Press Pack IEGT　Silicon N-Channel IEGT

# ST3000GXH35A

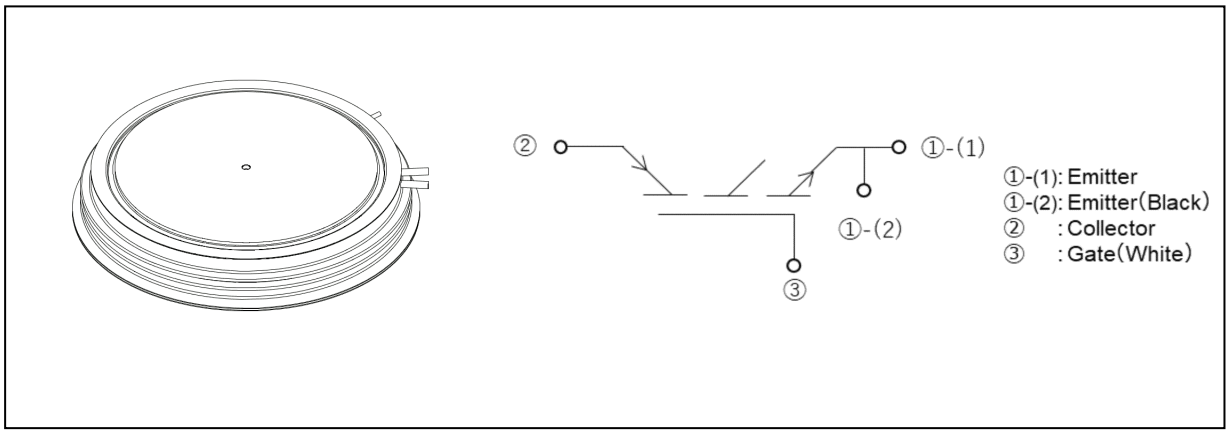
## 1. Applications

- Electric power transmission and distribution
- Motor Controllers
- High-Power Switching

## 2. Features

(1) High reliability due to hermetic sealing structure.
(2) Double side cooling type.

## 3. Packaging and Internal Circuit




Start of commercial production
2024-02

## 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) | $I_C$ | (Note 1) | | 3000 | A |
| Collector current (pulsed) | $I_{CP}$ | (Note 2) | | 6000 | A |
| Collector power dissipation | $P_C$ | (Note 3) | $T_f$ = 25 °C | 25879 | W |
| Junction temperature | $T_j$ | | | -40 to 150 | °C |
| Operating junction temperature | $T_{j(opr)}$ | | | -40 to 125 | °C |
| Storage temperature | $T_{stg}$ | | | -40 to 125 | °C |
| Mounting force | — | | | 59 to 70 | 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: $T_f$ = 105 °C

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

Note 3: Refer to the application notes.

## 5. Thermal Characteristics (Note)

| Characteristics | Symbol | Note | Test Condition | Max | Unit |
|---|---|---|---|---|---|
| Thermal resistance (junction-to-fin) | $R_{th(j-f)}$ | (Note4) | Double side | 4.83 | K/kW |

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.

Note4: 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 | — | — | ±100 | nA |
| Collector-emitter cut-off current | $I_{CES}$ | $V_{CE}$ = 4500 V, $V_{GE}$ = 0 V, $T_j$ = 25 °C | — | — | 0.2 | mA |
| Gate-emitter cut-off voltage | $V_{GE(off)}$ | $I_C$ = 3.0 A, $V_{CE}$ = 5 V, $T_j$ = 25 °C | 6.70 | 7.20 | 7.70 | V |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$ = 3000 A, $V_{GE}$ = 15 V, $T_j$ = 25 °C | — | 2.10 | — | V |
| | | $I_C$ = 3000 A, $V_{GE}$ = 15 V, $T_j$ = 150 °C | — | 2.60 | 3.05 | |
| Input capacitance | $C_{ies}$ | $V_{CE}$ = 10 V, $V_{GE}$ = 0 V, f = 100 kHz, $T_j$ = 25 °C | — | 402 | — | nF |
| Switching time (rise time) | $t_r$ | $V_{CC}$ = 2800 V, $I_C$ = 3000 A, $R_{G(on)}$ = 2.2 Ω, $R_{G(off)}$ = 39 Ω, $V_{GE}$ = ±15 V, $T_j$ = 150 °C Diode:3000GXHH32 $T_j$ = 150 °C (Inductive load, $L_s$ ≈ 300 nH) See Fig. 6.1 and Fig. 6.2 | — | 0.44 | — | μs |
| Switching time (turn-on delay time) | $t_{d(on)}$ | | — | 0.38 | — | μs |
| Switching time (turn-on time) | $t_{on}$ | | — | 0.82 | — | μs |
| Switching time (fall time) | $t_f$ | | — | 2.20 | — | μs |
| Switching time (turn-off delay time) | $t_{d(off)}$ | | — | 11.40 | — | μs |
| Switching time (turn-off time) | $t_{off}$ | | — | 13.60 | — | μs |
| Turn-on switching loss | $E_{on}$ | | — | 8.00 | — | J |
| Turn-off switching loss | $E_{off}$ | | — | 20.00 | — | J |
| Short-circuit pulse width | $t_{psc}$ | $V_{CC}$ = 3400 V, $V_{GE}$ = ±15 V, $R_{G(on)}$ = 2.2 Ω, $R_{G(off)}$ = 39 Ω, $L_s$ ≈ 150 nH, $T_j$ = 125 °C | — | — | 10 | μs |

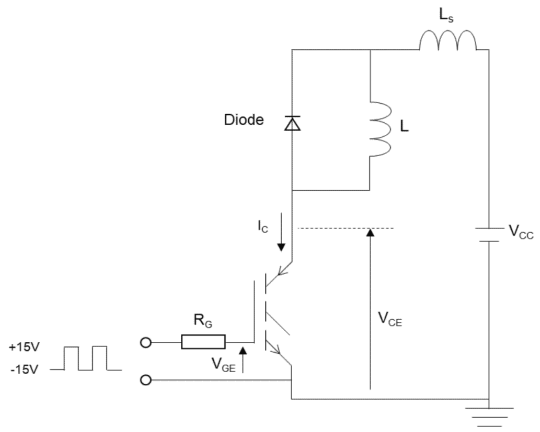
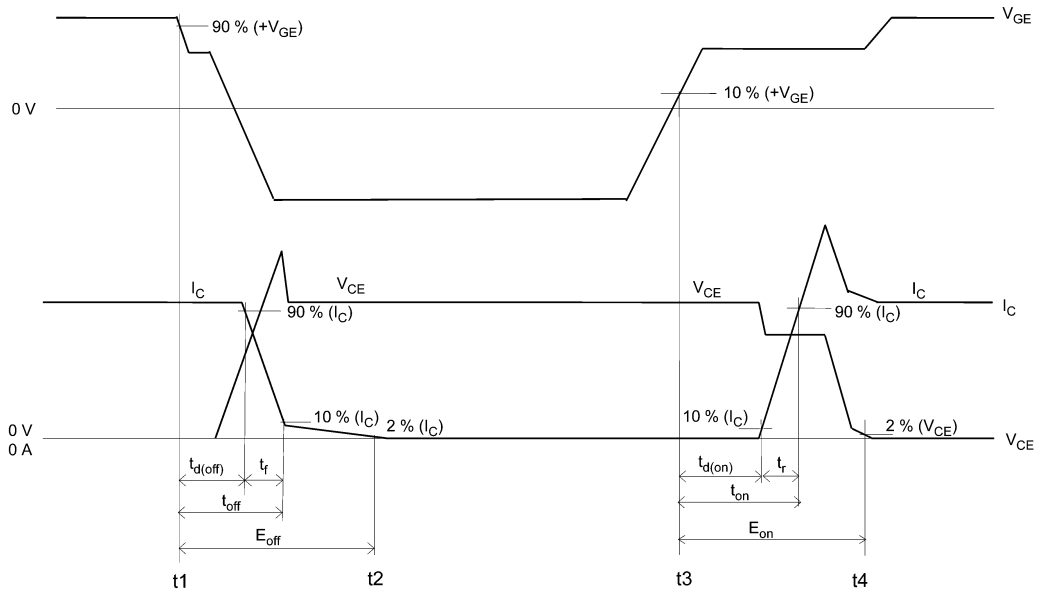



**Fig. 6.1 Test Circuit**




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

**Fig. 6.2 Timing Chart**

## 7. Characteristics Curves (Note)

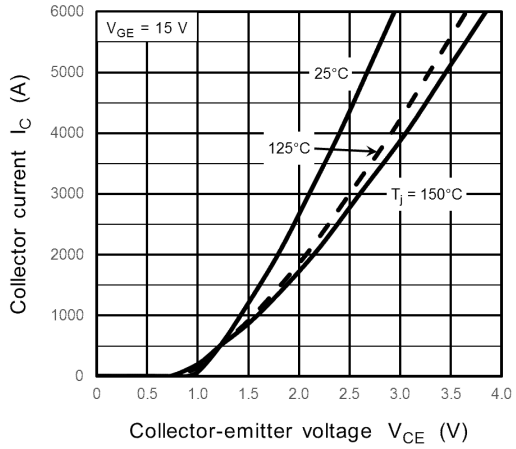



Fig. 7.1 $I_C$ - $V_{CE}$

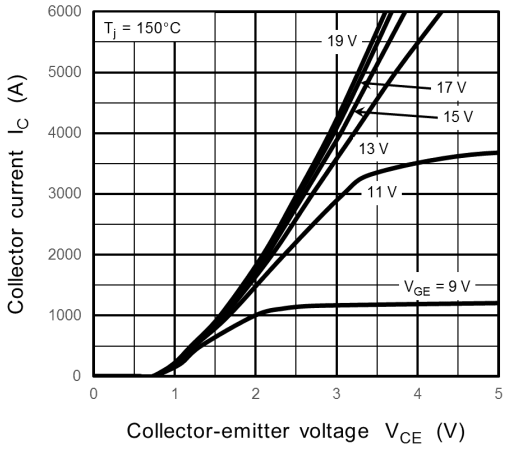



Fig. 7.2 $I_C$ - $V_{CE}$

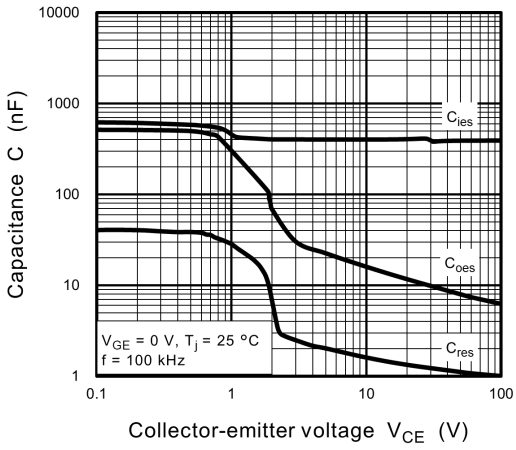



Fig. 7.3 Capacitance - $V_{CE}$

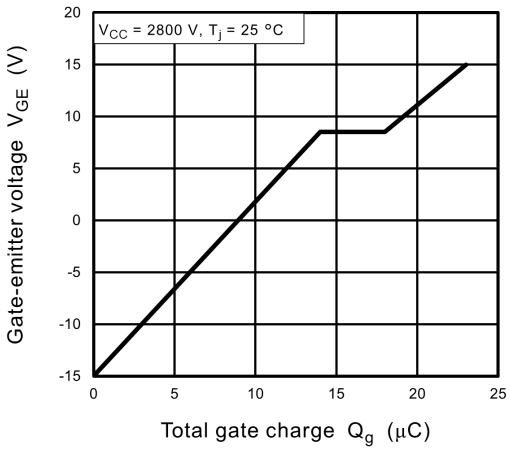



Fig. 7.4 $V_{GE}$ - $Q_g$

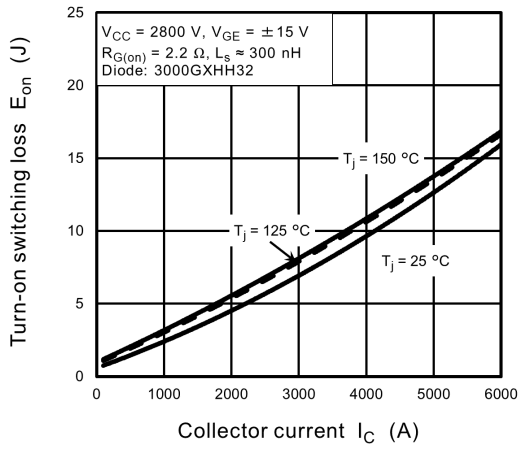



Fig. 7.5 $E_{on}$ - $I_C$

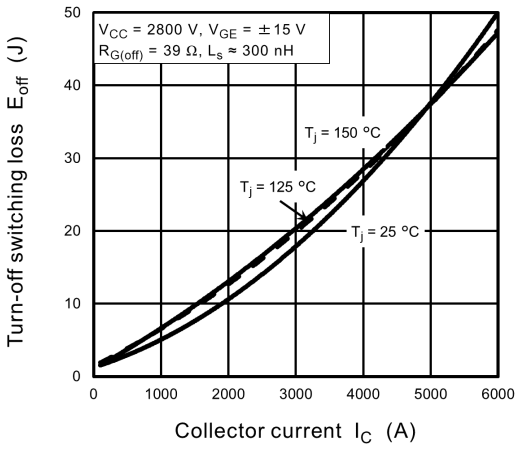



Fig. 7.6 $E_{off}$ - $I_C$

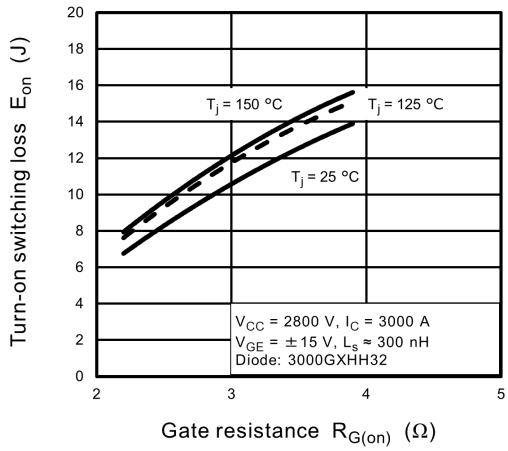



**Fig. 7.7 $E_{on}$ - $R_{G(on)}$**

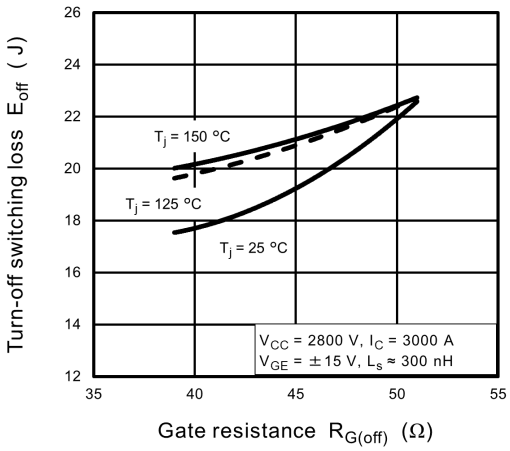



**Fig. 7.8 $E_{off}$ - $R_{G(off)}$**

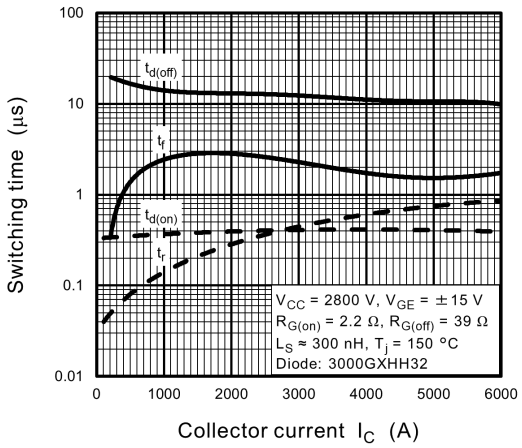



**Fig. 7.9 Switching time - $I_C$**

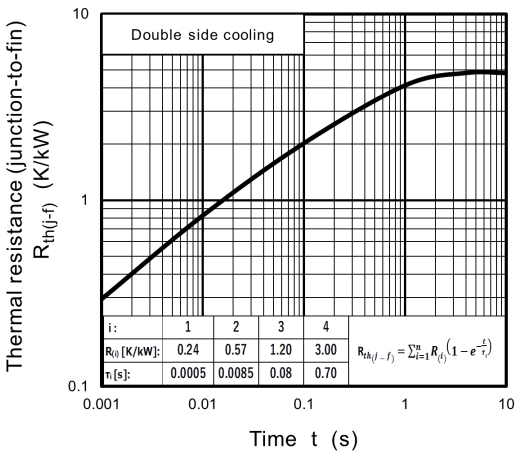



**Fig. 7.10 $R_{th(j-f)}$ - t (Guaranteed value)**

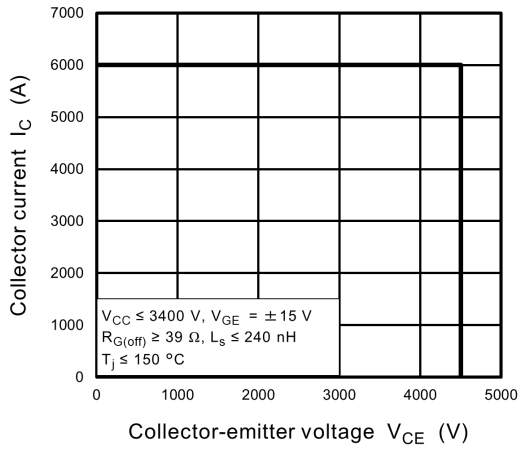
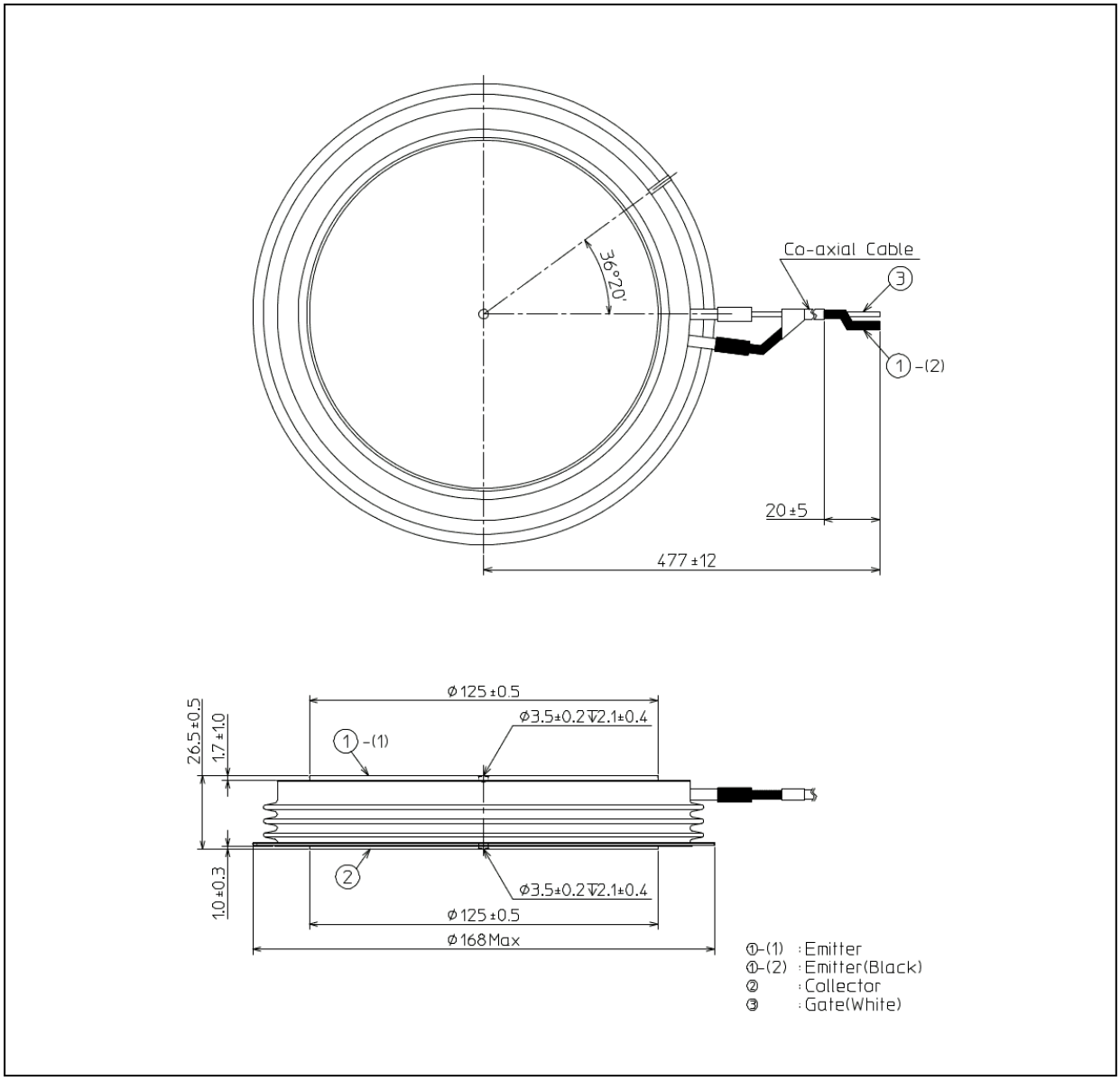



**Fig. 7.11 RBSOA (Guaranteed value)**

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

## Package Dimensions

Unit: mm




Weight: 2700 g (typ.)

| Package Name(s) |
| --- |
| TOSHIBA: 2-168A2S |

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