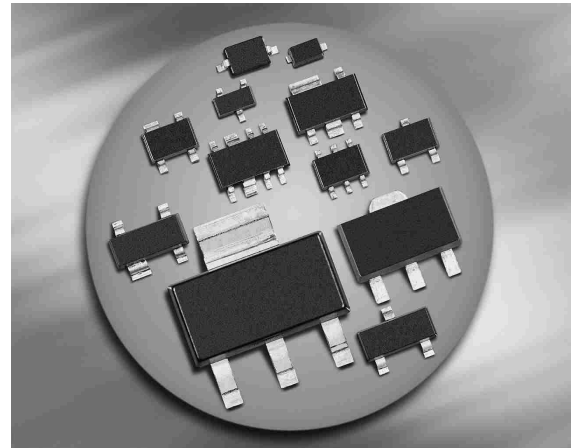


### NPN Silicon AF Transistors

- 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)

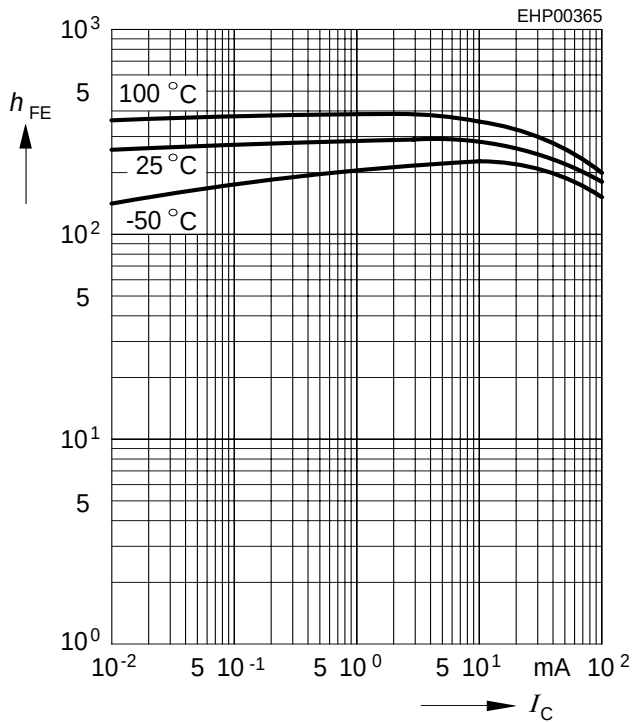
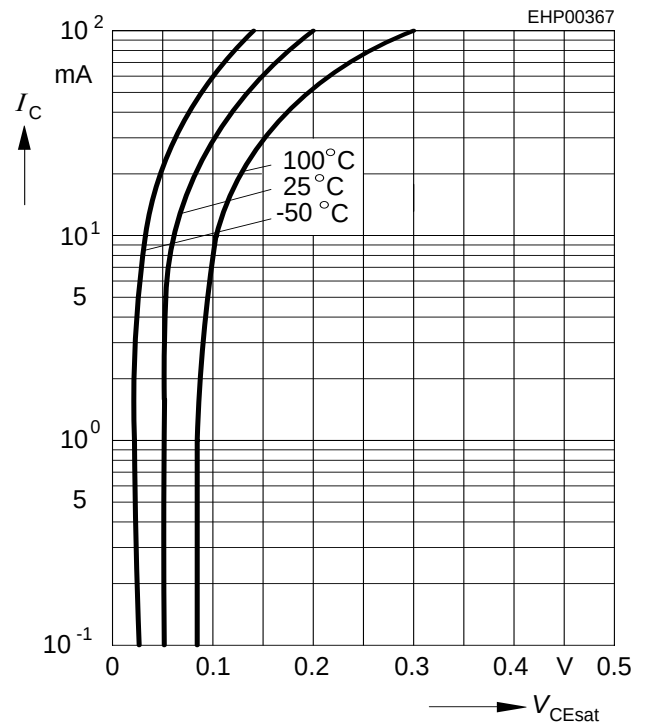
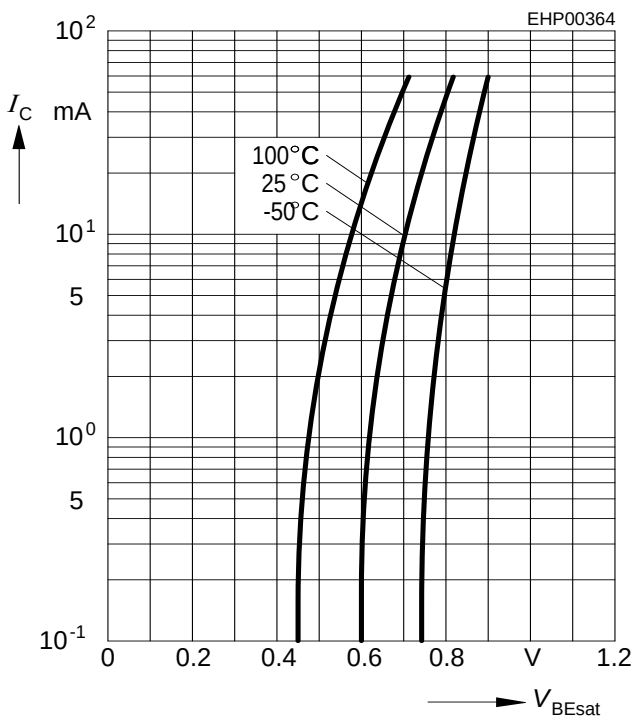
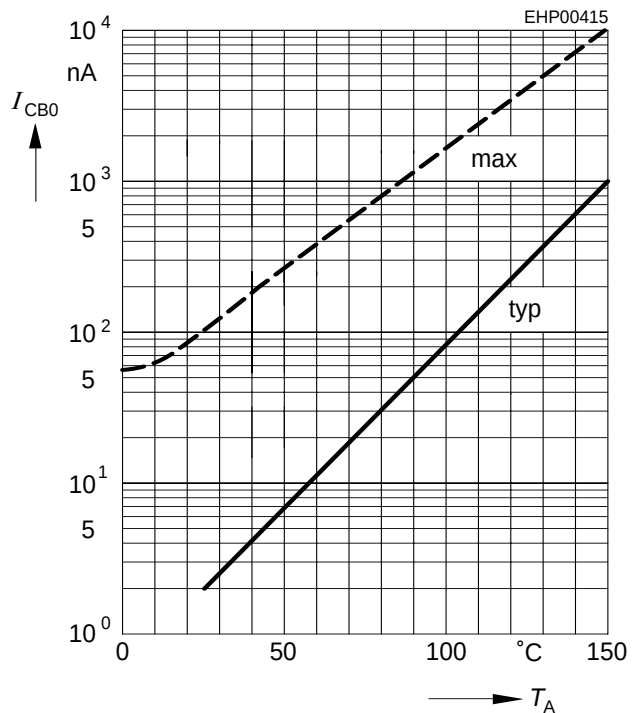
**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

| 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:  $t < 300\mu\text{s}$ ;  $D < 2\%$

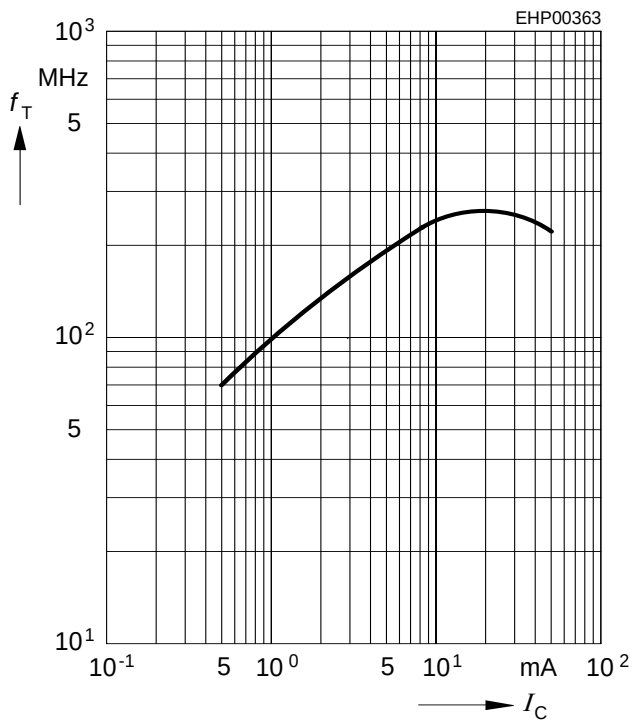
**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

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


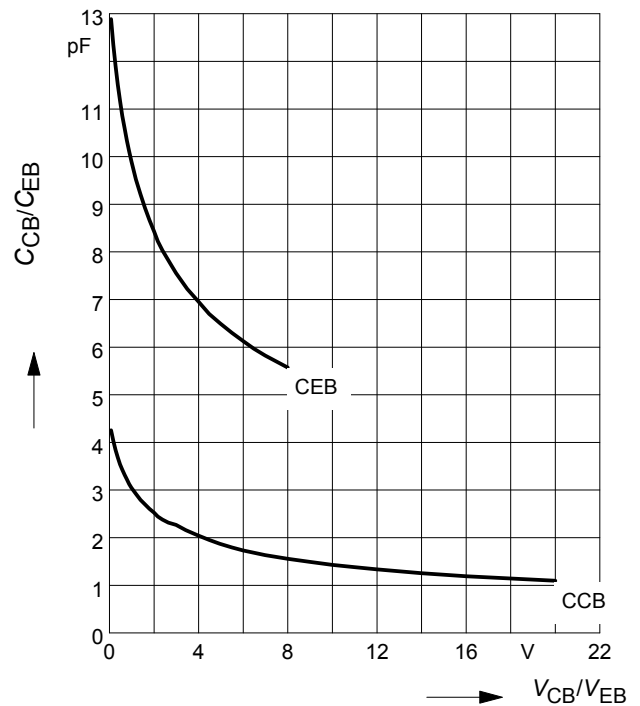
Transition frequency  $f_T = f(I_C)$

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



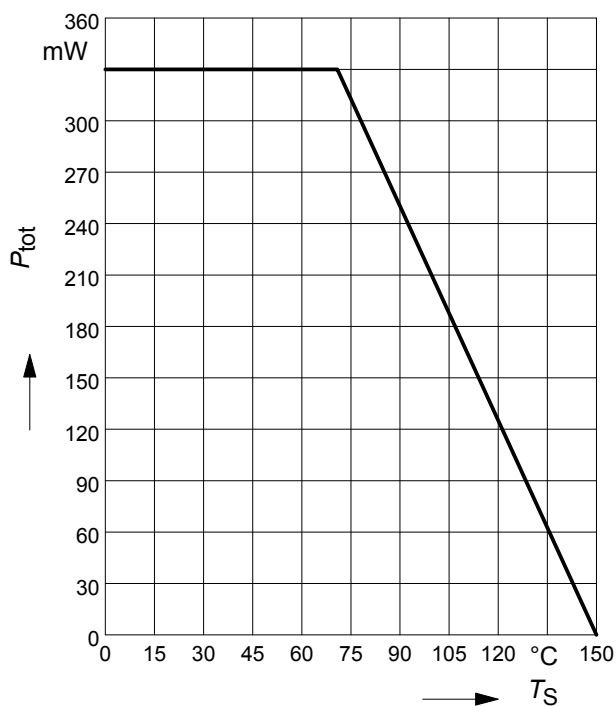
Collector-base capacitance  $C_{cb} = f(V_{CB})$

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



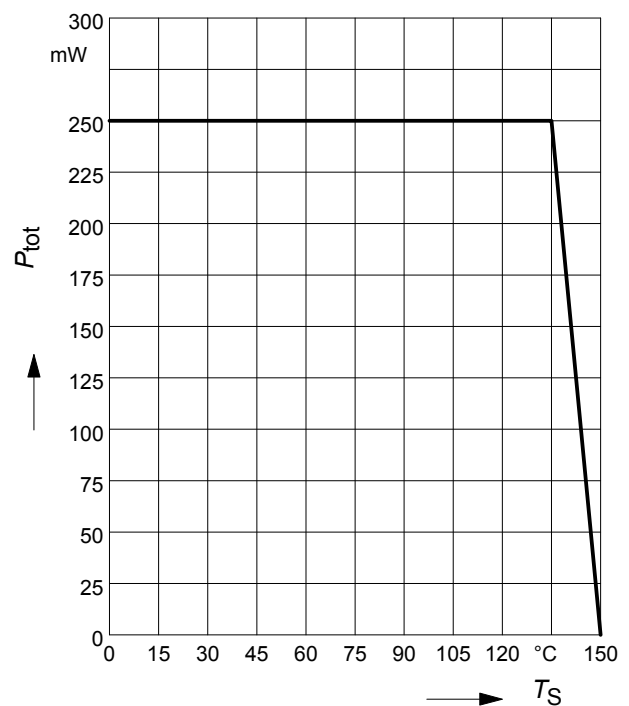
Total power dissipation  $P_{tot} = f(T_S)$

BC847-BC850



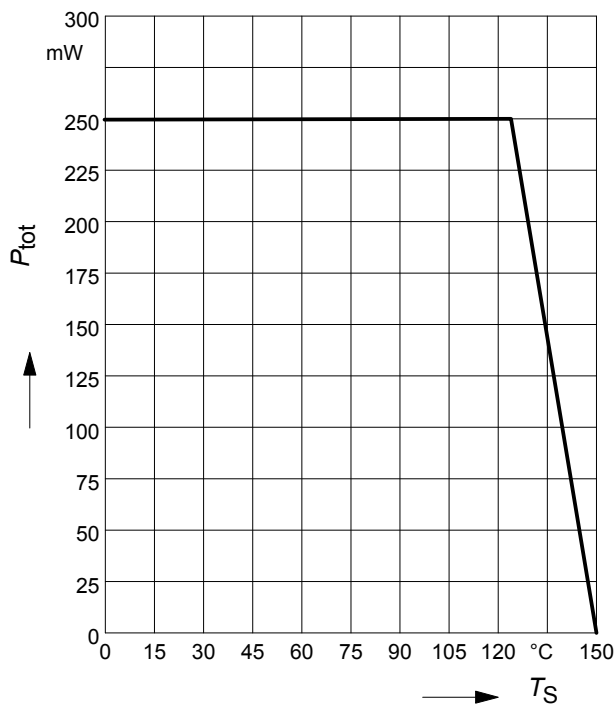
Total power dissipation  $P_{tot} = f(T_S)$

BC847BL3/BC848BL3



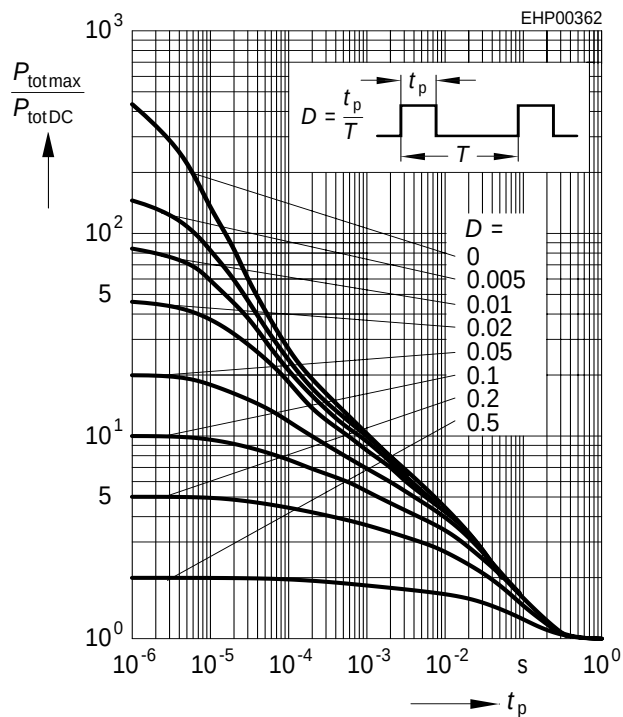
**Total power dissipation  $P_{\text{tot}} = f(T_S)$** 

BC847W-BC850W

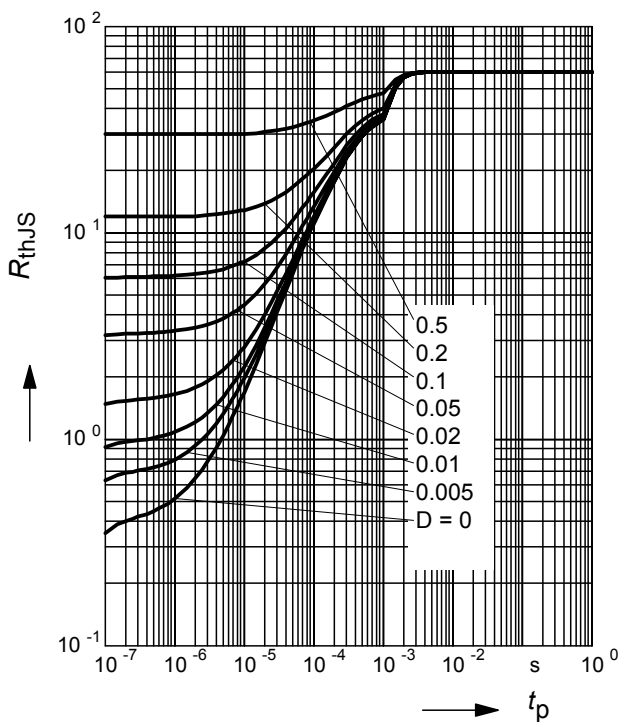

**Permissible Pulse Load**

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

BC847/W-BC850/W

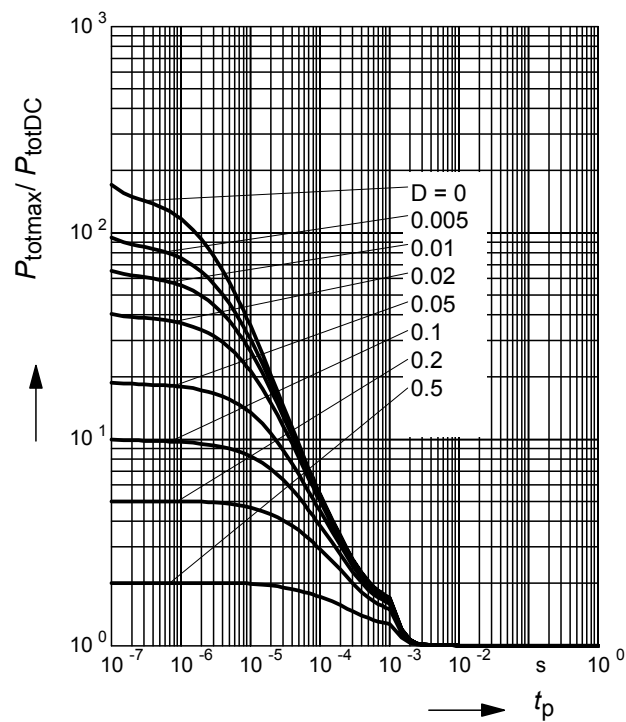

**Permissible Puls Load  $R_{\text{thJS}} = f(t_p)$** 

BC847BL3, BC848BL3


**Permissible Pulse Load**

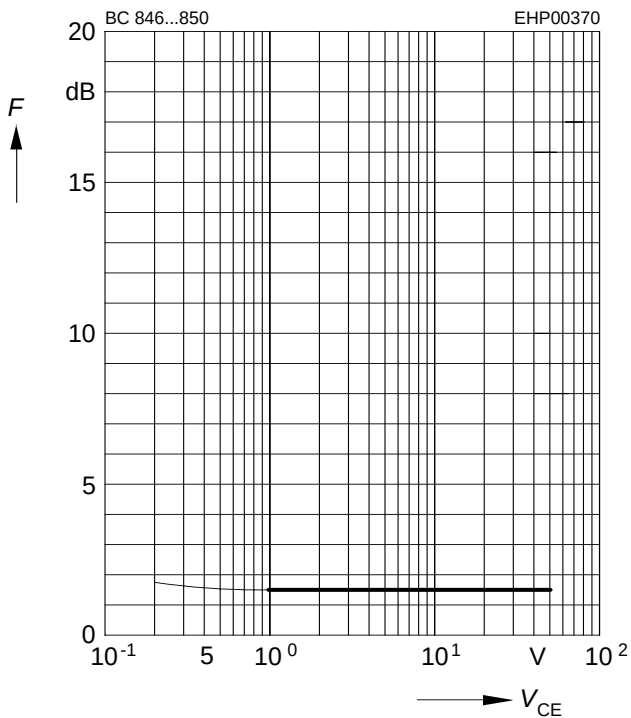
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

BC847BL3, BC848BL3



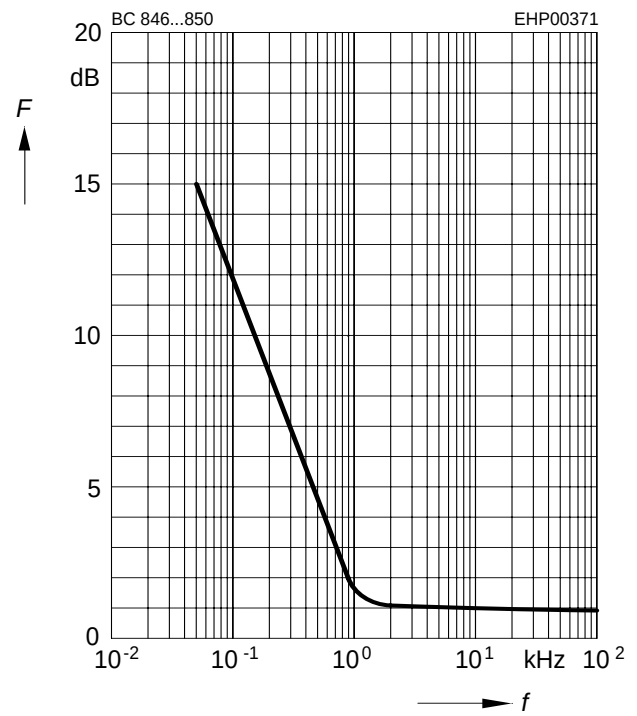
Noise figure  $F = f(V_{CE})$

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



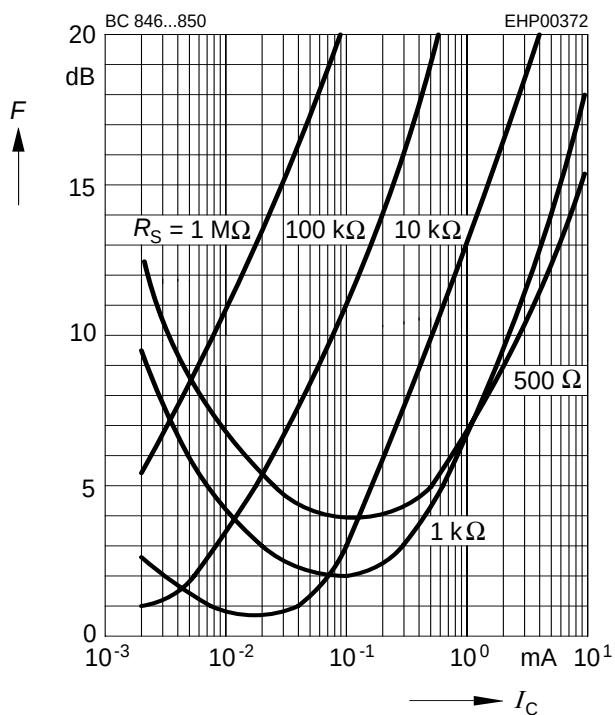
Noise figure  $F = f(f)$

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



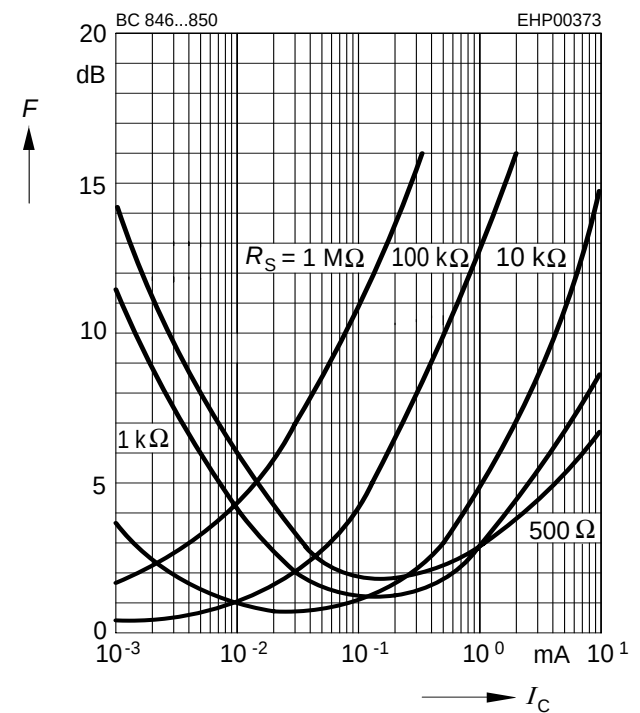
Noise figure  $F = f(I_C)$

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



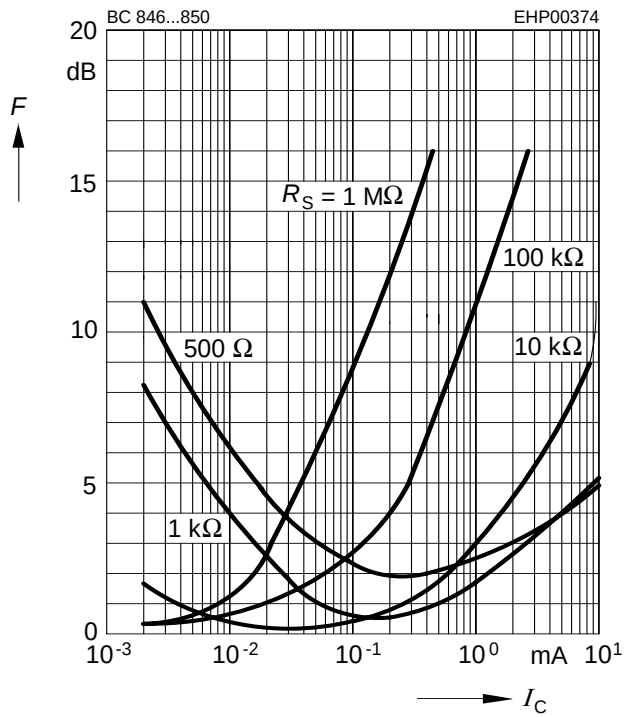
Noise figure  $F = f(I_C)$

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

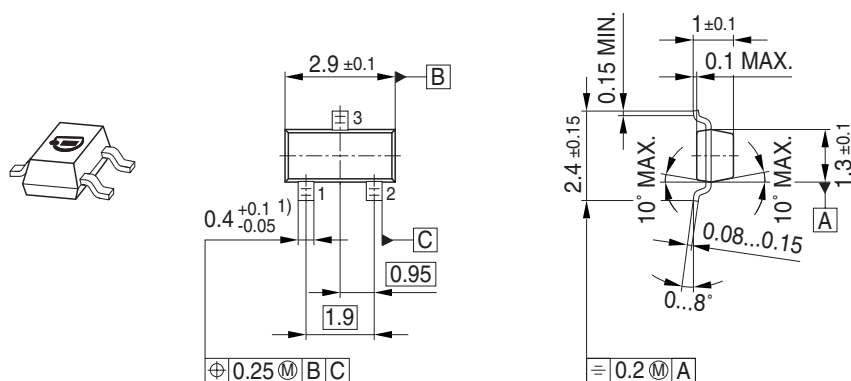


Noise figure  $F = f(I_C)$

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

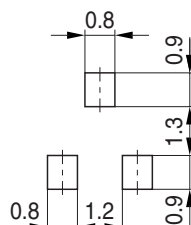


## Package Outline

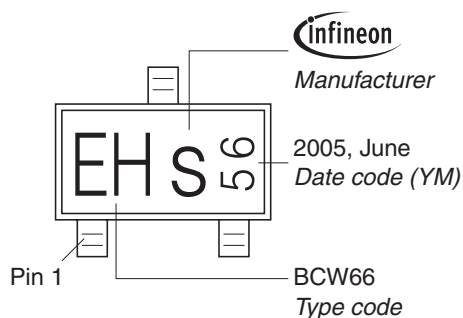


1) Lead width can be 0.6 max. in dambar area

## Foot Print

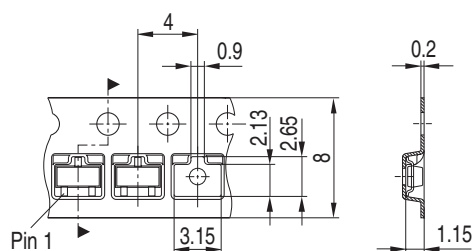


## Marking Layout (Example)

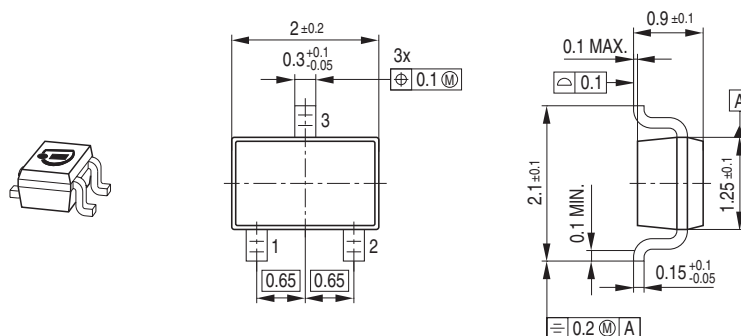


## Standard Packing

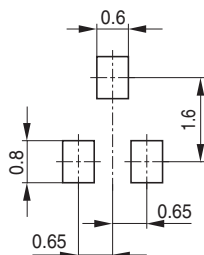
Reel ø180 mm = 3.000 Pieces/Reel  
Reel ø330 mm = 10.000 Pieces/Reel



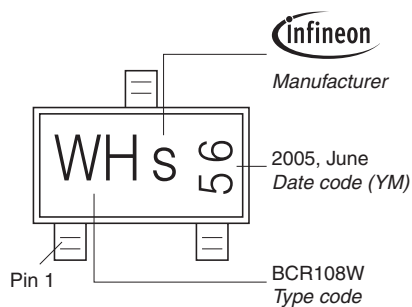
## Package Outline



## Foot Print

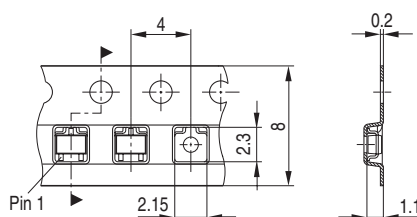


## Marking Layout (Example)

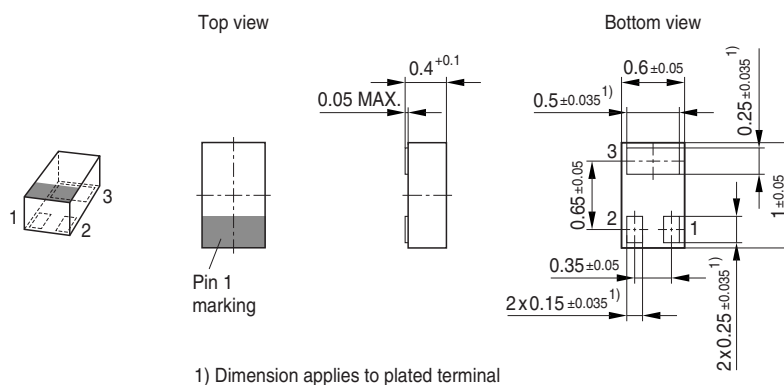


## Standard Packing

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

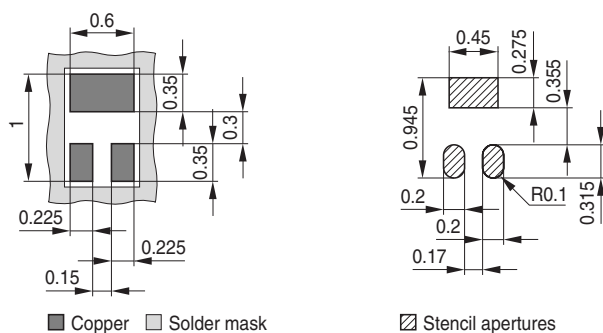


## Package Outline

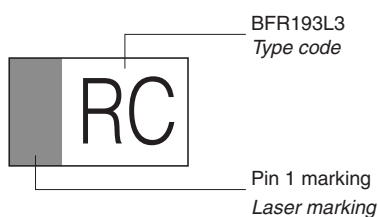


## Foot Print

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

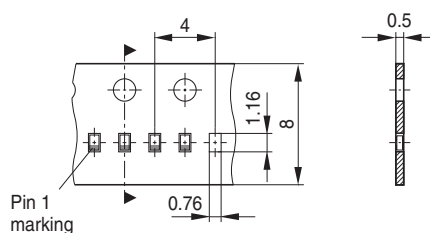


## Marking Layout (Example)



## Standard Packing

Reel  $\varnothing$ 180 mm = 15.000 Pieces/Reel



**Edition 2009-11-16**

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

**© 2009 Infineon Technologies AG  
All Rights Reserved.**

### **Legal Disclaimer**

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

### **Information**

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([<www.infineon.com>](http://www.infineon.com)).

### **Warnings**

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.