

# TTD1415B

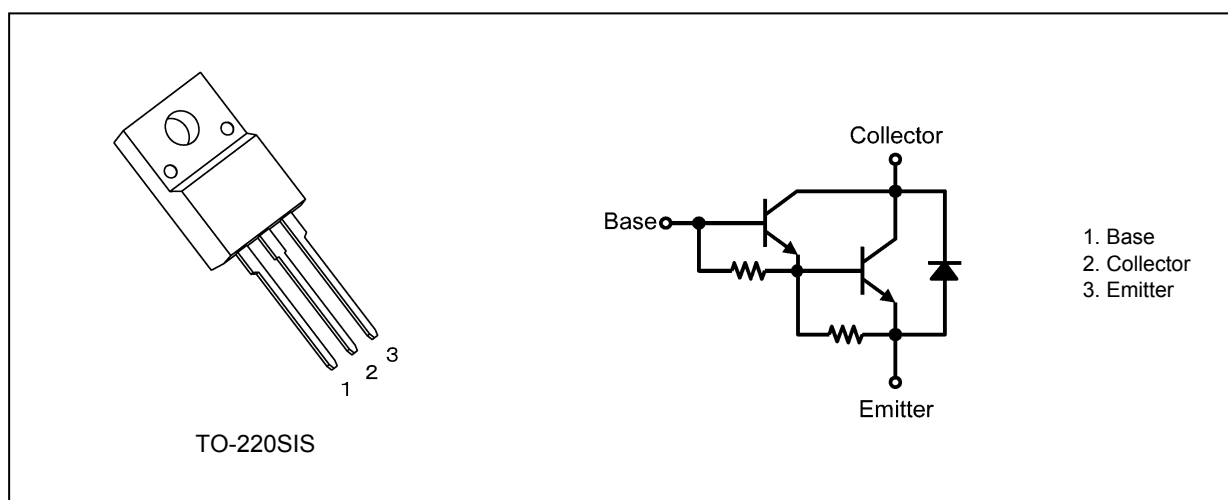
## 1. Applications

- High-Power Switching
- Hammer Drivers

## 2. Features

- (1) High DC current gain:  $h_{FE} = 2000$  (min) ( $V_{CE} = 3$  V,  $I_C = 3$  A)
- (2) Low collector-emitter saturation voltage:  $V_{CE(sat)} = 1.5$  V (max) ( $I_C = 3$  A,  $I_B = 6$  mA)
- (3) Complementary to TTB1020B

## 3. Packaging and Internal Circuit



Start of commercial production  
2012-09

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

| Characteristics                                                    | Symbol    | Rating     | Unit               |
|--------------------------------------------------------------------|-----------|------------|--------------------|
| Collector-base voltage                                             | $V_{CBO}$ | 120        | V                  |
| Collector-emitter voltage                                          | $V_{CEO}$ | 100        |                    |
| Emitter-base voltage                                               | $V_{EBO}$ | 6          |                    |
| Collector current (DC)                                             | $I_C$     | 7          | A                  |
| Collector current (pulsed)                                         | $I_{CP}$  | 10         |                    |
| Base current                                                       | $I_B$     | 0.7        |                    |
| Collector power dissipation                                        | $P_C$     | 2          | W                  |
| Collector power dissipation ( $T_c = 25\text{ }^{\circ}\text{C}$ ) | $P_C$     | 25         |                    |
| Junction temperature                                               | $T_j$     | 150        | $^{\circ}\text{C}$ |
| 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  $150\text{ }^{\circ}\text{C}$ .

#### 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            | $I_{CBO}$     | $V_{CB} = 120\text{ V}$ , $I_E = 0\text{ A}$ | —    | —    | 2     | $\mu\text{A}$ |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB} = 6\text{ V}$ , $I_C = 0\text{ A}$   | 0.75 | —    | 3.0   | mA            |
| Collector-emitter breakdown voltage  | $V_{(BR)CEO}$ | $I_C = 50\text{ mA}$ , $I_B = 0\text{ A}$    | 100  | —    | —     | V             |
| DC current gain                      | $h_{FE(1)}$   | $V_{CE} = 3\text{ V}$ , $I_C = 3\text{ A}$   | 2000 | —    | 15000 | —             |
|                                      | $h_{FE(2)}$   | $V_{CE} = 3\text{ V}$ , $I_C = 6\text{ A}$   | 1000 | —    | —     |               |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 3\text{ A}$ , $I_B = 6\text{ mA}$     | —    | 0.9  | 1.5   | V             |
| Base-emitter saturation voltage      | $V_{BE(sat)}$ | $I_C = 3\text{ A}$ , $I_B = 6\text{ mA}$     | —    | 1.5  | 2.0   |               |

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

| Characteristics               | Symbol    | Test Condition                                                                                  | Min | Typ. | Max | Unit          |
|-------------------------------|-----------|-------------------------------------------------------------------------------------------------|-----|------|-----|---------------|
| Switching time (turn-on time) | $t_{on}$  | See Figure 5.2.1.                                                                               | —   | 0.3  | —   | $\mu\text{s}$ |
| Switching time (storage time) | $t_{stg}$ | $V_{CC} \approx 45\text{ V}$ , $R_L = 15\text{ }\Omega$ ,<br>$I_{B1} = -I_{B2} = 6\text{ mA}$ , | —   | 5.1  | —   |               |
| Switching time (fall time)    | $t_f$     | Duty cycle $\leq 1\%$                                                                           | —   | 0.6  | —   |               |

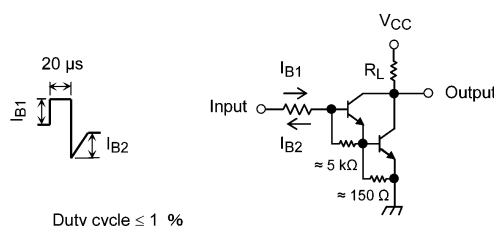
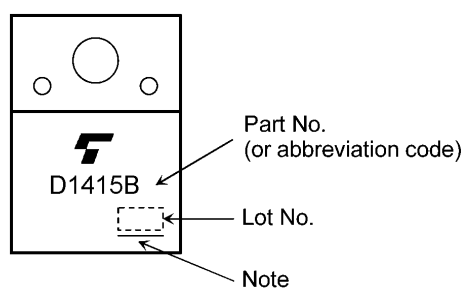


Fig. 5.2.1 Switching Time Test Circuit

**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)

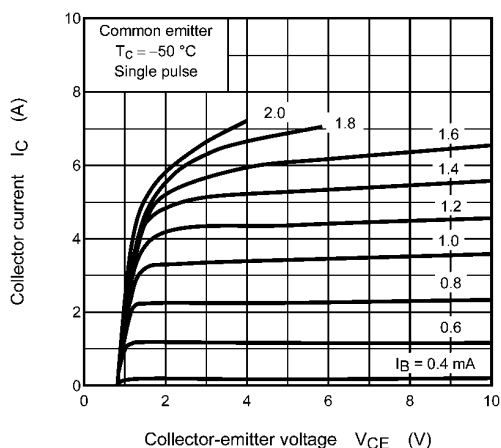


Fig. 7.1  $I_C - V_{CE}$

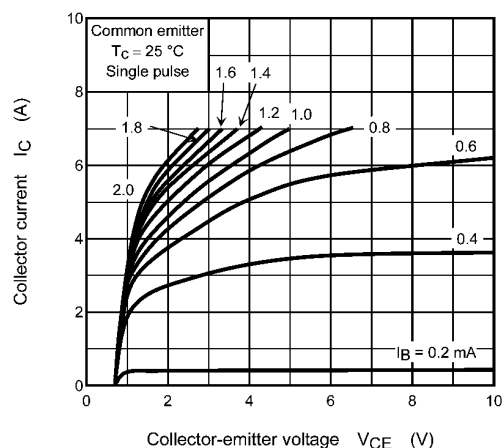


Fig. 7.2  $I_C - V_{CE}$

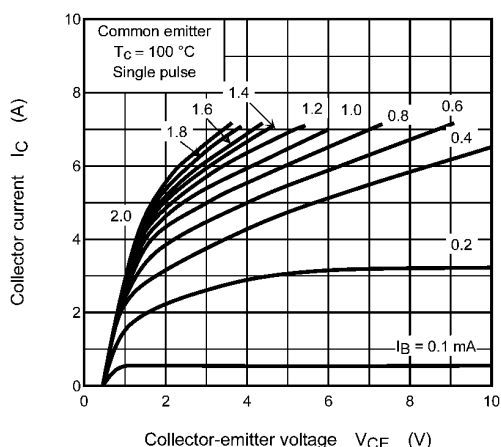


Fig. 7.3  $I_C - V_{CE}$

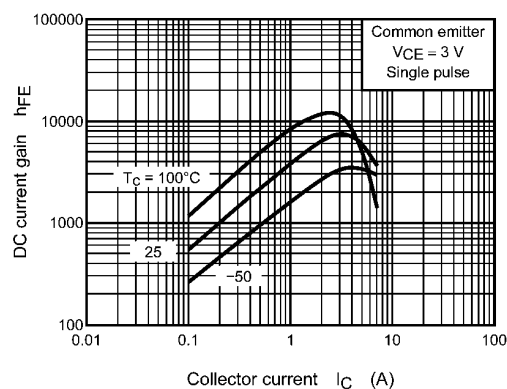


Fig. 7.4  $h_{FE} - I_C$

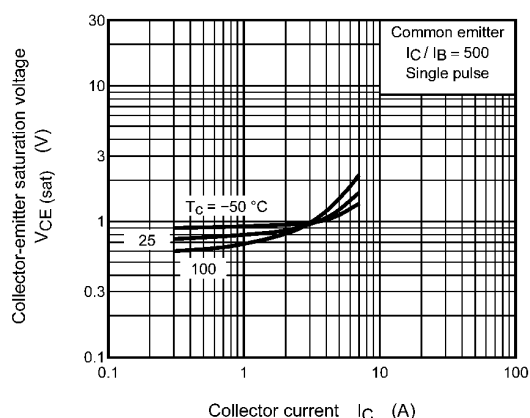


Fig. 7.5  $V_{CE(sat)} - I_C$

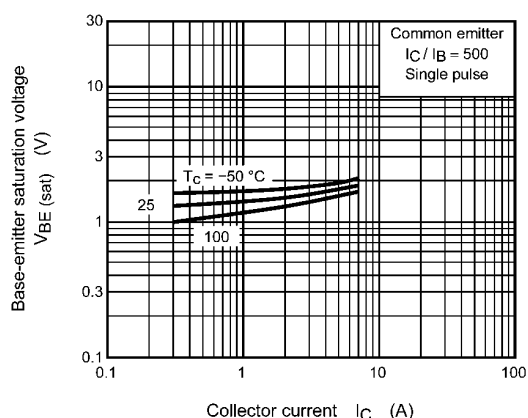
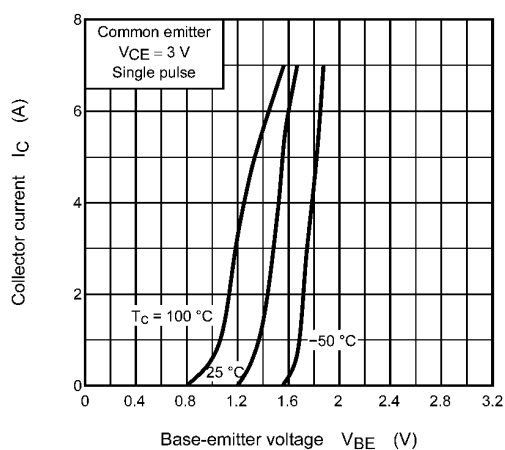
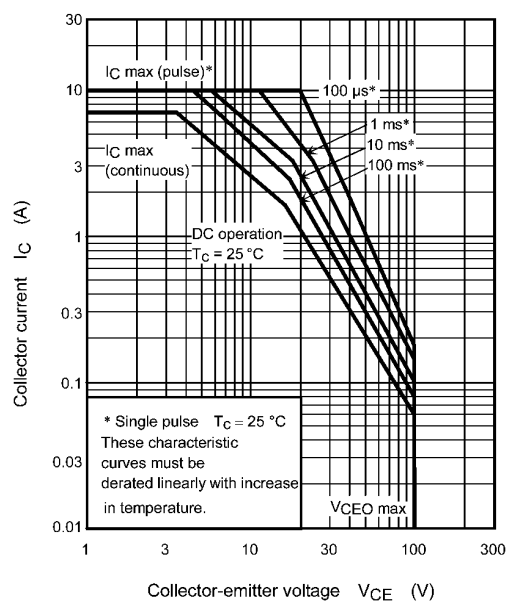


Fig. 7.6  $V_{BE(sat)} - I_C$



**Fig. 7.7  $I_C - V_{BE}$**

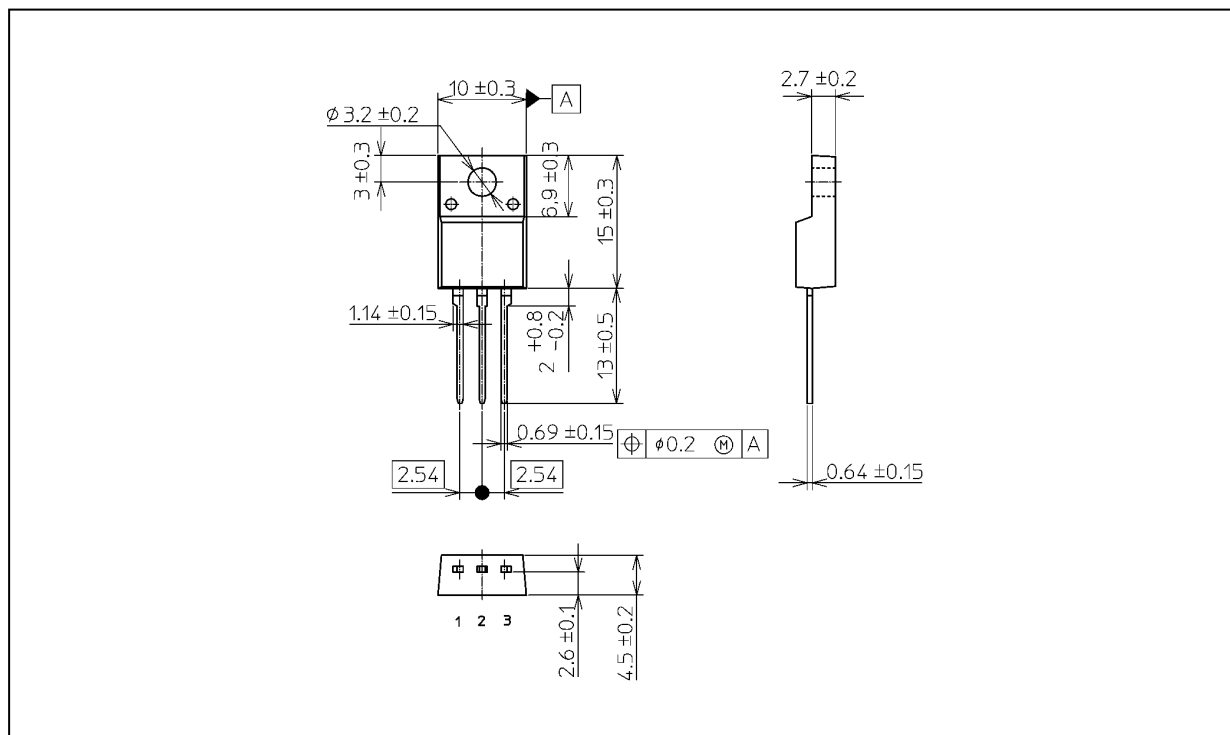


**Fig. 7.8 Safe Operating Area (Guaranteed Maximum)**

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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