

### PNP Silicon AF Transistor

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types:  
BC847...-BC850... (NPN)
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101<sup>1)</sup>



<sup>1)</sup>BC857BL3 is not qualified according AEC Q101

| Type      | Marking | Pin Configuration |     |     |   |   |   | Package  |
|-----------|---------|-------------------|-----|-----|---|---|---|----------|
| BC857A    | 3Es     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC857B    | 3Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC857BL3* | 3F      | 1=B               | 2=E | 3=C | - | - | - | TSLP-3-1 |
| BC857BW   | 3Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC857C    | 3Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC857CW   | 3Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC858A    | 3Js     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC858B    | 3Ks     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC858BW   | 3Ks     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC858C    | 3Ls     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC858CW   | 3Ls     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC859C    | 4Cs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC860B    | 4Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC860BW   | 4Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC860CW   | 4Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |

\* Not qualified according AEC Q101

**Maximum Ratings**

| Parameter                                                                                                                   | Symbol    | Value             | Unit |
|-----------------------------------------------------------------------------------------------------------------------------|-----------|-------------------|------|
| Collector-emitter voltage<br>BC857..., BC860...<br>BC858..., BC859...                                                       | $V_{CEO}$ | 45<br>30          | V    |
| Collector-base voltage<br>BC857..., BC860...<br>BC858..., BC859...                                                          | $V_{CBO}$ | 50<br>30          |      |
| Emitter-base voltage                                                                                                        | $V_{EBO}$ | 5                 |      |
| Collector current                                                                                                           | $I_C$     | 100               | mA   |
| Peak collector current, $t_p \leq 10$ ms                                                                                    | $I_{CM}$  | 200               |      |
| Total power dissipation<br>$T_S \leq 71$ °C, BC857-BC860<br>$T_S \leq 135$ °C, BC857BL3<br>$T_S \leq 124$ °C, BC857W-BC860W | $P_{tot}$ | 330<br>250<br>250 | mW   |
| Junction temperature                                                                                                        | $T_j$     | 150               |      |
| Storage temperature                                                                                                         | $T_{stg}$ | -65 ... 150       | °C   |

**Thermal Resistance**

| Parameter                                                                            | Symbol     | Value                                 | Unit |
|--------------------------------------------------------------------------------------|------------|---------------------------------------|------|
| Junction - soldering point <sup>1)</sup><br>BC857-BC860<br>BC857BL3<br>BC857W-BC860W | $R_{thJS}$ | $\leq 240$<br>$\leq 60$<br>$\leq 105$ | K/W  |

<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Symbol        | Values                           |                                        |                                  | Unit          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------|----------------------------------------|----------------------------------|---------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               | min.                             | typ.                                   | max.                             |               |
| DC Characteristics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                  |                                        |                                  |               |
| Collector-emitter breakdown voltage<br>$I_C = 10\text{ mA}$ , $I_B = 0$ , BC857..., BC860...<br>$I_C = 10\text{ mA}$ , $I_B = 0$ , BC858..., BC859...                                                                                                                                                                                                                                                                                                                                                 | $V_{(BR)CEO}$ | 45<br>30                         | -<br>-                                 | -<br>-                           | V             |
| Collector-base breakdown voltage<br>$I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ , BC857..., BC860...<br>$I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ , BC858..., BC859...                                                                                                                                                                                                                                                                                                                                  | $V_{(BR)CBO}$ | 50<br>30                         | -<br>-                                 | -<br>-                           |               |
| Emitter-base breakdown voltage<br>$I_E = 1\text{ }\mu\text{A}$ , $I_C = 0$                                                                                                                                                                                                                                                                                                                                                                                                                            | $V_{(BR)EBO}$ | 5                                | -                                      | -                                |               |
| Collector-base cutoff current<br>$V_{CB} = 45\text{ V}$ , $I_E = 0$<br>$V_{CB} = 30\text{ V}$ , $I_E = 0$ , $T_A = 150\text{ }^\circ\text{C}$                                                                                                                                                                                                                                                                                                                                                         | $I_{CBO}$     | -<br>-                           | -<br>-                                 | 0.015<br>5                       | $\mu\text{A}$ |
| DC current gain <sup>1)</sup><br>$I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.C}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $h_{FE}\text{-grp.C}$ | $h_{FE}$      | -<br>-<br>-<br>125<br>220<br>420 | 140<br>250<br>480<br>180<br>290<br>520 | -<br>-<br>-<br>250<br>475<br>800 | -             |
| Collector-emitter saturation voltage <sup>1)</sup><br>$I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$<br>$I_C = 100\text{ mA}$ , $I_B = 5\text{ mA}$                                                                                                                                                                                                                                                                                                                                                     | $V_{CEsat}$   | -<br>-                           | 75<br>250                              | 300<br>650                       | mV            |
| Base emitter saturation voltage <sup>1)</sup><br>$I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$<br>$I_C = 100\text{ mA}$ , $I_B = 5\text{ mA}$                                                                                                                                                                                                                                                                                                                                                          | $V_{BEsat}$   | -<br>-                           | 700<br>850                             | -<br>-                           |               |
| Base-emitter voltage <sup>1)</sup><br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$<br>$I_C = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$                                                                                                                                                                                                                                                                                                                                                                     | $V_{BE(ON)}$  | 600<br>-                         | 650<br>-                               | 750<br>820                       |               |

<sup>1)</sup>Pulse test:  $t < 300\mu\text{s}$ ;  $D < 2\%$

**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

| Parameter                                                                                                                                                                                                                                                                                                                       | Symbol    | Values      |                   |             | Unit             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|-------------------|-------------|------------------|
|                                                                                                                                                                                                                                                                                                                                 |           | min.        | typ.              | max.        |                  |
| AC Characteristics                                                                                                                                                                                                                                                                                                              |           |             |                   |             |                  |
| Transition frequency<br>$I_C = 20\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 100\text{ MHz}$                                                                                                                                                                                                                                     | $f_T$     | -           | 250               | -           | MHz              |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                       | $C_{cb}$  | -           | 1.5               | -           | pF               |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                        | $C_{eb}$  | -           | 8                 | -           |                  |
| Short-circuit input impedance<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.C}$               | $h_{11e}$ | -<br>-<br>- | 2.7<br>4.5<br>8.7 | -<br>-<br>- | kΩ               |
| Open-circuit reverse voltage transf. ratio<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.C}$  | $h_{12e}$ | -<br>-<br>- | 1.5<br>2<br>3     | -<br>-<br>- | 10 <sup>-4</sup> |
| Short-circuit forward current transf. ratio<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.C}$ | $h_{21e}$ | -<br>-<br>- | 200<br>330<br>600 | -<br>-<br>- | -                |
| Open-circuit output admittance<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.A}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.B}$<br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ , $h_{FE}\text{-grp.C}$              | $h_{22e}$ | -<br>-<br>- | 18<br>30<br>60    | -<br>-<br>- | μS               |
| Noise figure<br>$I_C = 0.2\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ ,<br>$\Delta f = 200\text{ Hz}$ , $R_S = 2\text{ k}\Omega$ , BC859, BC850                                                                                                                                                                    | $F$       | -           | 1                 | 4           | dB               |
| Equivalent noise voltage<br>$I_C = 200\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ k}\Omega$ ,<br>$f = 10\text{...}50\text{ Hz}$ , BC860                                                                                                                                                                                | $V_n$     | -           | -                 | 0.11        | μV               |

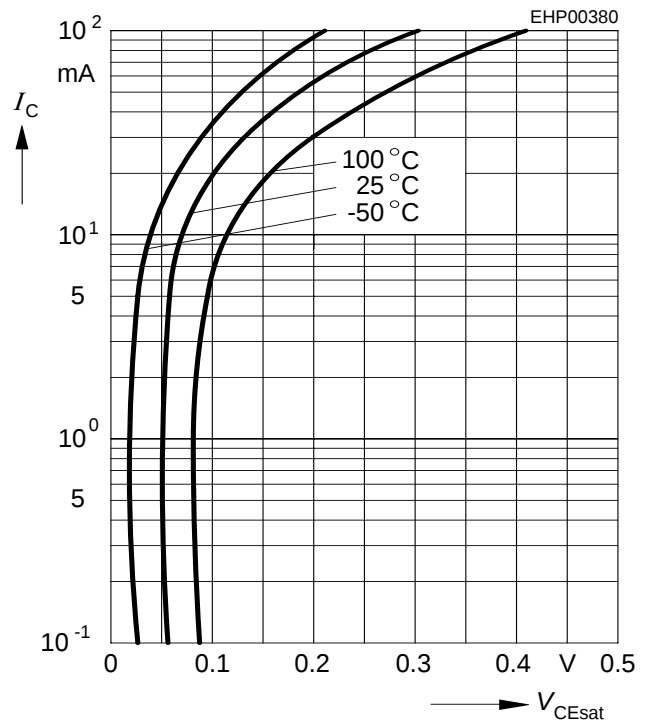
### DC current gain $h_{FE} = f(I_C)$

$$V_{CE} = 1 \text{ V}$$



### Collector-emitter saturation voltage

$$I_C = f(V_{CEsat}), h_{FE} = 20$$



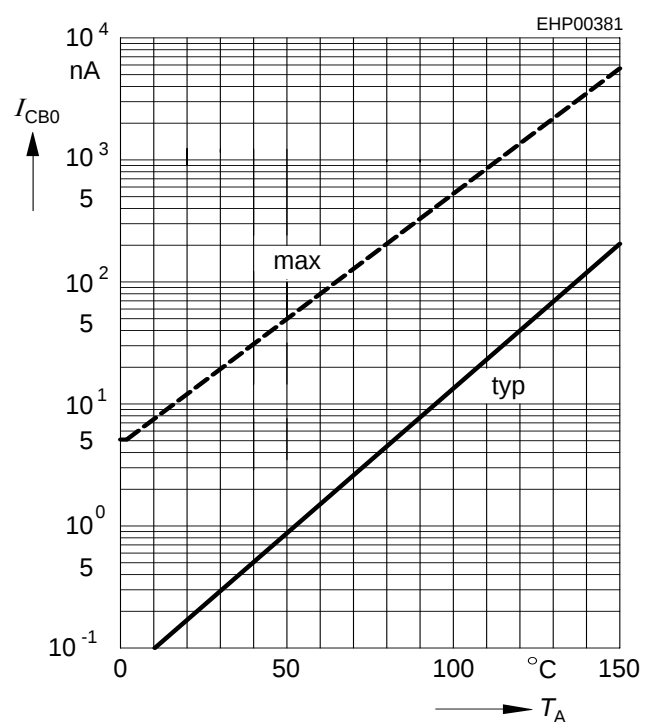
### Base-emitter saturation voltage

$$I_C = f(V_{BEsat}), h_{FE} = 20$$



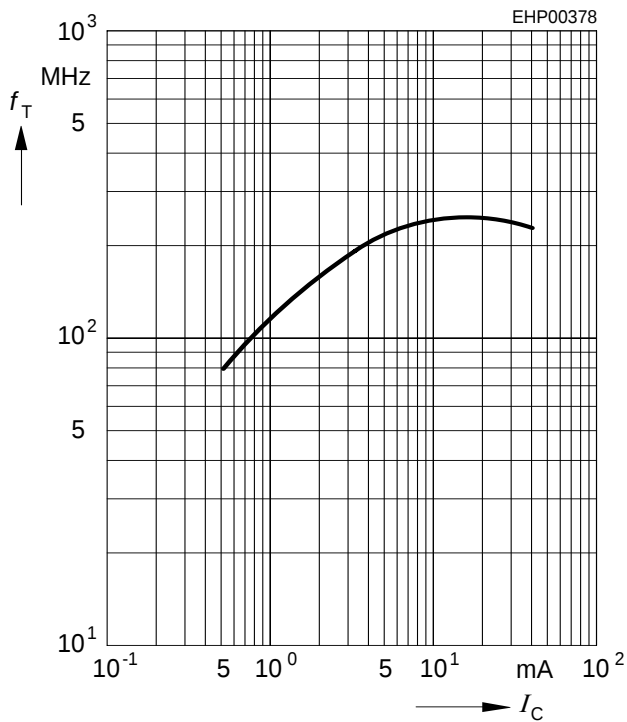
### Collector cutoff current $I_{CBO} = f(T_A)$

$$V_{CBO} = 30 \text{ V}$$



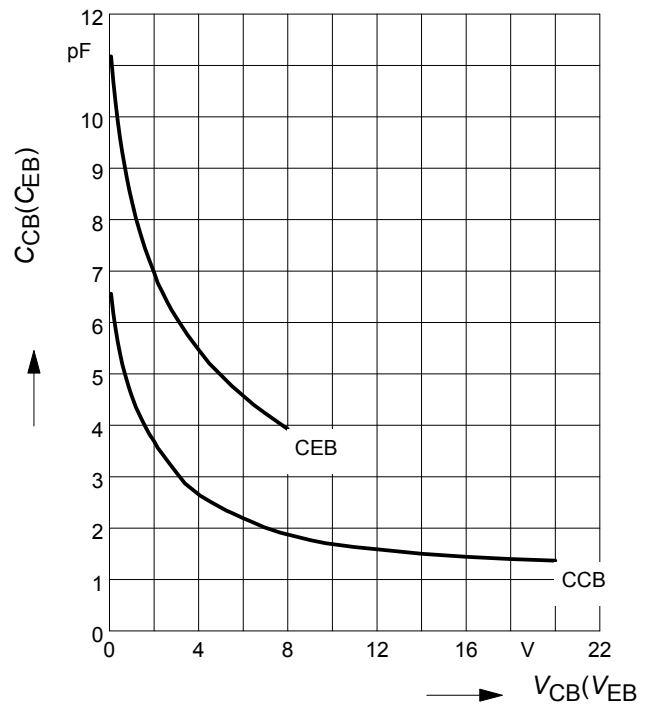
**Transition frequency  $f_T = f(I_C)$**

$V_{CE} = 5 \text{ V}$



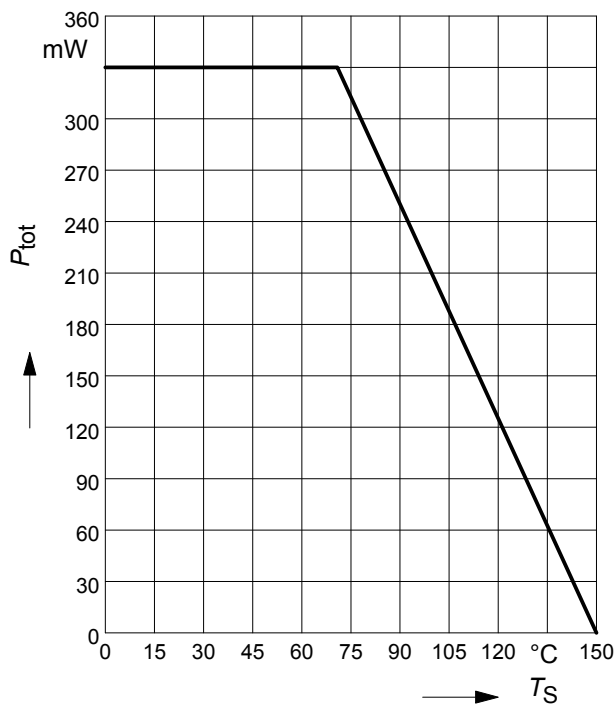
**Collector-base capacitance  $C_{cb} = f(V_{CB})$**

**Emitter-base capacitance  $C_{eb} = f(V_{EB})$**



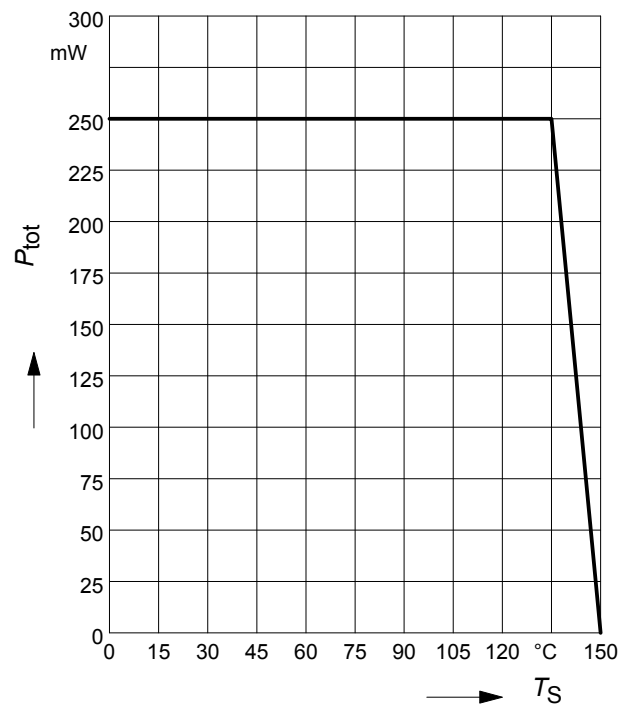
**Total power dissipation  $P_{tot} = f(T_S)$**

BC856-BC860



**Total power dissipation  $P_{tot} = f(T_S)$**

BC857BL3



### Total power dissipation $P_{\text{tot}} = f(T_S)$

BC857W-BC860W



### Permissible Pulse Load

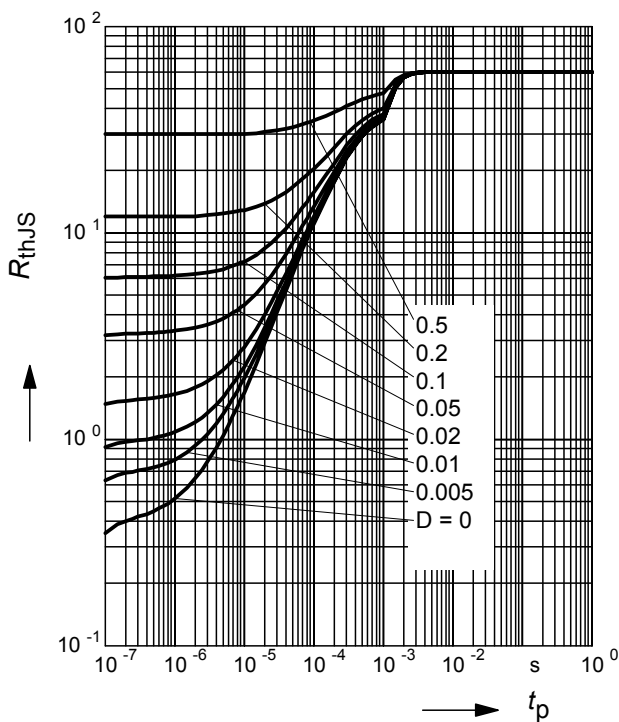
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

BC857/W-BC860/W



### Permissible Puls Load $R_{\text{thJS}} = f(t_p)$

BC857BL3



### Permissible Pulse Load

$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

BC857BL3



## Package Outline



1) Lead width can be 0.6 max. in dambar area

## Foot Print



## Marking Layout (Example)



## Standard Packing

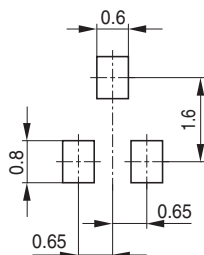
Reel ø180 mm = 3.000 Pieces/Reel  
Reel ø330 mm = 10.000 Pieces/Reel



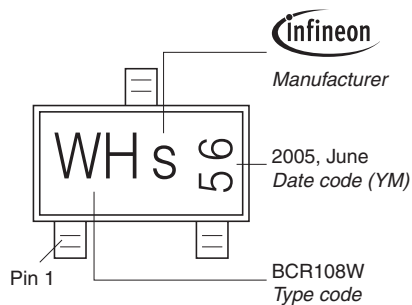
## Package Outline



## Foot Print

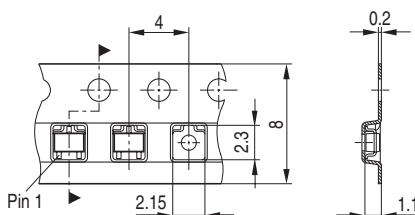


## Marking Layout (Example)



## Standard Packing

Reel  $\varnothing 180 \text{ mm}$  = 3.000 Pieces/Reel  
 Reel  $\varnothing 330 \text{ mm}$  = 10.000 Pieces/Reel



## Package Outline

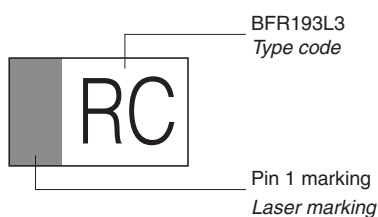


## Foot Print

For board assembly information please refer to Infineon website "Packages"

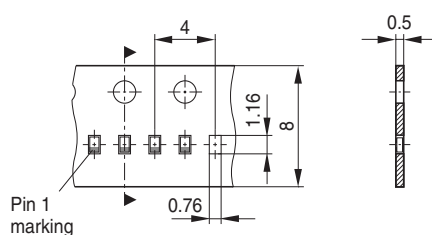


## Marking Layout (Example)



## Standard Packing

Reel ø180 mm = 15.000 Pieces/Reel



**Edition 2009-11-16**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

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