

TTD1409B

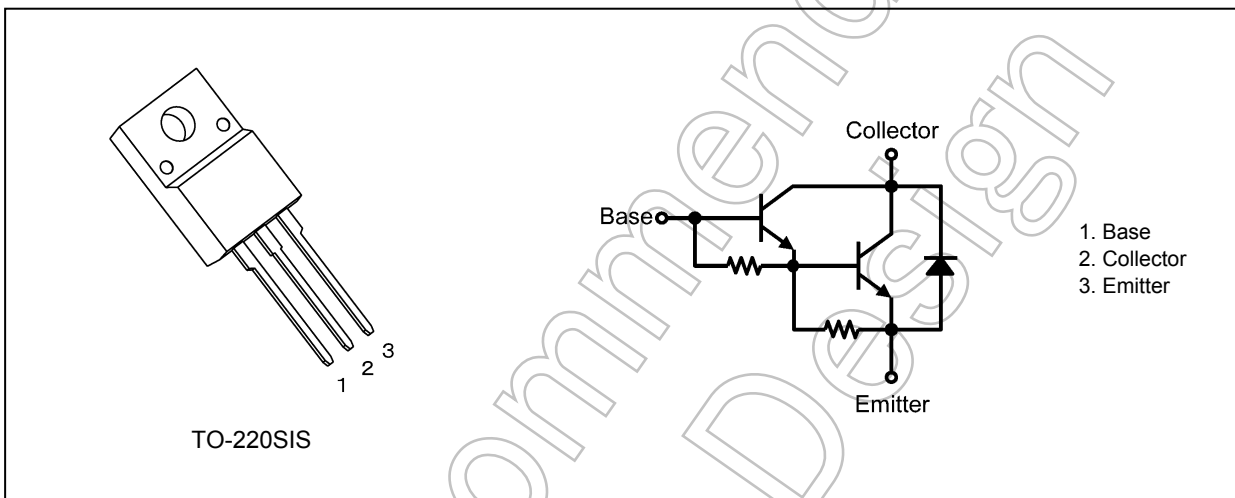
1. Applications

- High-Voltage Switching

2. Features

- (1) High DC current gain: $h_{FE} = 600$ (min) ($V_{CE} = 2\text{ V}$, $I_C = 2\text{ A}$)
- (2) Monolithic construction with built-in base-emitter shunt resistor

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings (Note) ($T_a = 25\text{ °C}$ unless otherwise specified)

| Characteristics | Symbol | Rating | Unit |
|--|-------------------|------------|-------|
| Collector-base voltage | V_{CBO} | 600 | V |
| Collector-emitter voltage | V_{CEO} | 400 | |
| Emitter-base voltage | V_{EBO} | 5 | |
| Collector current (DC) | (Note 1) I_C | 6 | A |
| Collector current (pulsed) | (Note 1) I_{CP} | 10 | |
| Base current | I_B | 1 | |
| Collector power dissipation | P_C | 2 | W |
| Collector power dissipation ($T_c = 25\text{ °C}$) | P_C | 25 | |
| Junction temperature | T_j | 150 | °C |
| Storage temperature | T_{stg} | -55 to 150 | |
| Mounting torque | TOR | 0.6 | N · m |

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: Ensure that the junction temperature does not exceed 150 °C.

Start of commercial production

2012-09

5. Electrical Characteristics

5.1. Static Characteristics ($T_a = 25\text{ }^\circ\text{C}$ unless otherwise specified)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|---------------|---|-----|------|-----|---------------|
| Collector cut-off current | I_{CBO} | $V_{CB} = 600\text{ V}, I_E = 0\text{ A}$ | — | — | 20 | μA |
| Emitter cut-off current | I_{EBO} | $V_{EB} = 5\text{ V}, I_C = 0\text{ A}$ | — | — | 3.0 | mA |
| Collector-emitter breakdown voltage | $V_{(BR)CEO}$ | $I_C = 10\text{ mA}, I_B = 0\text{ A}$ | 400 | — | — | V |
| DC current gain | $h_{FE(1)}$ | $V_{CE} = 2\text{ V}, I_C = 2\text{ A}$ | 600 | — | — | — |
| | $h_{FE(2)}$ | $V_{CE} = 2\text{ V}, I_C = 4\text{ A}$ | 100 | — | — | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 4\text{ A}, I_B = 0.04\text{ A}$ | — | — | 2.0 | V |
| Base-emitter saturation voltage | $V_{BE(sat)}$ | $I_C = 4\text{ A}, I_B = 0.04\text{ A}$ | — | — | 2.5 | |
| Emitter-collector forward voltage | V_{ECF} | $I_E = 4\text{ A}, I_B = 0\text{ A}$ | — | — | 3.0 | |

5.2. Dynamic Characteristics ($T_a = 25\text{ }^\circ\text{C}$ unless otherwise specified)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------------|-----------|---|-----|------|-----|---------------|
| Collector output capacitance | C_{ob} | $V_{CB} = 50\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$ | — | 35 | — | pF |
| Switching time (turn-on time) | t_{on} | See Figure 5.2.1. | — | 1 | — | μs |
| Switching time (storage time) | t_{stg} | $V_{CC} \approx 100\text{ V}, R_L = 25\ \Omega,$ $I_{B1} = -I_{B2} = 0.04\text{ A},$ | — | 8 | — | |
| Switching time (fall time) | t_f | Duty cycle $\leq 1\%$ | — | 5 | — | |

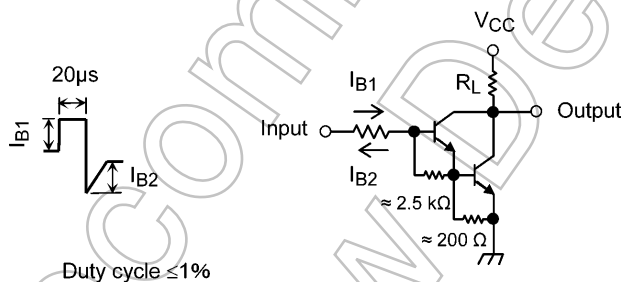


Fig. 5.2.1 Switching Time Test Circuit

6. Marking (Note)

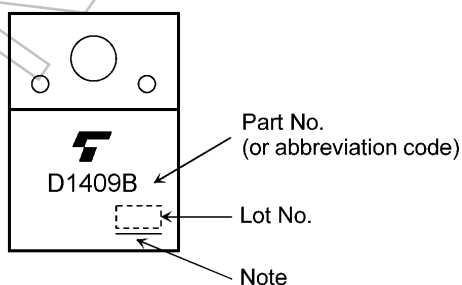


Fig. 6.1 Marking

Note: A line under a Lot No. identifies the indication of product Labels.

[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

7. Characteristics Curves (Note)

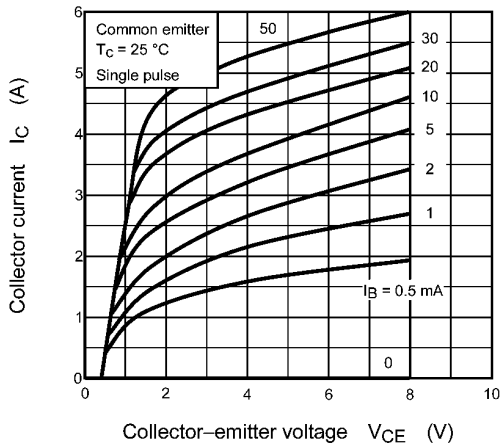


Fig. 7.1 $I_C - V_{CE}$

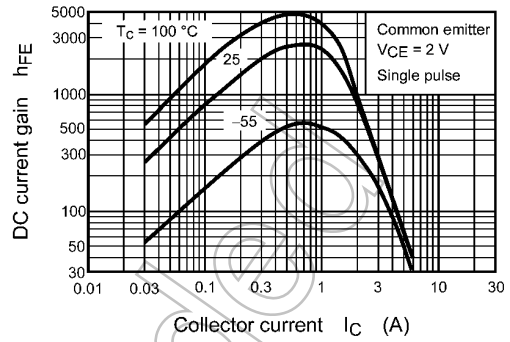


Fig. 7.2 $h_{FE} - I_C$

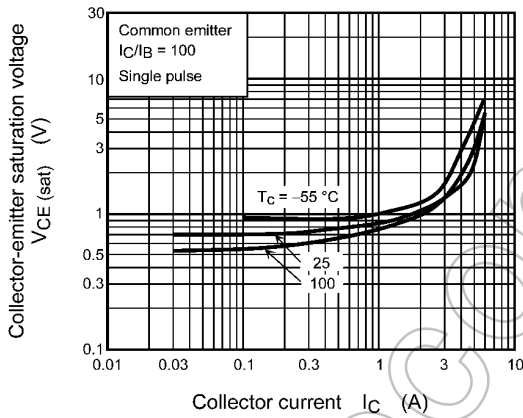


Fig. 7.3 $V_{CE(sat)} - I_C$

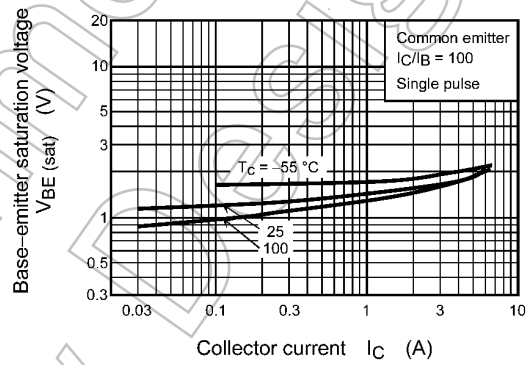


Fig. 7.4 $V_{BE(sat)} - I_C$

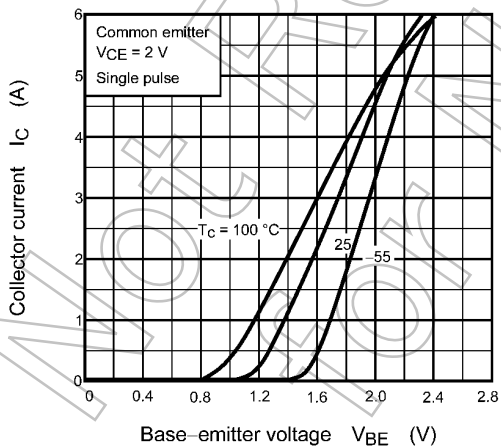


Fig. 7.5 $I_C - V_{BE}$

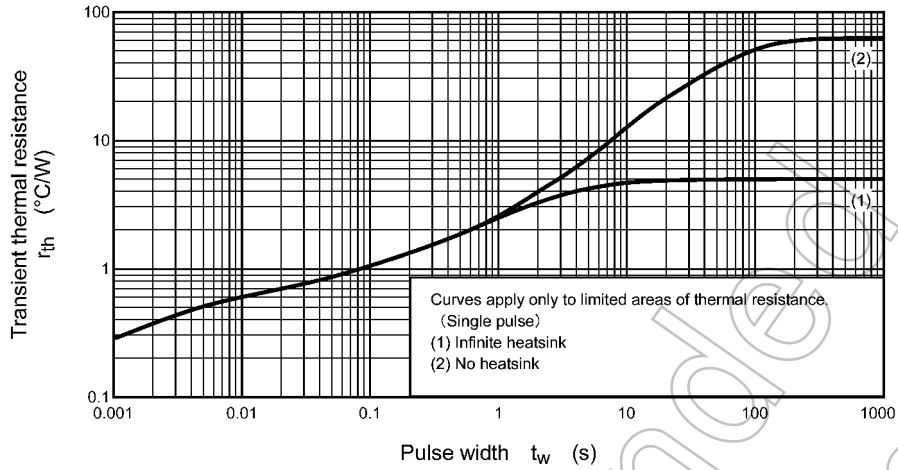


Fig. 7.6 $r_{th} - t_w$
(Guaranteed Maximum)

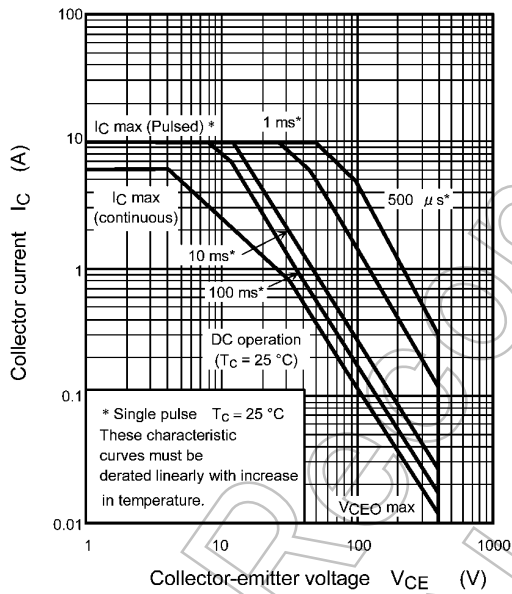
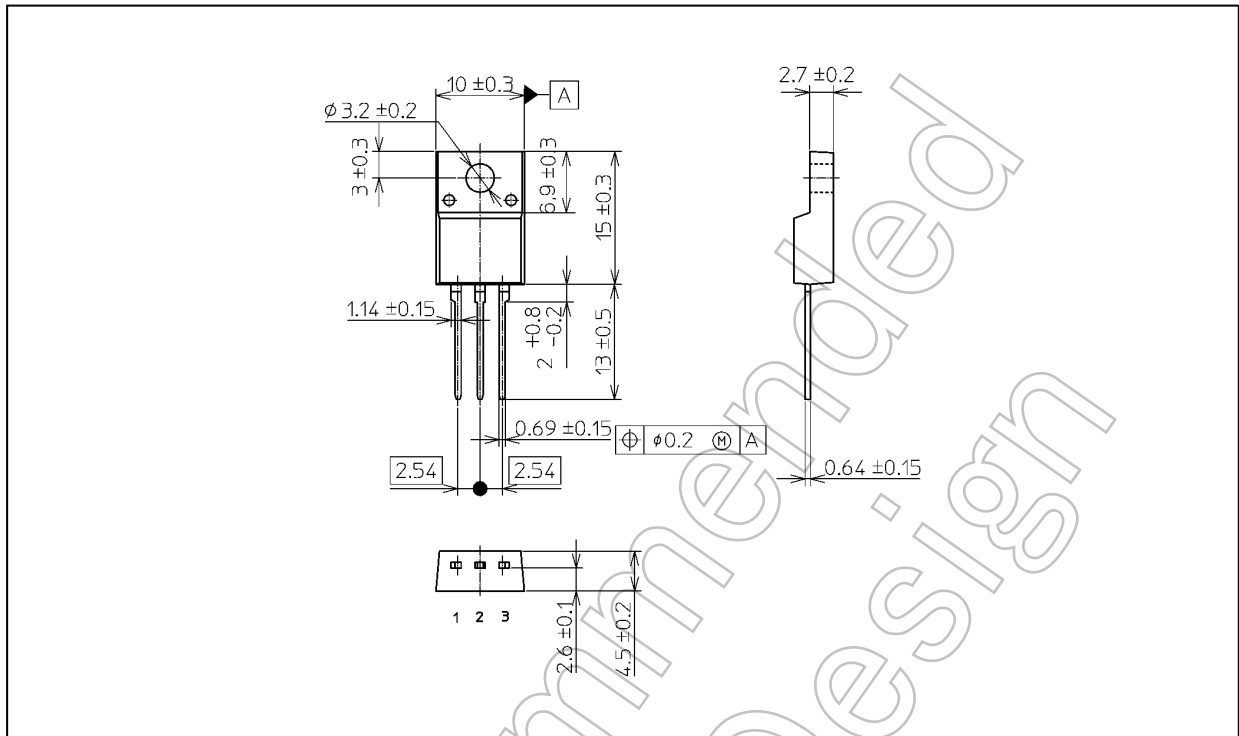


Fig. 7.7 Safe Operating Area
(Guaranteed Maximum)

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

Package Dimensions

Unit: mm



Weight: 1.7 g (typ.)

| Package Name(s) |
|---------------------|
| TOSHIBA: 2-10U1S |
| Nickname: TO-220SIS |

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