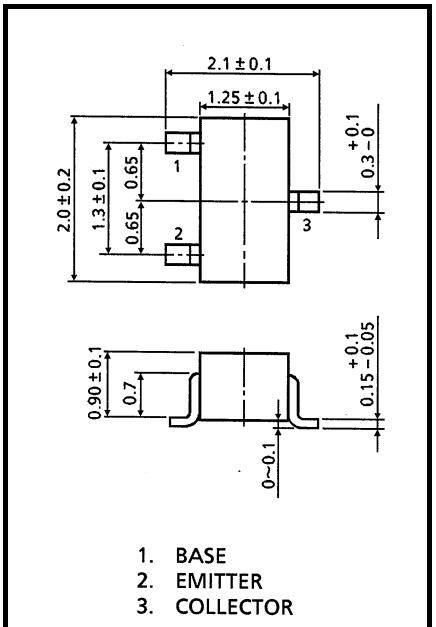
TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

# RN1307,RN1308,RN1309

Switching, Inverter Circuit, Interface Circuit
And Driver Circuit Applications

- With built-in bias resistors.
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Complementary to RN2307~RN2309

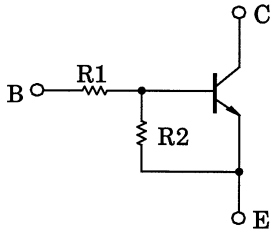
Unit: mm




| | |
|---|---|
| JEDEC | — |
| JEITA | SC-70 |
| TOSHIBA | 2-2E1A |

Weight: 0.006g (typ.)

## Equivalent Circuit and Bias Resistor Values




| Type No. | R1 (kΩ) | R2 (kΩ) |
|---|---|---|
| RN2207 | 10 | 47 |
| RN2208 | 22 | 47 |
| RN2209 | 47 | 22 |

## Absolute Maximum Ratings (Ta = 25°C)

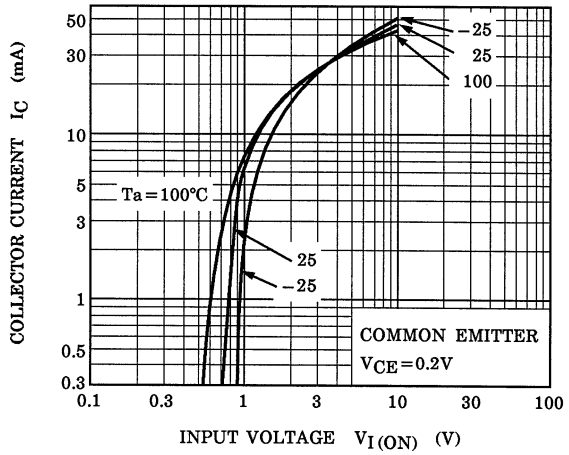
| Characteristic | | Symbol | Rating | Unit |
|---|---|---|---|---|
| Collector-base voltage | | $V_{CBO}$ | 50 | V |
| Collector-emitter voltage | | $V_{CEO}$ | 50 | V |
| Emitter-base voltage | RN1307 | $V_{EBO}$ | 6 | V |
| | RN1308 | | 7 | |
| | RN1309 | | 15 | |
| Collector current | | $I_C$ | 100 | mA |
| Collector power dissipation | | $P_C$ | 100 | mW |
| Junction temperature | | $T_j$ | 150 | °C |
| Storage temperature range | | $T_{stg}$ | −55~150 | °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).

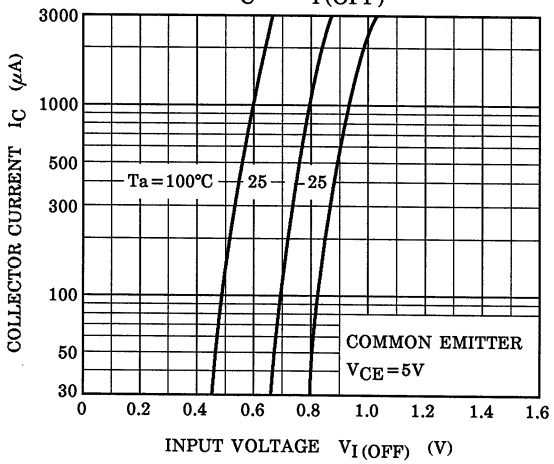
## Electrical Characteristics (Ta = 25°C)

| Characteristic | | Symbol | Test Circuit | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| Collector cut-off current | | $I_{CBO}$ | — | $V_{CB}$ = 50V, $I_E$ = 0 | — | — | 100 | nA |
| | | $I_{CEO}$ | — | $V_{CE}$ = 50V, $I_B$ = 0 | — | — | 500 | |
| Emitter cut-off current | RN1307 | $I_{EBO}$ | — | $V_{EB}$ = 6V, $I_C$ = 0 | 0.081 | — | 0.15 | mA |
| | RN1308 | | — | $V_{EB}$ = 7V, $I_C$ = 0 | 0.078 | — | 0.145 | |
| | RN1309 | | — | $V_{EB}$ = 15V, $I_C$ = 0 | 0.167 | — | 0.311 | |
| DC current gain | RN1307 | $h_{FE}$ | — | $V_{CE}$ = 5V, $I_C$ = 10mA | 80 | — | — | — |
| | RN1308 | | — | | 80 | — | — | |
| | RN1309 | | — | | 70 | — | — | |
| Collector-emitter saturation voltage | | $V_{CE\ (sat)}$ | — | $I_C$ = 5mA, $I_B$ = 0.25mA | — | 0.1 | 0.3 | V |
| Input voltage (ON) | RN1307 | $V_{I\ (ON)}$ | — | $V_{CE}$ = 0.2V, $I_C$ = 5mA | 0.7 | — | 1.8 | V |
| | RN1308 | | — | | 1.0 | — | 2.6 | |
| | RN1309 | | — | | 2.2 | — | 5.8 | |
| Input voltage (OFF) | RN1307 | $V_{I\ (OFF)}$ | — | $V_{CE}$ = 5V, $I_C$ = 0.1mA | 0.5 | — | 1.0 | V |
| | RN1308 | | — | | 0.6 | — | 1.16 | |
| | RN1309 | | — | | 1.5 | — | 2.6 | |
| Translation frequency | | $f_T$ | — | $V_{CE}$ = 10V, $I_C$ = 5mA | — | 250 | — | MHz |
| Collector output capacitance | | $C_{ob}$ | — | $V_{CB}$ = 10V, $I_E$ = 0, f = 1MHz | — | 3 | 6 | pF |
| Input resistor | RN1307 | R1 | — | — | 7 | 10 | 13 | kΩ |
| | RN1308 | | — | | 15.4 | 22 | 28.6 | |
| | RN1309 | | — | | 32.9 | 47 | 61.1 | |
| Resistor ratio | RN1307 | R1/R2 | — | — | 0.191 | 0.213 | 0.232 | — |
| | RN1308 | | — | | 0.421 | 0.468 | 0.515 | |
| | RN1309 | | — | | 1.92 | 2.14 | 2.35 | |

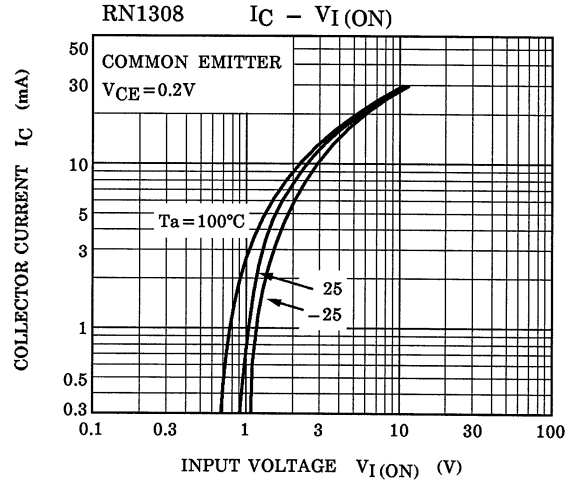
RN1307 $I_C$ – $V_{I(ON)}$



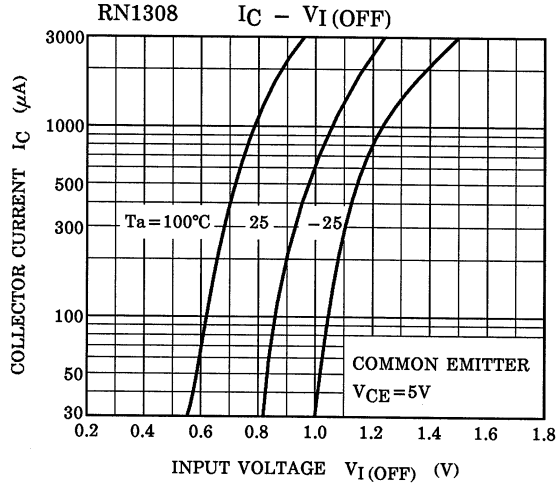

RN1307 $I_C$ – $V_{I(OFF)}$



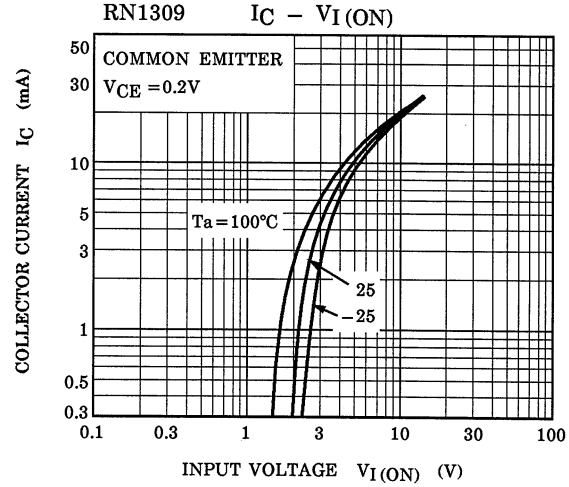

RN1308 $I_C$ – $V_{I(ON)}$



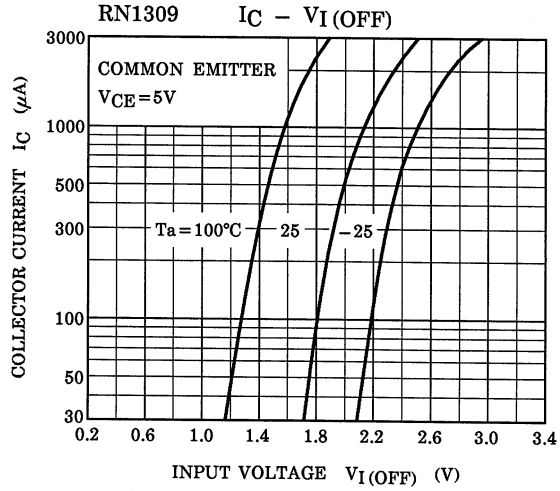

RN1308 $I_C$ – $V_{I(OFF)}$



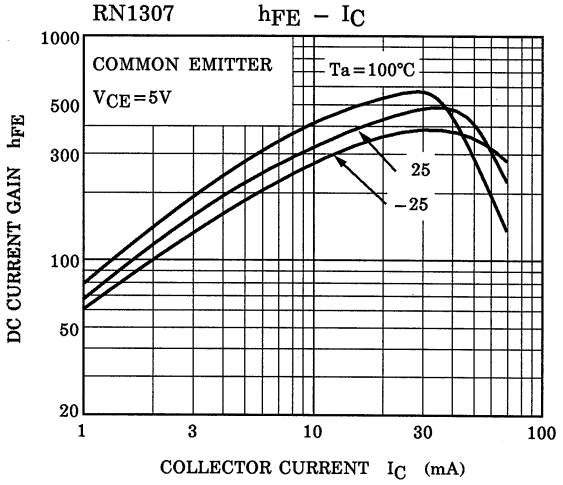

RN1309 $I_C$ – $V_{I(ON)}$



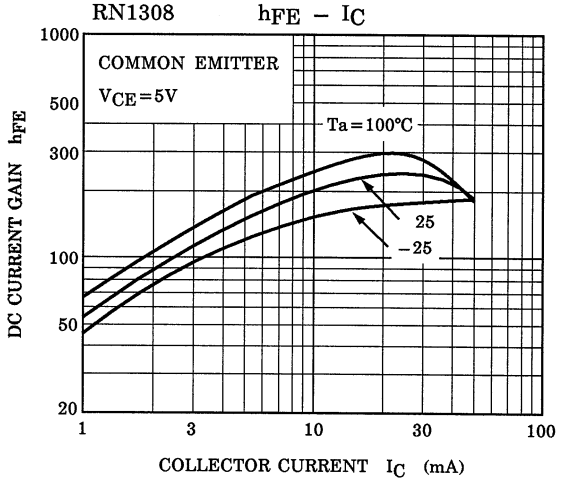

RN1309 $I_C$ – $V_{I(OFF)}$



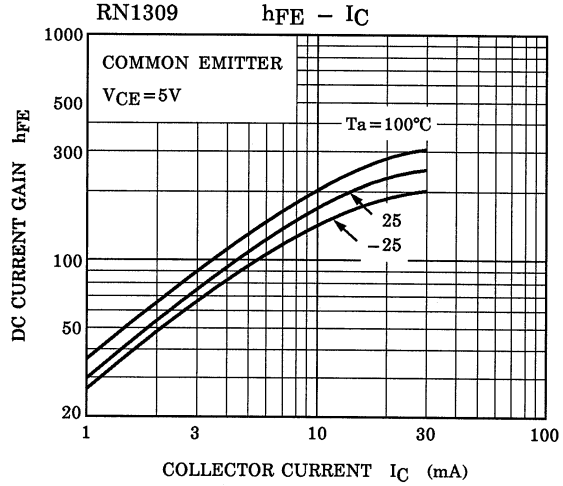
RN1307 $h_{FE}$ – $I_C$

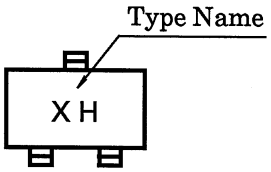
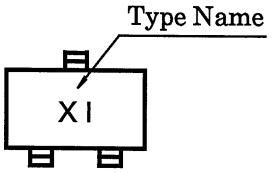
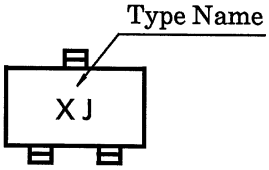



RN1308 $h_{FE}$ – $I_C$




RN1309 $h_{FE}$ – $I_C$



| Type Name | Marking |
|---|---|
| RN1307 |   |
| RN1308 |   |
| Rn1309 |   |

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