

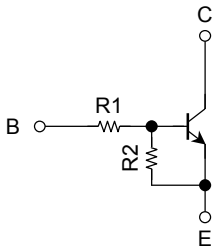
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

# RN1967FE, RN1968FE, RN1969FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications.

- Two devices are incorporated into an Extreme-Super-Mini (6 pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enable the manufacture of ever more compact equipment and save assembly cost.
- Complementary to RN2967FE~RN2969FE

## Equivalent Circuit and Bias Resistor Values



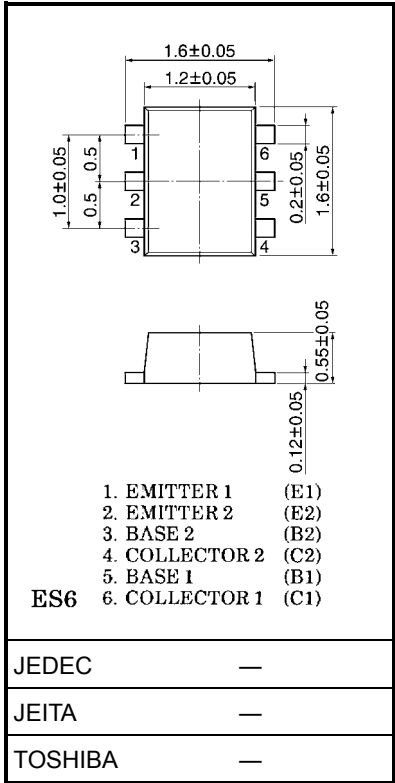
| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN1967FE | 10      | 47      |
| RN1968FE | 22      | 47      |
| RN1969FE | 47      | 22      |

## Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

| Characteristics             | Symbol       | Rating  | Unit |
|-----------------------------|--------------|---------|------|
| Collector-base voltage      | $V_{CBO}$    | 50      | V    |
| Collector-emitter voltage   | $V_{CEO}$    | 50      | V    |
| Emitter-base voltage        | $V_{EBO}$    | 6       | V    |
|                             |              | 7       |      |
|                             |              | 15      |      |
| Collector current           | $I_C$        | 100     | mA   |
| Collector power dissipation | $P_C$ (Note) | 100     | mW   |
| Junction temperature        | $T_j$        | 150     | °C   |
| Storage temperature range   | $T_{stg}$    | -55~150 | °C   |

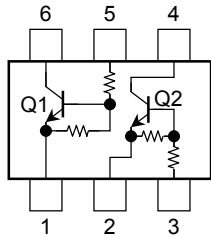
Note: Total rating

Unit: mm



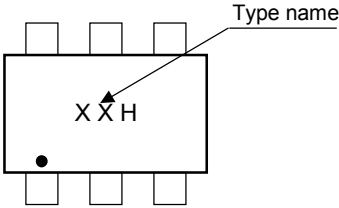
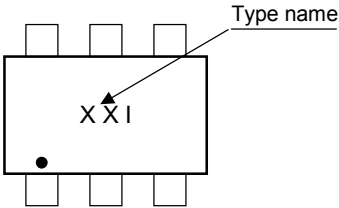
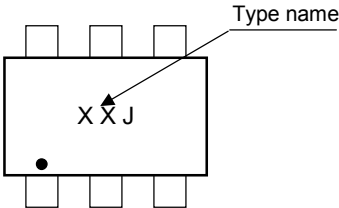
Weight: g (typ.)

## Equivalent Circuit (top view)



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

| Characteristics                      |                 | Symbol        | Test Condition                                      | Min   | Typ.  | Max   | Unit |
|--------------------------------------|-----------------|---------------|-----------------------------------------------------|-------|-------|-------|------|
| Collector cut-off current            | RN1967FE~1969FE | $I_{CBO}$     | $V_{CB} = 50 \text{ V}, I_E = 0$                    | —     | —     | 100   | nA   |
|                                      |                 | $I_{CEO}$     | $V_{CE} = 50 \text{ V}, I_B = 0$                    | —     | —     | 500   |      |
| Emitter cut-off current              | RN1967FE        | $I_{EBO}$     | $V_{EB} = 6 \text{ V}, I_C = 0$                     | 0.081 | —     | 0.15  | mA   |
|                                      | RN1968FE        |               | $V_{EB} = 7 \text{ V}, I_C = 0$                     | 0.078 | —     | 0.145 |      |
|                                      | RN1969FE        |               | $V_{EB} = 15 \text{ V}, I_C = 0$                    | 0.167 | —     | 0.311 |      |
| DC current gain                      | RN1967FE        | $h_{FE}$      | $V_{CE} = 5 \text{ V}, I_C = 10 \text{ mA}$         | 80    | —     | —     |      |
|                                      | RN1968FE        |               |                                                     | 80    | —     | —     |      |
|                                      | RN1969FE        |               |                                                     | 70    | —     | —     |      |
| Collector-emitter saturation voltage | RN1967FE~1969FE | $V_{CE(sat)}$ | $I_C = 5 \text{ mA}, I_B = 0.25 \text{ mA}$         | —     | 0.1   | 0.3   | V    |
| Input voltage (ON)                   | RN1967FE        | $V_{I(ON)}$   | $V_{CE} = 0.2 \text{ V}, I_C = 5 \text{ mA}$        | 0.7   | —     | 1.8   | V    |
|                                      | RN1968FE        |               |                                                     | 1.0   | —     | 2.6   |      |
|                                      | RN1969FE        |               |                                                     | 2.2   | —     | 5.8   |      |
| Input voltage (OFF)                  | RN1967FE        | $V_{I(OFF)}$  | $V_{CE} = 5 \text{ V}, I_C = 0.1 \text{ mA}$        | 0.5   | —     | 1.0   | V    |
|                                      | RN1968FE        |               |                                                     | 0.6   | —     | 1.16  |      |
|                                      | RN1969FE        |               |                                                     | 1.5   | —     | 2.6   |      |
| Transition frequency                 | RN1967FE~1969FE | $f_T$         | $V_{CE} = 10 \text{ V}, I_C = 5 \text{ mA}$         | —     | 250   | —     | MHz  |
| Collector output capacitance         | RN1967FE~1969FE | $C_{ob}$      | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$ | —     | 3     | 6     | pF   |
| Input resistor                       | RN1967FE        | R1            | —                                                   | 7     | 10    | 13    | kΩ   |
|                                      | RN1968FE        |               |                                                     | 15.4  | 22    | 28.6  |      |
|                                      | RN1969FE        |               |                                                     | 32.9  | 47    | 61.1  |      |
| Resistor ratio                       | RN1967FE        | R1/R2         | —                                                   | 0.191 | 0.2   | 0.232 |      |
|                                      | RN1968FE        |               |                                                     | 0.421 | 0.468 | 0.515 |      |
|                                      | RN1969FE        |               |                                                     | 1.92  | 2.14  | 2.35  |      |

| Type Name | Marking                                                                                                                                                                                                                                                                                             |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| RN1967FE  |  <p>The diagram shows a rectangular component with six pins (three on top, three on bottom). Inside the rectangle, the text 'X X H' is printed. An arrow points from the label 'Type name' to the second 'X'.</p>  |
| RN1968FE  |  <p>The diagram shows a rectangular component with six pins (three on top, three on bottom). Inside the rectangle, the text 'X X I' is printed. An arrow points from the label 'Type name' to the second 'X'.</p>  |
| RN1969FE  |  <p>The diagram shows a rectangular component with six pins (three on top, three on bottom). Inside the rectangle, the text 'X X J' is printed. An arrow points from the label 'Type name' to the second 'X'.</p> |

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