

Bipolar Transistors Silicon PNP/NPN Epitaxial Type (PCT Process)(Bias Resistor built-in Transistor)

# RN4903

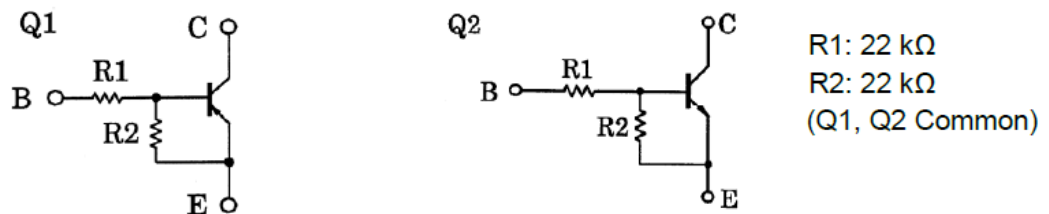
### 1. Applications

- Switching
- Inverter Circuits
- Interfacing
- Driver Circuits

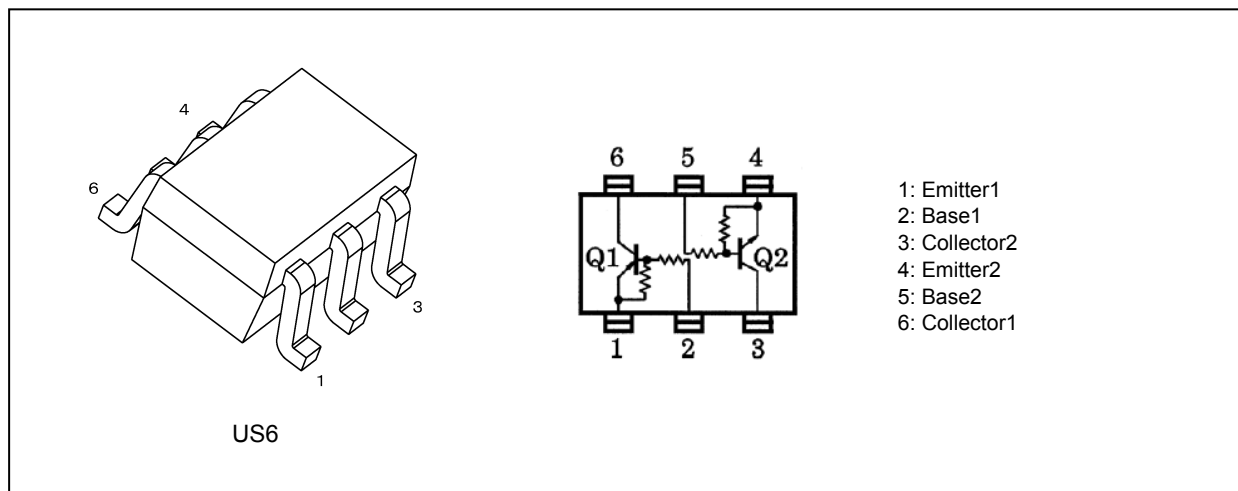
### 2. Features

- (1) AEC-Q101 qualified (Please see the orderable part number list)
- (2) Including two devices in US6 (ultra super mini type with 6 leads)
- (3) The integrated bias resistor reduces the number of external parts required, making it possible to reduce system size and assembly time.

### 3. Equivalent Circuit



### 4. Packaging and Pin Assignment



### 5. Orderable part number

| Orderable part number | AEC-Q101     | Note                    |
|-----------------------|--------------|-------------------------|
| RN4903,LF             | —            | General Use             |
| RN4903,LXGF           | YES (Note 1) | Unintended Use (Note 1) |
| RN4903,LXHF           | YES          | Automotive Use          |

Note 1: For more information, please contact our sales or use the inquiry form on our website.

Start of commercial production

1990-10

## 6. Q1 Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics           | Symbol    | Rating | Unit |
|---------------------------|-----------|--------|------|
| Collector-base voltage    | $V_{CB0}$ | -50    | V    |
| Collector-emitter voltage | $V_{CEO}$ | -50    |      |
| Emitter-base voltage      | $V_{EBO}$ | -10    |      |
| Collector current         | $I_C$     | -100   | mA   |

## 7. Q2 Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics           | Symbol    | Rating | Unit |
|---------------------------|-----------|--------|------|
| Collector-base voltage    | $V_{CB0}$ | 50     | V    |
| Collector-emitter voltage | $V_{CEO}$ | 50     |      |
| Emitter-base voltage      | $V_{EBO}$ | 10     |      |
| Collector current         | $I_C$     | 100    | mA   |

## 8. Q1, Q2 Common Absolute Maximum Ratings (Note) (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics                      | Symbol    | Rating     | Unit             |
|--------------------------------------|-----------|------------|------------------|
| Collector power dissipation (Note 1) | $P_C$     | 200        | mW               |
| Junction temperature                 | $T_j$     | 150        | $^\circ\text{C}$ |
| Storage temperature                  | $T_{stg}$ | -55 to 150 |                  |

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

## 9. Q1 Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics                      | Symbol        | Test Condition   | Min   | Typ. | Max   | Unit |
|--------------------------------------|---------------|--|-------|------|-------|------|
| Collector cut-off current            | $I_{CBO}$     | $V_{CB} = -50\text{ V}, I_E = 0\text{ mA}$                   | —     | —    | -100  | nA   |
| Collector cut-off current            | $I_{CEO}$     | $V_{CE} = -50\text{ V}, I_B = 0\text{ mA}$                   | —     | —    | -500  |      |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB} = -10\text{ V}, I_C = 0\text{ mA}$                   | -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  |      |
| Input voltage (off)                  | $V_{I(off)}$  | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$                 | -1.0  | —    | -1.5  |      |
| Transition frequency                 | $f_T$         | $V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$                  | —     | 200  | —     | MHz  |
| Collector output capacitance         | $C_{ob}$      | $V_{CB} = -10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$ | —     | 3    | 6     | pF   |

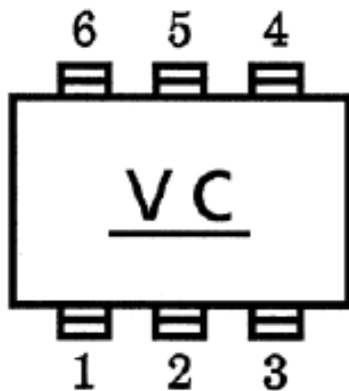
## 10. Q2 Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics                      | Symbol        | Test Condition  | Min  | Typ. | Max  | Unit |
|--------------------------------------|---------------|---|------|------|------|------|
| Collector cut-off current            | $I_{CBO}$     | $V_{CB} = 50\text{ V}, I_E = 0\text{ mA}$                   | —    | —    | 100  | nA   |
| Collector cut-off current            | $I_{CEO}$     | $V_{CE} = 50\text{ V}, I_B = 0\text{ mA}$                   | —    | —    | 500  |      |
| Emitter cut-off current              | $I_{EBO}$     | $V_{EB} = 10\text{ V}, I_C = 0\text{ mA}$                   | 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  |      |
| Input voltage (off)                  | $V_{I(off)}$  | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$                  | 1.0  | —    | 1.5  |      |
| Transition frequency                 | $f_T$         | $V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$                   | —    | 250  | —    | MHz  |
| Collector output capacitance         | $C_{ob}$      | $V_{CB} = 10\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$ | —    | 3    | 6    | pF   |

## 11. Q1, Q2 Common Electrical Characteristics (Unless otherwise specified, $T_a = 25\text{ }^\circ\text{C}$ )

| Characteristics  | Symbol | Test Condition | Min  | Typ. | Max  | Unit       |
|------------------|--------|----------------|------|------|------|------------|
| Input resistance | $R_1$  | -              | 15.4 | 22   | 28.6 | k $\Omega$ |
| Resistor ratio   | R1/R2  | -              | 0.9  | 1.0  | 1.1  | —          |

## 12. Marking



## 13. Characteristics Curves (Note)

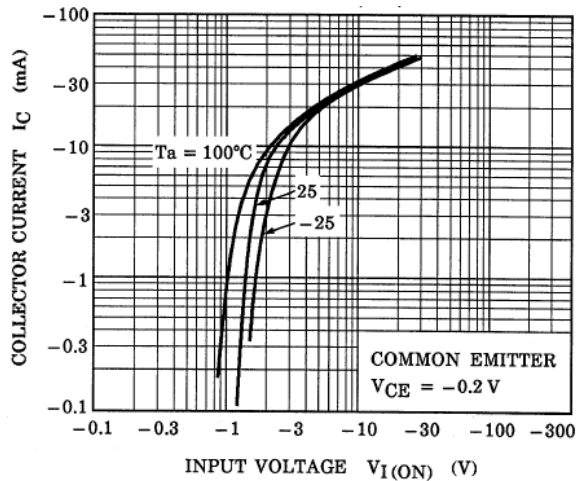


Fig. 13.1 Q1  $I_C$ - $V_{I(ON)}$

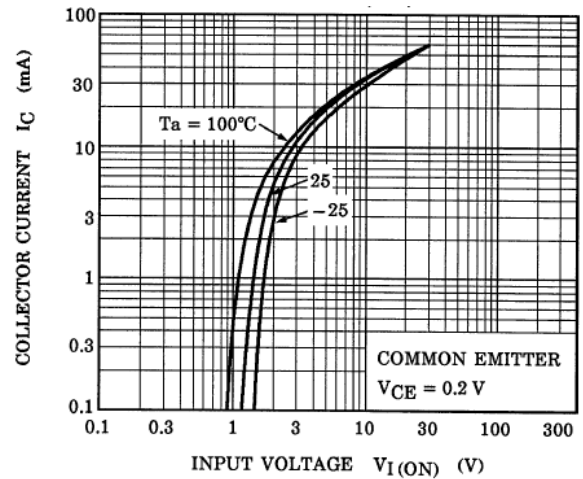


Fig. 13.2 Q2  $I_C$ - $V_{I(ON)}$

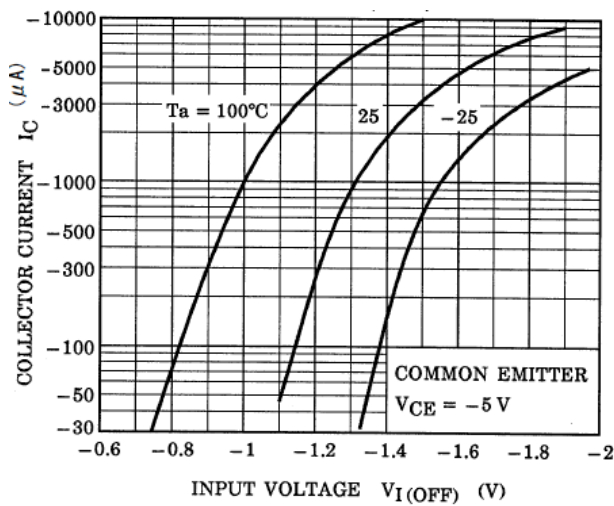


Fig. 13.3 Q1  $I_C$ - $V_{I(OFF)}$

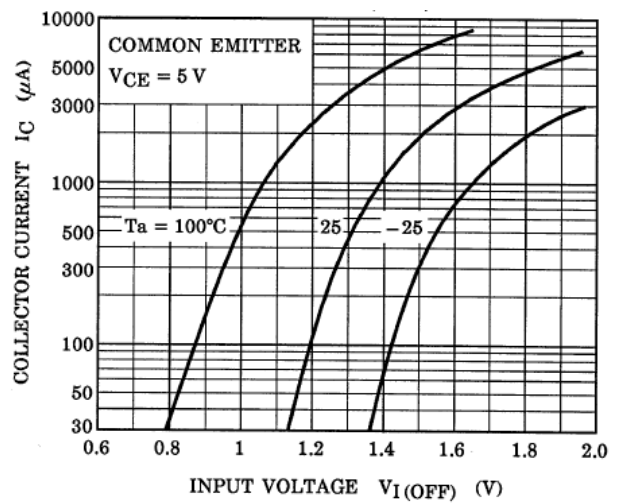


Fig. 13.4 Q2  $I_C$ - $V_{I(OFF)}$

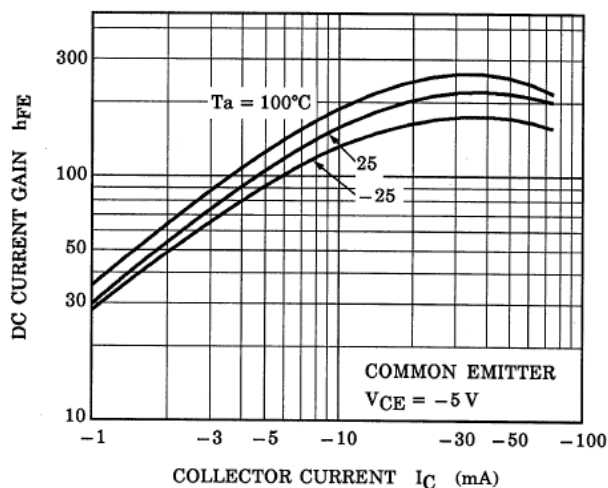


Fig. 13.5 Q1  $h_{FE}$ - $I_C$

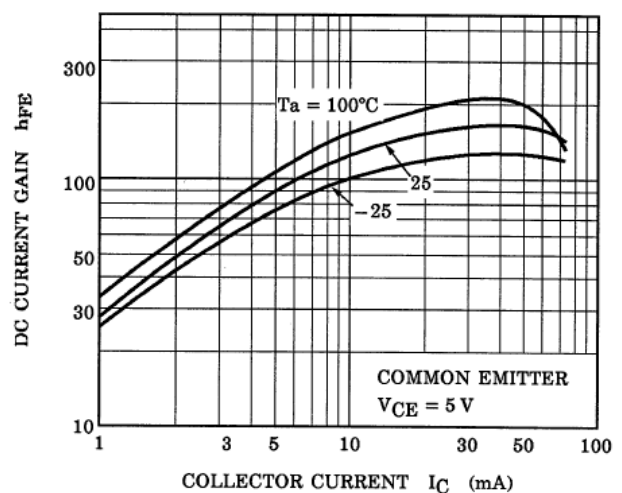


Fig. 13.6 Q2  $h_{FE}$ - $I_C$

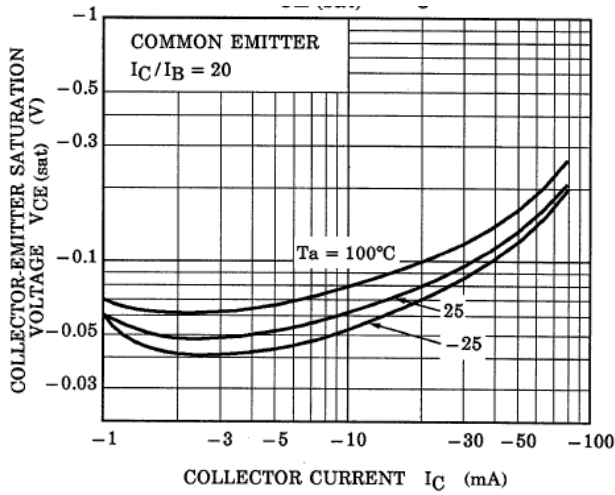


Fig. 13.7 Q1  $V_{CE(sat)}-I_C$

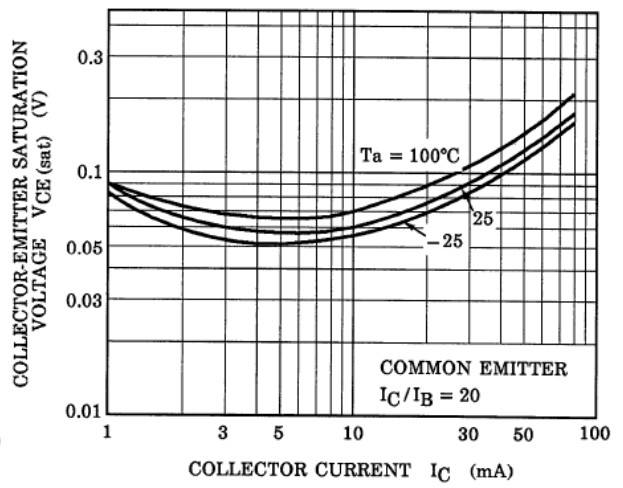
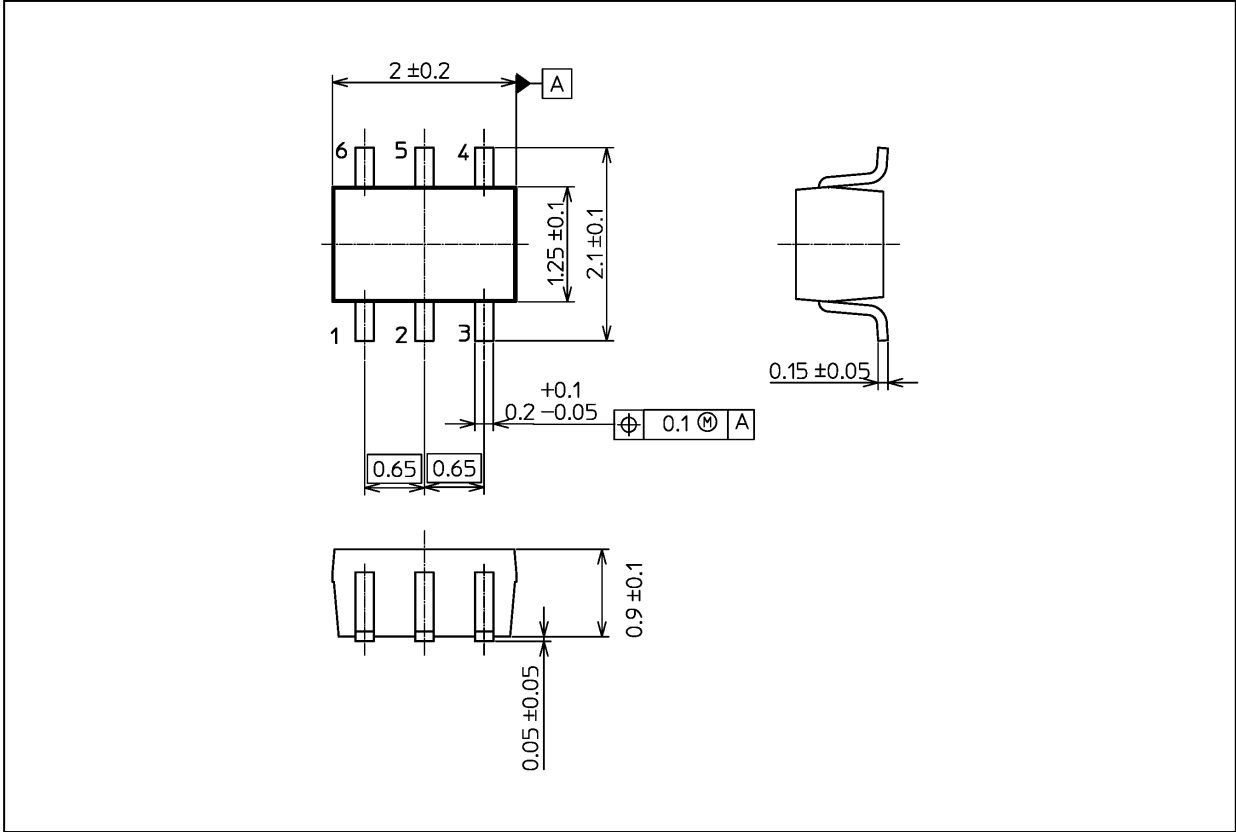


Fig. 13.8 Q2  $V_{CE(sat)}-I_C$

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

Package Dimensions

Unit: mm



Weight: 6.8 mg (typ.)

| Package Name(s) |
|-----------------|
| TOSHIBA: 1-2T1S |
| Nickname: US6   |

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