Bipolar Transistors Silicon PNP/NPN Epitaxial Type (PCT Process)(Bias Resistor built-in Transistor)

# RN4908FE

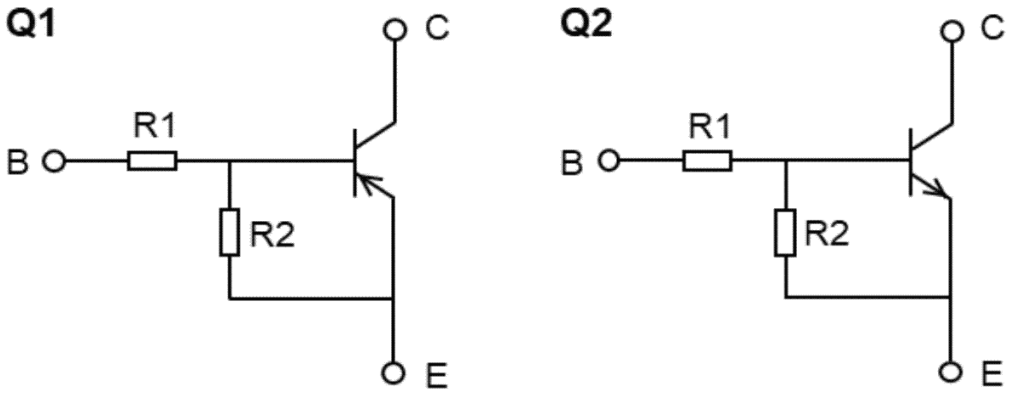
## 1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

## 2. Features

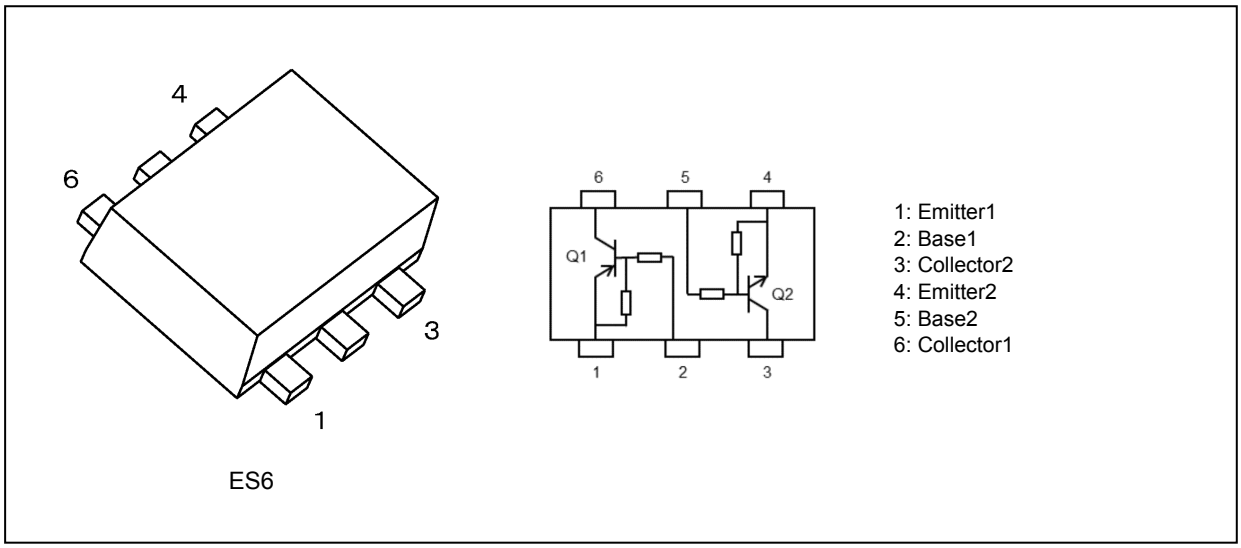
(1) AEC-Q101 qualified
(2) Small package (Dual type)
(3) The integrated bias resistor reduces the number of external parts required, making it possible to reduce system size and assembly time.

## 3. Equivalent Circuit




Note: R1 = 22 kΩ, R2 = 47 kΩ (Q1, Q2 Common)

## 4. Packaging and Pin Assignment




Start of commercial production
2000-05

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## 5. Q1 Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | -50 | V |
| Collector-emitter voltage | $V_{CEO}$ | -50 | |
| Emitter-base voltage | $V_{EBO}$ | -7 | |
| Collector current | $I_C$ | -100 | mA |

## 6. Q2 Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-base voltage | $V_{CBO}$ | 50 | V |
| Collector-emitter voltage | $V_{CEO}$ | 50 | |
| Emitter-base voltage | $V_{EBO}$ | 7 | |
| Collector current | $I_C$ | 100 | mA |

## 7. Q1, Q2 Common Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Collector power dissipation | (Note 1) | $P_C$ | 100 | mW |
| Junction temperature | | $T_j$ | 150 | °C |
| Storage temperature | | $T_{stg}$ | -55 to 150 | |

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: Total rating

## 8. Q1 Electrical Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector cut-off current | $I_{CBO}$ | $V_{CB}$ = -50 V, $I_E$ = 0 mA | — | — | -100 | nA |
| Collector cut-off current | $I_{CEO}$ | $V_{CE}$ = -50 V, $I_B$ = 0 mA | — | — | -500 | |
| Emitter cut-off current | $I_{EBO}$ | $V_{EB}$ = -7 V, $I_C$ = 0 mA | -0.078 | — | -0.145 | mA |
| DC current gain | $h_{FE}$ | $V_{CE}$ = -5 V, $I_C$ = -10 mA | 80 | — | — | — |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$ = -5 mA, $I_B$ = -0.25 mA | — | -0.1 | -0.3 | V |
| Input voltage (ON) | $V_{I(ON)}$ | $V_{CE}$ = -0.2 V, $I_C$ = -5 mA | -1.0 | — | -2.6 | |
| Input voltage (off) | $V_{I(off)}$ | $V_{CE}$ = -5 V, $I_C$ = -0.1 mA | -0.6 | — | -1.16 | |
| Transition frequency | $f_T$ | $V_{CE}$ = -10 V, $I_C$ = -5 mA | — | 200 | — | MHz |
| Collector output capacitance | $C_{ob}$ | $V_{CB}$ = -10 V, $I_E$ = 0 mA, f = 1 MHz | — | 3 | 6 | pF |

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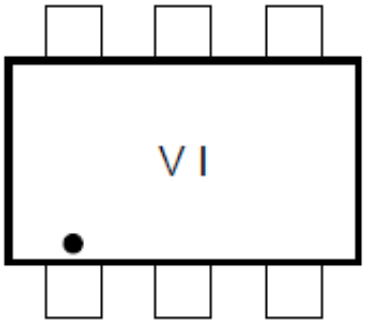
## 9. Q2 Electrical Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Collector cut-off current | $I_{CBO}$ | $V_{CB}$ = 50 V, $I_E$ = 0 mA | — | — | 100 | nA |
| Collector cut-off current | $I_{CEO}$ | $V_{CE}$ = 50 V, $I_B$ = 0 mA | — | — | 500 | |
| Emitter cut-off current | $I_{EBO}$ | $V_{EB}$ = 7 V, $I_C$ = 0 mA | 0.078 | — | 0.145 | mA |
| DC current gain | $h_{FE}$ | $V_{CE}$ = 5 V, $I_C$ = 10 mA | 80 | — | — | — |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C$ = 5 mA, $I_B$ = 0.25 mA | — | 0.1 | 0.3 | V |
| Input voltage (ON) | $V_{I(ON)}$ | $V_{CE}$ = 0.2 V, $I_C$ = 5 mA | 1.0 | — | 2.6 | |
| Input voltage (off) | $V_{I(off)}$ | $V_{CE}$ = 5 V, $I_C$ = 0.1 mA | 0.6 | — | 1.16 | |
| Transition frequency | $f_T$ | $V_{CE}$ = 10 V, $I_C$ = 5 mA | — | 250 | — | MHz |
| Collector output capacitance | $C_{ob}$ | $V_{CB}$ = 10 V, $I_E$ = 0 mA, f = 1 MHz | — | 3 | 6 | pF |

## 10. Q1, Q2 Common Electrical Characteristics (Unless otherwise specified, $T_a$ = 25 °C)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Input resistance | $R_1$ | - | 15.4 | 22 | 28.6 | kΩ |
| Resistor ratio | R1/R2 | - | 0.421 | 0.468 | 0.515 | — |

## 11. Marking

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## 12. Characteristics Curves (Note)

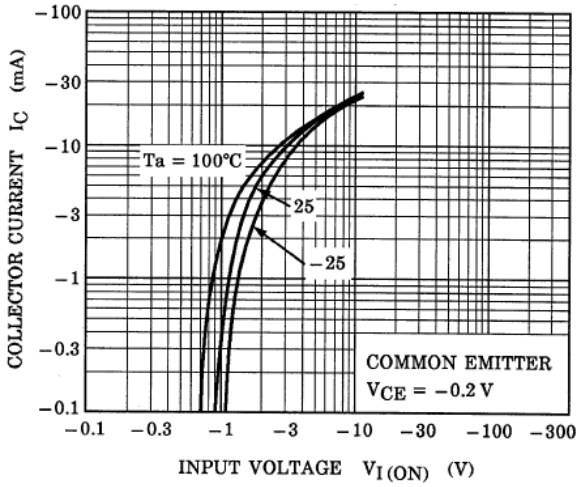


Fig. 12.1 Q1 $I_C$-$V_{I(ON)}$

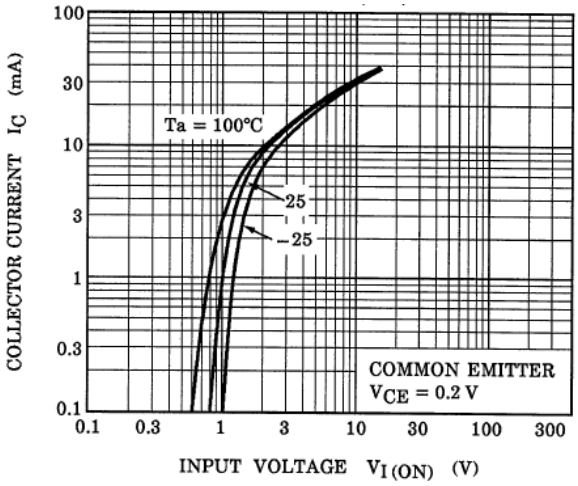


Fig. 12.2 Q2 $I_C$-$V_{I(ON)}$

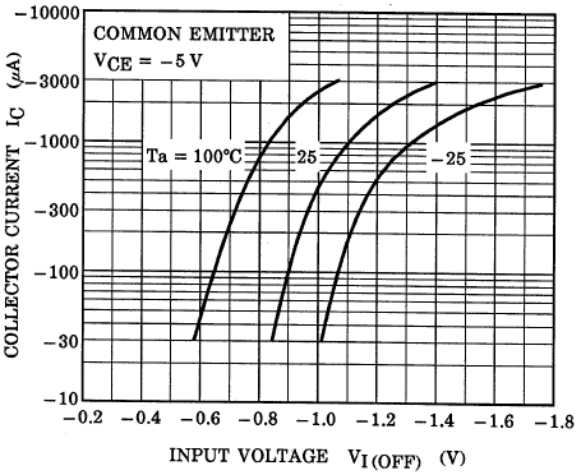


Fig. 12.3 Q1 $I_C$-$V_{I(OFF)}$

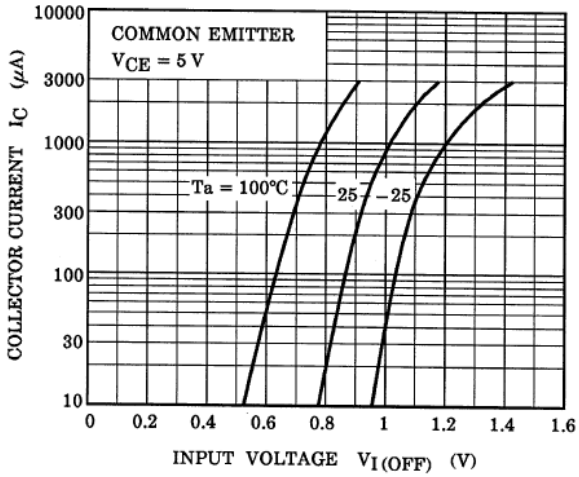


Fig. 12.4 Q2 $I_C$-$V_{I(OFF)}$

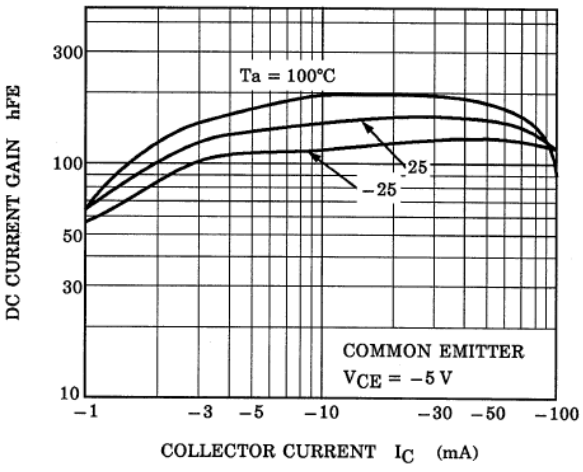


Fig. 12.5 Q1 $h_{FE}$-$I_C$

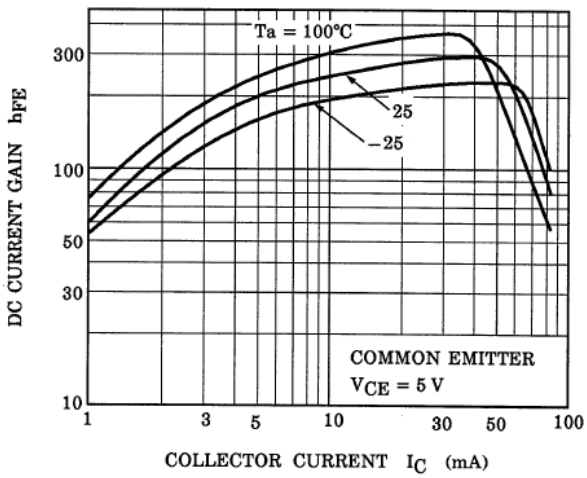


Fig. 12.6 Q2 $h_{FE}$-$I_C$

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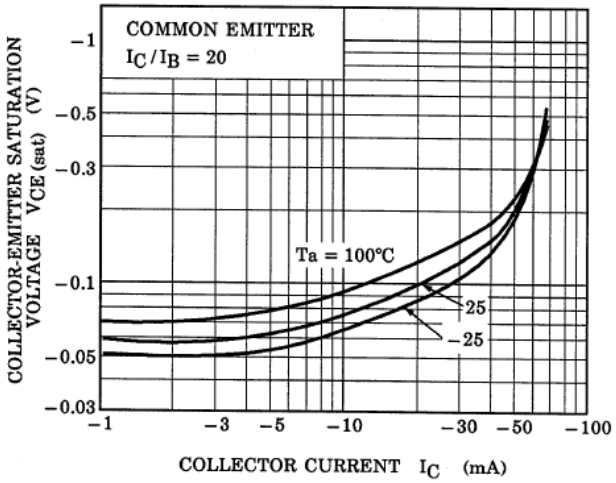


Fig. 12.7 Q1 $V_{CE(sat)}$-$I_C$

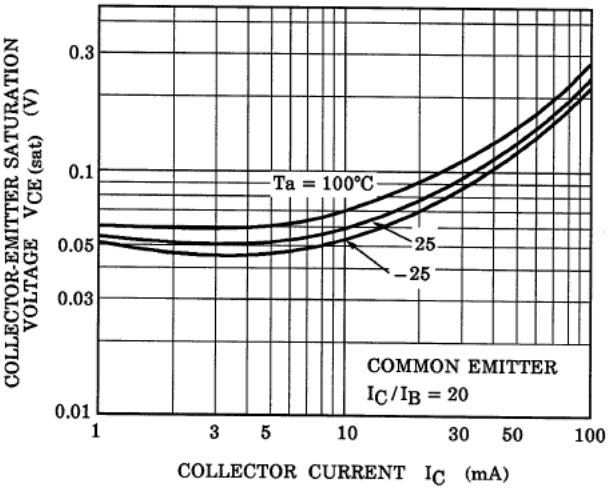


Fig. 12.8 Q2 $V_{CE(sat)}$-$I_C$

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

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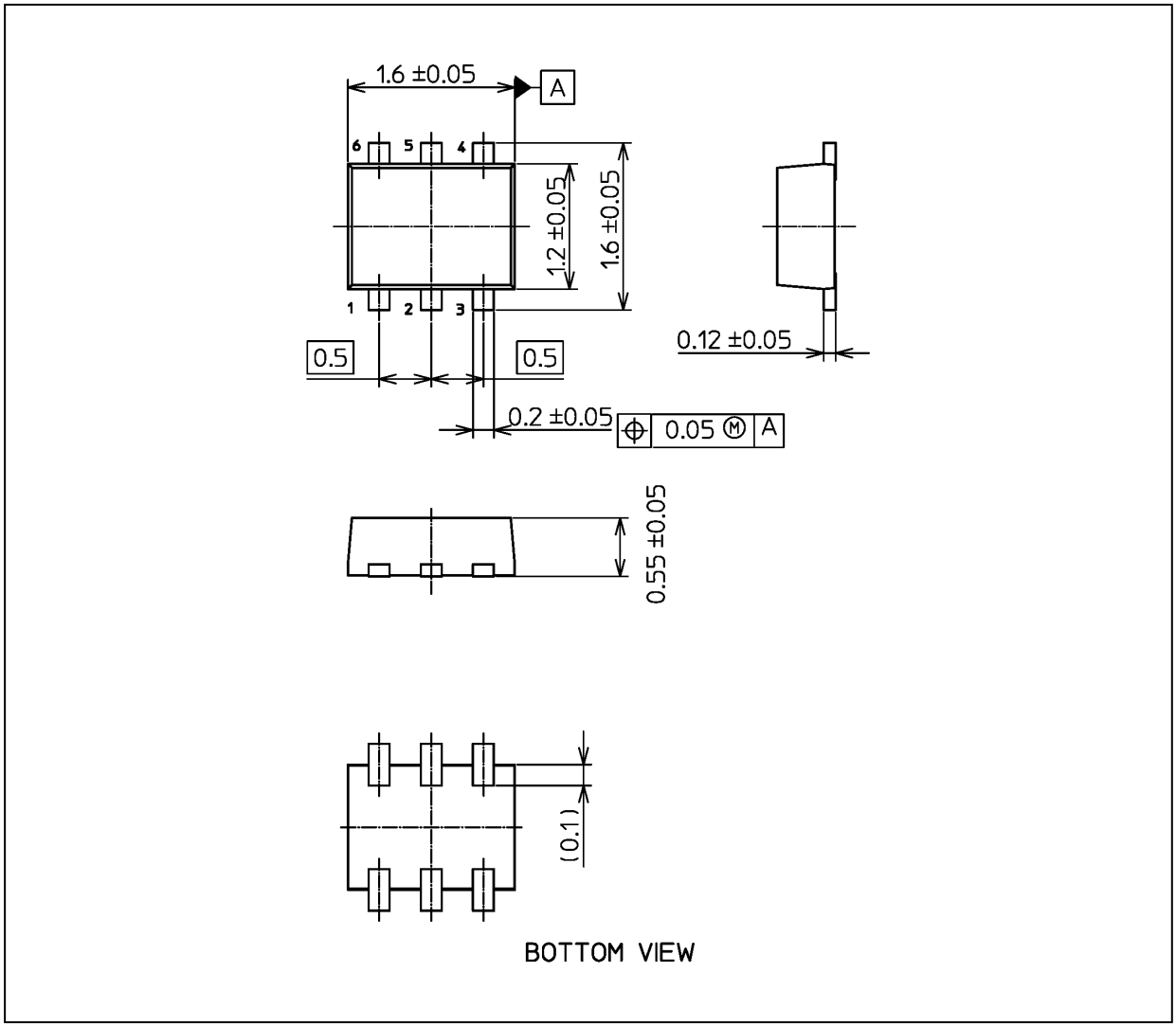
## Package Dimensions

Unit: mm




Weight: 3.0 mg (typ.)

| Package Name(s) |
| --- |
| Nickname: ES6 |

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