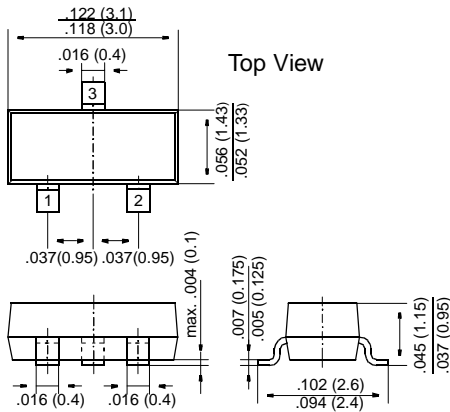


# BC856 THRU BC859

## Small Signal Transistors (PNP)

### SOT-23



Dimensions in inches and (millimeters)

Pin configuration

1 = Base, 2 = Emitter, 3 = Collector.

### FEATURES

- ◆ PNP Silicon Epitaxial Planar Transistors for switching and AF amplifier applications.
- ◆ Especially suited for automatic insertion in thick- and thin-film circuits.
- ◆ These transistors are subdivided into three groups A, B and C according to their current gain. The type BC856 is available in groups A and B, however, the types BC857, BC858 and BC859 can be supplied in all three groups. The BC859 is a low noise type.
- ◆ As complementary types, the NPN transistors BC846 ... BC849 are recommended.



### MECHANICAL DATA

Case: SOT-23 Plastic Package

Weight: approx. 0.008 g

Marking code

| Type   | Marking | Type   | Marking |
|--------|---------|--------|---------|
| BC856A | 3A      | BC859A | 4A      |
| B      | 3B      |        | 4B      |
| BC857A | 3E      |        | C       |
| B      | 3F      |        |         |
| C      | 3G      |        |         |
| BC858A | 3J      |        |         |
| B      | 3K      |        |         |
| C      | 3L      |        |         |

### MAXIMUM RATINGS AND ELECTRICAL CHARACTERISTICS

Ratings at 25 °C ambient temperature unless otherwise specified

|  | Symbol       | Value              | Unit |   |
|--|--------------|--------------------|------|---|
| Collector-Base Voltage                       | BC856        | $-V_{CBO}$         | 80   | V |
|  | BC857        | $-V_{CBO}$         | 50   | V |
|  | BC858, BC859 | $-V_{CBO}$         | 30   | V |
| Collector-Emitter Voltage                    | BC856        | $-V_{CES}$         | 80   | V |
|  | BC857        | $-V_{CES}$         | 50   | V |
|  | BC858, BC859 | $-V_{CES}$         | 30   | V |
| Collector-Emitter Voltage                    | BC856        | $-V_{CEO}$         | 65   | V |
|  | BC857        | $-V_{CEO}$         | 45   | V |
|  | BC858, BC859 | $-V_{CEO}$         | 30   | V |
| Emitter-Base Voltage                         | $-V_{EBO}$   | 5                  | V    |   |
| Collector Current                            | $-I_C$       | 100                | mA   |   |
| Peak Collector Current                       | $-I_{CM}$    | 200                | mA   |   |
| Peak Base Current                            | $-I_{BM}$    | 200                | mA   |   |
| Peak Emitter Current                         | $I_{EM}$     | 200                | mA   |   |
| Power Dissipation at $T_{SB} = 50\text{ °C}$ | $P_{tot}$    | 310 <sup>(1)</sup> | mW   |   |
| Junction Temperature                         | $T_j$        | 150                | °C   |   |
| Storage Temperature Range                    | $T_S$        | -65 to +150        | °C   |   |

# BC856 THRU BC859

## ELECTRICAL CHARACTERISTICS

Ratings at 25 °C ambient temperature unless otherwise specified

|  | Symbol               | Min.       | Typ. | Max.                | Unit |
|--|----------------------|------------|------|---------------------|------|
| <b>h-Parameters</b><br>at $-V_{CE} = 5\text{ V}$ , $-I_C = 2\text{ mA}$ , $f = 1\text{ kHz}$       |                      |            |      |                     |      |
| Current Gain   | Current Gain Group A | $h_{fe}$   | —    | 220                 | —    |
|  | B                    | $h_{fe}$   | —    | 330                 | —    |
|  | C                    | $h_{fe}$   | —    | 600                 | —    |
| Input Impedance  | Current Gain Group A | $h_{ie}$   | 1.6  | 2.7                 | 4.5  |
|  | B                    | $h_{ie}$   | 3.2  | 4.5                 | 8.5  |
|  | C                    | $h_{ie}$   | 6    | 8.7                 | 15   |
| Output Admittance  | Current Gain Group A | $h_{oe}$   | —    | 18                  | 30   |
|  | B                    | $h_{oe}$   | —    | 30                  | 60   |
|  | C                    | $h_{oe}$   | —    | 60                  | 110  |
| Reverse Voltage Transfer Ratio   | Current Gain Group A | $h_{re}$   | —    | $1.5 \cdot 10^{-4}$ | —    |
|  | B                    | $h_{re}$   | —    | $2 \cdot 10^{-4}$   | —    |
|  | C                    | $h_{re}$   | —    | $3 \cdot 10^{-4}$   | —    |
| <b>DC Current Gain</b><br>at $-V_{CE} = 5\text{ V}$ , $-I_C = 10\text{ }\mu\text{A}$               |                      |            |      |                     |      |
|  | Current Gain Group A | $h_{FE}$   | —    | 90                  | —    |
|  | B                    | $h_{FE}$   | —    | 150                 | —    |
|  | C                    | $h_{FE}$   | —    | 270                 | —    |
| at $-V_{CE} = 5\text{ V}$ , $-I_C = 2\text{ mA}$   |                      |            |      |                     |      |
|  | Current Gain Group A | $h_{FE}$   | 110  | 180                 | 220  |
|  | B                    | $h_{FE}$   | 200  | 290                 | 450  |
|  | C                    | $h_{FE}$   | 420  | 520                 | 800  |
| Thermal Resistance Junction to Substrate Backside  | $R_{thSB}$           | —          | —    | 320 <sup>1)</sup>   | K/W  |
| Thermal Resistance Junction to Ambient Air   | $R_{thJA}$           | —          | —    | 450 <sup>1)</sup>   | K/W  |
| <b>Collector Saturation Voltage</b><br>at $-I_C = 10\text{ mA}$ , $-I_B = 0.5\text{ mA}$           |                      |            |      |                     |      |
|  | $-V_{CEsat}$         | —          | 90   | 300                 | mV   |
| at $-I_C = 100\text{ mA}$ , $-I_B = 5\text{ mA}$   |                      |            |      |                     |      |
|  | $-V_{CEsat}$         | —          | 250  | 650                 | mV   |
| <b>Base Saturation Voltage</b><br>at $-I_C = 10\text{ mA}$ , $-I_B = 0.5\text{ mA}$                |                      |            |      |                     |      |
|  | $-V_{BEsat}$         | —          | 700  | —                   | mV   |
| at $-I_C = 100\text{ mA}$ , $-I_B = 5\text{ mA}$   |                      |            |      |                     |      |
|  | $-V_{BEsat}$         | —          | 900  | —                   | mV   |
| <b>Base-Emitter Voltage</b><br>at $-V_{CE} = 5\text{ V}$ , $-I_C = 2\text{ mA}$                    |                      |            |      |                     |      |
|  | $-V_{BE}$            | 600        | 660  | 750                 | mV   |
| at $-V_{CE} = 5\text{ V}$ , $-I_C = 10\text{ mA}$  |                      |            |      |                     |      |
|  | $-V_{BE}$            | —          | —    | 800                 | mV   |
| <b>Collector-Emitter Cutoff Current</b><br>at $-V_{CE} = 80\text{ V}$                              |                      |            |      |                     |      |
|  | BC856                | $-I_{CES}$ | —    | 0.2                 | 15   |
| at $-V_{CE} = 50\text{ V}$   |                      |            |      |                     |      |
|  | BC857                | $-I_{CES}$ | —    | 0.2                 | 15   |
| at $-V_{CE} = 30\text{ V}$   |                      |            |      |                     |      |
|  | BC858, BC859         | $-I_{CES}$ | —    | 0.2                 | 15   |
| at $-V_{CE} = 80\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$                                     |                      |            |      |                     |      |
|  | BC856                | $-I_{CES}$ | —    | —                   | 4    |
| at $-V_{CE} = 50\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$                                     |                      |            |      |                     |      |
|  | BC857                | $-I_{CES}$ | —    | —                   | 4    |
| at $-V_{CE} = 30\text{ V}$ , $T_j = 125\text{ }^\circ\text{C}$                                     |                      |            |      |                     |      |
|  | BC858, BC859         | $-I_{CES}$ | —    | —                   | 4    |
| at $-V_{CB} = 30\text{ V}$   |                      |            |      |                     |      |
|  |                      | $-I_{CBO}$ | —    | —                   | 15   |
| at $-V_{CB} = 30\text{ V}$ , $T_j = 150\text{ }^\circ\text{C}$                                     |                      |            |      |                     |      |
|  |                      | $-I_{CBO}$ | —    | —                   | 5    |
| Gain-Bandwidth Product<br>at $-V_{CE} = 5\text{ V}$ , $-I_C = 10\text{ mA}$ , $f = 100\text{ MHz}$ | $f_T$                | —          | 150  | —                   | MHz  |

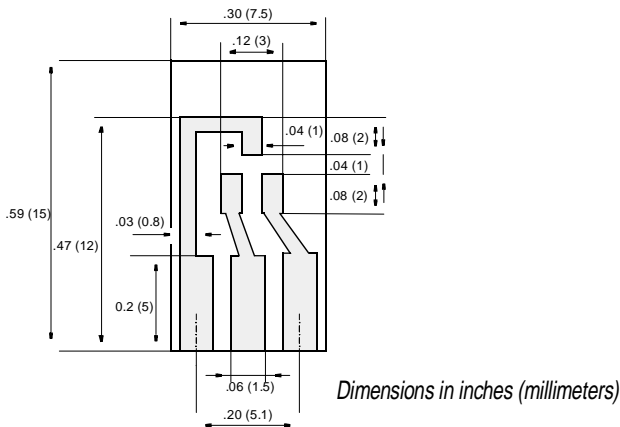
<sup>1)</sup> Device on fiberglass substrate, see layout

# BC856 THRU BC859

## ELECTRICAL CHARACTERISTICS

Ratings at 25 °C ambient temperature unless otherwise specified

|   | Symbol    | Min. | Typ. | Max. | Unit |
|---|-----------|------|------|------|------|
| Collector-Base Capacitance<br>at $-V_{CB} = 10 \text{ V}$ , $f = 1 \text{ MHz}$   | $C_{CBO}$ | –    | –    | 6    | pF   |
| Noise Figure<br>at $-V_{CE} = 5 \text{ V}$ , $-I_C = 200 \mu\text{A}$ , $R_G = 2 \text{ k}\Omega$ ,<br>$f = 1 \text{ kHz}$ , $\Delta f = 200 \text{ Hz}$ <b>BC856, BC857, BC858</b> | F         | –    | 2    | 10   | dB   |
| <b>BC859</b>  | F         | –    | 1    | 4    | dB   |
| Noise Figure<br>at $-V_{CE} = 5 \text{ V}$ , $-I_C = 200 \mu\text{A}$ , $R_G = 2 \text{ k}\Omega$ ,<br>$f = 30 \dots 15000 \text{ Hz}$ <b>BC859</b>                                 | F         | –    | 1.2  | 4    | dB   |



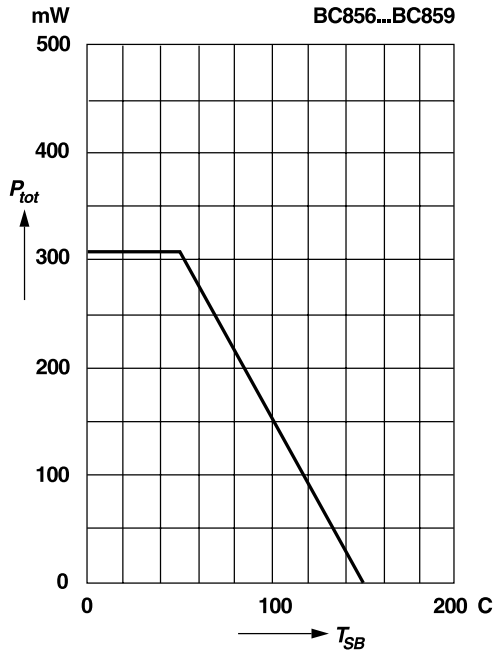
### Layout for $R_{thJA}$ test

Thickness: Fiberglass 0.059 in (1.5 mm)

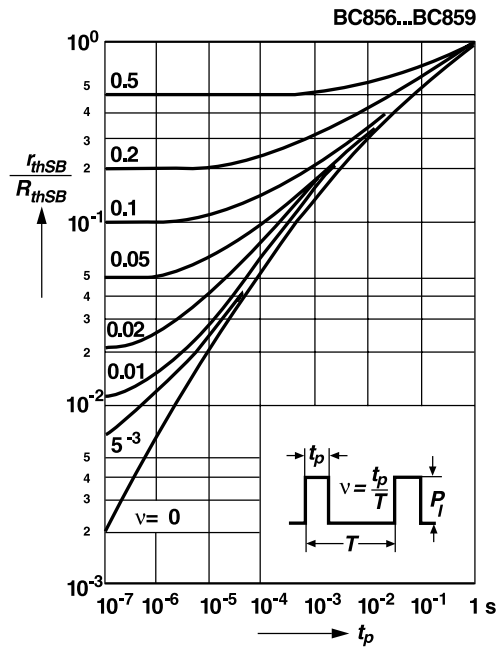
Copper leads 0.012 in (0.3 mm)

# RATINGS AND CHARACTERISTIC CURVES BC856 THRU BC859

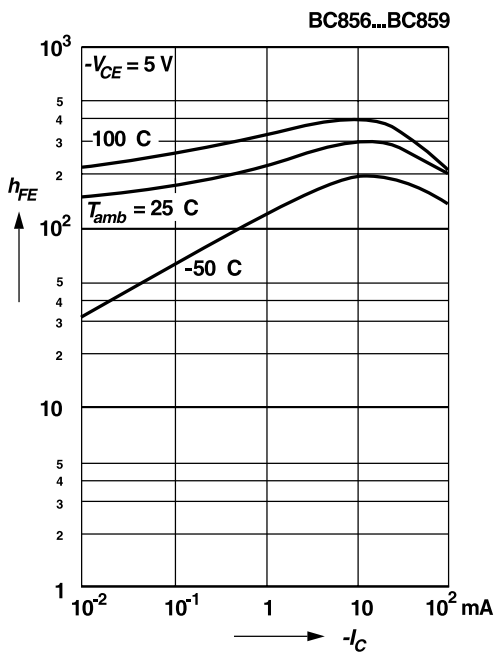
**Admissible power dissipation versus temperature of substrate backside**  
Device on fiberglass substrate, see layout



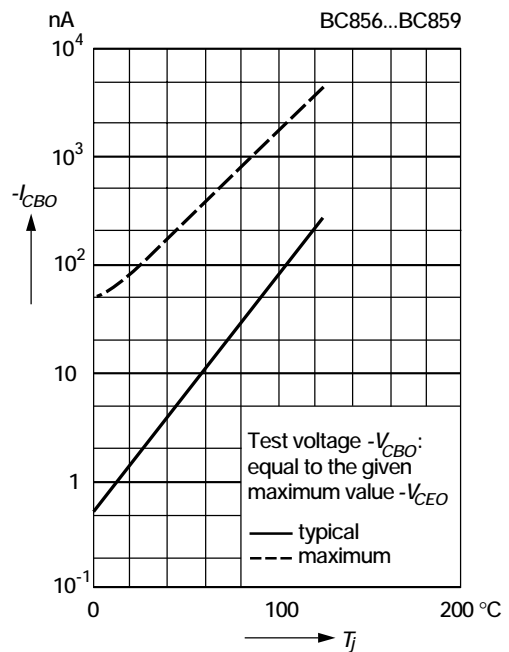
**Pulse thermal resistance versus pulse duration (normalized)**  
Device on fiberglass substrate, see layout



**DC current gain versus collector current**

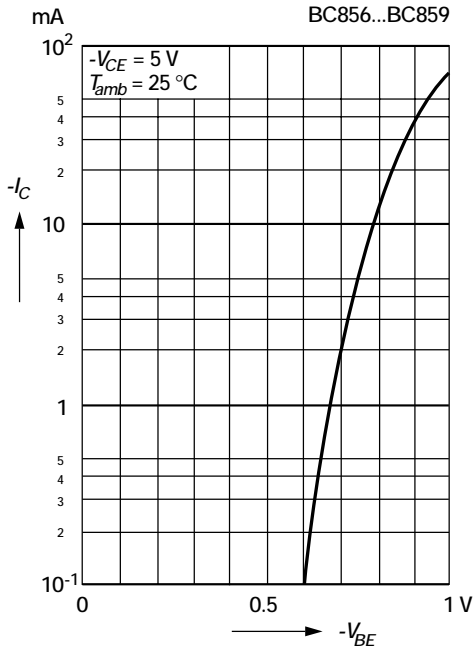


**Collector-base cutoff current versus junction temperature**

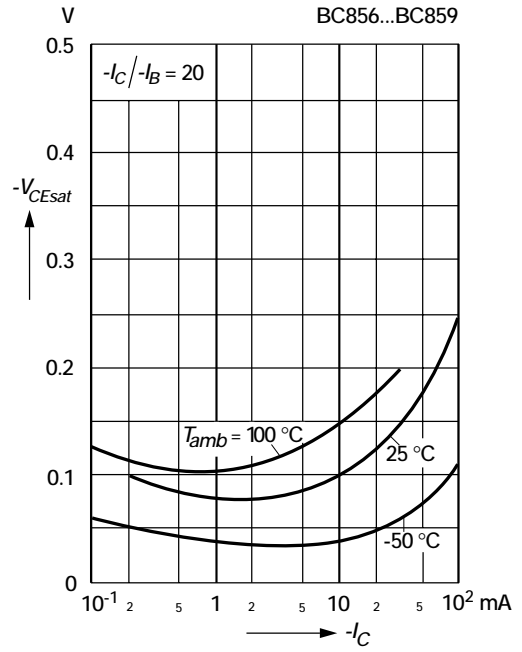


# RATINGS AND CHARACTERISTIC CURVES BC856 THRU BC859

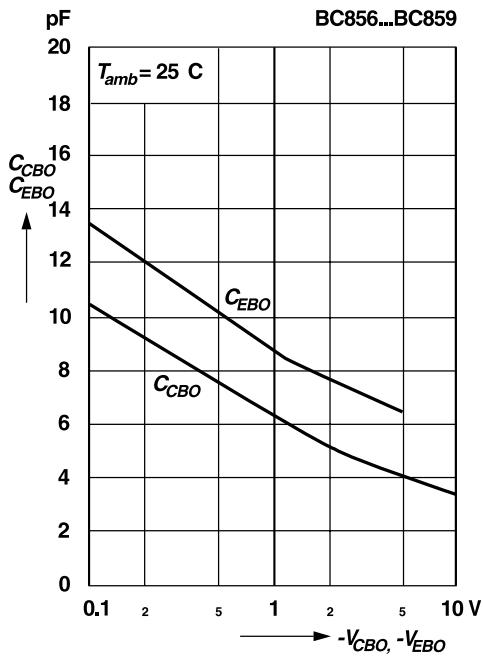
Collector current versus base-emitter voltage



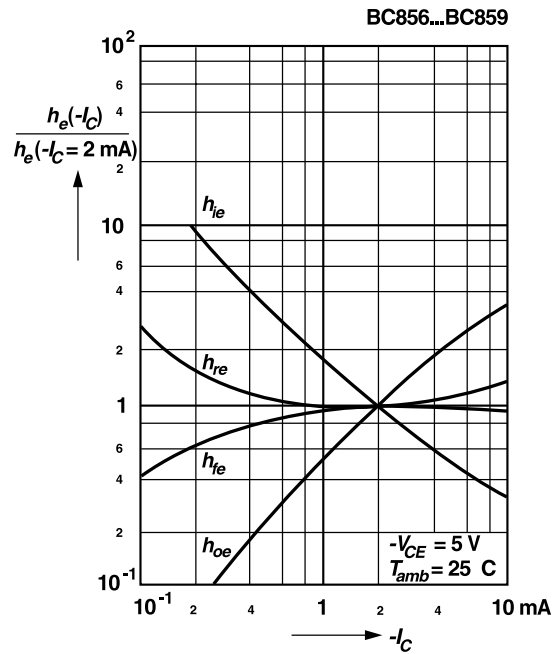
Collector saturation voltage versus collector current



Collector-base capacitance, Emitter-base capacitance versus reverse bias voltage

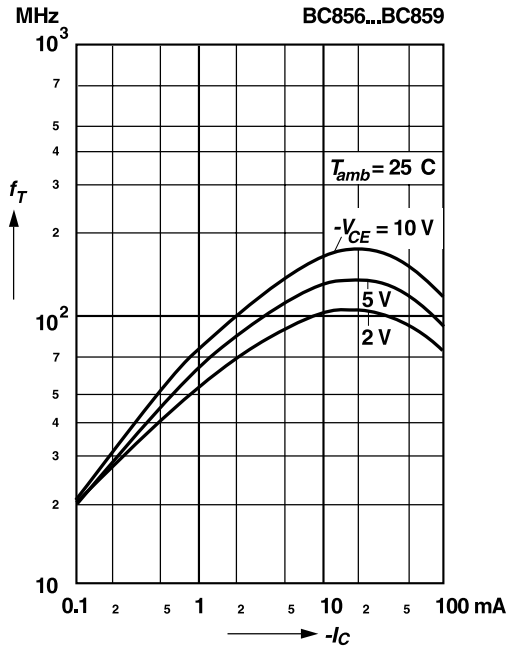


Relative h-parameters versus collector current

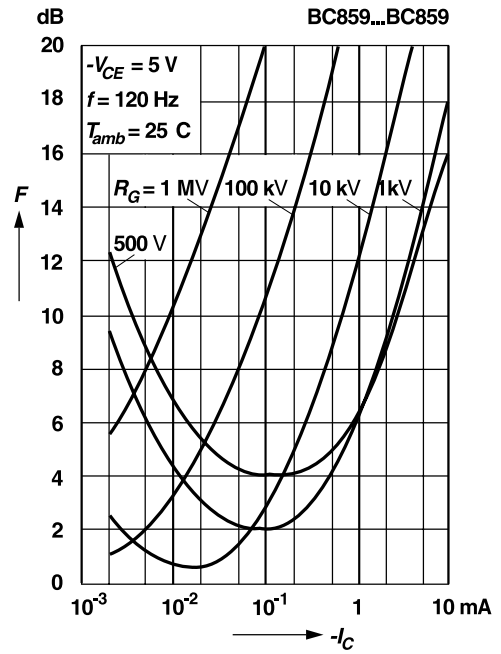


# RATINGS AND CHARACTERISTIC CURVES BC856 THRU BC859

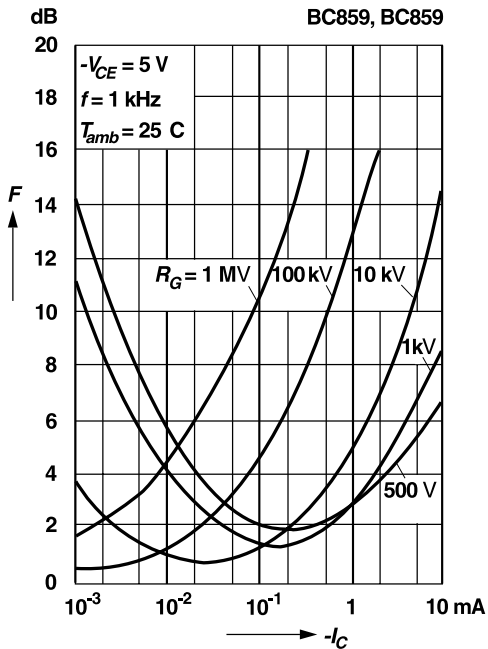
Gain-bandwidth product  
versus collector current



Noise figure  
versus collector current



Noise figure  
versus collector current



Noise figure  
versus collector-emitter voltage

