Bipolar Transistors Silicon NPN Epitaxial Type

TTC502

1. Applications

- High-Speed Switching
- DC-DC Converters

2. Features

(1) AEC-Q101 qualified (Note 1)

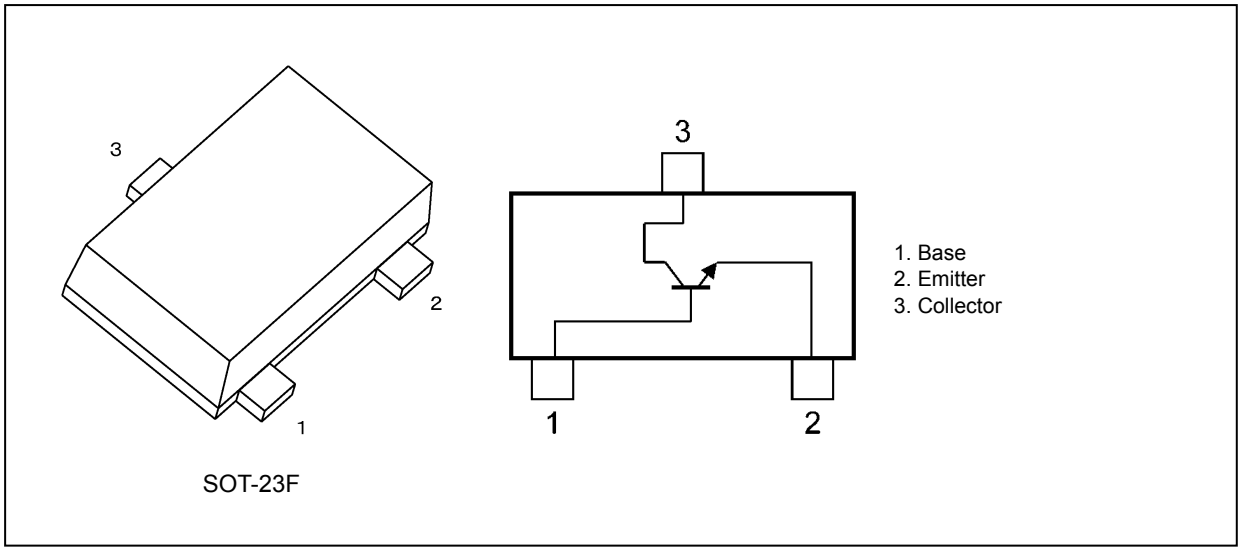
(2) High DC current gain: h_{FE} = 120 to 300 (I_C = 0.1 A)

(3) Low collector-emitter saturation voltage: $V_{CE(sat)}$ = 0.14 V (max)

(4) High-speed switching: t_f = 200 ns (typ.)

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

3. Packaging and Internal Circuit



Start of commercial production
2021-03

4. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics			Symbol	Rating	Unit
Collector-base voltage			V_{CBO}	180	V
Collector-emitter voltage			V_{CEO}	120	V
Emitter-base voltage			V_{EBO}	7	V
Collector current (DC)		(Note 1)	I_C	1.0	A
Collector current (pulsed)		(Note 1)	I_{CP}	2.0	A
Base current			I_B	100	mA
Collector power dissipation	DC	(Note 2)	P_C	1	W
Collector power dissipation	(t = 1 s)	(Note 2)	P_C	1.8	W
Junction temperature			T_j	150	°C
Storage temperature			T_{stg}	- 55 to 150	°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 °C.

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

5. Electrical Characteristics

5.1. Electrical Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	V_{CB} = 180 V , I_E = 0 mA	—	—	100	nA
Emitter cut-off current	I_{EBO}	V_{EB} = 7 V, I_C = 0 mA	—	—	100	nA
Collector-base breakdown voltage	$V_{(BR)CBO}$	I_C = 1 mA, I_B = 0 mA	180	—	—	V
Collector-emitter breakdown voltage	$V_{(BR)CEO}$	I_C = 10 mA, I_B = 0 mA	120	—	—	V
DC current gain	$h_{FE}(1)$	V_{CE} = 2 V, I_C = 1 mA	100	—	—	—
	$h_{FE}(2)$	V_{CE} = 2 V, I_C = 0.1 A	120	—	300	—
	$h_{FE}(3)$	V_{CE} = 2 V, I_C = 0.3 A	60	—	—	—
Collector-emitter saturation voltage	$V_{CE(sat)}$	I_C = 0.3 A, I_B = 10 mA	—	—	0.14	V
Base-emitter saturation voltage	$V_{BE(sat)}$	I_C = 0.3 A, I_B = 10 mA	—	—	1.10	V

5.2. Dynamic Characteristics (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Switching time (rise time)	t_r	See Figure 5.2.1 $V_{cc} \approx$ 72 V, R_L = 240 Ω, I_{B1} = 10 mA, I_{B2} = 10 mA	—	100	—	ns
Switching time (storage time)	t_{stg}		—	1500	—	ns
Switching time (fall time)	t_f		—	200	—	ns

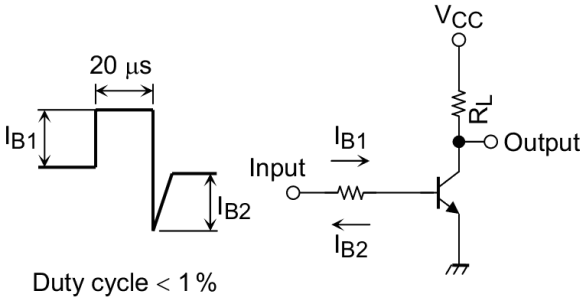


Fig. 5.2.1 Switching Time Test Circuit

6. Marking

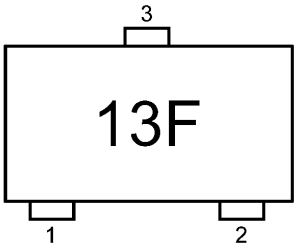


Fig. 6.1 Marking

7. Characteristics Curves (Note)

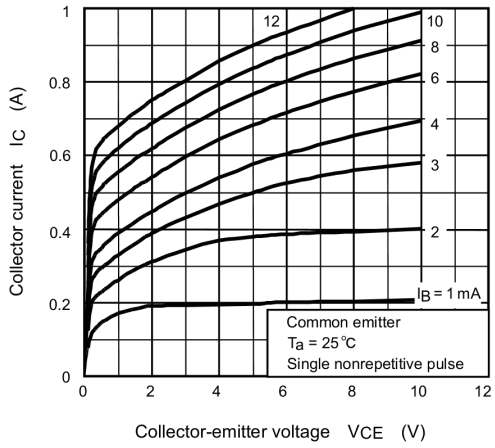


Fig. 7.1 I_C - V_{CE}

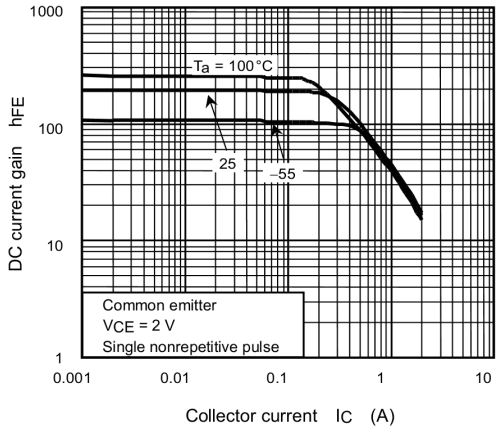


Fig. 7.2 h_{FE} - I_C

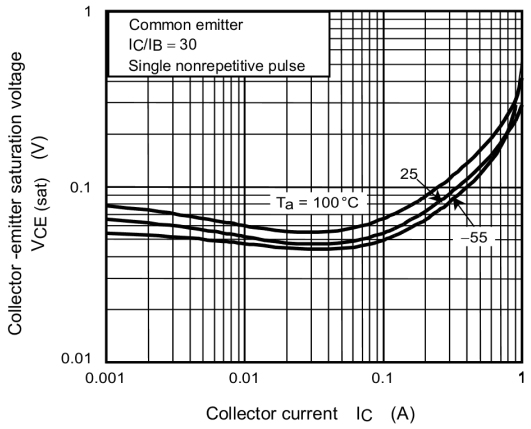


Fig. 7.3 $V_{CE(sat)}$ - I_C

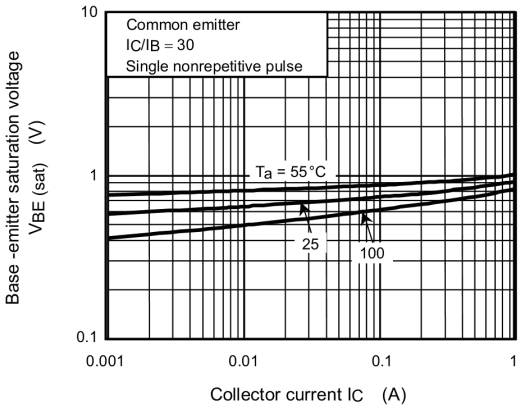


Fig. 7.4 $V_{BE(sat)}$ - I_C

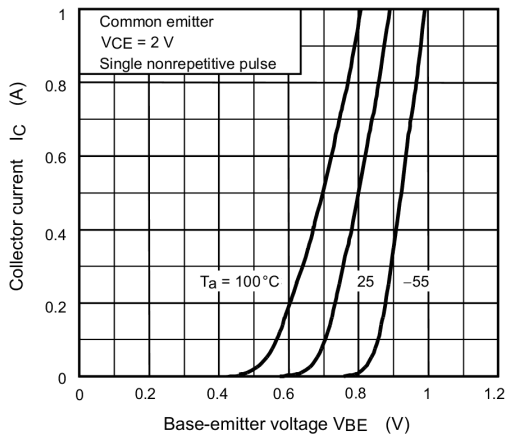


Fig. 7.5 I_C - V_{BE}

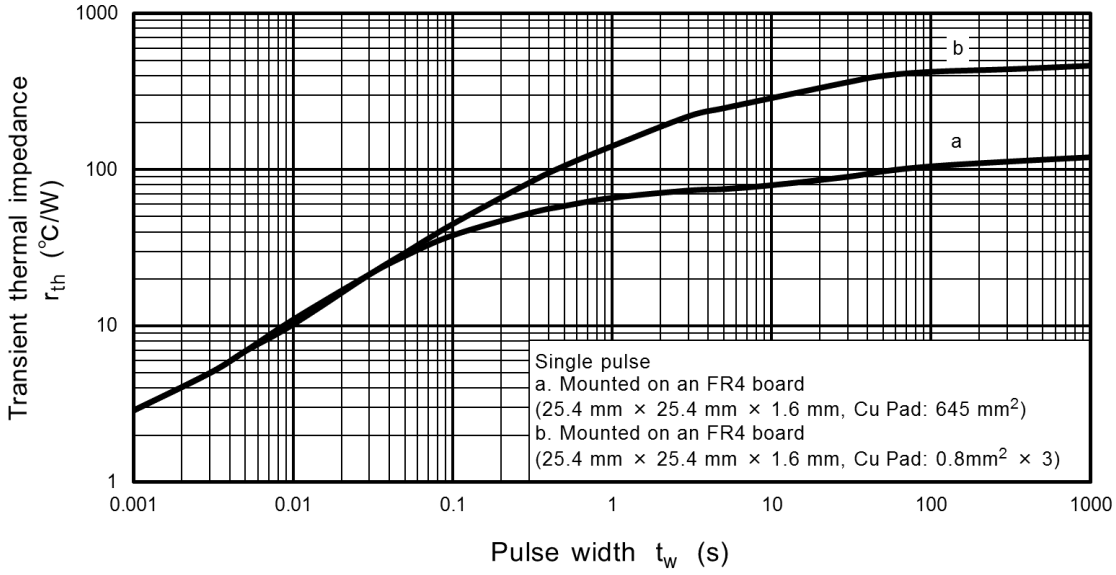


Fig. 7.6 r_{th} - t_w

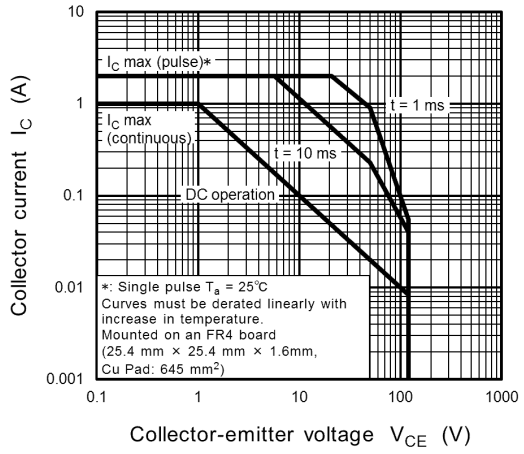
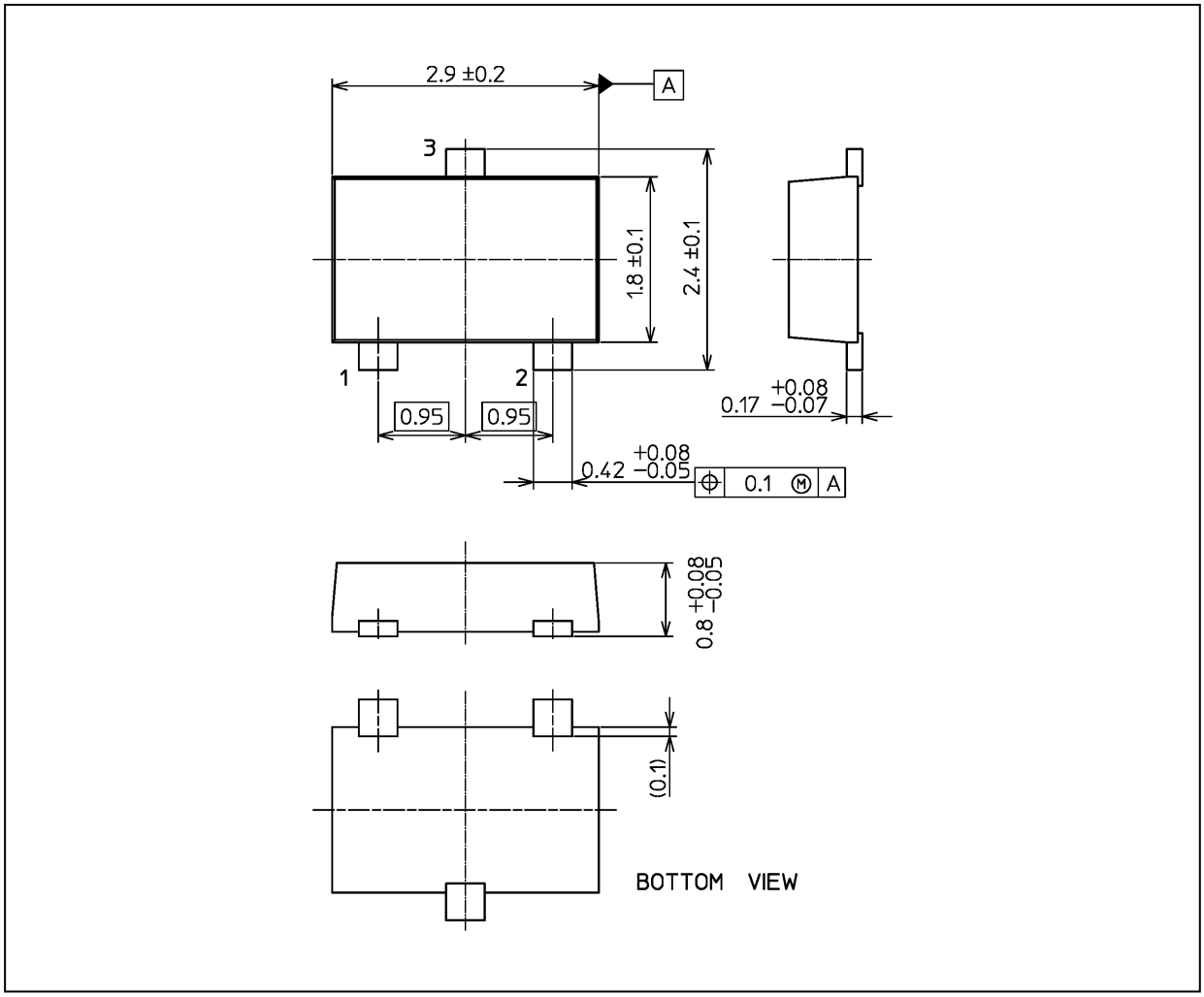


Fig. 7.7 Safe Operating Area

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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