

# Die no. D-25

# NPN Darlington transistor

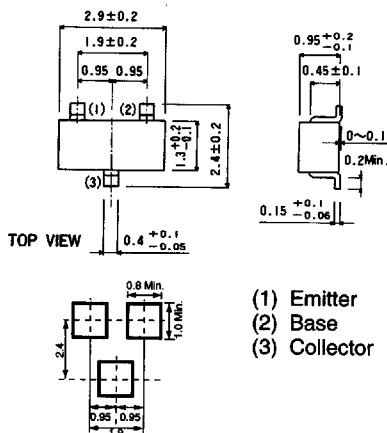
These are epitaxial planar NPN silicon Darlington transistors.

## Features

- available in a SST3 (SST, SOT-23) package, see page 300
- collector-to-emitter breakdown voltage,  $BV_{CES} = 30 \text{ V (min)}$  at  $I_C = 100 \mu\text{A}$
- low noise,  $NF = 2.0 \text{ dB}$  at  $I_C = 1.0 \text{ mA}$
- high DC current gain
- high transition frequency, typically  $f_T = 250 \text{ MHz (max)}$  at  $I_C = 10 \text{ mA}$

## Dimensions (Units : mm)

### SST3



## Device types

| Package style | Part number | Part marking |
|---------------|-------------|--------------|
| SST3 (SOT-23) | SSTA13      | R1M          |

## Applications

- extremely high current gain applications

## Absolute maximum ratings ( $T_a = 25^\circ\text{C}$ )

| Parameter                    | Symbol    | Limits          | Unit             | Conditions                                 |
|------------------------------|-----------|-----------------|------------------|--------------------------------------------|
| Collector-to-base voltage    | $V_{CBO}$ | 40              | V                |                                            |
| Collector-to-emitter voltage | $V_{CEO}$ | 30              | V                |                                            |
| Emitter-to-base voltage      | $V_{EBO}$ | 10              | V                |                                            |
| Collector current            | $I_C$     | 500             | mA               | DC                                         |
| Power dissipation            | $P_C$     | 200             | mW               | For derating, see derating curve following |
| Junction temperature         | $T_j$     | $-55 \sim +150$ | $^\circ\text{C}$ |                                            |

## D-25 Transistors (US/European) NPN

### Electrical characteristics (unless otherwise noted, $T_a = 25^\circ\text{C}$ )

| Parameter                                        | Symbol        | Min  | Typical | Max | Unit | Conditions                                                                                 |
|--------------------------------------------------|---------------|------|---------|-----|------|--------------------------------------------------------------------------------------------|
| Collector-to-base breakdown voltage              | $BV_{CBO}$    | 40   |         |     | V    | $I_C = 50 \mu\text{A}$                                                                     |
| Collector-to-emitter breakdown voltage           | $BV_{CES}$    | 30   |         |     | V    | $I_C = 100 \mu\text{A}$                                                                    |
| Collector cutoff current, base & emitter shorted | $I_{CES}$     |      |         | 100 | nA   | $V_{CE} = 15 \text{ V}, V_{BE} = 0$                                                        |
| Collector cutoff current                         | $I_{CBO}$     |      |         | 100 | nA   | $V_{CB} = 30 \text{ V}$                                                                    |
| Emitter cutoff current                           | $I_{EBO}$     |      |         | 100 | nA   | $V_{BE} = 10 \text{ V}$                                                                    |
| DC current gain                                  | $h_{FE}$      | 2000 | 8000    |     |      | $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}$                                              |
|                                                  |               | 8000 | 40000   |     |      | $I_C = 100 \text{ mA}, V_{CE} = 5.0 \text{ V}$                                             |
| Collector-to-emitter saturation voltage          | $V_{CE(sat)}$ |      |         | 1.0 | V    | $I_C/I_B = 10 \text{ mA}/0.01 \text{ mA}$                                                  |
|                                                  |               |      |         | 1.5 |      | $I_C/I_B = 100 \text{ mA}/0.1 \text{ mA}$                                                  |
| Base-to-emitter saturation voltage               | $V_{BE(sat)}$ |      | 1.4     | 2.0 | V    | $I_C/I_B = 100 \text{ mA}/0.1 \text{ mA}$                                                  |
| Collector output capacitance                     | $C_{ob}$      |      | 4       | 7   | pF   | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$                                        |
| Transition frequency                             | $f_T$         |      | 250     |     | MHz  | $I_C = 10 \text{ mA}, V_{CE} = 5.0 \text{ V}, f = 100 \text{ MHz}$                         |
| Noise figure                                     | NF            |      | 2       |     | dB   | $I_C = 1.0 \text{ mA}, V_{CE} = 5 \text{ V}, R_S = 100 \text{ k}\Omega, f = 1 \text{ kHz}$ |

### Electrical characteristic curves

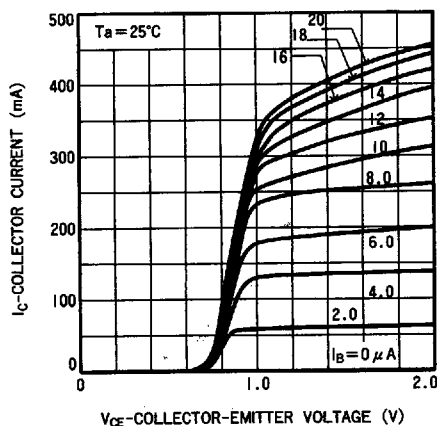


Figure 1

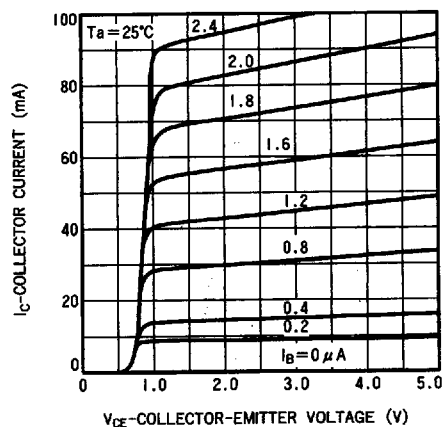


Figure 2

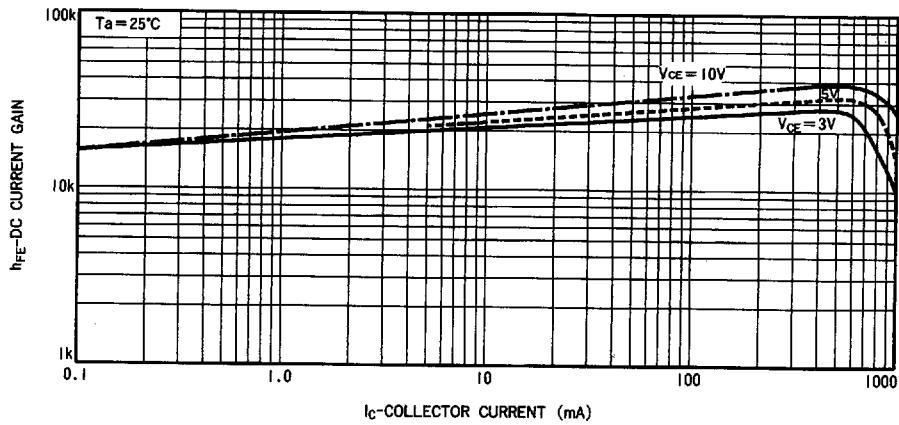


Figure 3

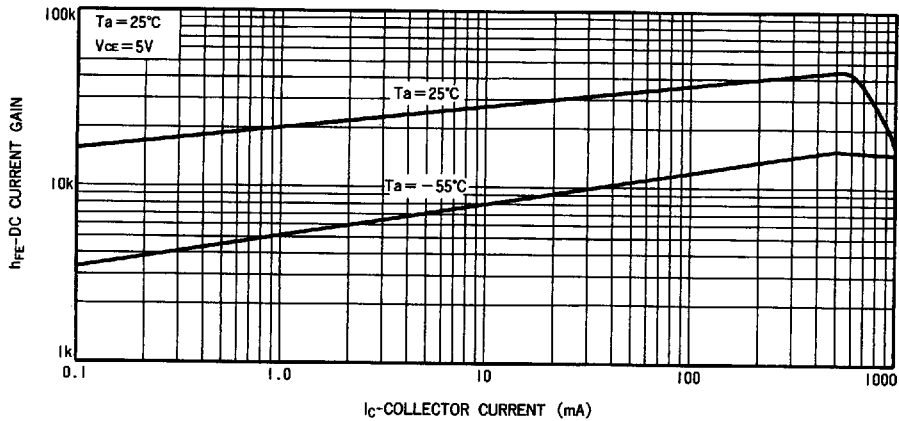


Figure 4

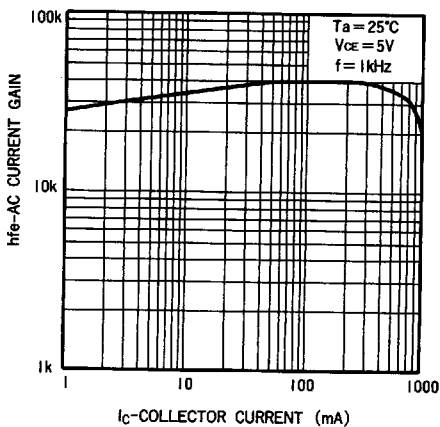


Figure 5

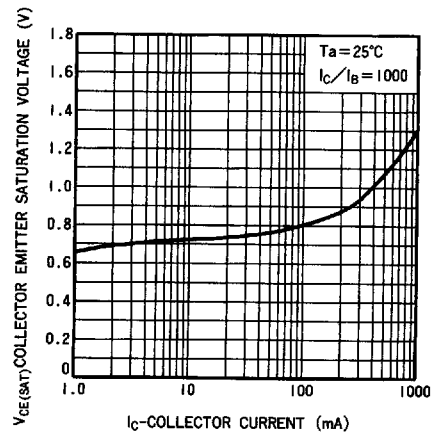


Figure 6

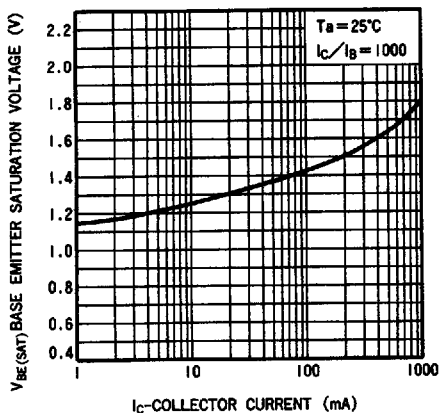


Figure 7

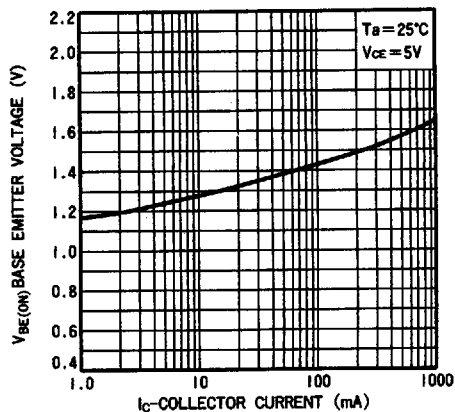


Figure 8

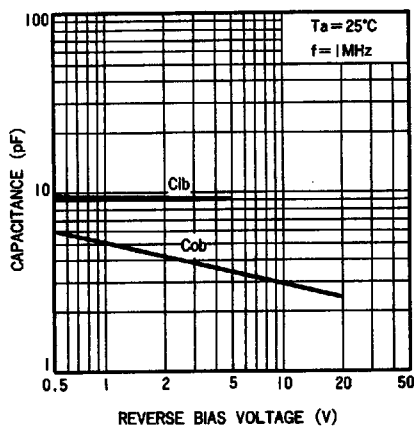


Figure 9

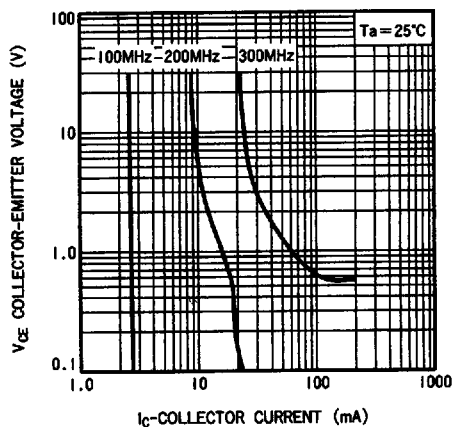


Figure 10

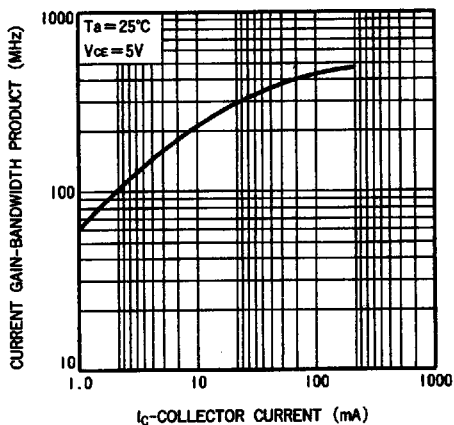


Figure 11

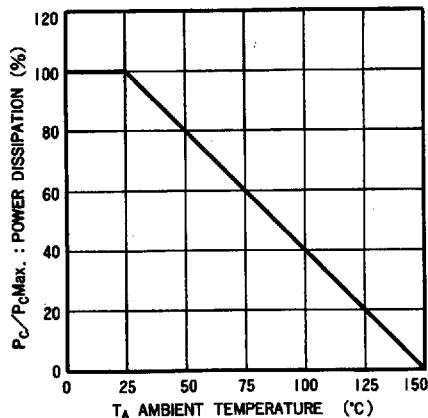


Figure 12