

TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) Silicon NPN Epitaxial Type (PCT Process)

# HN1B04F

Audio Frequency General Purpose Amplifier Applications  
 Driver Stage Amplifier Applications  
 Switching application

Unit: mm

Q1:

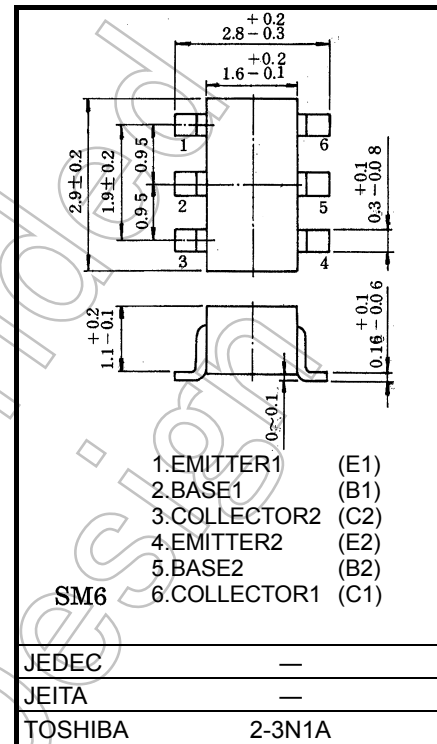
- Excellent  $h_{FE}$  linearity  
 :  $h_{FE(2)} = 25$  (min) at  $V_{CE} = -6V$ ,  $I_C = -400mA$

Q2:

- Excellent  $h_{FE}$  linearity  
 :  $h_{FE(2)} = 25$  (min) at  $V_{CE} = 6V$ ,  $I_C = 400mA$

### Q1 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-35	V
Collector-emitter voltage	$V_{CEO}$	-30	V
Emitter-base voltage	$V_{EBO}$	-5	V
Collector current	$I_C$	-500	mA



Weight: 0.015g (typ.)

### Q2 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	35	V
Collector-emitter voltage	$V_{CEO}$	30	V
Emitter-base voltage	$V_{EBO}$	5	V
Collector current	$I_C$	500	mA

### Q1, Q2 Common Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	$P_C^*$	300	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).

\* Total rating. 200mW per element must be exceeded.

Start of commercial production  
 2002-02

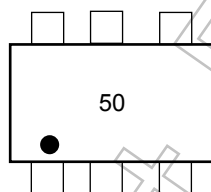
## Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	—	$V_{CB} = -35V, I_E = 0$	—	—	-100	nA
Emitter cut-off current	$I_{EBO}$	—	$V_{EB} = -5V, I_C = 0$	—	—	-100	nA
DC current gain	$h_{FE(1)}$	—	$V_{CE} = -1V, I_C = -100mA$	70	—	400	
	$h_{FE(2)}$	—	$V_{CE} = -6V, I_C = -400mA$	25	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	$I_C = -100mA, I_B = -10mA$	—	-0.1	-0.25	V
Base-Emitter Voltage	$V_{BE}$	—	$V_{CE} = -1V, I_C = -100mA$	—	-0.8	-1.0	V
Transition frequency	$f_T$	—	$V_{CE} = -6V, I_C = -20mA$	—	200	—	MHz
Collector output capacitance	$C_{ob}$	—	$V_{CB} = -6V, I_E = 0, f = 1MHz$	—	7	—	pF

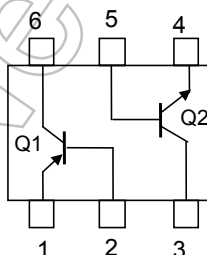
## Q2 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	$I_{CBO}$	—	$V_{CB} = 35V, I_E = 0$	—	—	100	nA
Emitter cut-off current	$I_{EBO}$	—	$V_{EB} = 5V, I_C = 0$	—	—	100	nA
DC current gain	$h_{FE(1)}$	—	$V_{CE} = 1V, I_C = 100mA$	70	—	400	
	$h_{FE(2)}$	—	$V_{CE} = 6V, I_C = 400mA$	25	—	—	
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	$I_C = 100mA, I_B = 10mA$	—	0.1	0.25	V
Base-Emitter Voltage	$V_{BE}$	—	$V_{CE} = 1V, I_C = 100mA$	—	0.8	1.0	V
Transition frequency	$f_T$	—	$V_{CE} = 6V, I_C = 20mA$	—	300	—	MHz
Collector output capacitance	$C_{ob}$	—	$V_{CB} = 6V, I_E = 0, f = 1MHz$	—	7	—	pF

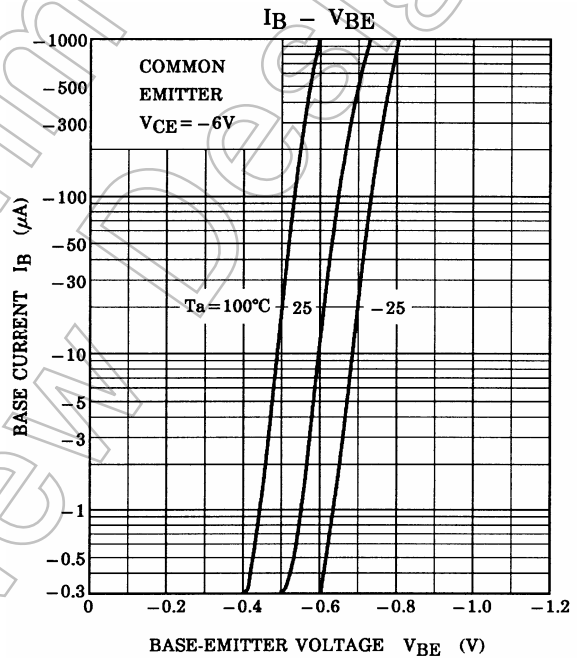
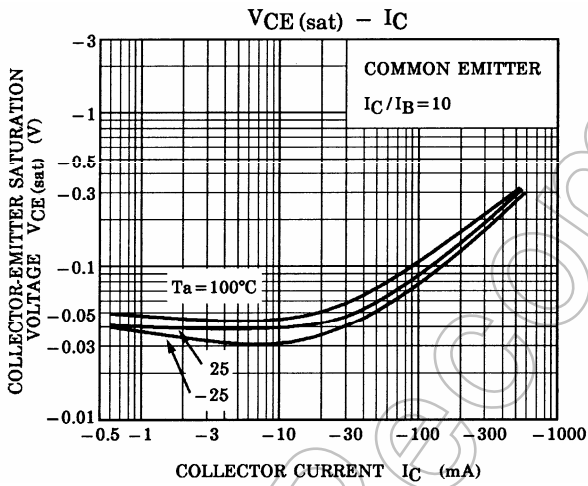
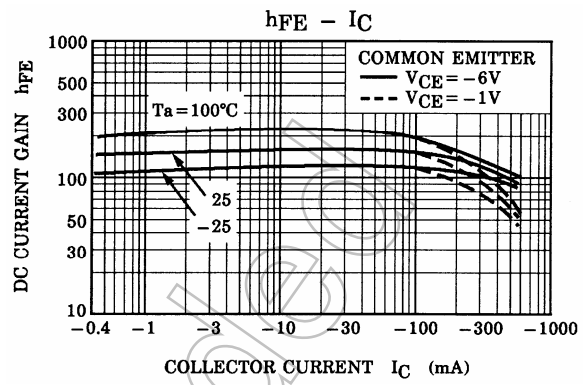
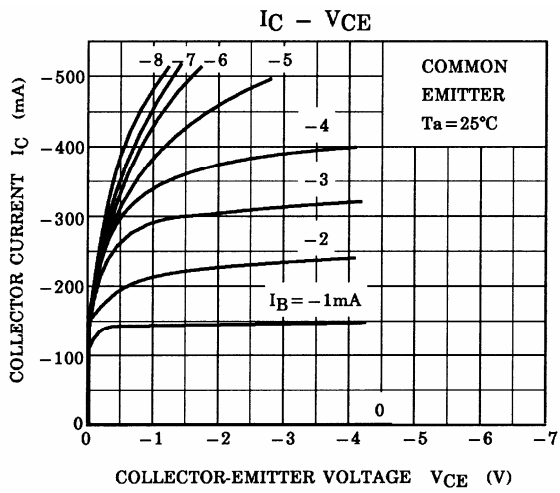
### Marking



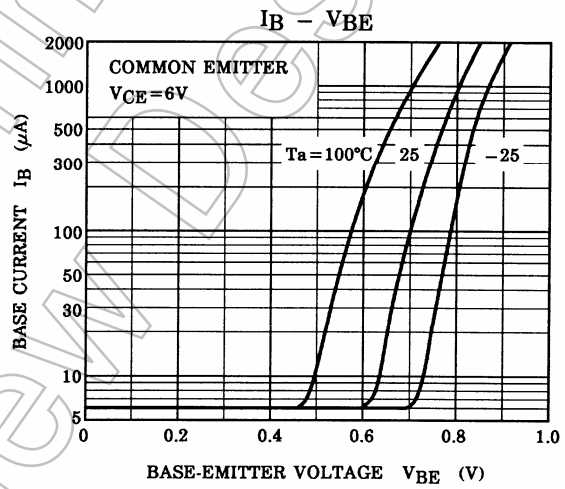
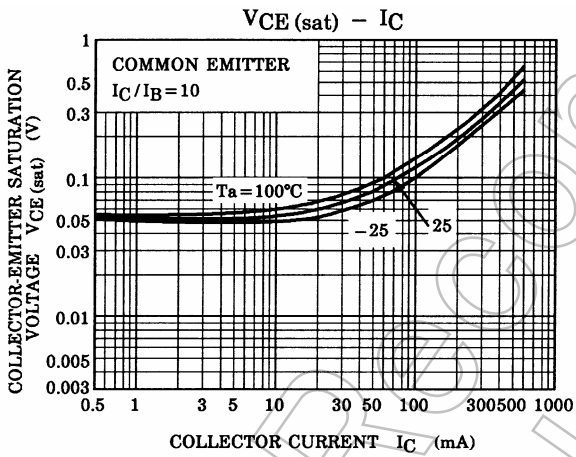
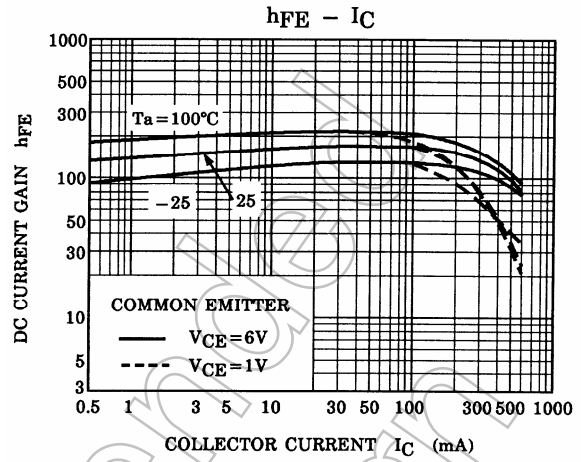
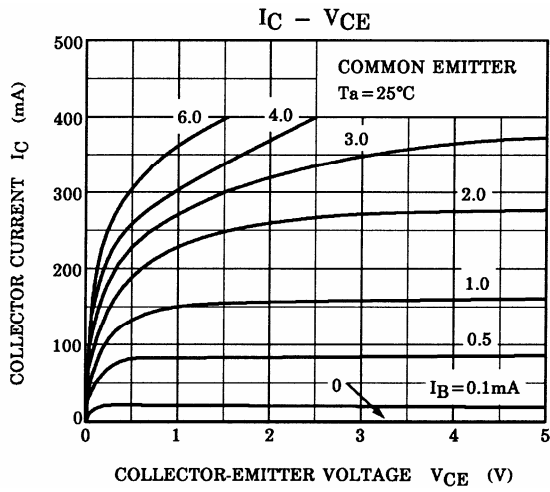
### Equivalent Circuit (Top View)



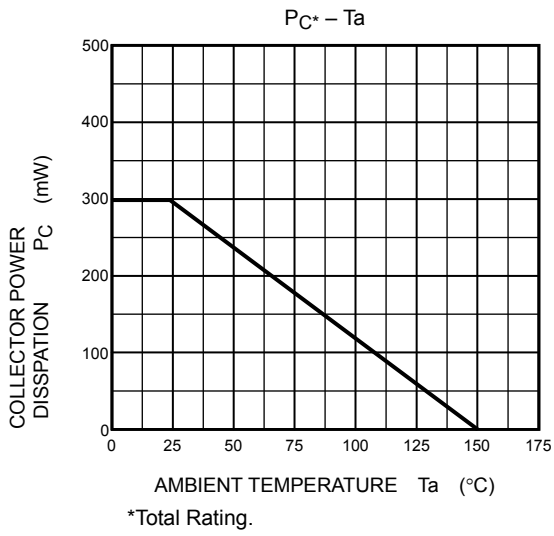
**Q1 (PNP transistor)**



**Q2 (NPN transistor)**



(Q1, Q2 Common)



Not Recommended for New Design

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