

TOSHIBA Transistor Silicon PNP Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

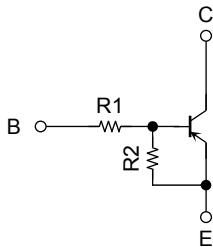
RN2401, RN2402, RN2403 RN2404, RN2405, RN2406

Unit: mm

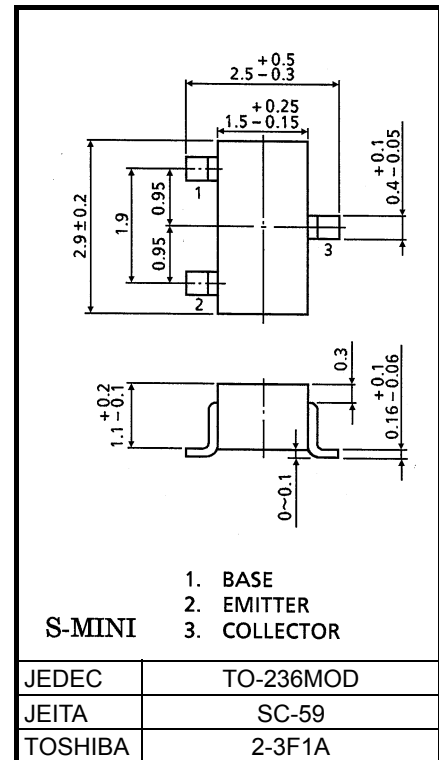
Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

- With built-in bias resistors
- Simplified circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN1401 to 1406

Equivalent Circuit Bias Resistor Values



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN2401 | 4.7 | 4.7 |
| RN2402 | 10 | 10 |
| RN2403 | 22 | 22 |
| RN2404 | 47 | 47 |
| RN2405 | 2.2 | 47 |
| RN2406 | 4.7 | 47 |



Weight: 12mg (typ.)

Absolute Maximum Ratings (Ta = 25°C)

| Characteristic | Symbol | Rating | Unit | |
|-----------------------------|----------------|------------------|------------|----|
| Collector-base voltage | RN2401 to 2406 | V _{CB0} | -50 | V |
| Collector-emitter voltage | | | | |
| Emitter-base voltage | RN2401 to 2404 | V _{EBO} | -10 | V |
| | RN2405, 2406 | | -5 | V |
| Collector current | RN2401 to 2406 | I _C | -100 | mA |
| Collector power dissipation | | P _C | 200 | mW |
| Junction temperature | | T _j | 150 | °C |
| Storage temperature range | | T _{stg} | -55 to 150 | °C |

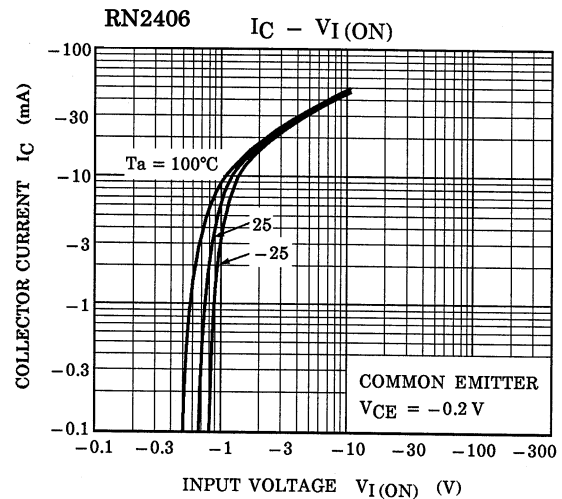
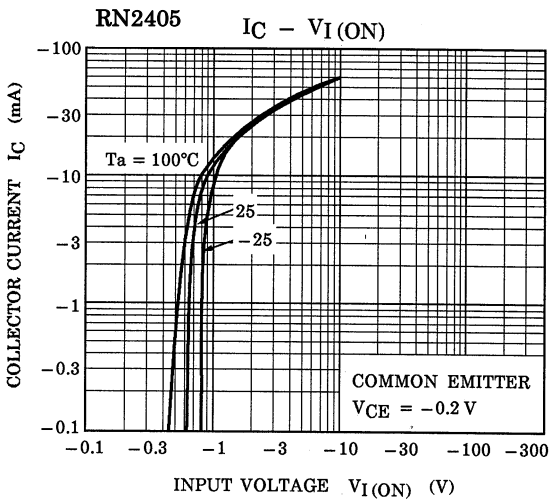
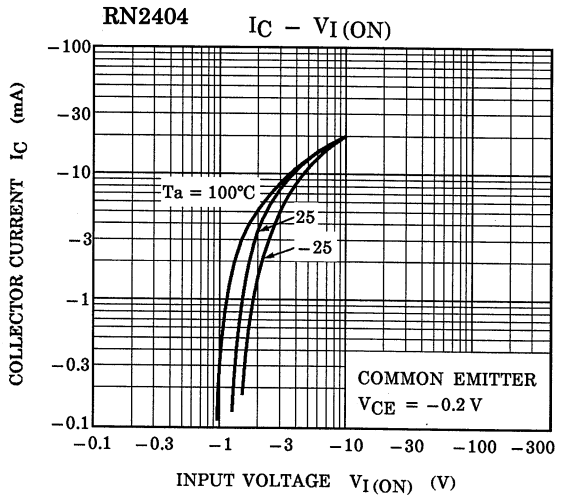
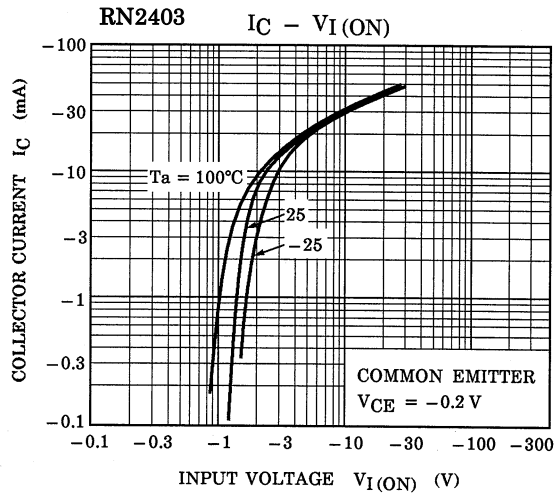
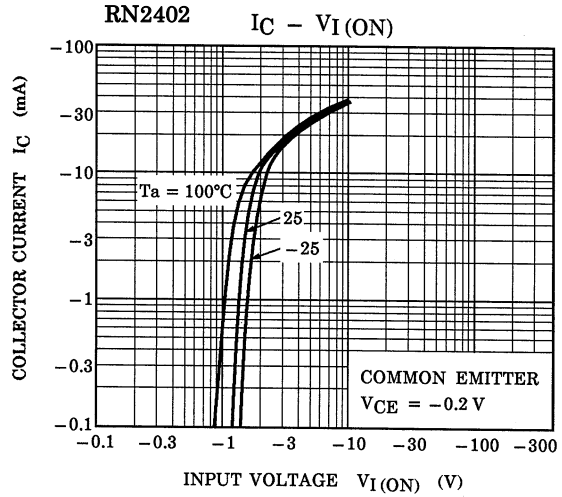
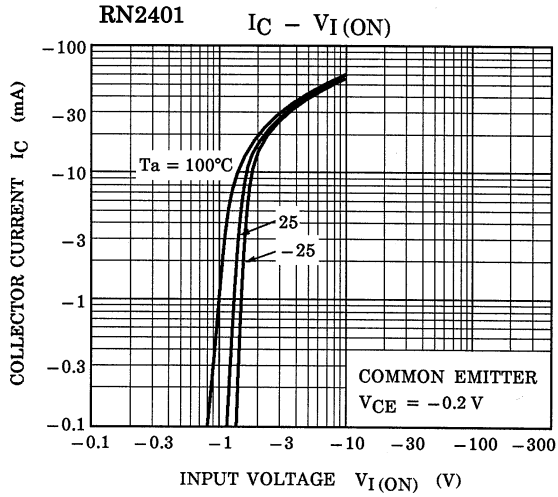
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.)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

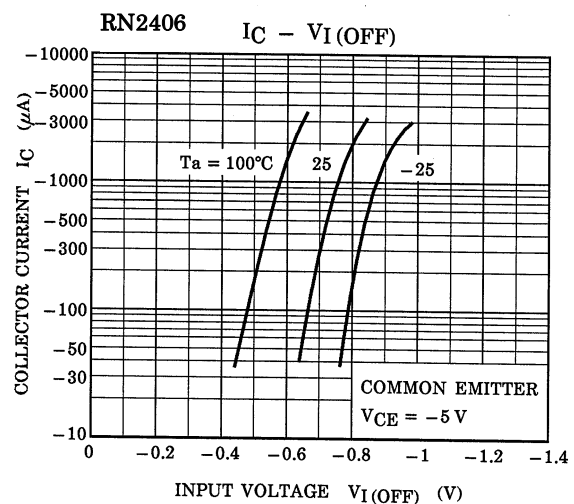
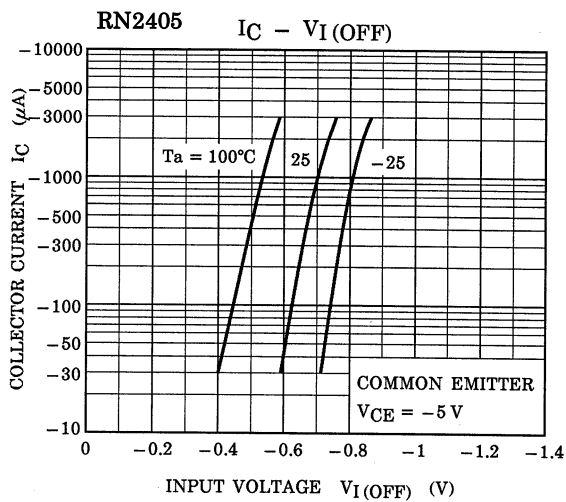
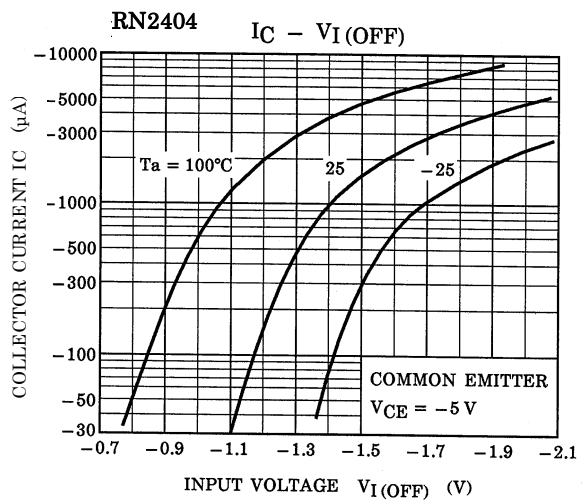
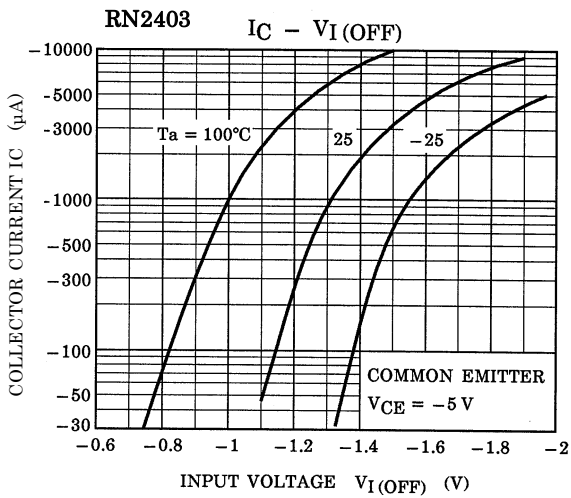
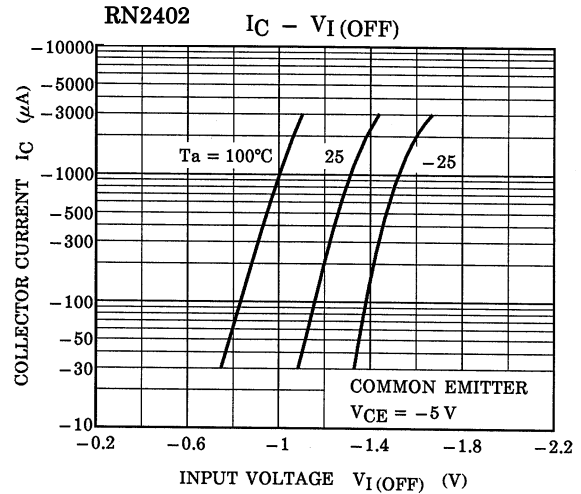
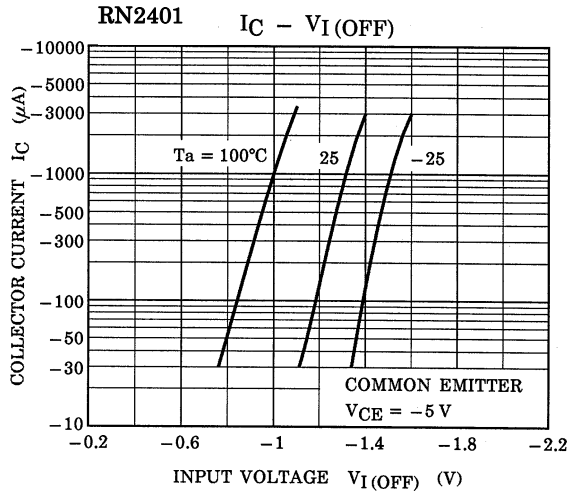
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

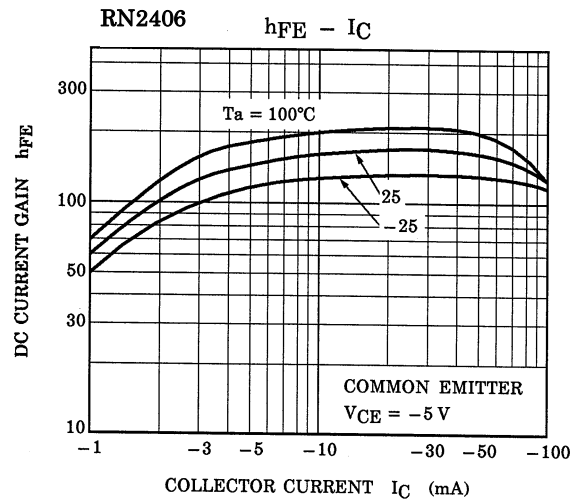
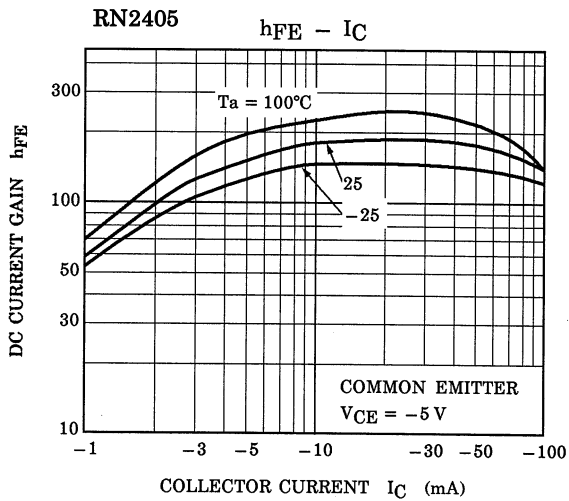
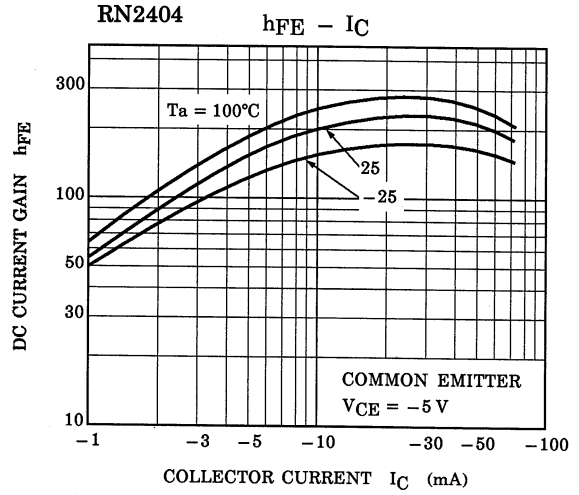
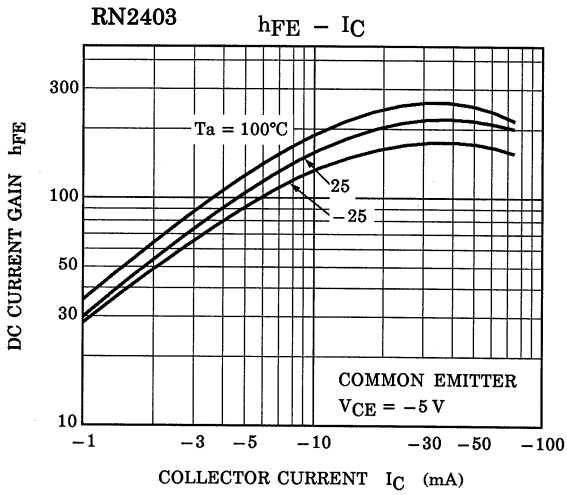
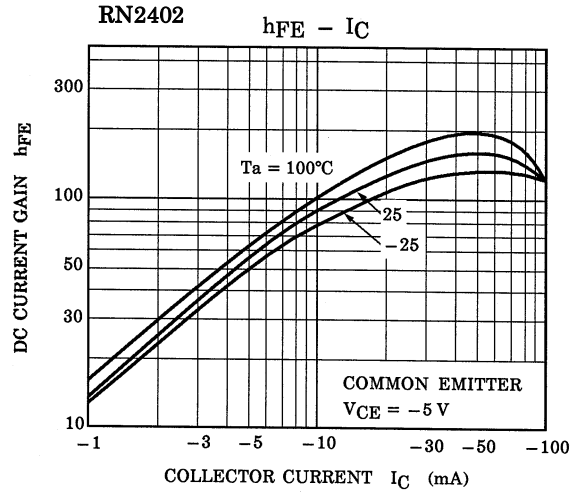
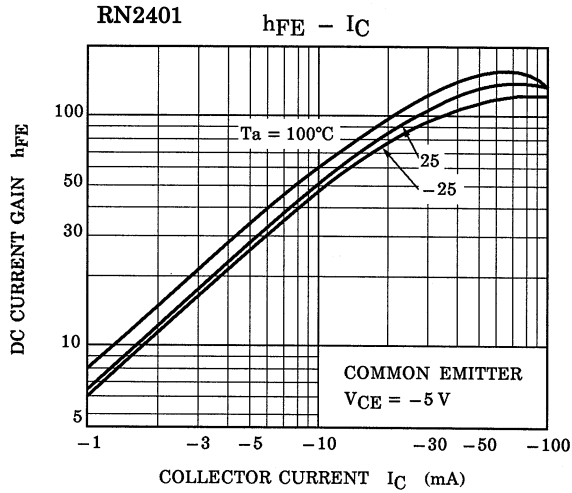
Start of commercial production
1983-06

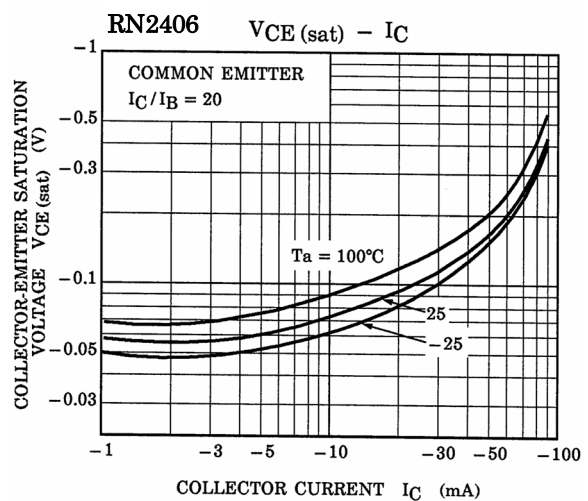
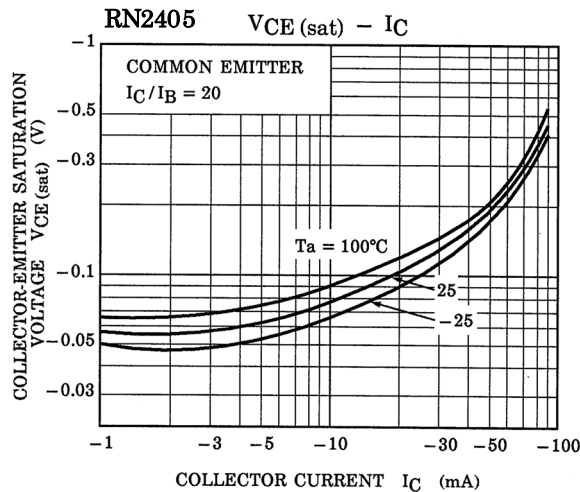
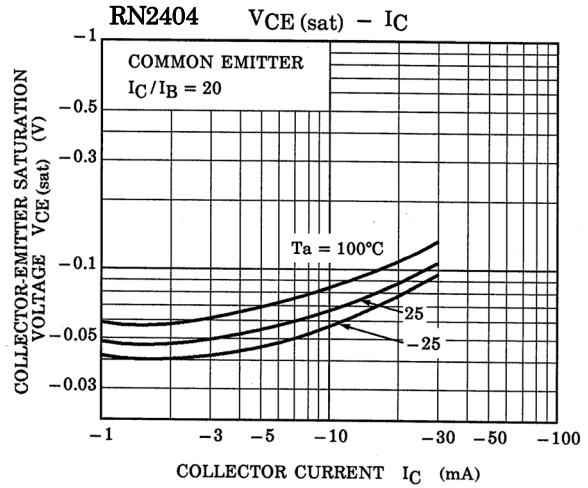
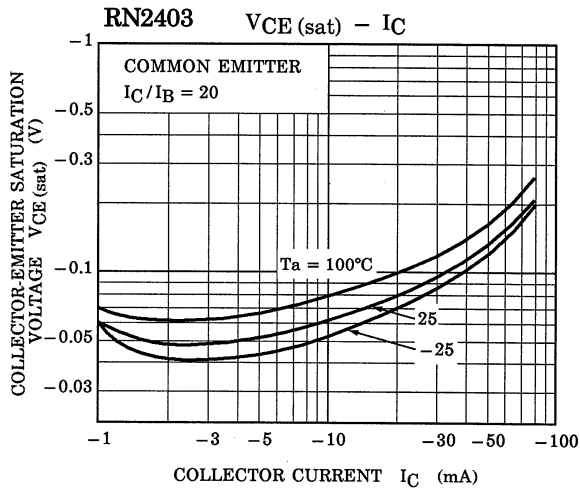
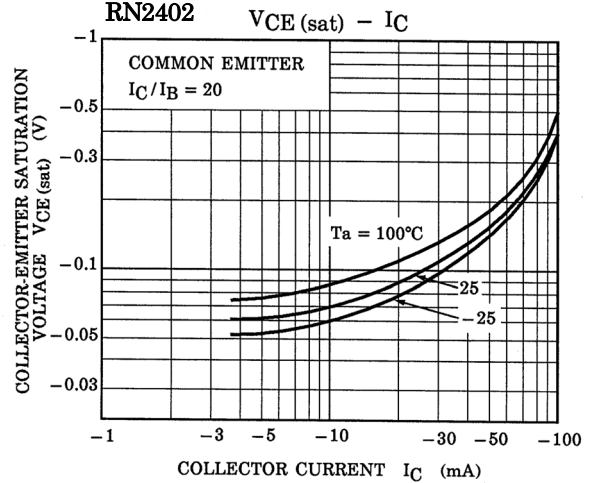
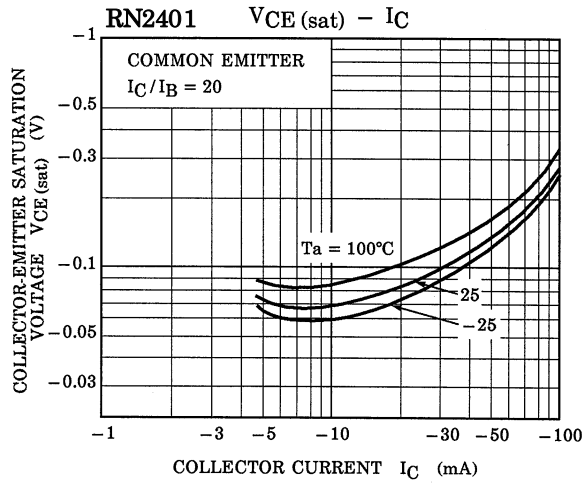
Electrical Characteristics (Ta = 25°C)

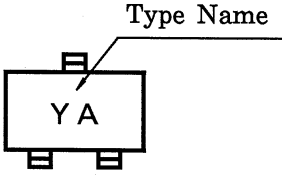
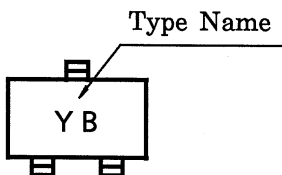
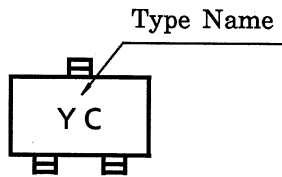
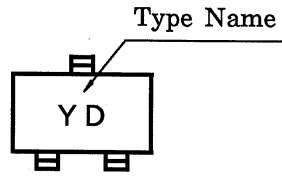
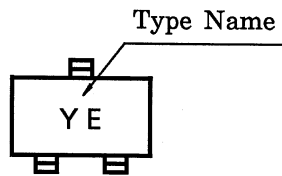
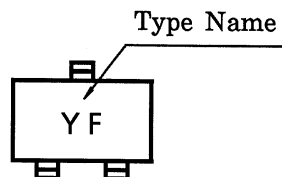
| Characteristic | | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|----------------|---------------|--------------|--|--------|--------|--------|------|
| Collector cut-off current | RN2401 to 2406 | I_{CBO} | — | $V_{CB} = -50\text{ V}, I_E = 0$ | — | — | -100 | nA |
| | | I_{CEO} | — | $V_{CE} = -50\text{ V}, I_B = 0$ | — | — | -500 | |
| Emitter cut-off current | RN2401 | I_{EBO} | — | $V_{EB} = -10\text{ V}, I_C = 0$ | -0.82 | — | -1.52 | mA |
| | RN2402 | | — | | -0.38 | — | -0.71 | |
| | RN2403 | | — | | -0.17 | — | -0.33 | |
| | RN2404 | | — | -0.082 | — | -0.15 | | |
| | RN2405 | | — | $V_{EB} = -5\text{ V}, I_C = 0$ | -0.078 | — | -0.145 | |
| | RN2406 | | — | | -0.074 | — | -0.138 | |
| DC current gain | RN2401 | h_{FE} | — | $V_{CE} = -5\text{ V}, I_C = -10\text{ mA}$ | 30 | — | — | — |
| | RN2402 | | — | | 50 | — | — | |
| | RN2403 | | — | | 70 | — | — | |
| | RN2404 | | — | | 80 | — | — | |
| | RN2405 | | — | | 80 | — | — | |
| | RN2406 | | — | | 80 | — | — | |
| Collector-emitter saturation voltage | RN2401 to 2406 | $V_{CE(sat)}$ | — | $I_C = -5\text{ mA}, I_B = -0.25\text{ mA}$ | — | -0.1 | -0.3 | V |
| Input voltage (ON) | RN2401 | $V_I(ON)$ | — | $V_{CE} = -0.2\text{ V}, I_C = -5\text{ mA}$ | -1.1 | — | -2.0 | V |
| | RN2402 | | — | | -1.2 | — | -2.4 | |
| | RN2403 | | — | | -1.3 | — | -3.0 | |
| | RN2404 | | — | | -1.5 | — | -5.0 | |
| | RN2405 | | — | | -0.6 | — | -1.1 | |
| | RN2406 | | — | | -0.7 | — | -1.3 | |
| Input voltage (OFF) | RN2401 to 2404 | $V_I(OFF)$ | — | $V_{CE} = -5\text{ V}, I_C = -0.1\text{ mA}$ | -1.0 | — | -1.5 | V |
| | RN2405, 2406 | | — | | -0.5 | — | -0.8 | |
| Transition frequency | RN2401 to 2406 | f_T | — | $V_{CE} = -10\text{ V}, I_C = -5\text{ mA}$ | — | 200 | — | MHz |
| Collector output capacitance | RN2401 to 2406 | C_{ob} | — | $V_{CB} = -10\text{ V}, I_E = 0$ $f = 1\text{ MHz}$ | — | 3 | 6 | pF |
| Input resistor | RN2401 | R1 | — | — | 3.29 | 4.7 | 6.11 | kΩ |
| | RN2402 | | — | | 7 | 10 | 13 | |
| | RN2403 | | — | | 15.4 | 22 | 28.6 | |
| | RN2404 | | — | | 32.9 | 47 | 61.1 | |
| | RN2405 | | — | | 1.54 | 2.2 | 2.86 | |
| | RN2406 | | — | | 3.29 | 4.7 | 6.11 | |
| Resistor ratio | RN2401 to 2404 | R1/R2 | — | — | 0.9 | 1.0 | 1.1 | — |
| | RN2405 | | — | | 0.0421 | 0.0468 | 0.0515 | |
| | RN2406 | | — | | 0.09 | 0.1 | 0.11 | |









| Type Name | Marking |
|-----------|---|
| RN2401 |  |
| RN2402 |  |
| RN2403 |  |
| RN2404 |  |
| RN2405 |  |
| RN2406 |  |

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