

# Digital transistors (built-in resistor)

## DTD123TK / DTD123TS

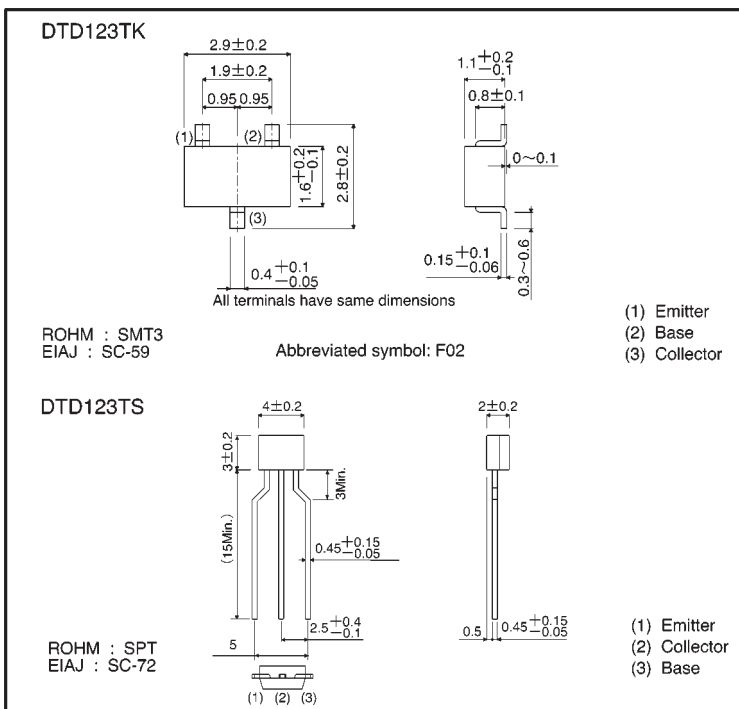
### ●Features

- 1) Built-in bias resistors enable the configuration of an inverter circuit without connecting external input resistors (see equivalent circuit).
- 2) The bias resistors consist of thin-film resistors with complete isolation to allow negative biasing of the input. They also have the advantage of almost completely eliminating parasitic effects.
- 3) Only the on/off conditions need to be set for operation, making device design easy.

### ●Structure

NPN digital transistor  
(Built-in resistor type)

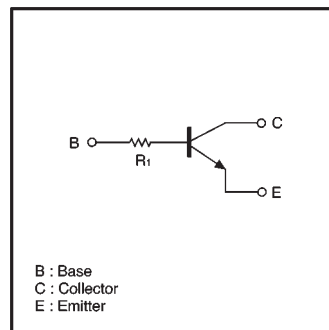
### ●External dimensions (Units: mm)



### ●Absolute maximum ratings (Ta = 25°C)

| Parameter                   | Symbol    | Limits(DTD123T□) |     | Unit |
|-----------------------------|-----------|------------------|-----|------|
|                             |           | K                | S   |      |
| Collector-base voltage      | $V_{CBO}$ | 50               |     | V    |
| Collector-emitter voltage   | $V_{CEO}$ | 40               |     | V    |
| Emitter-base voltage        | $V_{EBO}$ | 5                |     | V    |
| Collector current           | $I_C$     | 500              |     | mA   |
| Collector power dissipation | $P_C$     | 200              | 300 | mW   |
| Junction temperature        | $T_j$     | 150              |     | °C   |
| Storage temperature         | $T_{stg}$ | $-55 \sim +150$  |     | °C   |

### ●Equivalent circuit



## ●Electrical characteristics (Ta = 25°C)

| Parameter                            | Symbol        | Min. | Typ. | Max. | Unit          | Conditions                                                     |
|--------------------------------------|---------------|------|------|------|---------------|----------------------------------------------------------------|
| Collector-base breakdown voltage     | $BV_{CBO}$    | 50   | —    | —    | V             | $I_C=50\text{ }\mu\text{A}$                                    |
| Collector-emitter breakdown voltage  | $BV_{CEO}$    | 40   | —    | —    | V             | $I_C=1\text{mA}$                                               |
| Emitter-base breakdown voltage       | $BV_{EBO}$    | 5    | —    | —    | V             | $I_E=50\text{ }\mu\text{A}$                                    |
| Collector cutoff current             | $I_{CBO}$     | —    | —    | 0.5  | $\mu\text{A}$ | $V_{CB}=50\text{V}$                                            |
| Emitter cutoff current               | $I_{EBO}$     | —    | —    | 0.5  | $\mu\text{A}$ | $V_{EB}=4\text{V}$                                             |
| Collector-emitter saturation voltage | $V_{CE(sat)}$ | —    | —    | 0.3  | V             | $I_C/I_E=50\text{m}/2.5\text{mA}$                              |
| DC current transfer ratio            | $h_{FE}$      | 100  | 250  | 600  | —             | $V_{CE}=5\text{V}$ , $I_C=50\text{mA}$                         |
| Input resistance                     | $R_i$         | 1.54 | 2.2  | 2.86 | k $\Omega$    | —                                                              |
| Transition frequency                 | $f_T$         | —    | 200  | —    | MHz           | $V_{CE}=10\text{V}$ , $I_E=-50\text{mA}$ , $f=100\text{MHz}$ * |

\* Transition frequency of the device

## ●Packaging specifications

|          |                              |        |        |
|----------|------------------------------|--------|--------|
| Part No. | Package                      | SMT3   | SPT    |
|          | Packaging type               | Taping | Taping |
|          | Code                         | T146   | TP     |
|          | Basic ordering unit (pieces) | 3000   | 5000   |
| DTD123TK |                              | ○      | —      |
| DTD123TS |                              | —      | ○      |

## ●Electrical characteristic curves

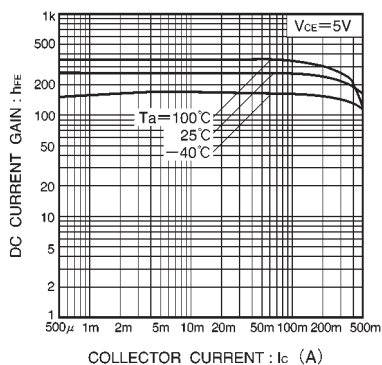


Fig.1 DC current gain vs. collector current

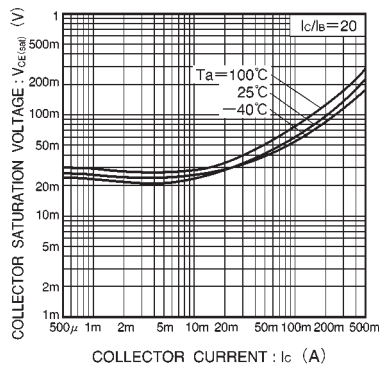


Fig.2 Collector-emitter saturation voltage vs. collector current