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

# HN4B04J

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

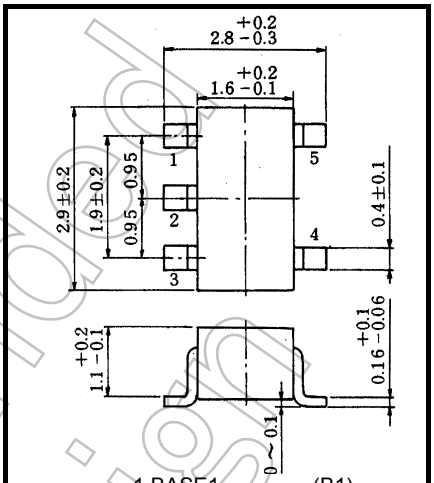
Q1:

- 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

Unit: mm




| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 2-3L1A |

Weight: 0.014g (typ.)

## 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 |

## 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. Power dissipation per element should not exceed 200mW.

Start of commercial production
2000-06

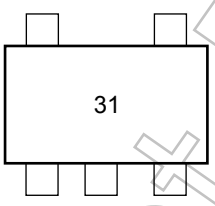
## Q1 Electrical Characteristics (Ta = 25°C)

| 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 | — | 240 | |
| | $h_{FE(2)}$ | — | $V_{CE}$ = −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 | — | 13 | — | pF |

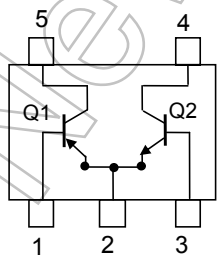
## Q2 Electrical Characteristics (Ta = 25°C)

| 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 | — | 240 | |
| | $h_{FE(2)}$ | — | $V_{CE}$ = 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 |

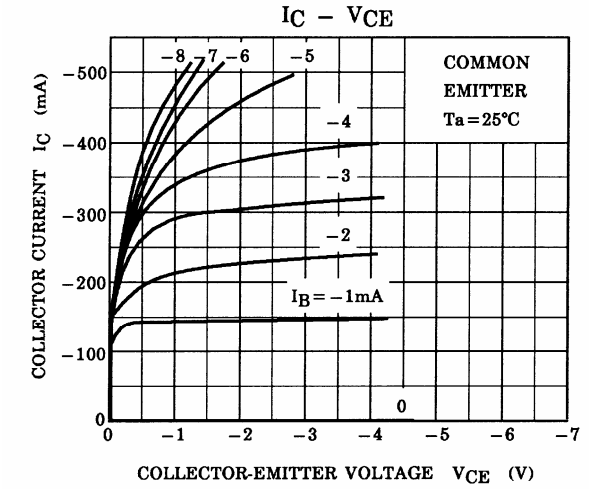
**Marking**

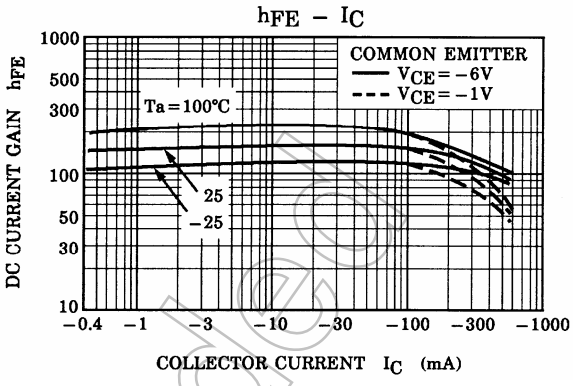


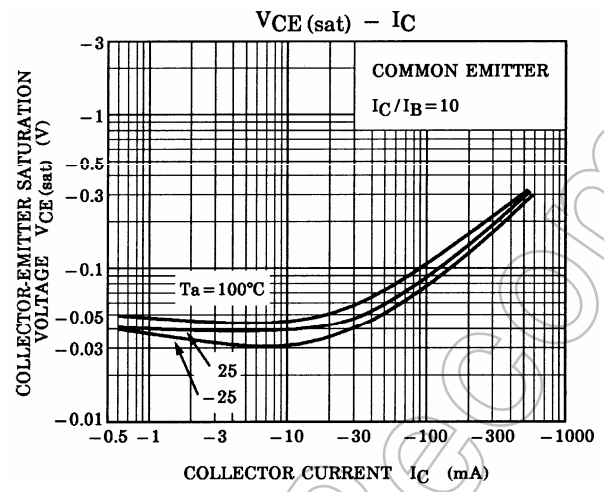

**Equivalent Circuit (Top View)**

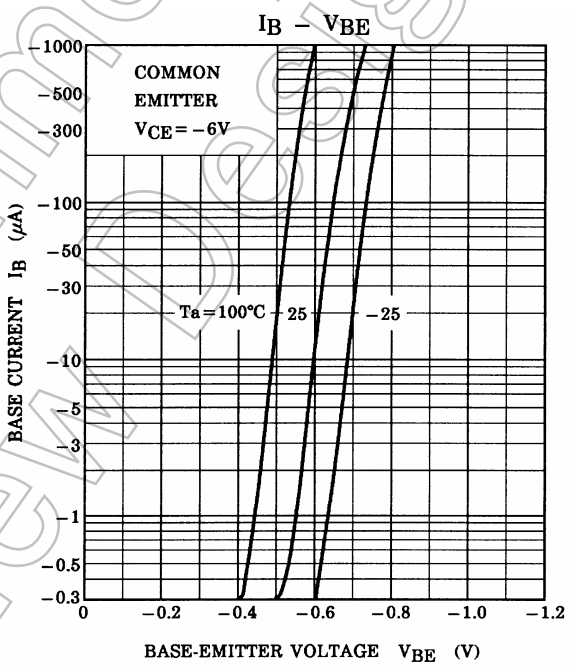


## Q1 (PNP transistor)

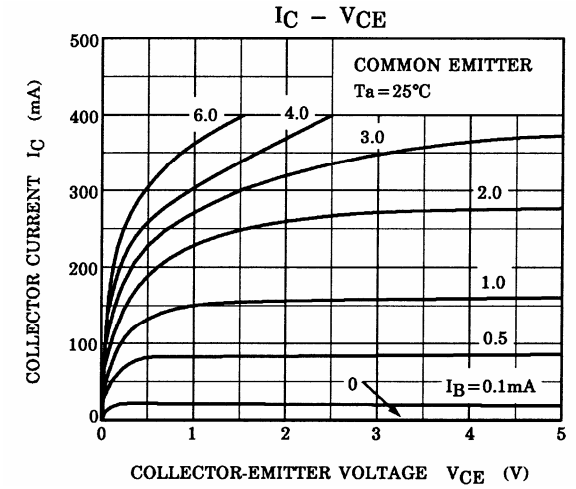


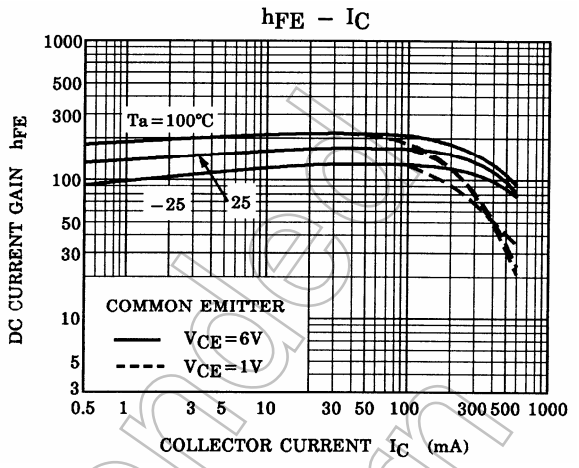



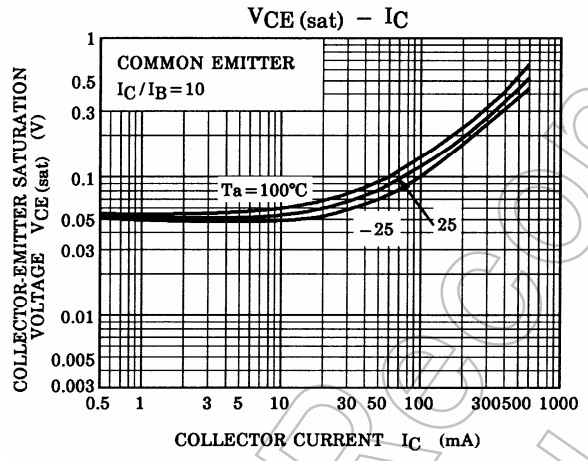



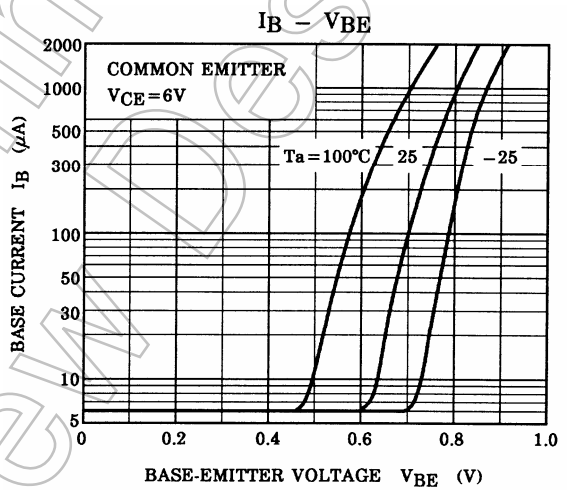



## Q2 (NPN transistor)

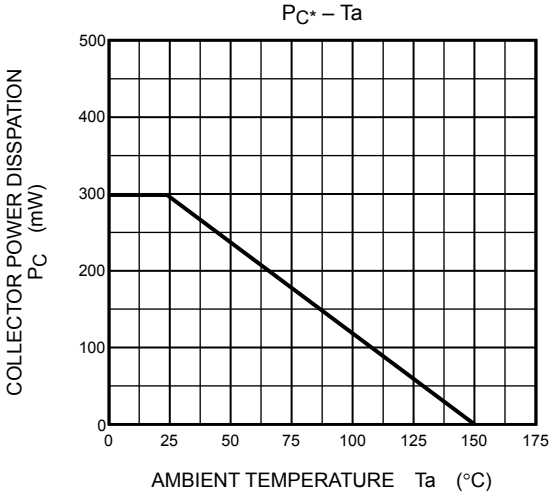


**(Q1,Q2 Common)**




*Total Rating.

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