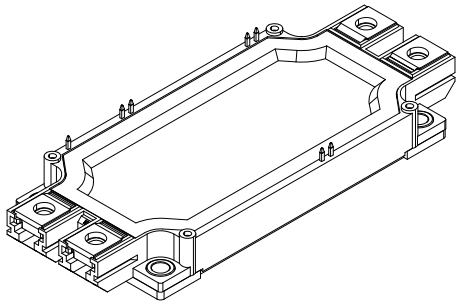
## Features



- Low $V_{CE(SAT)}$
- Low inductance module structure
- Solder pin terminals

## Applications

- Inverter for motor drives AC and DC servo drives
- Uninterruptible power supply systems
- Wind turbines
- PV power conditioning systems

### Table 1 Key Performance and Package Parameters

| Type | $V_{CE}$ | $I_C$ ($T_C$= 90°C) | $V_{CE(SAT)}$ ($T_{vj}$ = 25°C, $I_C$ = 450A, $V_{GE}$ = 15V) | $T_{vjmax}$ | Package |
|---|---|---|---|---|---|
| IGBT | 1700V | 450A | 1.62V | 175°C | D3 |

## Table 2 Absolute Maximum Ratings

| Parameter | Symbol | Conditions | Value | Unit |
|---|---|---|---|---|
| Collector emitter voltage | $V_{CE}$ | $T_{vj}$ = 25°C | 1700 | V |
| Continuous DC collector current | $I_{CDC}$ | $T_C$ = 90°C | 450 | A |
| Repetitive peak collector current | $I_{CRM}$ | Tp=1ms | 900 | |
| Continuous DC forward current | $I_F$ | | 450 | A |
| Repetitive peak forward current | $I_{FRM}$ | Tp=1ms | 900 | A |
| $I^2t$-value | $I^2t$ | Tp=10ms,$V_R$=0V, $T_{vj}$ = 175°C | 45000 | $A^2S$ |
| Gate Source Voltage | $V_{GE}$ | $T_{vj}$ = 25°C | ±20 | V |
| Junction Temperature | $T_{vj}$ | | -40 to +175 | °C |
| Storage Temperature | $T_{stg}$ | | -40 to +125 | |
| Operating virtual junction temperature | $T_{vjop}$ | | -40 to +150 | °C |

## Table 3 Thermal Resistance

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| IGBT Thermal resistance junction - case | $R_{thJC}$ | Per IGBT | - | 0.06 | - | °C / W |
| Diode Thermal resistance junction - case | $R_{thJC}$ | Per diode | - | 0.098 | - | °C / W |

## Table 4 Static Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Collector emitter voltage | $V_{(BR)CES}$ | $T_{vj}$ = 25°C | 1700 | - | - | V |
| Collector emitter saturation voltage | $V_{CEsat}$ (terminal) | $V_{GE}$ = 15V, $I_C$ =450A, $T_{vj}$ = 25°C | - | 1.76 | - | V |
| | | $V_{GE}$ = 15V, $I_C$ =450A, $T_{vj}$ = 175°C | - | 2.34 | - | |
| | $V_{CEsat}$ (chip) | $V_{GE}$ = 15V, $I_C$ =450A, $T_{vj}$ = 25°C | - | 1.62 | - | |
| | | $V_{GE}$ = 15V, $I_C$ =450A, $T_{vj}$ = 175°C | - | 2.13 | - | |
| Diode forward voltage | $V_F$ (terminal) | $V_{GE}$ = 0V, $I_C$ = 450A, $T_{vj}$ = 25°C | - | 1.72 | - | V |
| | | $V_{GE}$ = 0V, $I_C$ = 450A, $T_{vj}$ = 175°C | - | 1.87 | - | |
| | $V_F$ (chip) | $V_{GE}$ = 0V, $I_C$ = 450A, $T_{vj}$ = 25°C | - | 1.62 | - | |
| | | $V_{GE}$ = 0V, $I_C$ = 450A, $T_{vj}$ = 175°C | - | 1.80 | - | |
| Gate-emitter threshold voltage | $V_{GE(th)}$ | $V_{CE}$ = $V_{GE}$, $I_C$ = 18mA | - | 5.87 | - | V |
| Zero gate voltage collector current | $I_{CES}$ | $V_{CE}$ = 1700V, $V_{GE}$ = 0V, $T_{vj}$ = 25°C | - | - | 100 | uA |
| Gate-emitter leakage current | $I_{GES}$ | $V_{GE}$ = 20V, $V_{CE}$ = 0V | - | - | 100 | nA |
| Input capacitance | $C_{ies}$ | $V_{GE}$ = 0 V, $V_{CE}$ = 25 V, f = 100kHz | - | 58.2 | - | nF |
| Output capacitance | $C_{oes}$ | | - | 2.44 | - | |
| Reverse transfer capacitance | $C_{res}$ | | - | 0.36 | - | |
| Gate input resistance | $R_G$ | f = 1M Hz | - | 2.08 | - | Ω |
| Gate charge | $Q_G$ | $V_{GE}$ = -15 V to 15 V, $V_{CE}$ = 600 V | - | 3.57 | - | μC |

## Table 5 Switching Characteristic, Inductive Load

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Turn-on delay time | $t_{don}$ | $T_{vj}$ = 25°C, $V_{CC}$ = 900V, $I_C$ = 450A, $V_{GE}$ = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω | - | 205 | - | ns |
| Rise time | $t_r$ | | - | 60 | - | |
| Turn-off delay time | $t_{doff}$ | | - | 350 | - | |
| Fall time | $t_f$ | | - | 485 | - | |
| Turn-on energy | $E_{on}$ | | - | 111 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 89 | - | |
| Total switching energy | $E_{ts}$ | | - | 200 | - | |
| Turn-on delay time | $t_{don}$ | $T_{vj}$ = 150°C, $V_{CC}$ = 900V, $I_C$ = 450A, $V_{GE}$ = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω | - | 250 | - | ns |
| Rise time | $t_r$ | | - | 75 | - | |
| Turn-off delay time | $t_{doff}$ | | - | 400 | - | |
| Fall time | $t_f$ | | - | 630 | - | |
| Turn-on energy | $E_{on}$ | | - | 157.3 | - | mJ |
| Turn-off energy | $E_{off}$ | | - | 111.8 | - | |
| Total switching energy | $E_{ts}$ | | - | 269.1 | - | |
| Short circuit current | $I_{SC}$ | $T_{vj}$ = 175°C, $V_{CC}$ = 1000V, $V_{GE}$ = 15V, $V_{CEmax}$ = $V_{CES}$ -$L_{sCE}$*di/dt $T_P$ ≤ 6 us | - | 1800 | - | A |

## Table 6 Diode Recovery Characteristics

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Reverse recovery Time | $T_{rr}$ | $T_{vj}$ = 25°C, $V_{CC}$ = 900V, $I_C$ = 450A, $V_{GE}$ = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω | - | 615 | - | ns |
| Peak reverse recovery current | $I_{rrm}$ | | - | 440 | - | A |
| Reverse recovery charge | $Q_{rr}$ | | - | 107 | - | µC |
| Reverse recovery energy | $E_{rec}$ | | - | 56.8 | - | mJ |
| Reverse recovery Time | $T_{rr}$ | $T_{vj}$ = 150°C , $V_{CC}$ = 900V, $I_C$ = 450A, $V_{GE}$ = -15/15V, $R_{G(on)}$= 0.51Ω,$R_{G(off)}$= 0.51Ω | - | 1095 | - | ns |
| Peak reverse recovery current | $I_{rrm}$ | | - | 510 | - | A |
| Reverse recovery charge | $Q_{rr}$ | | - | 196 | - | µC |
| Reverse recovery energy | $E_{rec}$ | | - | 111.1 | - | mJ |

## Table 7 Module Characteristics

| Parameter | Symbol | Conditions | Value | Typ |
|---|---|---|---|---|
| Isolation test voltage | $V_{ISOL}$ | RMS, f = 50 Hz, t = 1min | 3.4 | kV |
| Material of module baseplate | | | Cu+Ni | |
| Internal isolation | | Basic insulation | $Al_2O_3$ | |
| Mounting torque of screws to heat sink | $M_s$ | M5 | 3.0-6.0 | N·m |
| Mounting torque of screws to terminals | $M_t$ | M6 | 3.0-6.0 | N·m |
| Comperative tracking index | CTI | | >175 | |

## Table 8 NTC-Thermistor

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Rated resistance | R25 | TC = 25°C | - | 5 | - | kΩ |
| Deviation of R100 | △R/R | TC = 100°C, R100 = 493 Ω | -5 | - | 5 | % |
| B-value | B25/50 | R2 = R25 exp[B25/50(1/T2-1/(298,15K))] | - | 3375 | - | K |

## Characteristics Diagrams

Fig.1 Typical Output Characteristic, IGBT, Inverter
$I_C$= f ($V_{CE}$) / (terminal)
$V_{GE}$ = 15V

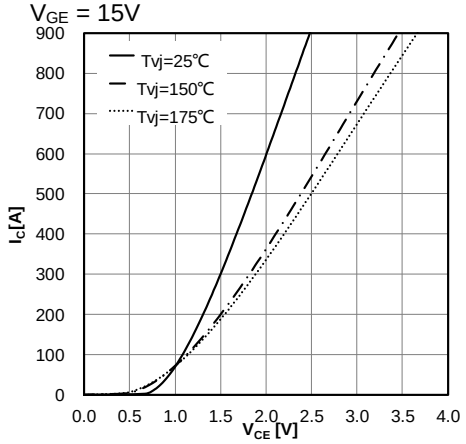



Fig.2 Typical Output Characteristic, IGBT, Inverter
$I_C$ = f ($V_{CE}$) / (terminal)
$T_{Vj}$ = 175°C

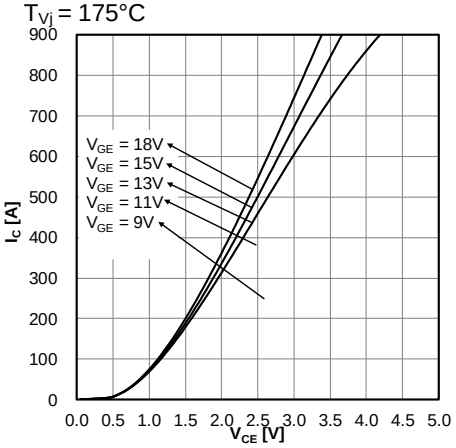



Fig.3 Typical Output Characteristic, IGBT, Inverter
$I_C$ = f ($V_{GE}$)
$V_{CE}$ = 20V

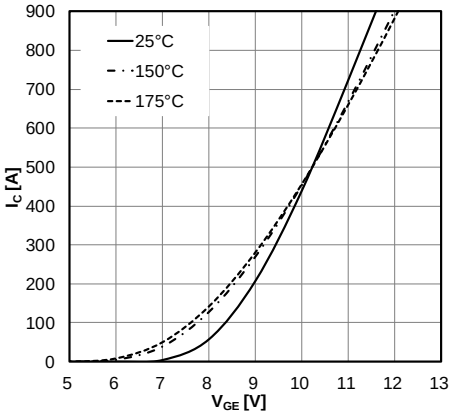



Fig.4 Switching losses, IGBT, Inverter
E = f($I_C$)
$R_{Goff}$ = 0.51Ω, $R_{Gon}$ = 0.51Ω, $V_{CE}$ = 900V, $V_{GE}$ = ±15V

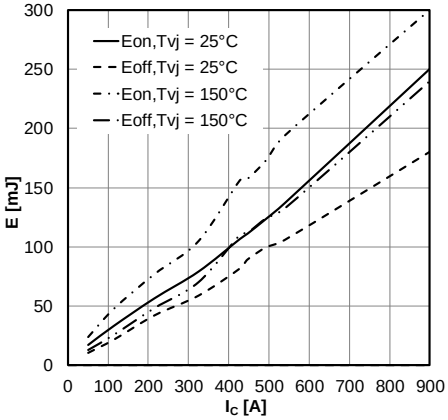



Fig.5 Switching losses, IGBT, Inverter
E = f ($R_G$)
$I_C$ = 450A, $V_{CE}$ = 900V, $V_{GE}$ = ±15V

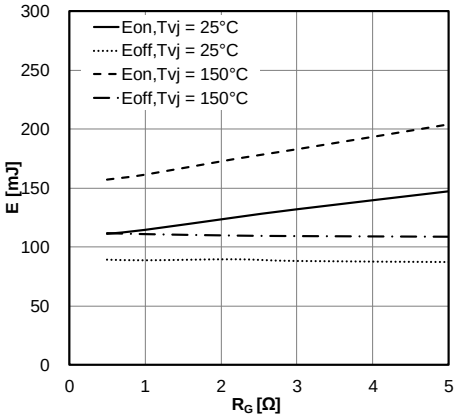
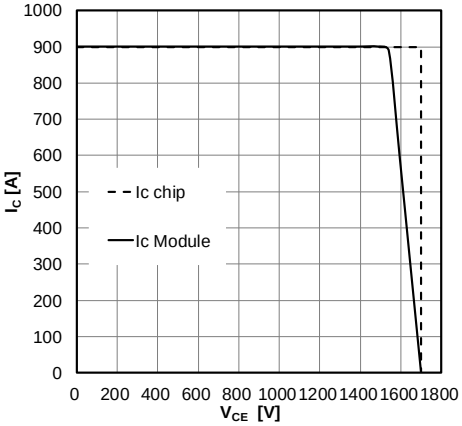



Fig.6 Reverse bias safe operating area (RBOSA), IGBT, Inverter
$I_C$ = f ($V_{CE}$)
$R_{Goff}$ = 0.51Ω, $V_{GE}$ = ±15V, $T_{vj}$ = 175°C



# Characteristics Diagrams

Fig.7 Capacity characteristic, IGBT, Inverter
C= f ($V_{CE}$)
f = 100 KHz, $V_{GE}$ = 0V, $T_{vj}$= 25°C

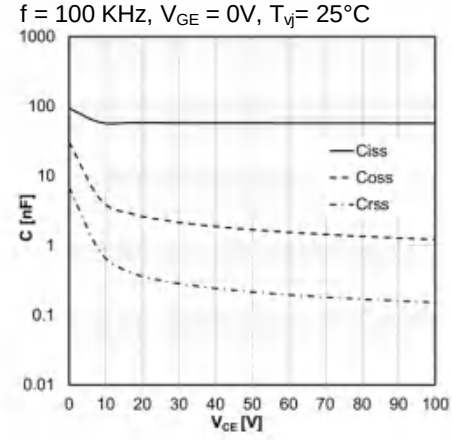



Fig.8 Transient thermal impedance IGBT, Inverter
$Z_{thJC}$ = f (t)

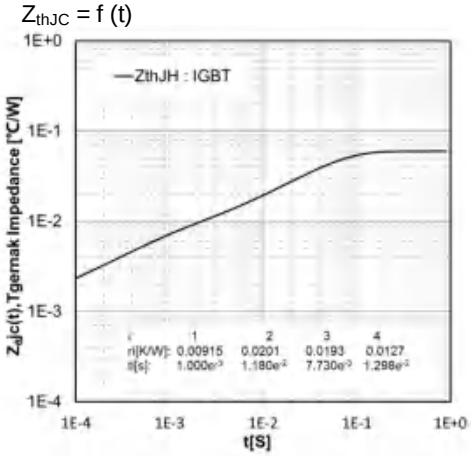



Fig.9 Forward characteristic, Diode, Inverter
$I_F$ = f ($V_F$) / (terminal)

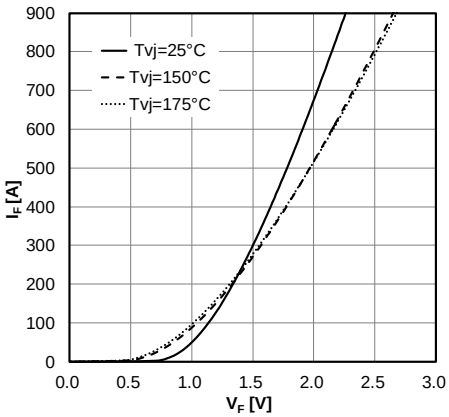



Fig.10 Switching losses, Diode, Inverter
$E_{rec}$ = f ($I_F$)
$V_{CE}$ = 900V, $R_{Goff}$ = 0.51Ω, $R_{Gon}$ = 0.51Ω, $V_{GE}$ = ±15V

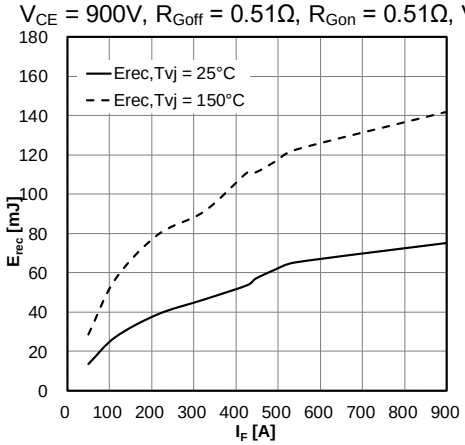



Fig.11 Switching losses, Diode, Inverter
$E_{rec}$ = f ($R_G$)
$V_{CE}$ = 900V, $I_F$= 450A

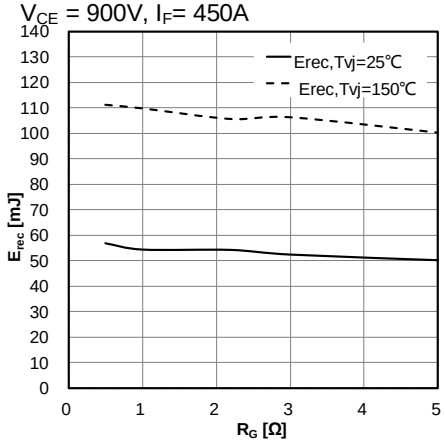
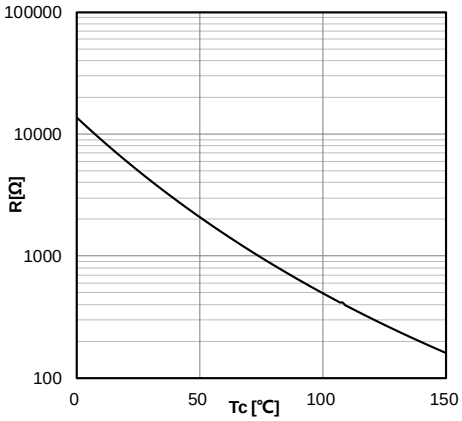
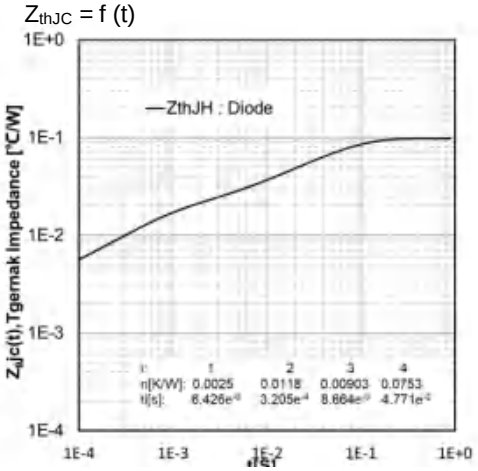



Fig.12 Temperature characteristic, NTC - Thermistor



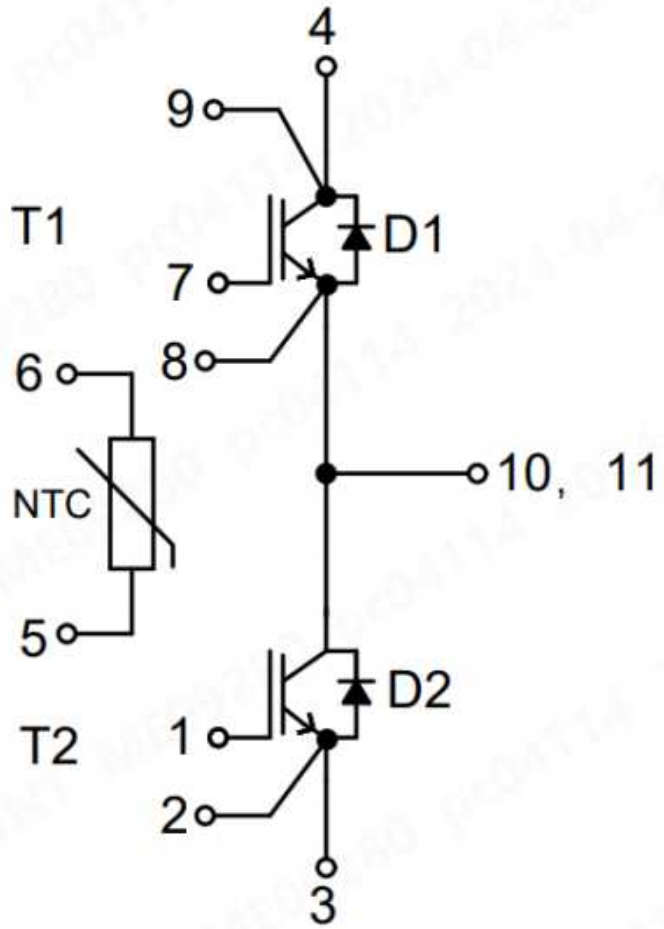
## Characteristics Diagrams

Fig.13 Transient thermal impedance Diode, Inverter
$Z_{thJC}$ = f (t)



## Package Information

**Circuit Diagram**



## Package Outlines