

TOSHIBA Transistor Silicon NPN Epitaxial Type (PCT Process)

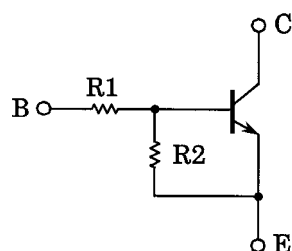
## RN1221,RN1222,RN1223,RN1224 RN1225,RN1226,RN1227

Switching, Inverter Circuit, Interface Circuit  
And Driver Circuit Applications

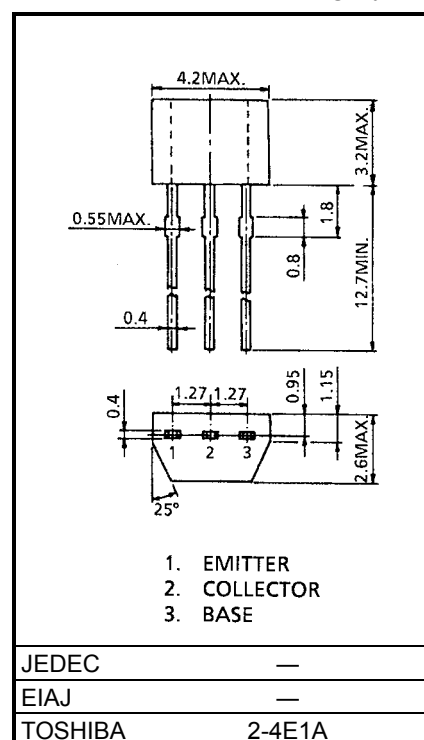
Unit: mm

- High current type ( $I_{C(MAX)} = 800\text{mA}$ )
- With built-in bias resistors.
- Simplify circuit design
- Reduce a quantity of parts and manufacturing process
- Low  $V_{CE(sat)}$
- Complementary to RN2221~2227

### Equivalent Circuit



| Type No. | R1 (kΩ) | R2 (kΩ) |
|----------|---------|---------|
| RN1221   | 1       | 1       |
| RN1222   | 2.2     | 2.2     |
| RN1223   | 4.7     | 4.7     |
| RN1224   | 10      | 10      |
| RN1225   | 0.47    | 10      |
| RN1226   | 1       | 10      |
| RN1227   | 2.2     | 10      |



Weight: 0.13g

### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

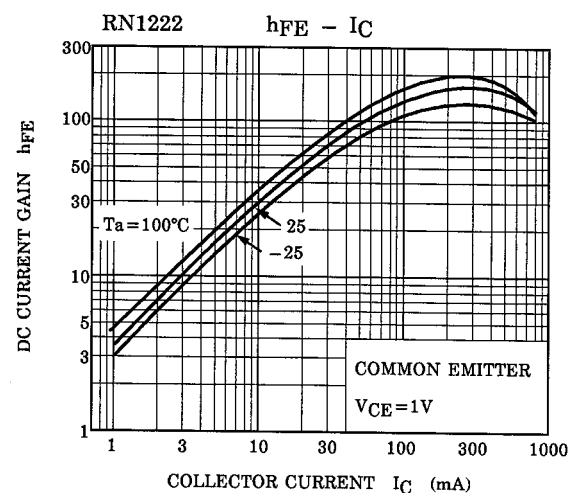
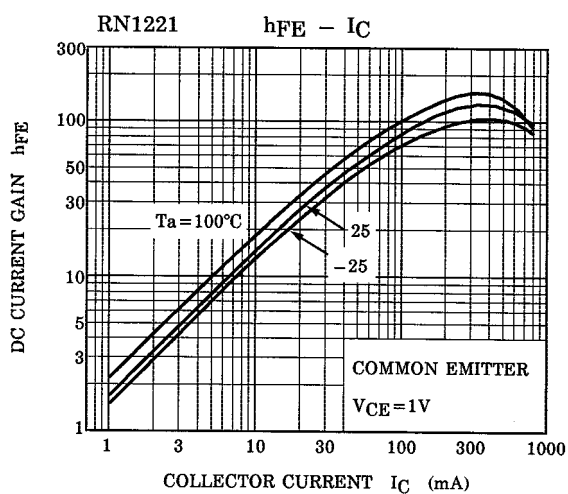
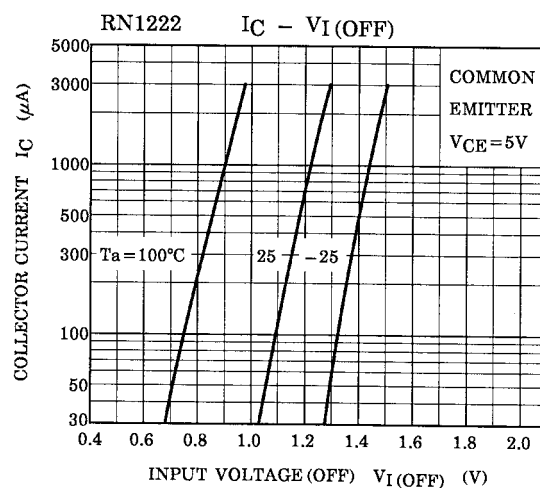
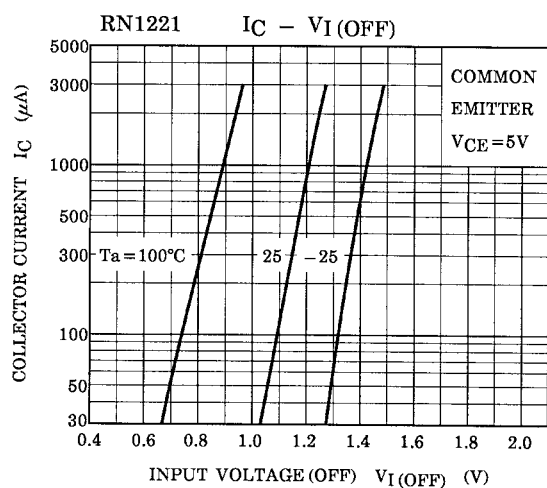
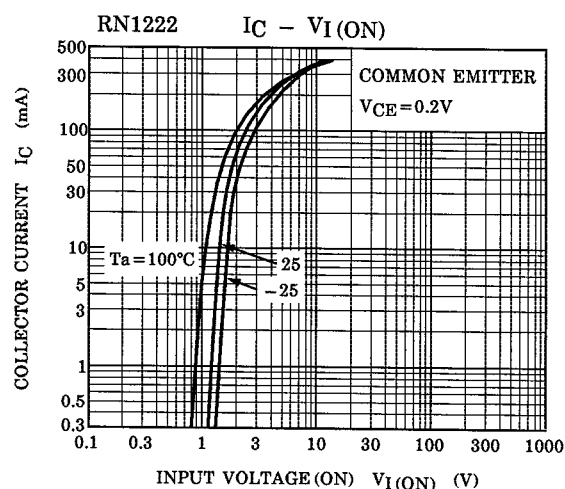
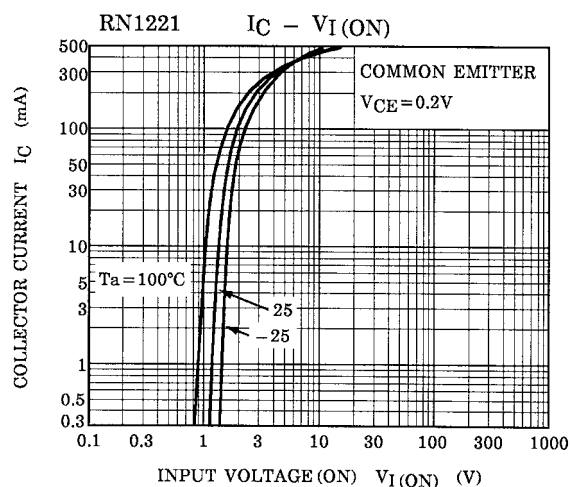
| Characteristic              |              | Symbol    | Rating  | Unit             |
|-----------------------------|--------------|-----------|---------|------------------|
| Collector-base voltage      | RN1221~1227  | $V_{CBO}$ | 50      | V                |
| Collector-emitter voltage   |              | $V_{CEO}$ | 50      | V                |
| Emitter-base voltage        | RN1221~1224  | $V_{EBO}$ | 10      | V                |
|                             | RN1225, 1226 |           | 5       |                  |
|                             | RN1227       |           | 6       |                  |
| Collector current           | RN1221~1227  | $I_c$     | 800     | mA               |
| Collector power dissipation |              | $P_c$     | 300     | mW               |
| Junction temperature        |              | $T_j$     | 150     | $^\circ\text{C}$ |
| Storage temperature range   |              | $T_{stg}$ | -55~150 | $^\circ\text{C}$ |

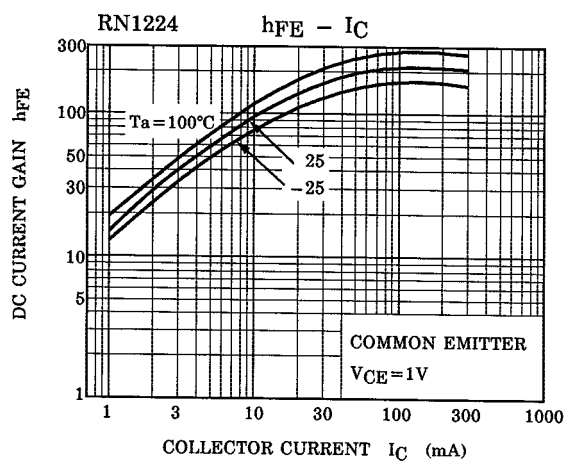
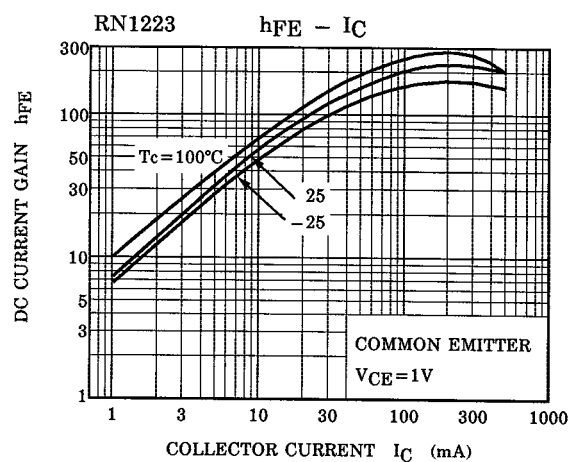
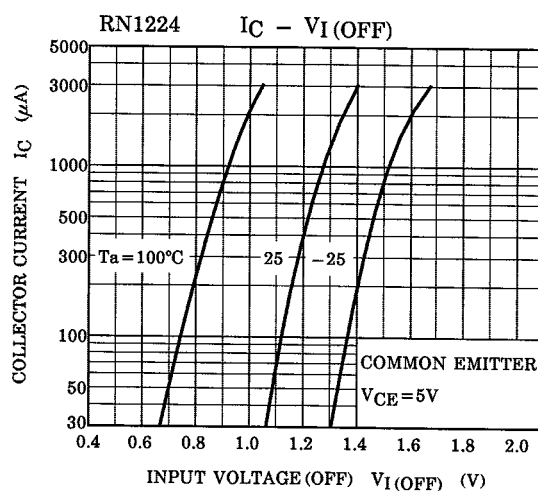
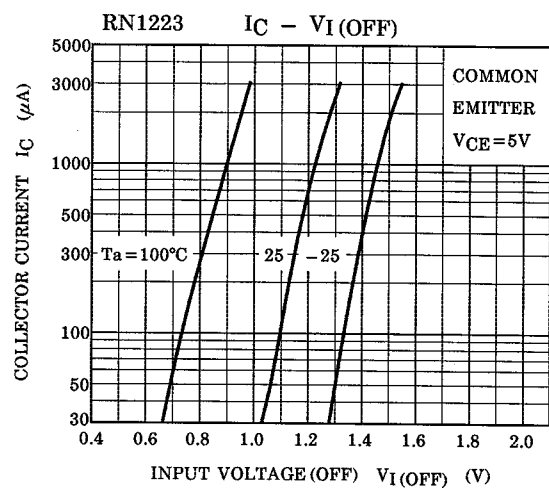
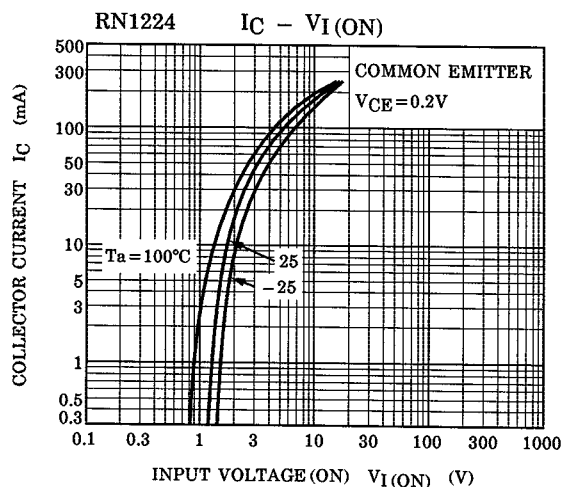
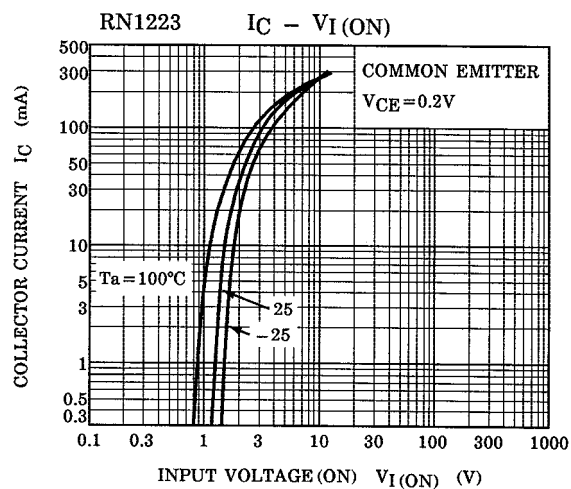
**Electrical Characteristics (Ta = 25°C)**

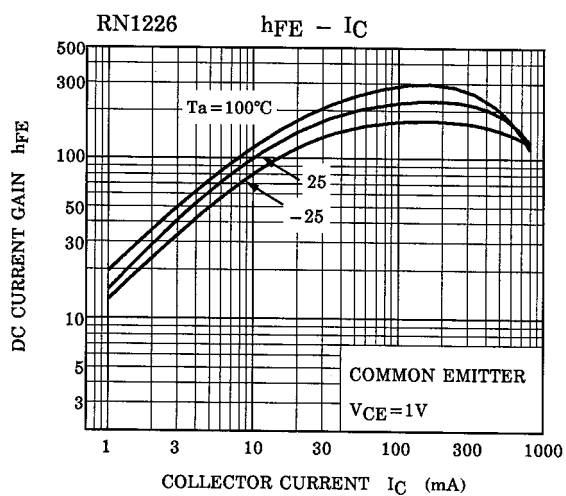
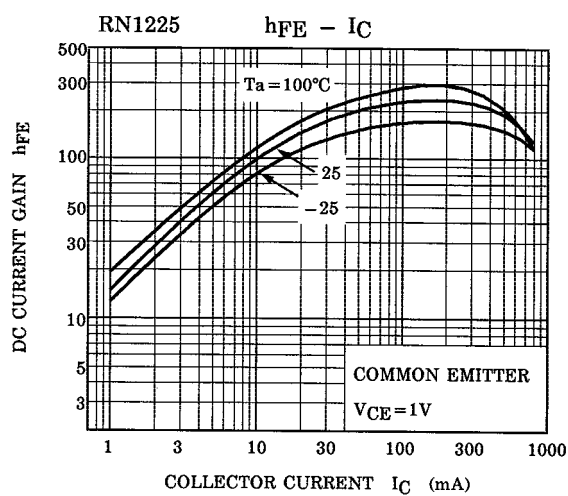
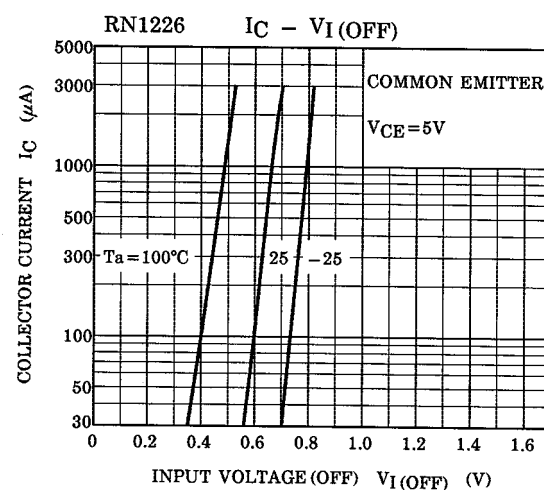
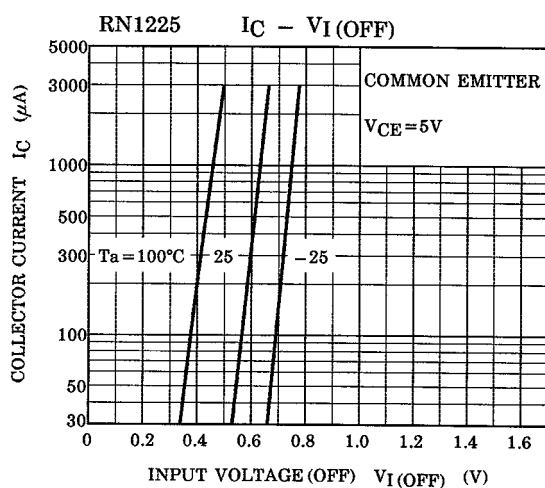
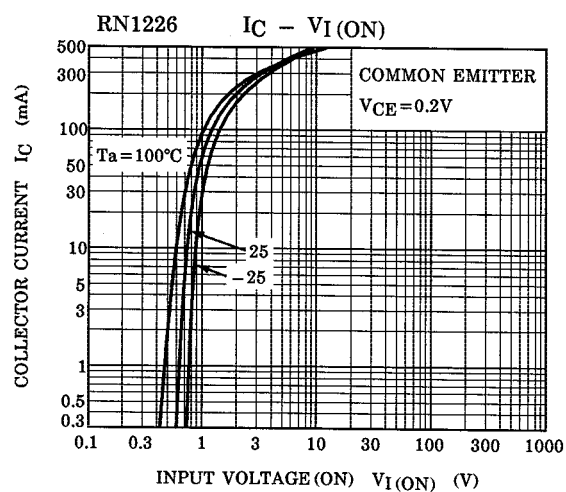
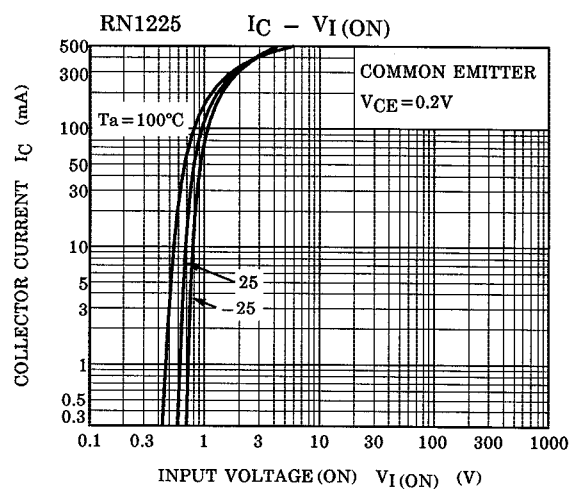
| Characteristic                       |              | Symbol        | Test Circuit | Test Condition                    | Min   | Typ. | Max   | Unit |
|--------------------------------------|--------------|---------------|--------------|-----------------------------------|-------|------|-------|------|
| Collector cut-off current            | RN1221~1227  | $I_{CBO}$     | —            | $V_{CB} = 50V, I_E = 0$           | —     | —    | 100   | nA   |
|                                      |              | $I_{CEO}$     | —            | $V_{CE} = 50V, I_B = 0$           | —     | —    | 500   |      |
| Emitter cut-off current              | RN1221       | $I_{EBO}$     | —            | $V_{EB} = 10V, I_C = 0$           | 3.85  | —    | 7.14  | mA   |
|                                      | RN1222       |               | —            |                                   | 1.75  | —    | 3.25  |      |
|                                      | RN1223       |               | —            |                                   | 0.82  | —    | 1.52  |      |
|                                      | RN1224       |               | —            |                                   | 0.38  | —    | 0.71  |      |
|                                      | RN1225       |               | —            | $V_{EB} = 5V, I_C = 0$            | 0.365 | —    | 0.682 |      |
|                                      | RN1226       |               | —            |                                   | 0.35  | —    | 0.65  |      |
|                                      | RN1227       |               | —            | $V_{EB} = 6V, I_C = 0$            | 0.378 | —    | 0.703 |      |
| DC current gain                      | RN1221       | $h_{FE}$      | —            | $V_{CE} = 5V, I_C = 100mA$        | 60    | —    | —     | —    |
|                                      | RN1222       |               | —            |                                   | 65    | —    | —     |      |
|                                      | RN1223       |               | —            |                                   | 70    | —    | —     |      |
|                                      | RN1224       |               | —            |                                   | 90    | —    | —     |      |
|                                      | RN1225       |               | —            |                                   | 90    | —    | —     |      |
|                                      | RN1226       |               | —            |                                   | 90    | —    | —     |      |
|                                      | RN1227       |               | —            |                                   | 90    | —    | —     |      |
| Collector-emitter saturation voltage | RN1221       | $V_{CE(sat)}$ | —            | $I_C = 50mA, I_B = 2mA$           | —     | —    | 0.25  | V    |
|                                      | RN1222~1227  |               | —            | $I_C = 50mA, I_B = 1mA$           |       |      |       |      |
| Input voltage (ON)                   | RN1221       | $V_{I(ON)}$   | —            | $V_{CE} = 0.2V, I_C = 100mA$      | 1.0   | —    | 3.5   | V    |
|                                      | RN1222       |               | —            |                                   | 1.4   | —    | 4.5   |      |
|                                      | RN1223       |               | —            |                                   | 2.0   | —    | 6.5   |      |
|                                      | RN1224       |               | —            |                                   | 3.0   | —    | 12.0  |      |
|                                      | RN1225       |               | —            |                                   | 0.6   | —    | 2.0   |      |
|                                      | RN1226       |               | —            |                                   | 0.7   | —    | 2.5   |      |
|                                      | RN1227       |               | —            |                                   | 1.0   | —    | 3.0   |      |
| Input voltage (OFF)                  | RN1221~1224  | $V_{I(OFF)}$  | —            | $V_{CE} = 5V, I_C = 0.1mA$        | 0.8   | —    | 1.3   | V    |
|                                      | RN1225, 1226 |               | —            |                                   | 0.4   | —    | 0.8   |      |
|                                      | RN1227       |               | —            |                                   | 0.5   | —    | 1.0   |      |
| Transition frequency                 | RN1221~1227  | $f_T$         | —            | $V_{CE} = 5V, I_C = 20mA$         | —     | 300  | —     | MHz  |
| Collector output capacitance         | RN1221~1227  | $C_{ob}$      | —            | $V_{CB} = 10V, I_E = 0, f = 1MHz$ | —     | 7    | —     | pF   |

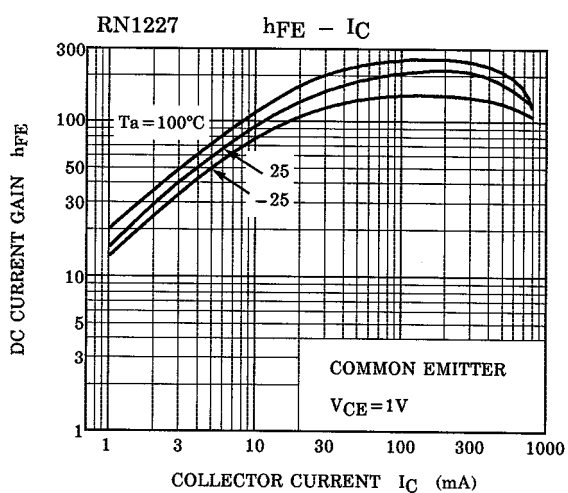
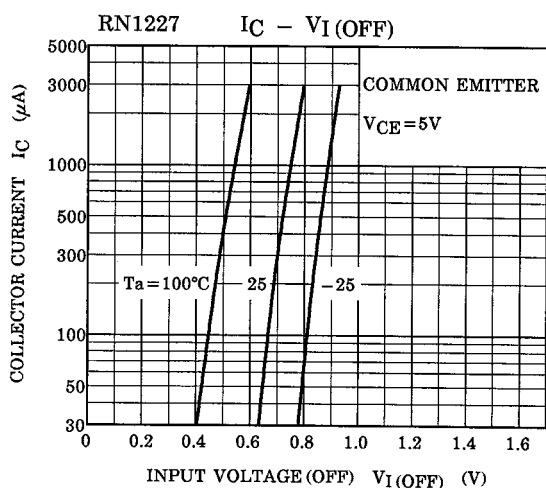
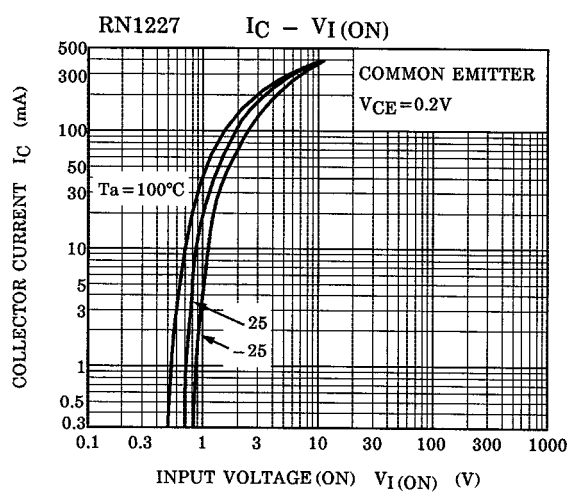
**Electrical Characteristics (Ta = 25°C)**

| Characteristic |             | Symbol | Test Circuit | Test Condition | Min    | Typ.  | Max    | Unit |
|----------------|-------------|--------|--------------|----------------|--------|-------|--------|------|
| Input resistor | RN1221      | R1     | —            | —              | 0.7    | 1.0   | 1.3    | kΩ   |
|                | RN1222      |        | —            |                | 1.54   | 2.2   | 2.86   |      |
|                | RN1223      |        | —            |                | 3.29   | 4.7   | 6.11   |      |
|                | RN1224      |        | —            |                | 7      | 10    | 13     |      |
|                | RN1225      |        | —            |                | 0.329  | 0.47  | 0.61   |      |
|                | RN1226      |        | —            |                | 0.7    | 1.0   | 1.3    |      |
|                | RN1227      |        | —            |                | 1.54   | 2.2   | 2.86   |      |
| Resistor ratio | RN1221~1224 | R1/R2  | —            | —              | 0.9    | 1.0   | 1.1    | —    |
|                | RN1225      |        | —            |                | 0.0423 | 0.047 | 0.0517 |      |
|                | RN1226      |        | —            |                | 0.09   | 0.1   | 0.11   |      |
|                | RN1227      |        | —            |                | 0.2    | 0.22  | 0.24   |      |









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