# Econo Dual module with Trench/Fieldstop IGBT and Fast recovery diode and NTC

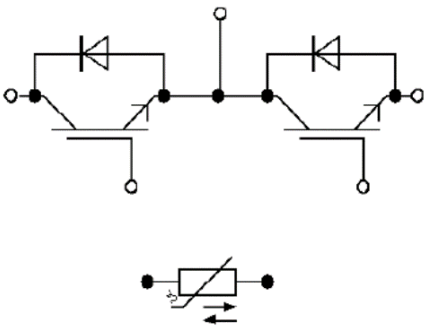
## Features

- Low Switching Losses
- Low $V_{CEsat}$
- Low $V_{CE(sat)}$ with Positive Temperature Coefficient

## Applications

- Motor/ Servo Drives
- High Power Converters
- UPS Systems

## Equivalent Circuit Schematic



## IGBT - Inverter

### Maximum Rated Values

| Symbol | Description | Conditions | Values | Unit |
|---|---|---|---|---|
| $V_{CES}$ | Collector-Emitter Voltage | $T_{vj}$=25℃ | 1200 | V |
| $V_{GES}$ | Gate-Emitter Peak Voltage | $T_{vj}$=25℃ | ±20 | V |
| $I_C$ | Continuous DC Collector Current | $T_C$=100℃ | 450 | A |
| $I_{CRM}$ | Repetitive Peak Collector Current | $t_P$=1ms | 900 | A |
| $P_{tot}$ | Total Power Dissipation | $T_C$=25℃, $T_{vj\ max}$=175℃ | 2265 | W |

## Characteristic Values

| Symbol | Description | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $V_{GE}$=15V, $I_C$=450A, $T_{vj}$=25℃ | --- | 1.65 | -- | V |
| | | $V_{GE}$=15V, $I_C$=450A, $T_{vj}$=125℃ | --- | 1.85 | -- | V |
| $V_{GE(th)}$ | Gate Threshold Voltage | $V_{GE}$=$V_{CE}$, $I_C$=17.1mA | 5.0 | 5.6 | 6.8 | V |
| $I_{CES}$ | Collector-Emitter Cut-Off Current | $V_{CE}$=1200V, $V_{GE}$=0V | --- | --- | 1 | mA |
| $I_{GES}$ | Gate-Emitter Leakage Current | $V_{GE}$=20V, $V_{CE}$=0V | --- | --- | 600 | nA |
| $R_{Gint}$ | Internal Gate Resistor | $T_{vj}$=25℃ | --- | 1.6 | --- | Ω |
| $C_{ies}$ | Input Capacitance | $V_{CE}$=25V, $V_{GE}$=0V, f=1MHz | --- | 37 | --- | nF |
| $C_{res}$ | Reverse Transfer Capacitance | | --- | 1.4 | --- | nF |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{CC}$=600V<br>$V_{GE}$=±15V<br>$I_C$=450A<br>$R_G$=0.36Ω<br>Inductive Load<br>$T_{vj}$=25℃ | --- | 160 | --- | ns |
| $t_r$ | Turn-on Rise Time | | --- | 36 | --- | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | --- | 350 | --- | ns |
| $t_f$ | Turn-off Fall Time | | --- | 150 | --- | ns |
| $E_{on}$ | Turn-on Switching Loss | | --- | 7.8 | --- | mJ |
| $E_{off}$ | Turn-off Switching Loss | | --- | 36 | --- | mJ |
| $I_{SC}$ | Short Circuit Data | $V_{GE}$≤15V, $V_{CC}$=600V<br>$t_P$≤10μs, $T_{vj}$=25°C | --- | 1980 | --- | A |
| $R_{thJC}$ | Thermal Resistance, Junction to Case | Per IGBT | --- | --- | 0.059 | K/W |
| $T_{VJ\ OP}$ | Virtual Junction Temperature | Under Switching | -40 | --- | 150 | ℃ |

# NTC-Thermistor

## Characteristic Values

| Symbol | Description | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $R_{25}$ | Rated Resistance | $T_C$=25℃ | --- | 5 | --- | KΩ |
| $P_{25}$ | Power Dissipation | $T_C$=25℃ | --- | 20 | --- | mW |
| $B_{25/50}$ | B Value | $R_2 = R_{25}$ exp [$B_{25/50}$(1/$T_2$ –1/(298 K))] | --- | 3375 | --- | K |

# Diode - Inverter

## Maximum Rated Values

| Symbol | Description | Conditions | Values | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | $T_{vj}$=25℃ | 1200 | V |
| $I_F$ | Continuous DC Forward Current | | 450 | A |
| $I_{FRM}$ | Repetitive Peak Collector Current | $t_P$=1ms | 900 | A |

## Characteristic Values

| Symbol | Description | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $V_F$ | Forward Voltage | $I_F$=450A, $V_{GE}$=0V, $T_{vj}$=25℃ | --- | 2.0 | --- | V |
| | | $I_F$=450A, $V_{GE}$=0V, $T_{vj}$=125℃ | --- | 1.7 | --- | V |
| $I_{RM}$ | Peak Reverse Recovery Current | $I_F$=450A, $V_R$=600V, $V_{GE}$=-15V $T_{vj}$=25℃ | --- | 450 | --- | A |
| $Q_r$ | Recovered Charge | | --- | 52 | --- | uC |
| $E_{rec}$ | Reverse Recovery Energy | | --- | 25.8 | --- | mJ |
| $T_{VJ\ OP}$ | Virtual Junction Temperature | Under Switching | -40 | --- | 150 | ℃ |

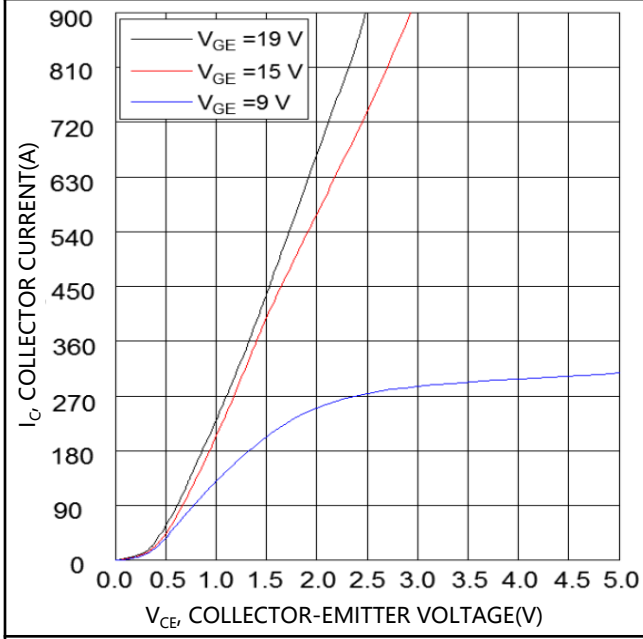
## Module

| Symbol | Description | Conditions | Values | Unit |
|---|---|---|---|---|
| $V_{ISOL}$ | Isolation Test Voltage | RMS, f=50Hz, t=1min | 4 | KV |
| | Material of Module Baseplate | | Cu | |
| | Internal Isolation | Basic Insulation (Class 1, IEC 61140) | $Al_2O_3$ | |
| | Creepage Distance | Terminal to Heatsink<br>Terminal to Terminal | 14.5<br>13.0 | mm |
| | Clearance | Terminal to Heatsink<br>Terminal to Terminal | 13.0<br>10.5 | mm |
| CTI | Comparative Tracking Index | | > 200 | |

| Symbol | Description | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $R_{thCH}$ | Thermal Resistance, Case to Heatsink | Per Module<br>$\lambda_{Paste}$=1W/(m·k) /<br>$\lambda_{Grease}$=1W/(m·k) | --- | 0.009 | --- | K/W |
| $L_{sCE}$ | Stray Inductance Module | | --- | 20 | --- | nH |
| $R_{CC'+EE'}$ | Module Lead Resistance, Terminals-chip | TC=25℃, Per Switch | --- | 0.99 | --- | mΩ |
| $T_{stg}$ | Storage Temperature | | -40 | --- | 125 | ℃ |
| M | Mounting Torque for Modul Mounting | | 3.0 | --- | 6.0 | Nm |
| G | Weight | | --- | 350 | --- | g |

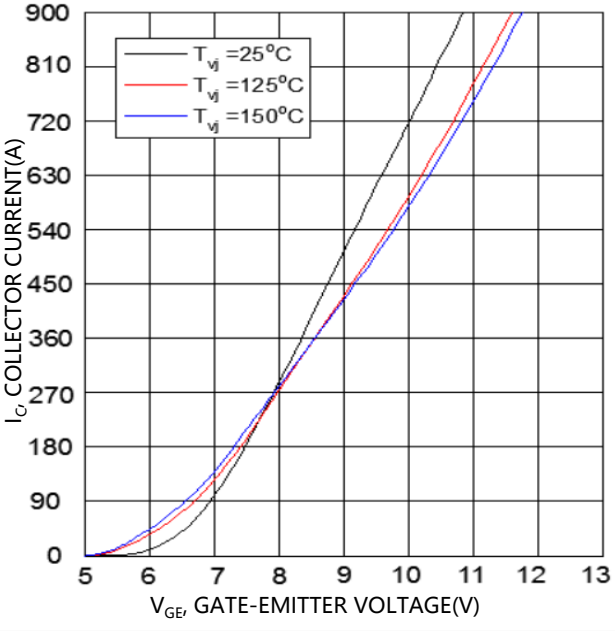
## Typical Characteristics

**Fig. 1**



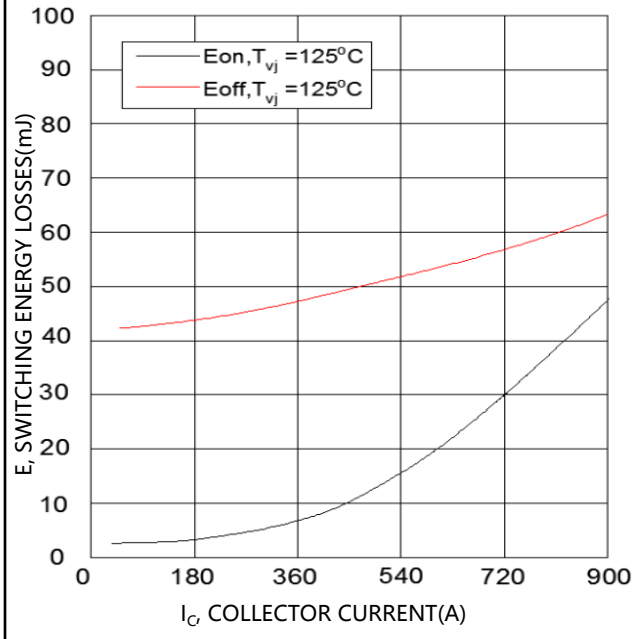

Output characteristic IGBT-Inverter (typical)
$I_C=f(V_{CE})$

**Fig. 2**



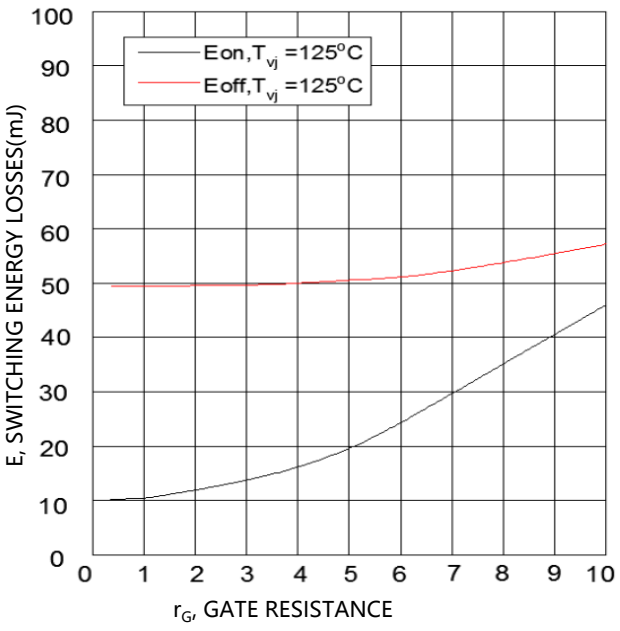

Transfer characteristic IGBT-Inverter (typical)
$I_C=f(V_{GE})$ at $V_{CE}$=20V

**Fig. 3**




Switching losses IGBT-Inverter (typical)
$E_{on}=f(I_C)$, $E_{off}=f(I_C)$ at $V_{GE}=\pm15V$ , $R_G=0.36\Omega$ and $V_{CE}$=600V

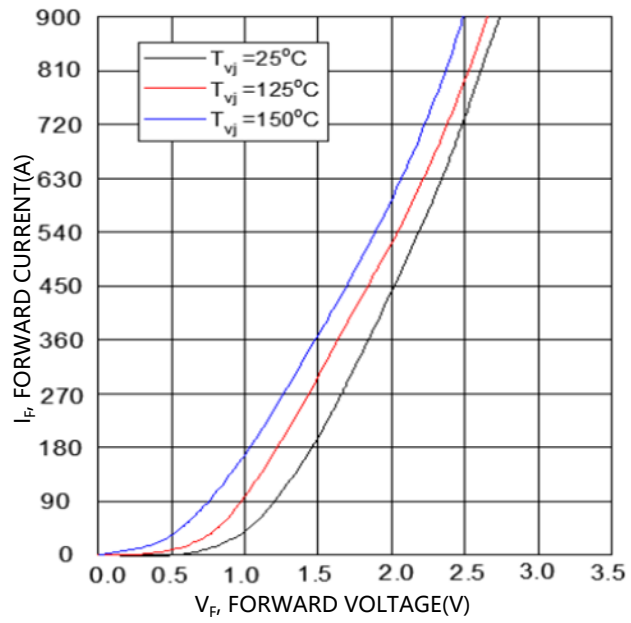
**Fig. 4**




Switching losses IGBT-Inverter (typical)
$E_{on}=f(R_G)$, $E_{off}=f(R_G)$ at $V_{GE}=\pm15V$, $I_C$=450A and $V_{CE}$=600V

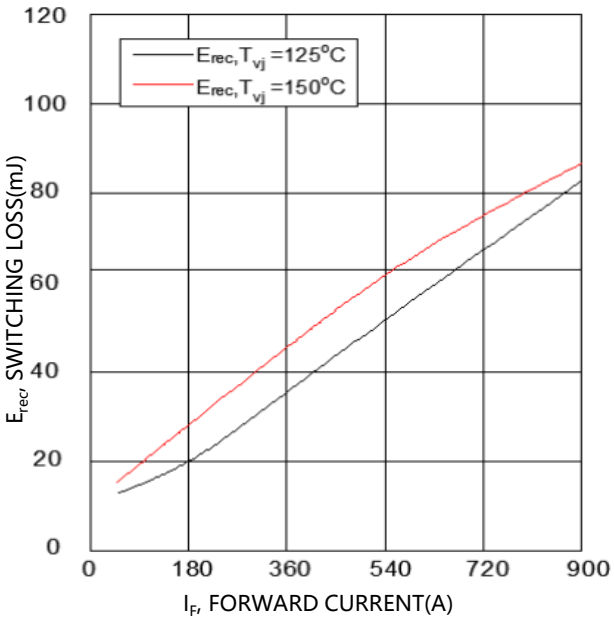
## Typical Characteristics

**Fig. 5**



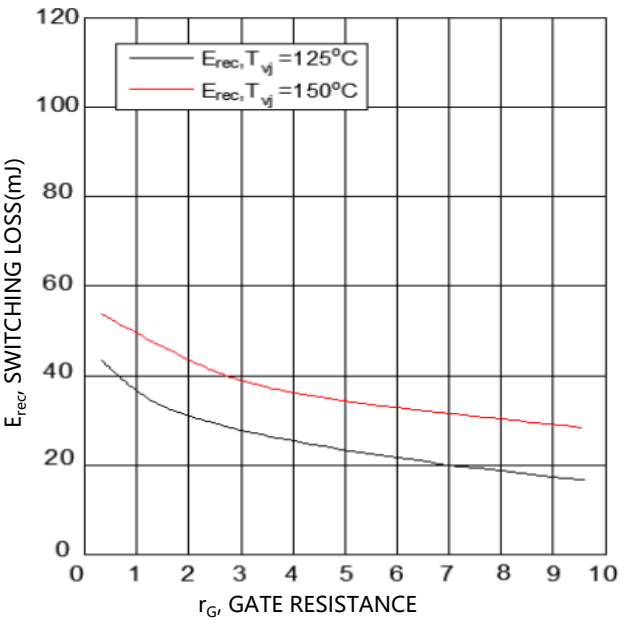

Forward characteristic of Diode-Inverter (typical)
$I_F=f(V_F)$

**Fig. 6**



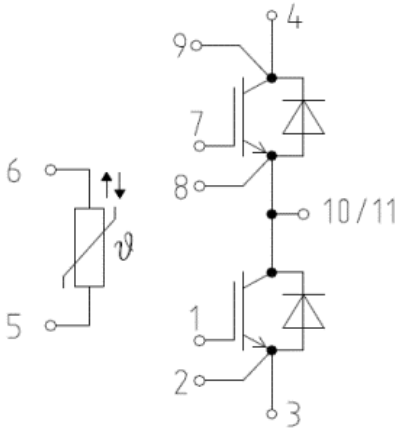

Switching losses Diode-Inverter (typical)
$E_{rec}=f(I_F)$ at $R_G=0.65\Omega$ and $V_{CE}=600V$

**Fig. 7**




Switching Losses Diode-Inverter (typical)
$E_{rec}=f(R_G)$ at $I_F=450A$ and $V_{CE}=600V$

## Circuit Diagram




## Package Outlines (mm)