

# XN04321

Silicon NPN epitaxial planar transistor (Tr1)  
Silicon PNP epitaxial planar transistor (Tr2)

For switching/digital circuits

## ■ Features

- Two elements incorporated into one package  
(Transistors with built-in resistor)
- Reduction of the mounting area and assembly cost by one half

## ■ Basic Part Number of Element

- UNR2221 (UN2221) + UNR2121 (UN2121)

## ■ Absolute Maximum Ratings $T_a = 25^\circ\text{C}$

| Parameter | Symbol                                | Rating    | Unit                         |
|-----------|---------------------------------------|-----------|------------------------------|
| Tr1       | Collector-base voltage (Emitter open) | $V_{CBO}$ | 50 V                         |
|           | Collector-emitter voltage (Base open) | $V_{CEO}$ | 50 V                         |
|           | Collector current                     | $I_C$     | 500 mA                       |
| Tr2       | Collector-base voltage (Emitter open) | $V_{CBO}$ | -50 V                        |
|           | Collector-emitter voltage (Base open) | $V_{CEO}$ | -50 V                        |
|           | Collector current                     | $I_C$     | -500 mA                      |
| Overall   | Total power dissipation               | $P_T$     | 300 mW                       |
|           | Junction temperature                  | $T_j$     | 150 $^\circ\text{C}$         |
|           | Storage temperature                   | $T_{stg}$ | -55 to +150 $^\circ\text{C}$ |

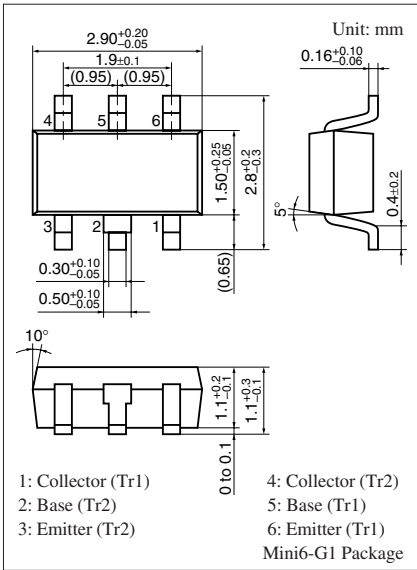
## ■ Electrical Characteristics $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

- Tr1

| Parameter                                    | Symbol        | Conditions                                                               | Min  | Typ | Max  | Unit          |
|----------------------------------------------|---------------|--------------------------------------------------------------------------|------|-----|------|---------------|
| Collector-base voltage (Emitter open)        | $V_{CBO}$     | $I_C = 10 \mu\text{A}$ , $I_E = 0$                                       | 50   |     |      | V             |
| Collector-emitter voltage (Base open)        | $V_{CEO}$     | $I_C = 2 \text{ mA}$ , $I_B = 0$                                         | 50   |     |      | V             |
| Collector-base cutoff current (Emitter open) | $I_{CBO}$     | $V_{CB} = 50 \text{ V}$ , $I_E = 0$                                      |      |     | 1    | $\mu\text{A}$ |
| Collector-emitter cutoff current (Base open) | $I_{CEO}$     | $V_{CE} = 50 \text{ V}$ , $I_B = 0$                                      |      |     | 1    | $\mu\text{A}$ |
| Emitter-base cutoff current (Collector open) | $I_{EBO}$     | $V_{EB} = 6 \text{ V}$ , $I_C = 0$                                       |      |     | 5    | mA            |
| Forward current transfer ratio               | $h_{FE}$      | $V_{CE} = 10 \text{ V}$ , $I_C = 100 \text{ mA}$                         | 40   |     |      | —             |
| Collector-emitter saturation voltage         | $V_{CE(sat)}$ | $I_C = 100 \text{ mA}$ , $I_B = 5 \text{ mA}$                            |      |     | 0.25 | V             |
| Output voltage high level                    | $V_{OH}$      | $V_{CC} = 5 \text{ V}$ , $V_B = 0.5 \text{ V}$ , $R_L = 500 \Omega$      | 4.9  |     |      | V             |
| Output voltage low level                     | $V_{OL}$      | $V_{CC} = 5 \text{ V}$ , $V_B = 3.5 \text{ V}$ , $R_L = 500 \Omega$      |      |     | 0.2  | V             |
| Input resistance                             | $R_1$         |                                                                          | -30% | 2.2 | +30% | k $\Omega$    |
| Resistance ratio                             | $R_1 / R_2$   |                                                                          | 0.8  | 1.0 | 1.2  | —             |
| Transition frequency                         | $f_T$         | $V_{CB} = 10 \text{ V}$ , $I_E = -50 \text{ mA}$ , $f = 200 \text{ MHz}$ |      | 200 |      | MHz           |

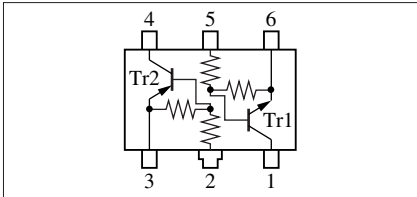
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Note) The part number in the parenthesis shows conventional part number.



Marking Symbol: EB

Internal Connection



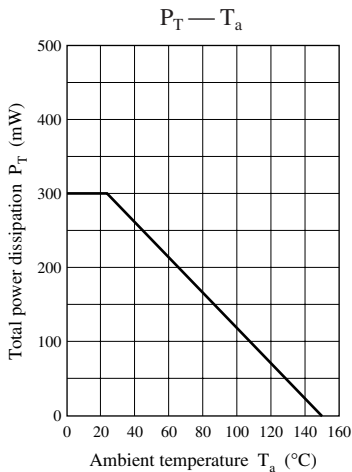
■ Electrical Characteristics (continued)  $T_a = 25^\circ\text{C} \pm 3^\circ\text{C}$

• Tr2

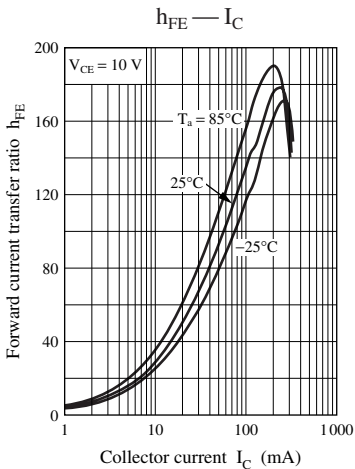
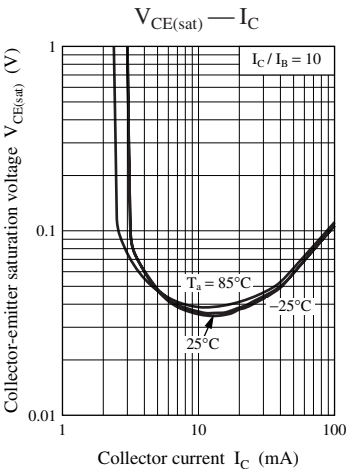
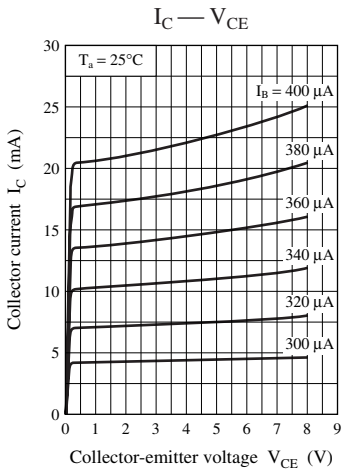
| Parameter                                    | Symbol        | Conditions                                                               | Min  | Typ | Max   | Unit             |
|----------------------------------------------|---------------|--------------------------------------------------------------------------|------|-----|-------|------------------|
| Collector-base voltage (Emitter open)        | $V_{CBO}$     | $I_C = -10\ \mu\text{A}$ , $I_E = 0$                                     | -50  |     |       | V                |
| Collector-emitter voltage (Base open)        | $V_{CEO}$     | $I_C = -2\ \text{mA}$ , $I_B = 0$                                        | -50  |     |       | V                |
| Collector-base cutoff current (Emitter open) | $I_{CBO}$     | $V_{CB} = -50\ \text{V}$ , $I_E = 0$                                     |      |     | -1    | $\mu\text{A}$    |
| Collector-emitter cutoff current (Base open) | $I_{CEO}$     | $V_{CE} = -50\ \text{V}$ , $I_B = 0$                                     |      |     | -1    | $\mu\text{A}$    |
| Emitter-base cutoff current (Collector open) | $I_{EBO}$     | $V_{EB} = -6\ \text{V}$ , $I_C = 0$                                      |      |     | -5    | mA               |
| Forward current transfer ratio               | $h_{FE}$      | $V_{CE} = -10\ \text{V}$ , $I_C = -100\ \text{mA}$                       | 40   |     |       | —                |
| Collector-emitter saturation voltage         | $V_{CE(sat)}$ | $I_C = -100\ \text{mA}$ , $I_B = -5\ \text{mA}$                          |      |     | -0.25 | V                |
| Output voltage high level                    | $V_{OH}$      | $V_{CC} = -5\ \text{V}$ , $V_B = -0.5\ \text{V}$ , $R_L = 500\ \Omega$   | -4.9 |     |       | V                |
| Output voltage low level                     | $V_{OL}$      | $V_{CC} = -5\ \text{V}$ , $V_B = -3.5\ \text{V}$ , $R_L = 500\ \Omega$   |      |     | -0.2  | V                |
| Input resistance                             | $R_i$         |                                                                          | -30% | 2.2 | +30%  | $\text{k}\Omega$ |
| Resistance ratio                             | $R_1 / R_2$   |                                                                          | 0.8  | 1.0 | 1.2   | —                |
| Transition frequency                         | $f_T$         | $V_{CB} = -10\ \text{V}$ , $I_E = 50\ \text{mA}$ , $f = 200\ \text{MHz}$ |      | 200 |       | MHz              |

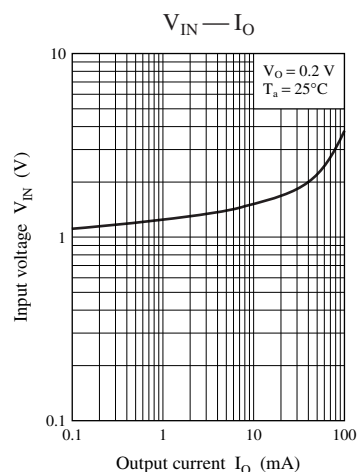
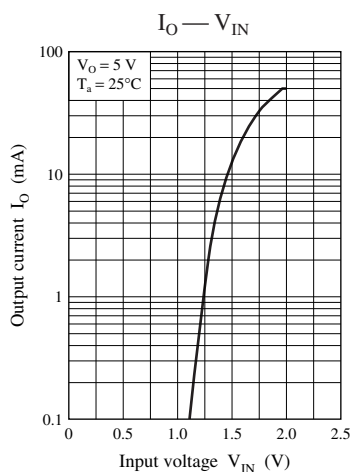
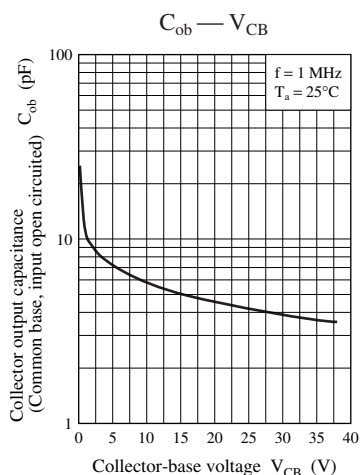
Note) Measuring methods are based on JAPANESE INDUSTRIAL STANDARD JIS C 7030 measuring methods for transistors.

Common characteristics chart

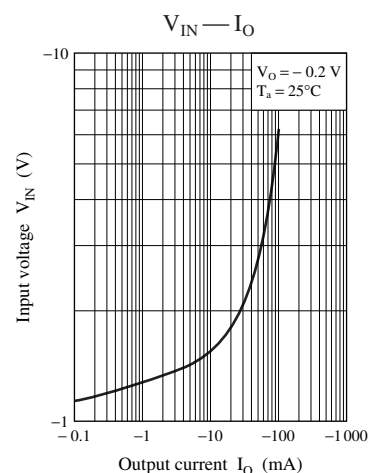
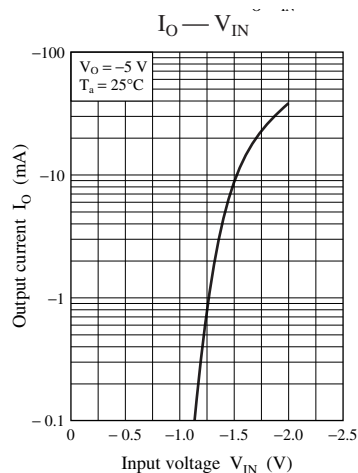
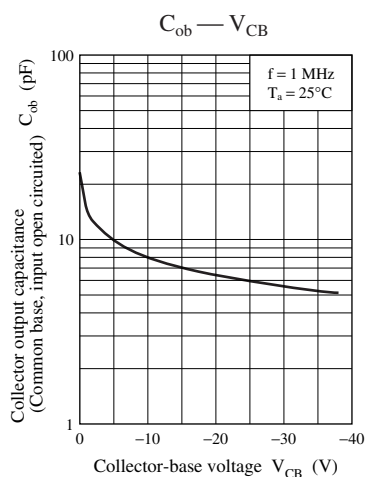
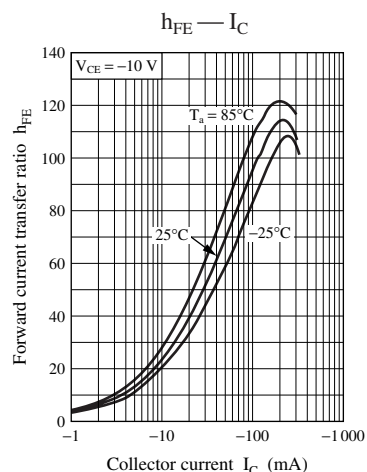
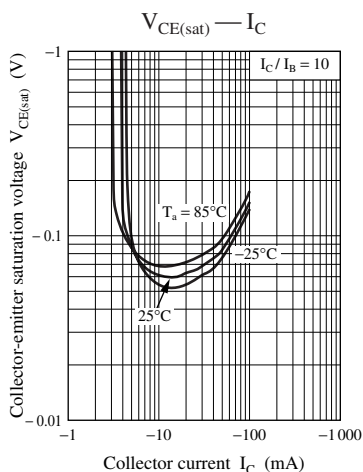
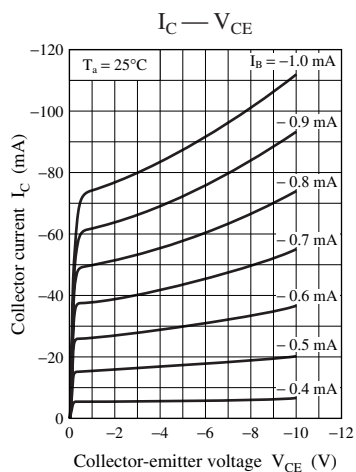


Characteristics charts of Tr1





### Characteristics charts of Tr2



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