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

HN1B04FE

Audio Frequency General Purpose Amplifier Applications

Q1:

High voltage and high current

: V_{CEO} = 50V, I_C = 150mA (max)

- High h_{FE} : h_{FE} = 120~400
- Excellent h_{FE} linearity

: h_{FE} (I_C = 0.1mA) / h_{FE} (I_C = 2mA) = 0.95 (typ.)

Q2:

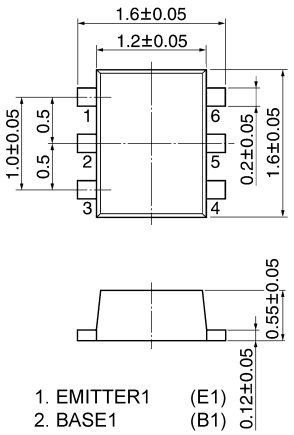
- High voltage and high current

: V_{CEO} = −50V, I_C = −150mA (max)

- High h_{FE} : h_{FE} = 120~400
- Excellent h_{FE} linearity

: h_{FE} (I_C = −0.1mA) / h_{FE} (I_C = −2mA) = 0.95 (typ.)

Unit: mm



1. EMITTER1 (E1)
2. BASE1 (B1)
3. COLLECTOR2 (C2)
4. EMITTER2 (E2)
5. BASE2 (B2)
6. COLLECTOR1 (C1)

ES6

JEDEC	—
JEITA	—
TOSHIBA	2-2N1G

Weight: 3.0mg (typ.)

Q1 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	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	150	mA
Base current	I_B	30	mA

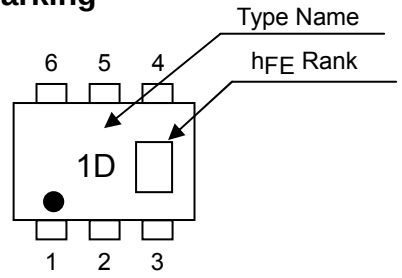
Q2 Absolute Maximum Ratings (Ta = 25°C)

Characteristic	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	I_C	−150	mA
Base current	I_B	−30	mA

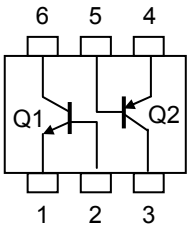
Q1, Q2 Common Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Collector power dissipation	P_C*	100	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−55~150	°C

Marking



Equivalent Circuit (Top View)



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

Q1 Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = 60V, I_E = 0	—	—	0.1	μA
Emitter cut-off current	I_{EBO}	—	V_{EB} = 5V, I_C = 0	—	—	0.1	μA
DC current gain	$h_{FE\ (Note)}$	—	V_{CE} = 6V, I_C = 2mA	120	—	400	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = 100mA, I_B = 10mA	—	0.1	0.25	V
Transition frequency	f_T	—	V_{CE} = 10V, I_C = 1mA	80	—	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = 10V, I_E = 0, f = 1MHz	—	2	—	pF

Q2 Electrical Characteristics (Ta = 25°C)

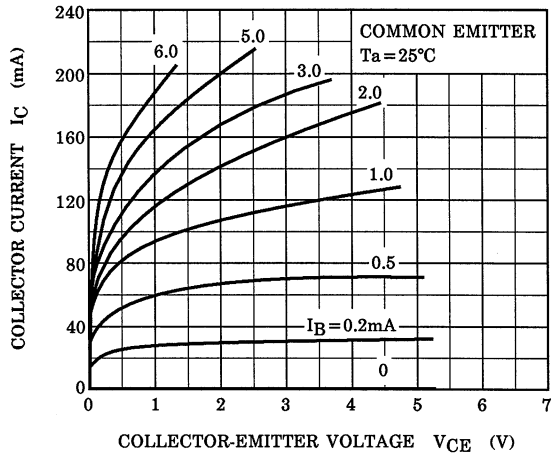
Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Collector cut-off current	I_{CBO}	—	V_{CB} = −50V, I_E = 0	—	—	−0.1	μA
Emitter cut-off current	I_{EBO}	—	V_{EB} = −5V, I_C = 0	—	—	−0.1	μA
DC current gain	$h_{FE\ (Note)}$	—	V_{CE} = −6V, I_C = −2mA	120	—	400	
Collector-emitter saturation voltage	$V_{CE\ (sat)}$	—	I_C = −100mA, I_B = −10mA	—	−0.1	−0.3	V
Transition frequency	f_T	—	V_{CE} = −10V, I_C = −1mA	80	—	—	MHz
Collector output capacitance	C_{ob}	—	V_{CB} = −10V, I_E = 0, f = 1MHz	—	4	—	pF

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

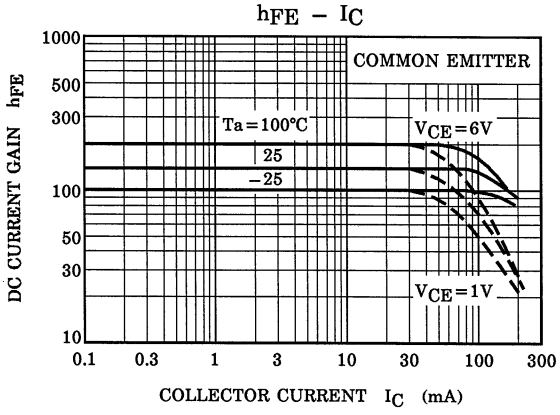
( ) Marking Symbol

Q1 (NPN transistor)

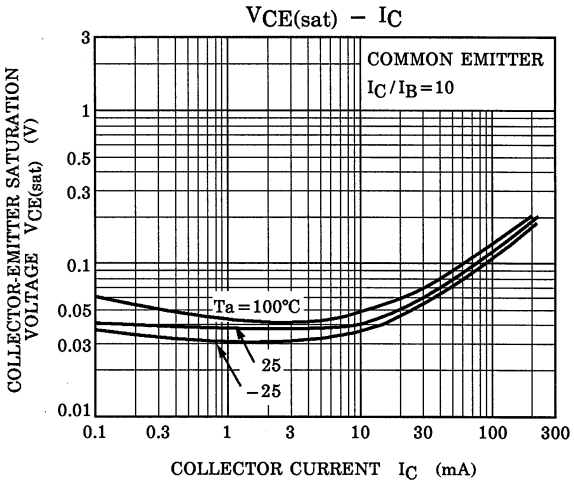
I_C – V_{CE}



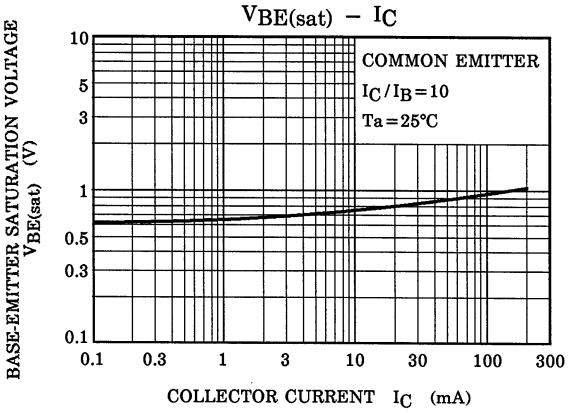
h_{FE} – I_C



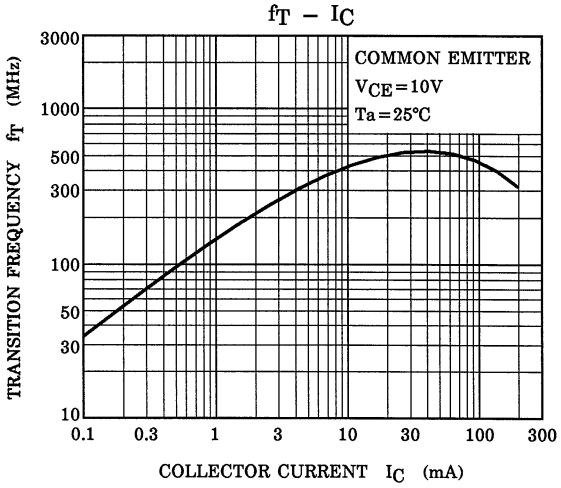
$V_{CE(sat)}$ – I_C



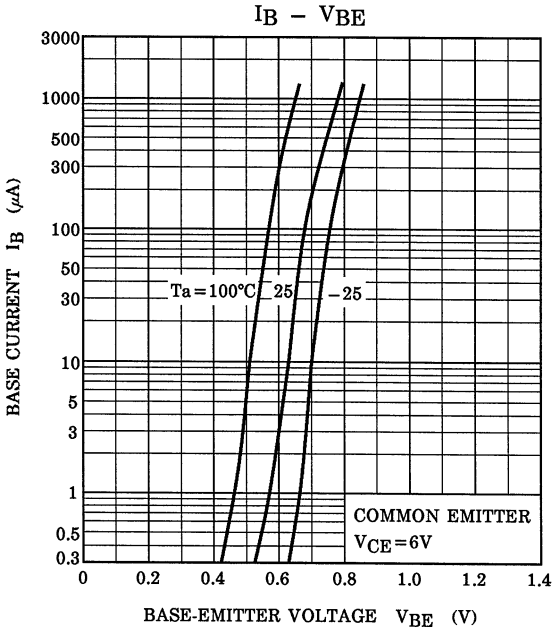
$V_{BE(sat)}$ – I_C



f_T – I_C

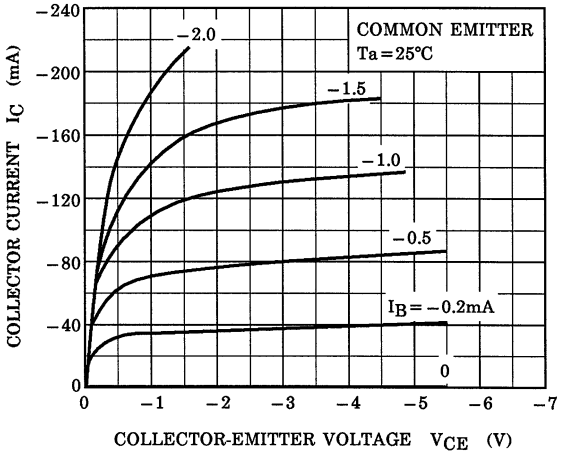


I_B – V_{BE}

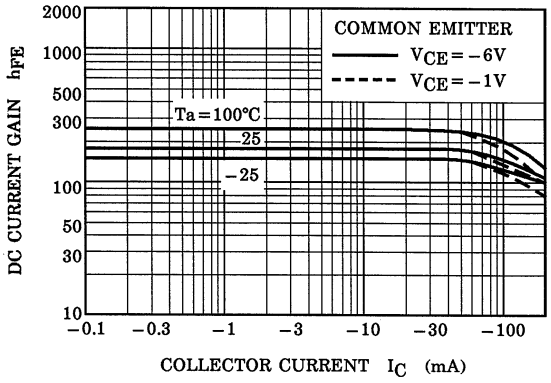


Q2 (PNP transistor)

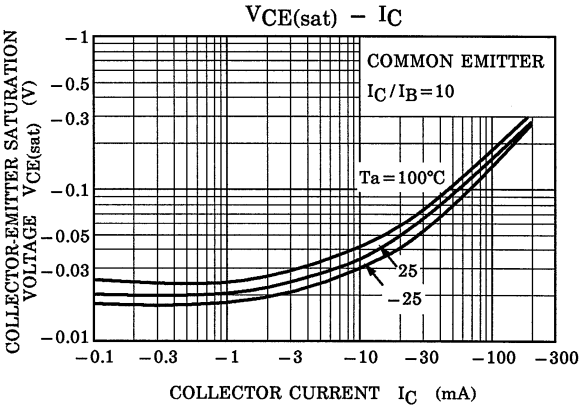
I_C – V_{CE}



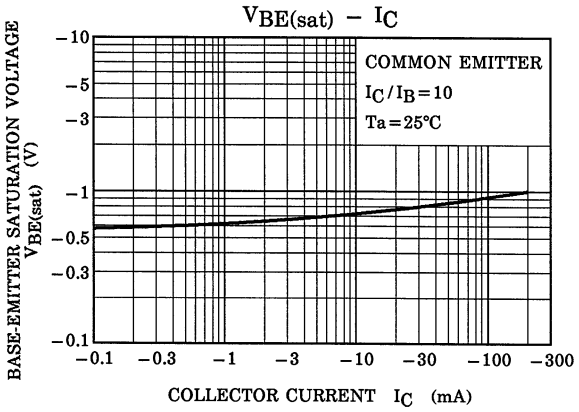
h_{FE} – I_C



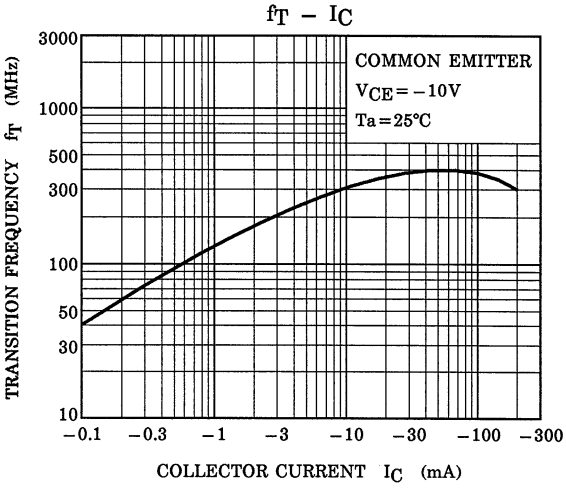
$V_{CE(sat)}$ – I_C



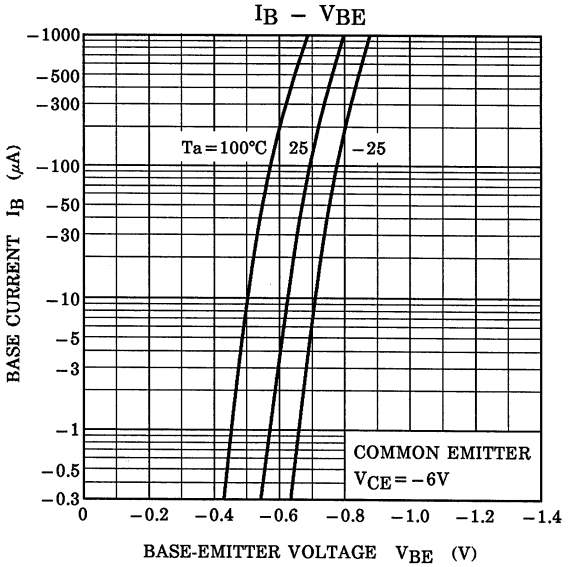
$V_{BE(sat)}$ – I_C



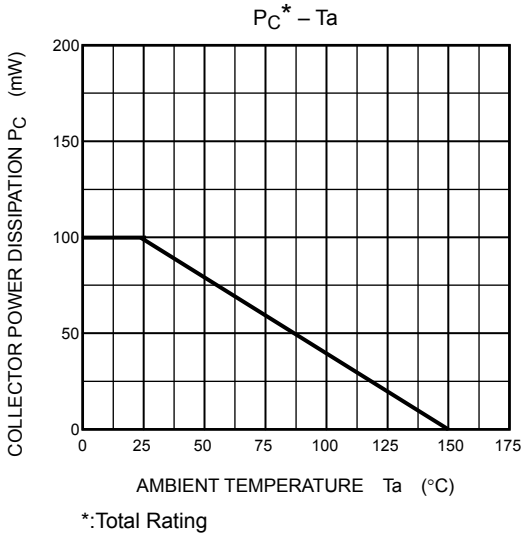
f_T – I_C



I_B – V_{BE}



(Q1, Q2 Common)



*:Total Rating

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