

TTD1409B

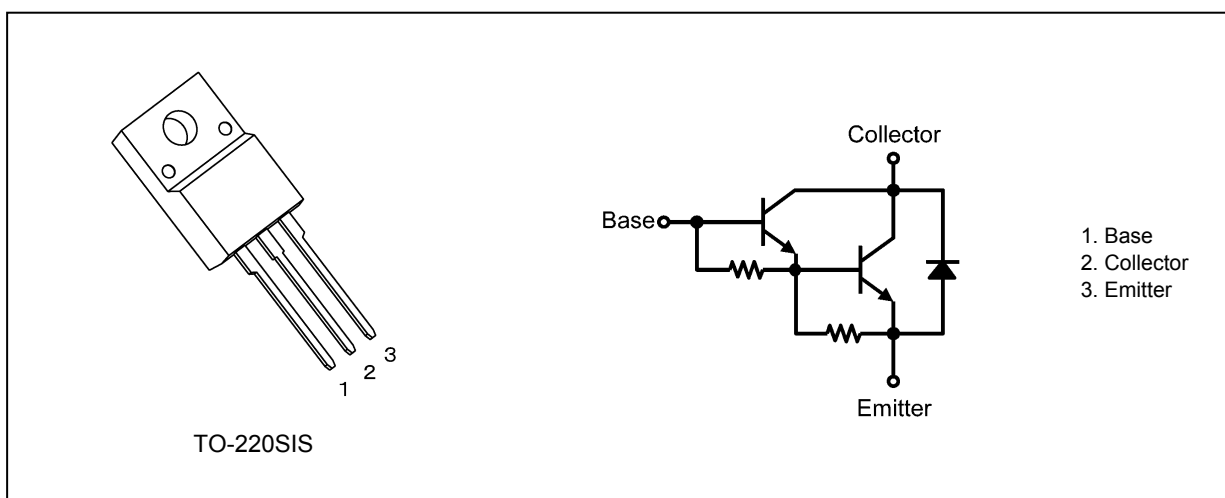
1. Applications

- 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) ($T_a = 25\text{ }^{\circ}\text{C}$ 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 ($T_c = 25\text{ }^{\circ}\text{C}$)	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 $150\text{ }^{\circ}\text{C}$.

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. $V_{CC} \approx 100\text{ V}$, $R_L = 25\text{ }\Omega$, $I_{B1} = -I_{B2} = 0.04\text{ A}$, Duty cycle $\leq 1\%$	—	1	—	μs
Switching time (storage time)	t_{stg}		—	8	—	
Switching time (fall time)	t_f		—	5	—	

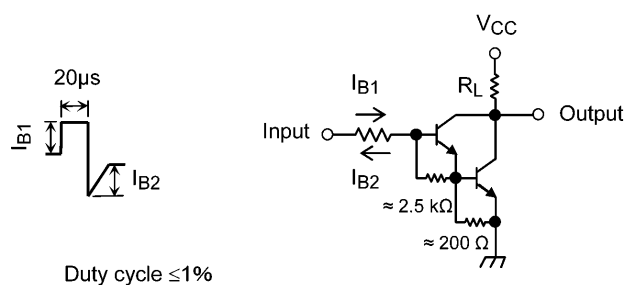


Fig. 5.2.1 Switching Time Test Circuit

6. Marking (Note)

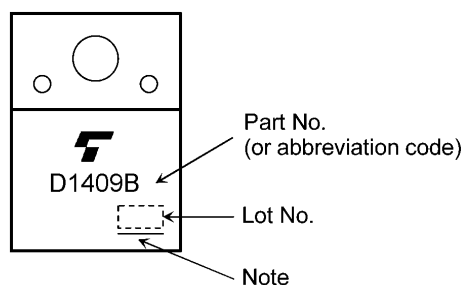


Fig. 6.1 Marking

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)

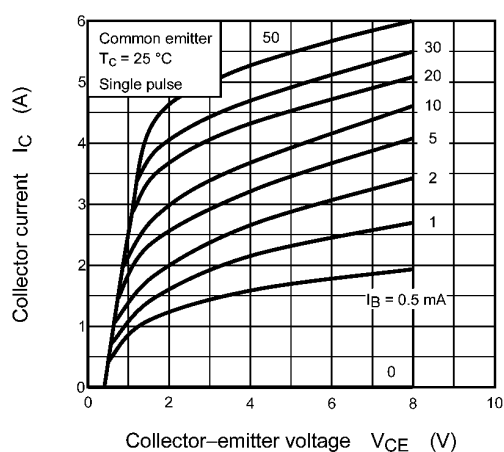


Fig. 7.1 $I_C - V_{CE}$

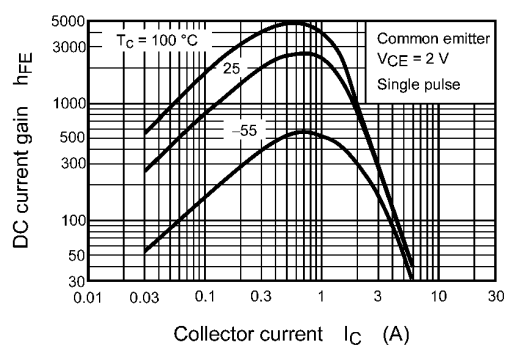


Fig. 7.2 $h_{FE} - I_C$

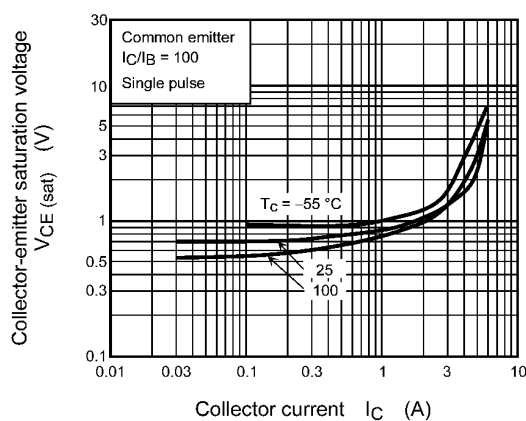


Fig. 7.3 $V_{CE}(\text{sat}) - I_C$

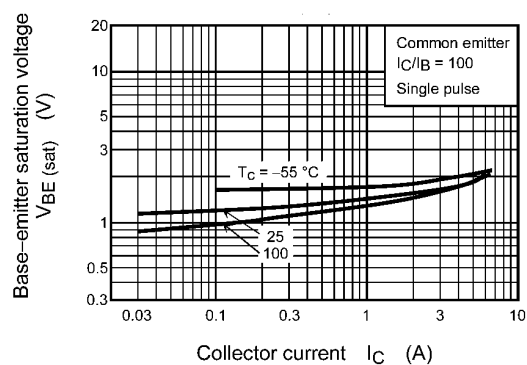


Fig. 7.4 $V_{BE}(\text{sat}) - I_C$

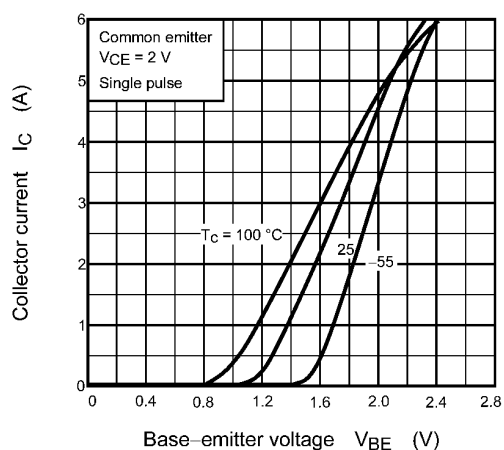


Fig. 7.5 $I_C - V_{BE}$

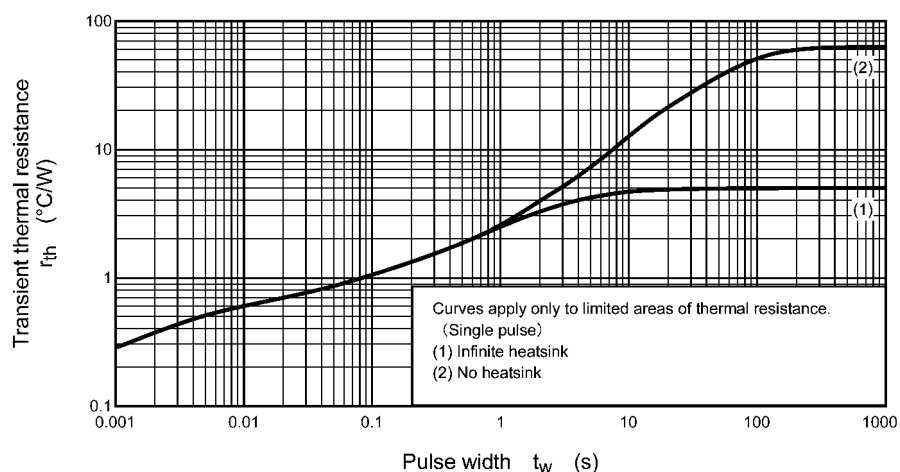


Fig. 7.6 $r_{th} - t_w$
(Guaranteed Maximum)

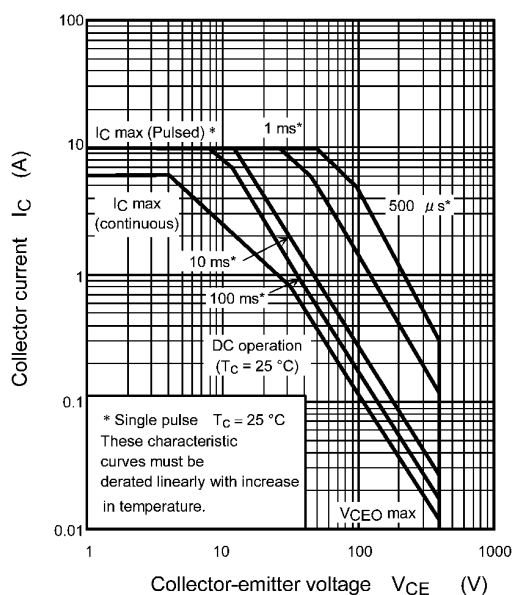
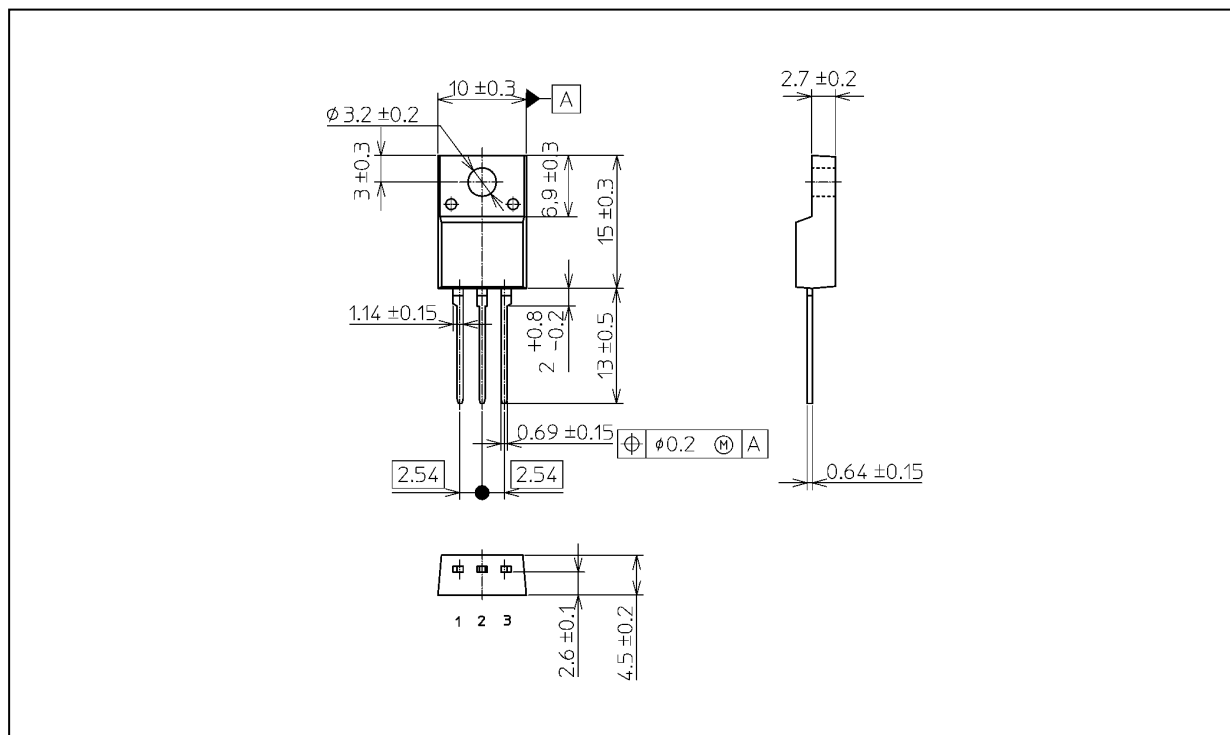


Fig. 7.7 Safe Operating Area
(Guaranteed Maximum)

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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