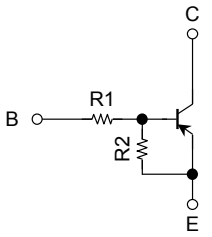
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process) (Bias Resistor Built-in Transistor)

# RN2967FE,RN2968FE,RN2969FE

Switching, Inverter Circuit, Interface Circuit and Driver Circuit Applications

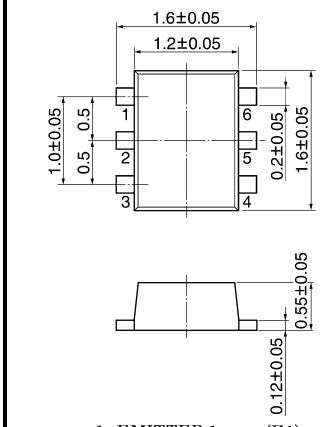
- Two devices are incorporated into an Extreme-Super-Mini (6-pin) package.
- Incorporating a bias resistor into a transistor reduces parts count. Reducing the parts count enables the manufacture of ever more compact equipment and lowers assembly cost.
- Complementary to RN1967FE~RN1969FE

## Equivalent Circuit and Bias Resistor Values




| Type No. | R1 (kΩ) | R2 (kΩ) |
|---|---|---|
| RN2967FE | 10 | 47 |
| RN2968FE | 22 | 47 |
| RN2969FE | 47 | 22 |

Unit: mm




| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 2-2N1A |

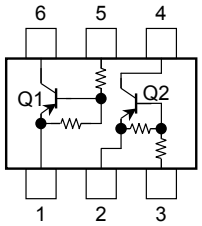
Weight:0.003 g (typ.)

## 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 | RN2967FE | $V_{EBO}$ | −6 | V |
| | RN2968FE | | −7 | |
| | RN2969FE | | −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

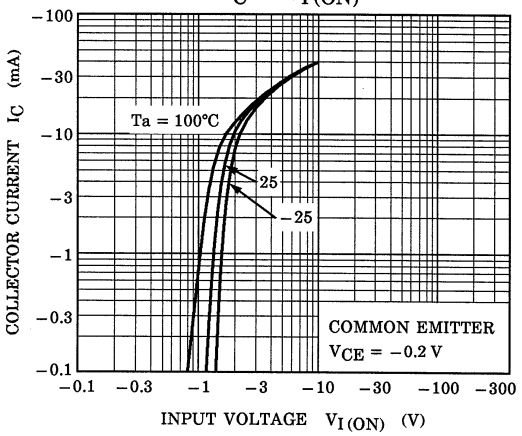
## Equivalent Circuit (top view)



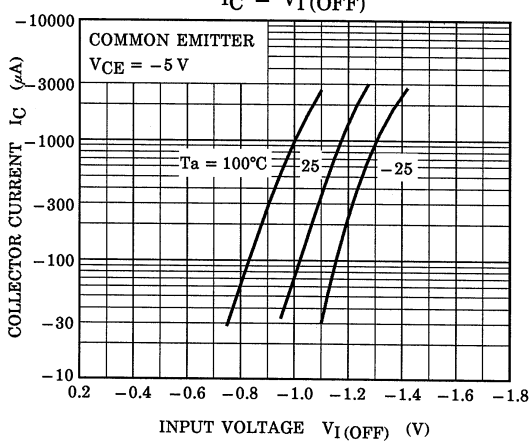
## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

| Characteristics | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|
| Collector cut-off current | RN2967FE~2969FE | $I_{CBO}$ | $V_{CB}$ = −50 V, $I_E$ = 0 | — | — | −100 | nA |
| | | $I_{CEO}$ | $V_{CE}$ = −50 V, $I_B$ = 0 | — | — | −500 | |
| Emitter cut-off current | RN2967FE | $I_{EBO}$ | $V_{EB}$ = −6 V, $I_C$ = 0 | −0.081 | — | −0.15 | mA |
| | RN2968FE | | $V_{EB}$ = −7 V, $I_C$ = 0 | −0.078 | — | −0.145 | |
| | RN2969FE | | $V_{EB}$ = −15 V, $I_C$ = 0 | −0.167 | — | −0.311 | |
| DC current gain | RN2967FE | $h_{FE}$ | $V_{CE}$ = −5 V, $I_C$ = −10 mA | 80 | — | — | |
| | RN2968FE | | | 80 | — | — | |
| | RN2969FE | | | 70 | — | — | |
| Collector-emitter saturation voltage | RN2967FE~2969FE | $V_{CE\ (sat)}$ | $I_C$ = −5 mA, $I_B$ = −0.25 mA | — | −0.1 | −0.3 | V |
| Input voltage (ON) | RN2967FE | $V_{I\ (ON)}$ | $V_{CE}$ = −0.2 V, $I_C$ = −5 mA | −0.7 | — | −1.8 | V |
| | RN2968FE | | | −1.0 | — | −2.6 | |
| | RN2969FE | | | −2.2 | — | −5.8 | |
| Input voltage (OFF) | RN2967FE | $V_{I\ (OFF)}$ | $V_{CE}$ = −5 V, $I_C$ = −0.1 mA | −0.5 | — | −1.0 | V |
| | RN2968FE | | | −0.6 | — | −1.16 | |
| | RN2969FE | | | −1.5 | — | −2.6 | |
| Transition frequency | RN2967FE~2969FE | $f_T$ | $V_{CE}$ = −10 V, $I_C$ = −5 mA | — | 200 | — | MHz |
| Collector output capacitance | RN2967FE~2969FE | $C_{ob}$ | $V_{CB}$ = −10 V, $I_E$ = 0, f = 1 MHz | — | 3 | 6 | pF |
| Input resistor | RN2967FE | R1 | — | 7 | 10 | 13 | kΩ |
| | RN2968FE | | | 15.4 | 22 | 28.6 | |
| | RN2969FE | | | 32.9 | 47 | 61.1 | |
| Resistor ratio | RN2967FE | R1/R2 | — | 0.191 | 0.2 | 0.232 | |
| | RN2968FE | | | 0.421 | 0.468 | 0.515 | |
| | RN2969FE | | | 1.92 | 2.14 | 2.35 | |

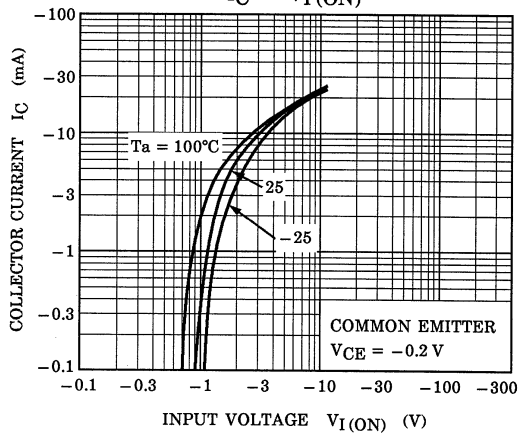
RN2967FE $I_C - V_{I(ON)}$



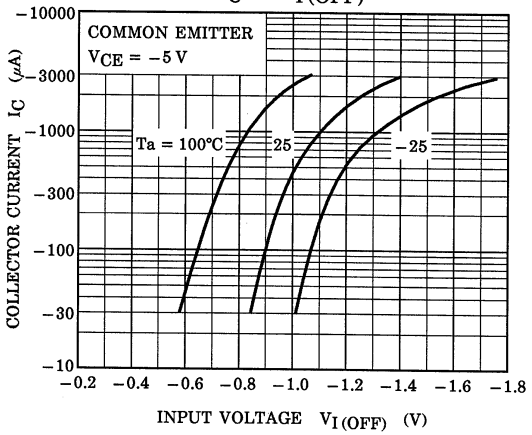

RN2967FE $I_C - V_{I(OFF)}$



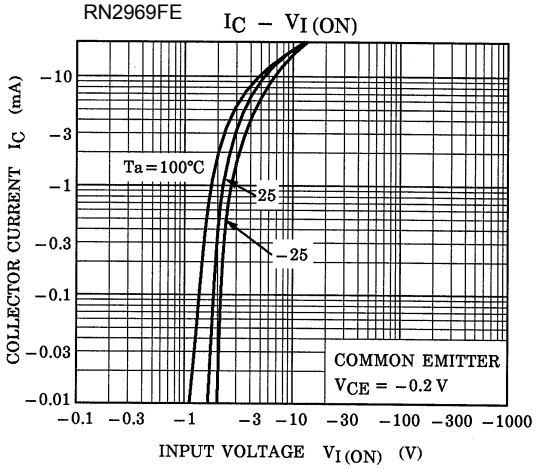

RN2968FE $I_C - V_{I(ON)}$




RN2968FE $I_C - V_{I(OFF)}$




RN2969FE $I_C - V_{I(ON)}$




RN2969FE $I_C - V_{I(OFF)}$