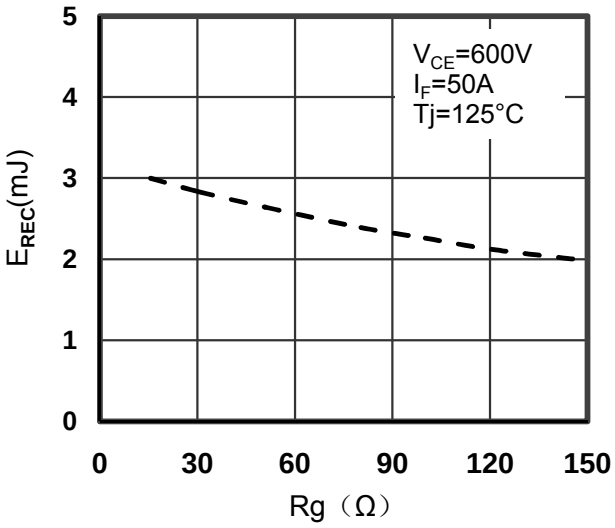



**Figure8. Switching Energy vs. Gate Resistor Diode -inverter**

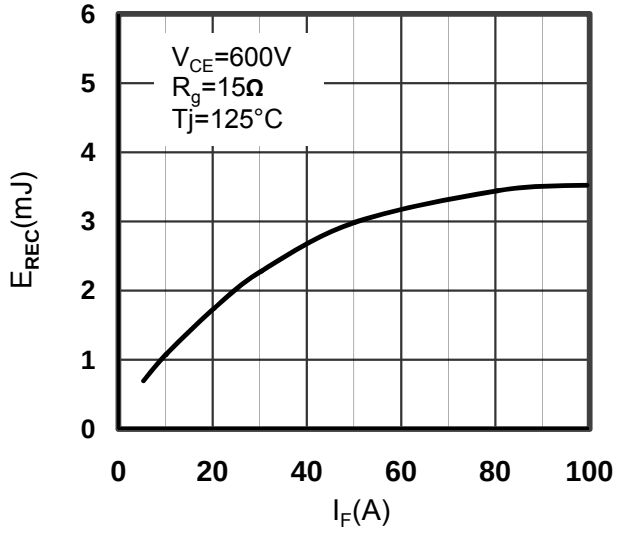



**Figure9. Switching Energy vs. Forward Current Diode-inverter**

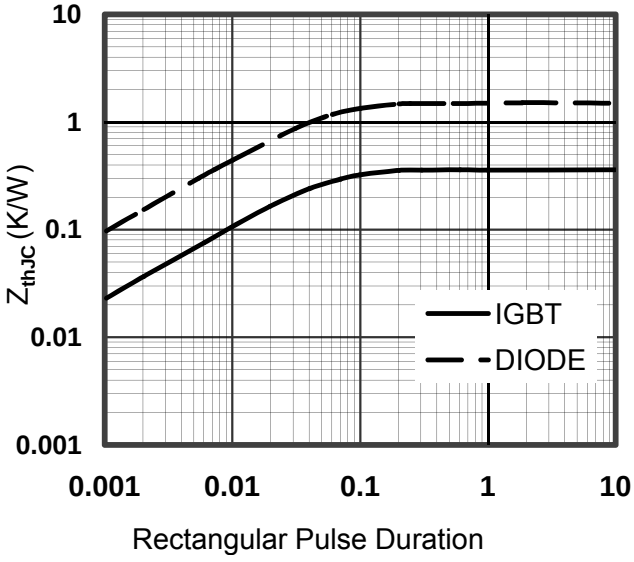



**Figure10. Transient Thermal Impedance of Diode and IGBT-inverter**

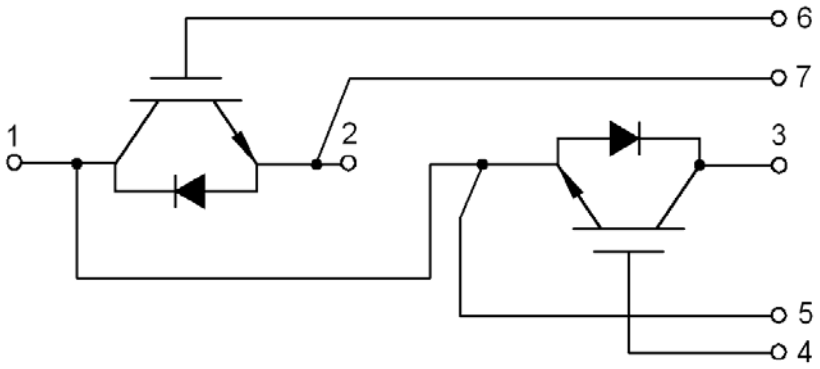
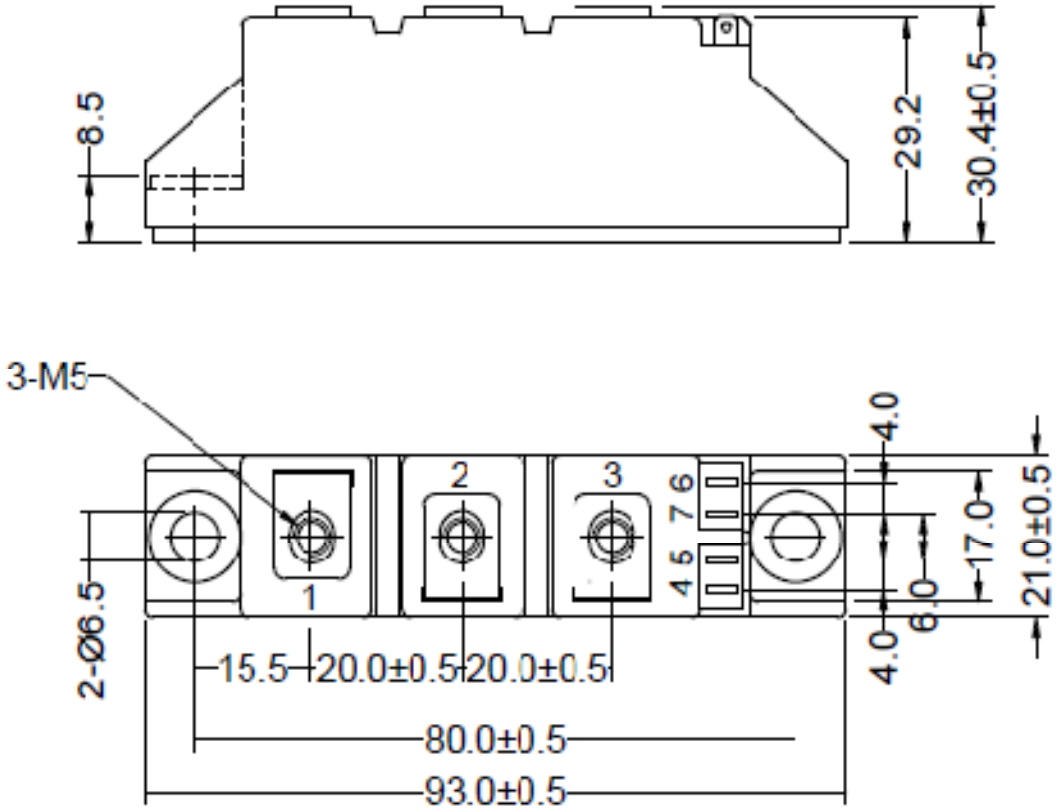



**Figure11. Circuit Diagram**




**Dimensions in Millimeters**
**Figure12. Package Outline**