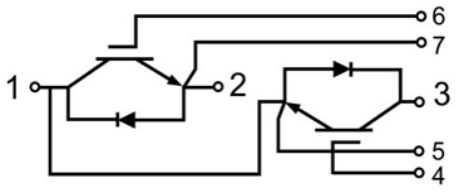
# GK100HF60T1VH
## IGBT Module

### Features：

- Non Punch Through (NPT) Technology
- Short Circuit Rated >10μs
- Low Saturation Voltage
- Low Switching Loss
- 100% RBSOA Tested(2×Ic)
- Low Stray Inductance
- Lead Free, Compliant with RoHS Requirement

### Circuit Diagram




### Applications：

- Welding
- HEV Inverter
- Industrial Motor Drives
- UPS

### IGBT, Inverter
**Maximum Rated Values** ($T_C$=25℃ unless otherwise specified)

| | | | | |
|---|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Blocking Voltage | | 600 | V |
| $V_{GES}$ | Gate-Emitter Voltage | | ±20 | V |
| $I_C$ | Continuous Collector Current | $T_C$=80℃ | 100 | A |
| | | $T_C$=25℃ | 120 | A |
| $I_{CM}$ | Repetitive Peak Collector Current | tp=1ms | 200 | A |
| $P_D$ | Maximum Power Dissipation per leg | $T_C$=25℃<br>$T_{Jmax}$=150℃ | 466 | W |

## Electrical Characteristics of IGBT ($T_C$=25℃ unless otherwise specified)

Static Characteristics

| Symbol | Description | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{GE(th)}$ | Gate-Emitter Threshold Voltage | $I_C$=2mA, $V_{CE}$=$V_{GE}$ | | 4.3 | 5.2 | 6.4 | V |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_C$=100A, $V_{GE}$=15V | $T_J$=25℃ | | 1.95 | 2.30 | V |
| | | | $T_J$=125℃ | | 2.20 | | |
| | | | $T_J$=150℃ | | 2.25 | | |
| $I_{CES}$ | Collector-Emitter Leakage Current | $V_{GE}$=0V, $V_{CE}$=$V_{CES}$, $T_J$=25℃ | | | | 1 | mA |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{GE}$=20V, $V_{CE}$=0V, $T_J$=25℃ | | | | 200 | nA |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f=100kHz, $T_J$=25℃ | | | 3.83 | | nF |
| $C_{oes}$ | Output Capacitance | | | | 0.60 | | |
| $C_{res}$ | Reverse Transfer Capacitance | | | | 0.29 | | |

Switching Characteristics

| Symbol | Description | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}$=300V, $I_C$=100A, $R_{Gon}$=10Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 158 | | ns |
| | | | $T_J$=125℃ | | 169 | | |
| | | | $T_J$=150℃ | | 178 | | |
| $t_r$ | Rise Time | | $T_J$=25℃ | | 79 | | ns |
| | | | $T_J$=125℃ | | 80 | | |
| | | | $T_J$=150℃ | | 81 | | |
| $t_{d(off)}$ | Turn-off Delay Time | $V_{CC}$=300V, $I_C$=100A, $R_{Goff}$=10Ω, $V_{GE}$=±15V, Inductive Load | $T_J$=25℃ | | 276 | | ns |
| | | | $T_J$=125℃ | | 293 | | |
| | | | $T_J$=150℃ | | 306 | | |
| $t_f$ | Fall Time | | $T_J$=25℃ | | 116 | | ns |
| | | | $T_J$=125℃ | | 134 | | |
| | | | $T_J$=150℃ | | 143 | | |
| $E_{on}$ | Turn-on Switching Loss | $V_{CC}$=300V, $I_C$=100A, $R_{Gon}$=10Ω, $V_{GE}$=±15V, di/dt=1086A/μs($T_J$=150℃), Inductive Load | $T_J$=25℃ | | 0.83 | | mJ |
| | | | $T_J$=125℃ | | 1.36 | | |
| | | | $T_J$=150℃ | | 1.57 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $E_{off}$ | Turn-off Switching Loss | $V_{CC}$=300V, $I_C$=100A, $R_{Goff}$=10Ω, $V_{GE}$=±15V, du/dt=3687V/μs($T_J$=150℃), Inductive Load | $T_J$=25℃ | | 1.83 | | mJ |
| | | | $T_J$=125℃ | | 2.10 | | |
| | | | $T_J$=150℃ | | 2.29 | | |
| $Q_g$ | Total Gate Charge | $V_{GE}$=+15V…-15V | $T_J$=25℃ | | 555 | | nC |
| $R_{G(int)}$ | Internal Gate Resistance | | $T_J$=25℃ | | 0 | | Ω |
| SCSOA | $V_{CC}$=300V, $V_{GE}$=±15V, $R_G$=10Ω, $T_J$=125℃ | | | 10 | | | us |
| $R_{θJC}$ | Thermal Resistance: Junction-to-Case (per IGBT) | | | | | 0.268 | ℃/W |

## FWD, Inverter

**Maximum Rated Values** ($T_C$=25℃ unless otherwise specified)

| | | | | |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | $T_J$=25℃ | 600 | V |
| $I_F$ | Diode Continuous Forward Current | | 100 | A |
| $I_{FM}$ | Diode Maximum Forward Current | tp=1ms | 200 | A |

**Electrical Characteristics of Diode** ($T_C$=25℃ unless otherwise specified)

| Symbol | Description | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{FM}$ | Forward Voltage | $I_F$=100A | $T_J$=25℃ | | 1.80 | 2.10 | V |
| | | | $T_J$=125℃ | | 1.85 | | |
| | | | $T_J$=150℃ | | 1.80 | | |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=100A, -diF/dt=1464A/μs($T_J$=150℃), $V_{rr}$=300V, $V_{GE}$=-15V | $T_J$=25℃ | | 108 | | ns |
| | | | $T_J$=125℃ | | 163 | | |
| | | | $T_J$=150℃ | | 175 | | |
| $I_{rr}$ | Peak Reverse Recovery Current | | $T_J$=25℃ | | 39.1 | | A |
| | | | $T_J$=125℃ | | 60.9 | | |
| | | | $T_J$=150℃ | | 65.6 | | |
| $Q_{rr}$ | Reverse Recovery Charge | | $T_J$=25℃ | | 2.90 | | μC |
| | | | $T_J$=125℃ | | 6.15 | | |
| | | | $T_J$=150℃ | | 7.14 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $E_{rec}$ | Reverse Recovery Energy | $I_F$=100A, -diF/dt=1464A/μs($T_J$=150℃), $V_{rr}$=300V, $V_{GE}$=-15V | $T_J$=25℃ | | 0.57 | | mJ |
| | | | $T_J$=125℃ | | 1.39 | | |
| | | | $T_J$=150℃ | | 1.62 | | |
| $R_{\theta JC}$ | Thermal Resistance: Junction-to-Case (per Diode) | | | | | 0.612 | ℃/W |

## Module

| Symbol | Description | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| $V_{Iso}$ | Isolation Voltage (All Terminals Shorted) | RMS, f=50Hz, 1minute | | 2500 | | V |
| $T_J$ | Maximum Junction Temperature | | | | 150 | ℃ |
| $T_{JOP}$ | Maximum Operating Junction Temperature Range | | -40 | | +125 | ℃ |
| $T_{stg}$ | Storage Temperature | | -40 | | +125 | ℃ |
| CTI | Comparative Tracking Index | | | 200 | | |
| $R_{\theta CS}$ | Case-to-Sink Thermally (Conductive Grease Applied) | | | | 0.07 | ℃/W |
| T | Power Terminals Screw:M5 | | 3.0 | | 5.0 | N·m |
| T | Mounting Screw:M6 | | 4.0 | | 6.0 | N·m |
| G | Weight | | | 165 | | g |

## Ordering Information Table

Device code

| G | K | 100 | HF | 60 | T1V | H |
|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |

① - IGBT Module
② - NPT, Standard IGBT
③ - Rated Current (100=100A)
④ - Circuit Configuration: HF (Half Bridge)
⑤ - Rated Voltage (60=600V)
⑥ - Package Type
⑦ - Test Level (Pass the Important Reliability Test-Industrial Grade)

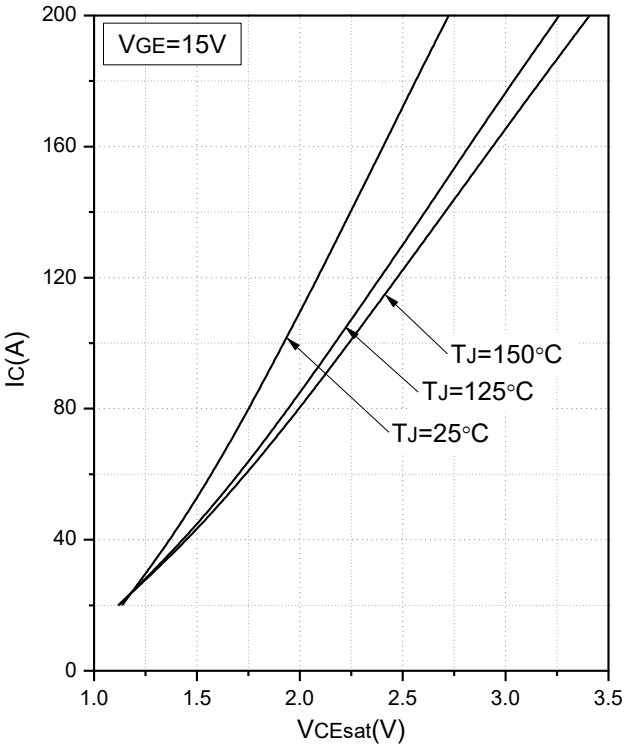



Fig.1 Typical Saturation Voltage Characteristics

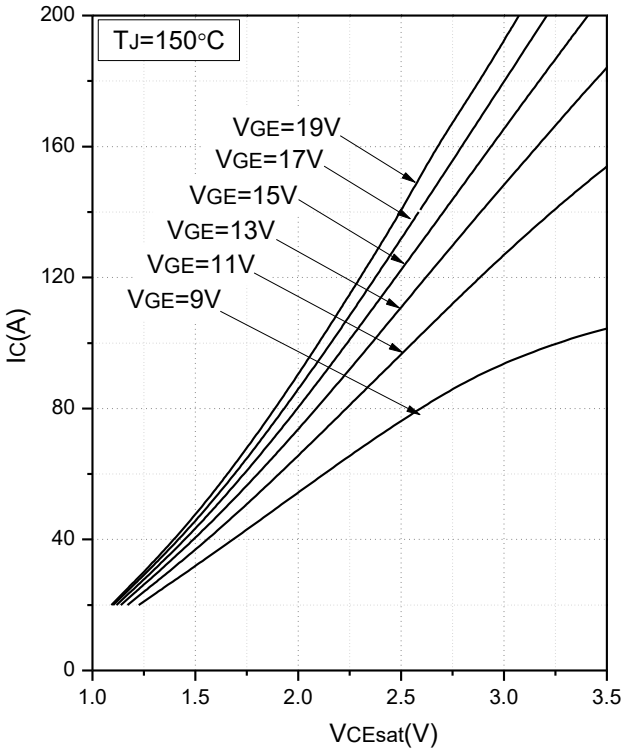



Fig.2 Typical Output Characteristics

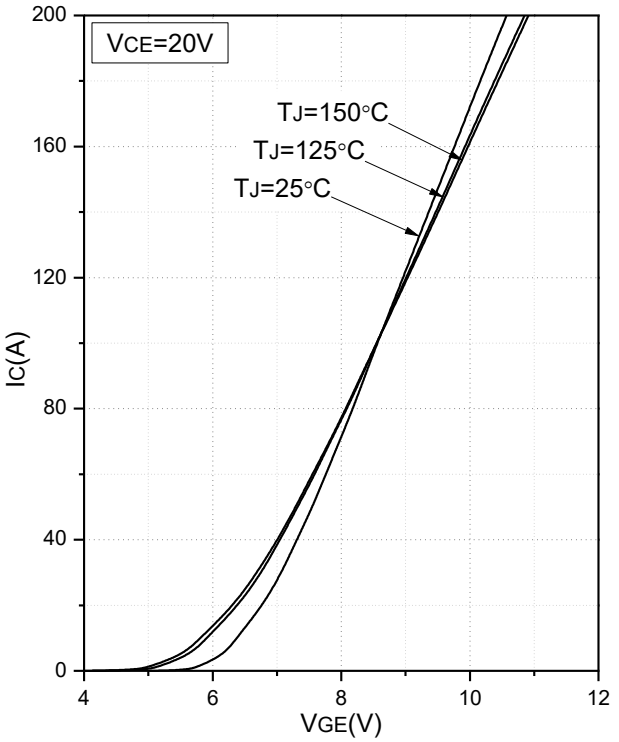



Fig.3 Transfer Characteristics

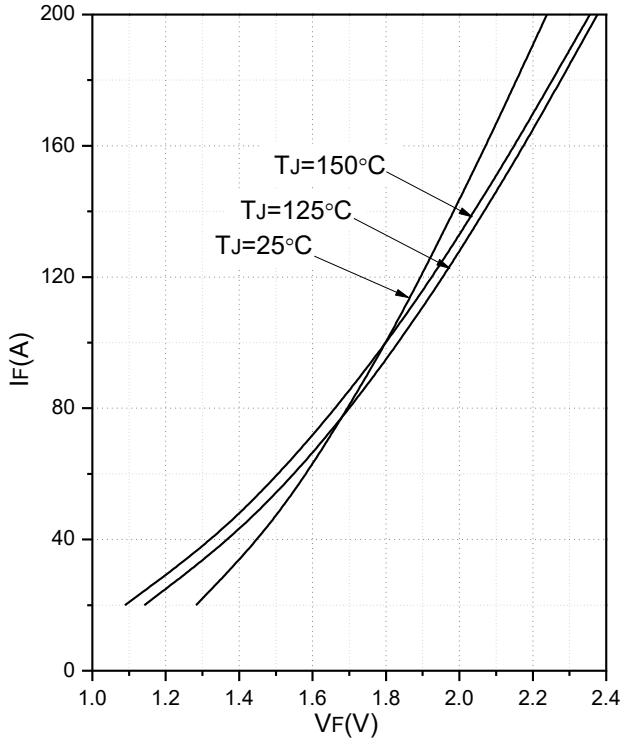



Fig.4 Forward Characteristics of FWD

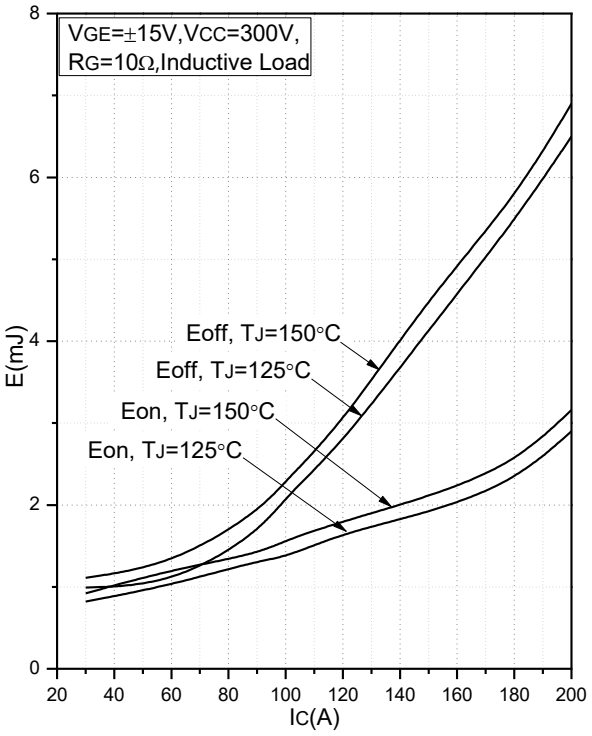



Fig.5 Typical Switching Loss vs. Collector Current

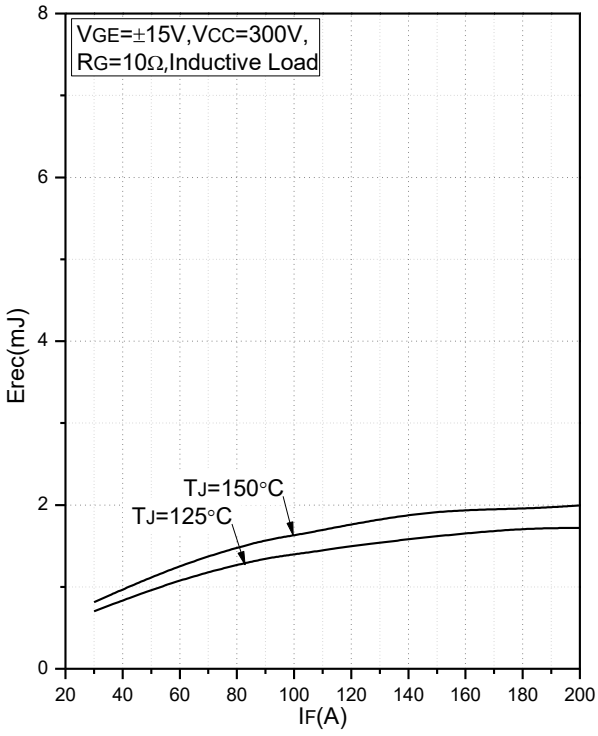



Fig.6 Typical Switching Loss vs. Forward Current

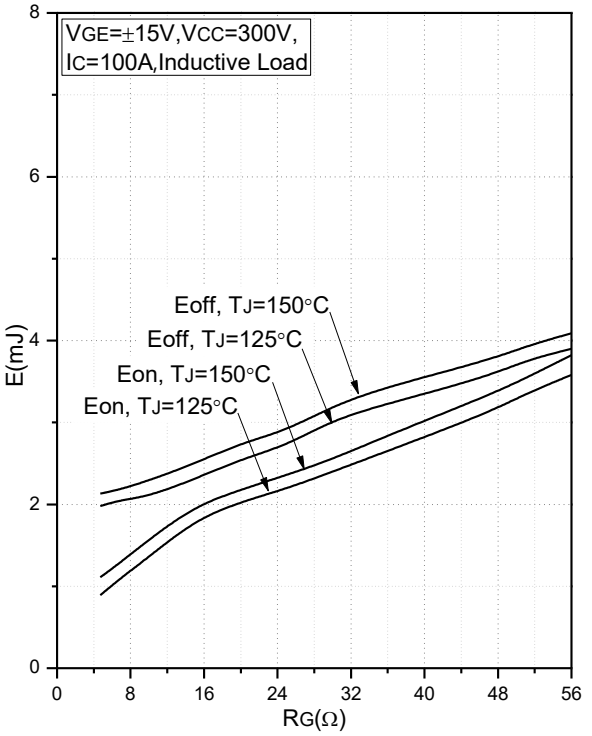



Fig.7 Typical Switching Loss vs. Gate Resistance

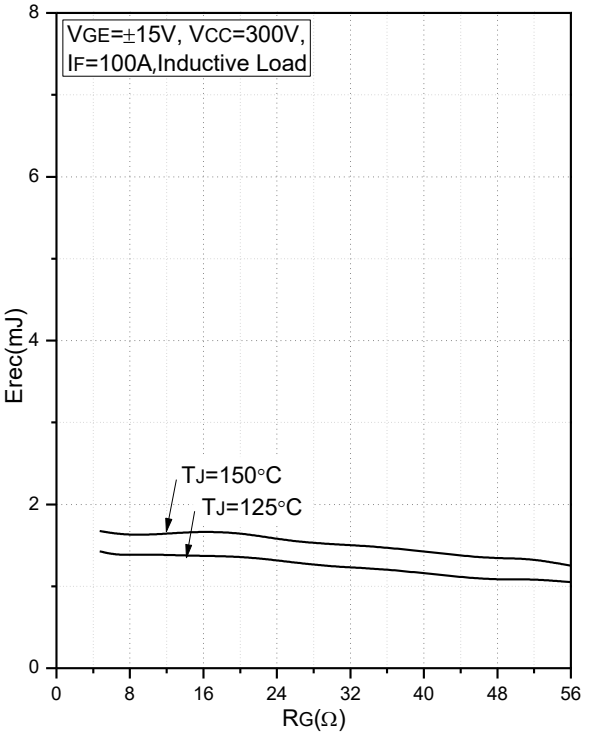



Fig.8 Typical Switching Loss vs. Gate Resistance

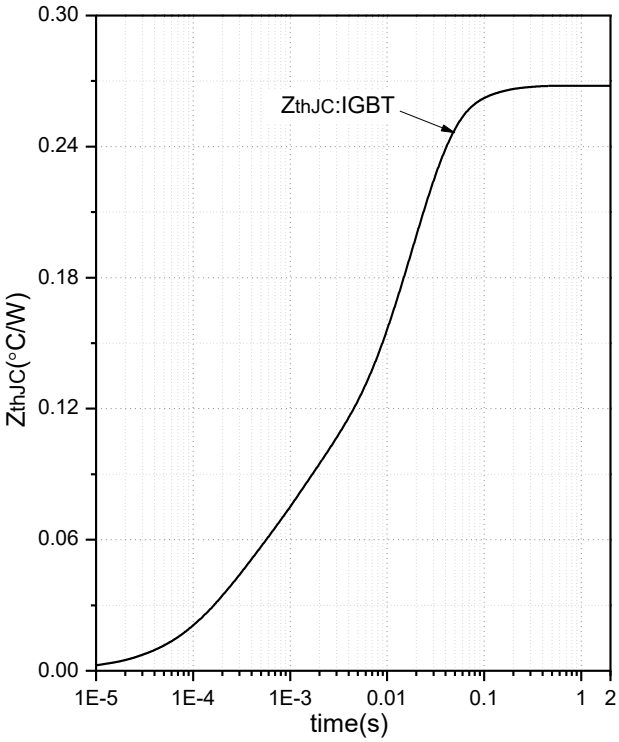



Fig.9 Transient Thermal Impedance of IGBT

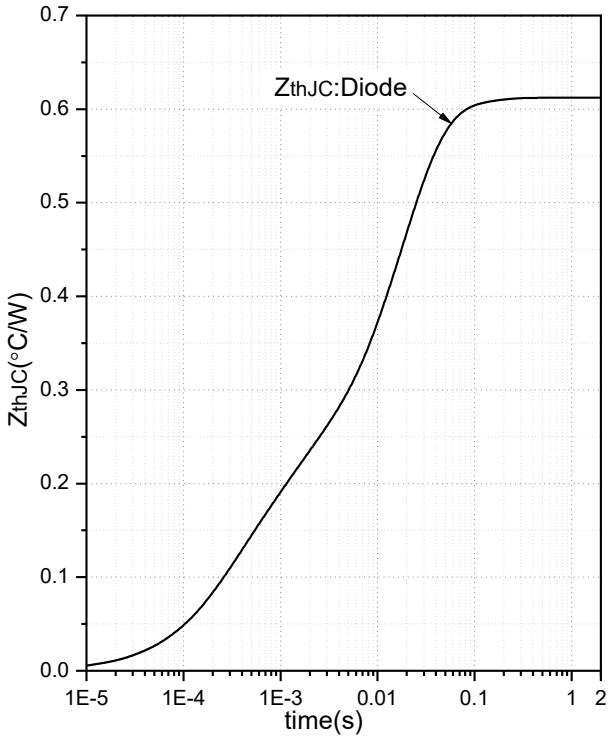



Fig.10 Transient Thermal Impedance of Diode

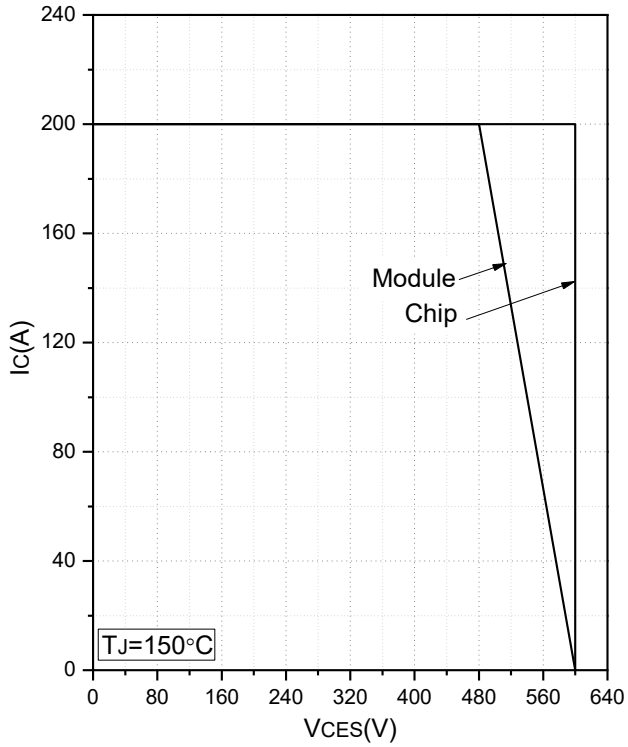



Fig.11 Reverse Bias Safe Operation Area (RBSOA)

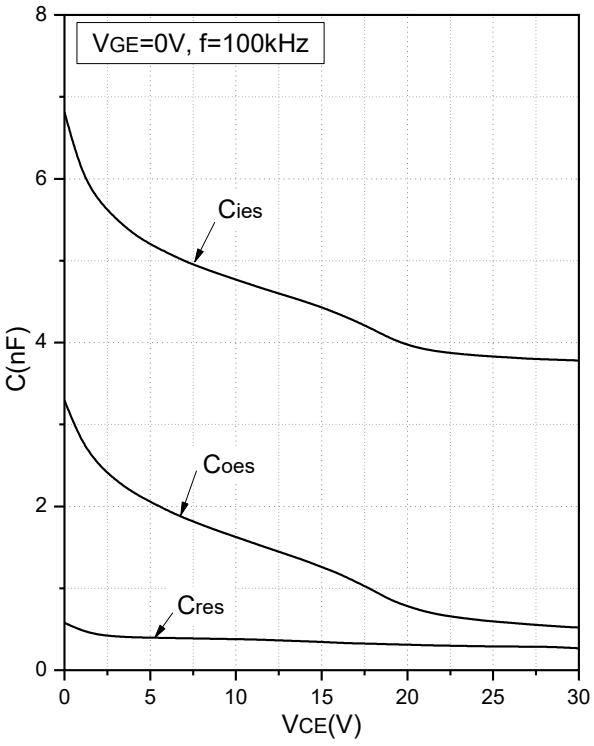
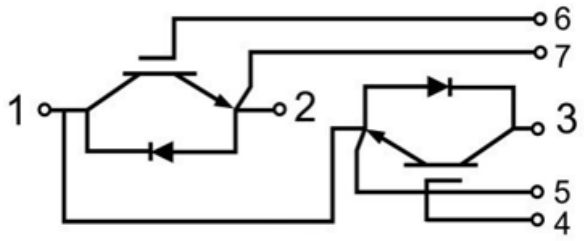
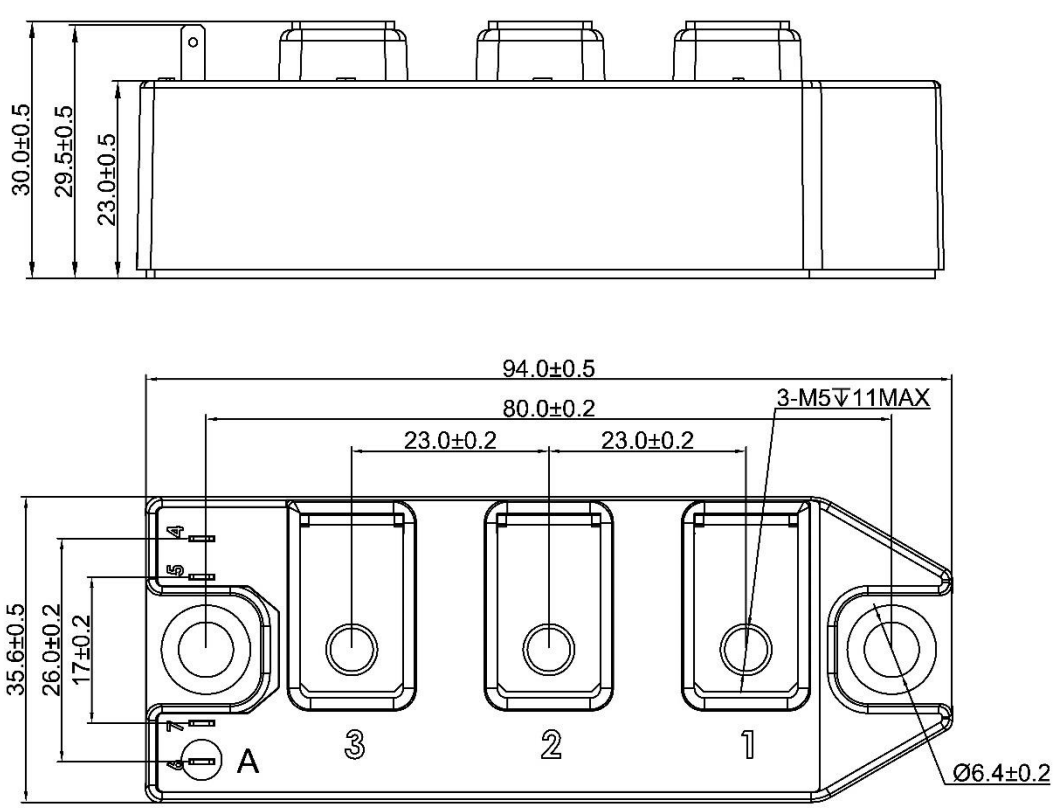



Fig.12 Capacitance Characteristics

## Internal Circuit




## Package Outline (Unit: mm):



| Revision | Notes |
|---|---|
| A | Final Version |
| B | Updated Electrical Characteristic Parameter Values |

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