

TOSHIBA Transistor Silicon PNP · NPN Epitaxial Type  
(PCT Process) (Bias Resistor Built-in Transistor)

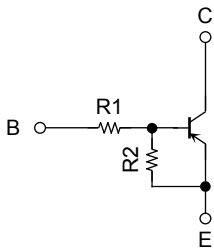
RN4909FE

Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications

- Two devices are incorporated into an Extreme-Super-Mini (6-pin) package.
- Incorporating a bias resistor into a transistor reduces parts count.  
Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

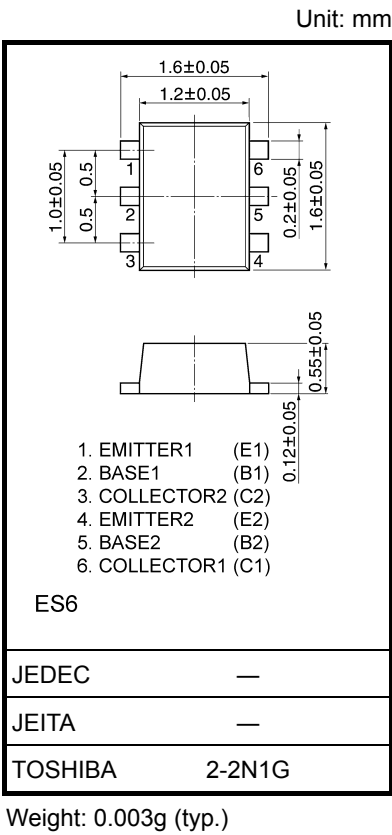
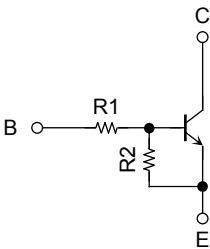
Equivalent Circuit and Bias Resistor Values

Q1

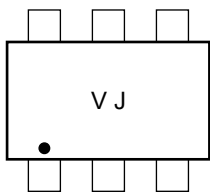


R1: 47 kΩ  
R2: 22 kΩ  
(Q1, Q2 common)

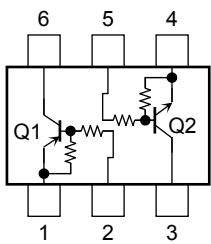
Q2



Marking



Equivalent Circuit (top view)



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

| Characteristics           | Symbol           | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage    | V <sub>CBO</sub> | –50    | V    |
| Collector-emitter voltage | V <sub>CEO</sub> | –50    | V    |
| Emitter-base voltage      | V <sub>EBO</sub> | –15    | V    |
| Collector current         | I <sub>C</sub>   | –100   | mA   |

## Absolute Maximum Ratings (Ta = 25°C) (Q2)

| Characteristics           | Symbol           | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage    | V <sub>CBO</sub> | 50     | V    |
| Collector-emitter voltage | V <sub>CEO</sub> | 50     | V    |
| Emitter-base voltage      | V <sub>EBO</sub> | 15     | V    |
| Collector current         | I <sub>C</sub>   | 100    | mA   |

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

| Characteristics             | Symbol                | Rating  | Unit |
|-----------------------------|-----------------------|---------|------|
| Collector power dissipation | P <sub>C</sub> (Note) | 100     | mW   |
| Junction temperature        | T <sub>j</sub>        | 150     | °C   |
| Storage temperature range   | T <sub>stg</sub>      | –55~150 | °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: Total rating

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

| Characteristics                      | Symbol            | Test Condition                                     | Min    | Typ. | Max    | Unit |
|--------------------------------------|-------------------|----------------------------------------------------|--------|------|--------|------|
| Collector cut-off current            | $I_{CBO}$         | $V_{CB} = -50\text{ V}, I_E = 0$                   | —      | —    | -100   | nA   |
|                                      | $I_{CEO}$         | $V_{CE} = -50\text{ V}, I_B = 0$                   | —      | —    | -500   |      |
| Emitter cut-off current              | $I_{EBO}$         | $V_{EB} = -15\text{ V}, I_C = 0$                   | -0.167 | —    | -0.311 | mA   |
| DC current gain                      | $h_{FE}$          | $V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$        | 70     | —    | —      |      |
| Collector-emitter saturation voltage | $V_{CE(sat)}$     | $I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$        | —      | -0.1 | -0.3   | V    |
| Input voltage (ON)                   | $V_I(\text{ON})$  | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$       | -2.2   | —    | -5.8   | V    |
| Input voltage (OFF)                  | $V_I(\text{OFF})$ | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$       | -1.5   | —    | -2.6   | V    |
| Transition frequency                 | $f_T$             | $V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$        | —      | 200  | —      | MHz  |
| Collector output capacitance         | $C_{ob}$          | $V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | —      | 3    | 6      | pF   |

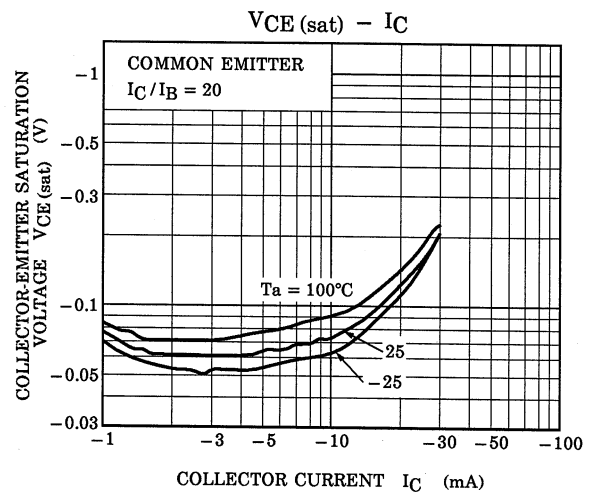
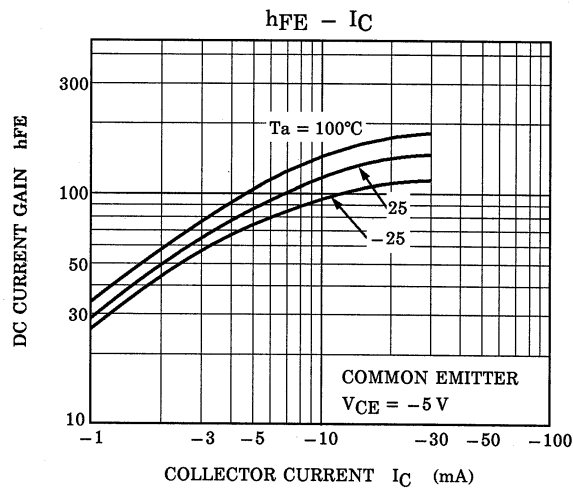
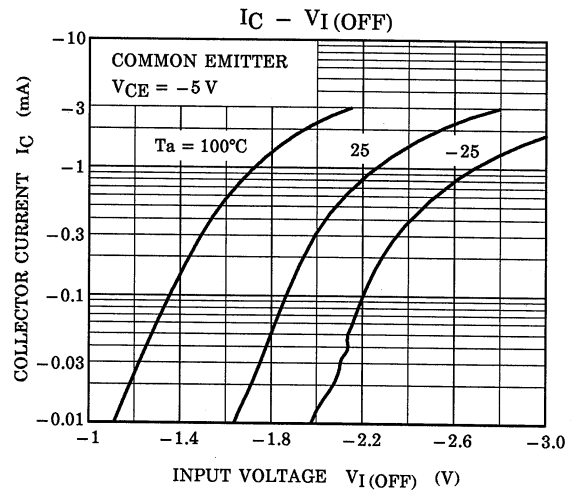
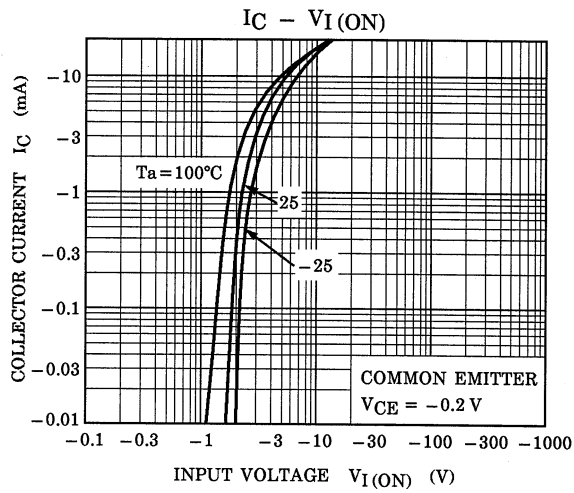
**Electrical Characteristics (Ta = 25°C) (Q2)**

| Characteristics                      | Symbol            | Test Condition                                    | Min   | Typ. | Max   | Unit |
|--------------------------------------|-------------------|---------------------------------------------------|-------|------|-------|------|
| Collector cut-off current            | $I_{CBO}$         | $V_{CB} = 50\text{ V}, I_E = 0$                   | —     | —    | 100   | nA   |
|                                      | $I_{CEO}$         | $V_{CE} = 50\text{ V}, I_B = 0$                   | —     | —    | 500   |      |
| Emitter cut-off current              | $I_{EBO}$         | $V_{EB} = 15\text{ V}, I_C = 0$                   | 0.167 | —    | 0.311 | mA   |
| DC current gain                      | $h_{FE}$          | $V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$         | 70    | —    | —     |      |
| Collector-emitter saturation voltage | $V_{CE(sat)}$     | $I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$         | —     | 0.1  | 0.3   | V    |
| Input voltage (ON)                   | $V_I(\text{ON})$  | $V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$        | 2.2   | —    | 5.8   | V    |
| Input voltage (OFF)                  | $V_I(\text{OFF})$ | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$        | 1.5   | —    | 2.6   | V    |
| Transition frequency                 | $f_T$             | $V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$         | —     | 250  | —     | MHz  |
| Collector output capacitance         | $C_{ob}$          | $V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | —     | 3    | 6     | pF   |

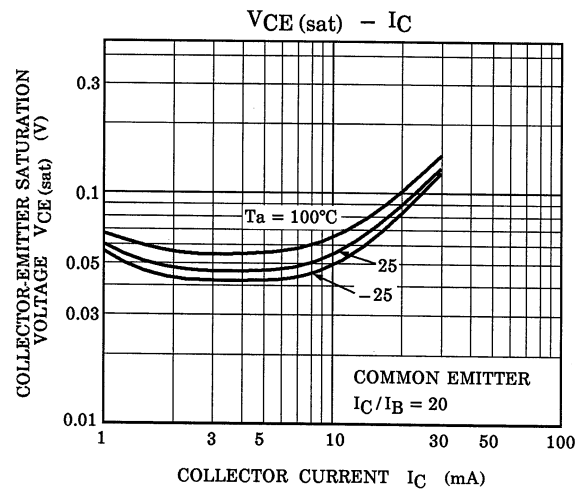
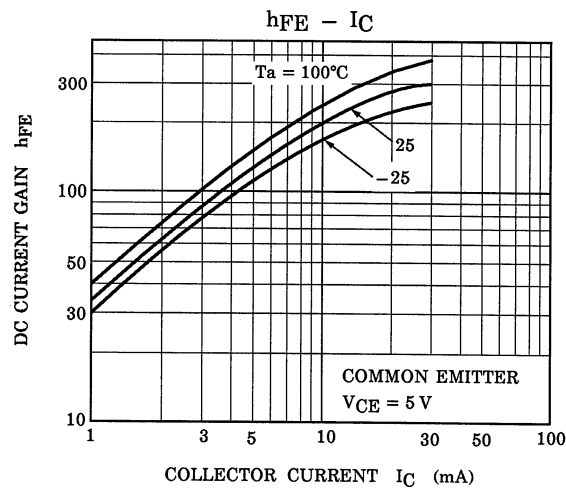
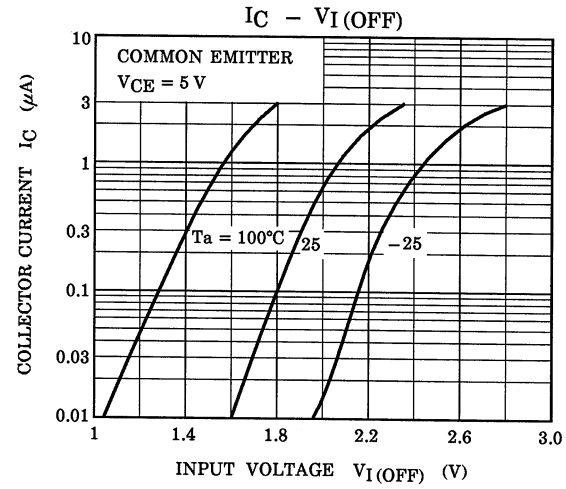
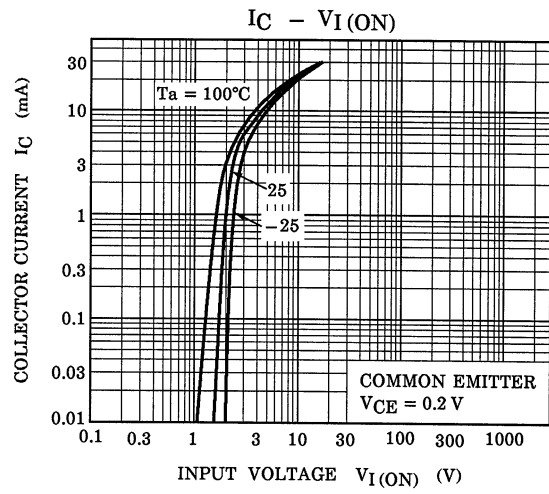
**Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)**

| Characteristics | Symbol | Test Condition | Min  | Typ. | Max  | Unit       |
|-----------------|--------|----------------|------|------|------|------------|
| Input resistor  | R1     | —              | 32.9 | 47   | 61.1 | k $\Omega$ |
| Resistor ratio  | R1/R2  | —              | 1.92 | 2.14 | 2.35 |            |

Q1



Q2



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