Press Pack IEGT　Silicon N-Channel IEGT

# ST750GXH24

## 1. Applications

- High-Power Switching
- Motor Controllers

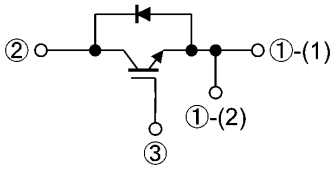
## 2. Features

(1) Enhancement mode.

(2) Double side cooling type.

## 3. Packaging and Internal Circuit

PPI85B




①-(1): Emitter (Anode)
①-(2): Emitter (Black)
②　: Collector (Cathode)
③　: Gate (White)

Start of commercial production
2008-12

## 4. Absolute Maximum Ratings (Note) ($T_C$ = 25°C unless otherwise specified)

| Characteristics | Symbol | Note | Test Condition | Rating | Unit |
|---|---|---|---|---|---|
| Collector-emitter voltage | $V_{CES}$ | | | 4500 | V |
| Gate-emitter voltage | $V_{GES}$ | | | ±20 | V |
| Collector current (DC) | $I_C$ | | $T_f$ = 80 °C | 750 | A |
| Collector current (pulsed) | $I_{CP}$ | (Note 2) | | 1500 | A |
| Diode forward current (DC) | $I_F$ | | | 750 | A |
| Diode forward current (pulsed) | $I_{FP}$ | (Note 2) | | 1500 | A |
| Non-repetitive peak forward surge current | $I_{FSM}$ | | 10 ms half-sine wave | 10 | kA |
| Collector power dissipation | $P_C$ | (Note 1) | $T_f$ = 25 °C | 7143 | W |
| Power dissipation | $P_D$ | (Note 1) | Diode part, $T_f$ = 25 °C | 2857 | W |
| Junction temperature | $T_j$ | | | -40 to 125 | °C |
| Storage temperature | $T_{stg}$ | | | -40 to 125 | °C |
| Mounting force | — | | | 28.3 to 34.7 | kN |

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: In addition to the above remarks, refer to the application notes.

Note 2: Pulse width and repetition rate should be such that junction temperature ($T_j$) does not exceed maximum $T_j$ rating.

## 5. Thermal Characteristics (Note)

| Characteristics | Symbol | Note | Test Condition | | Max | Unit |
|---|---|---|---|---|---|---|
| Thermal resistance (junction-to-fin) | $R_{th(j-f)}$ | (Note 1) | Transistor part | Emitter side | 37.2 | K/kW |
| | | | | Collector side | 22.6 | |
| | | | | Double side | 14.0 | |
| | | | Diode part | Anode side(Emitter side) | 97.8 | |
| | | | | Cathode side(Collector side) | 54.9 | |
| | | | | Double side | 35.0 | |

Note: Customers must also refer to and comply with the latest versions of all relevant TOSHIBA information, including without limitation, this document, the specifications, the data sheets and application notes for Product and the precautions and conditions set forth in the "TOSHIBA Semiconductor Reliability Handbook" and the instructions for the application with which the Product will be used with or for.

Note 1: Conductive thermal compound is added.

## 6. Electrical Characteristics

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Gate-emitter leakage current | $I_{GES}$ | $V_{GE}$ = ±20 V, $V_{CE}$ = 0 V, $T_j$ = 25 °C | — | — | ±20 | nA |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 4500 V, $V_{GE}$ = 0 V, $T_j$ = 125 °C | — | — | 100 | mA |
| Gate-emitter cut-off voltage | $V_{GE(off)}$ | $I_C$ = 0.75 A, $V_{CE}$ = 10 V, $T_j$ = 25 °C | 6.5 | 7.5 | 8.5 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$ = 750 A, $V_{GE}$ = 15 V, $T_j$ = 25 °C | — | 2.6 | — | V |
| | | $I_C$ = 750 A, $V_{GE}$ = 15 V, $T_j$ = 125 °C | — | 3.0 | 4.0 | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 10 V, $V_{GE}$ = 0 V, f = 100 kHz, $T_j$ = 25 °C | — | 175 | — | nF |
| Switching time (turn-on delay time) | $t_{d(on)}$ | $V_{CC}$ = 2700 V, $I_C$ = 750 A, $V_{GE}$ = ±15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 20 Ω, $C_{GE}$ = 0.22 μF, $T_j$ = 125 °C (Inductive load, $L_s$ ≈ 330 nH) See Fig.6.1 and Fig.6.2. | — | 1.7 | — | μs |
| Switching time (rise time) | $t_r$ | | — | 0.7 | — | μs |
| Switching time (turn-on time) | $t_{on}$ | | — | 2.4 | — | μs |
| Switching time (turn-off delay time) | $t_{d(off)}$ | | — | 8.6 | — | μs |
| Switching time (fall time) | $t_f$ | | — | 2.2 | — | μs |
| Switching time (turn-off time) | $t_{off}$ | | — | 10.8 | — | μs |
| Forward voltage | $V_F$ | $I_F$ = 750 A, $T_j$ = 25 °C | — | 2.8 | — | V |
| | | $I_F$ = 750 A, $T_j$ = 125 °C | — | 3.0 | — | |
| Peak reverse recovery current | $I_{rr}$ | $V_{CC}$ = 2700 V, $I_F$ = 750 A, $V_{GE}$ = -15 V, $T_j$ = 125 °C Drive side: $V_{GE}$ = ±15 V $R_{G(on)}$ = 10 Ω, $C_{GE}$ = 0.22 μF (Inductive load, $L_s$ ≈ 330 nH) See Fig. 6.1 and Fig. 6.3. | — | 550 | — | A |
| Reverse recovery time | $t_{rr}$ | | — | 1.8 | — | μs |
| Turn-on switching loss | $E_{on}$ | $V_{CC}$ = 2700 V, $I_C$ = 750 A, $V_{GE}$ = ±15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 20 Ω, $C_{GE}$ = 0.22 μF, $T_j$ = 125 °C (Inductive load, $L_s$ ≈ 330 nH) See Fig.6.1 and Fig.6.2. | — | 6.0 | — | J |
| Turn-off switching loss | $E_{off}$ | | — | 3.7 | — | J |
| Reverse recovery loss | $E_{rr}$ | $V_{CC}$ = 2700 V, $I_F$ = 750 A, $V_{GE}$ = -15 V, $T_j$ = 125 °C Drive side: $V_{GE}$ = ±15 V $R_{G(on)}$ = 10 Ω, $C_{GE}$ = 0.22 μF (Inductive load, $L_s$ ≈ 330 nH) See Fig. 6.1 and Fig. 6.3. | — | 1.6 | — | J |
| Short-circuit pulse width | $t_{psc}$ | $V_{CC}$ = 3000 V, $V_{GE}$ = ±15 V, $R_{G(on)}$ = 10 Ω, $R_{G(off)}$ = 20 Ω, $C_{GE}$ = 0.1 μF, $T_j$ = 125 °C | — | 10 | — | μs |

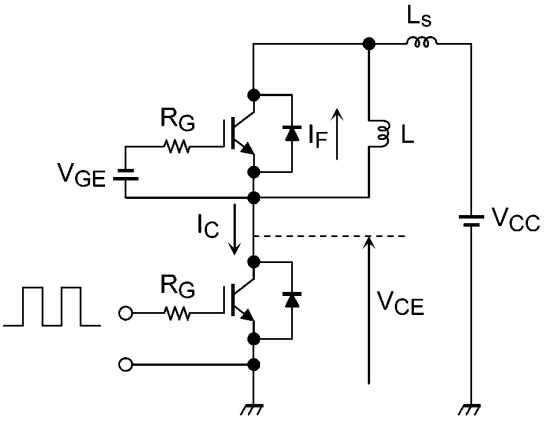
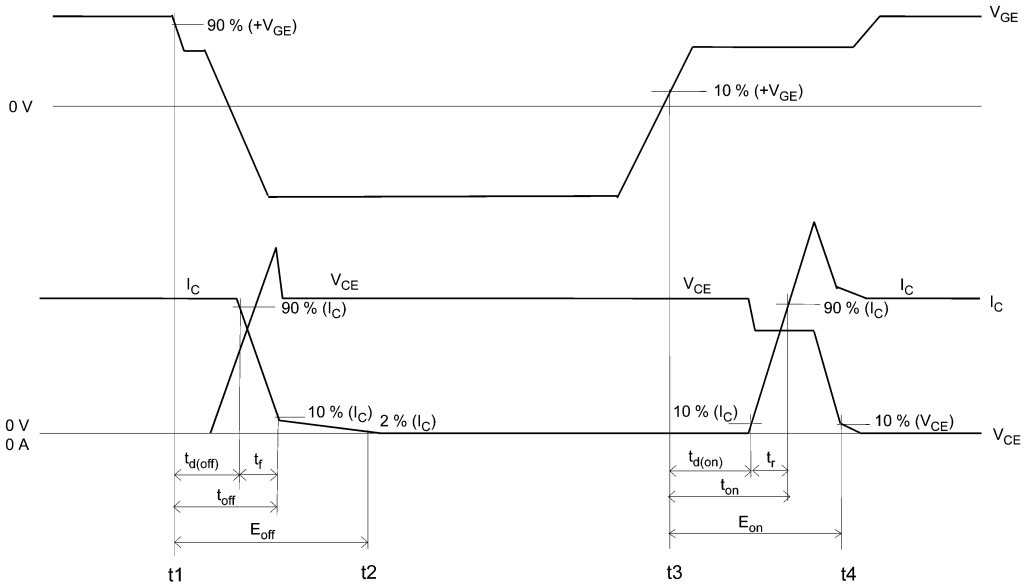
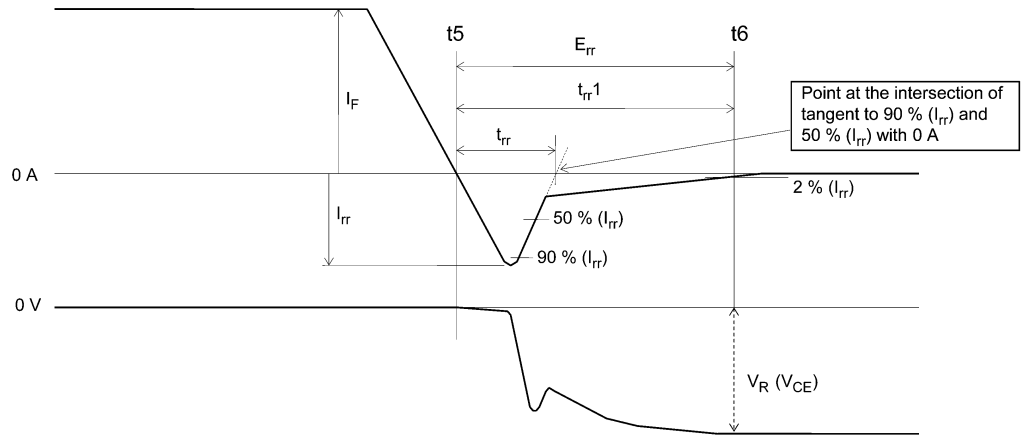



**Fig. 6.1 Test Circuit**




$$E_{off} = \int_{t1}^{t2} I_C \times V_{CE}\, dt \qquad E_{on} = \int_{t3}^{t4} I_C \times V_{CE}\, dt$$

**Fig. 6.2 Timing Chart (Transistor part)**




$$E_{rr} = \int_{t5}^{t6} I_F \times V_R\, dt$$

**Fig. 6.3 Timing Chart (Diode part)**

## 7. Characteristics Curves (Note)

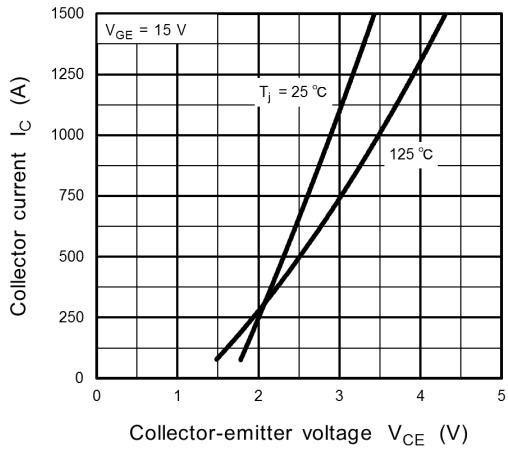



Fig. 7.1 $I_C$ - $V_{CE}$

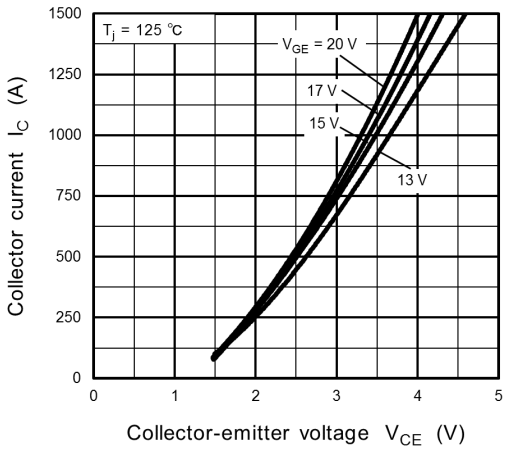



Fig. 7.2 $I_C$ - $V_{CE}$

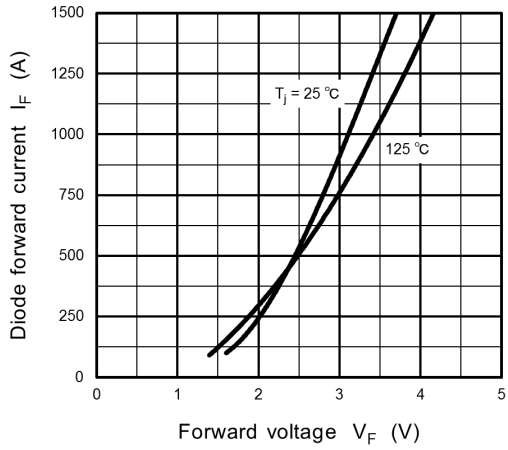



Fig. 7.3 $I_F$ - $V_F$

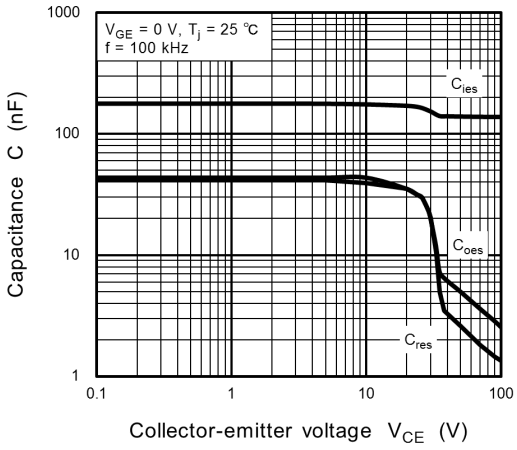



Fig. 7.4 Capacitance - $V_{CE}$

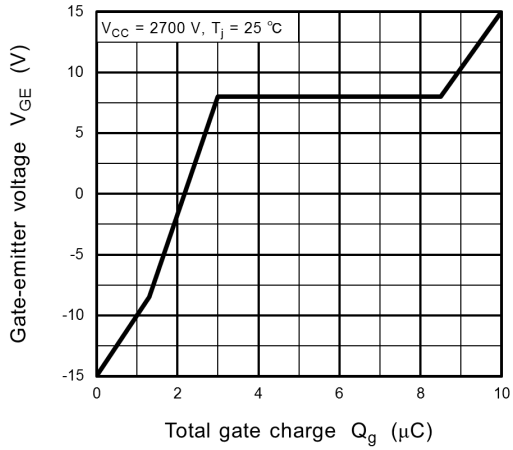



Fig. 7.5 $V_{GE}$ - $Q_g$

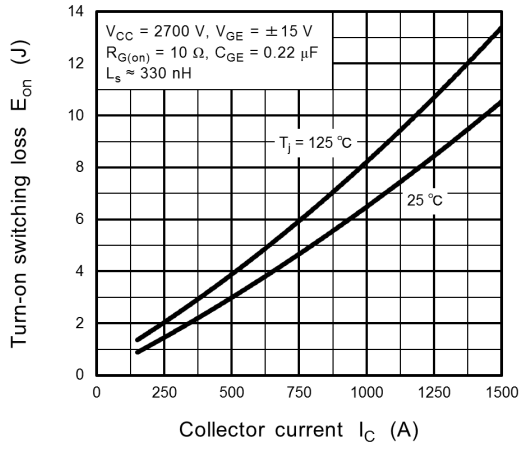



Fig. 7.6 $E_{on}$ - $I_C$

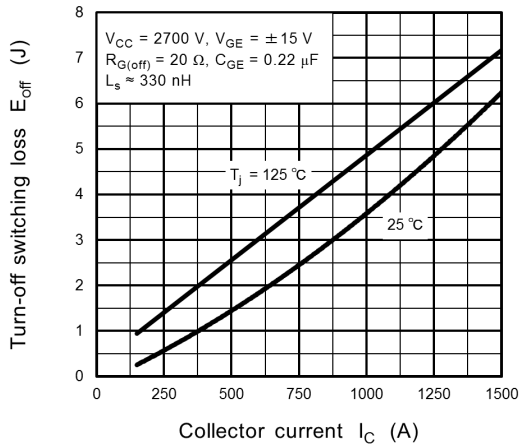



**Fig. 7.7 $E_{off}$ - $I_C$**

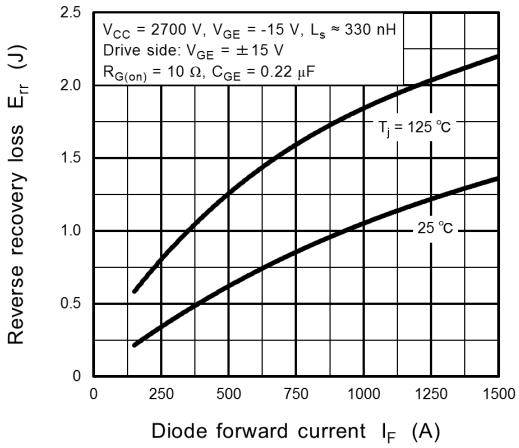



**Fig. 7.8 $E_{rr}$ - $I_F$**

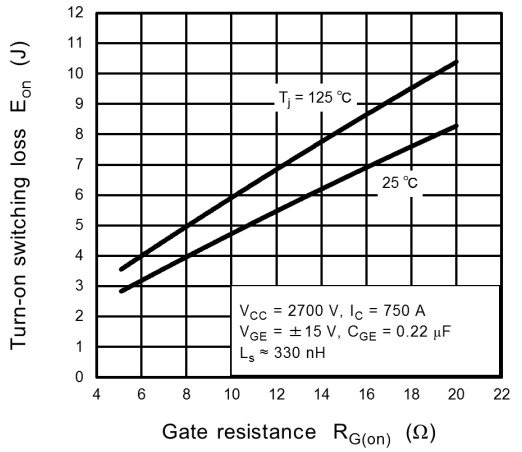



**Fig. 7.9 $E_{on}$ - $R_{G(on)}$**

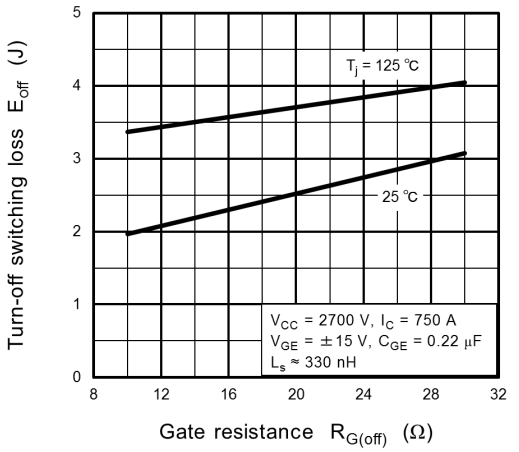



**Fig. 7.10 $E_{off}$ - $R_{G(off)}$**

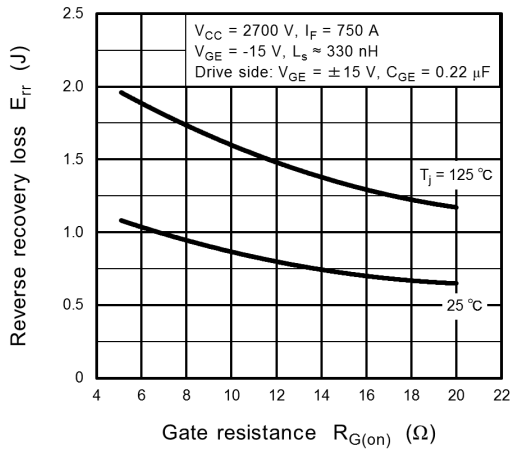



**Fig. 7.11 $E_{rr}$ - $R_{G(on)}$**

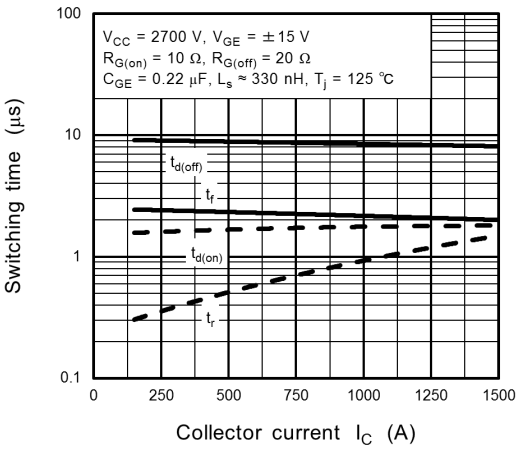



**Fig. 7.12 Switching time - $I_C$**

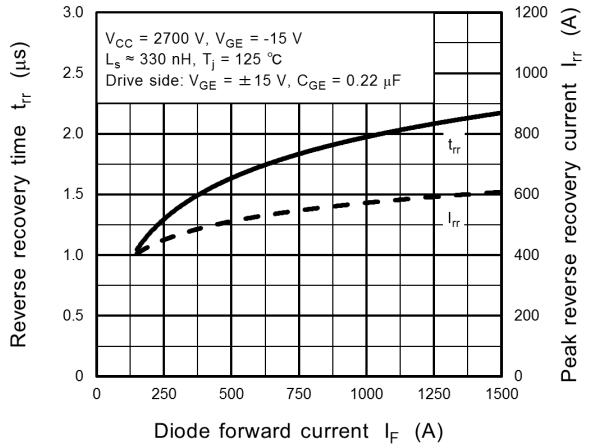



**Fig. 7.13 $t_{rr}$, $I_{rr}$ - $I_F$**

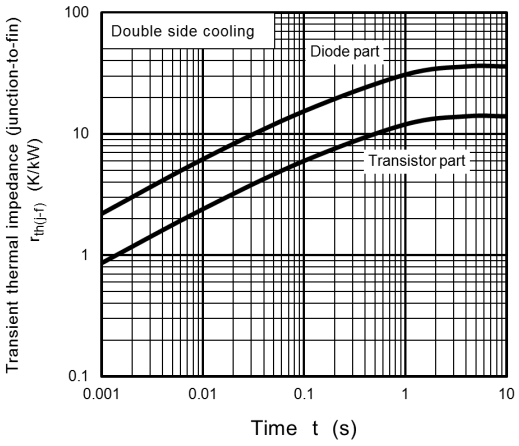



**Fig. 7.14 $r_{th(j-f)}$ - t (Guaranteed value)**

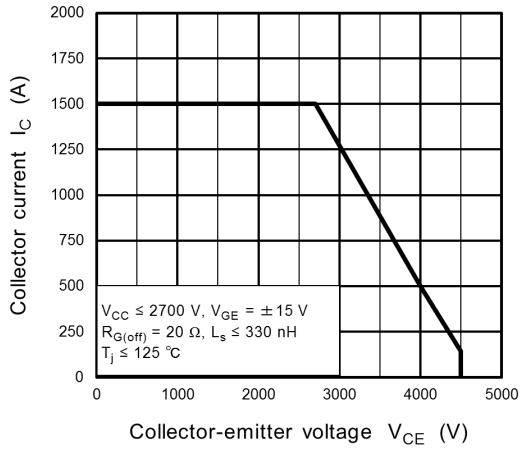



**Fig. 7.15 RBSOA (Guaranteed value)**

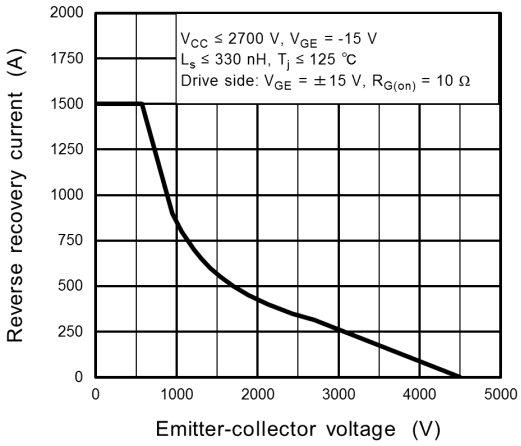
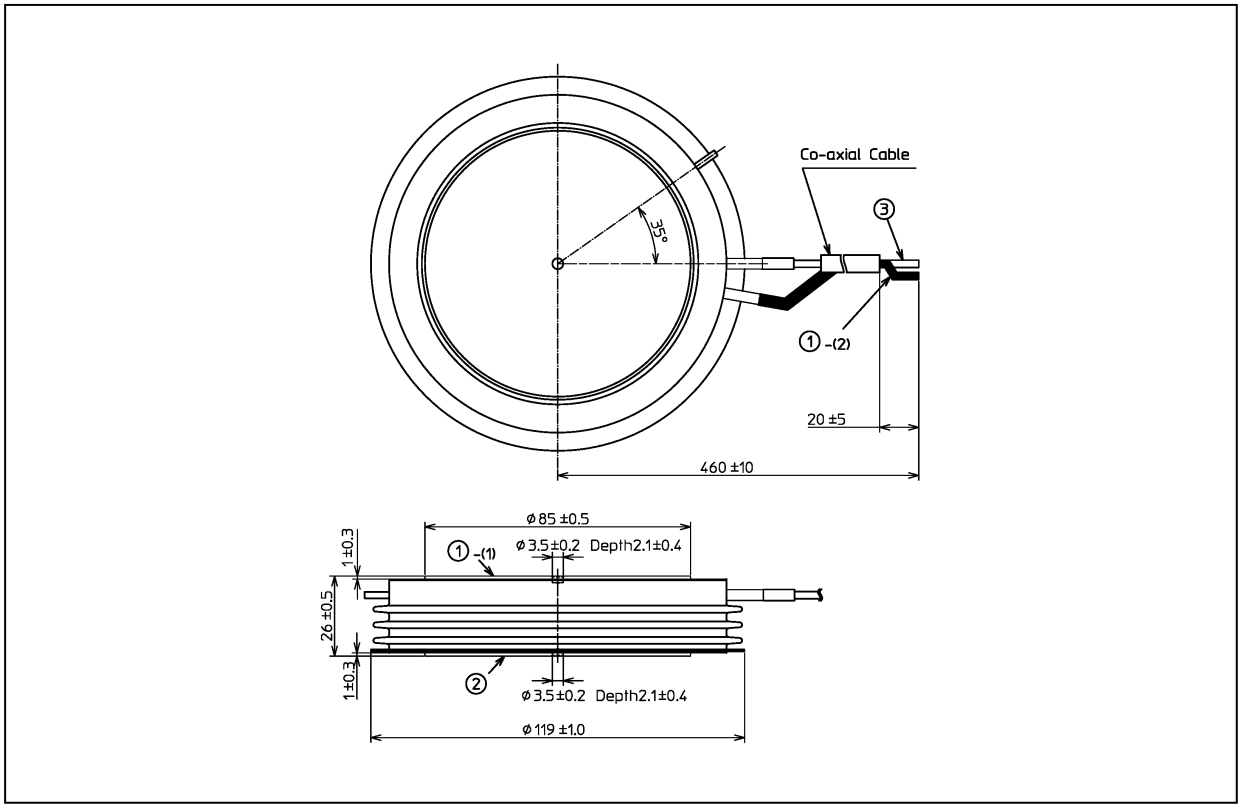



**Fig. 7.16 RRSOA (Guaranteed value)**

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

## Package Dimensions

Unit: mm




Weight: 1400 g (typ.)

| Package Name(s) |
|---|
| TOSHIBA: 2-120B1S |
| Nickname: PPI85B |

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