

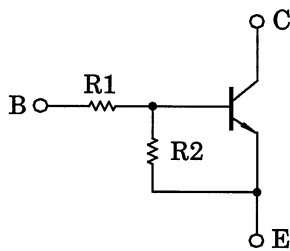
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor built-in Transistor)

RN1707, RN1708, RN1709

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

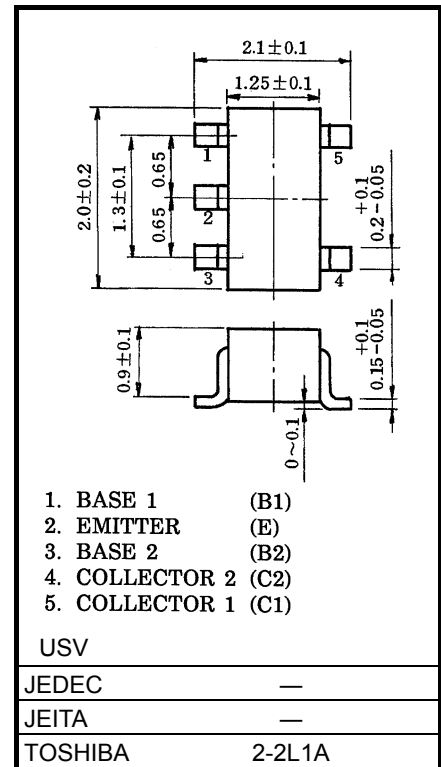
- Including two devices in USV (ultra super mini type with 5 leads)
- With built-in bias resistors
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2707 to RN2709

Equivalent Circuit and Bias Resistor Values



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN1707 | 10 | 47 |
| RN1708 | 22 | 47 |
| RN1709 | 47 | 22 |

Unit: mm



1. BASE 1 (B1)
2. EMITTER (E)
3. BASE 2 (B2)
4. COLLECTOR 2 (C2)
5. COLLECTOR 1 (C1)

USV

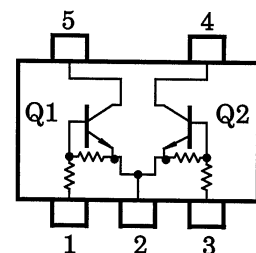
| | |
|---------|--------|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 2-2L1A |

Weight: 6.2mg (typ.)

Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 Common)

| Characteristic | Symbol | Rating | Unit | |
|-----------------------------|----------------|-----------|------------|----|
| Collector-base voltage | RN1707 to 1709 | V_{CBO} | 50 | V |
| Collector-emitter voltage | | V_{CEO} | 50 | V |
| Emitter-base voltage | RN1707 | V_{EBO} | 6 | V |
| | RN1708 | | 7 | |
| | RN1709 | | 15 | |
| Collector current | RN1707 to 1709 | 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 |

Equivalent Circuit (Top View)



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.

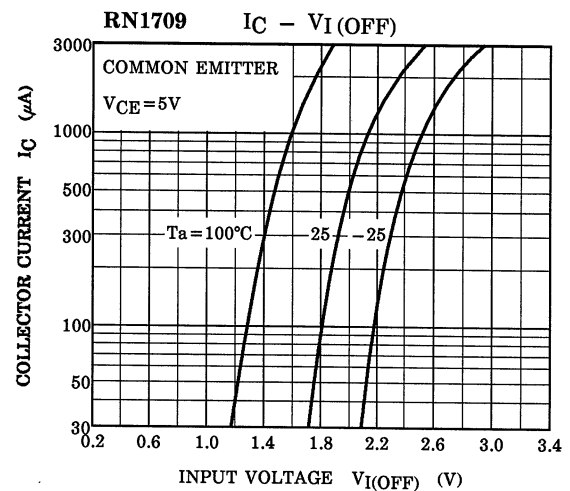
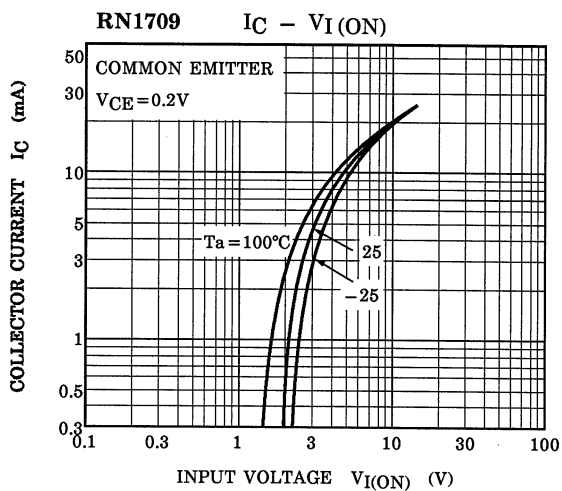
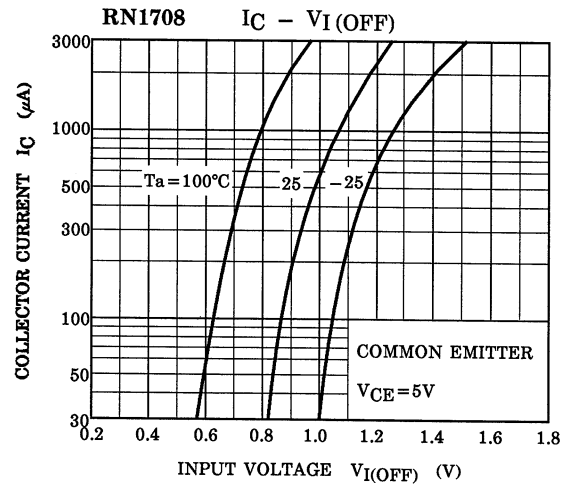
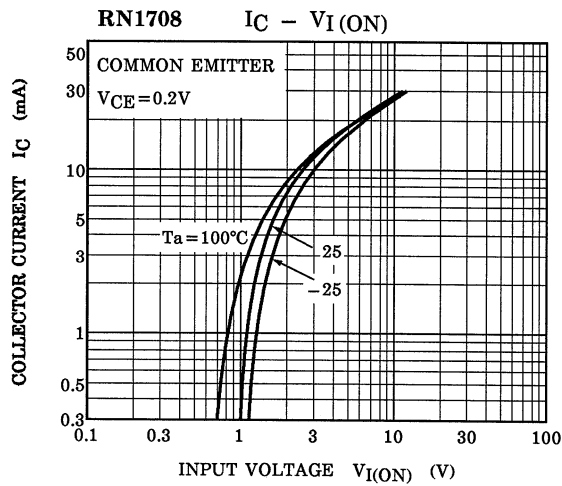
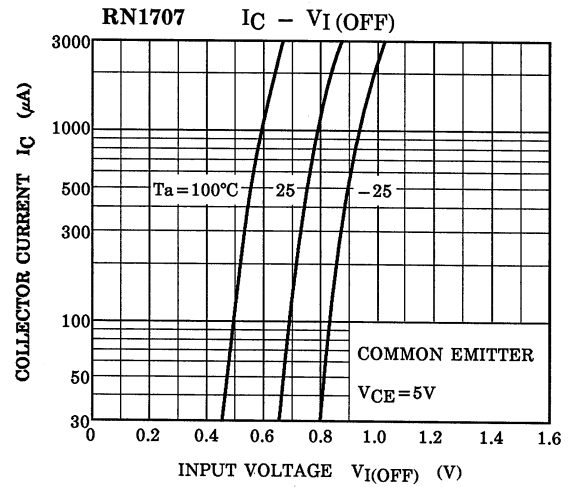
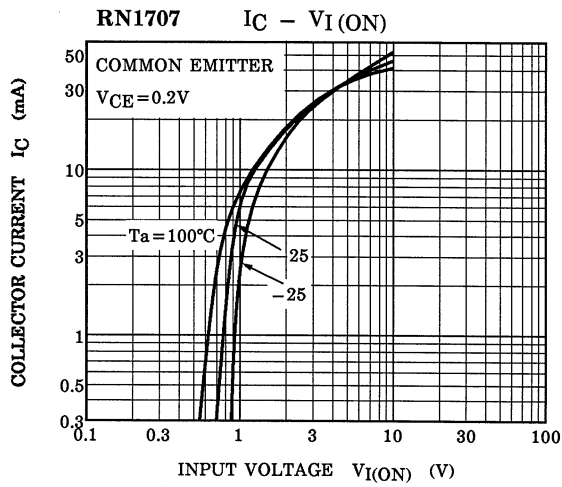
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

*: Total rating

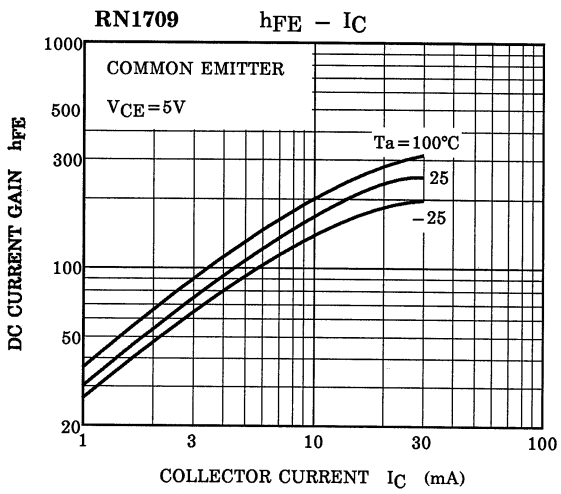
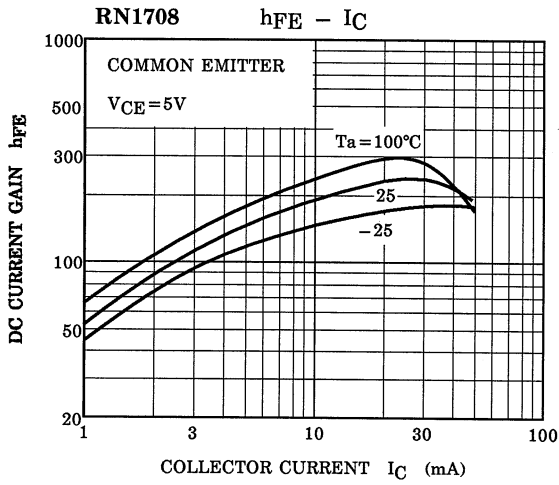
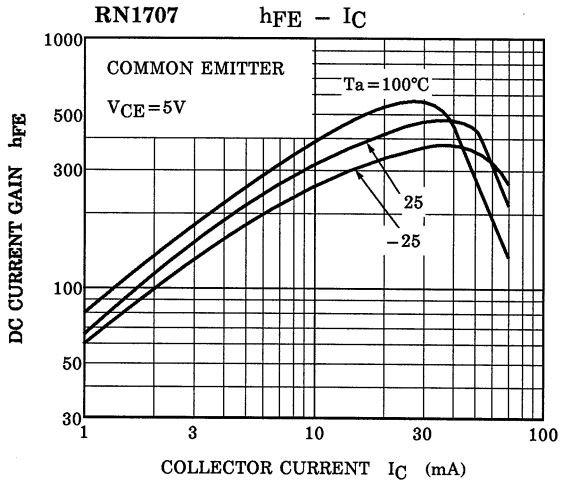
Electrical Characteristics (Ta = 25°C) (Q1, Q2 Common)

| Characteristic | | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|----------------|---------------|--------------|-----------------------------------|-------|-------|-------|------|
| Collector cut-off current | RN1707 to 1709 | I_{CBO} | — | $V_{CB} = 50V, I_E = 0$ | — | — | 100 | nA |
| | | I_{CEO} | — | $V_{CE} = 50V, I_B = 0$ | — | — | 500 | nA |
| Emitter cut-off current | RN1707 | I_{EBO} | — | $V_{EB} = 6V, I_C = 0$ | 0.081 | — | 0.15 | mA |
| | RN1708 | | — | $V_{EB} = 7V, I_C = 0$ | 0.078 | — | 0.145 | |
| | RN1709 | | — | $V_{EB} = 15V, I_C = 0$ | 0.167 | — | 0.311 | |
| DC current gain | RN1707 | h_{FE} | — | $V_{CE} = 5V, I_C = 10mA$ | 80 | — | — | — |
| | RN1708 | | — | | 80 | — | — | |
| | RN1709 | | — | | 70 | — | — | |
| Collector-emitter saturation voltage | RN1707 to 1709 | $V_{CE(sat)}$ | — | $I_C = 5mA, I_B = 0.25mA$ | — | 0.1 | 0.3 | V |
| Input voltage (ON) | RN1707 | $V_I(ON)$ | — | $V_{CE} = 0.2V, I_C = 5mA$ | 0.7 | — | 1.8 | V |
| | RN1708 | | — | | 1.0 | — | 2.6 | |
| | RN1709 | | — | | 2.2 | — | 5.8 | |
| Input voltage (OFF) | RN1707 | $V_I(OFF)$ | — | $V_{CE} = 5V, I_C = 0.1mA$ | 0.5 | — | 1.0 | V |
| | RN1708 | | — | | 0.6 | — | 1.16 | |
| | RN1709 | | — | | 1.5 | — | 2.6 | |
| Transition frequency | RN1707 to 1709 | f_T | — | $V_{CE} = 10V, I_C = 5mA$ | — | 250 | — | MHz |
| Collector output capacitance | RN1707 to 1709 | C_{ob} | — | $V_{CB} = 10V, I_E = 0, f = 1MHz$ | — | 3 | 6 | pF |
| Input resistor | RN1707 | R1 | — | — | 7 | 10 | 13 | kΩ |
| | RN1708 | | — | | 15.4 | 22 | 28.6 | |
| | RN1709 | | — | | 32.9 | 47 | 61.1 | |
| Resistor ratio | RN1707 | R1/R2 | — | — | 0.191 | 0.213 | 0.232 | — |
| | RN1708 | | — | | 0.421 | 0.468 | 0.515 | |
| | RN1709 | | — | | 1.92 | 2.14 | 2.35 | |

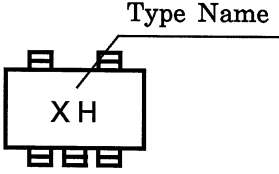
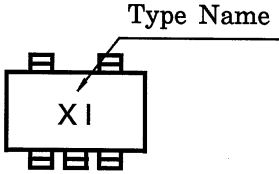
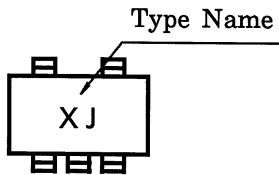
(Q1, Q2 Common)



(Q1, Q2 Common)



Marking

| Type Name | Marking |
|-----------|--|
| RN1707 |  <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X H' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p> |
| RN1708 |  <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X I' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p> |
| RN1709 |  <p>The diagram shows a rectangular component with two pins on top and four pins on the bottom. The letters 'X J' are printed in the center. A line points from the text 'Type Name' above to the 'X' in the marking.</p> |

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