

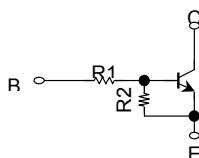
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT process) (Bias Resistor built-in Transistor)

RN1967FS, RN1968FS, RN1969FS

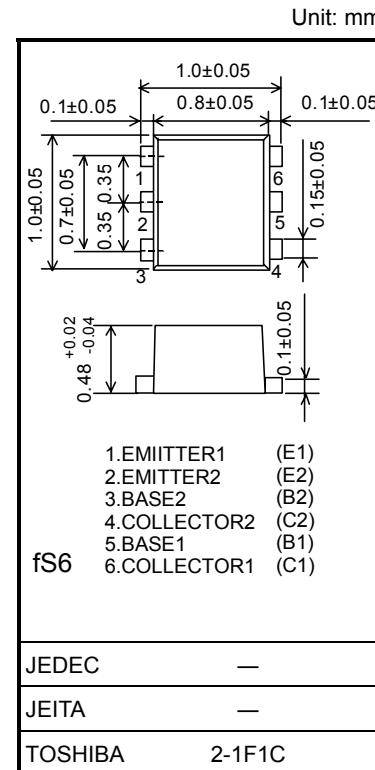
Switching, Inverter Circuit, Interface Circuit and
Driver Circuit Applications

- Two devices are incorporated into a fine pitch Small Mold (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 RN2967FS~RN2969FS

Equivalent Circuit and Bias Resistor Values



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN1967FS | 10 | 47 |
| RN1968FS | 22 | 47 |
| RN1969FS | 47 | 22 |



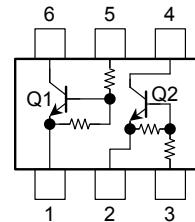
Weight: 0.001g (typ.)

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

| Characteristics | | Symbol | Rating | Unit |
|-----------------------------|-------------------|-----------------------|---------|------|
| Collector-base voltage | RN1967FS~1969FS | V _{CBO} | 20 | V |
| Collector-emitter voltage | | V _{CEO} | 20 | V |
| Emitter-base voltage | RN1967FS | V _{EBO} | 6 | V |
| | | | 7 | |
| | | | 15 | |
| Collector current | RN1967FS~RN1969FS | I _C | 50 | mA |
| Collector power dissipation | | P _C (Note) | 50 | mW |
| Junction temperature | | T _j | 150 | °C |
| Storage temperature range | | T _{stg} | -55~150 | °C |

Note: Total rating

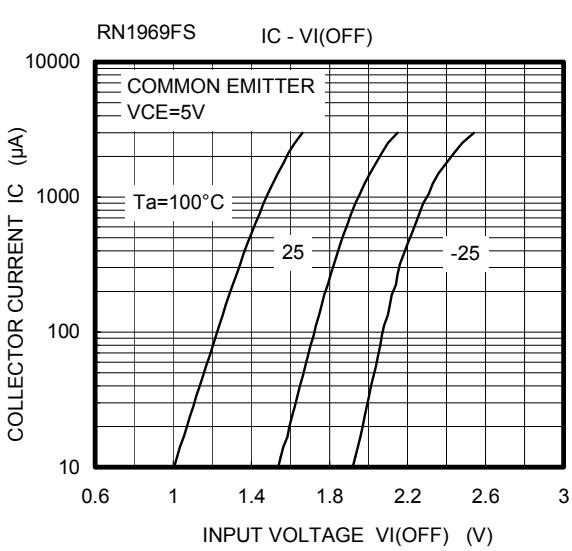
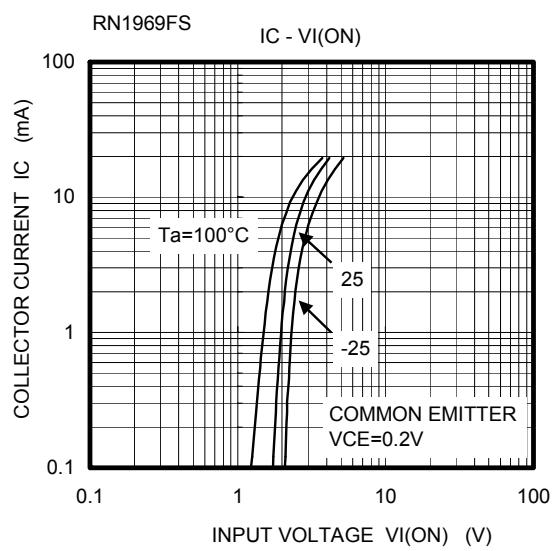
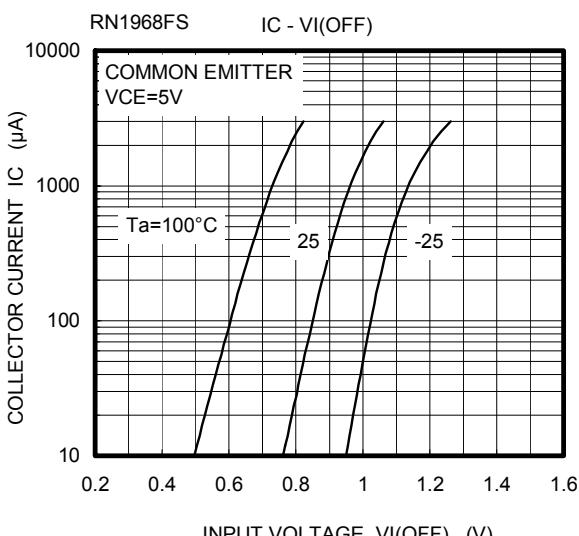
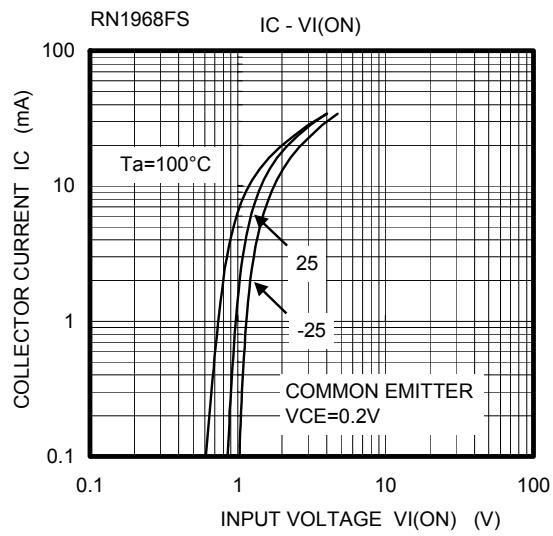
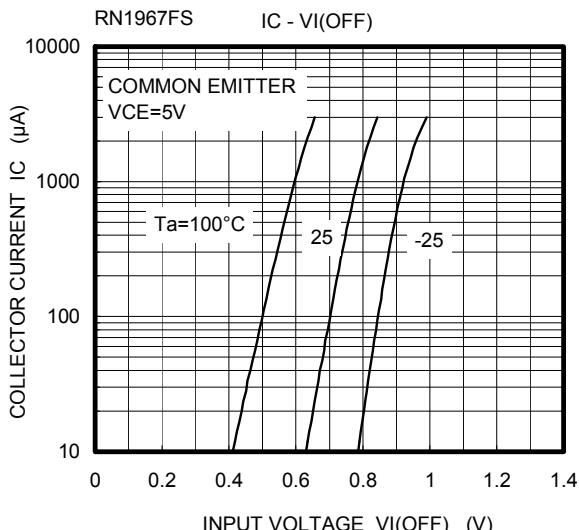
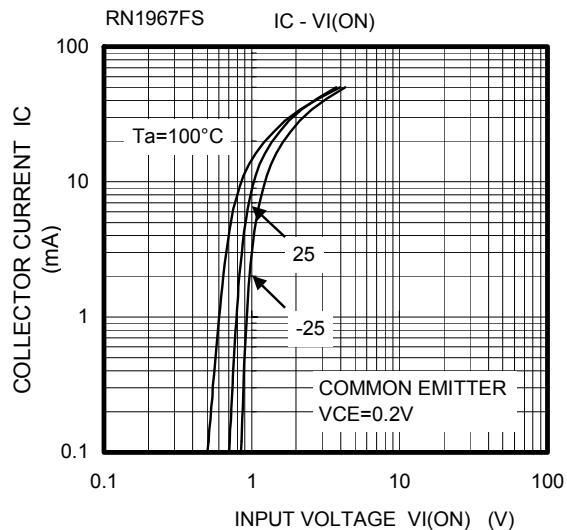
Equivalent Circuit (top view)



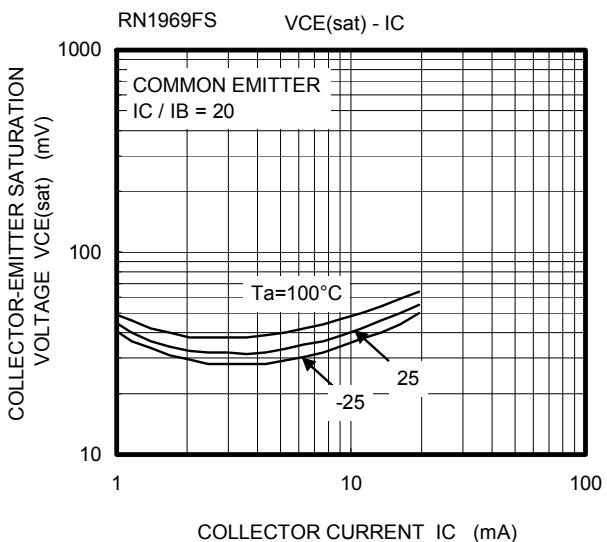
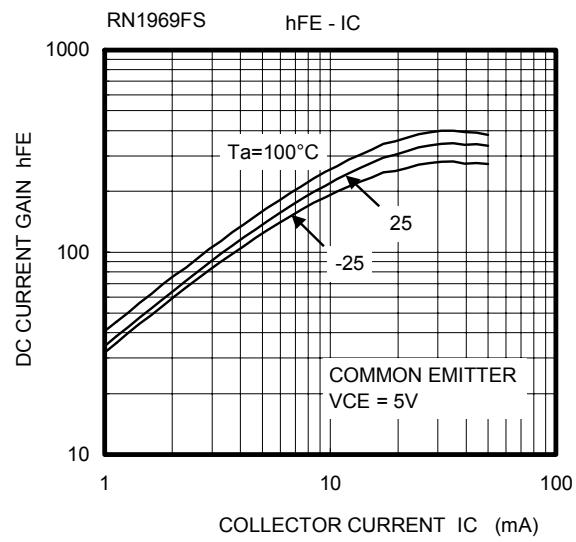
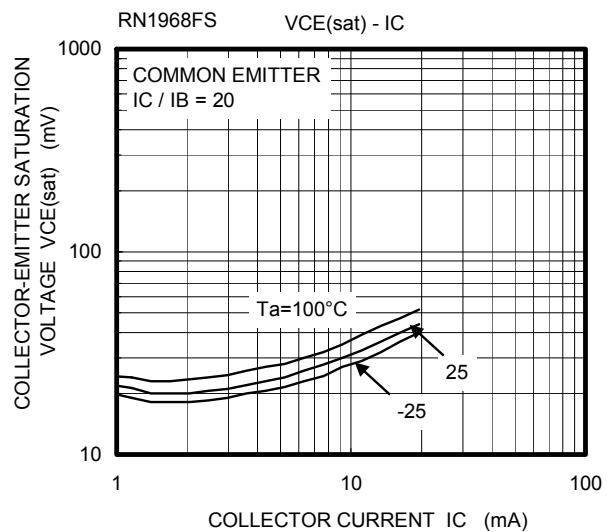
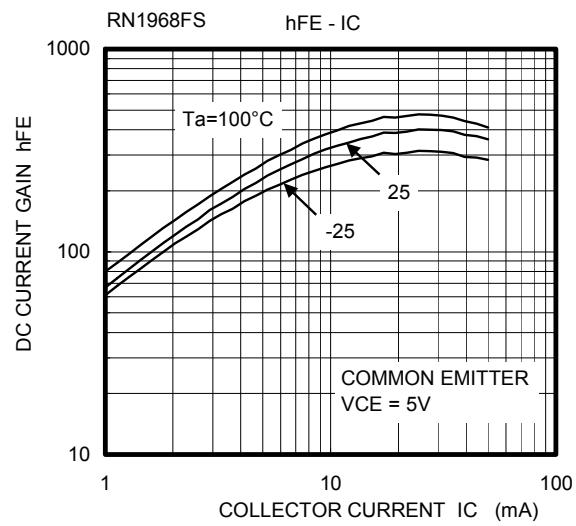
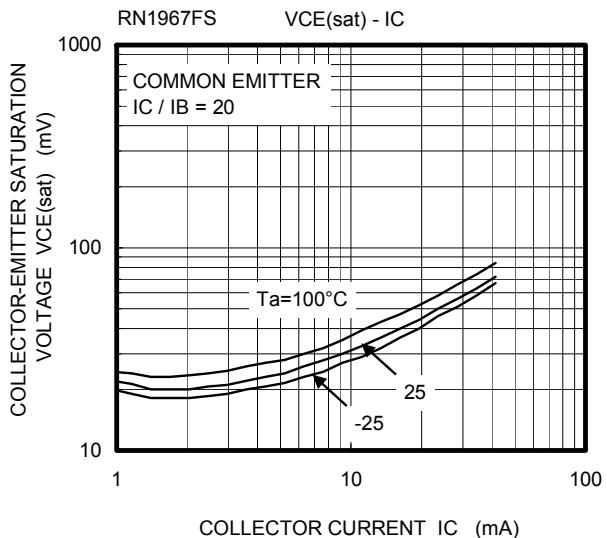
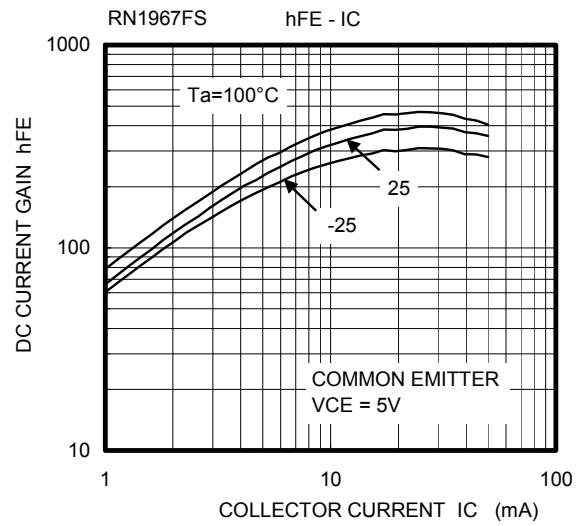
Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

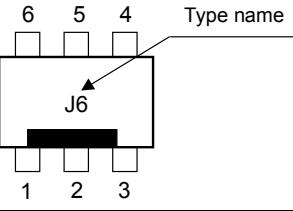
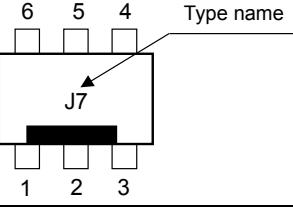
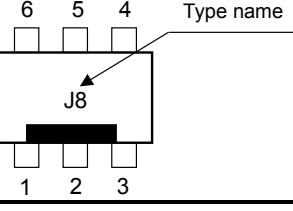
| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|--------------------------------------|-----------------|----------------|--|-------|-------|-------|------------|
| Collector cut-off current | RN1967FS~1969FS | I_{CBO} | $V_{CB} = 20\text{ V}$, $I_E = 0$ | — | — | 100 | nA |
| | | I_{CEO} | $V_{CE} = 20\text{ V}$, $I_B = 0$ | — | — | 500 | |
| Emitter cut-off current | RN1967FS | I_{EBO} | $V_{EB} = 6\text{ V}$, $I_C = 0$ | 0.088 | — | 0.131 | mA |
| | RN1968FS | | $V_{EB} = 7\text{ V}$, $I_C = 0$ | 0.085 | — | 0.126 | |
| | RN1969FS | | $V_{EB} = 15\text{ V}$, $I_C = 0$ | 0.182 | — | 0.271 | |
| DC current gain | RN1967FS | h_{FE} | $V_{CE} = 5\text{ V}$, $I_C = 10\text{ mA}$ | 120 | — | — | |
| | RN1968FS | | | 120 | — | — | |
| | RN1969FS | | | 100 | — | — | |
| Collector-emitter saturation voltage | RN1967FS~1969FS | V_{CE} (sat) | $I_C = 5\text{ mA}$, $I_B = 0.25\text{ mA}$ | — | — | 0.15 | V |
| Input voltage (ON) | RN1967FS | V_I (ON) | $V_{CE} = 0.2\text{ V}$, $I_C = 5\text{ mA}$ | 0.7 | — | 1.5 | V |
| | RN1968FS | | | 0.8 | — | 2.2 | |
| | RN1969FS | | | 1.6 | — | 5.0 | |
| Input voltage (OFF) | RN1967FS | V_I (OFF) | $V_{CE} = 5\text{ V}$, $I_C = 0.1\text{ mA}$ | 0.5 | — | 1.0 | V |
| | RN1968FS | | | 0.6 | — | 1.1 | |
| | RN1969FS | | | 1.3 | — | 2.6 | |
| Collector output capacitance | RN1967FS~1969FS | C_{ob} | $V_{CB} = 10\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$ | — | 1.2 | — | pF |
| Input resistor | RN1967FS | R1 | — | 8 | 10 | 12 | k Ω |
| | RN1968FS | | | 17.6 | 22 | 26.4 | |
| | RN1969FS | | | 37.6 | 47 | 56.4 | |
| Resistor ratio | RN1967FS | R1/R2 | — | 0.17 | 0.213 | 0.255 | |
| | RN1968FS | | | 0.374 | 0.468 | 0.562 | |
| | RN1969FS | | | 1.71 | 2.14 | 2.56 | |

(Q1,Q2 common)



(Q1,Q2 common)



| Type Name | Marking |
|-----------|---|
| RN1967FS |  |
| RN1968FS |  |
| RN1969FS |  |

HANDLING PRECAUTION

When handling individual devices (which are not yet mounted on a circuit board), be sure that the environment is protected against electrostatic electricity. Operators should wear anti-static clothing, and containers and other objects that come into direct contact with devices should be made of anti-static materials.

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