

# HN1B04FE

## Audio Frequency General Purpose Amplifier Applications

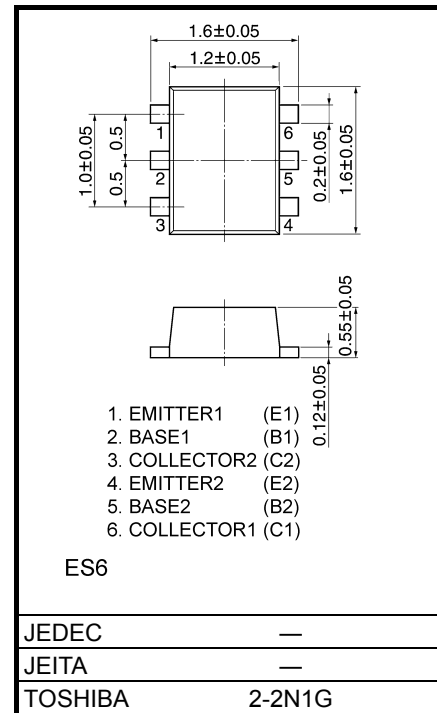
Unit: mm

### Q1:

- High voltage and high current  
:  $V_{CEO} = 50V, I_C = 150mA$  (max)
- High  $h_{FE}$ :  $h_{FE} = 120$  to 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  $h_{FE}$ :  $h_{FE} = 120$  to 400
- Excellent  $h_{FE}$  linearity  
:  $h_{FE}(I_C = -0.1mA) / h_{FE}(I_C = -2mA) = 0.95$  (typ.)



Weight: 3.0mg (typ.)

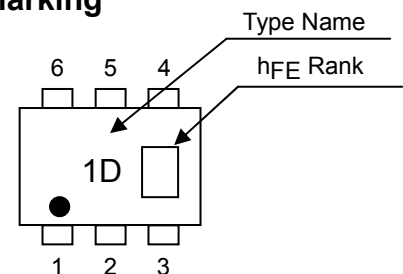
### Q1 Absolute Maximum Ratings (Ta = 25°C)

| 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   |

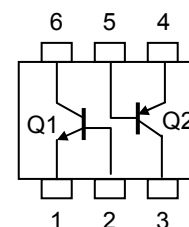
### Marking



### 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 to 150 | °C   |

### 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

Start of commercial production  
2000-05

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

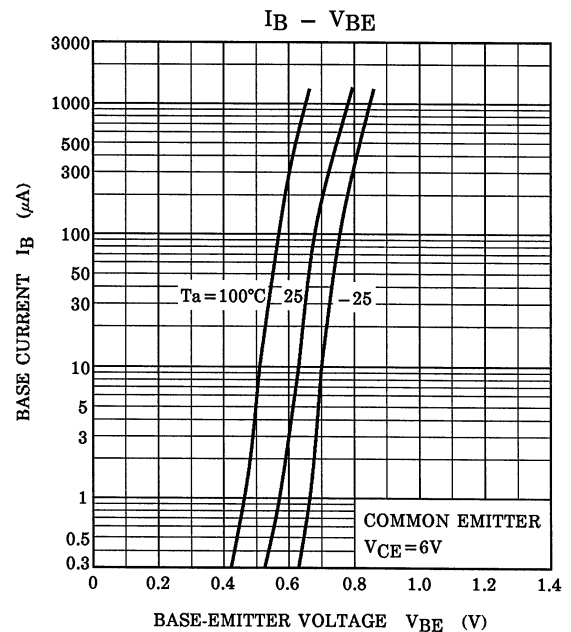
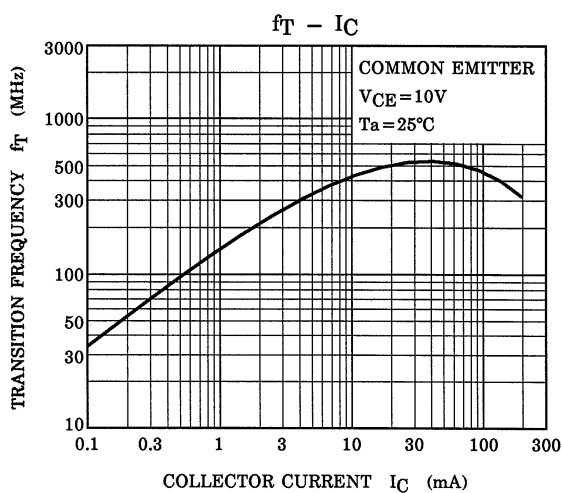
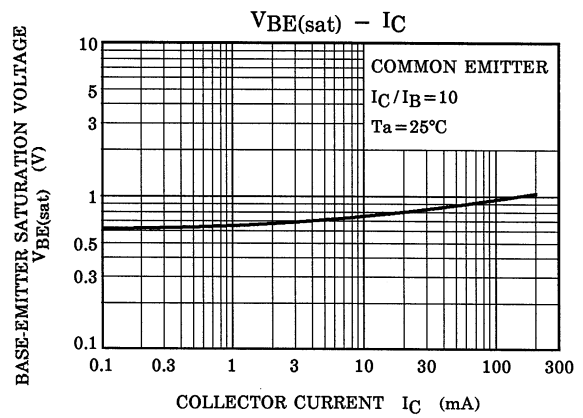
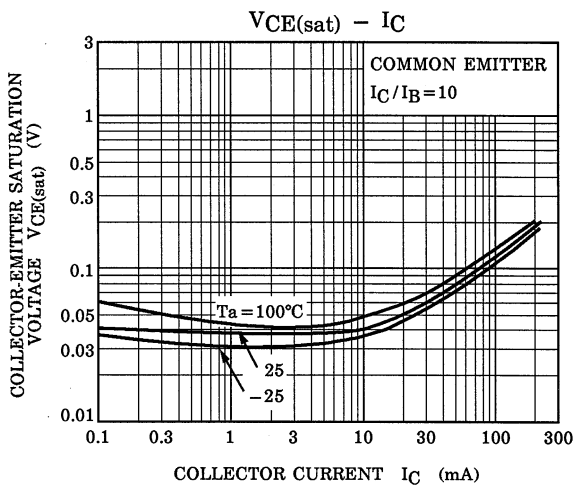
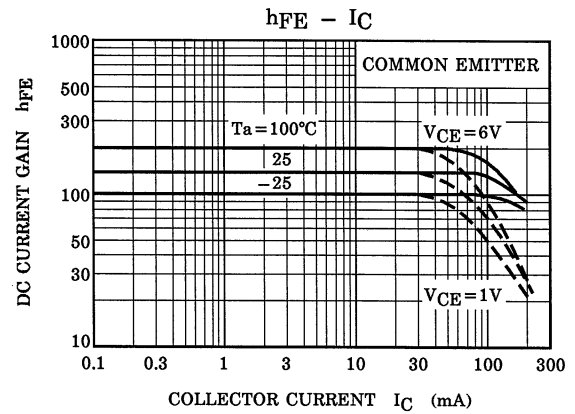
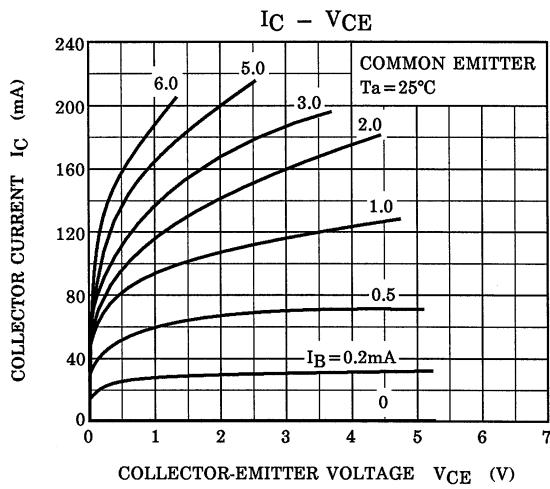
| Characteristic                       | Symbol          | Test Circuit | Test Condition                    | Min | Typ. | Max  | Unit    |
|--------------------------------------|-----------------|--------------|-----------------------------------|-----|------|------|---------|
| Collector cut-off current            | $I_{CBO}$       | —            | $V_{CB} = 60V, I_E = 0$           | —   | —    | 0.1  | $\mu A$ |
| Emitter cut-off current              | $I_{EBO}$       | —            | $V_{EB} = 5V, I_C = 0$            | —   | —    | 0.1  | $\mu A$ |
| 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)

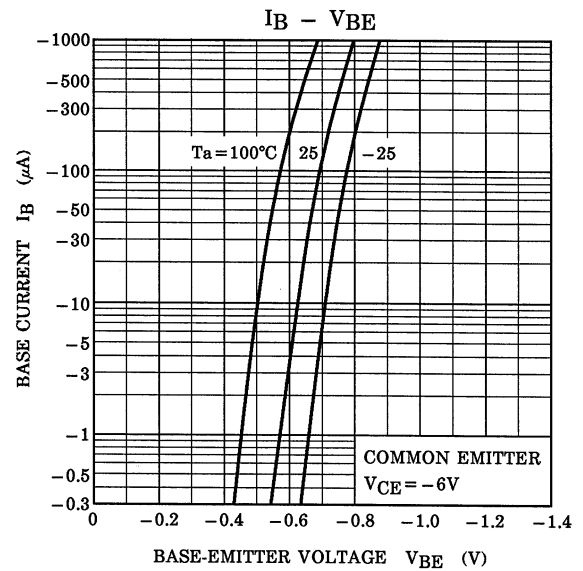
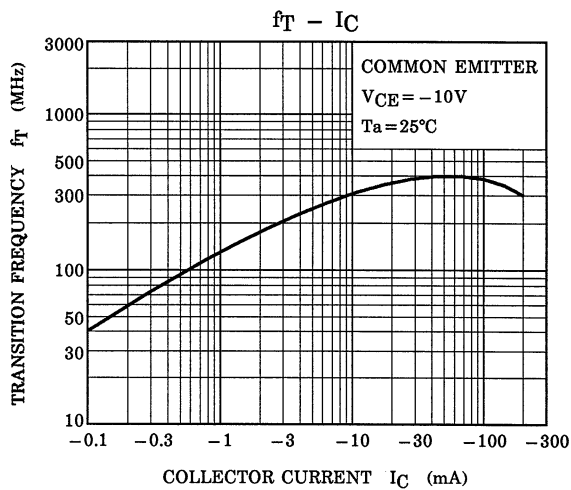
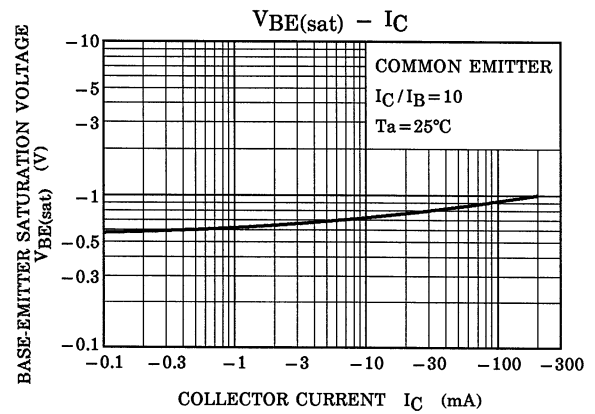
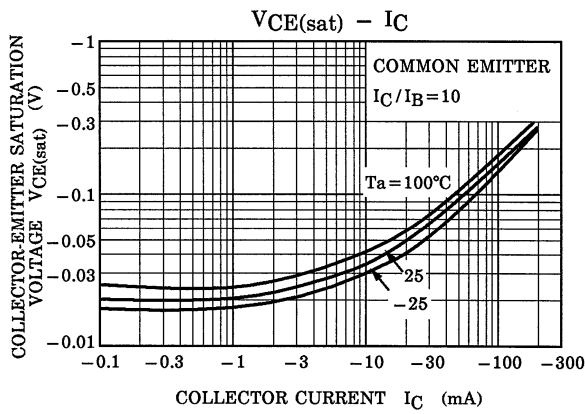
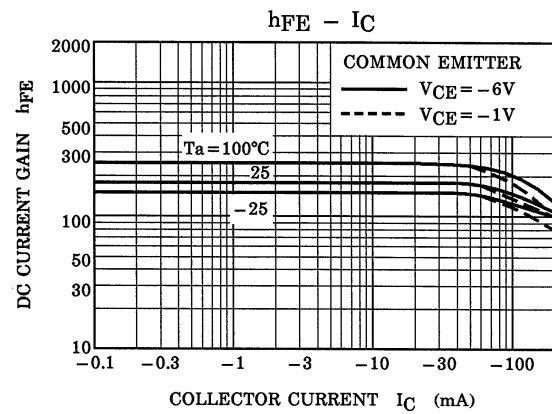
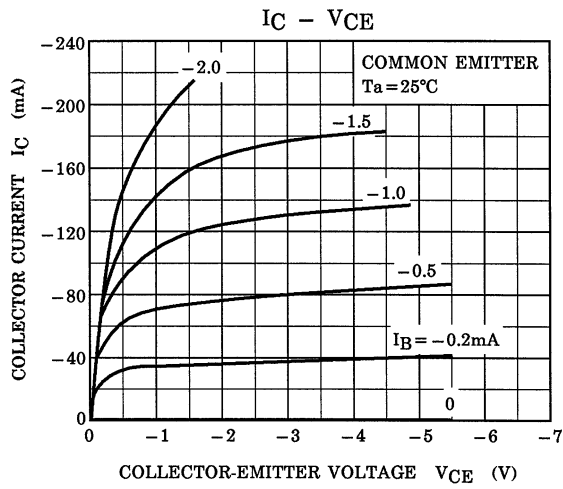
| Characteristic                       | Symbol          | Test Circuit | Test Condition                     | Min | Typ. | Max  | Unit    |
|--------------------------------------|-----------------|--------------|------------------------------------|-----|------|------|---------|
| Collector cut-off current            | $I_{CBO}$       | —            | $V_{CB} = -50V, I_E = 0$           | —   | —    | -0.1 | $\mu A$ |
| Emitter cut-off current              | $I_{EBO}$       | —            | $V_{EB} = -5V, I_C = 0$            | —   | —    | -0.1 | $\mu A$ |
| 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 to 240, GR (G): 200 to 400  
 ( ) Marking Symbol

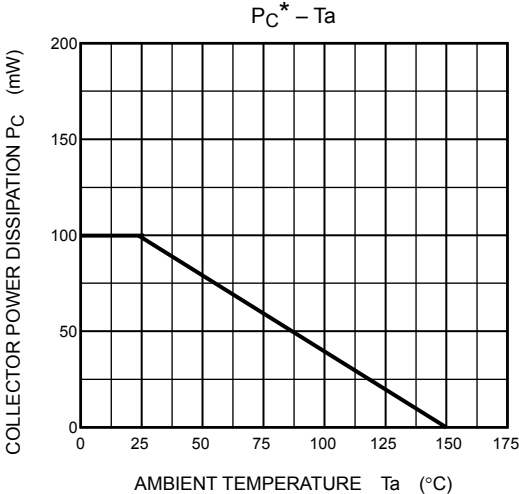
## Q1 (NPN transistor)



## Q2 (PNP transistor)



(Q1, Q2 Common)



\*:Total Rating

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