

TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process)

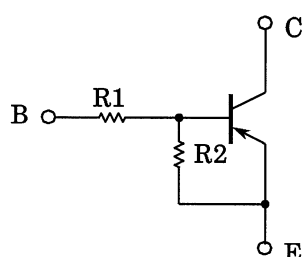
## RN2101, RN2102, RN2103, RN2104, RN2105, RN2106

Switching, Inverter Circuit, Interface Circuit  
and Driver Circuit Applications

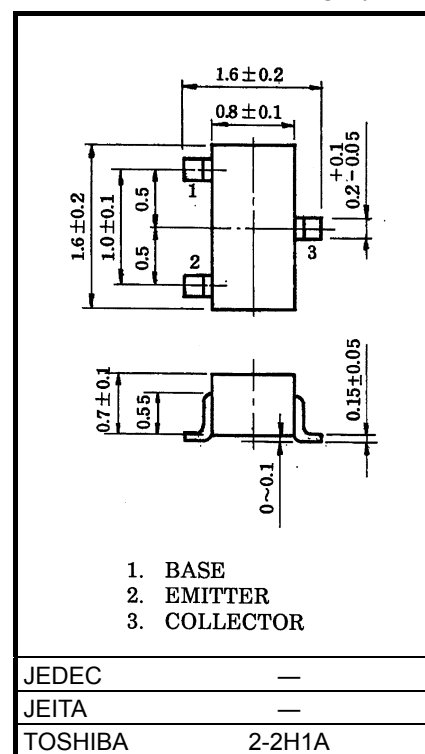
Unit: mm

- Built-in bias resistors
- Simplified circuit design
- Fewer parts and simplified manufacturing process
- Complementary to RN1101~RN1106

### Equivalent Circuit and Bias Resistor Values



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN2101   | 4.7     | 4.7     |
| RN2102   | 10      | 10      |
| RN2103   | 22      | 22      |
| RN2104   | 47      | 47      |
| RN2105   | 2.2     | 47      |
| RN2106   | 4.7     | 47      |



Weight: 2.4 mg (typ.)

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

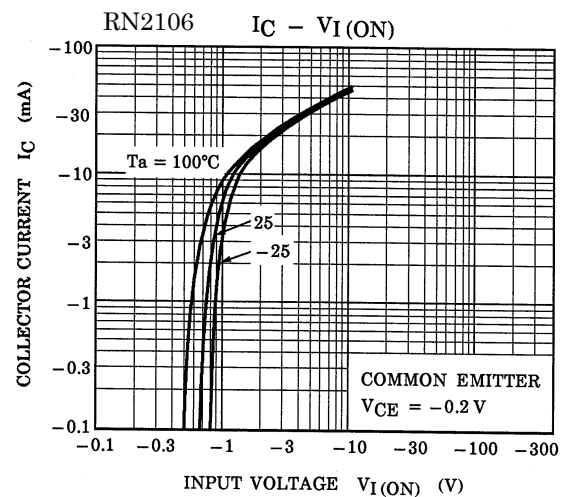
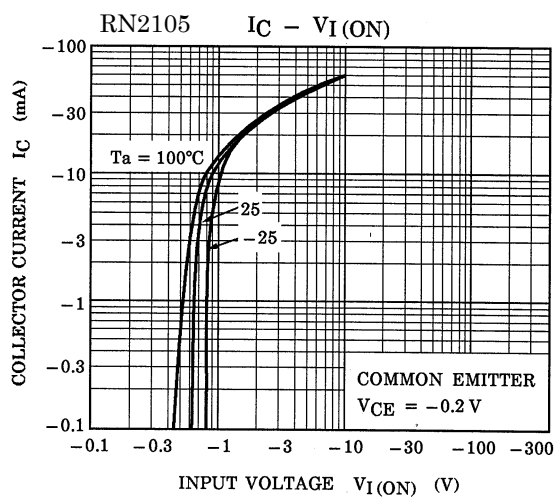
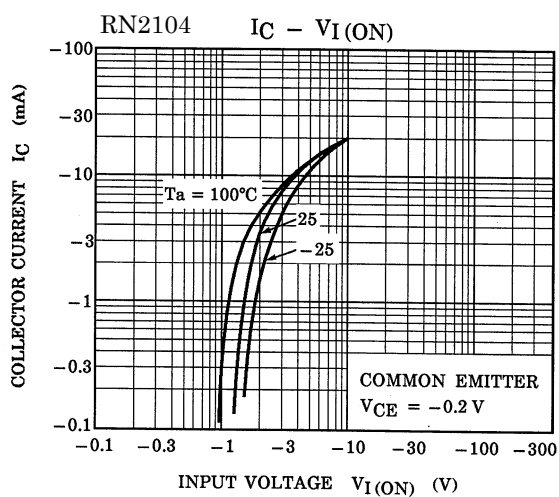
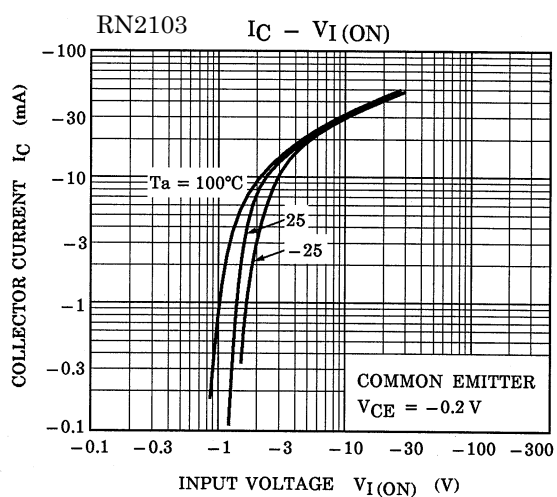
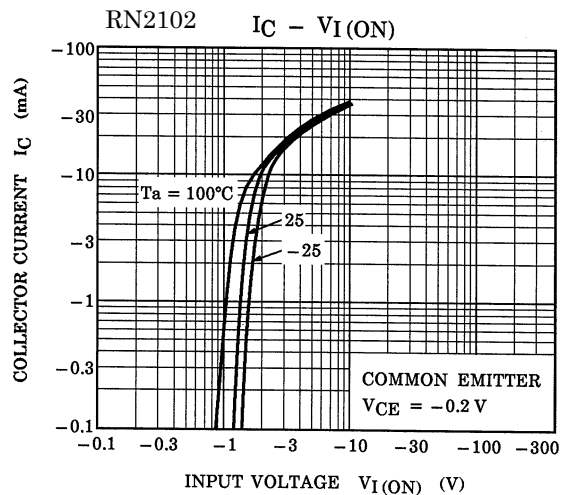
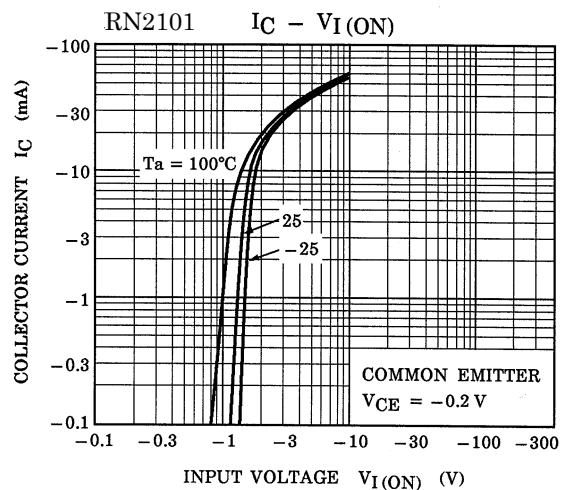
| Characteristic              | Symbol           | Rating  | Unit |
|-----------------------------|------------------|---------|------|
| Collector-base voltage      | V <sub>CBO</sub> | -50     | V    |
| Collector-emitter voltage   | V <sub>CEO</sub> | -50     | V    |
| Emitter-base voltage        | V <sub>EBO</sub> | -10     | V    |
|                             |                  | -5      | V    |
| Collector current           | I <sub>C</sub>   | -100    | mA   |
| Collector power dissipation | P <sub>C</sub>   | 100     | mW   |
| Junction temperature        | T <sub>j</sub>   | 150     | °C   |
| Storage temperature range   | T <sub>stg</sub> | -55~150 | °C   |

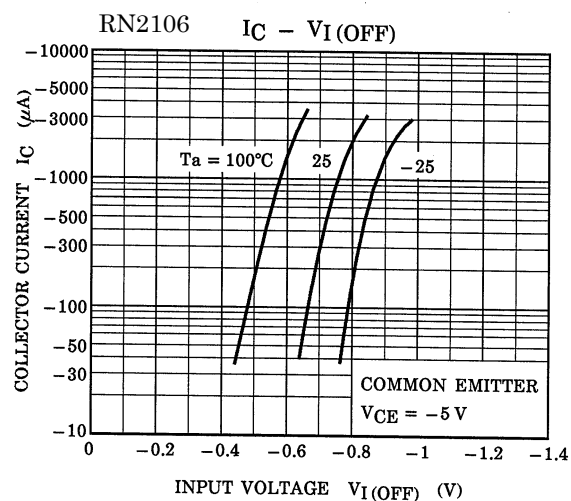
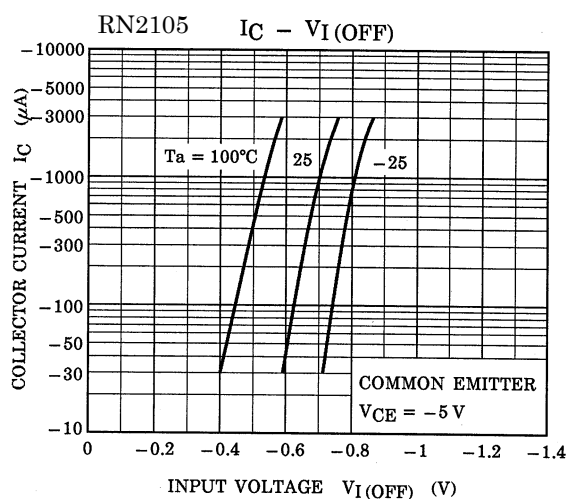
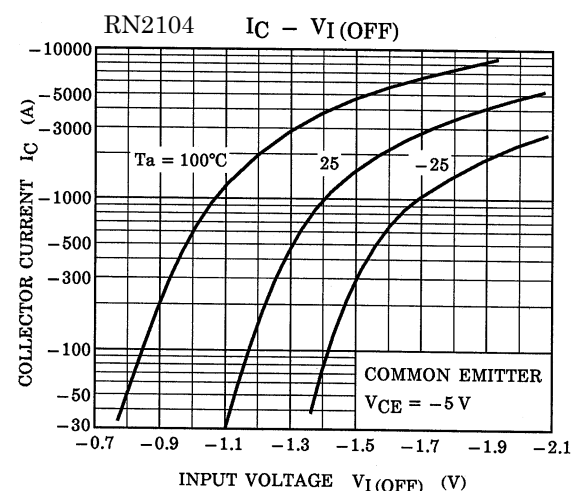
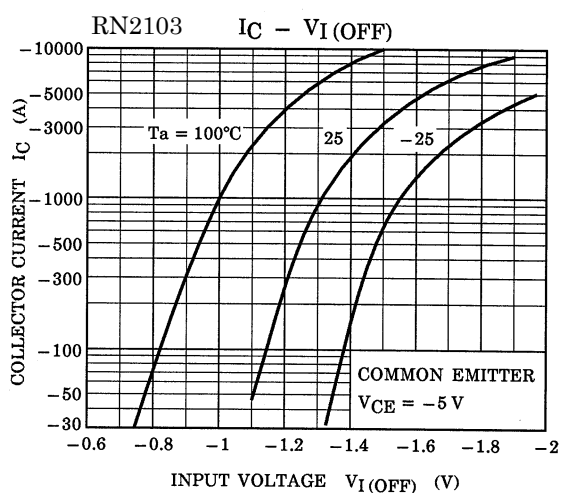
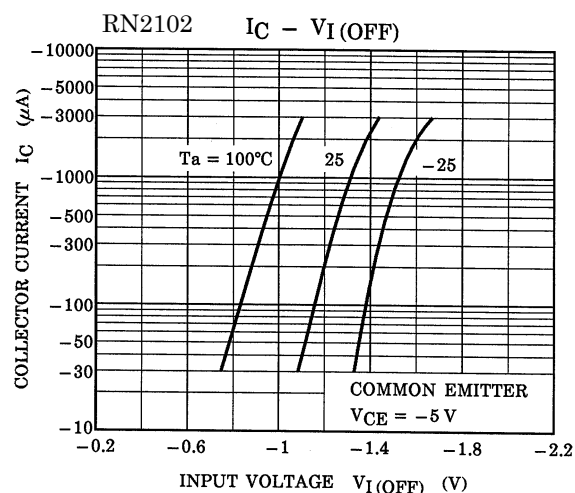
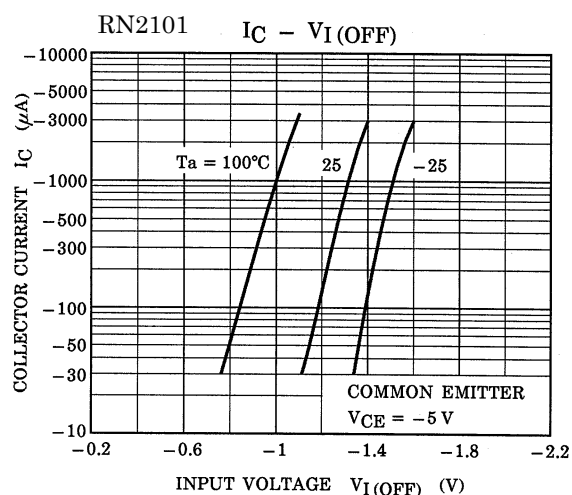
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

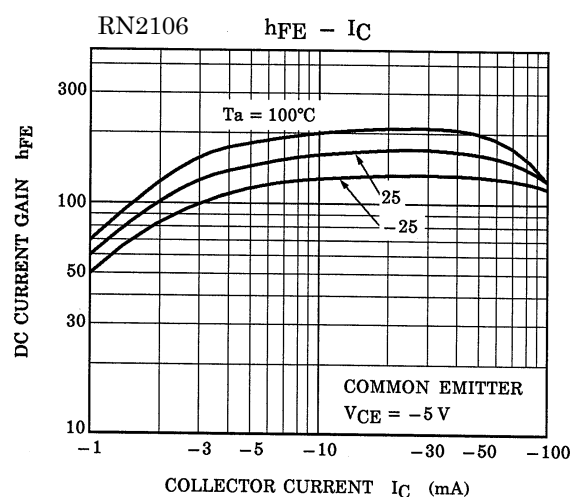
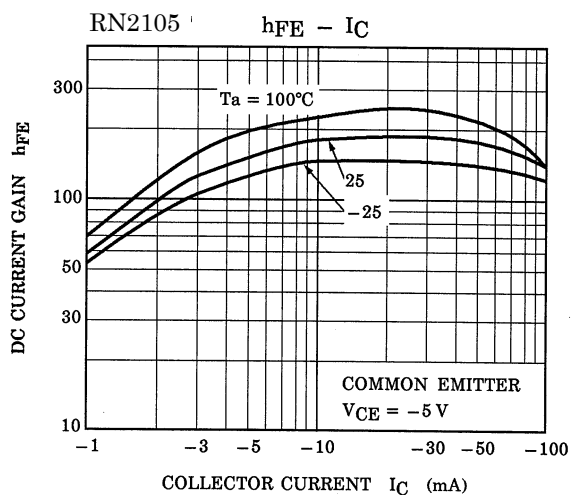
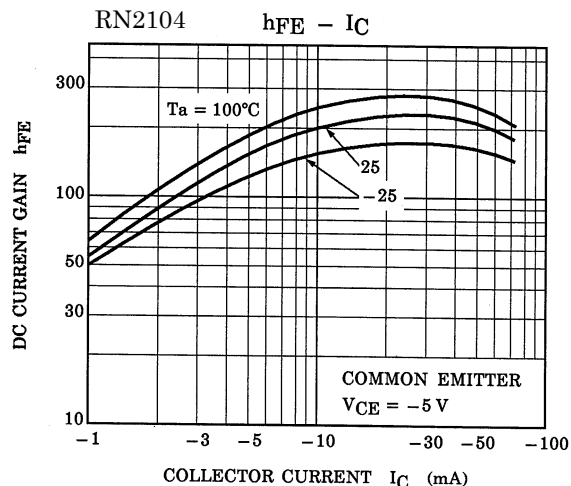
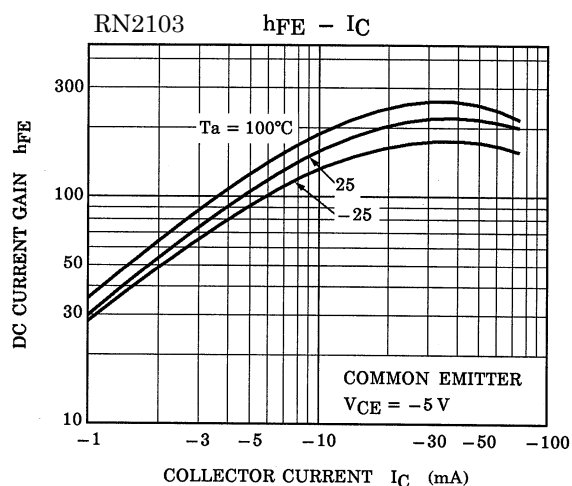
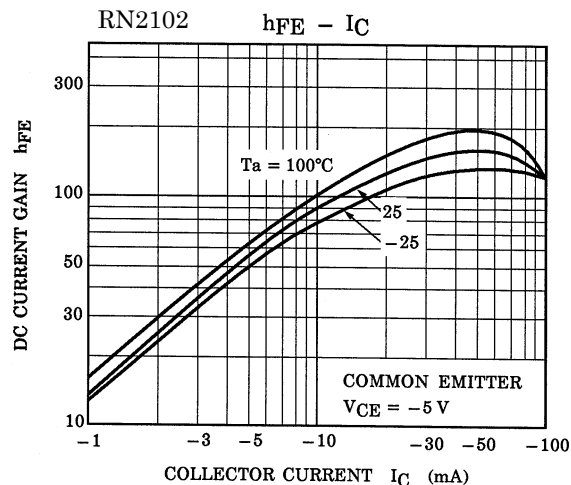
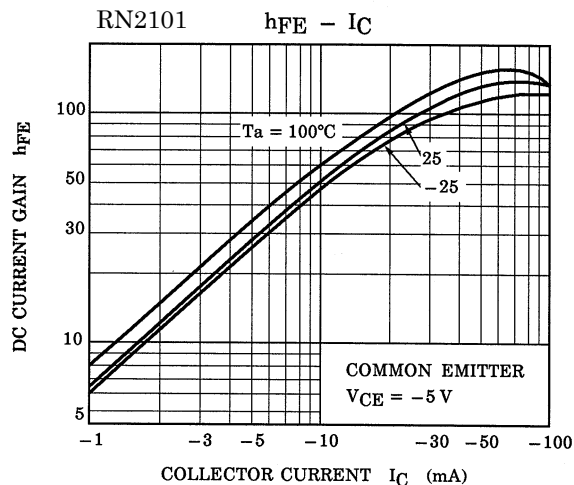
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

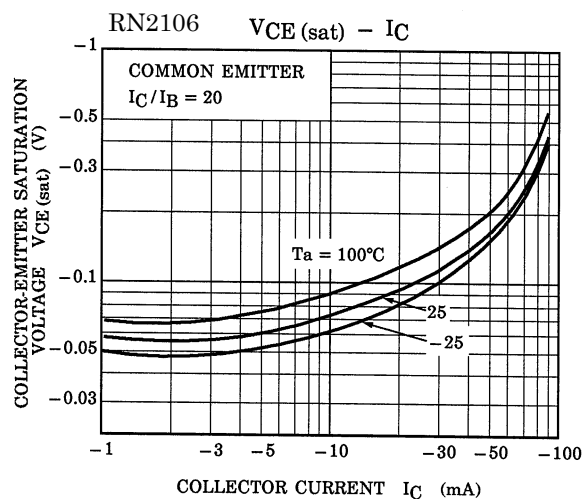
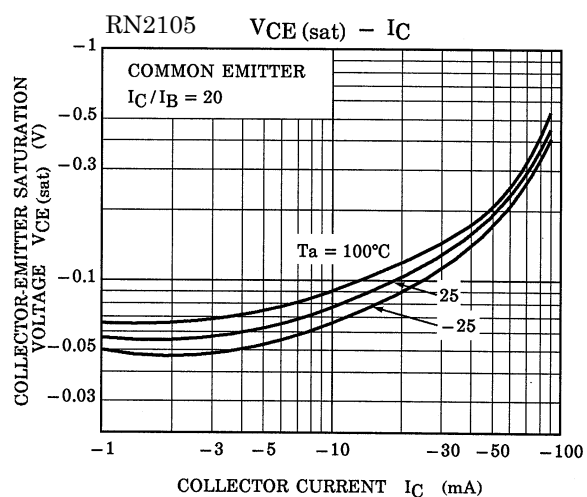
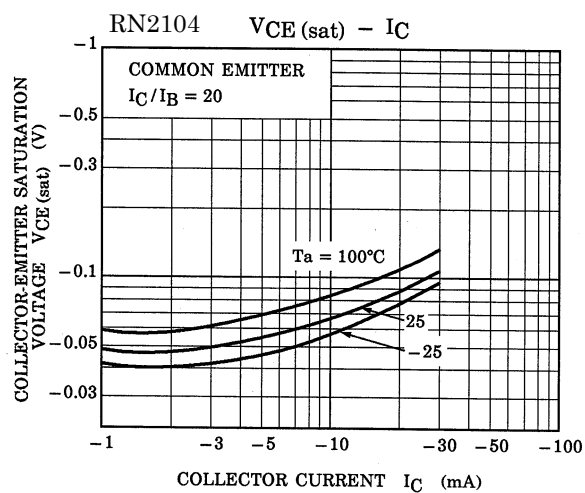
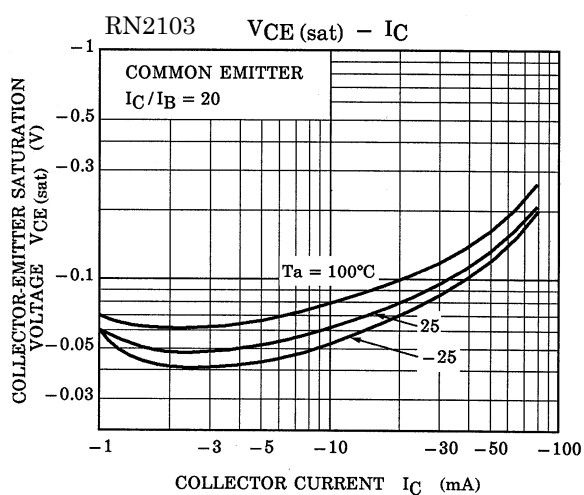
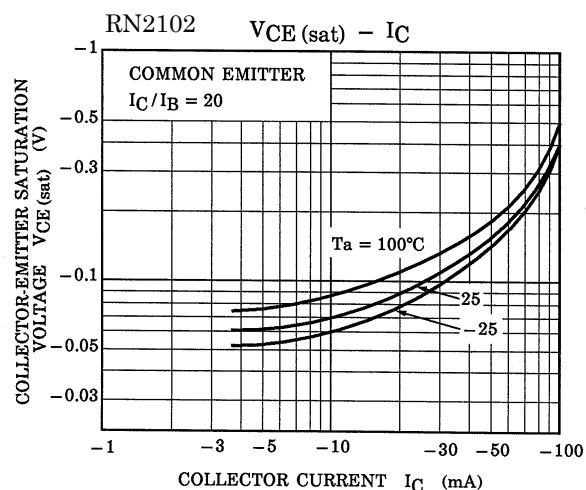
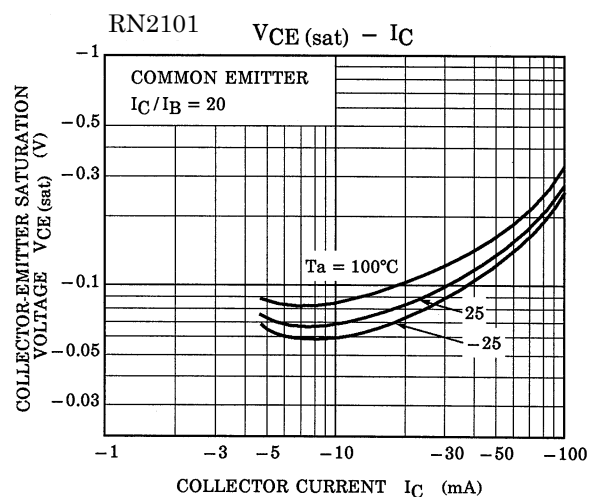
## Electrical Characteristics (Ta = 25°C)

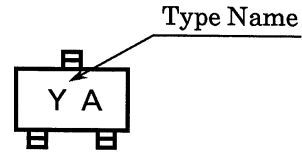
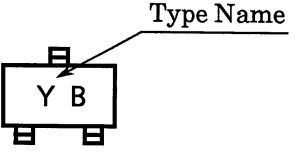
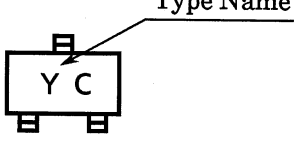
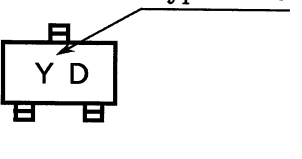
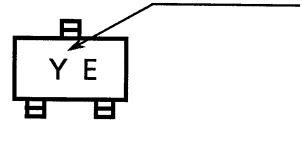
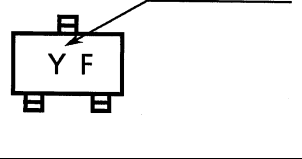
| Characteristic                       |              | Symbol        | Test Circuit | Test Condition                                     | Min    | Typ.   | Max    | Unit |
|--------------------------------------|--------------|---------------|--------------|----------------------------------------------------|--------|--------|--------|------|
| Collector cut-off current            | RN2101~2106  | $I_{CBO}$     | —            | $V_{CB} = -50\text{ V}, I_E = 0$                   | —      | —      | -100   | nA   |
|                                      |              | $I_{CEO}$     |              | $V_{CE} = -50\text{ V}, I_B = 0$                   | —      | —      | -500   |      |
| Emitter cut-off current              | RN2101       | $I_{EBO}$     | —            | $V_{EB} = -10\text{ V}, I_C = 0$                   | -0.82  | —      | -1.52  | mA   |
|                                      | RN2102       |               |              |                                                    | -0.38  | —      | -0.71  |      |
|                                      | RN2103       |               |              |                                                    | -0.17  | —      | -0.33  |      |
|                                      | RN2104       |               |              |                                                    | -0.082 | —      | -0.15  |      |
|                                      | RN2105       |               |              | $V_{EB} = -5\text{ V}, I_C = 0$                    | -0.078 | —      | -0.145 |      |
|                                      | RN2106       |               |              |                                                    | -0.074 | —      | -0.138 |      |
| DC current gain                      | RN2101       | $h_{FE}$      | —            | $V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$        | 30     | —      | —      |      |
|                                      | RN2102       |               |              |                                                    | 50     | —      | —      |      |
|                                      | RN2103       |               |              |                                                    | 70     | —      | —      |      |
|                                      | RN2104       |               |              |                                                    | 80     | —      | —      |      |
|                                      | RN2105       |               |              |                                                    | 80     | —      | —      |      |
|                                      | RN2106       |               |              |                                                    | 80     | —      | —      |      |
| Collector-emitter saturation voltage | RN2101~2106  | $V_{CE(sat)}$ | —            | $I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$        | —      | -0.1   | -0.3   | V    |
| Input voltage (ON)                   | RN2101       | $V_I(ON)$     | —            | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$       | -1.1   | —      | -2.0   | V    |
|                                      | RN2102       |               |              |                                                    | -1.2   | —      | -2.4   |      |
|                                      | RN2103       |               |              |                                                    | -1.3   | —      | -3.0   |      |
|                                      | RN2104       |               |              |                                                    | -1.5   | —      | -5.0   |      |
|                                      | RN2105       |               |              |                                                    | -0.6   | —      | -1.1   |      |
|                                      | RN2106       |               |              |                                                    | -0.7   | —      | -1.3   |      |
| Input voltage (OFF)                  | RN2101~2104  | $V_I(OFF)$    | —            | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$       | -1.0   | —      | -1.5   | V    |
|                                      | RN2105, 2106 |               |              |                                                    | -0.5   | —      | -0.8   |      |
| Transition frequency                 | RN2101~2106  | $f_T$         | —            | $V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$        | —      | 200    | —      | MHz  |
| Collector Output capacitance         | RN2101~2106  | $C_{ob}$      | —            | $V_{CB} = -10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | —      | 3      | 6      | pF   |
| Input resistor                       | RN2101       | R1            | —            |                                                    | 3.29   | 4.7    | 6.11   | kΩ   |
|                                      | RN2102       |               |              |                                                    | 7      | 10     | 13     |      |
|                                      | RN2103       |               |              |                                                    | 15.4   | 22     | 28.6   |      |
|                                      | RN2104       |               |              |                                                    | 32.9   | 47     | 61.1   |      |
|                                      | RN2105       |               |              |                                                    | 1.54   | 2.2    | 2.86   |      |
|                                      | RN2106       |               |              |                                                    | 3.29   | 4.7    | 6.11   |      |
| Resistor ratio                       | RN2101~2104  | R1/R2         | —            |                                                    | 0.9    | 1.0    | 1.1    |      |
|                                      | RN2105       |               |              |                                                    | 0.0421 | 0.0468 | 0.0515 |      |
|                                      | RN2106       |               |              |                                                    | 0.09   | 0.1    | 0.11   |      |









| Type Name | Marking                                                                             |
|-----------|-------------------------------------------------------------------------------------|
| RN2001    |    |
| RN2102    |    |
| RN2103    |    |
| RN2104    |   |
| RN2105    |  |
| RN2106    |  |

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