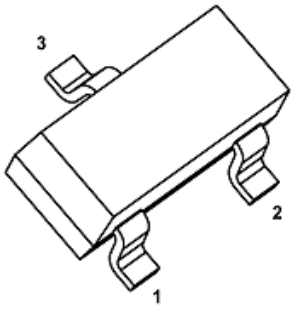
TOSHIBA Transistor Silicon NPN Epitaxial Type

TMBT3904

Audio Frequency General Purpose Amplifier Applications

- High voltage and high current
  : V_{CEO} = 50 V, I_C = 200 mA (max)
- Complementary to TMBT3906



1. Base
2. Emitter
3. Collector

SOT23

Absolute Maximum Ratings (Ta = 25°C)

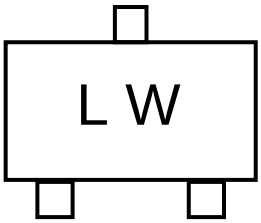
Characteristics	Symbol	Rating	Unit
Collector-base voltage	V_{CBO}	60	V
Collector-emitter voltage	V_{CEO}	50	V
Emitter-base voltage	V_{EBO}	5	V
Collector current	I_C	200	mA
Base current	I_B	30	mA
Collector power dissipation	P_C (Note 1)	320	mW
	P_C (Note 2)	1000	mW
Junction temperature	T_j	150	°C
Storage temperature range	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: Mounted on an FR4 board.
(25.4mm x 25.4mm x 1.6mm, Cu Pad: 0.42mm^2 x 3)

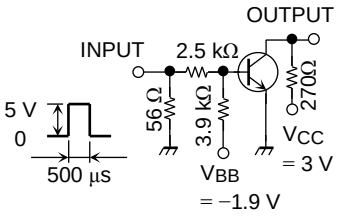
Note 2: Mounted on an FR4 board.
(25.4mm x 25.4mm x 1.6mm, Cu Pad: 645mm^2)

Marking

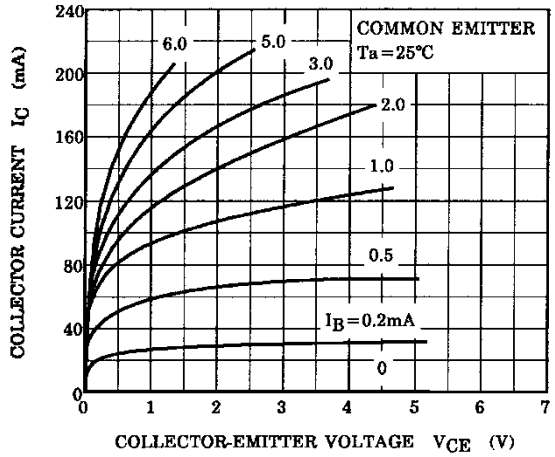


Start of commercial production
2015-01

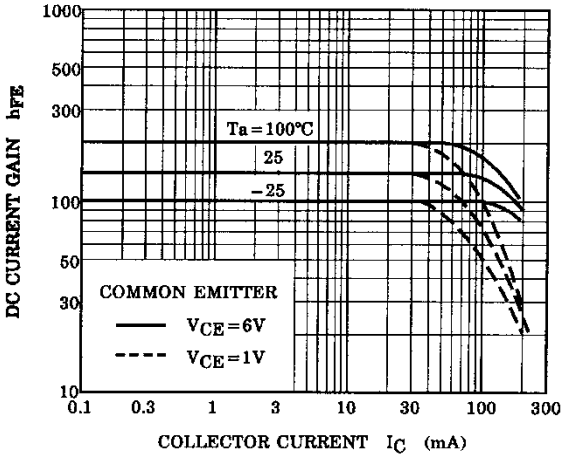
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current		I_{CBO}	V_{CB} = 60 V, I_E = 0 mA	—	—	0.1	μA
Emitter cut-off current		I_{EBO}	V_{EB} = 5 V, I_C = 0 mA	—	—	0.1	μA
DC current gain		h_{FE}	V_{CE} = 1 V, I_C = 0.1 mA	60	—	—	—
			V_{CE} = 1 V, I_C = 1 mA	80	—	—	
			V_{CE} = 1 V, I_C = 10 mA	100	—	300	
			V_{CE} = 1 V, I_C = 50 mA	60	—	—	
			V_{CE} = 1 V, I_C = 100 mA	30	—	—	
Collector-emitter saturation voltage		$V_{CE\ (sat)}$	I_C = 10 mA, I_B = 1 mA	—	—	0.2	V
			I_C = 50 mA, I_B = 5 mA	—	—	0.3	
Base-emitter saturation voltage		$V_{BE\ (sat)}$	I_C = 10 mA, I_B = 1 mA	—	0.65	0.85	
			I_C = 50 mA, I_B = 5 mA	—	—	0.95	
Transition frequency		f_T	V_{CE} = 20 V, I_C = 10 mA	300	—	—	MHz
Collector output capacitance		C_{ob}	V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	—	1.7	3.5	pF
Noise figure		NF	V_{CE} = 5 V, I_C = 0.1 mA, f = 1 kHz, R_g = 1 kΩ	—	—	5	dB
Switching times	delay time	td	 I_C = 10mA, I_{B1} = -I_{B2} = 1mA	—	—	35	ns
	rise time	tr		—	—	35	
	storage time	ts		—	—	200	
	fall time	tf		—	—	50	

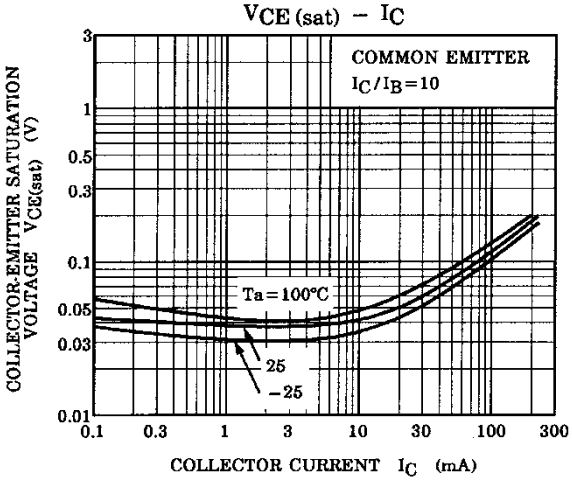
I_C – V_{CE}



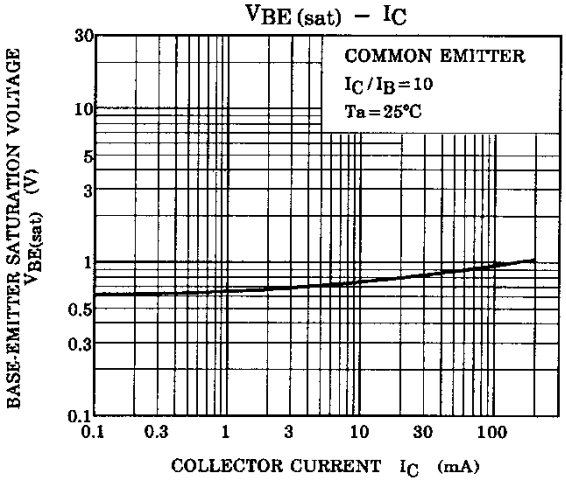
h_{FE} – I_C



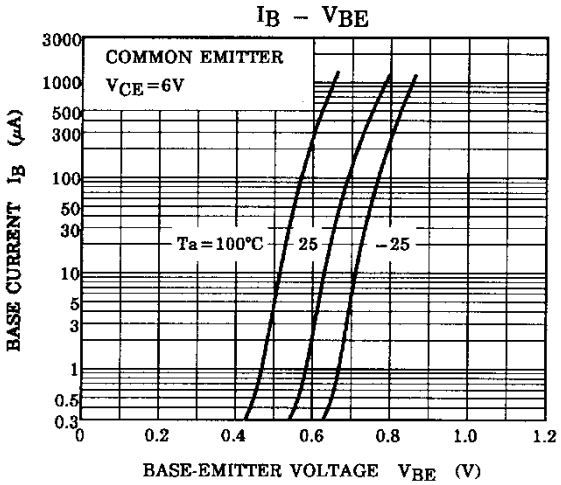
$V_{CE\,(sat)}$ – I_C



$V_{BE\,(sat)}$ – I_C

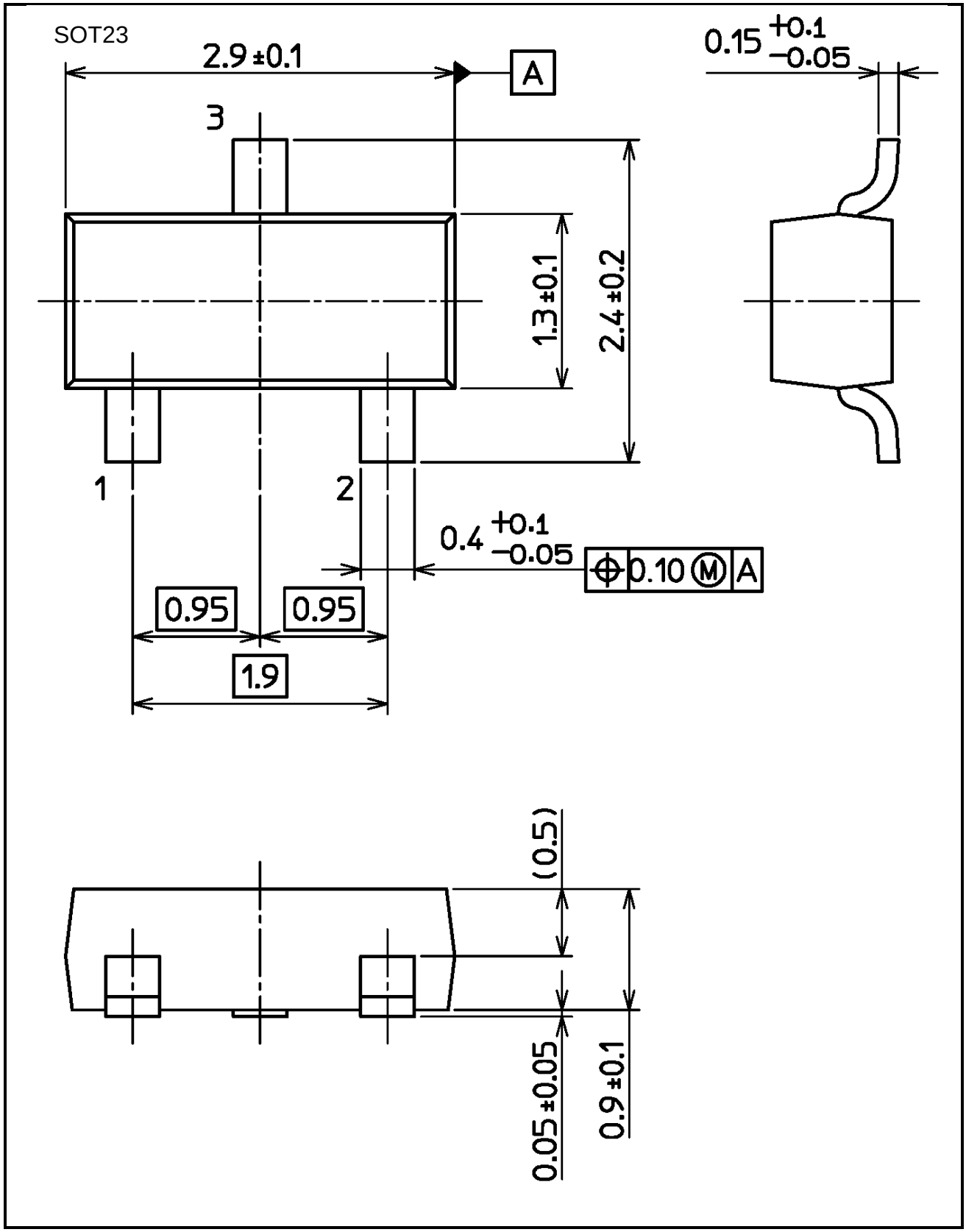


I_B – V_{BE}



Package Dimensions

Unit: mm



Weight: 0.009g (typ.)

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