

Bipolar Transistors Silicon PNP Epitaxial Type

# TTA501

## 1. Applications

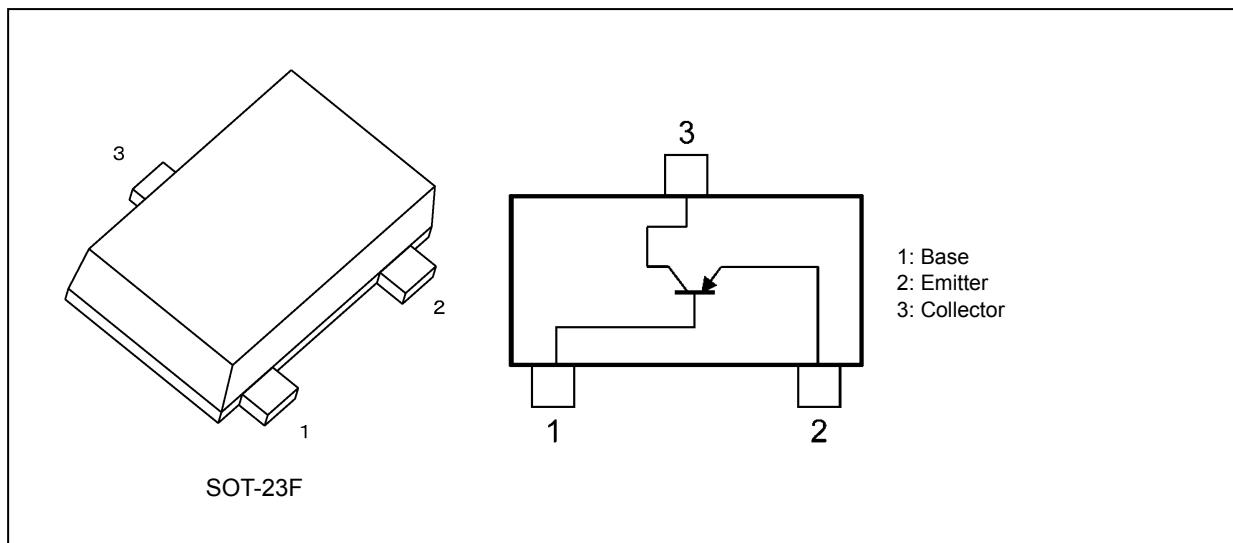
- High-Speed Switching
- DC-DC Converters

## 2. Features

- (1) AEC-Q101 qualified (Note 1)
- (2) High DC current gain:  $h_{FE} = 200$  to 500 ( $I_C = 0.3$  A)
- (3) Low collector-emitter saturation voltage:  $V_{CE(sat)} = -0.2$  V (max)
- (4) High-speed switching:  $t_f = 90$  ns (typ.)

Note 1: For detail information, please contact our sales.

## 3. Packaging and Internal Circuit



Start of commercial production  
2020-12

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

Characteristics	Symbol	Rating	Unit		
Collector-base voltage	$V_{CBO}$	-50	V		
Collector-emitter voltage	$V_{CEO}$	-50	V		
Emitter-base voltage	$V_{EBO}$	-7	V		
Collector current (DC)	(Note 1)	$I_C$	-2.0	A	
Collector current (pulsed)	(Note 1)	$I_{CP}$	-3.5	A	
Base current	$I_B$	-200	mA		
Collector power dissipation	DC	(Note 2)	$P_C$	1	W
Collector power dissipation	( $t = 10\text{ s}$ )	(Note 2)	$P_C$	1.5	W
Junction temperature	$T_j$	150	$^\circ\text{C}$		
Storage temperature	$T_{stg}$	-55 to 150	$^\circ\text{C}$		

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 channel temperature does not exceed  $150^\circ\text{C}$ .

Note 2: Device mounted on an FR4 board. (25.4 mm  $\times$  25.4 mm  $\times$  1.6 mm, Cu pad: 645 mm $^2$ )

## 5. Electrical Characteristics

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	$V_{CB} = -50\text{ V}$ , $I_E = 0\text{ mA}$	—	—	-100	nA
Emitter cut-off current	$I_{EBO}$	$V_{EB} = -7\text{ V}$ , $I_C = 0\text{ mA}$	—	—	-100	nA
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	$I_C = -10\text{ mA}$ , $I_B = 0\text{ mA}$	-50	—	—	V
DC current gain	$h_{FE}(1)$	$V_{CE} = -2\text{ V}$ , $I_C = -0.3\text{ A}$	200	—	500	—
	$h_{FE}(2)$	$V_{CE} = -2\text{ V}$ , $I_C = -1.0\text{ A}$	100	—	—	—
Collector-emitter saturation voltage	$V_{CE(\text{sat})}$	$I_C = -1.0\text{ A}$ , $I_B = -33\text{ mA}$	—	—	-0.2	V
Base-emitter saturation voltage	$V_{BE(\text{sat})}$	$I_C = -1.0\text{ A}$ , $I_B = -33\text{ mA}$	—	—	-1.1	V

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector output capacitance	$C_{ob}$	$V_{CB} = -10\text{ V}$ , $I_E = 0\text{ mA}$ , $f = 1\text{ MHz}$	—	20	—	pF
Switching time (rise time)	$t_r$	See Figure 5.2.1	—	60	—	ns
Switching time (storage time)	$t_{\text{stg}}$	$V_{cc} \approx -30\text{ V}$ , $R_L = 30\Omega$ , $I_{B1} = 33\text{ mA}$ , $I_{B2} = 33\text{ mA}$	—	250	—	ns
Switching time (fall time)	$t_f$		—	90	—	ns

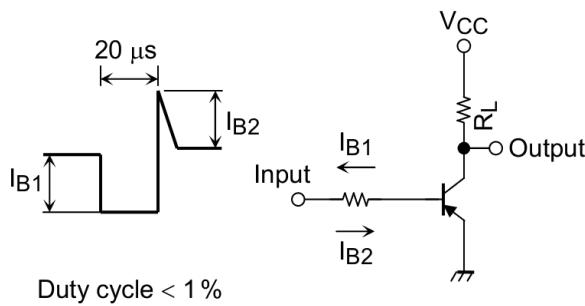


Fig. 5.2.1 Switching Time Test Circuit

## 6. Marking

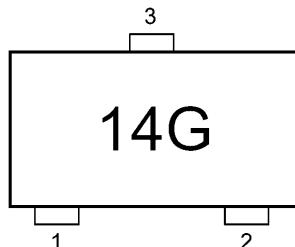


Fig. 6.1 Marking

## 7. Characteristics Curves (Note)

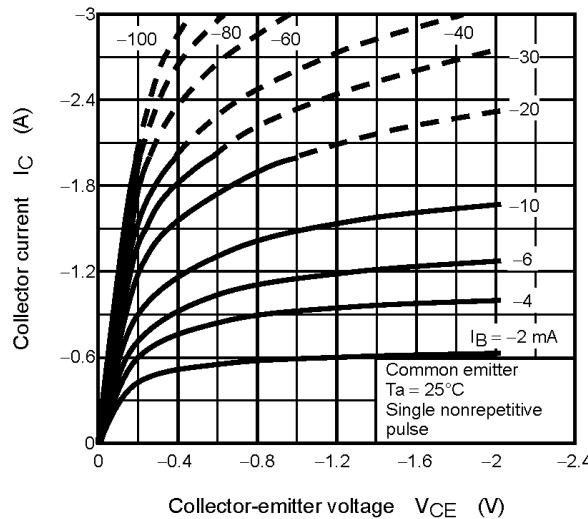


Fig. 7.1  $I_C$  -  $V_{CE}$

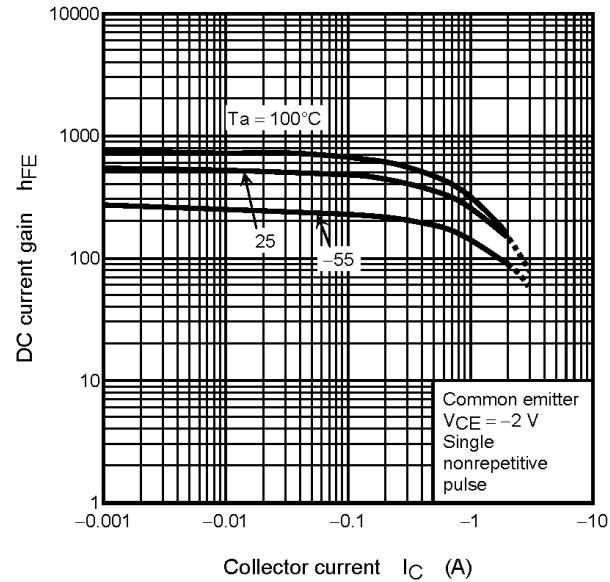


Fig. 7.2  $h_{FE}$  -  $I_C$

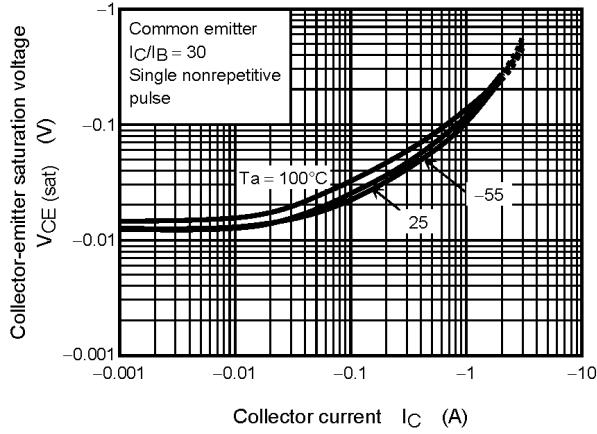


Fig. 7.3  $V_{CE(sat)}$  -  $I_C$

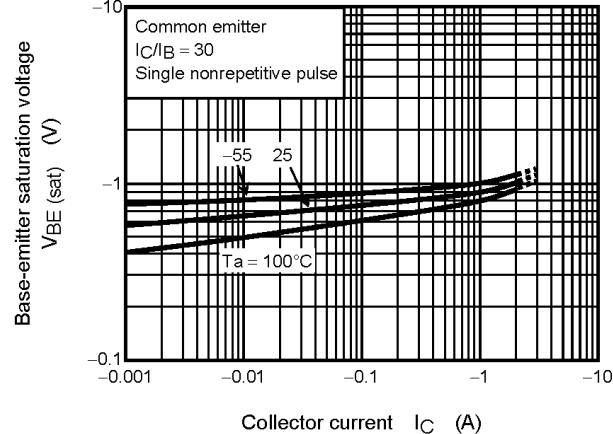


Fig. 7.4  $V_{BE(sat)}$  -  $I_C$

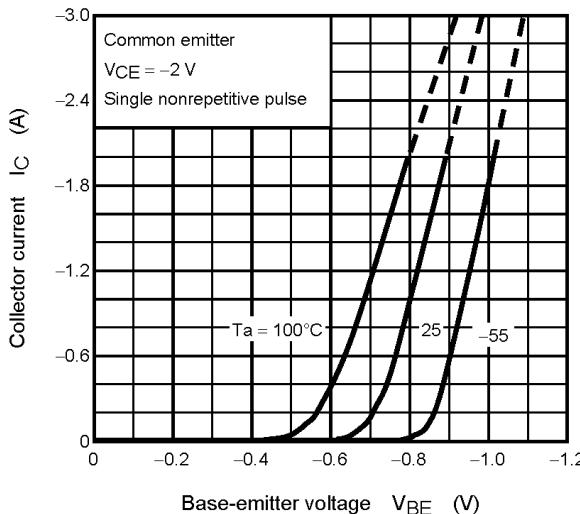


Fig. 7.5  $I_C$  -  $V_{BE}$

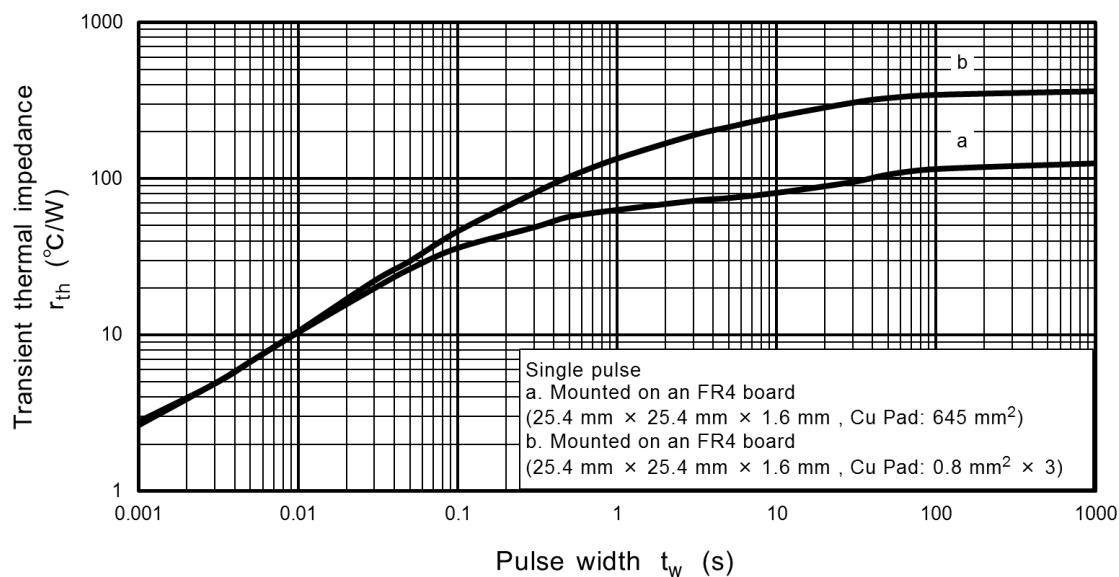
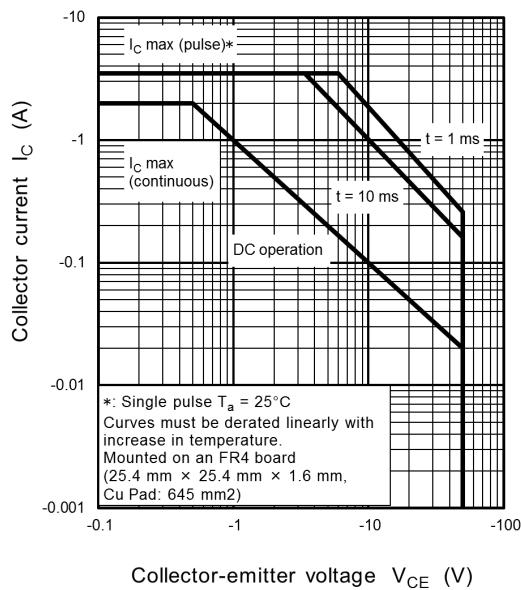
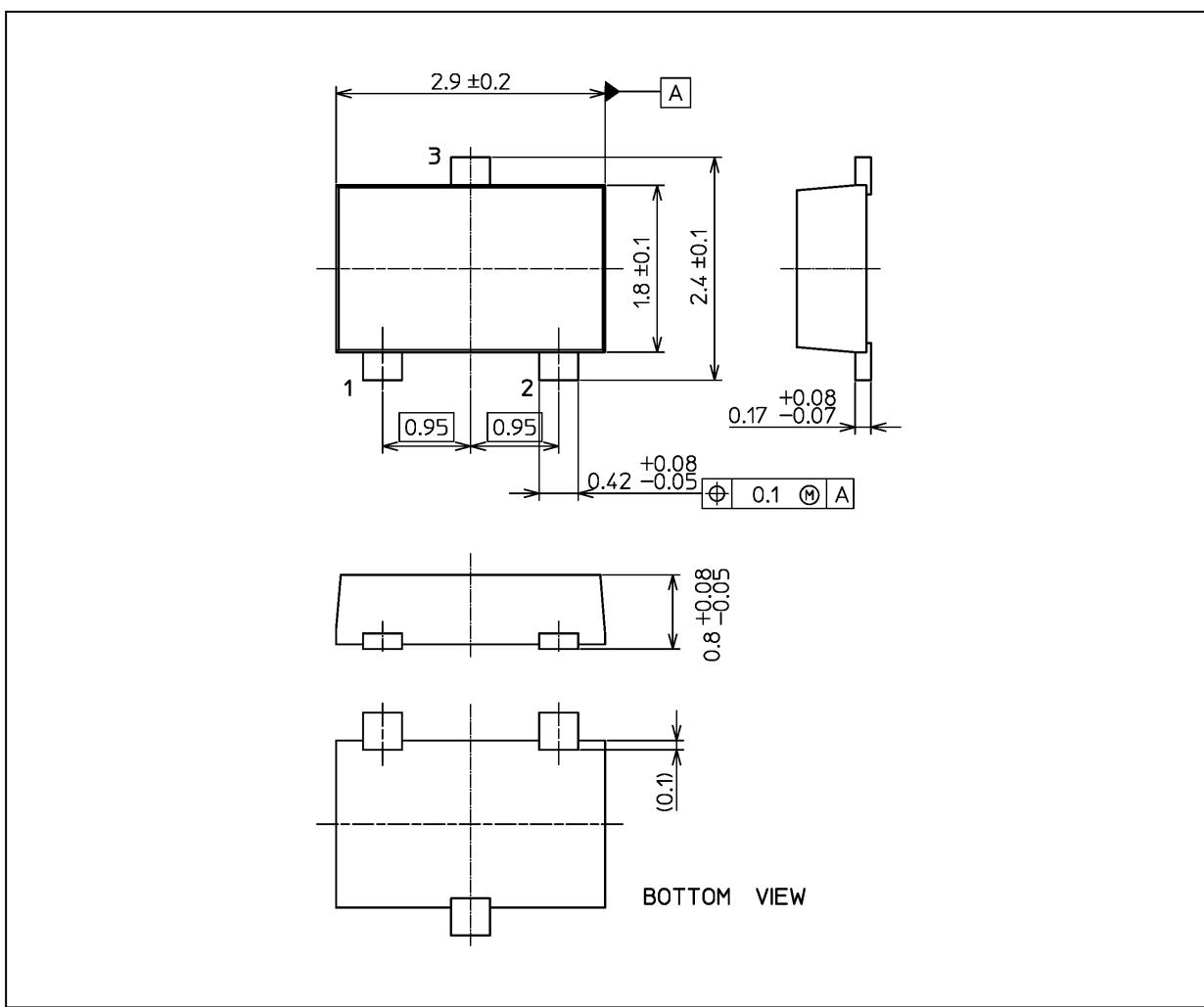
Fig. 7.6  $r_{th}$  -  $t_w$ 

Fig. 7.7 Safe Operating Area

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

**Package Dimensions**

Unit: mm



Weight: 0.011 g (typ.)

Package Name(s)
Nickname: SOT-23F

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