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

# HN1B04FU

# Audio Frequency General Purpose Amplifier Applications

Q1:

• High voltage and high current

 $: V_{CEO} = 50V, I_{C} = 150 \text{mA (max)}$ 

• High  $h_{FE}$ :  $h_{FE} = 120$  to 400

• Excellent hfe linearity

:  $h_{FE}$  ( $I_{C} = 0.1 \text{mA}$ ) /  $h_{FE}$  ( $I_{C} = 2 \text{mA}$ ) = 0.95 (typ.)

Q2:

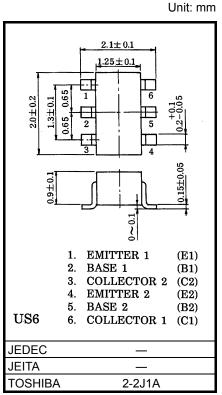
• High voltage and high current

 $: V_{CEO} = -50V, I_{C} = -150 \text{mA (max)}$ 

• High  $h_{FE}$ :  $h_{FE} = 120$  to 400

• Excellent hfe linearity

:  $h_{FE}$  ( $I_{C} = -0.1 \text{mA}$ ) /  $h_{FE}$  ( $I_{C} = -2 \text{mA}$ ) = 0.95 (typ.)

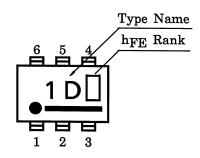


Weight: 6.8mg (typ.)

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

Characteristic	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	60	V
Collector-emitter voltage	V <sub>CEO</sub>	50	V
Emitter-base voltage	V <sub>EBO</sub>	5	V
Collector current	IC	150	mA
Base current	Ι <sub>Β</sub>	30	mA

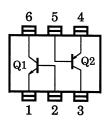
# Marking



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

# **Equivalent Circuit (Top View)**

Characteristic	Symbol	Rating	Unit
Collector-base voltage	$V_{CBO}$	-50	V
Collector-emitter voltage	V <sub>CEO</sub>	-50	٧
Emitter-base voltage	V <sub>EBO</sub>	-5	٧
Collector current	IC	-150	mA
Base current	ΙΒ	-30	mA



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

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P <sub>C</sub> *	200	mW
Junction temperature	Tj	125	°C
Storage temperature range	T <sub>stg</sub>	−55 to 125	°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).

# Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	_	V <sub>CB</sub> = 60V, I <sub>E</sub> = 0	_	_	0.1	μA
Emitter cut-off current	I <sub>EBO</sub>	_	$V_{EB} = 5V, I_{C} = 0$	1	1	0.1	μΑ
DC current gain	h <sub>FE</sub> (Note)	_	$V_{CE}$ = 6V, $I_C$ = 2mA	120	_	400	
Collector-emitter saturation voltage	V <sub>CE (sat)</sub>	_	I <sub>C</sub> = 100mA, I <sub>B</sub> = 10mA	-	0.1	0.25	٧
Transition frequency	f <sub>T</sub>	_	V <sub>CE</sub> = 10V, I <sub>C</sub> = 1mA	_	150	_	MHz
Collector output capacitance	C <sub>ob</sub>	_	V <sub>CB</sub> = 10V, I <sub>E</sub> = 0, f = 1MHz	_	2	_	pF

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

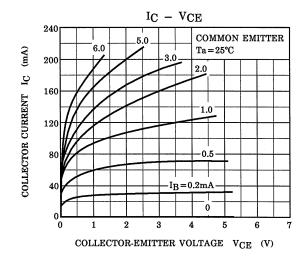
Characteristic	Symbol	Test Circuit	Test Condition	Min	Тур.	Max	Unit
Collector cut-off current	I <sub>CBO</sub>	_	$V_{CB} = -50V$ , $I_E = 0$	_	_	-0.1	μΑ
Emitter cut-off current	I <sub>EBO</sub>	_	V <sub>EB</sub> = -5V, I <sub>C</sub> = 0	_	_	-0.1	μΑ
DC current gain	h <sub>FE</sub> (Note)	_	$V_{CE} = -6V, I_{C} = -2mA$	120	_	400	
Collector-emitter saturation voltage	V <sub>CE</sub> (sat)	_	I <sub>C</sub> = -100mA, I <sub>B</sub> = -10mA	_	-0.1	-0.3	٧
Transition frequency	f <sub>T</sub>	_	V <sub>CE</sub> = −10V, I <sub>C</sub> = −1mA	_	120	_	MHz
Collector output capacitance	C <sub>ob</sub>	_	V <sub>CB</sub> = −10V, I <sub>E</sub> = 0, f = 1MHz	_	4	_	pF

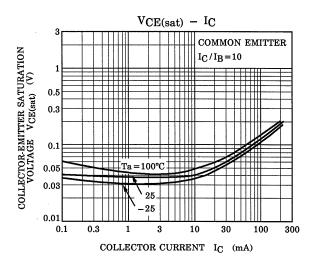
Note:  $h_{FE}$  Classification Y (Y): 120 to 240, GR (G): 200 to 400

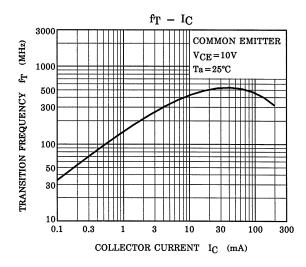
( ) Marking Symbol

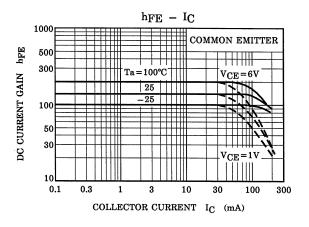
<sup>\*</sup> Total rating

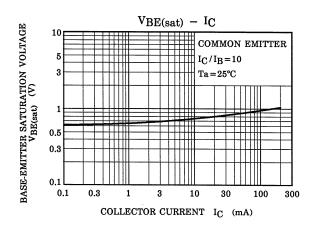
#### Q1 (NPN transistor)

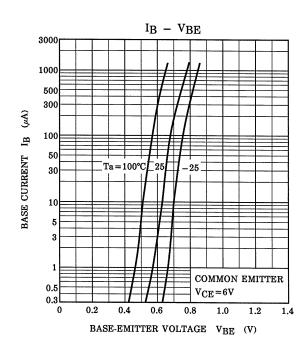




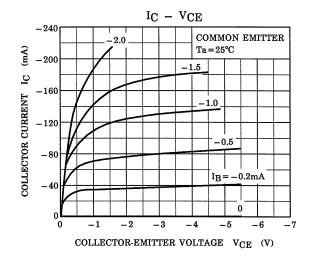


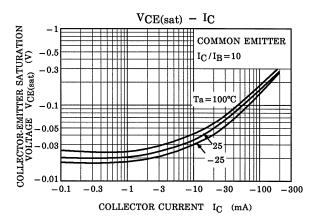


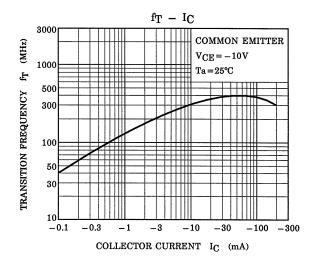


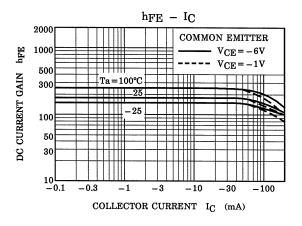


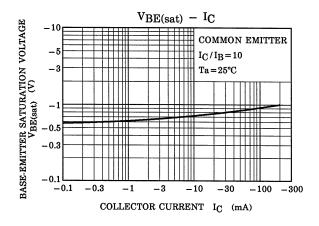
#### Q2 (PNP transistor)

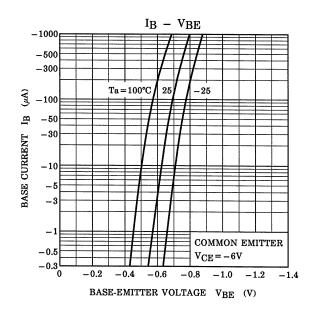




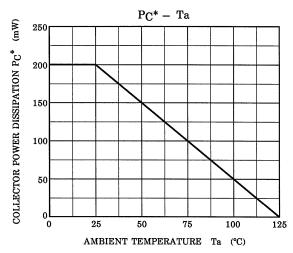








# (Q1, Q2 Common)



\*: Total Rating

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