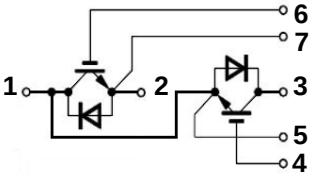
## General Description

TRinno IGBT power module provides low conduction loss, low switching loss and short circuit ruggedness. It is designed for applications such as Motor Driver, IH , Rectifier and Welder.

## Features

- 1200V Field Stop Trench IGBT Technology
- Fast & Soft Recovery Diodes
- Positive Temperature Coefficient
- Short Circuit Withstanding Time : 10μs




## Applications

Motor driver, IH(Induction heating), Rectifier, Welder

## Absolute Maximum Ratings

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | | $V_{CES}$ | 1200 | V |
| Gate-Emitter Voltage | | $V_{GES}$ | ±20 | V |
| Continuous Collector Current | $T_C$ = 25 ℃ | $I_C$ | 600 | A |
| | $T_C$ = 100 ℃ | | 300 | A |
| Pulsed Collector Current (Note 1) | | $I_{CM}$ | 600 | A |
| Diode Continuous Forward Current | $T_C$ = 100 ℃ | $I_F$ | 300 | A |
| Power Dissipation | $T_C$ = 25 ℃ | $P_D$ | 1389 | W |
| | $T_C$ = 100 ℃ | | 556 | W |
| Operating Junction Temperature | | $T_{vj}$ | -40 ~ 150 | ℃ |
| Storage Temperature Range | | $T_{STG}$ | -40 ~ 150 | ℃ |

Notes :
(1) Repetitive rating : Pulse width limited by maximum junction temperature

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Typical Thermal resistance, Junction-to-Case (Per ½ Module) | $R_{\theta JC}$ (IGBT) | 0.09 | K/W |
| Typical Thermal resistance, Junction-to-Case (Per ½ Module) | $R_{\theta JC}$ (DIODE) | 0.11 | K/W |

## Electrical Characteristics of the IGBT $T_{vj}$=25℃, unless otherwise noted

| Parameter | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **OFF** | | | | | | |
| Collector – Emitter Breakdown Voltage | $BV_{CES}$ | $V_{GE}$ = 0V, $I_C$ = 1mA | 1200 | -- | -- | V |
| Zero Gate Voltage Collector Current | $I_{CES}$ | $V_{CE}$ = 1200V, $V_{GE}$ = 0V | -- | -- | 2 | mA |
| Gate – Emitter Leakage Current | $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | -- | -- | ± 200 | nA |
| **ON** | | | | | | |
| Gate – Emitter Threshold Voltage | $V_{GE(TH)}$ | $V_{GE}$ = $V_{CE}$, $I_C$ = 250μA | 3.5 | -- | 7.5 | V |
| | | $V_{GE}$ = $V_{CE}$, $I_C$ = 300mA | 5.0 | -- | 8.5 | V |
| Collector – Emitter Saturation Voltage | $V_{CE(SAT)}$ | $V_{GE}$ = 15V, $I_C$ = 300A, $T_{vj}$ = 25 ℃ | -- | 1.8 | 2.2 | V |
| | | $V_{GE}$ = 15V, $I_C$ = 300A, $T_{vj}$ = 125 ℃ | -- | 2.0 | 2.4 | V |
| **DYNAMIC** | | | | | | |
| Internal Gate Resistor | $R_{Gint}$ | $T_{vj}$ = 25 ℃ | -- | 3.3 | -- | Ω |
| Input Capacitance | $C_{IES}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V f = 1MHz | -- | 48 | -- | nF |
| Output Capacitance | $C_{OES}$ | | -- | 2.08 | -- | nF |
| Reverse Transfer Capacitance | $C_{RES}$ | | -- | 1.04 | -- | nF |
| **SWITCHING** | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}$ = 600V, $I_C$ = 300A $R_{Gext}$ = 2Ω, $V_{GE}$ = ±15V Inductive Load, $T_{vj}$ = 25 ℃ | -- | 210 | -- | ns |
| Rise Time | $t_r$ | | -- | 105 | -- | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | -- | 585 | -- | ns |
| Fall Time | $t_f$ | | -- | 50 | -- | ns |
| Turn-On Switching Loss | $E_{ON}$ | | -- | 12.0 | -- | mJ |
| Turn-Off Switching Loss | $E_{OFF}$ | | -- | 20.0 | -- | mJ |
| Total Switching Loss | $E_{TS}$ | | -- | 32.0 | -- | mJ |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{CC}$ = 600V, $I_C$ = 300A $R_{Gext}$ = 2Ω, $V_{GE}$ = ±15V Inductive Load, $T_{vj}$ = 125 ℃ | -- | 315 | -- | ns |
| Rise Time | $t_r$ | | -- | 150 | -- | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | -- | 835 | -- | ns |
| Fall Time | $t_f$ | | -- | 75 | -- | ns |
| Turn-On Switching Loss | $E_{ON}$ | | -- | 35.0 | -- | mJ |
| Turn-Off Switching Loss | $E_{OFF}$ | | -- | 28.0 | -- | mJ |
| Total Switching Loss | $E_{TS}$ | | -- | 63.0 | -- | mJ |
| Total Gate Charge | $Q_g$ | $V_{CC}$ = 600V, $I_C$ = 300A $V_{GE}$ = 15V | -- | 2900 | -- | nC |
| Gate-Emitter Charge | $Q_{ge}$ | | -- | 440 | -- | nC |
| Gate-Collector Charge | $Q_{gc}$ | | -- | 1400 | -- | nC |
| Short Circuit Withstanding Time | $t_{SC}$ | $V_{CC}$ = 600V, $V_{GE}$ = 15V, $T_{vj}$ = 125 ℃ | 10 | -- | -- | μs |

## Electrical Characteristics of the DIODE $T_{vj}$=25℃, unless otherwise noted

| Parameter | Symbol | Test condition | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Diode Forward Voltage | $V_{FM}$ | $I_F$ = 300A | $T_{vj}$ = 25 ℃ | -- | 1.70 | 2.50 | V |
| | | | $T_{vj}$ = 125 ℃ | -- | 1.70 | 2.50 | |
| Reverse Recovery Current | $I_{rr}$ | $V_{CC}$ = 600V, $I_F$ = 300A<br>$R_{Gext}$ = 2Ω, $V_{GE}$ = ±15V<br>Inductive Load | $T_{vj}$ = 25 ℃ | -- | 208 | -- | A |
| | | | $T_{vj}$ = 125 ℃ | -- | 230 | -- | |
| Reverse Recovery Charge | $Q_{rr}$ | | $T_{vj}$ = 25 ℃ | -- | 24.1 | -- | μC |
| | | | $T_{vj}$ = 125 ℃ | -- | 28.5 | -- | |
| Reverse Recovery Time | $t_{rr}$ | | $T_{vj}$ = 25 ℃ | -- | 230 | -- | ns |
| | | | $T_{vj}$ = 125 ℃ | -- | 285 | -- | |

## Characteristics of the Module

| Parameter | Symbol | Test condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Isolation Voltage | $V_{ISO}$ | RMS, f=50Hz, t=1 minutes | -- | 2.5 | -- | kV |
| Terminal mounting torque (M5) | -- | | -- | 3.5 | -- | N.m |
| Weight | -- | | -- | 290 | -- | g |

# IGBT Characteristics

Fig. 1 Output characteristics

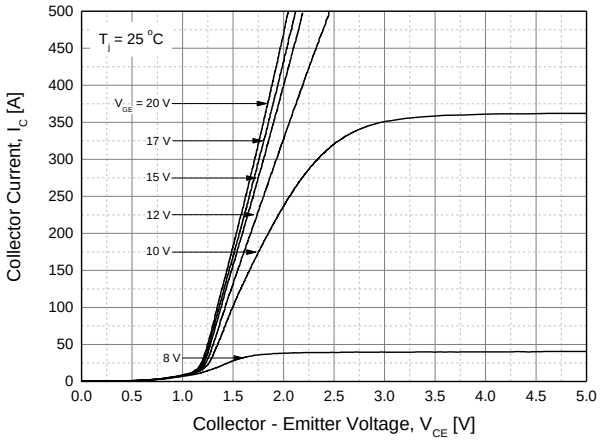



Fig. 2 Saturation voltage characteristics

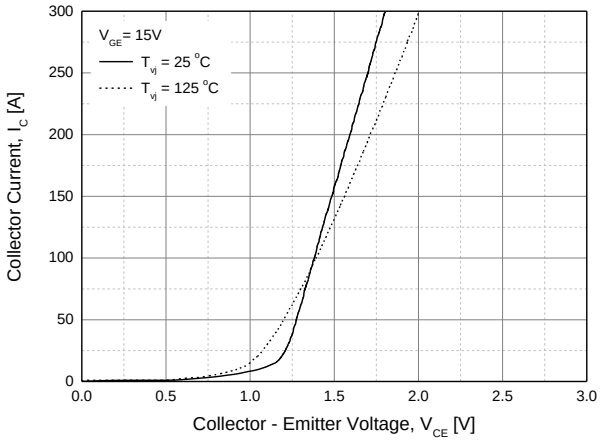



Fig. 3 Turn-on time vs. gate resistor

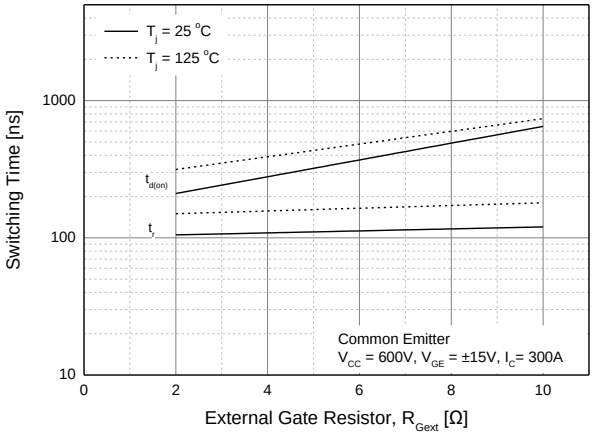



Fig. 4 Turn-off time vs. gate resistor

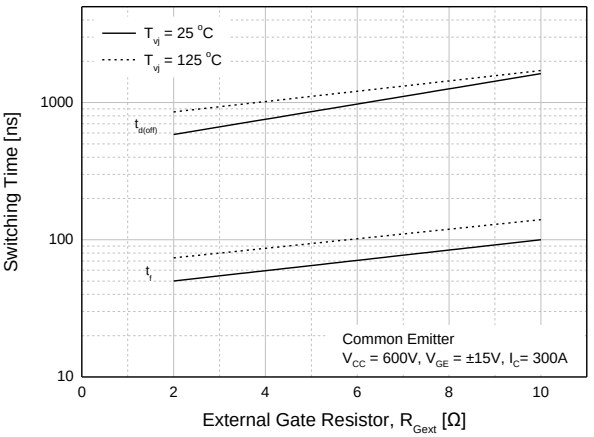



Fig. 5 Switching loss vs. gate resistor

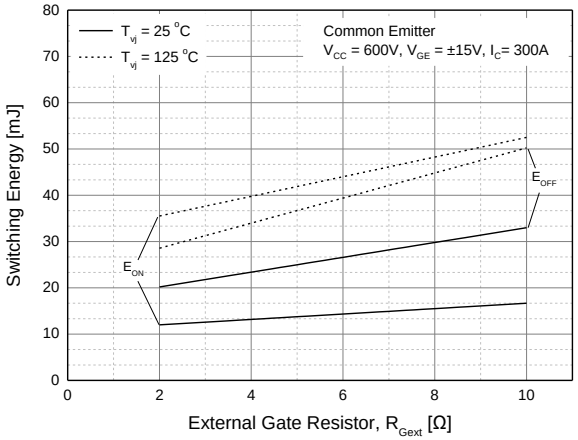
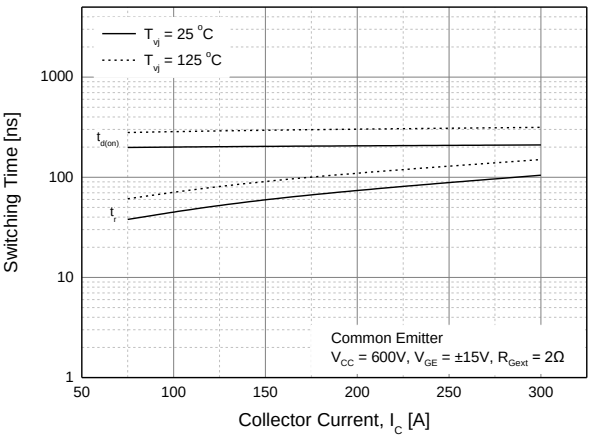



Fig. 6 Turn-on time vs. collector current



# IGBT Characteristics

Fig. 7 Turn-off time vs. collector current

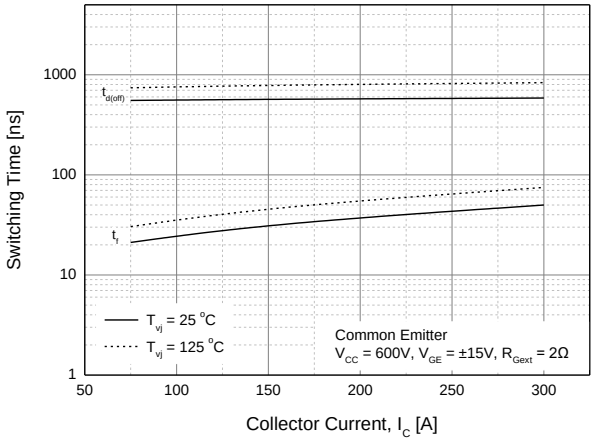



Fig. 8 Switching loss vs. collector current

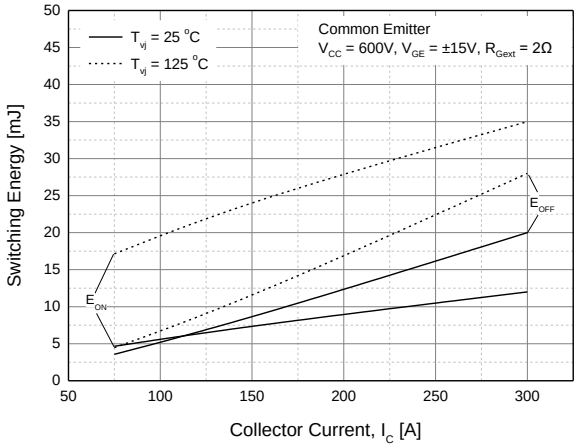



Fig. 9 Gate charge characteristics

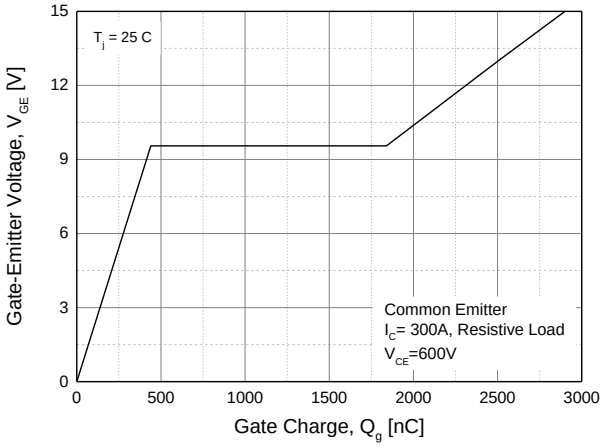



Fig. 10 Transient thermal impedance of IGBT

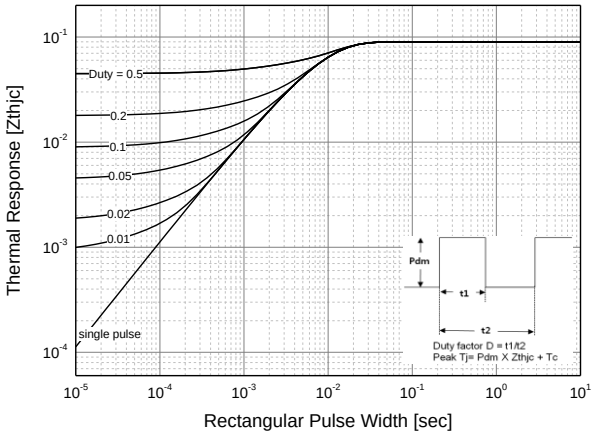



Fig. 11 SOA

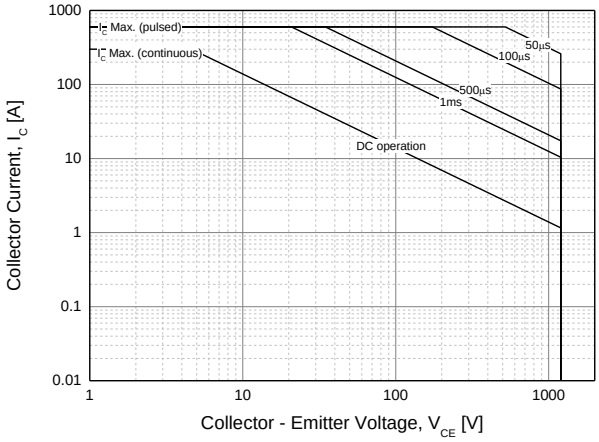
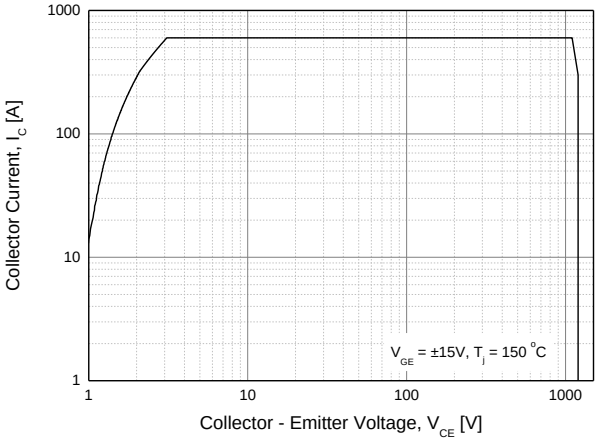
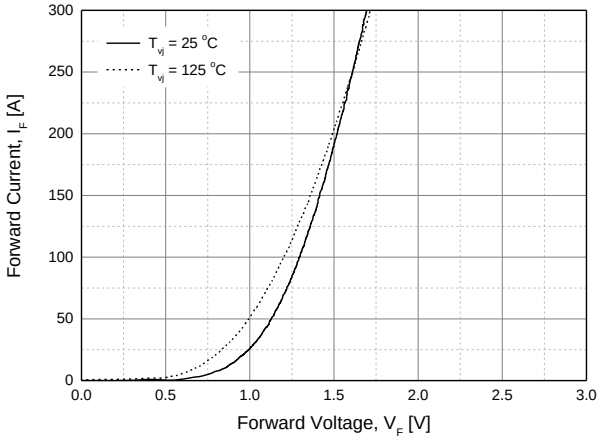



Fig. 12 RBSOA

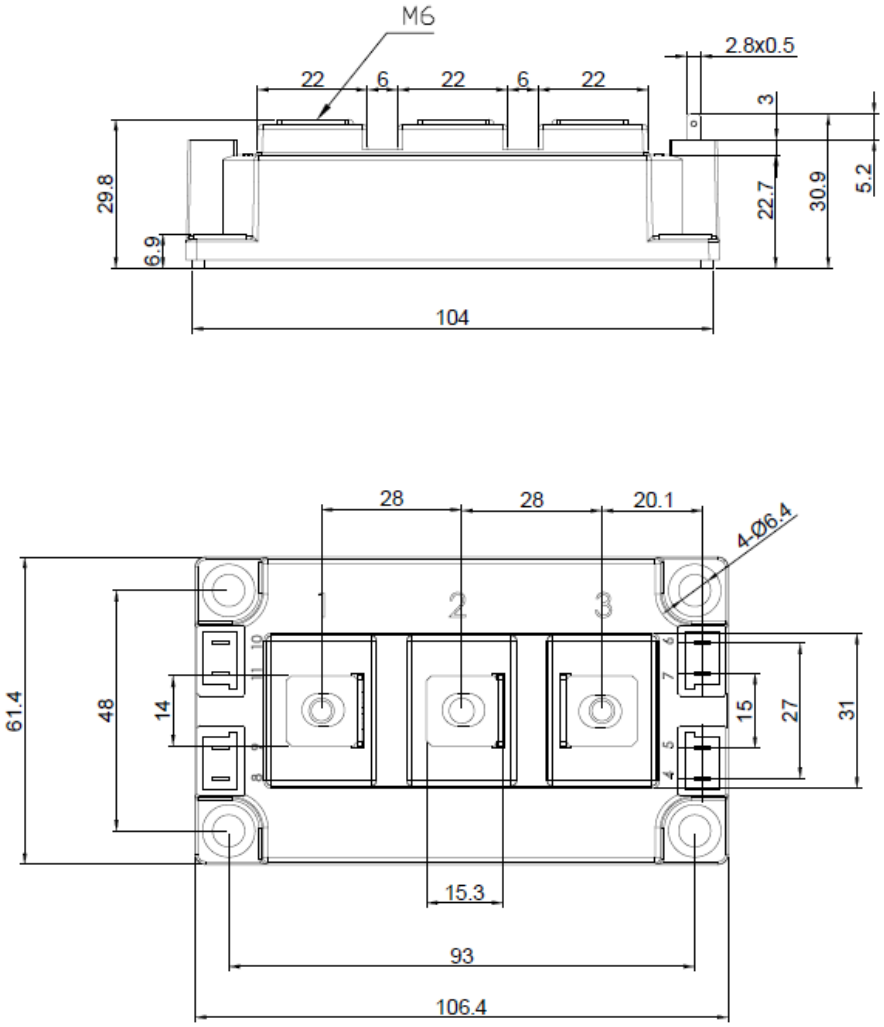


# Diode Characteristics

Fig. 13 Conduction characteristics of Diode



## Package Outline (Dimension in mm)

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