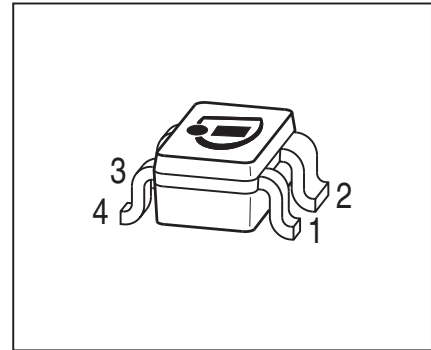


**NPN Silicon RF Transistor**

- For low current applications
- For oscillators up to 12 GHz
- Noise figure  $F = 1.25$  dB at 1.8 GHz  
outstanding  $G_{ms} = 23$  dB at 1.8 GHz
- SIEGET<sup>®</sup> 25 GHz ft - Line



- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



**ESD (Electrostatic discharge) sensitive device, observe handling precaution!**

| Type   | Marking | Pin Configuration |     |     |     |   |   | Package |
|--------|---------|-------------------|-----|-----|-----|---|---|---------|
| BFP405 | ALs     | 1=B               | 2=E | 3=C | 4=E | - | - | SOT343  |

**Maximum Ratings**

| Parameter                             | Symbol    | Value       | Unit |
|---------------------------------------|-----------|-------------|------|
| Collector-emitter voltage             | $V_{CEO}$ |             | V    |
| $T_A > 0$ °C                          |           | 4.5         |      |
| $T_A \leq 0$ °C                       |           | 4.1         |      |
| Collector-emitter voltage             | $V_{CES}$ | 15          |      |
| Collector-base voltage                | $V_{CBO}$ | 15          |      |
| Emitter-base voltage                  | $V_{EBO}$ | 1.5         |      |
| Collector current                     | $I_C$     | 25          | mA   |
| Base current                          | $I_B$     | 1           |      |
| Total power dissipation <sup>1)</sup> | $P_{tot}$ | 75          | mW   |
| $T_S \leq 108$ °C                     |           |             |      |
| Junction temperature                  | $T_j$     | 150         | °C   |
| Ambient temperature                   | $T_A$     | -65 ... 150 |      |
| Storage temperature                   | $T_{stg}$ | -65 ... 150 |      |

<sup>1)</sup>  $T_S$  is measured on the collector lead at the soldering point to the pcb

**Thermal Resistance**

| Parameter                                | Symbol     | Value      | Unit |
|--|------------|------------|------|
| Junction - soldering point <sup>1)</sup> | $R_{thJS}$ | $\leq 555$ | K/W  |

**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>$I_C = 1 \text{ mA}, I_B = 0$           | $V_{(BR)CEO}$ | 4.5 | 5  | -   | V             |
| Collector-emitter cutoff current<br>$V_{CE} = 15 \text{ V}, V_{BE} = 0$        | $I_{CES}$     | -   | -  | 10  | $\mu\text{A}$ |
| Collector-base cutoff current<br>$V_{CB} = 5 \text{ V}, I_E = 0$               | $I_{CBO}$     | -   | -  | 100 | nA            |
| Emitter-base cutoff current<br>$V_{EB} = 0.5 \text{ V}, I_C = 0$               | $I_{EBO}$     | -   | -  | 1   | $\mu\text{A}$ |
| DC current gain<br>$I_C = 5 \text{ mA}, V_{CE} = 4 \text{ V}$ , pulse measured | $h_{FE}$      | 60  | 95 | 130 | -             |

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

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

| Parameter   | Symbol       | Values |      |      | Unit |
|---|--------------|--------|------|------|------|
|   |              | min.   | typ. | max. |      |
| <b>AC Characteristics (verified by random sampling)</b>   |              |        |      |      |      |
| Transition frequency<br>$I_C = 10\text{ mA}$ , $V_{CE} = 3\text{ V}$ , $f = 2\text{ GHz}$   | $f_T$        | 18     | 25   | -    | GHz  |
| Collector-base capacitance<br>$V_{CB} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>emitter grounded   | $C_{cb}$     | -      | 0.05 | 0.1  | pF   |
| Collector emitter capacitance<br>$V_{CE} = 2\text{ V}$ , $f = 1\text{ MHz}$ , $V_{BE} = 0$ ,<br>base grounded   | $C_{ce}$     | -      | 0.24 | -    |      |
| Emitter-base capacitance<br>$V_{EB} = 0.5\text{ V}$ , $f = 1\text{ MHz}$ , $V_{CB} = 0$ ,<br>collector grounded   | $C_{eb}$     | -      | 0.29 | -    |      |
| Noise figure<br>$I_C = 2\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $f = 1.8\text{ GHz}$ , $Z_S = Z_{Sopt}$   | $F$          | -      | 1.25 | -    | dB   |
| Power gain, maximum stable <sup>1)</sup><br>$I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_{Sopt}$ ,<br>$Z_L = Z_{Lopt}$ , $f = 1.8\text{ GHz}$ | $G_{ms}$     | -      | 23   | -    | dB   |
| Insertion power gain<br>$V_{CE} = 2\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 1.8\text{ GHz}$ ,<br>$Z_S = Z_L = 50\ \Omega$                                | $ S_{21} ^2$ | 14     | 18.5 | -    |      |
| Third order intercept point at output <sup>2)</sup><br>$V_{CE} = 2\text{ V}$ , $I_C = 5\text{ mA}$ , $f = 1.8\text{ GHz}$ ,<br>$Z_S = Z_L = 50\ \Omega$ | $IP_3$       | -      | 15   | -    | dBm  |
| 1dB Compression point at output<br>$I_C = 5\text{ mA}$ , $V_{CE} = 2\text{ V}$ , $Z_S = Z_L = 50\ \Omega$ ,<br>$f = 1.8\text{ GHz}$                     | $P_{-1dB}$   | -      | 5    | -    |      |

$$^1G_{ms} = |S_{21} / S_{12}|$$

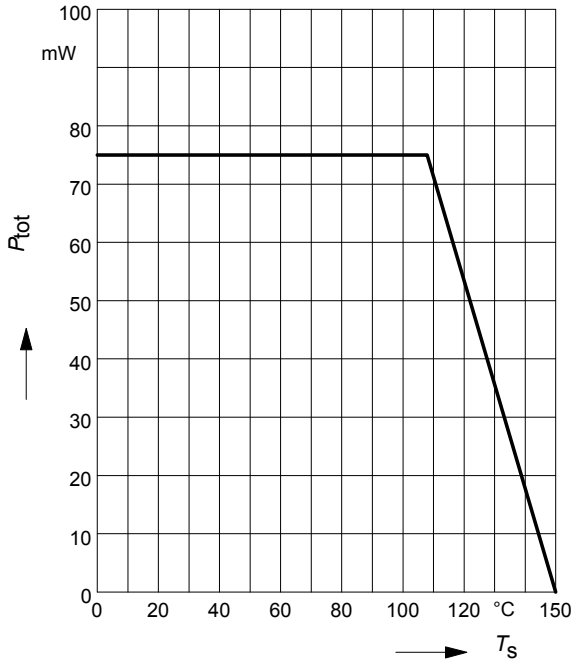
<sup>2</sup> $IP_3$  value depends on termination of all intermodulation frequency components.  
Termination used for this measurement is  $50\ \Omega$  from 0.1 MHz to 6 GHz

**Simulation Data**

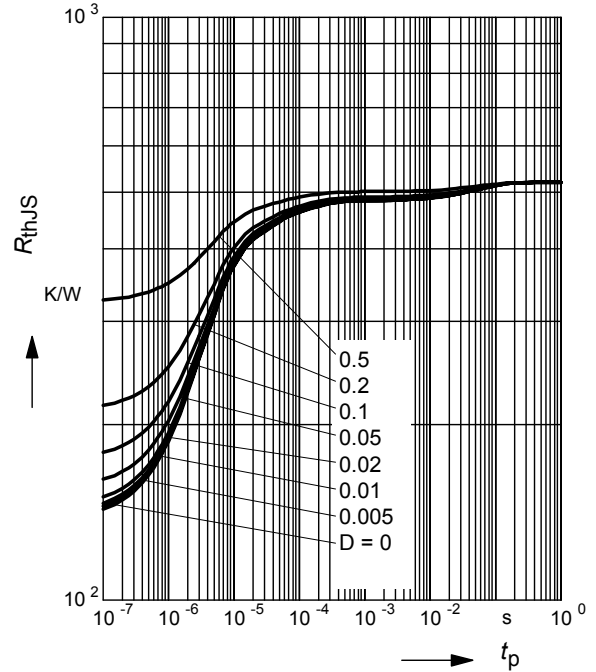
For SPICE-model as well as for S-parameters including noise parameters refer to our internet website: [www.infineon.com/rf.models](http://www.infineon.com/rf.models). Please consult our website and download the latest version before actually starting your design.

The simulation data have been generated and verified up to 12GHz using typical devices. The BFP405 nonlinear SPICE-model reflects the typical DC- and RF-device performance with high accuracy.

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

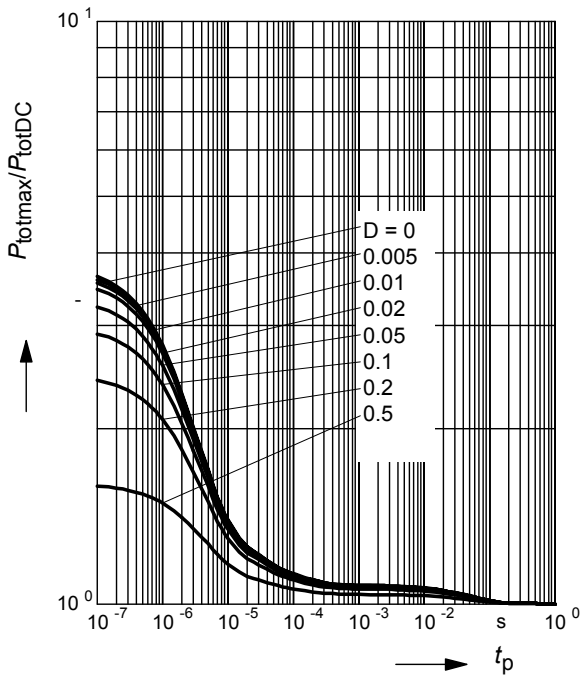


**Permissible Pulse Load  $R_{thJS} = f(t_p)$**



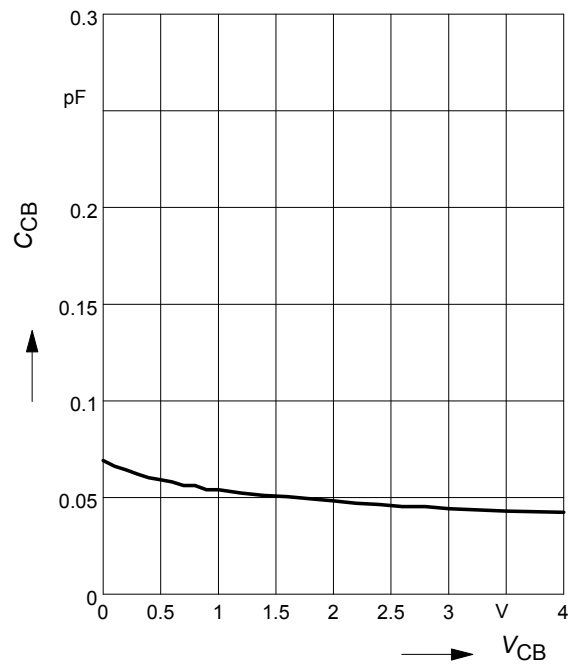
**Permissible Pulse Load**

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



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

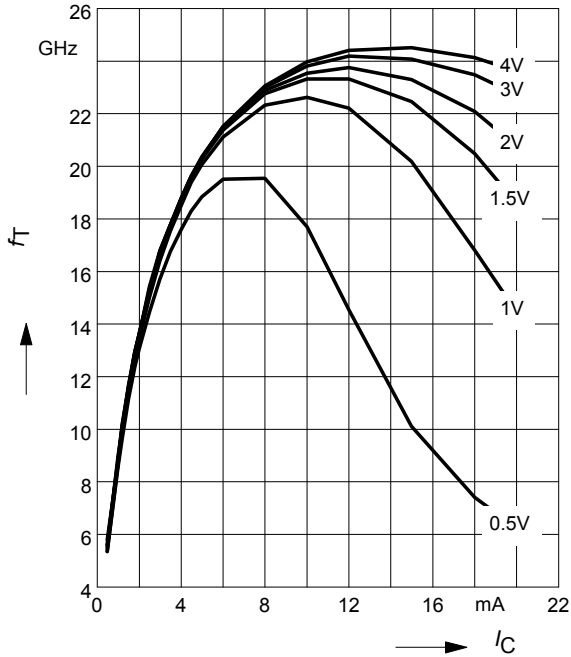
$f = 1\text{MHz}$



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

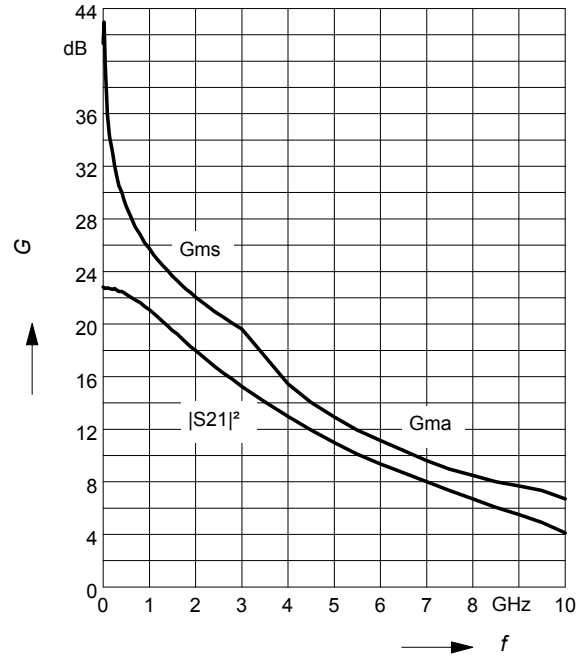
$f = 2 \text{ GHz}$

$V_{CE} = \text{parameter in V}$



**Power gain  $G_{ma}, G_{ms}, |S_{21}|^2 = f(f)$**

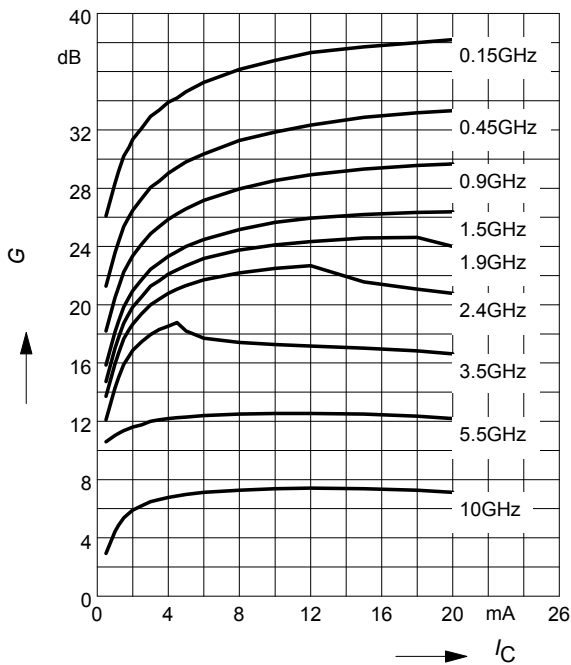
$V_{CE} = 3 \text{ V}, I_C = 5 \text{ mA}$



**Power gain  $G_{ma}, G_{ms} = f(I_C)$**

$V_{CE} = 3 \text{ V}$

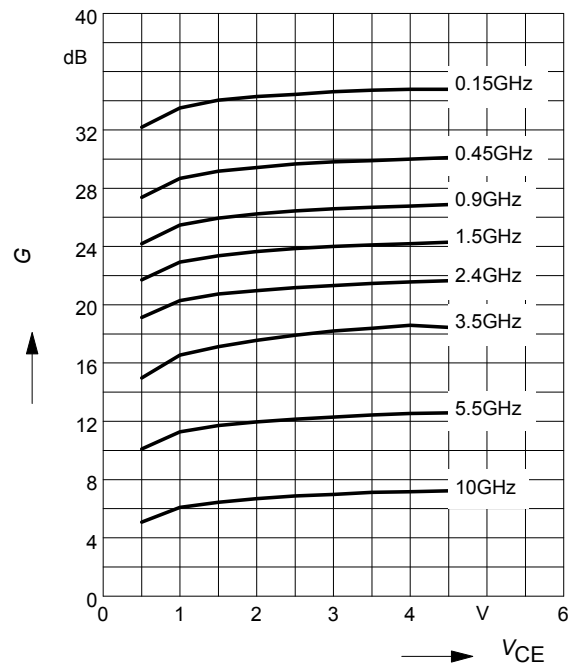
$f = \text{parameter in GHz}$



**Power gain  $G_{ma}, G_{ms} = f(V_{CE})$**

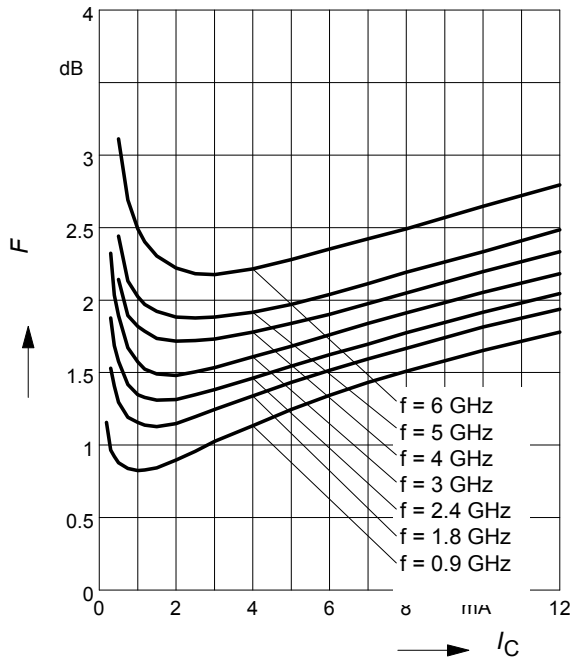
$I_C = 5 \text{ mA}$

$f = \text{parameter in GHz}$



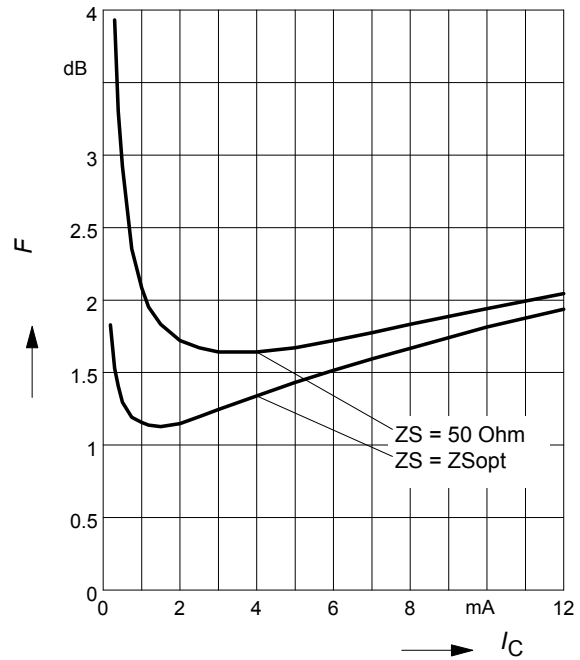
Noise figure  $F = f(I_C)$

$V_{CE} = 2\text{ V}$ ,  $Z_S = Z_{Sopt}$



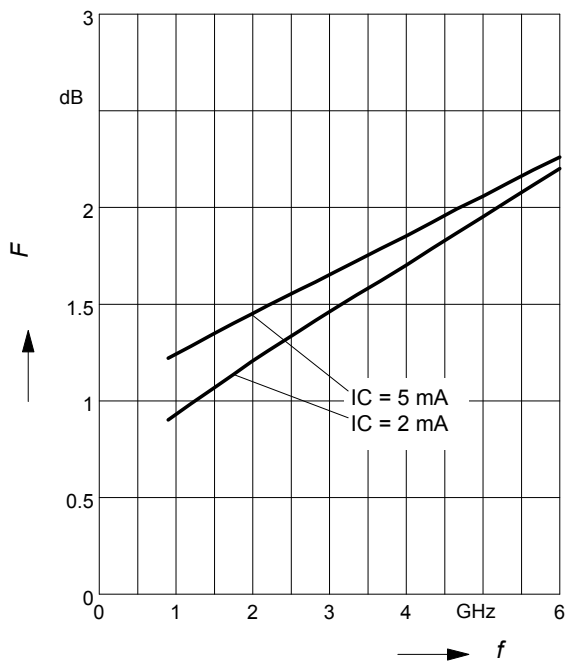
Noise figure  $F = f(I_C)$

$V_{CE} = 2\text{ V}$ ,  $f = 1.8\text{ GHz}$



Noise figure  $F = f(f)$

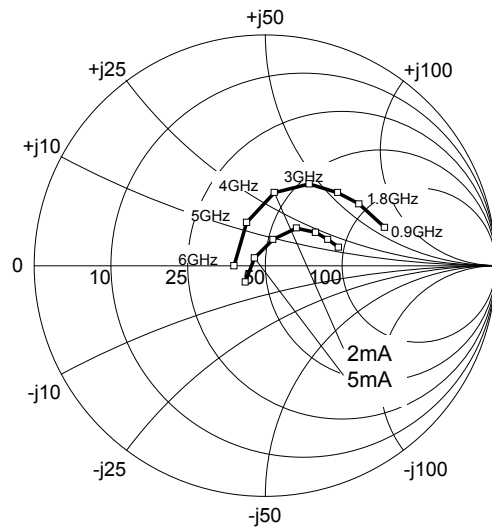
$V_{CE} = 1\text{ V}$ ,  $Z_S = Z_{Sopt}$



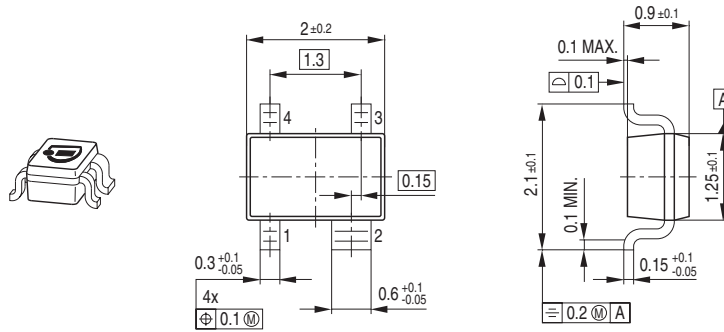
Source impedance for min.

noise figure vs. frequency

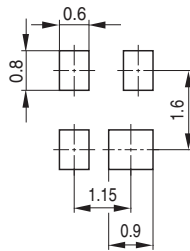
$V_{CE} = 3\text{ V}$ ,  $I_C = 2\text{ mA} / 5\text{ mA}$



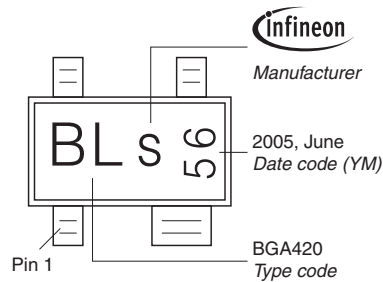
Package Outline



Foot Print

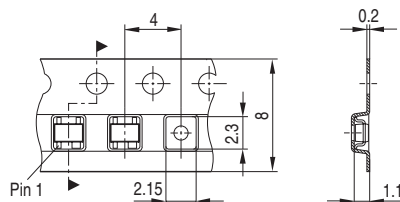


Marking Layout (Example)



Standard Packing

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





**Edition 2009-11-05**  
**Published by Infineon Technologies AG,**  
**85579 Neubiberg, Germany**  
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