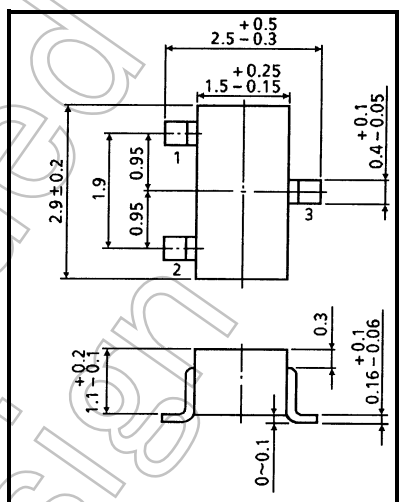
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process)

# 2SC3324

## Audio Frequency General Purpose Amplifier Applications

- High voltage: $V_{CEO}$ = 120 V
- Excellent $h_{FE}$ linearity: $h_{FE}$ ($I_C$ = 0.1 mA)/ $h_{FE}$ ($I_C$ = 2 mA) = 0.95 (typ.)
- High $h_{FE}$: $h_{FE}$ = 200 to 700
- Low noise: NF (2) = 0.2dB (typ.), 3dB (max)
- Complementary to 2SA1312
- Small package

Unit: mm




| | |
|---|---|
| JEDEC | TO-236MOD |
| JEITA | SC-59 |
| TOSHIBA | 2-3F1A |

Weight: 0.012 g (typ.)

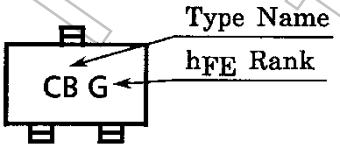
### Absolute Maximum Ratings (Ta = 25°C)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | 120 | V |
| Collector-emitter voltage | $V_{CEO}$ | 120 | V |
| Emitter-base voltage | $V_{EBO}$ | 5 | V |
| Collector current | $I_C$ | 100 | mA |
| Base current | $I_B$ | 20 | mA |
| Collector power dissipation | $P_C$ (Note 1,2) | 200 | mW |
| Junction temperature | $T_j$ (Note 2) | 150 | °C |
| Storage temperature range | $T_{stg}$ (Note 2) | −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).

Note 1: Mounted on a FR4 board. (25.4 mm × 25.4 mm × 1.6 mm, Cu pad: 0.8 $mm^2$ × 3)
Note 2: There are products which can support $P_C$: 150mW, $T_j$: 125 °C, Tstg: -55 to 125 °C.
Please contact our sales for detail information.

### Marking




Start of commercial production
1982-12

## Electrical Characteristics (Ta = 25°C)

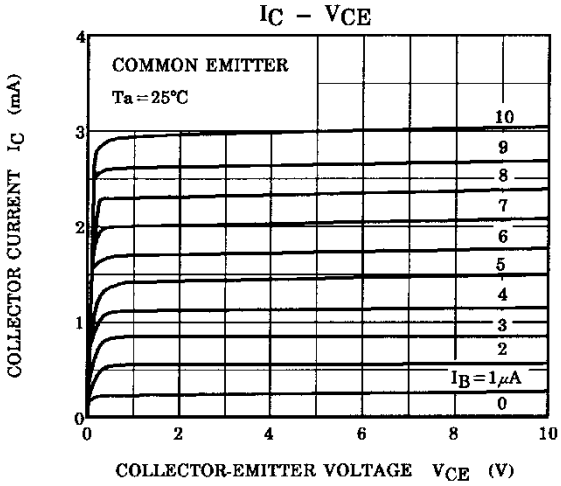
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector cut-off current | $I_{CBO}$ | $V_{CB}$ = 120 V, $I_E$ = 0 A | — | — | 0.1 | μA |
| Emitter cut-off current | $I_{EBO}$ | $V_{EB}$ = 5 V, $I_C$ = 0 A | — | — | 0.1 | μA |
| DC current gain | $h_{FE}$ (Note) | $V_{CE}$ = 6 V, $I_C$ = 2 mA | 200 | — | 700 | — |
| Collector-emitter saturation voltage | $V_{CE\ (sat)}$ | $I_C$ = 10 mA, $I_B$ = 1 mA | — | — | 0.3 | V |
| Transition frequency | $f_T$ | $V_{CE}$ = 6 V, $I_C$ = 1 mA | — | 100 | — | MHz |
| Collector output capacitance | $C_{ob}$ | $V_{CB}$ = 10 V, $I_E$ = 0 A, f = 1 MHz | — | 3 | — | pF |
| Noise figure | NF (1) | $V_{CB}$ = 6 V, $I_C$ = 0.1 mA, f = 100 Hz, Rg = 10 kΩ | — | 0.5 | 6 | dB |
| | NF (2) | $V_{CB}$ = 6 V, $I_C$ = 0.1 mA, f = 1 kHz, Rg = 10 kΩ | — | 0.2 | 3 | |

Note: $h_{FE}$ classification GR (G): 200 to 400, BL (L): 350 to 700

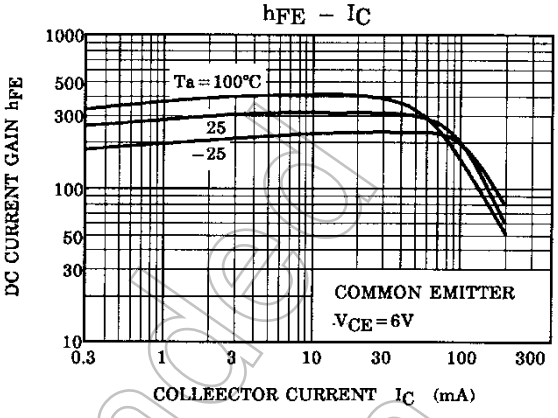
( ) marking symbol

## Characteristics Curves

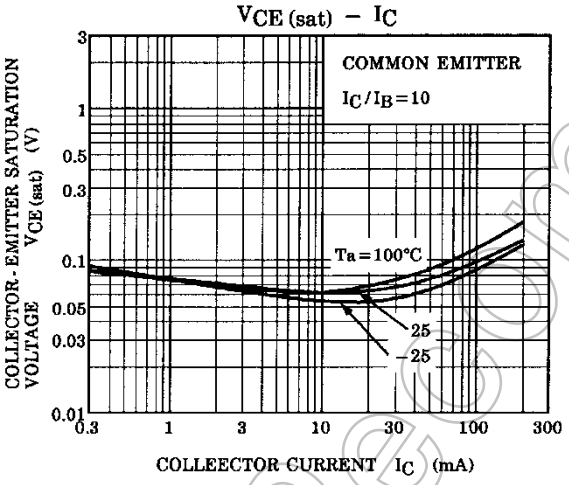
$I_C$ – $V_{CE}$



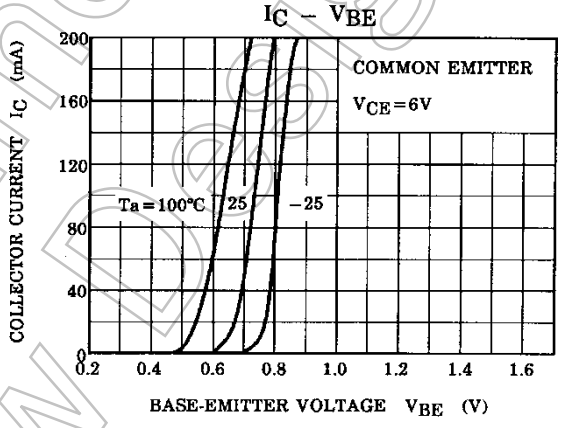

$h_{FE}$ – $I_C$



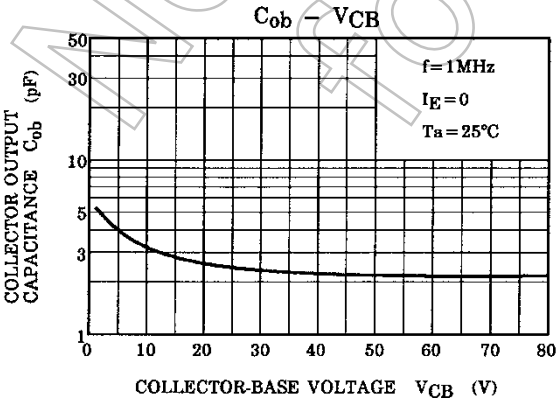

$V_{CE\,(sat)}$ – $I_C$



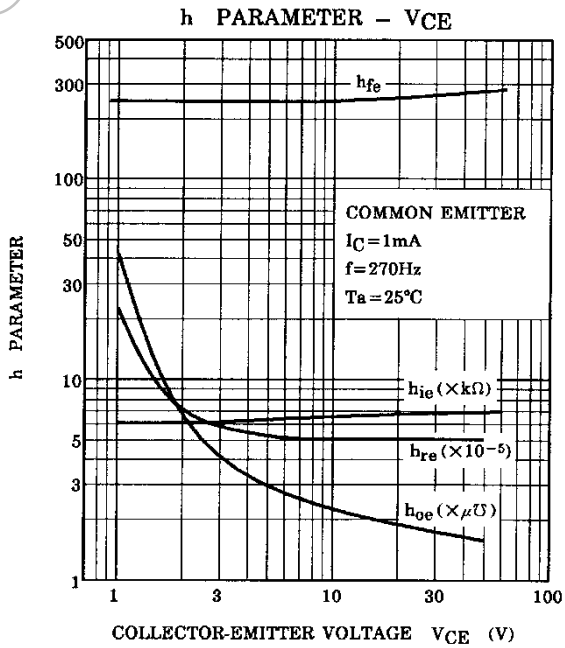

$I_C$ – $V_{BE}$

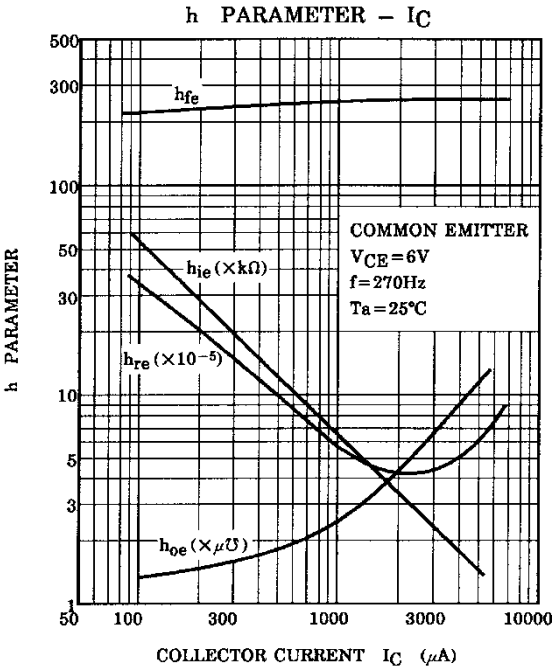


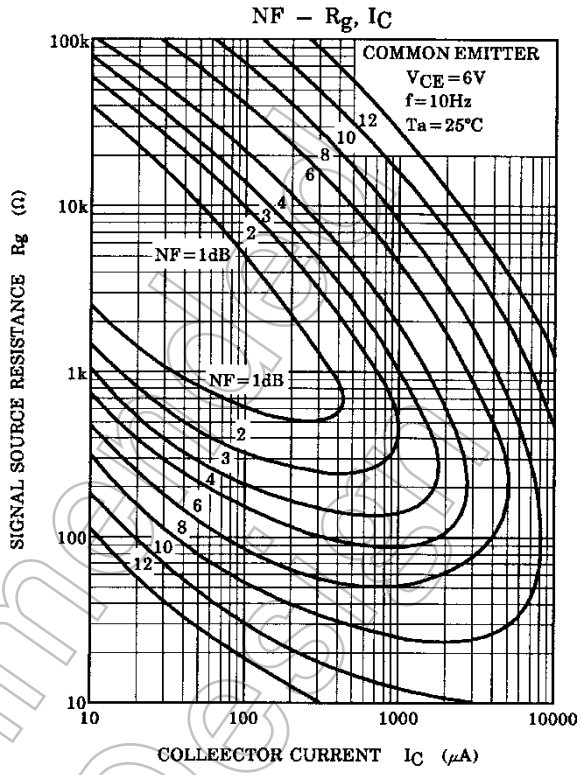

$C_{ob}$ – $V_{CB}$

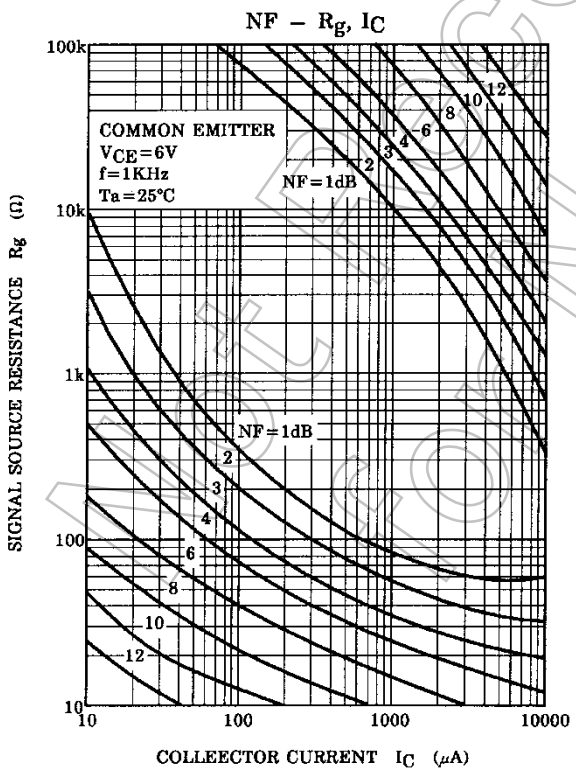


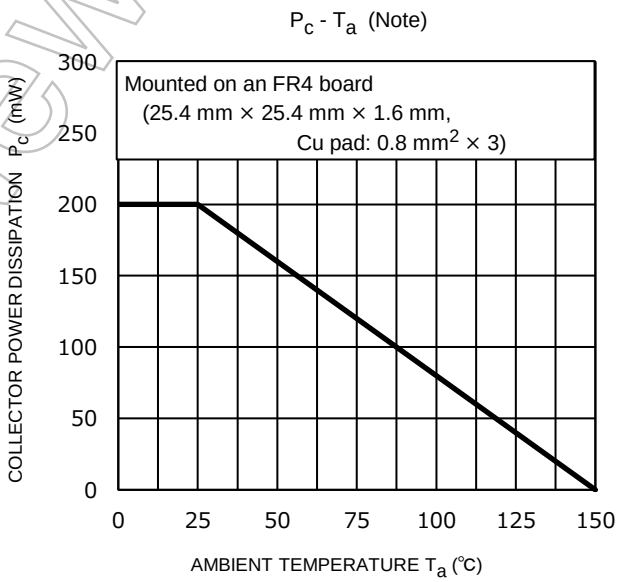

h PARAMETER – $V_{CE}$






Note: The above characteristics curves are reference only with a junction temperature $T_j$ of 150 °C.

The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

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