

Bipolar Transistors Silicon PNP Triple-Diffused Type

## TTB1020B

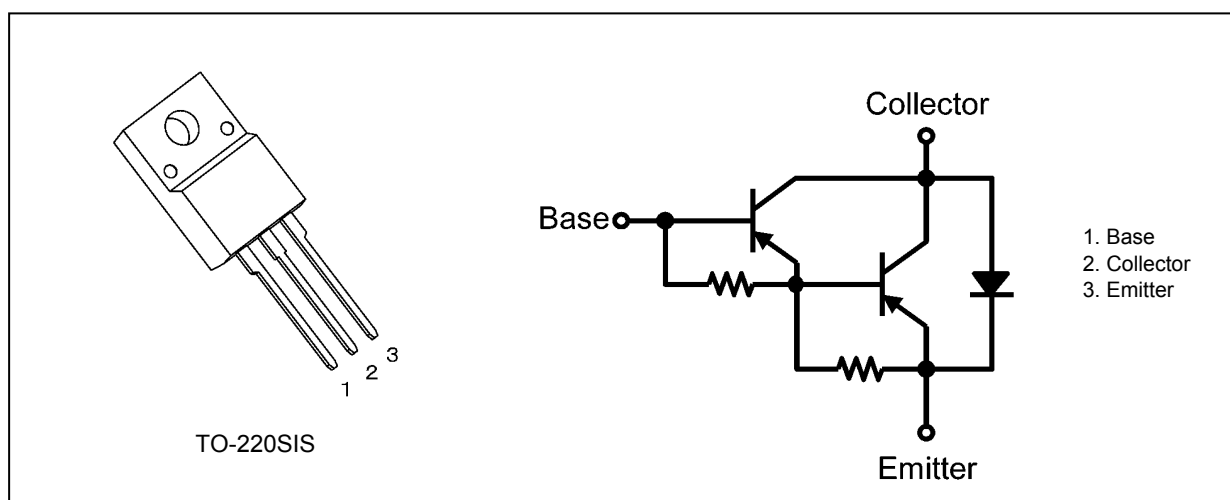
### 1. Applications

- High-Current 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 TTD1415B

### 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	$V_{CBO}$	-100	V
Collector-emitter voltage	$V_{CEO}$	-100	
Emitter-base voltage	$V_{EBO}$	-5	
Collector current (DC) (Note 1)	$I_C$	-7	A
Collector current (pulsed) (Note 1)	$I_{CP}$	-10	
Base current	$I_B$	-0.7	
Collector power dissipation	$P_C$	2	W
Collector power dissipation ( $T_c = 25\text{ }^\circ\text{C}$ )	$P_C$	30	
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  $150\text{ }^\circ\text{C}$ .

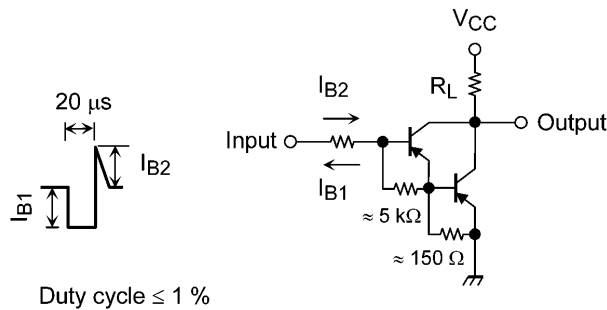
## 5. Electrical Characteristics

### 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	$I_{CBO}$	$V_{CB} = -100\text{ V}, I_E = 0\text{ A}$	—	—	-2	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -5\text{ V}, I_C = 0\text{ A}$	—	—	-2.8	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	—
	$h_{FE(2)}$	$V_{CE} = -3\text{ V}, I_C = -7\text{ A}$	1000	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)(1)}$	$I_C = -3\text{ A}, I_B = -6\text{ mA}$	—	-0.95	-1.5	V
Collector-emitter saturation voltage	$V_{CE(sat)(2)}$	$I_C = -7\text{ A}, I_B = -14\text{ mA}$	—	-1.3	-2.0	V
Base-emitter saturation voltage	$V_{BE(sat)}$	$I_C = -3\text{ A}, I_B = -6\text{ mA}$	—	-1.55	-2.0	V

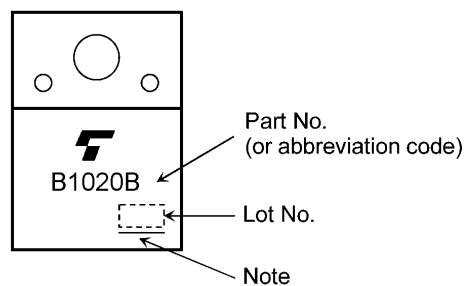
## 5.2. Dynamic Characteristics ( $T_a = 25\text{ }^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Switching time (turn-on time)	$t_{on}$	See Figure 5.2.1.	—	0.8	—	$\mu\text{s}$
Switching time (storage time)	$t_{stg}$	$V_{CC} \approx -45\text{ V}$ , $R_L = 15\ \Omega$ , $-I_{B1} = I_{B2} = 6\text{ mA}$ ,	—	2.0	—	$\mu\text{s}$
Switching time (fall time)	$t_f$	Duty cycle $\leq 1\%$	—	2.5	—	$\mu\text{s}$



**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)

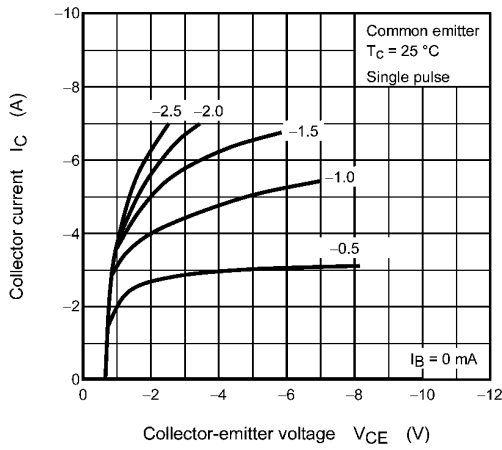


Fig. 7.1  $I_C - V_{CE}$

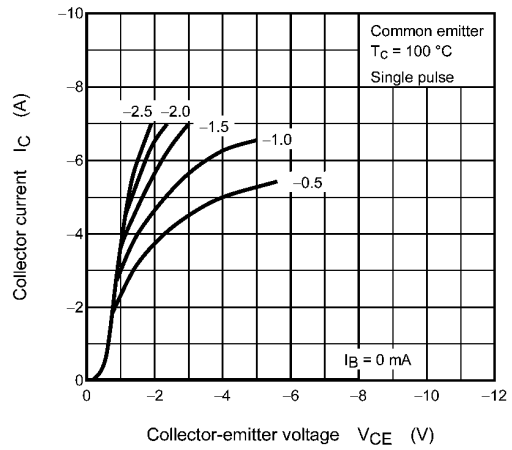


Fig. 7.2  $I_C - V_{CE}$

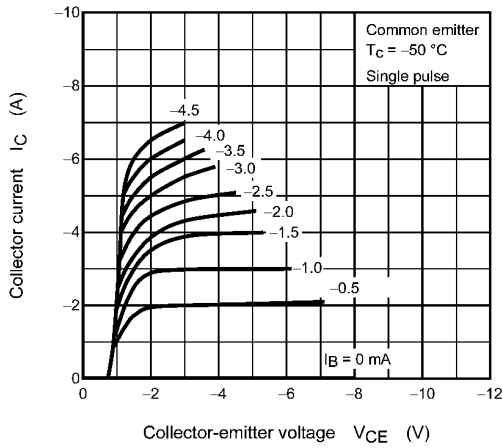


Fig. 7.3  $I_C - V_{CE}$

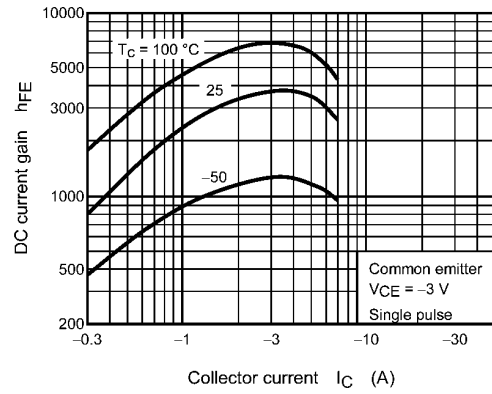


Fig. 7.4  $h_{FE} - I_C$

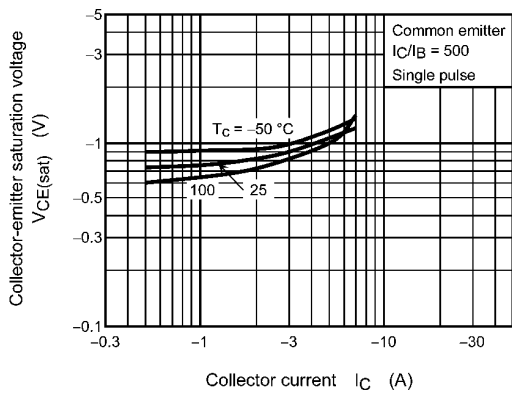


Fig. 7.5  $V_{CE(sat)} - I_C$

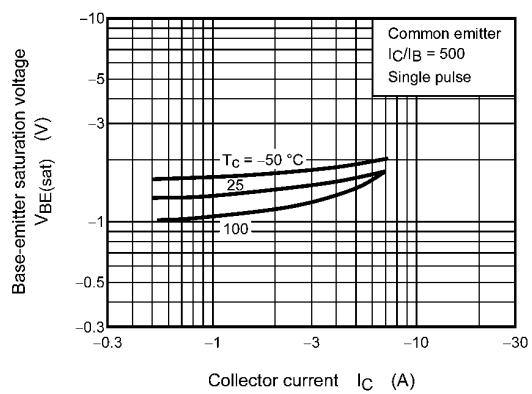
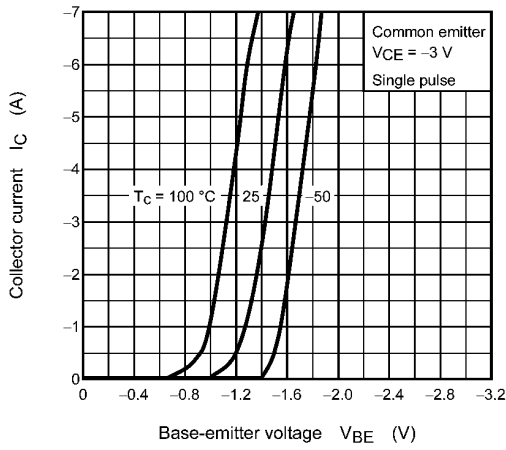
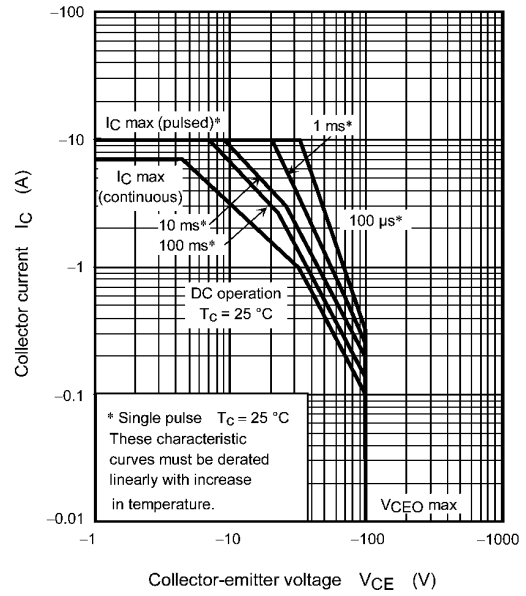


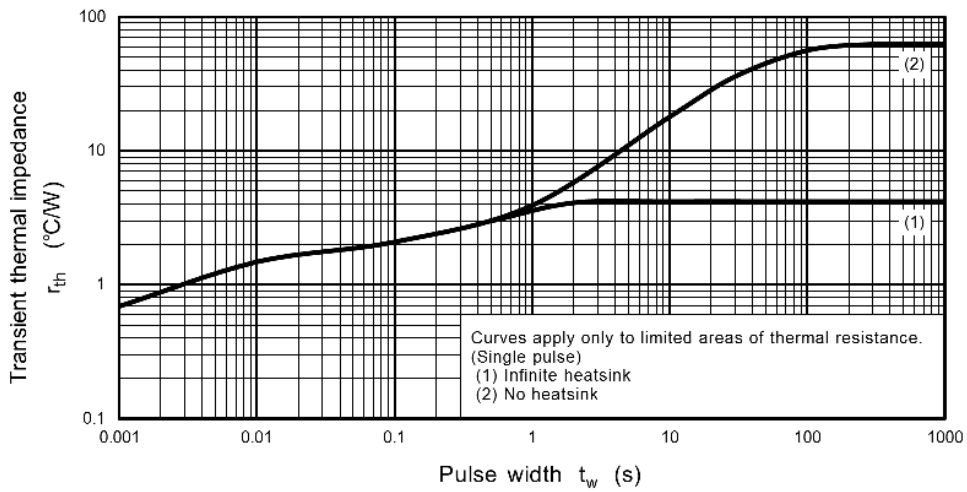
Fig. 7.6  $V_{BE(sat)} - I_C$



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



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

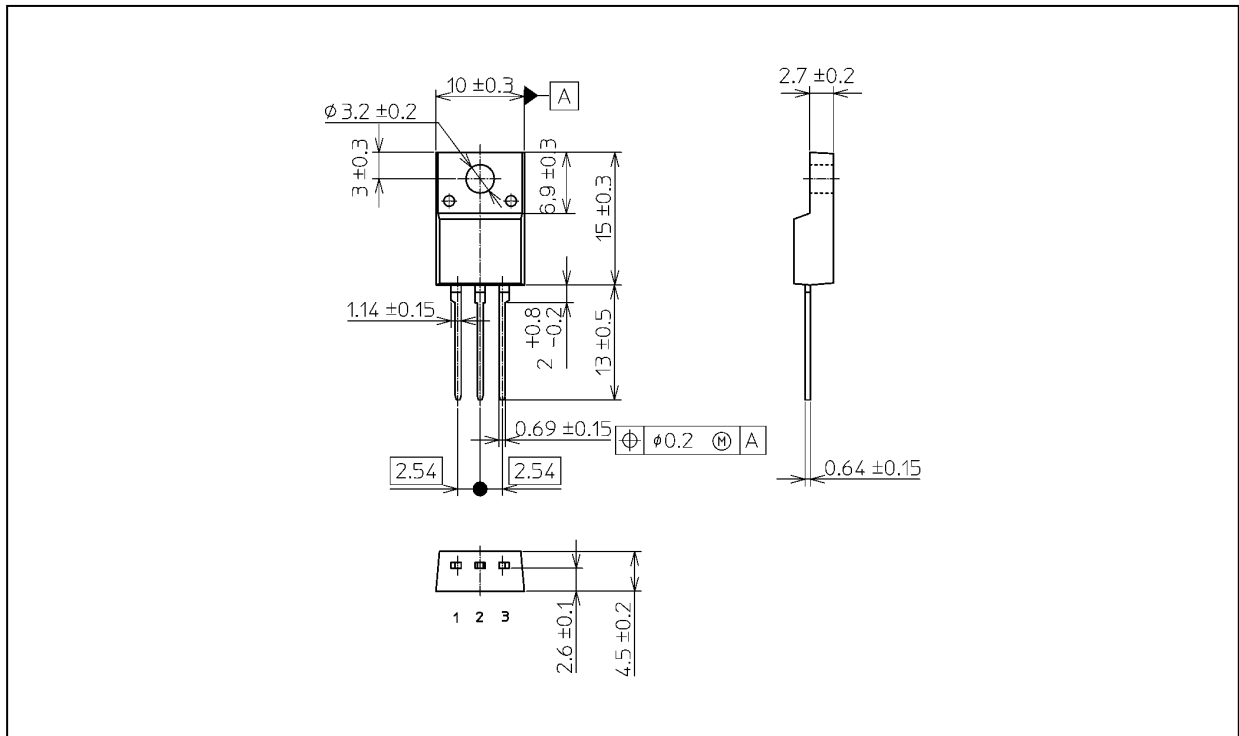


**Fig. 7.9  $r_{th} - t_w$  (Guaranteed Maximum)**

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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