

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

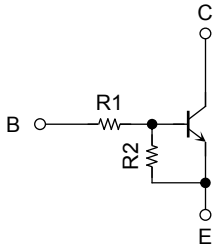
RN47A2

Switching, Inverter Circuit, Interface Circuit and  
Driver Circuit Applications.

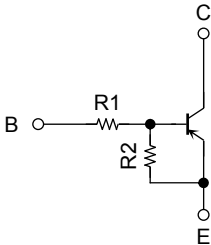
- Two devices are incorporated into an Ultra-Super-Mini (5 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count.  
Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.

Equivalent Circuit and Bias Resistor Values

Q1



Q2



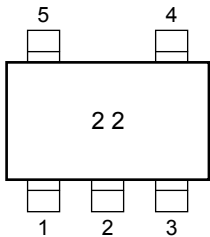
R1: 22 kΩ (Q1, Q2 common)

R2: 22 kΩ (Q1, Q2 common)

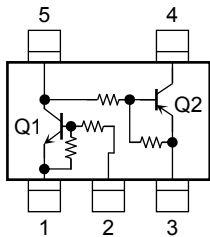
Q1: RN1103F

Q2: RN2103F

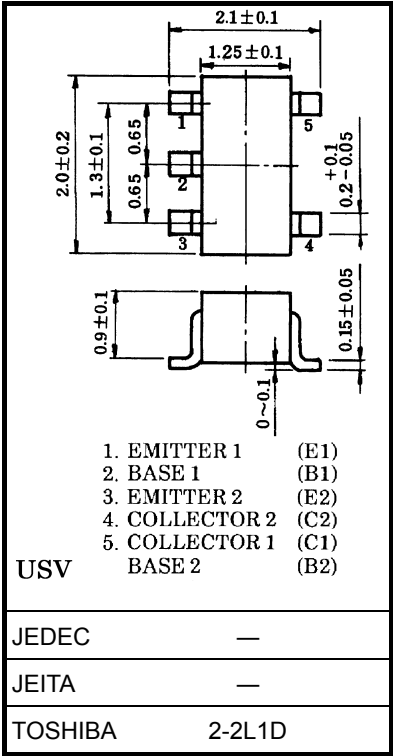
Marking



Equivalent Circuit (top view)



Unit: mm



Weight: 0.0062 g (typ.)

## 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> | 10     | 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> | –10    | 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

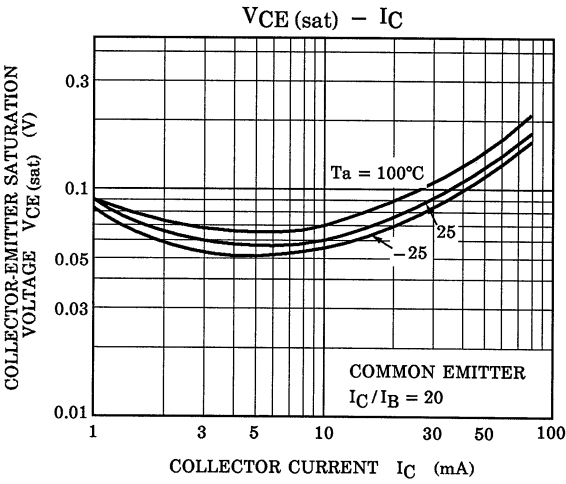
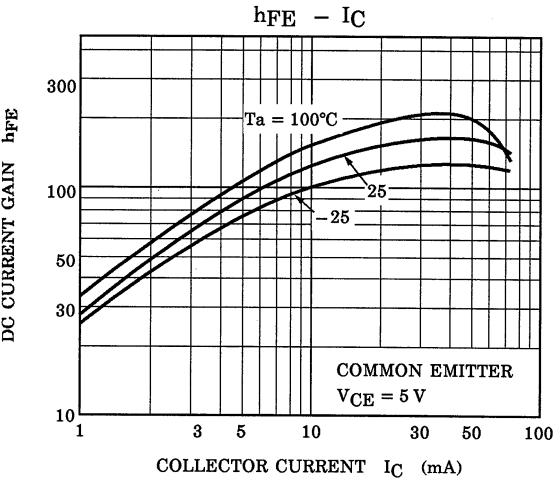
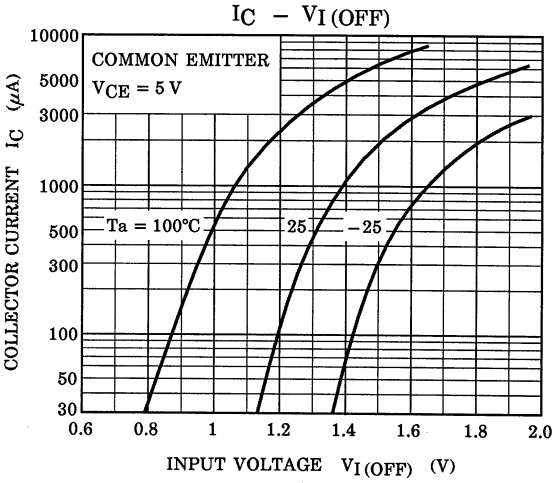
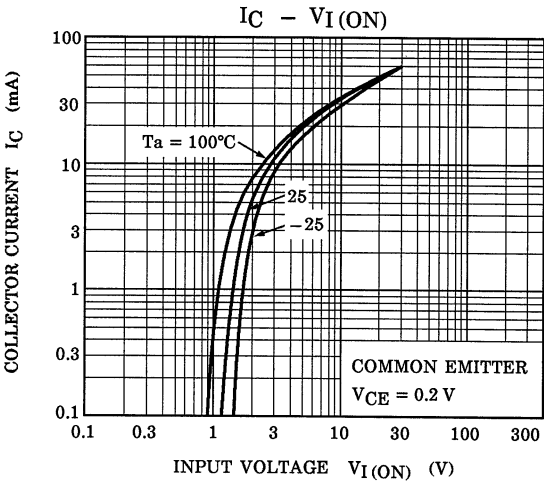
**Electrical Characteristics (Ta = 25°C) (Q1)**

| 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              | $I_{EBO}$     | $V_{EB} = 10\text{ V}, I_C = 0$                   | 0.17 | —    | 0.33 | 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)                   | $V_I(ON)$     | $V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$        | 1.3  | —    | 3.0  | V          |
| Input voltage (OFF)                  | $V_I(OFF)$    | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$        | 1.0  | —    | 1.5  | 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 resistor                       | R1            | —                                                 | 15.4 | 22   | 28.6 | k $\Omega$ |
| Resistor ratio                       | R1/R2         | —                                                 | 0.8  | 1.0  | 1.2  |            |

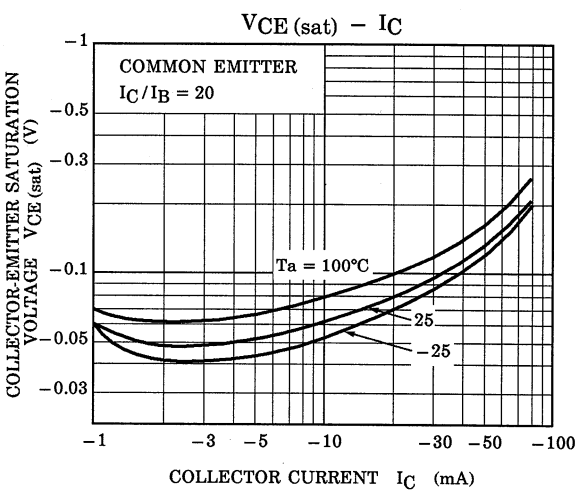
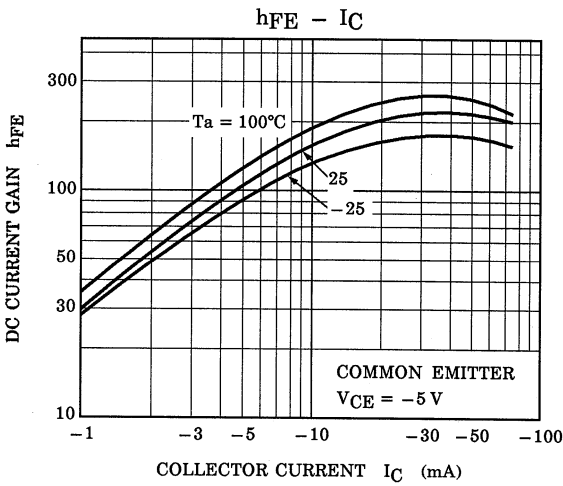
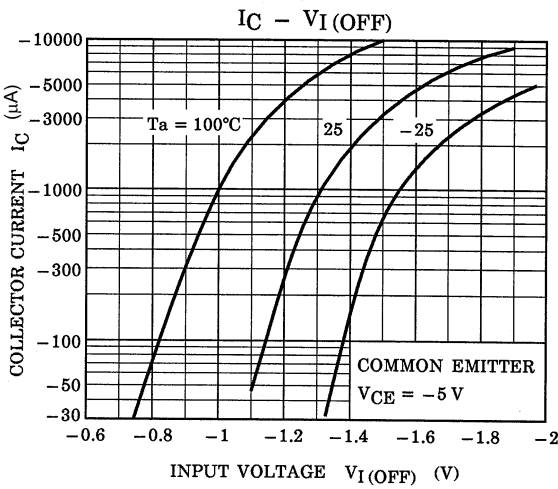
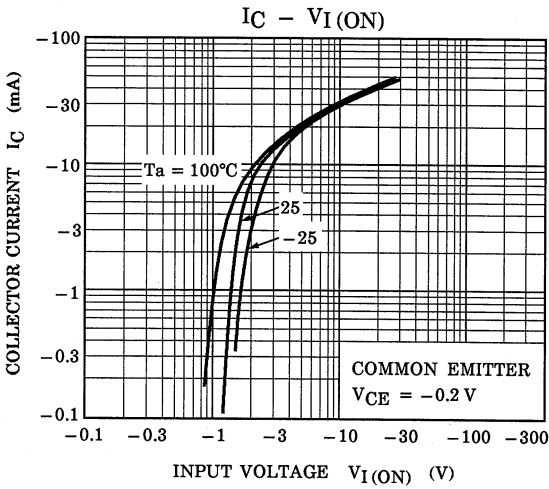
**Electrical Characteristics (Ta = 25°C) (Q2)**

| 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              | $I_{EBO}$     | $V_{EB} = -10\text{ V}, I_C = 0$                   | -0.17 | —    | -0.33 | 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)                   | $V_I(ON)$     | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$       | -1.3  | —    | -3.0  | V          |
| Input voltage (OFF)                  | $V_I(OFF)$    | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$       | -1.0  | —    | -1.5  | 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 resistor                       | R1            | —                                                  | 15.4  | 22   | 28.6  | k $\Omega$ |
| Resistor ratio                       | R1/R2         | —                                                  | 0.8   | 1.0  | 1.2   |            |

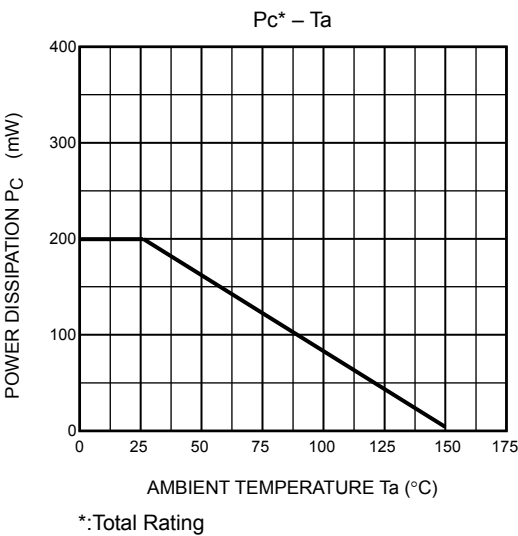
Q1



Q2



Q1,Q2 Common



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