

TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

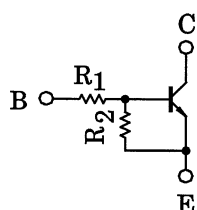
## RN1114, RN1115, RN1116, RN1117, RN1118

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 RN2114 to 2118

### Equivalent Circuit and Bias Resistor Values



| Type No. | R <sub>1</sub> (kΩ) | R <sub>2</sub> (kΩ) |
|----------|---------------------|---------------------|
| RN1114   | 1                   | 10                  |
| RN1115   | 2.2                 | 10                  |
| RN1116   | 4.7                 | 10                  |
| RN1117   | 10                  | 4.7                 |
| RN1118   | 47                  | 10                  |

|         |                                       |
|---------|---------------------------------------|
|         |                                       |
| SSM     | 1. BASE<br>2. EMITTER<br>3. COLLECTOR |
| JEDEC   | —                                     |
| JEITA   | —                                     |
| TOSHIBA | 2-2H1A                                |

Weight: 2.4mg (typ.)

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

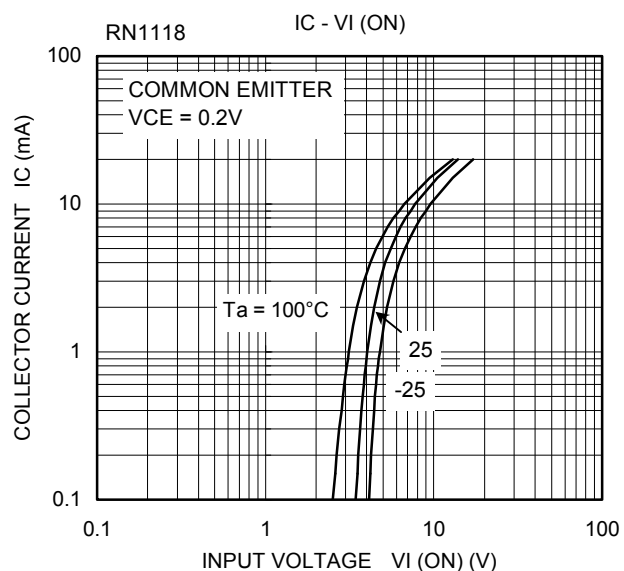
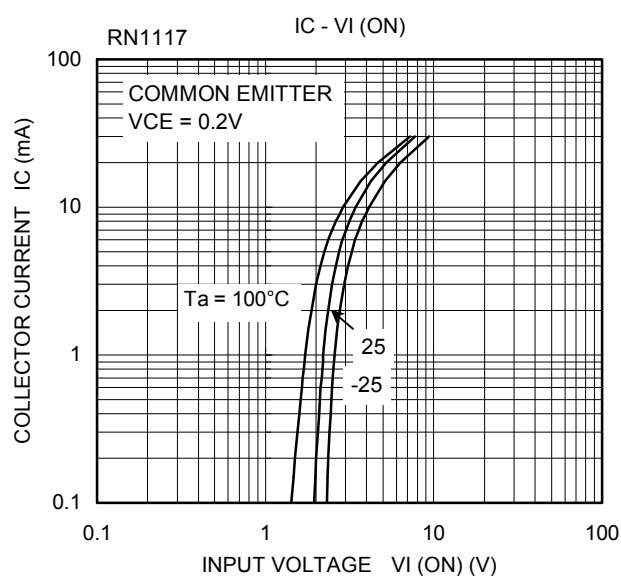
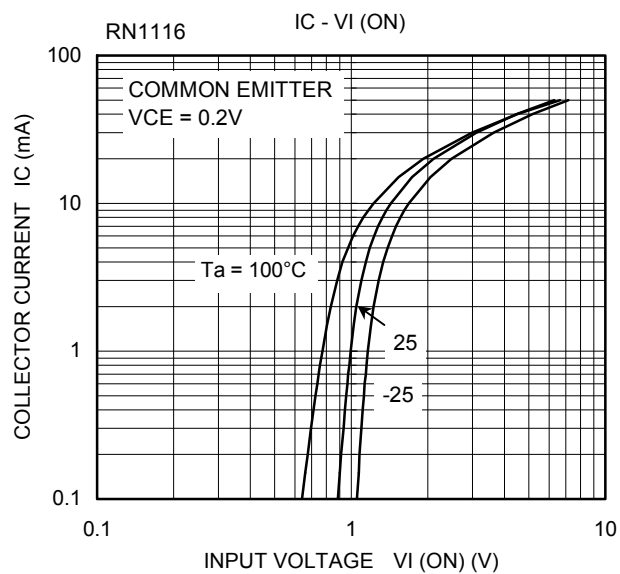
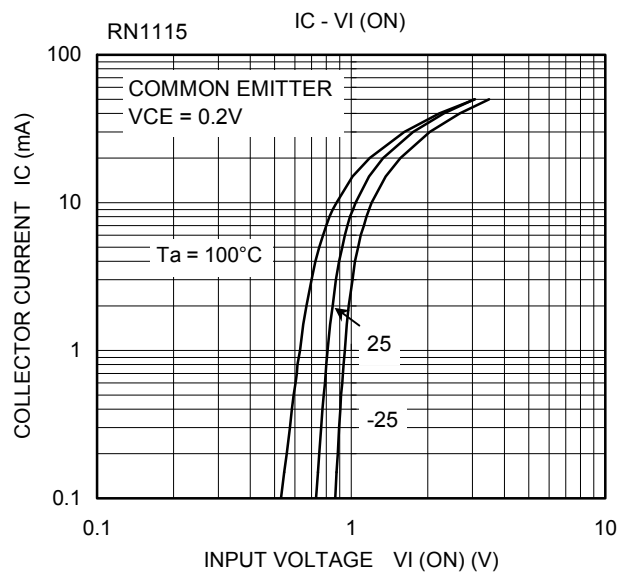
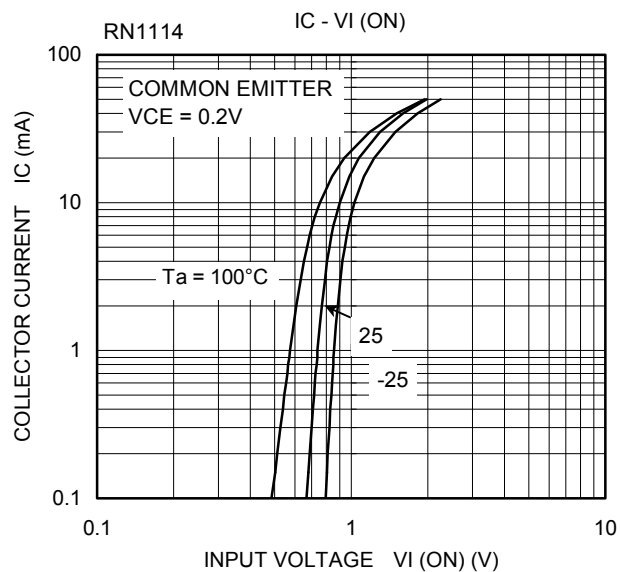
| Characteristic              |                | Symbol           | Rating     | Unit |
|-----------------------------|----------------|------------------|------------|------|
| Collector-base voltage      | RN1114 to 1118 | V <sub>CBO</sub> | 50         | V    |
| Collector-emitter voltage   |                | V <sub>CEO</sub> | 50         | V    |
| Emitter-base voltage        | RN1114         | V <sub>EBO</sub> | 5          | V    |
|                             | RN1115         |                  | 6          |      |
|                             | RN1116         |                  | 7          |      |
|                             | RN1117         |                  | 15         |      |
|                             | RN1118         |                  | 25         |      |
| Collector current           | RN1114 to 1118 | 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 to 150 | °C   |

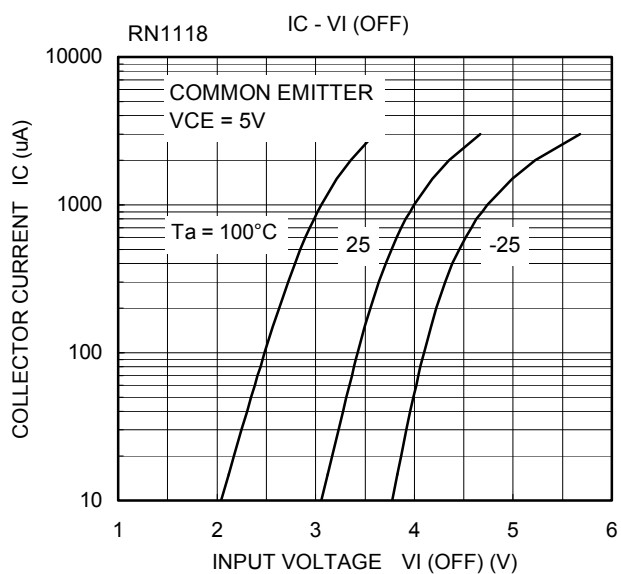
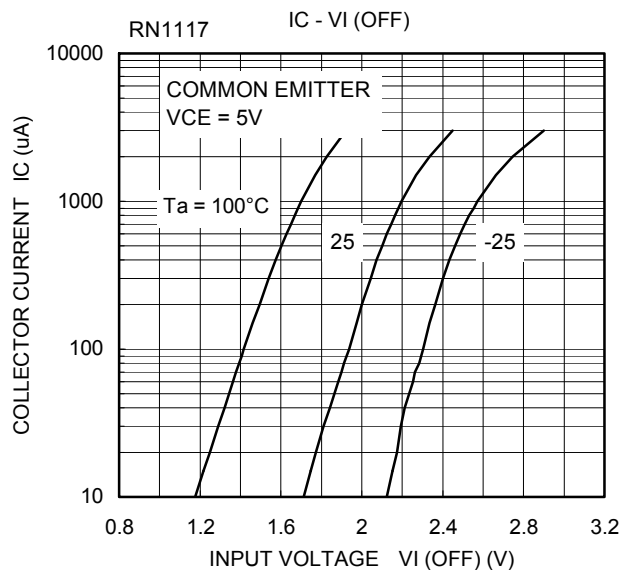
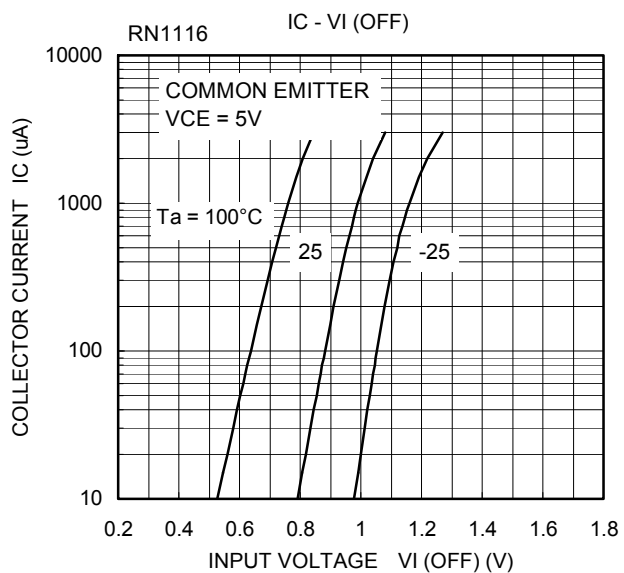
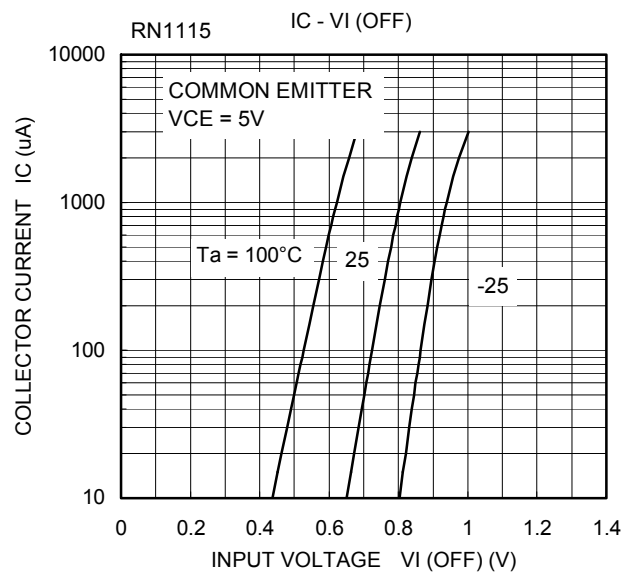
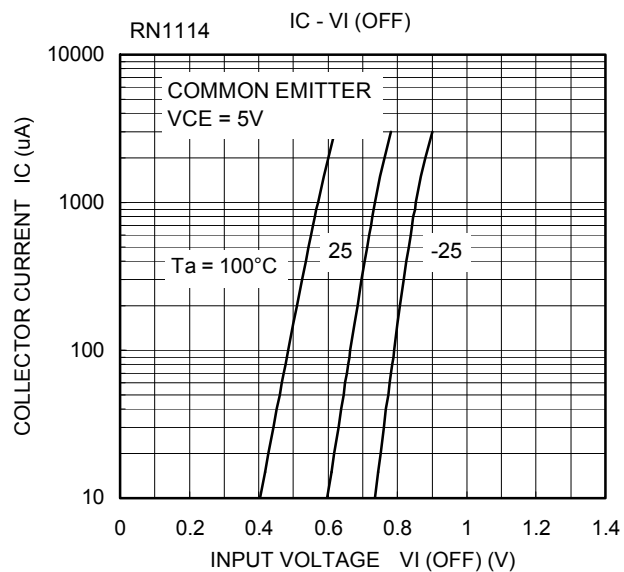
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

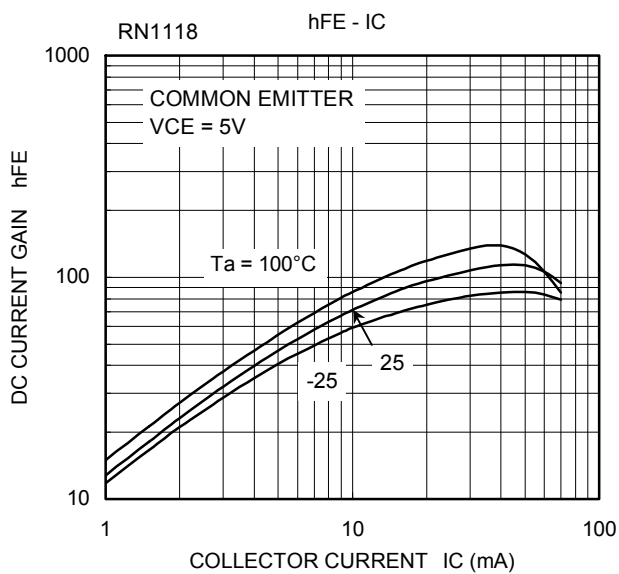
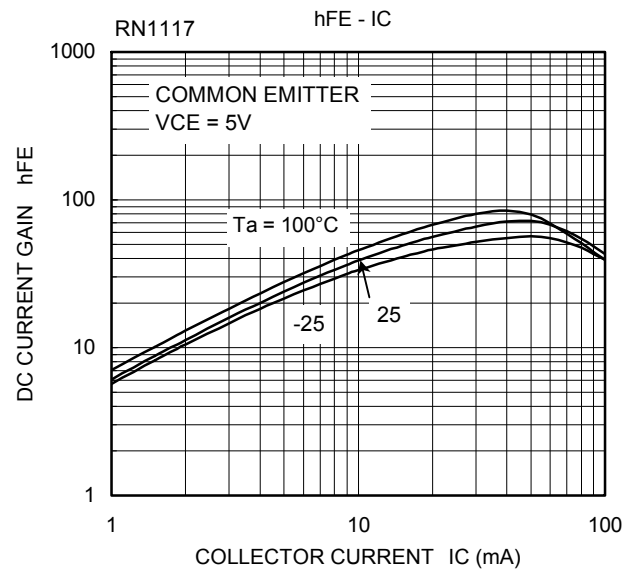
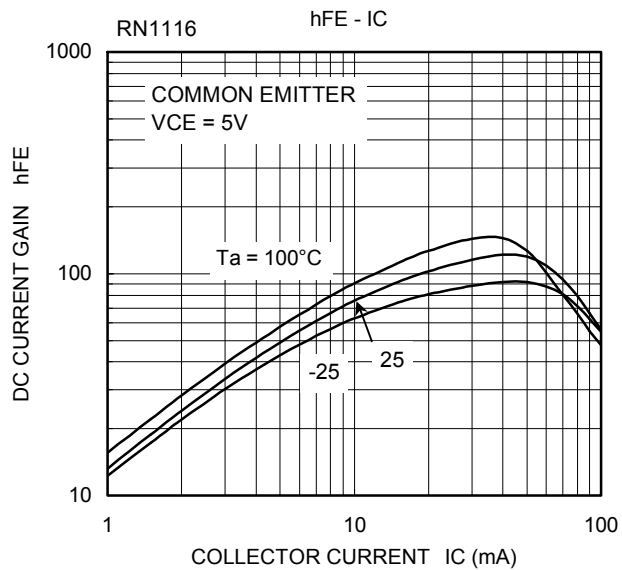
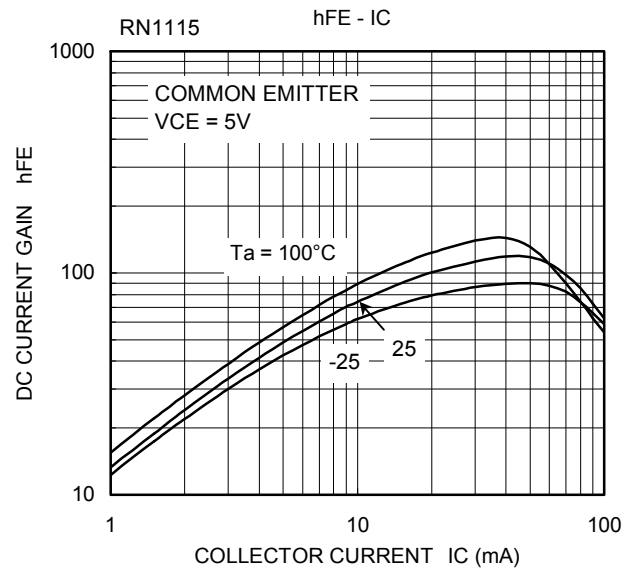
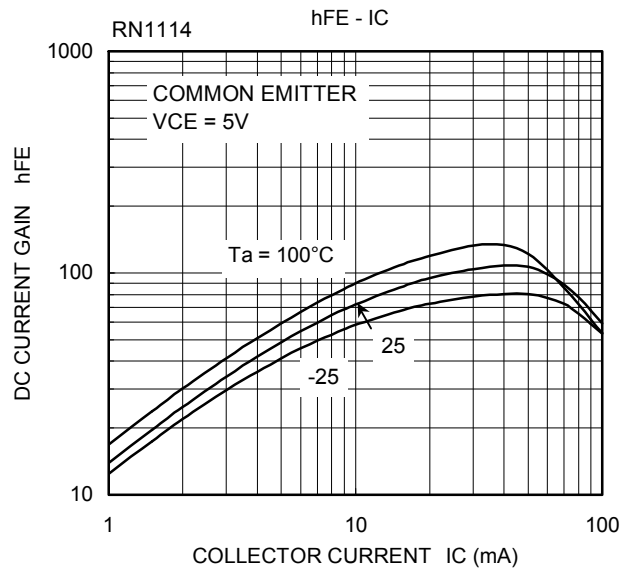
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

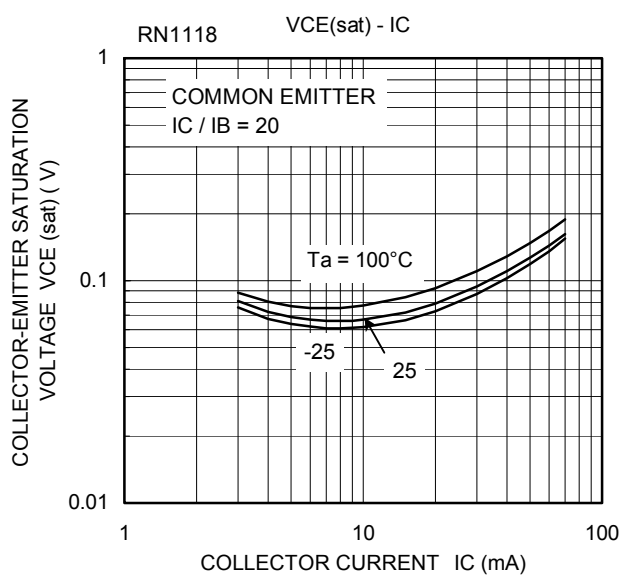
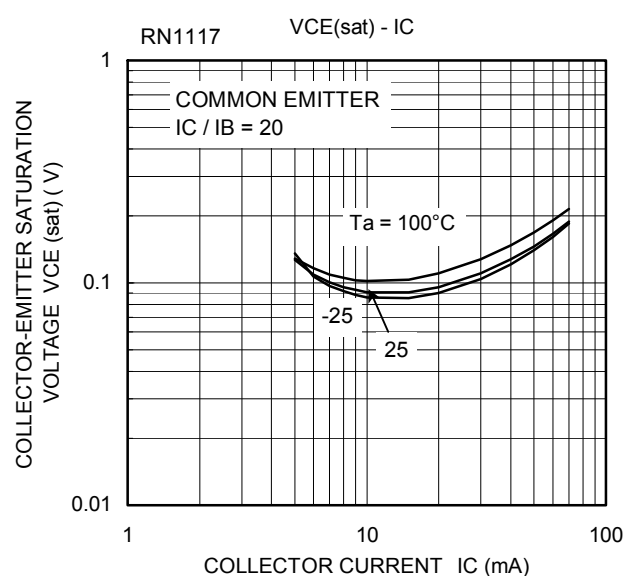
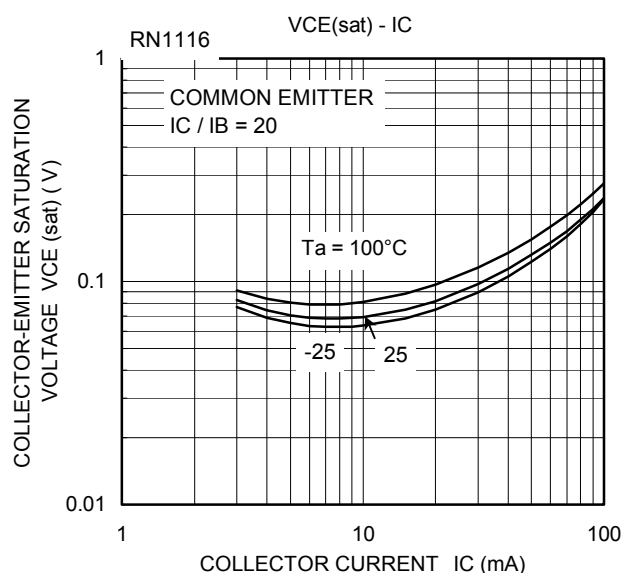
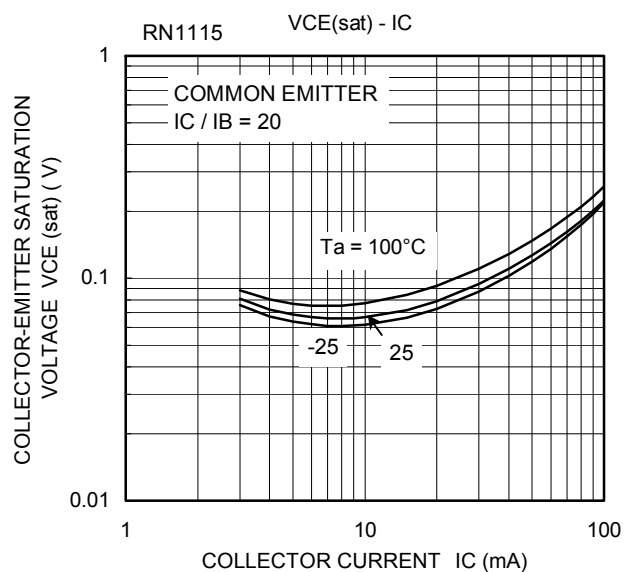
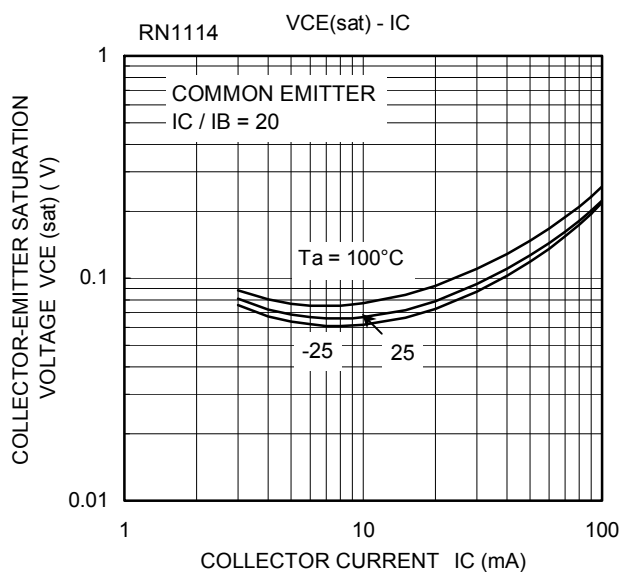
**Electrical Characteristics (Ta = 25°C)**

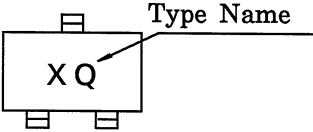
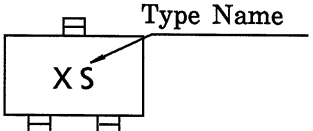
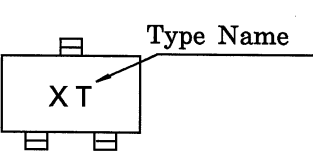
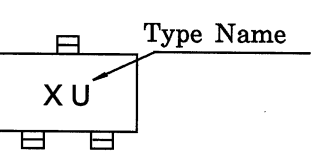
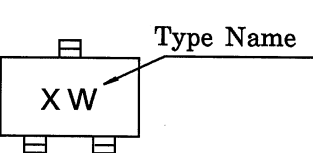
| Characteristic                       |                  | Symbol        | Test Circuit | Test Condition                                    | Min  | Typ. | Max  | Unit |
|--------------------------------------|------------------|---------------|--------------|---------------------------------------------------|------|------|------|------|
| Collector cut-off current            | RN1114 to 1118   | $I_{CBO}$     | —            | $V_{CB} = 50\text{ V}, I_E = 0$                   | —    | —    | 100  | nA   |
|                                      | RN1114 to 1118   | $I_{CEO}$     | —            | $V_{CE} = 50\text{ V}, I_B = 0$                   | —    | —    | 500  | nA   |
| Emitter cut-off current              | RN1114           | $I_{EBO}$     | —            | $V_{EB} = 5\text{ V}, I_C = 0$                    | 0.35 | —    | 0.65 | mA   |
|                                      | RN1115           |               | —            | $V_{EB} = 6\text{ V}, I_C = 0$                    | 0.37 | —    | 0.71 |      |
|                                      | RN1116           |               | —            | $V_{EB} = 7\text{ V}, I_C = 0$                    | 0.36 | —    | 0.68 |      |
|                                      | RN1117           |               | —            | $V_{EB} = 15\text{ V}, I_C = 0$                   | 0.78 | —    | 1.46 |      |
|                                      | RN1118           |               | —            | $V_{EB} = 25\text{ V}, I_C = 0$                   | 0.33 | —    | 0.63 |      |
| DC current gain                      | RN1114 to 16, 18 | $h_{FE}$      | —            | $V_{CE} = 5\text{ V}, I_C = 10\text{ mA}$         | 50   | —    | —    | —    |
|                                      | RN1117           |               | —            |                                                   | 30   | —    | —    |      |
| Collector-emitter saturation voltage | RN1114 to 1118   | $V_{CE(sat)}$ | —            | $I_C = 5\text{ mA}, I_B = 0.25\text{ mA}$         | —    | 0.1  | 0.3  | V    |
| Input voltage (ON)                   | RN1114           | $V_{I(ON)}$   | —            | $V_{CE} = 0.2\text{ V}, I_C = 5\text{ mA}$        | 0.6  | —    | 2.0  | V    |
|                                      | RN1115           |               | —            |                                                   | 0.7  | —    | 2.5  |      |
|                                      | RN1116           |               | —            |                                                   | 0.8  | —    | 2.5  |      |
|                                      | RN1117           |               | —            |                                                   | 1.5  | —    | 3.5  |      |
|                                      | RN1118           |               | —            |                                                   | 2.5  | —    | 10.0 |      |
| Input voltage (OFF)                  | RN1114           | $V_{I(OFF)}$  | —            | $V_{CE} = 5\text{ V}, I_C = 0.1\text{ mA}$        | 0.3  | —    | 0.9  | V    |
|                                      | RN1115           |               | —            |                                                   | 0.3  | —    | 1.0  |      |
|                                      | RN1116           |               | —            |                                                   | 0.3  | —    | 1.1  |      |
|                                      | RN1117           |               | —            |                                                   | 0.3  | —    | 2.3  |      |
|                                      | RN1118           |               | —            |                                                   | 0.5  | —    | 5.7  |      |
| Transition frequency                 | RN1114 to 1118   | $f_T$         | —            | $V_{CE} = 10\text{ V}, I_C = 5\text{ mA}$         | —    | 250  | —    | MHz  |
| Collector output capacitance         | RN1114 to 1118   | $C_{ob}$      | —            | $V_{CB} = 10\text{ V}, I_E = 0, f = 1\text{ MHz}$ | —    | 3.0  | 6.0  | pF   |
| Input Resistor                       | RN1114           | $R_1$         | —            | —                                                 | 0.7  | 1.0  | 1.3  | kΩ   |
|                                      | RN1115           |               | —            |                                                   | 1.54 | 2.2  | 2.86 |      |
|                                      | RN1116           |               | —            |                                                   | 3.29 | 4.7  | 6.11 |      |
|                                      | RN1117           |               | —            |                                                   | 7.0  | 10.0 | 13.0 |      |
|                                      | RN1118           |               | —            |                                                   | 32.9 | 47.0 | 61.1 |      |
| Resistor Ratio                       | RN1114           | $R_1/R_2$     | —            | —                                                 | —    | 0.1  | —    | —    |
|                                      | RN1115           |               | —            |                                                   | —    | 0.22 | —    |      |
|                                      | RN1116           |               | —            |                                                   | —    | 0.47 | —    |      |
|                                      | RN1117           |               | —            |                                                   | —    | 2.13 | —    |      |
|                                      | RN1118           |               | —            |                                                   | —    | 4.7  | —    |      |









| Type Name | Marking                                                                             |
|-----------|-------------------------------------------------------------------------------------|
| RN1114    |    |
| RN1115    |    |
| RN1116    |    |
| RN1117    |   |
| RN1118    |  |

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