

TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

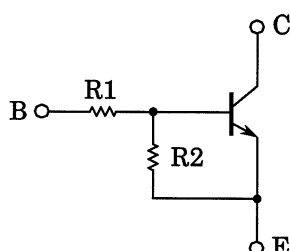
## RN1101, RN1102, RN1103, RN1104, RN1105, RN1106

Switching, Inverter Circuit, Interface Circuit  
and Driver Circuit Applications

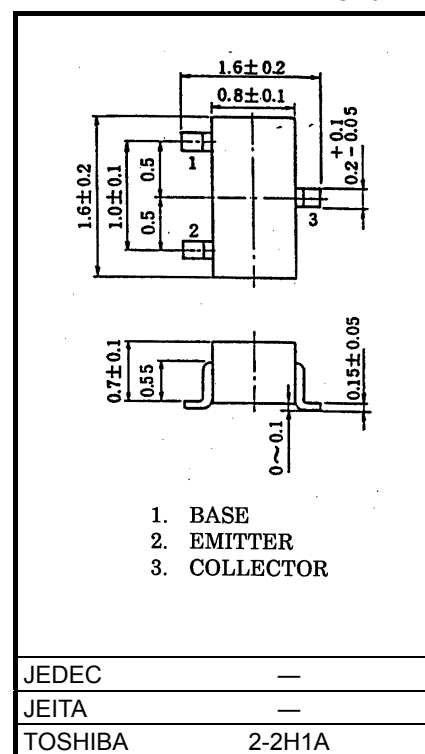
Unit: mm

- With built-in bias resistors
- Simplified circuit design
- Reduced number of parts and simplified manufacturing process
- Complementary to RN2101~ RN2106

### Equivalent Circuit and Bias Resister Values



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN1101   | 4.7     | 4.7     |
| RN1102   | 10      | 10      |
| RN1103   | 22      | 22      |
| RN1104   | 47      | 47      |
| RN1105   | 2.2     | 47      |
| RN1106   | 4.7     | 47      |



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

Weight: 2.4 mg (typ).

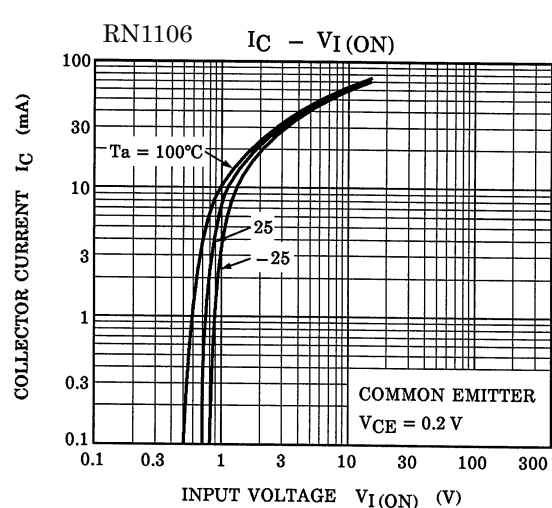
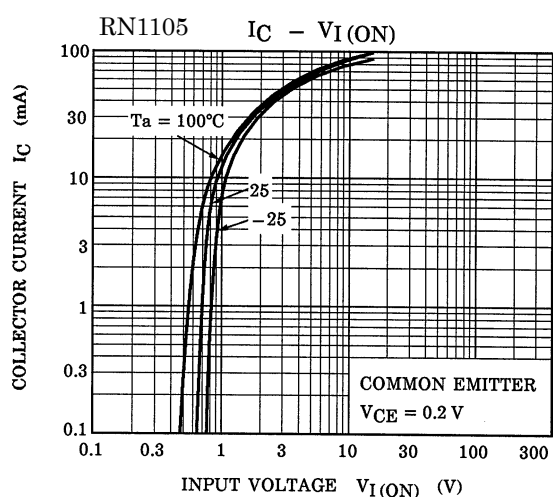
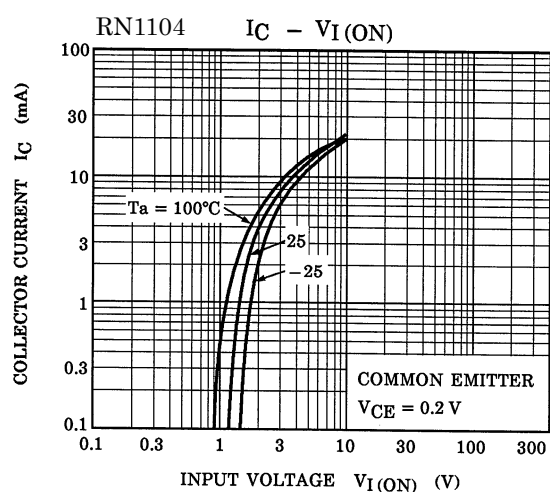
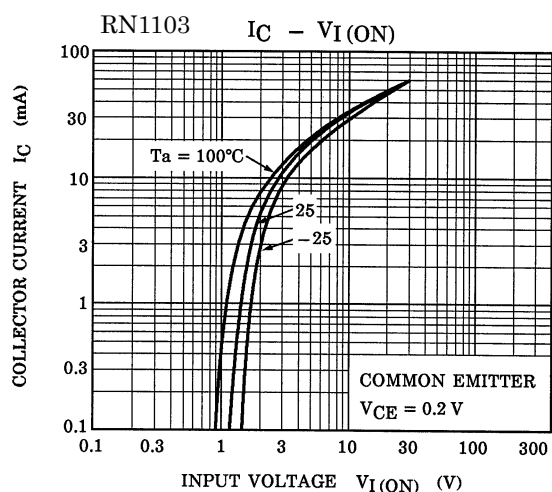
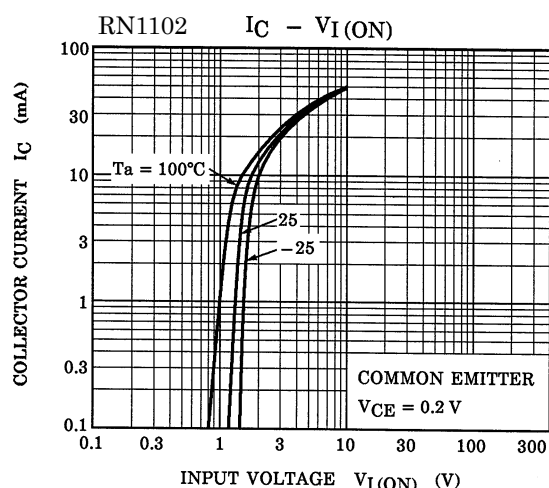
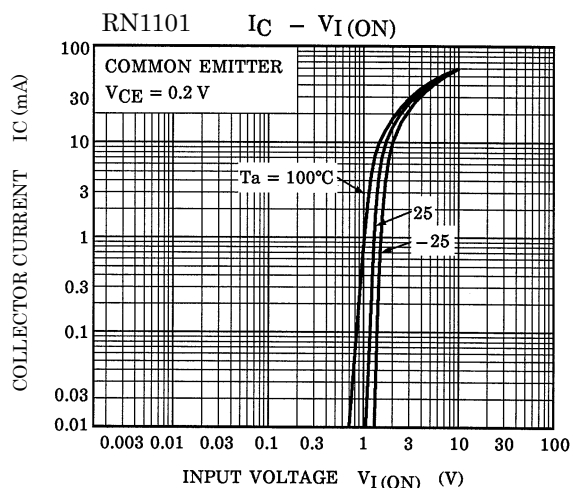
| Characteristic              | Symbol           | Rating  | Unit |
|-----------------------------|------------------|---------|------|
| Collector-base voltage      | V <sub>CBO</sub> | 50      | V    |
| Collector-emitter voltage   |                  | 50      | V    |
| Emitter-base voltage      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

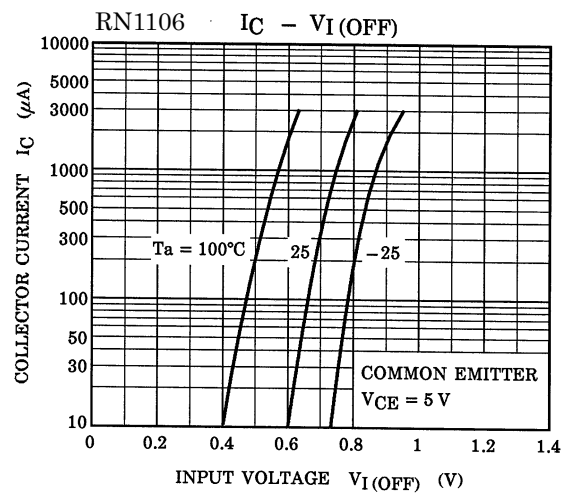
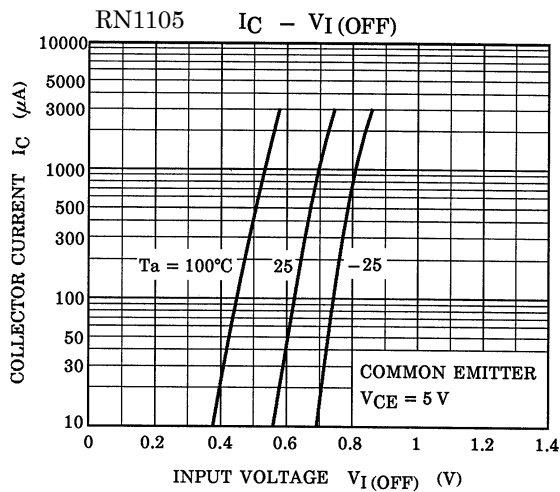
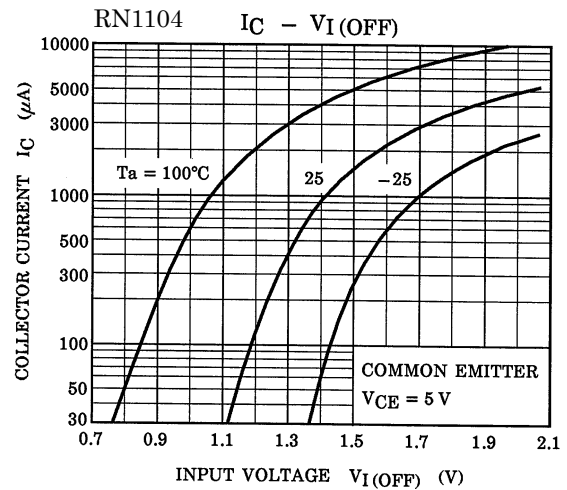
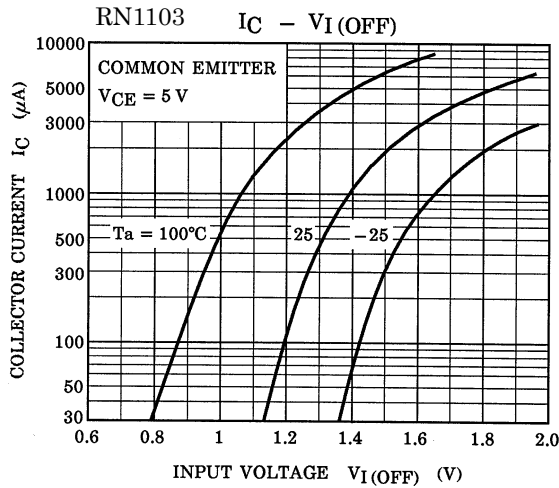
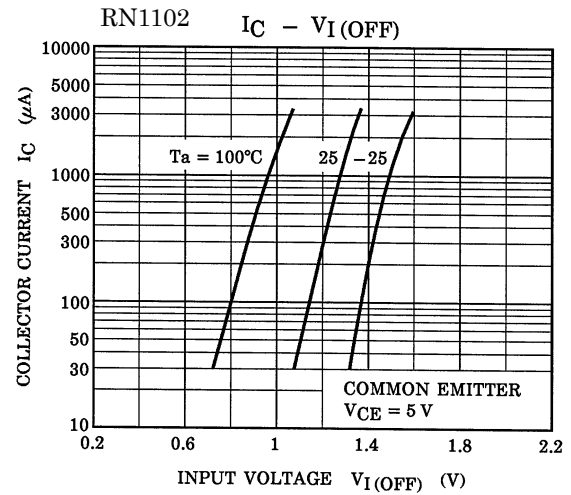
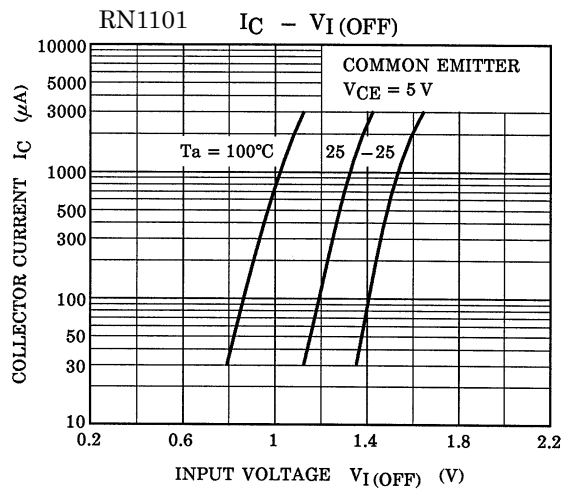
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

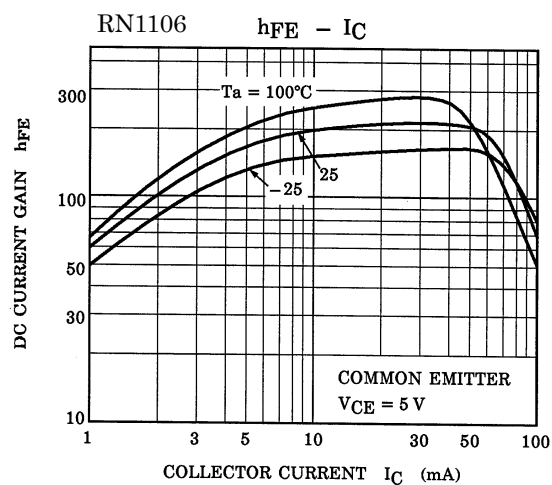
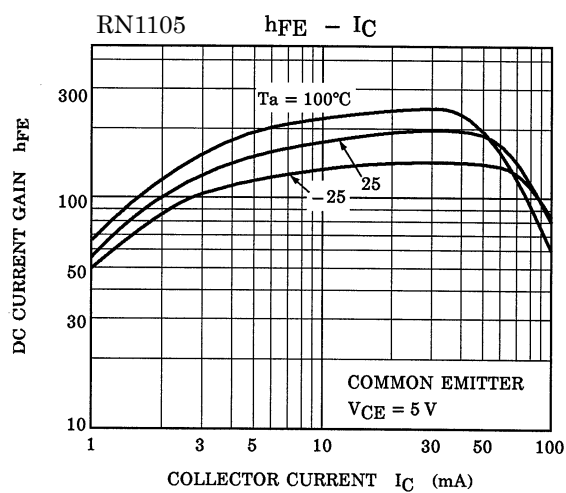
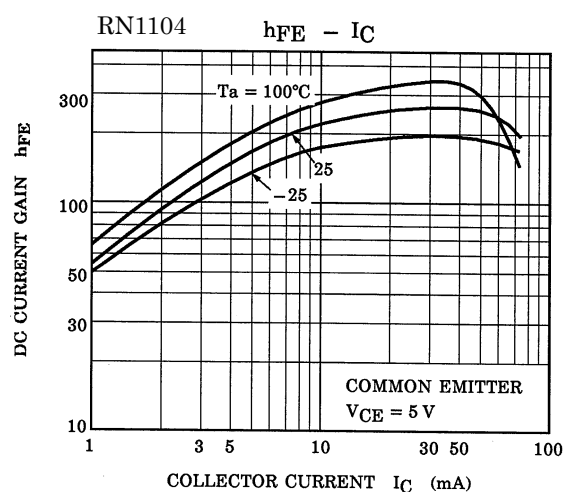
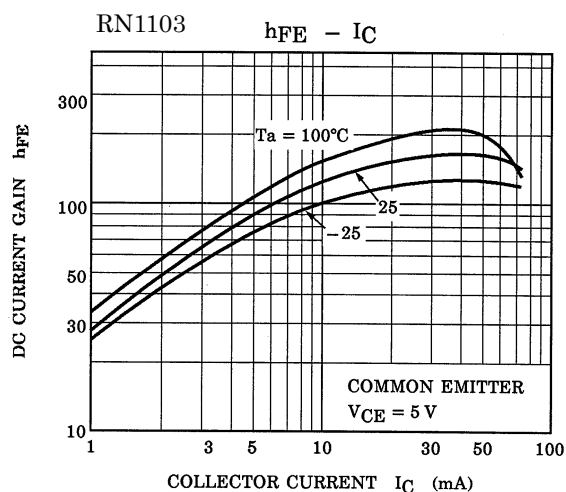
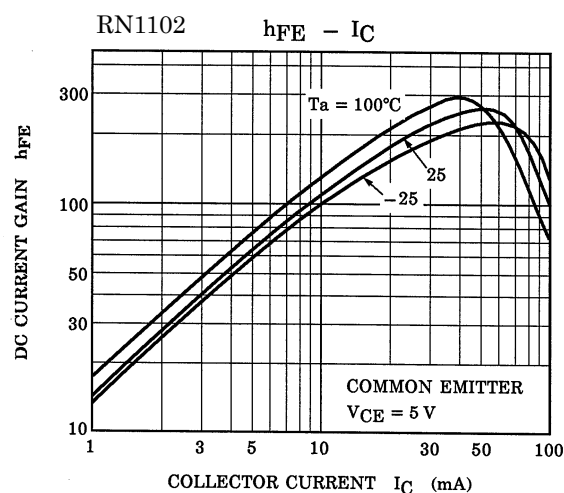
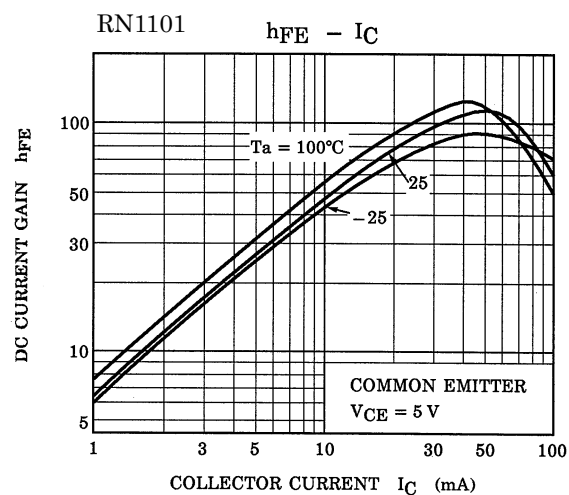
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

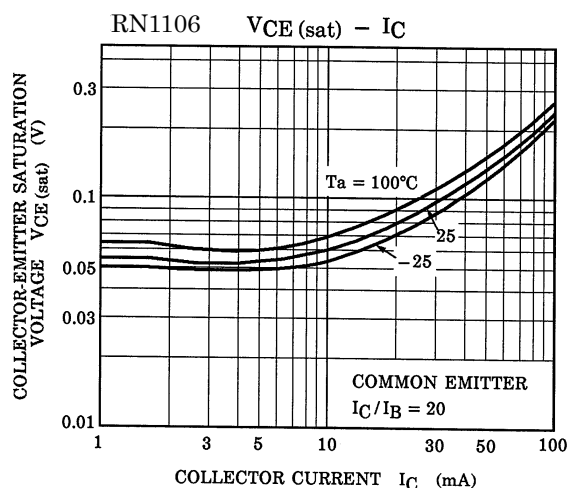
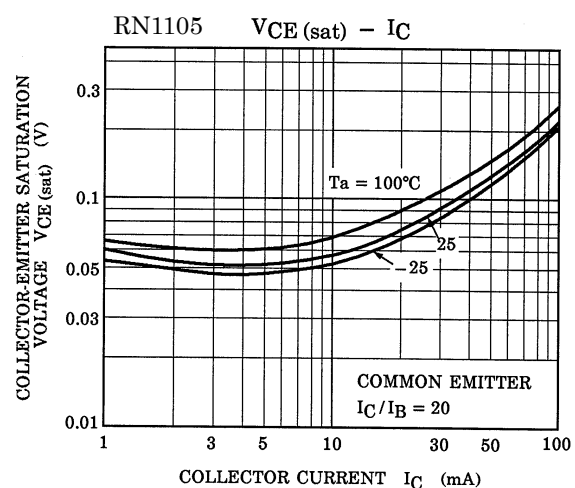
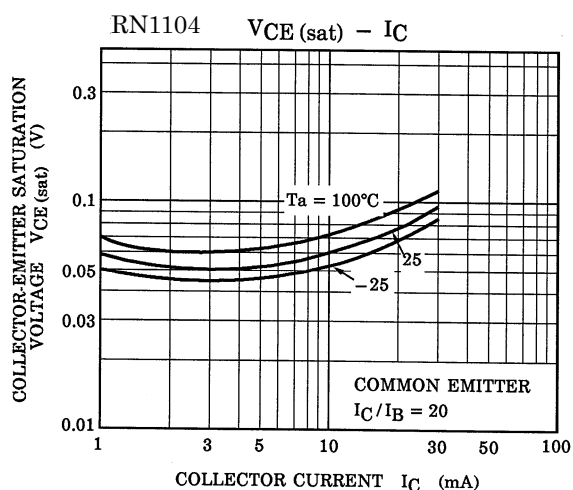
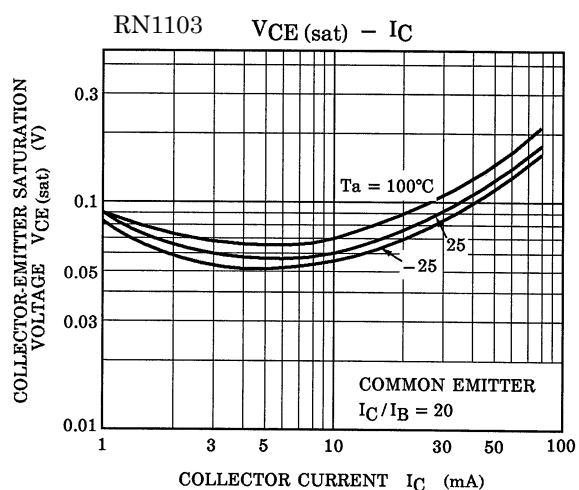
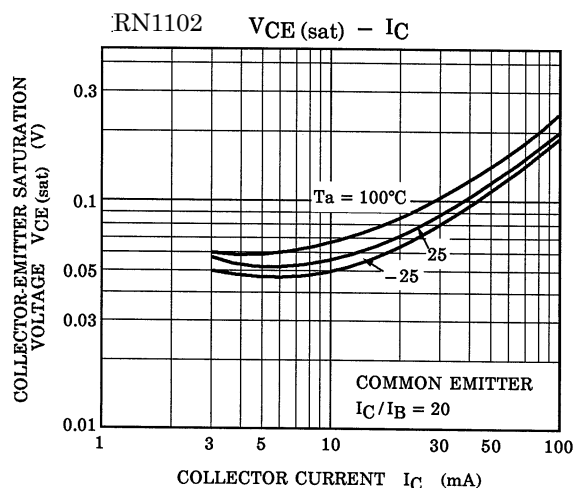
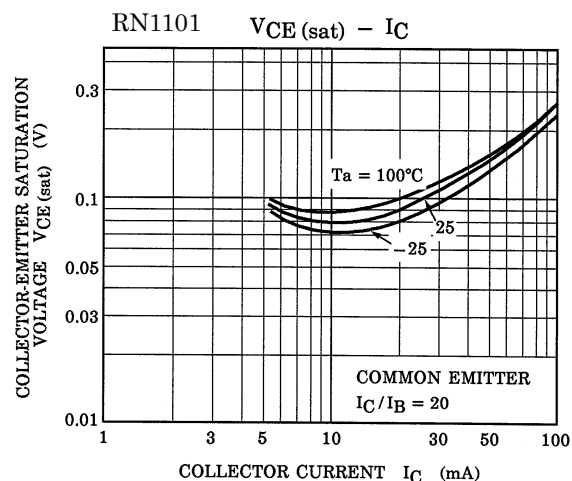
**Electrical Characteristics (Ta = 25°C)**

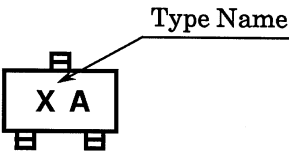
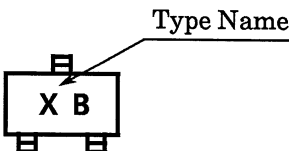
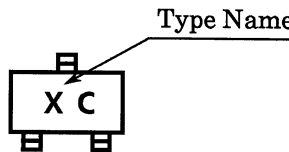
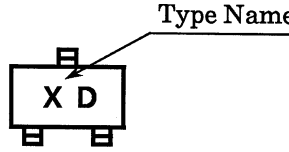
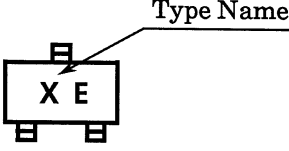
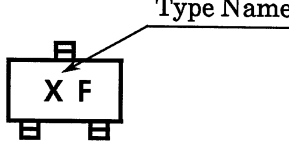
| Characteristic                       |              | Symbol        | Test Circuit | Test Condition                                      | Min    | Typ.   | Max    | Unit |
|--------------------------------------|--------------|---------------|--------------|-----------------------------------------------------|--------|--------|--------|------|
| Collector cut-off current            | RN1101~1106  | $I_{CBO}$     | —            | $V_{CB} = 50 \text{ V}, I_E = 0$                    | —      | —      | 100    | nA   |
|                                      |              | $I_{CEO}$     |              | $V_{CE} = 50 \text{ V}, I_B = 0$                    | —      | —      | 500    |      |
| Emitter cut-off current              | RN1101       | $I_{EBO}$     | —            | $V_{EB} = 10 \text{ V}, I_C = 0$                    | 0.82   | —      | 1.52   | mA   |
|                                      | RN1102       |               |              |                                                     | 0.38   | —      | 0.71   |      |
|                                      | RN1103       |               |              |                                                     | 0.17   | —      | 0.33   |      |
|                                      | RN1104       |               |              |                                                     | 0.082  | —      | 0.15   |      |
|                                      | RN1105       |               |              | $V_{EB} = 5 \text{ V}, I_C = 0$                     | 0.078  | —      | 0.145  |      |
|                                      | RN1106       |               |              |                                                     | 0.074  | —      | 0.138  |      |
| DC current gain                      | RN1101       | $h_{FE}$      | —            | $V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$         | 30     | —      | —      | —    |
|                                      | RN1102       |               |              |                                                     | 50     | —      | —      |      |
|                                      | RN1103       |               |              |                                                     | 70     | —      | —      |      |
|                                      | RN1104       |               |              |                                                     | 80     | —      | —      |      |
|                                      | RN1105       |               |              |                                                     | 80     | —      | —      |      |
|                                      | RN1106       |               |              |                                                     | 80     | —      | —      |      |
| Collector-emitter saturation voltage | RN1101~1106  | $V_{CE(sat)}$ | —            | $I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$         | —      | 0.1    | 0.3    | V    |
| Input voltage (ON)                   | RN1101       | $V_{I(ON)}$   | —            | $V_{CE} = 0.2 \text{ V}, I_C = 5 \text{ mA}$        | 1.1    | —      | 2.0    | V    |
|                                      | RN1102       |               |              |                                                     | 1.2    | —      | 2.4    |      |
|                                      | RN1103       |               |              |                                                     | 1.3    | —      | 3.0    |      |
|                                      | RN1104       |               |              |                                                     | 1.5    | —      | 5.0    |      |
|                                      | RN1105       |               |              |                                                     | 0.6    | —      | 1.1    |      |
|                                      | RN1106       |               |              |                                                     | 0.7    | —      | 1.3    |      |
| Input voltage (OFF)                  | RN1101~1104  | $V_{I(OFF)}$  | —            | $V_{CE} = 5 \text{ V}, I_C = 0.1 \text{ mA}$        | 1.0    | —      | 1.5    | V    |
|                                      | RN1105, 1106 |               |              |                                                     | 0.5    | —      | 0.8    |      |
| Transition frequency                 | RN1101~1106  | $f_T$         | —            | $V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$         | —      | 250    | —      | MHz  |
| Collector output capacitance         | RN1101~1106  | $C_{ob}$      | —            | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$ | —      | 3      | 6      | pF   |
| Input resistor                       | RN1101       | R1            | —            |                                                     | 3.29   | 4.7    | 6.11   | kΩ   |
|                                      | RN1102       |               |              |                                                     | 7      | 10     | 13     |      |
|                                      | RN1103       |               |              |                                                     | 15.4   | 22     | 28.6   |      |
|                                      | RN1104       |               |              |                                                     | 32.9   | 47     | 61.1   |      |
|                                      | RN1105       |               |              |                                                     | 1.54   | 2.2    | 2.86   |      |
|                                      | RN1106       |               |              |                                                     | 3.29   | 4.7    | 6.11   |      |
| Resistor ratio                       | RN1101~1104  | R1/R2         | —            |                                                     | 0.9    | 1.0    | 1.1    | —    |
|                                      | RN1105       |               |              |                                                     | 0.0421 | 0.0468 | 0.0515 |      |
|                                      | RN1106       |               |              |                                                     | 0.09   | 0.1    | 0.11   |      |









| Type Name | Marking                                                                             |
|-----------|-------------------------------------------------------------------------------------|
| RN1101    |    |
| RN1102    |    |
| RN1103    |    |
| N1104     |   |
| RN1105    |  |
| RN1106    |  |

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