

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

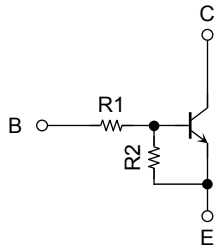
RN4989AFS

Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

- Two devices are incorporated into a fine-pitch, small-mold (6-pin) package.
- Incorporating a bias resistor into the transistor reduces the number of parts, so enabling the manufacture of ever more compact equipment and lowering assembly cost.

Equivalent Circuit and Bias Resistor Values

Q1

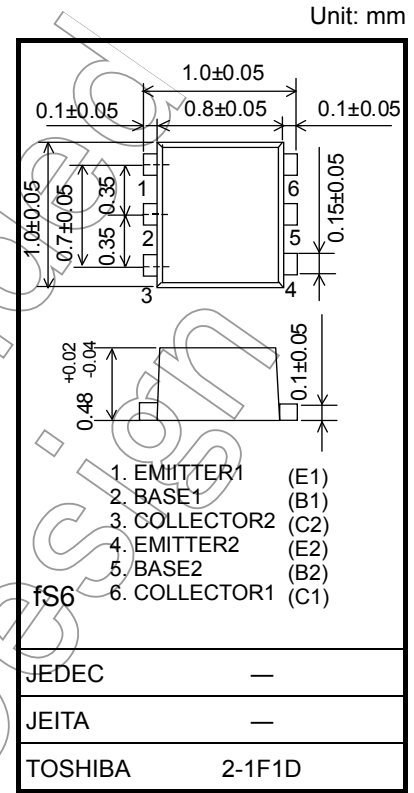
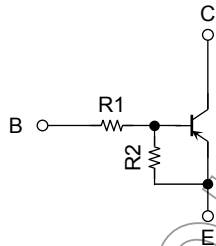


R1: 47 kΩ

R2: 22 kΩ

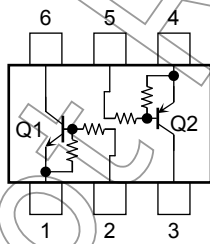
(Q1, Q2 common)

Q2

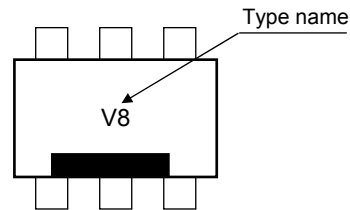


Weight: 0.001 g (typ.)

Equivalent Circuit (top view)



Marking



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

| Characteristic | Symbol | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage | V _{CBO} | 50 | V |
| Collector-emitter voltage | V _{CEO} | 50 | V |
| Emitter-base voltage | V _{EBO} | 15 | V |
| Collector current | I _C | 80 | mA |

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

| Characteristic | Symbol | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage | V _{CBO} | -50 | V |
| Collector-emitter voltage | V _{CEO} | -50 | V |
| Emitter-base voltage | V _{EBO} | -15 | V |
| Collector current | I _C | -80 | mA |

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

| Characteristic | Symbol | Rating | Unit |
|-----------------------------|-------------------------|---------|------|
| Collector power dissipation | P _C (Note 1) | 50 | mW |
| Junction temperature | T _j | 150 | °C |
| Storage temperature range | T _{stg} | -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)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|---------------|---|-------|------|-------|------|
| Collector cutoff 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 cutoff current | I_{EBO} | $V_{EB} = 15\text{ V}, I_C = 0$ | 0.182 | — | 0.271 | mA |
| DC current gain | h_{FE} | $V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$ | 70 | — | — | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$ | — | — | 0.15 | V |
| Input voltage (ON) | $V_I(ON)$ | $V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$ | 2.0 | — | 6.4 | V |
| Input voltage (OFF) | $V_I(OFF)$ | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$ | 1.5 | — | 2.6 | V |
| Collector output capacitance | C_{ob} | $V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | — | 0.7 | — | pF |

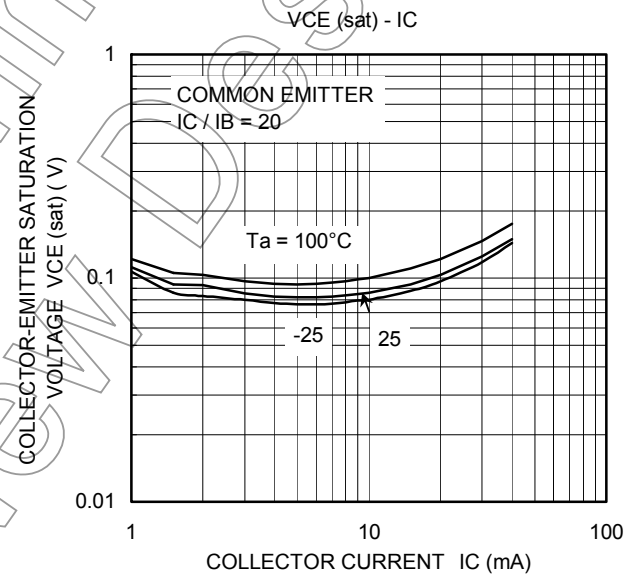
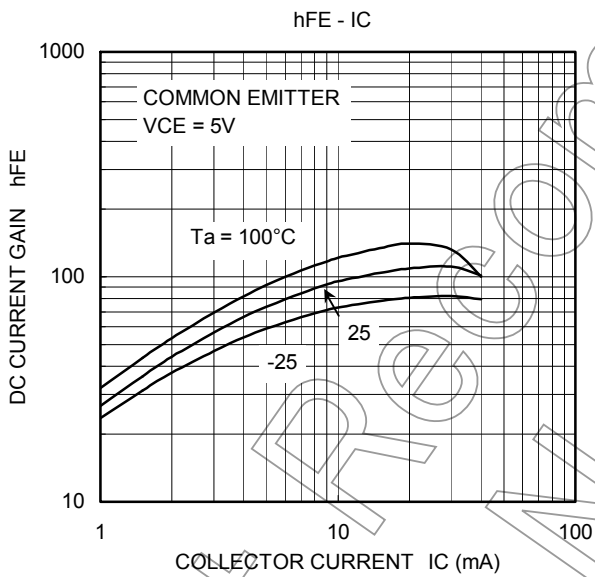
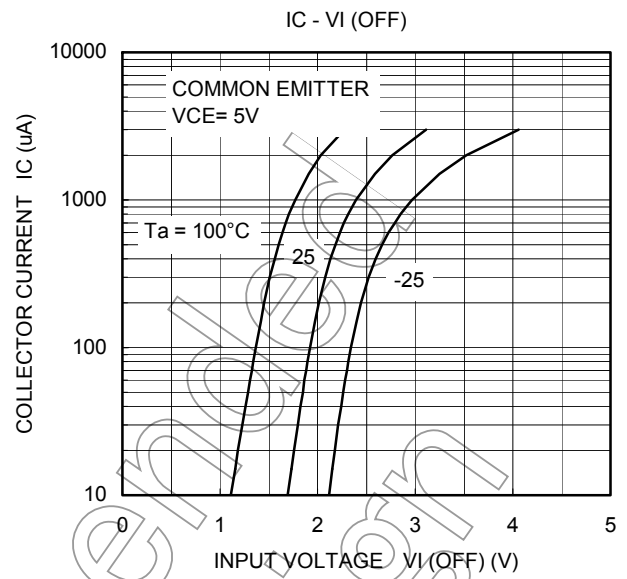
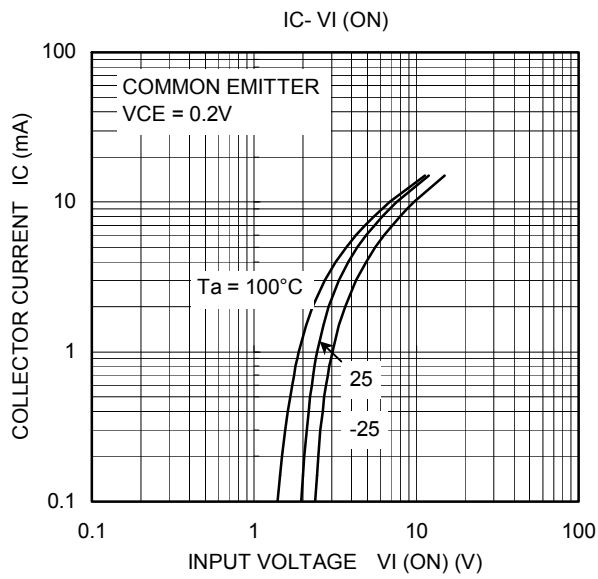
Electrical Characteristics (Ta = 25°C) (Q2)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|---------------|--|--------|------|--------|------|
| Collector cutoff 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 cutoff current | I_{EBO} | $V_{EB} = -15\text{ V}, I_C = 0$ | -0.182 | — | -0.271 | mA |
| DC current gain | h_{FE} | $V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$ | 70 | — | — | |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | $I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$ | — | — | -0.15 | V |
| Input voltage (ON) | $V_I(ON)$ | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$ | -2.0 | — | -6.4 | V |
| Input voltage (OFF) | $V_I(OFF)$ | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$ | -1.5 | — | -2.6 | V |
| Collector output capacitance | C_{ob} | $V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | — | 0.9 | — | pF |

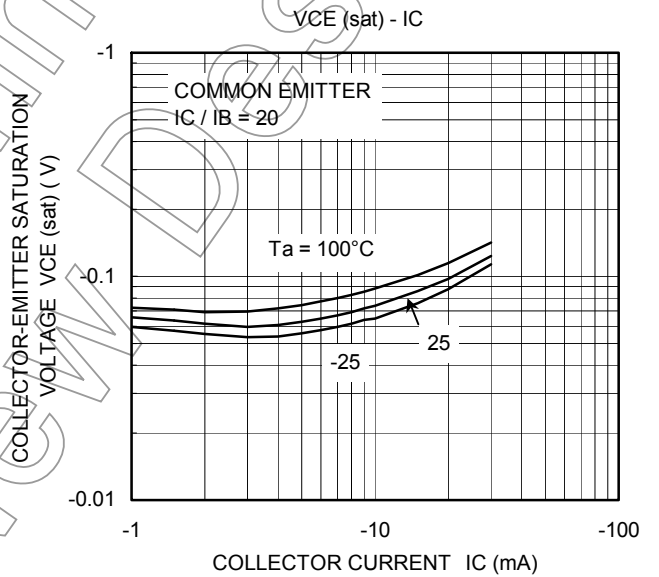
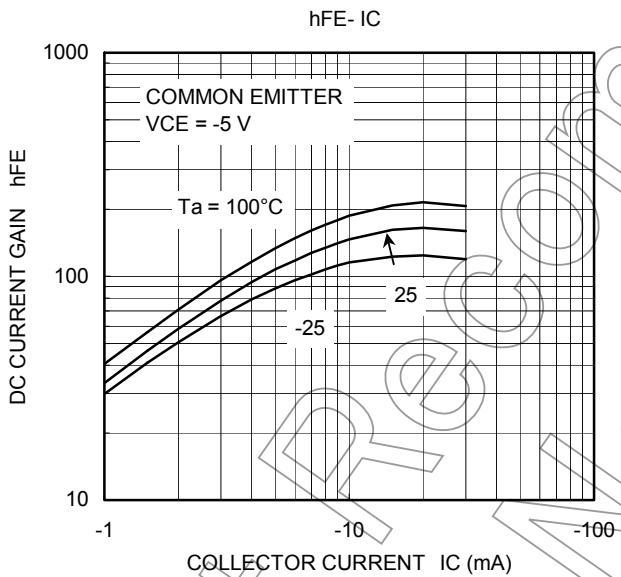
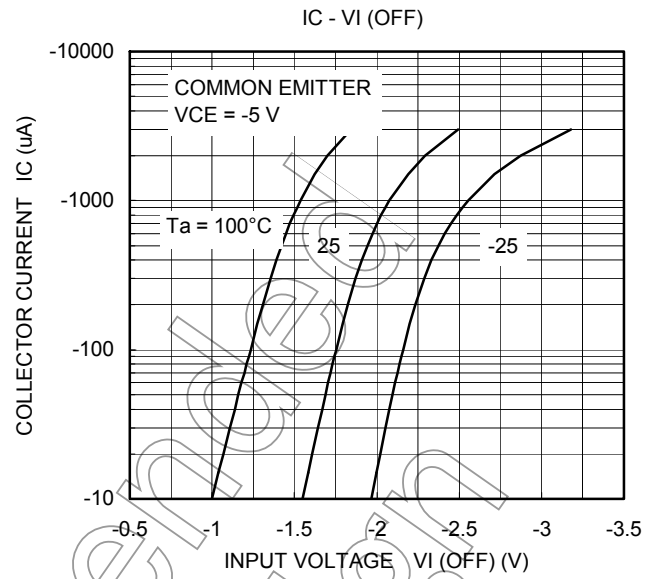
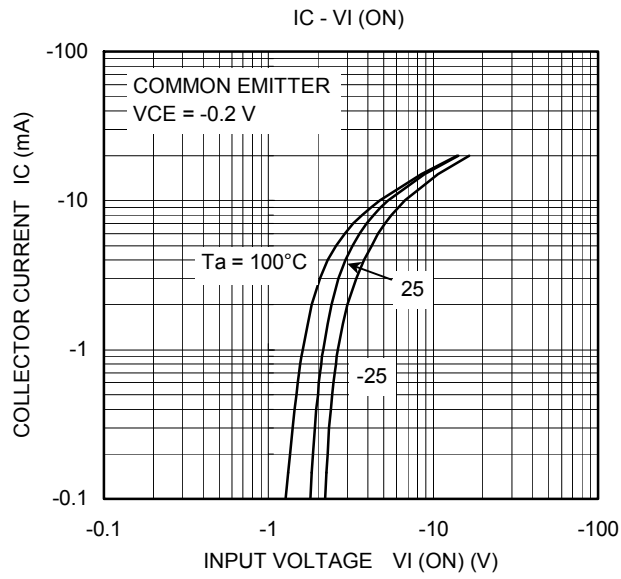
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

| Characteristic | Symbol | Test Condition | Min | Typ. | Max | Unit |
|----------------|--------|----------------|------|------|------|------------|
| Input resistor | R1 | — | 37.6 | 47 | 56.4 | k Ω |
| Resistor ratio | R1/R2 | — | 1.71 | 2.14 | 2.56 | |

Q1



Q2



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