

### NPN Silicon AF Transistors

- 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:  
BC857...-BC860...(PNP)
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101<sup>1)</sup>



<sup>1</sup>BC847BL3 is not qualified according AEC Q101

| Type      | Marking | Pin Configuration |     |     |   |   |   | Package  |
|-----------|---------|-------------------|-----|-----|---|---|---|----------|
| BC847A    | 1Es     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC847B    | 1Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC847BL3* | 1F      | 1=B               | 2=E | 3=C | - | - | - | TSLP-3-1 |
| BC847BW   | 1Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC847C    | 1Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC847CW   | 1Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC848A    | 1Js     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC848B    | 1Ks     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC848BL3  | 1K      | 1=B               | 2=E | 3=C | - | - | - | TSLP-3-1 |
| BC848BW   | 1Ks     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC848C    | 1Ls     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC848CW   | 1Ls     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC849B    | 2Bs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC849C    | 2Cs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC849CW   | 2Cs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC850B    | 2Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC850BW   | 2Fs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |
| BC850C    | 2Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT23    |
| BC850CW   | 2Gs     | 1=B               | 2=E | 3=C | - | - | - | SOT323   |

\* Not qualified according AEC Q101

**Maximum Ratings**

| Parameter                                                                                                                             | Symbol    | Value             | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------|------|
| Collector-emitter voltage<br>BC847..., BC850...<br>BC848..., BC849...                                                                 | $V_{CEO}$ | 45<br>30          | V    |
| Collector-emitter voltage<br>BC847..., BC850...<br>BC848..., BC849...                                                                 | $V_{CES}$ | 50<br>30          |      |
| Collector-base voltage<br>BC847..., BC850...<br>BC848..., BC849...                                                                    | $V_{CBO}$ | 50<br>30          |      |
| Emitter-base voltage<br>BC847..., BC850...<br>BC848..., BC849...                                                                      | $V_{EBO}$ | 6<br>6            |      |
| 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, BC847-BC850<br>$T_S \leq 135$ °C, BC847BL3-BC848BL3<br>$T_S \leq 124$ °C, BC847W-BC850W | $P_{tot}$ | 330<br>250<br>250 | mW   |
| Junction temperature                                                                                                                  | $T_j$     | 150               | °C   |
| Storage temperature                                                                                                                   | $T_{stg}$ | -65 ... 150       |      |

**Thermal Resistance**

| Parameter                                                                                     | Symbol     | Value                                 | Unit |
|-----------------------------------------------------------------------------------------------|------------|---------------------------------------|------|
| Junction - soldering point <sup>1)</sup><br>BC847-BC850<br>BC847BL3-BC848BL3<br>BC847W-BC850W | $R_{thJS}$ | $\leq 240$<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)

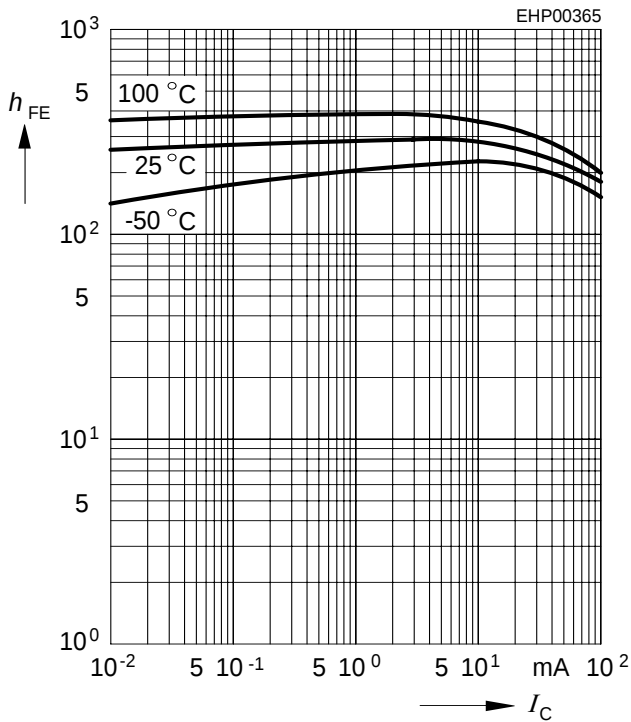
**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Symbol        | Values                           |                                        |                                  | Unit          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------|----------------------------------------|----------------------------------|---------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |               | min.                             | typ.                                   | max.                             |               |
| DC Characteristics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |               |                                  |                                        |                                  |               |
| Collector-emitter breakdown voltage<br>$I_C = 10\text{ mA}$ , $I_B = 0$ , BC847..., BC850...<br>$I_C = 10\text{ mA}$ , $I_B = 0$ , BC848..., BC849...                                                                                                                                                                                                                                                                                                                                                 | $V_{(BR)CEO}$ | 45<br>30                         | -<br>-                                 | -<br>-                           | V             |
| Collector-base breakdown voltage<br>$I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ , BC847..., BC850...<br>$I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ , BC848..., BC849...                                                                                                                                                                                                                                                                                                                                  | $V_{(BR)CBO}$ | 50<br>30                         | -<br>-                                 | -<br>-                           |               |
| Emitter-base breakdown voltage<br>$I_E = 0$ , $I_C = 10\text{ }\mu\text{A}$                                                                                                                                                                                                                                                                                                                                                                                                                           | $V_{(BR)EBO}$ | -                                | 6                                      | -                                |               |
| 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>-                           | 0.015<br>5                             | -<br>-                           | $\mu\text{A}$ |
| 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>110<br>200<br>420 | 140<br>250<br>480<br>180<br>290<br>520 | -<br>-<br>-<br>220<br>450<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>-                           | 90<br>200                              | 250<br>600                       | 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>900                             | -<br>-                           |               |
| Base-emitter voltage <sup>1)</sup><br>$I_C = 2\text{ mA}$ , $V_{CE} = 5\text{ V}$<br>$I_C = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$                                                                                                                                                                                                                                                                                                                                                                     | $V_{BE(ON)}$  | 580<br>-                         | 660<br>-                               | 700<br>770                       |               |

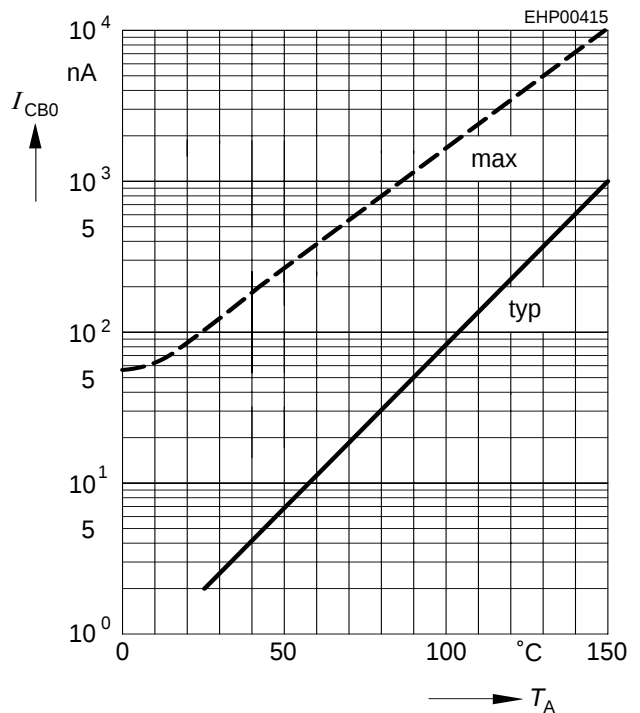
<sup>1)</sup>Pulse test:  $t < 300\mu\text{s}$ ;  $D < 2\%$

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

| Parameter                                                                                                                                                                                                                                                                                                                       | Symbol    | Values      |                   |             | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|-------------------|-------------|------|
|                                                                                                                                                                                                                                                                                                                                 |           | min.        | typ.              | max.        |      |
| AC Characteristics                                                                                                                                                                                                                                                                                                              |           |             |                   |             |      |
| Transition frequency<br>$I_C = 10\text{ mA}$ , $V_{CE} = 5\text{ V}$ , $f = 100\text{ MHz}$                                                                                                                                                                                                                                     | $f_T$     | -           | 250               | -           | MHz  |
| Collector-base capacitance<br>$V_{CB} = 10\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                       | $C_{cb}$  | -           | 0.95              | -           | pF   |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                        | $C_{eb}$  | -           | 9                 | -           |      |
| 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>- |      |
| 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>- |      |
| Noise figure<br>$I_C = 200\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $f = 1\text{ kHz}$ ,<br>$\Delta f = 200\text{ Hz}$ , $R_S = 2\text{ k}\Omega$ , BC849..., BC850...                                                                                                                                                     | $F$       | -           | 1.2               | 4           | dB   |
| Equivalent noise voltage<br>$I_C = 200\text{ }\mu\text{A}$ , $V_{CE} = 5\text{ V}$ , $R_S = 2\text{ k}\Omega$ ,<br>$f = 10 \dots 50\text{ Hz}$ , BC850...                                                                                                                                                                       | $V_n$     | -           | -                 | 0.135       | μV   |

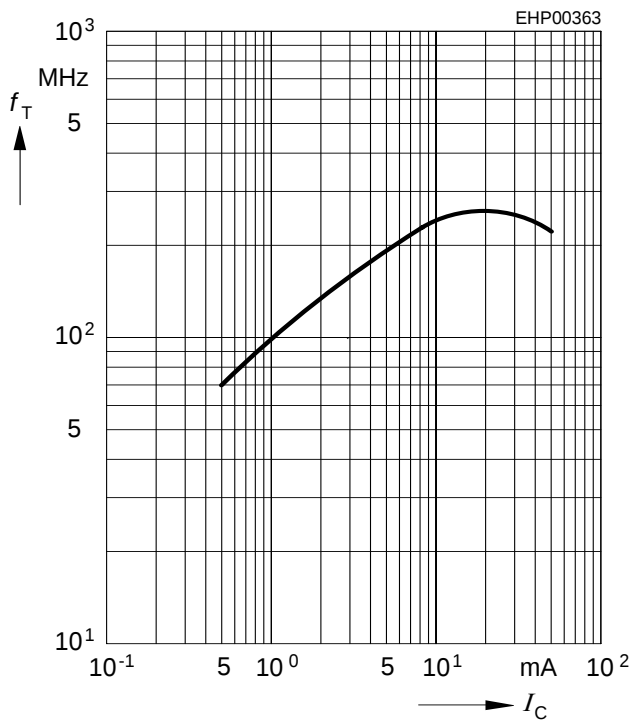
**DC current gain  $h_{FE} = f(I_C)$** 
 $V_{CE} = 5 \text{ V}$ 

**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  $I_{CBO} = f(T_A)$** 
 $V_{CB} = 30 \text{ V}$ 


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  $P_{tot} = f(T_S)$

BC847-BC850



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

BC847BL3/BC848BL3



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

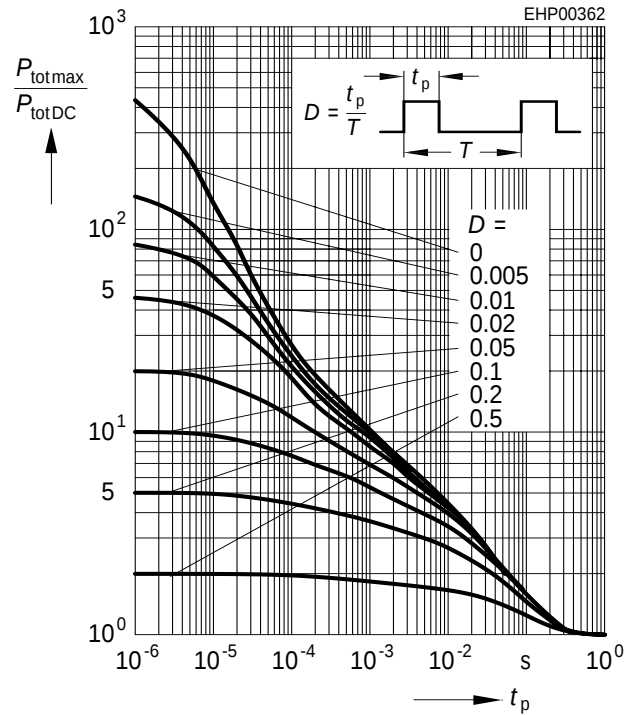
BC847W-BC850W



### Permissible Pulse Load

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

BC847/W-BC850/W



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

BC847BL3, BC848BL3



### Permissible Pulse Load

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

BC847BL3, BC848BL3



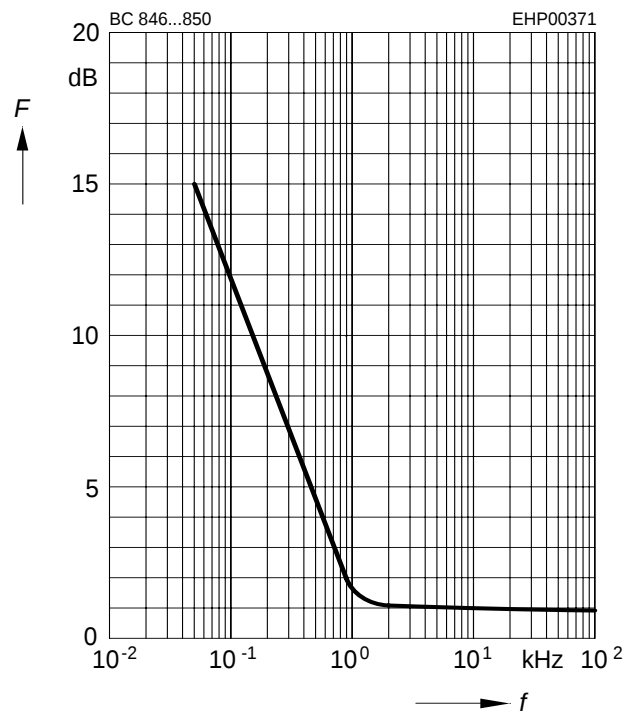
Noise figure  $F = f(V_{CE})$

$I_C = 0.2\text{mA}$ ,  $R_S = 2\text{k}\Omega$ ,  $f = 1\text{kHz}$



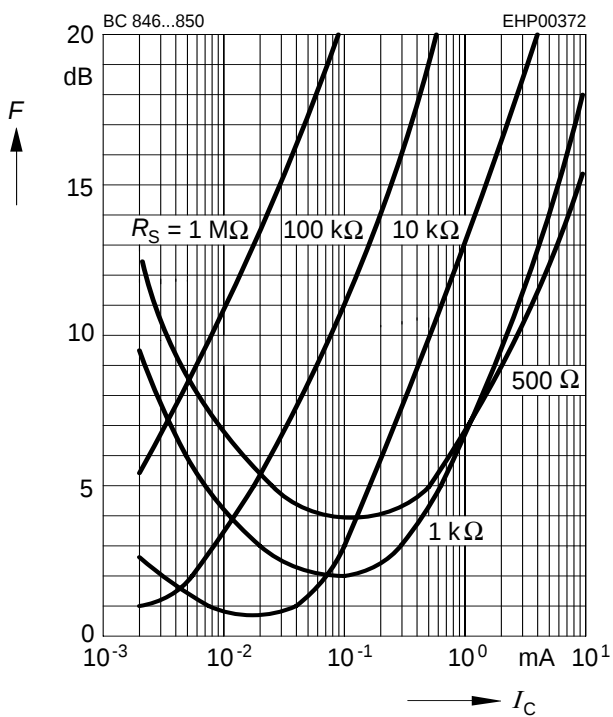
Noise figure  $F = f(f)$

$I_C = 0.2\text{ mA}$ ,  $V_{CE} = 5\text{V}$ ,  $R_S = 2\text{ k}\Omega$



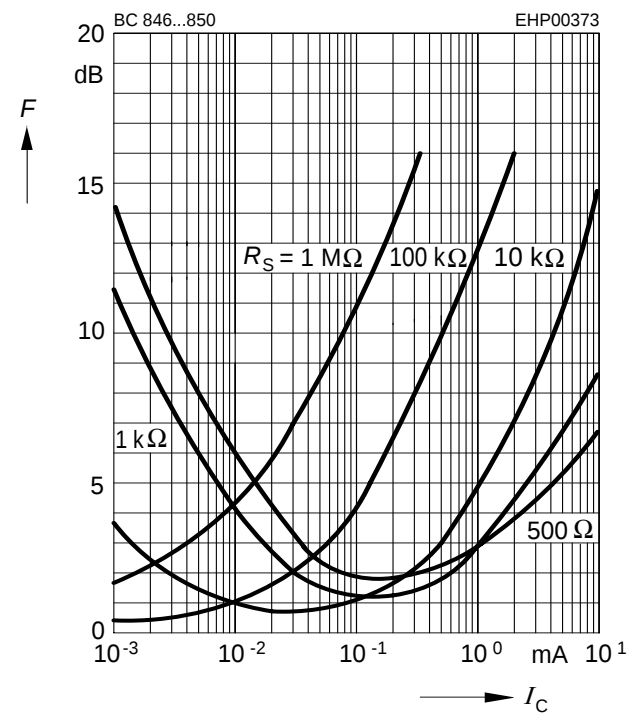
Noise figure  $F = f(I_C)$

$V_{CE} = 5\text{V}$ ,  $f = 120\text{Hz}$



Noise figure  $F = f(I_C)$

$V_{CE} = 5\text{V}$ ,  $f = 1\text{kHz}$



Noise figure  $F = f(I_C)$

$V_{CE} = 5V, f = 10kHz$



## Package Outline

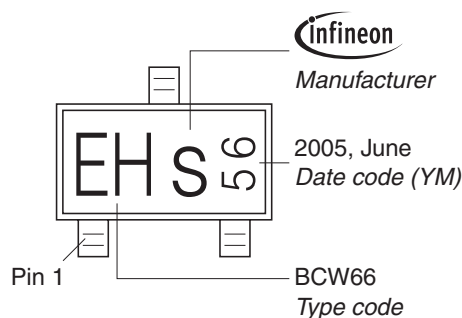


1) Lead width can be 0.6 max. in dambar area

## Foot Print



## Marking Layout (Example)



## Standard Packing

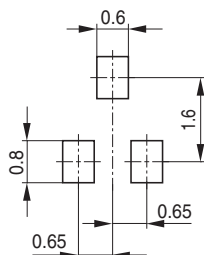
Reel ø180 mm = 3.000 Pieces/Reel  
Reel ø330 mm = 10.000 Pieces/Reel



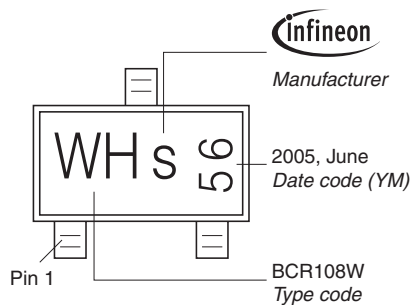
## Package Outline



## Foot Print

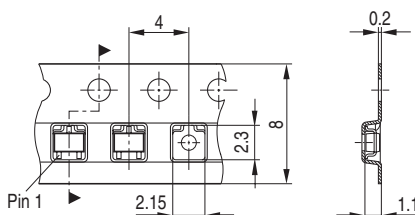


## Marking Layout (Example)



## Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 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



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