

Bipolar Transistors Silicon PNP Epitaxial Type

## 2SA1586

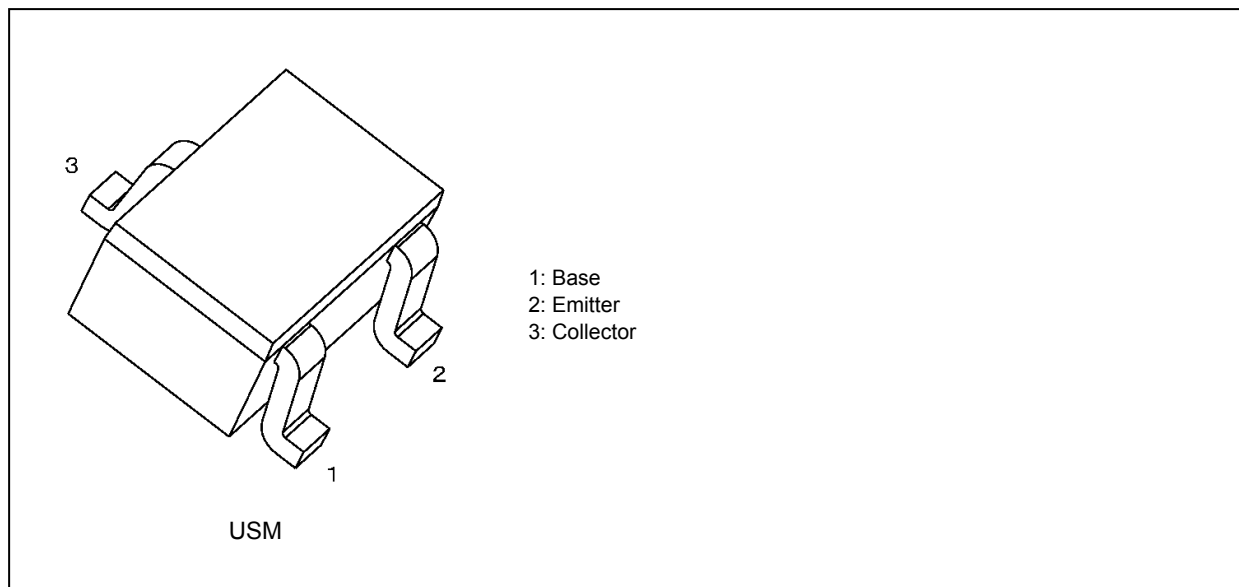
### 1. Applications

- Low-Frequency Amplifiers
- Audio Frequency General Purpose Amplifier Applications

### 2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) High voltage:  $V_{CEO} = -50\text{ V}$
- (3) High collector current:  $I_C = -150\text{ mA}$  (max)
- (4) High  $h_{FE}$ :  $h_{FE} = 70$  to  $400$
- (5) Excellent  $h_{FE}$  linearity:  $h_{FE}(I_C = -0.1\text{ mA})/h_{FE}(I_C = -2\text{ mA}) = 0.95$  (typ.)
- (6) Low noise:  $NF = 1\text{ dB}$  (typ.),  $10\text{ dB}$  (max)
- (7) Complementary to 2SC4116
- (8) Small package

### 3. Packaging



Start of commercial production

1987-01

### 4. Orderable part number

Orderable part number		AEC-Q101	Note
2SA1586-O	2SA1586-O,LF	—	General Use
	2SA1586-O,LXGF	YES (Note 1)	Unintended Use (Note 1)
	2SA1586-O,LXHF	YES	Automotive Use
2SA1586-Y	2SA1586-Y,LF	—	General Use
	2SA1586-Y,LXGF	YES (Note 1)	Unintended Use (Note 1)
	2SA1586-Y,LXHF	YES	Automotive Use
2SA1586-GR	2SA1586-GR,LF	—	General Use
	2SA1586-GR,LXGF	YES (Note 1)	Unintended Use (Note 1)
	2SA1586-GR,LXHF	YES	Automotive Use

Note 1: For more information, please contact our sales or use the inquiry form on our website.

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

Characteristics	Symbol	Rating	Unit	
Collector-base voltage	$V_{CBO}$	-50	V	
Collector-emitter voltage	$V_{CEO}$	-50	V	
Emitter-base voltage	$V_{EBO}$	-5	V	
Collector current (DC)	$I_C$	-150	mA	
Base current	$I_B$	-30	mA	
Collector power dissipation	(Note 2), (Note 4)	$P_C$	200	mW
	(Note 3)		100	
Junction temperature	(Note 2)	$T_j$	150	$^\circ\text{C}$
	(Note 3)		125	
Storage temperature	(Note 2)	$T_{stg}$	-55 to 150	$^\circ\text{C}$
	(Note 3)		-55 to 125	

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 2: For devices with the ordering part number ending in LF(T).

Note 3: For devices with the ordering part number ending in XGF(T), XHF(T).

Note 4: Device mounted on an 25.4 mm × 25.4 mm × 1.6 mm FR4 glass epoxy board (Cu pad: 0.5 mm<sup>2</sup> × 3)

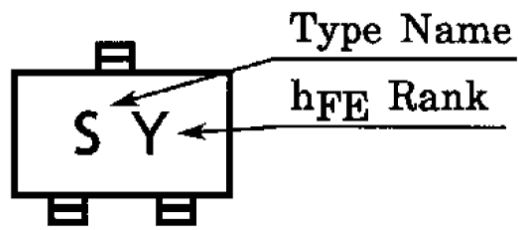
### 6. Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

Characteristics	Symbol	Note	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$		$V_{CB} = -50\text{ V}, I_E = 0\text{ A}$	—	—	-0.1	$\mu\text{A}$
Emitter cut-off current	$I_{EBO}$		$V_{EB} = -5\text{ V}, I_C = 0\text{ A}$	—	—	-0.1	$\mu\text{A}$
DC current gain	$h_{FE}$	(Note 5)	$V_{CE} = -6\text{ V}, I_C = -2\text{ mA}$	70	—	400	—
Collector-emitter saturation voltage	$V_{CE(sat)}$		$I_C = -100\text{ mA}, I_B = -10\text{ mA}$	—	-0.1	-0.3	V
Transition frequency	$f_T$		$V_{CE} = -10\text{ V}, I_C = -1\text{ mA}$	80	—	—	MHz
Collector output capacitance	$C_{ob}$		$V_{CB} = -10\text{ V}, I_E = 0\text{ A}, f = 1\text{ MHz}$	—	4	7	pF
Noise figure	NF		$V_{CE} = -6\text{ V}, I_C = -0.1\text{ mA}, f = 1\text{ kHz}, R_G = 10\text{ k}\Omega$	—	1.0	10	dB

Note 5:  $h_{FE}$  classification O (O): 70 to 140, Y (Y): 120 to 240, GR (G): 200 to 400

( ) marking symbol

## 7. Marking



8. Characteristics Curves (Note)

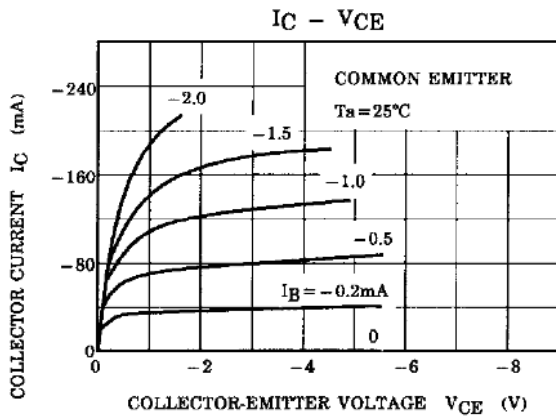


Fig. 8.1  $I_C - V_{CE}$

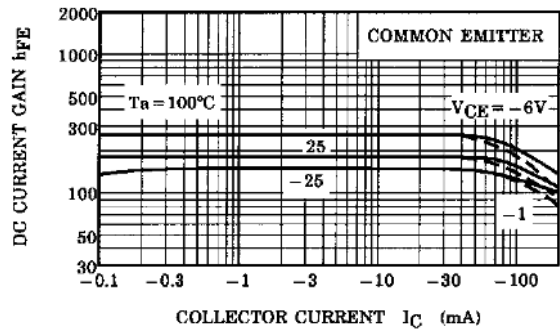


Fig. 8.2  $h_{FE} - I_C$

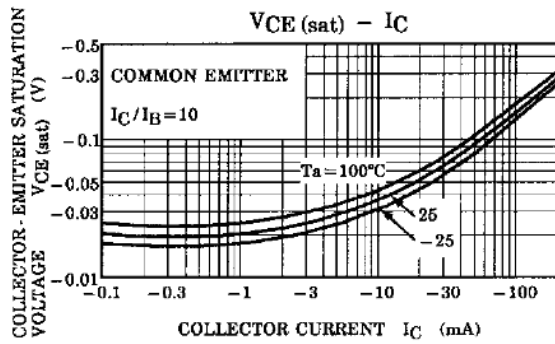


Fig. 8.3  $V_{CE(sat)} - I_C$

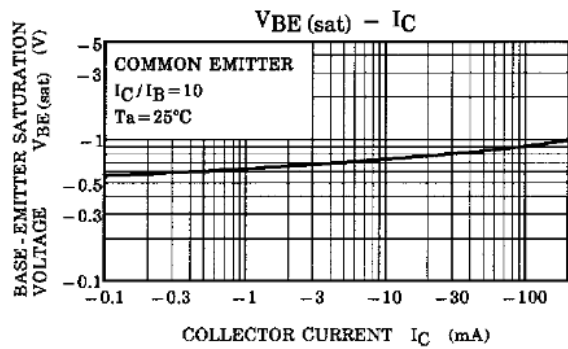


Fig. 8.4  $V_{BE(sat)} - I_C$

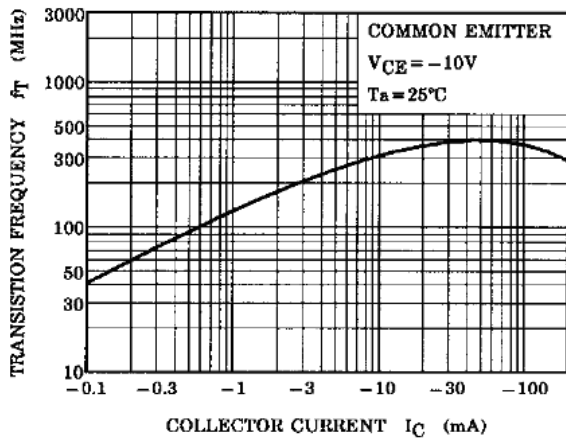


Fig. 8.5  $f_T - I_C$

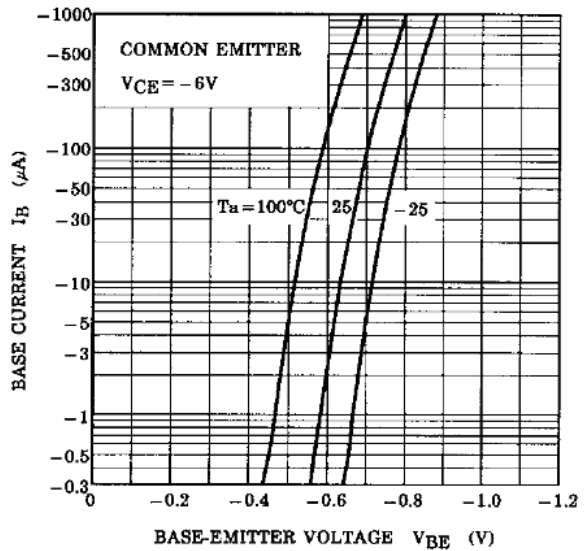
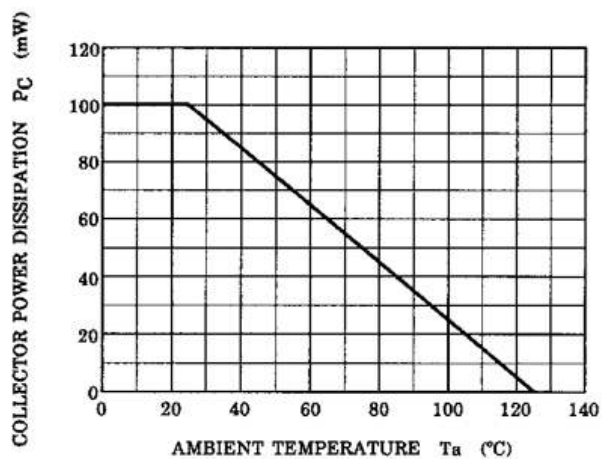
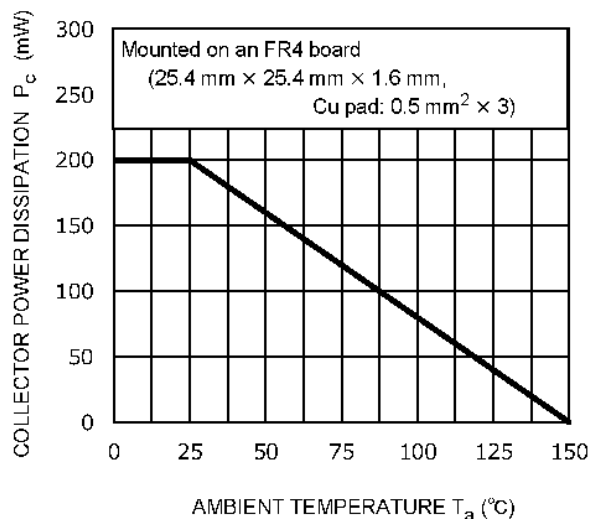


Fig. 8.6  $I_B - V_{BE}$



**Fig. 8.7  $P_c - T_a$**   
Reference only with  $T_j$  of 125 °C.

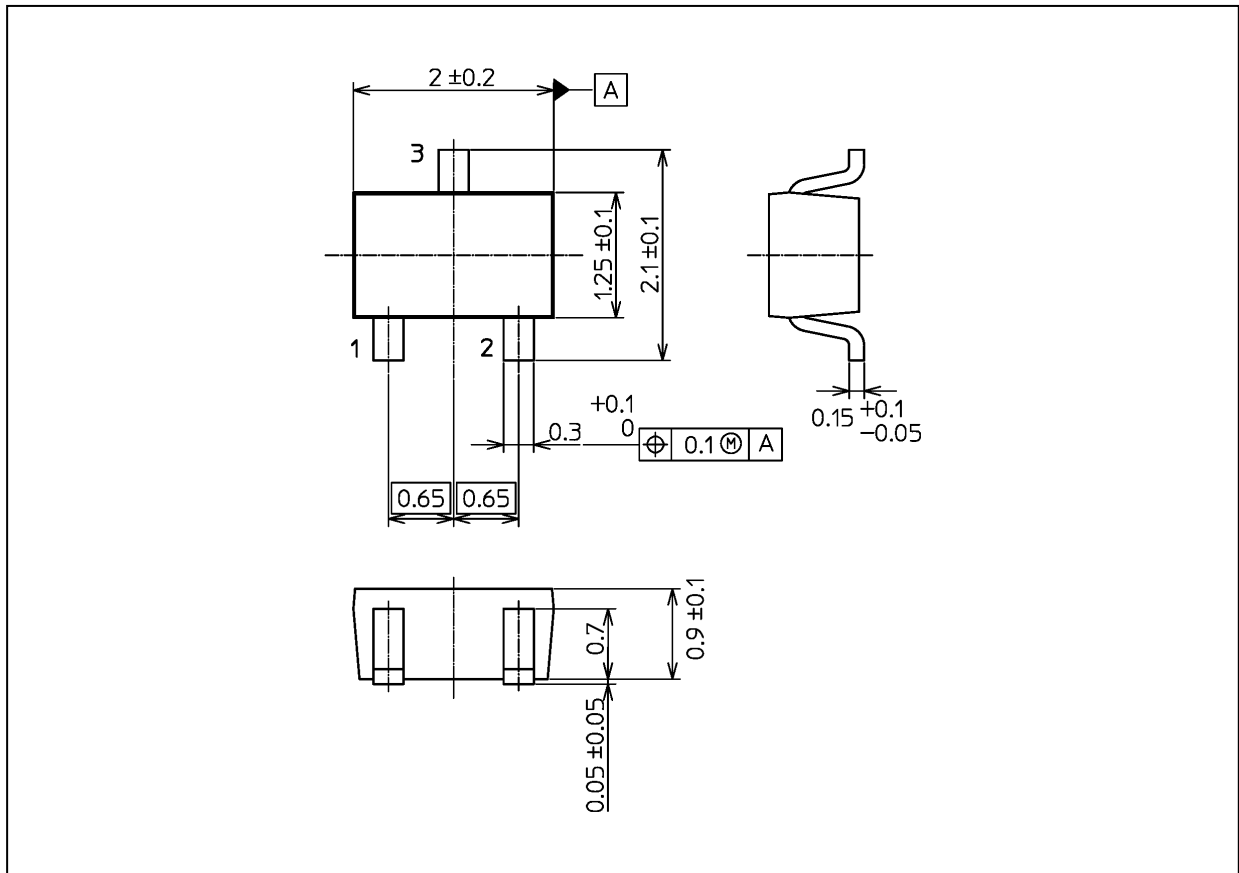


**Fig. 8.8  $P_c - T_a$**   
Reference only with  $T_j$  of 150 °C.

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

## Package Dimensions

Unit: mm



Weight: 6.0 mg (typ.)

Package Name(s)
TOSHIBA: 2-2E1S
Nickname: USM

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