

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

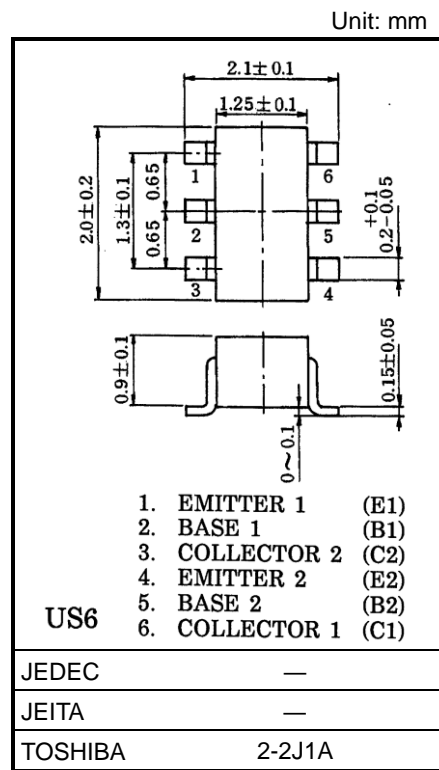
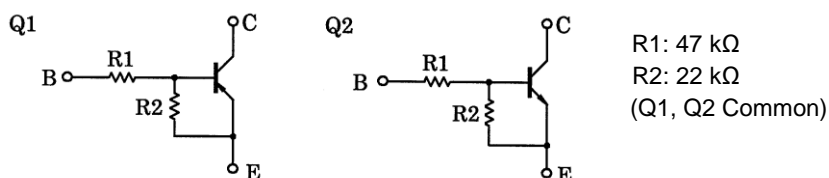
# RN4909

Switching, Inverter Circuit, Interface Circuit and Driver Circuit

- AEC-Q101 Qualified (Note1)
- Including two devices in US6 (ultra super mini type with 6 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process and miniaturize equipment.

Note1: For detail information, please contact to our sales.

### Equivalent Circuit and Bias Resistor Values



Weight: 6.8mg (typ.)

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

| Characteristic            | Symbol           | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage    | V <sub>CB0</sub> | -50    | V    |
| Collector-emitter voltage | V <sub>CE0</sub> | -50    | V    |
| Emitter-base voltage      | V <sub>EB0</sub> | -15    | V    |
| Collector current         | I <sub>C</sub>   | -100   | mA   |

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

| Characteristic            | Symbol           | Rating | Unit |
|---------------------------|------------------|--------|------|
| Collector-base voltage    | V <sub>CB0</sub> | 50     | V    |
| Collector-emitter voltage | V <sub>CE0</sub> | 50     | V    |
| Emitter-base voltage      | V <sub>EB0</sub> | 15     | V    |
| Collector current         | I <sub>C</sub>   | 100    | mA   |

Start of commercial production  
1998-02

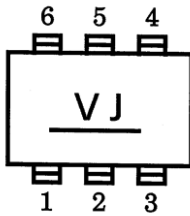
### Q1, Q2 Common Absolute Maximum Ratings (Ta = 25°C)

| Characteristic              | Symbol           | Rating     | Unit |
|-----------------------------|------------------|------------|------|
| Collector power dissipation | PC *             | 200        | mW   |
| Junction temperature        | T <sub>j</sub>   | 150        | °C   |
| Storage temperature range   | T <sub>stg</sub> | -55 to 150 | °C   |

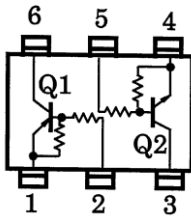
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

\* Total rating

### Marking



### Equivalent Circuit (Top View)



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

| Characteristic                       | Symbol                | Test Condition  | Min    | Typ. | Max    | Unit |
|--------------------------------------|-----------------------|---|--------|------|--------|------|
| Collector cut-off current            | ICBO                  | V <sub>CB</sub> = -50 V, I <sub>E</sub> = 0 mA            | —      | —    | -100   | nA   |
|                                      | ICEO                  | V <sub>CE</sub> = -50 V, I <sub>B</sub> = 0 mA            | —      | —    | -500   |      |
| Emitter cut-off current              | IEBO                  | V <sub>EB</sub> = -15 V, I <sub>C</sub> = 0 mA            | -0.167 | —    | -0.311 | mA   |
| DC current gain                      | h <sub>FE</sub>       | V <sub>CE</sub> = -5 V, I <sub>C</sub> = -10 mA           | 70     | —    | —      | —    |
| Collector-emitter saturation voltage | V <sub>CE (sat)</sub> | I <sub>C</sub> = -5 mA, I <sub>B</sub> = -0.25 mA         | —      | -0.1 | -0.3   | V    |
| Input voltage (ON)                   | V <sub>I (ON)</sub>   | V <sub>CE</sub> = -0.2 V, I <sub>C</sub> = -5 mA          | -2.2   | —    | -5.8   | V    |
| Input voltage (OFF)                  | V <sub>I (OFF)</sub>  | V <sub>CE</sub> = -5 V, I <sub>C</sub> = -0.1 mA          | -1.5   | —    | -2.6   | V    |
| Transition frequency                 | f <sub>T</sub>        | V <sub>CE</sub> = -10 V, I <sub>C</sub> = -5 mA           | —      | 200  | —      | MHz  |
| Collector output capacitance         | C <sub>ob</sub>       | V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0 mA, f = 1 MHz | —      | 3    | 6      | pF   |

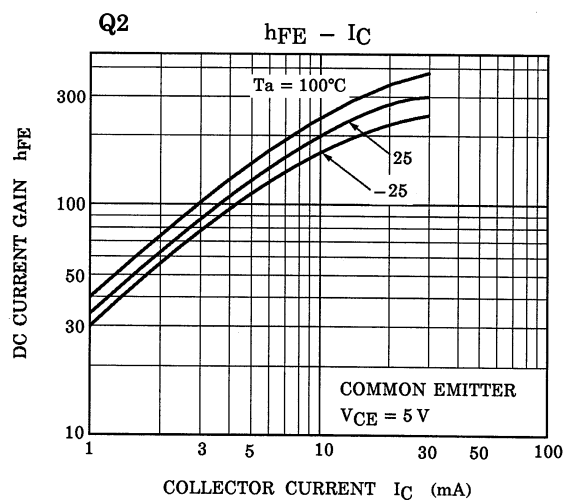
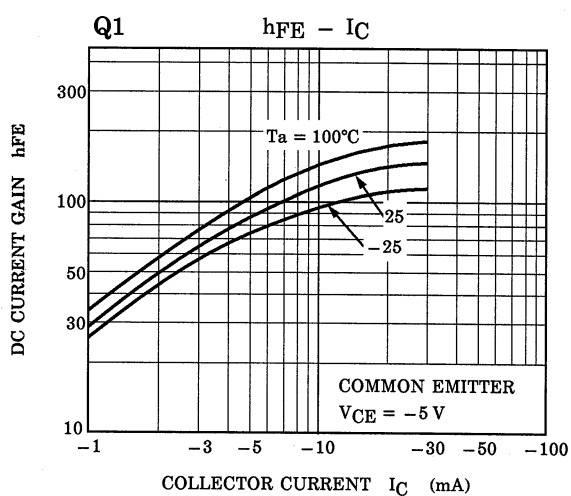
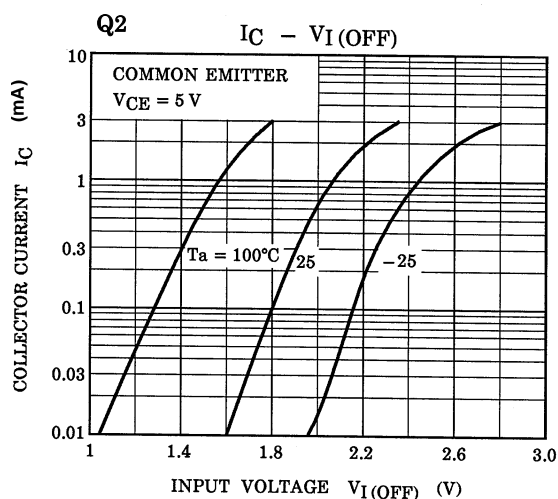
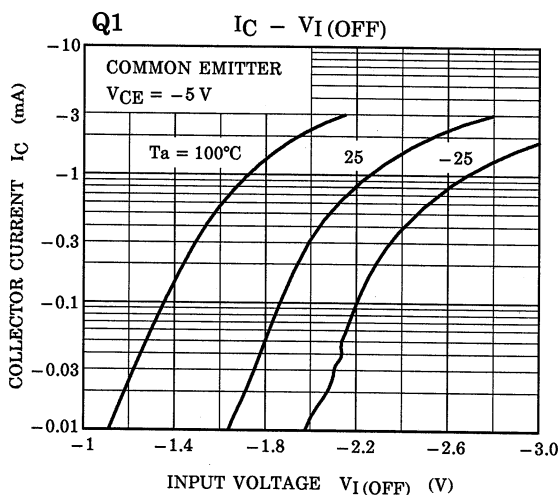
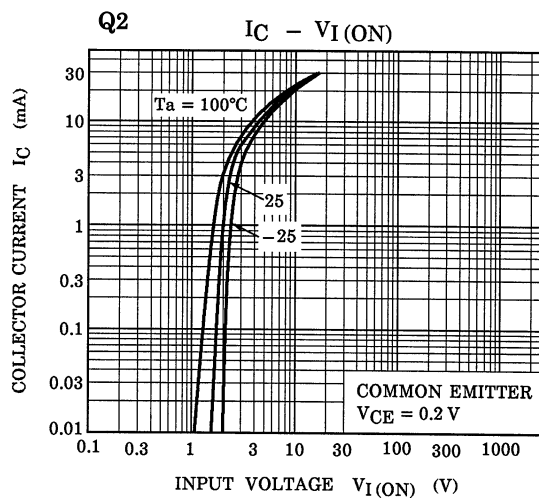
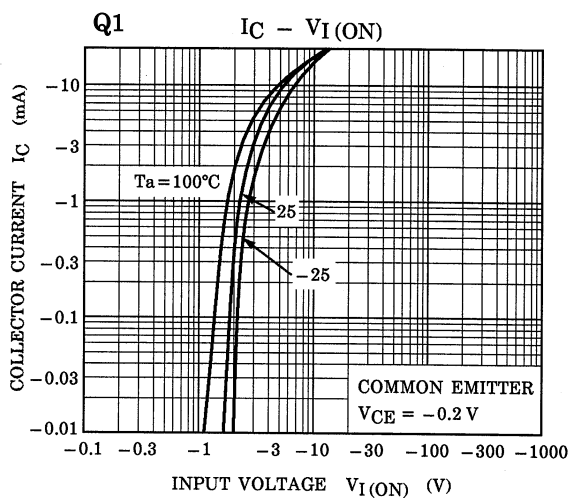
### Q2 Electrical Characteristics (Ta = 25°C)

| Characteristic                       | Symbol                | Test Condition   | Min   | Typ. | Max   | Unit |
|--------------------------------------|-----------------------|--|-------|------|-------|------|
| Collector cut-off current            | ICBO                  | V <sub>CB</sub> = 50 V, I <sub>E</sub> = 0 mA            | —     | —    | 100   | nA   |
|                                      | ICEO                  | V <sub>CE</sub> = 50 V, I <sub>B</sub> = 0 mA            | —     | —    | 500   |      |
| Emitter cut-off current              | IEBO                  | V <sub>EB</sub> = 15 V, I <sub>C</sub> = 0 mA            | 0.167 | —    | 0.311 | mA   |
| DC current gain                      | h <sub>FE</sub>       | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 10 mA            | 70    | —    | —     | —    |
| Collector-emitter saturation voltage | V <sub>CE (sat)</sub> | I <sub>C</sub> = 5 mA, I <sub>B</sub> = 0.25 mA          | —     | 0.1  | 0.3   | V    |
| Input voltage (ON)                   | V <sub>I (ON)</sub>   | V <sub>CE</sub> = 0.2 V, I <sub>C</sub> = 5 mA           | 2.2   | —    | 5.8   | V    |
| Input voltage (OFF)                  | V <sub>I (OFF)</sub>  | V <sub>CE</sub> = 5 V, I <sub>C</sub> = 0.1 mA           | 1.5   | —    | 2.6   | V    |
| Transition frequency                 | f <sub>T</sub>        | V <sub>CE</sub> = 10 V, I <sub>C</sub> = 5 mA            | —     | 250  | —     | MHz  |
| Collector output capacitance         | C <sub>ob</sub>       | V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1 MHz | —     | 3    | 6     | pF   |

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

| Characteristic | Symbol | Test Condition | Min  | Typ. | Max  | Unit |
|----------------|--------|----------------|------|------|------|------|
| Input resistor | R1     | —              | 32.9 | 47   | 61.1 | kΩ   |
| Resistor ratio | R1/R2  | —              | 1.92 | 2.14 | 2.35 | —    |

### Characteristics Curves



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

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