

TOSHIBA Transistor Silicon PNP · NPN Epitaxial Type  
(PCT process) (Bias Resistor built-in Transistor)

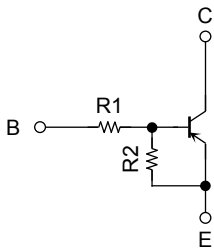
RN49A1

Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications

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

Equivalent Circuit and Bias Resistor Values

Q1



Q1

R1: 2.2 kΩ, R2: 47 kΩ

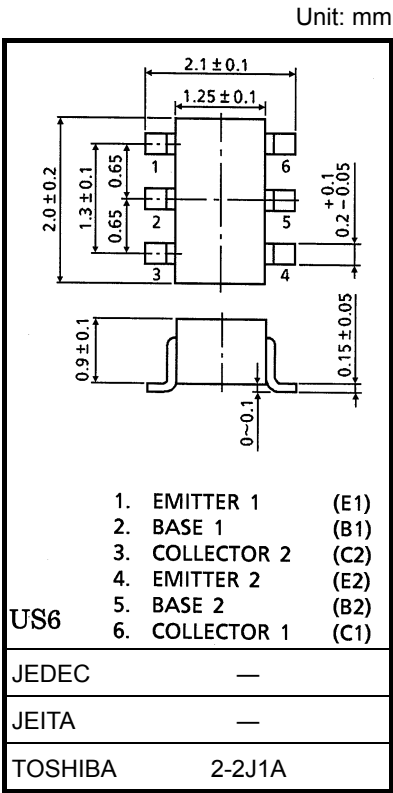
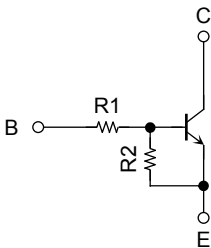
Q2

R1: 22 kΩ, R2: 47 kΩ

Q1:RN2105F equivalent

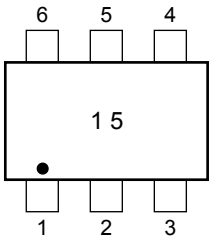
Q2:RN1108F equivalent

Q2

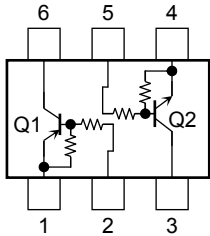


Weight: 0.006g (typ.)

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> | –5     | 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> | 7      | 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 1) | 200     | 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

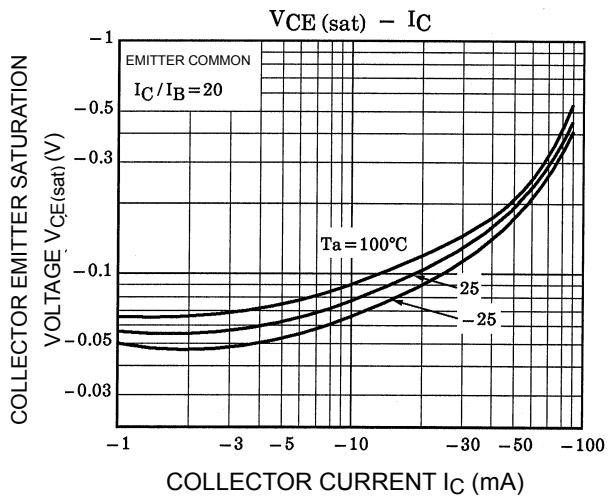
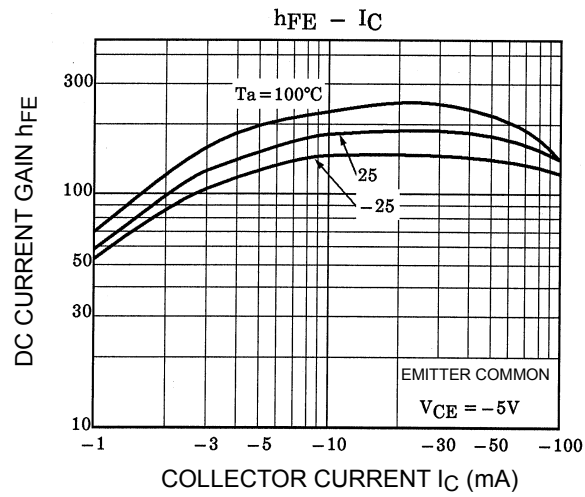
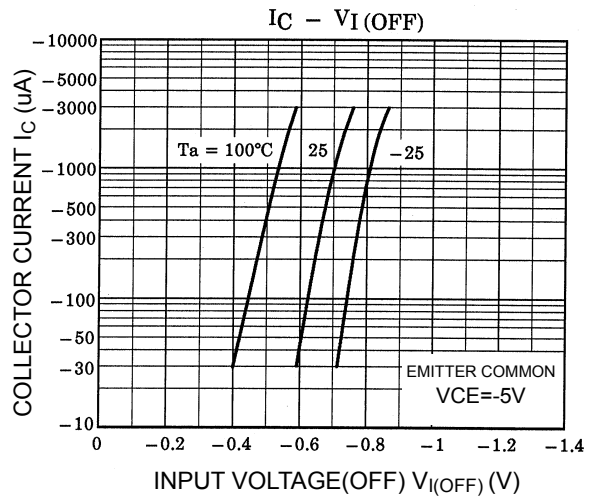
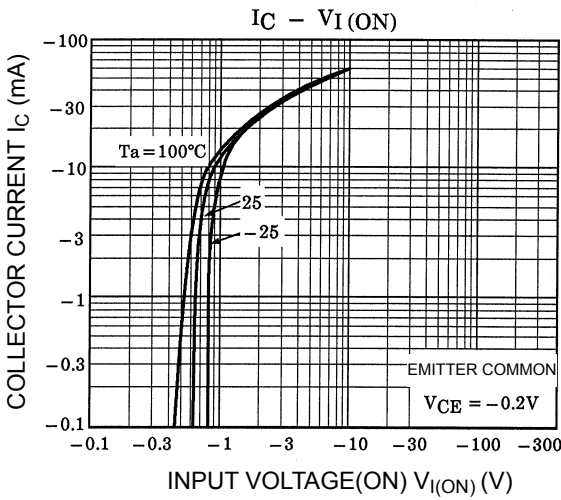
**Electrical Characteristics (Ta = 25°C) (Q1)**

| 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              | $I_{EBO}$         | $V_{EB} = -5\text{ V}, I_C = 0$                    | -0.078 | —      | -0.145 | mA         |
| DC current gain                      | $h_{FE}$          | $V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$        | 80     | —      | —      |            |
| 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)                   | $V_I(\text{ON})$  | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$       | -0.6   | —      | -1.1   | V          |
| Input voltage (OFF)                  | $V_I(\text{OFF})$ | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$       | -0.5   | —      | -0.8   | 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      | —      | pF         |
| Input resistance                     | $R_1$             | —                                                  | 1.54   | 2.2    | 2.86   | k $\Omega$ |
| Resistance ratio                     | $R_1/R_2$         | —                                                  | 0.0421 | 0.0468 | 0.0515 | —          |

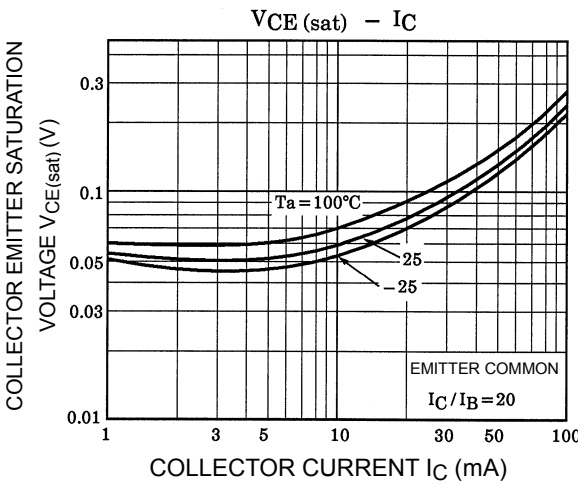
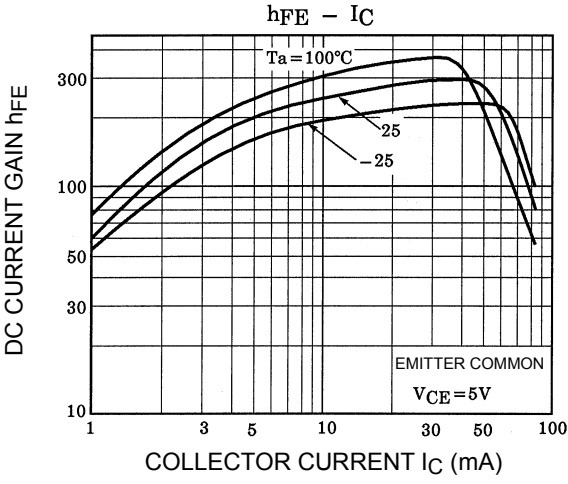
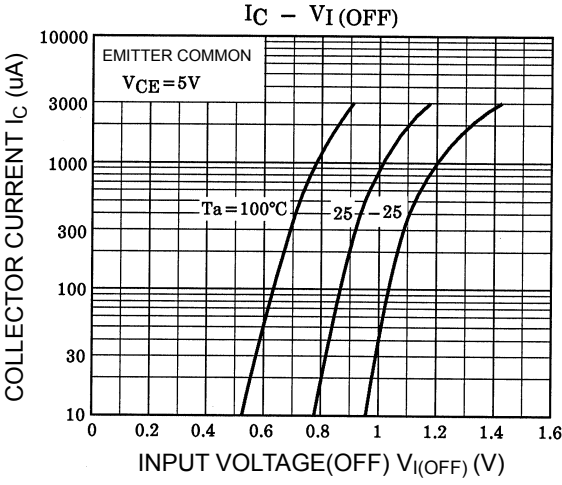
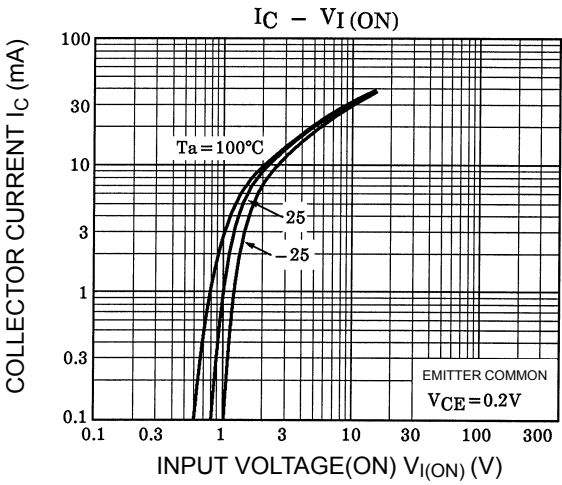
**Electrical Characteristics (Ta = 25°C) (Q2)**

| 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              | $I_{EBO}$         | $V_{EB} = 7\text{ V}, I_C = 0$                    | 0.078 | —     | 0.145 | mA         |
| DC current gain                      | $h_{FE}$          | $V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$         | 80    | —     | —     |            |
| 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)                   | $V_I(\text{ON})$  | $V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$        | 1.0   | —     | 2.6   | V          |
| Input voltage (OFF)                  | $V_I(\text{OFF})$ | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$        | 0.6   | —     | 1.16  | 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     | —     | pF         |
| Input resistance                     | $R_1$             | —                                                 | 1.54  | 22    | 2.86  | k $\Omega$ |
| Resistance ratio                     | $R_1/R_2$         | —                                                 | 0.421 | 0.468 | 0.515 | —          |

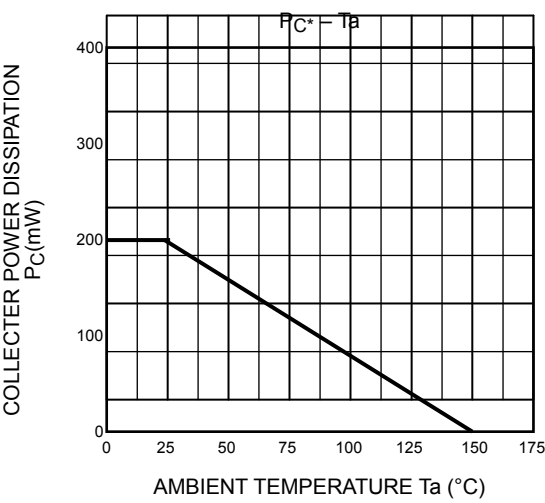
Q1



Q2



Q1,Q2 COMMON



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