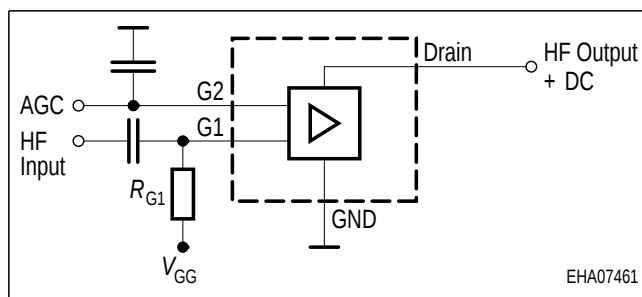
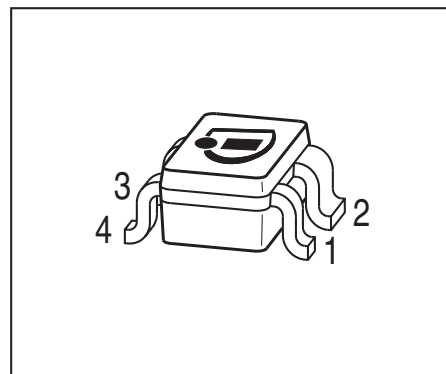


## Silicon N-Channel MOSFET Tetrode

- Low noise gain controlled input stages of UHF- and VHF - tuners with 3 V up to 5 V supply voltage
- Integrated gate protection diodes
- Excellent noise figure
- High gain, high forward transadmittance
- Improved cross modulation at gain reduction
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



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

| Type    | Package | Pin Configuration |       |        |        |   |   | Marking |
|---------|---------|-------------------|-------|--------|--------|---|---|---------|
| BF5020  | SOT143  | 1 = S             | 2 = D | 3 = G2 | 4 = G1 | - | - | KYs     |
| BF5020R | SOT143R | 1 = D             | 2 = S | 3 = G1 | 4 = G2 | - | - | KYs     |
| BF5020W | SOT343  | 1 = D             | 2 = S | 3 = G1 | 4 = G2 | - | - | KYs     |

## Maximum Ratings

| Parameter                                     | Symbol             | Value       | Unit             |
|-----------------------------------------------|--------------------|-------------|------------------|
| Drain-source voltage                          | $V_{DS}$           | 8           | V                |
| Continuous drain current                      | $I_D$              | 25          | mA               |
| Gate 1/ gate 2-source current                 | $I_{G1S}, I_{G2S}$ | $\pm 10$    | mA               |
| Gate 1/ gate 2-source voltage                 | $V_{G1S}, V_{G2S}$ | $\pm 6$     | V                |
| Total power dissipation                       | $P_{tot}$          |             | mW               |
| $T_s \leq 76^\circ\text{C}$ , BF5020, BF5020R |                    | 200         |                  |
| $T_s \leq 94^\circ\text{C}$ , BF5020W         |                    | 200         |                  |
| Storage temperature                           | $T_{stg}$          | -55 ... 150 | $^\circ\text{C}$ |
| Channel temperature                           | $T_{ch}$           | 150         |                  |

**Thermal Resistance**

| Parameter                                                             | Symbol      | Value                    | Unit |
|-----------------------------------------------------------------------|-------------|--------------------------|------|
| Channel - soldering point <sup>1)</sup><br>BF5020, BF5020R<br>BF5020W | $R_{thchs}$ | $\leq 370$<br>$\leq 280$ | K/W  |

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

| Parameter                                                                                                        | Symbol          | Values |      |      | Unit |
|------------------------------------------------------------------------------------------------------------------|-----------------|--------|------|------|------|
|                                                                                                                  |                 | min.   | typ. | max. |      |
| DC Characteristics                                                                                               |                 |        |      |      |      |
| Drain-source breakdown voltage<br>$I_D = 20\text{ }\mu\text{A}$ , $V_{G1S} = 0$ , $V_{G2S} = 0$                  | $V_{(BR)DS}$    | 12     | -    | -    | V    |
| Gate1-source breakdown voltage<br>$+I_{G1S} = 10\text{ mA}$ , $V_{G2S} = 0$ , $V_{DS} = 0$                       | $+V_{(BR)G1SS}$ | 6      | -    | 15   |      |
| Gate2-source breakdown voltage<br>$+I_{G2S} = 10\text{ mA}$ , $V_{G1S} = 0$ , $V_{DS} = 0$                       | $+V_{(BR)G2SS}$ | 6      | -    | 15   |      |
| Gate1-source leakage current<br>$V_{G1S} = 6\text{ V}$ , $V_{G2S} = 0$ , $V_{DS} = 0$                            | $+I_{G1SS}$     | -      | -    | 50   |      |
| Gate2-source leakage current<br>$V_{G2S} = 6\text{ V}$ , $V_{G1S} = 0$ , $V_{DS} = 0$                            | $+I_{G2SS}$     | -      | -    | 50   |      |
| Drain current<br>$V_{DS} = 5\text{ V}$ , $V_{G1S} = 0$ , $V_{G2S} = 4\text{ V}$                                  | $I_{DSS}$       | -      | -    | 100  |      |
| Drain-source current<br>$V_{DS} = 5\text{ V}$ , $V_{G2S} = 4\text{ V}$ , $R_{G1} = 120\text{ k}\Omega$           | $I_{DSX}$       | -      | 14   | -    |      |
| Gate1-source pinch-off voltage<br>$V_{DS} = 5\text{ V}$ , $V_{G2S} = 4\text{ V}$ , $I_D = 20\text{ }\mu\text{A}$ | $V_{G1S(p)}$    | -      | 0.7  | -    | V    |
| Gate2-source pinch-off voltage<br>$V_{DS} = 5\text{ V}$ , $I_D = 20\text{ }\mu\text{A}$ , $V_{G1S} = 2\text{ V}$ | $V_{G2S(p)}$    | -      | 0.7  | -    |      |

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

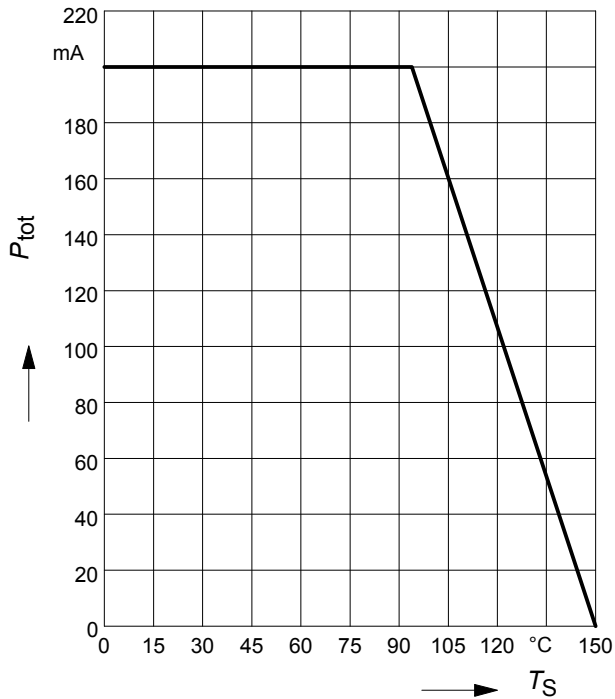
**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

| Parameter                                                                                                                                                                                                         | Symbol       | Values |      |      | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|------|------|------|
|                                                                                                                                                                                                                   |              | min.   | typ. | max. |      |
| AC Characteristics - (verified by random sampling)                                                                                                                                                                |              |        |      |      |      |
| Forward transconductance<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$                                                                                                                 | $g_{fs}$     | -      | 34   | -    | mS   |
| Gate1 input capacitance<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$                                                                                                                  | $C_{g1ss}$   | -      | 2.4  | -    | pF   |
| Output capacitance<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$                                                                                                                       | $C_{dss}$    | -      | 1    | -    |      |
| Power gain<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ ,<br>$f = 800\text{ MHz}$<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ ,<br>$f = 45\text{ MHz}$   | $G_p$        | -      | 26   | -    | dB   |
|                                                                                                                                                                                                                   |              | -      | 32   | -    |      |
| Noise figure<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ ,<br>$f = 800\text{ MHz}$<br>$V_{DS} = 5\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ ,<br>$f = 45\text{ MHz}$ | $F$          | -      | 1.2  | -    | dB   |
|                                                                                                                                                                                                                   |              | -      | 0.8  | -    |      |
| Gain control range<br>$V_{DS} = 5\text{ V}$ , $V_{G2S} = 4...0\text{ V}$                                                                                                                                          | $\Delta G_p$ | -      | 45   | -    |      |
| Cross-modulation <sup>1)</sup> , $V_{DS} = 5\text{ V}$ , $R_{G1} = 120\text{ k}\Omega$<br>AGC = 0<br>AGC = 10 dB<br>AGC = 40 dB                                                                                   | $X_{mod}$    | -      | 98   | -    | dBμV |
|                                                                                                                                                                                                                   |              | -      | 96   | -    |      |
|                                                                                                                                                                                                                   |              | -      | 106  | -    |      |

<sup>1</sup>Input level for  $k = 1\%$ ;  $f_w = 50\text{ MHz}$ ,  $f_{unw} = 60\text{ MHz}$

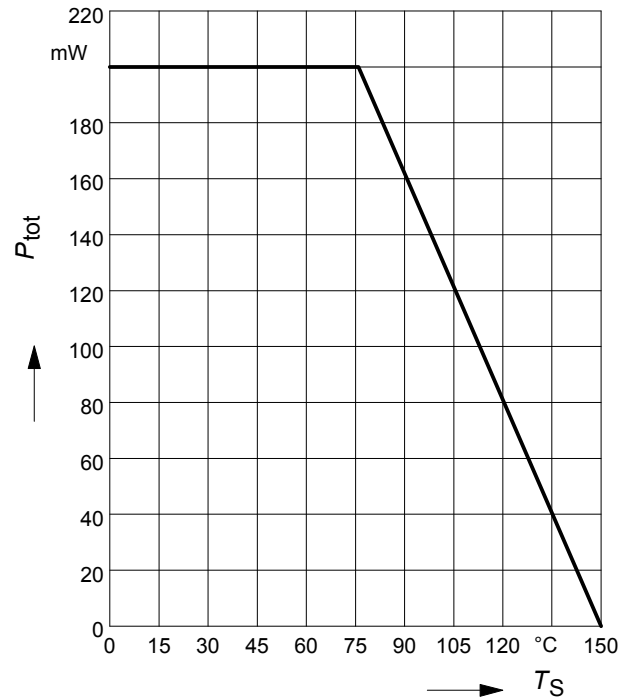
**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

BF5020W

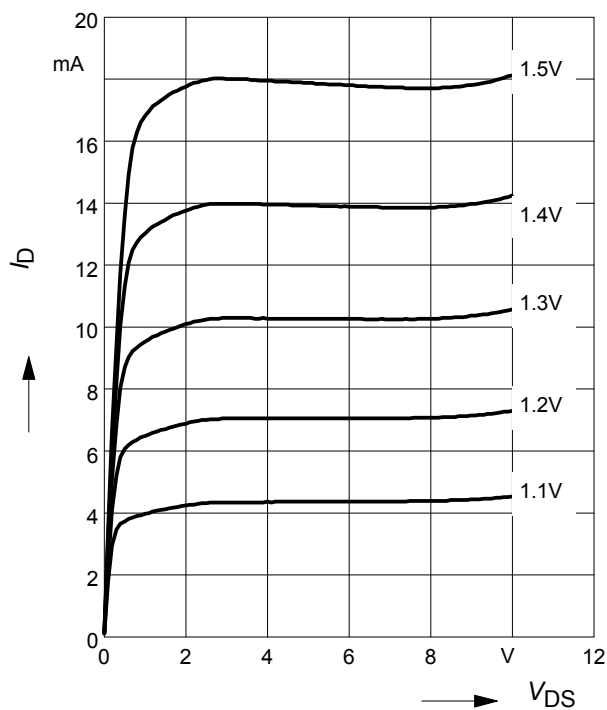


**Total power dissipation  $P_{\text{tot}} = f(T_S)$**

BF5020, BF5020R



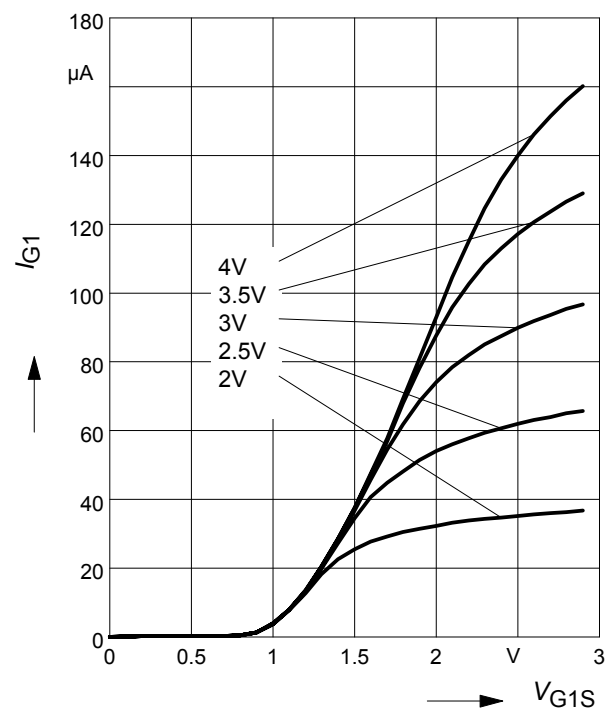
**Output characteristics  $I_D = f(V_{\text{DS}})$**



**Gate 1 current  $I_{\text{G1}} = f(V_{\text{G1S}})$**

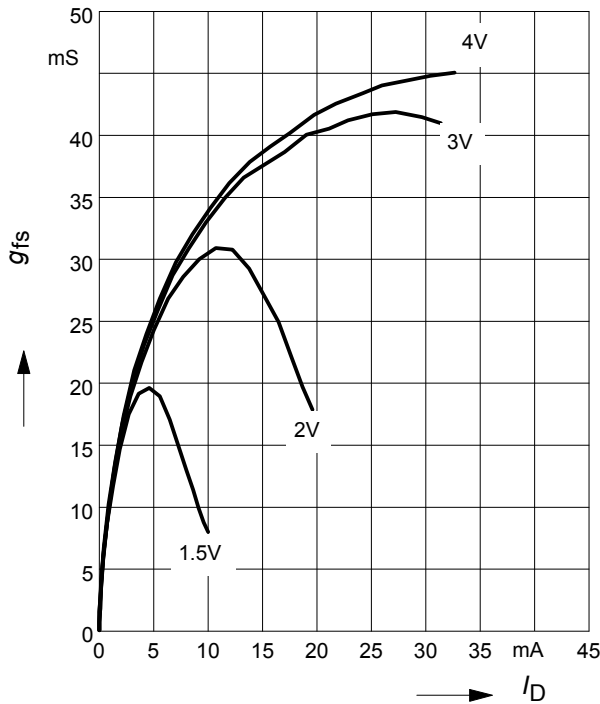
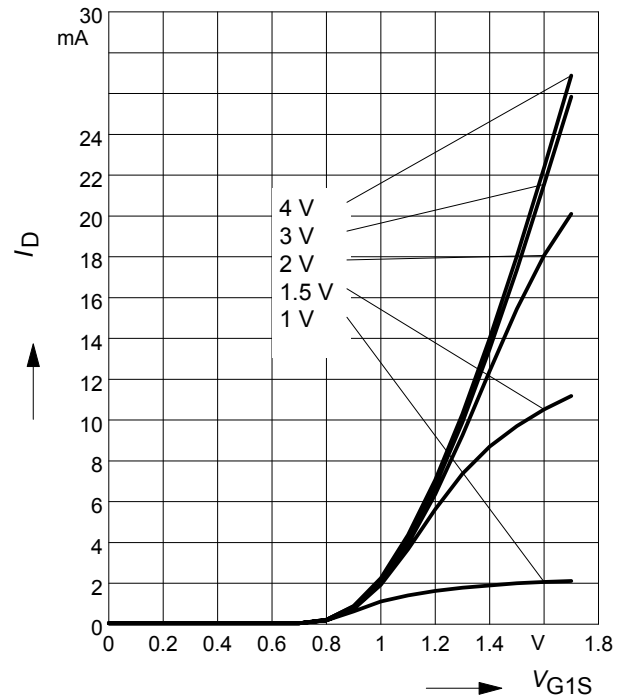
$V_{\text{DS}} = 5\text{V}$

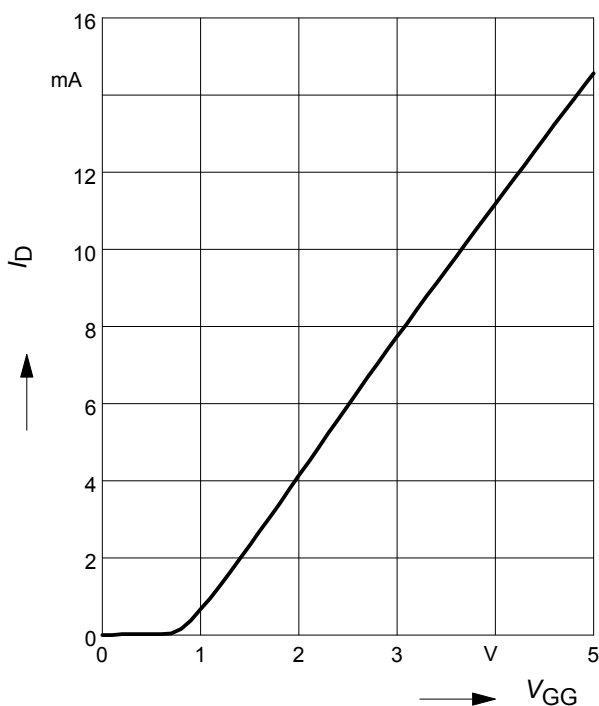
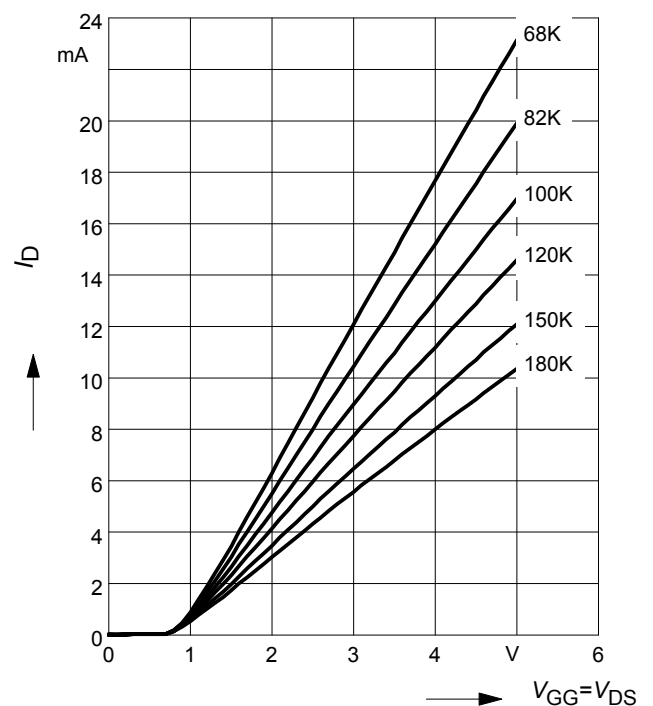
$V_{\text{G2S}} = \text{Parameter}$



**Gate 1 forward transconductance**

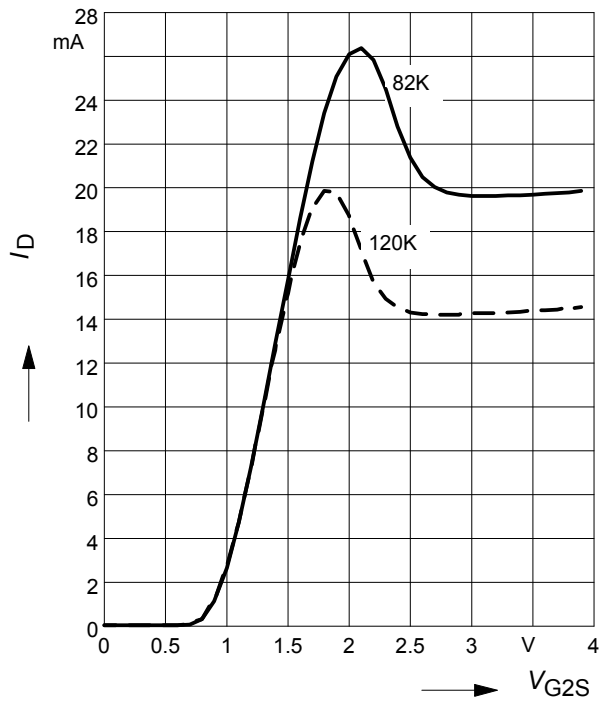
$$g_{fs} = f(I_D)$$

 $V_{DS} = 5V, V_{G2S} = \text{Parameter}$ 

**Drain current  $I_D = f(V_{G1S})$** 
 $V_{DS} = 5V$ 
 $V_{G2S} = \text{Parameter}$ 

**Drain current  $I_D = f(V_{GG})$** 
 $V_{DS} = 5V, V_{G2S} = 4V, R_{G1} = 120\text{ k}\Omega$ 

 (connected to  $V_{GG}$ ,  $V_{GG} = \text{gate1 supply voltage}$ )

**Drain current  $I_D = f(V_{GG})$** 
 $V_{G2S} = 4V$ 
 $R_{G1} = \text{Parameter in k}\Omega$ 


**Drain current  $I_D = f(V_{G2S})$**

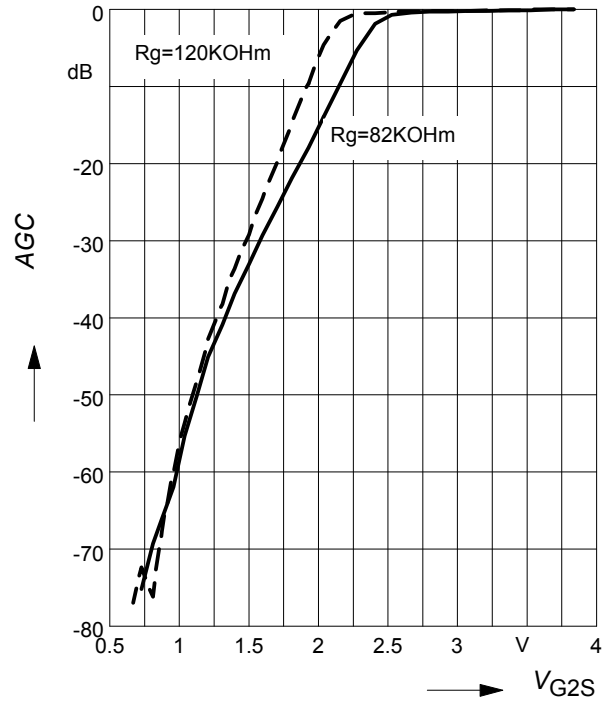
$V_{DS} = 5 \text{ V}$ ,  $R_{G1} = \text{Parameter in k}\Omega$



**AGC characteristic  $AGC = f(V_{G2S})$**

$f = 50 \text{ MHz}$

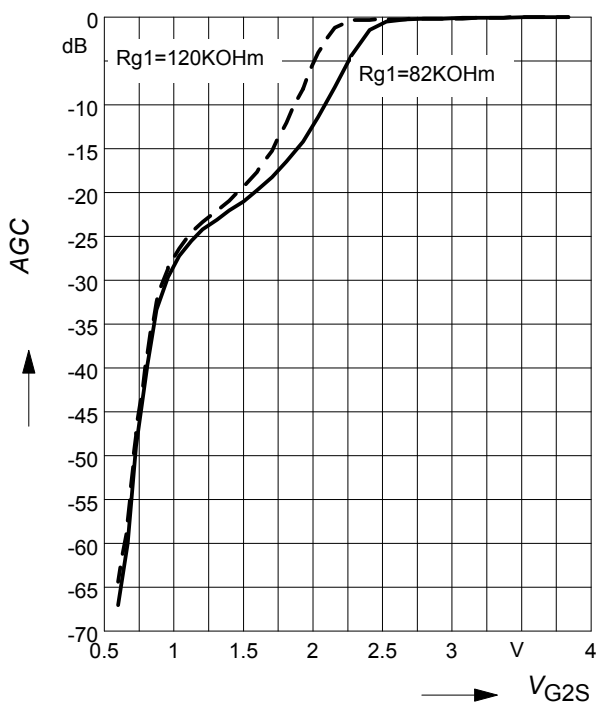
measured in test circuit, see page 7



**AGC characteristic  $AGC = f(V_{G2S})$**

$f = 800 \text{ MHz}$

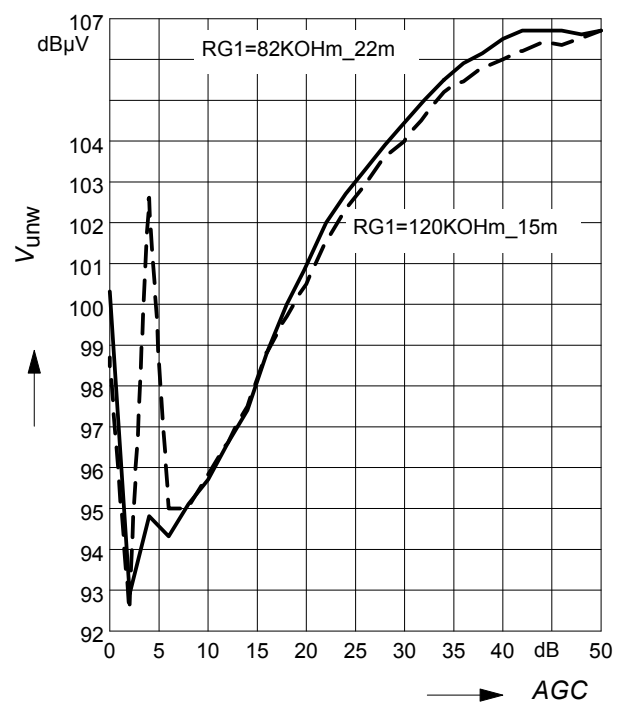
measured in test circuit, see page 7



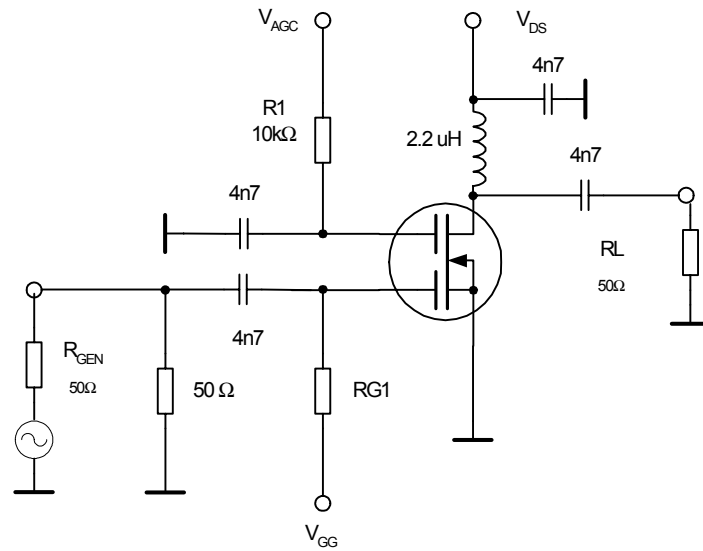
**Crossmodulation  $V_{unw} = (AGC)$**

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

measured in test circuit, see page 7



# Test circuit for Crossmodulation / AGC



Semibiased

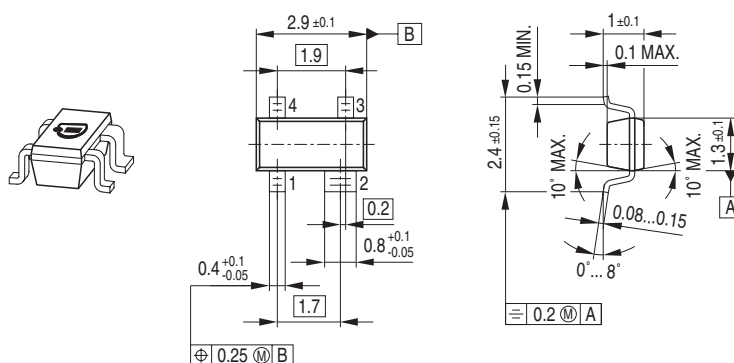
Technical drawing of a 4-pin connector. The drawing includes a perspective view of the component and two detailed cross-sectional views. The perspective view shows a rectangular body with four pins. The left cross-section shows the pin profile with dimensions: total width  $2.9 \pm 0.1$ , pin width  $1.9$ , pin diameter  $0.2$ , and pin height  $0.8^{+0.1}_{-0.05}$ . The right cross-section shows the internal structure with dimensions: total width  $1 \pm 0.1$ , internal width  $0.1$  MAX., pin diameter  $0.2 \text{ M A}$ , and pin height  $1.3 \pm 0.1$ . The drawing also includes callouts for material and finish:  $\oplus 0.25 \text{ M B}$  and  $\oplus 0.2 \text{ M A}$ .

Figure 1: Marking of the BFP181 package

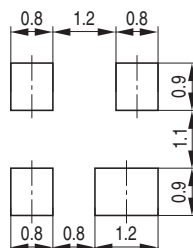
The diagram shows a top-down view of a square package with four pins. The marking area is a rectangle containing 'RF' and 'S' on the left, and '56' on the right. Callouts identify: 'infineon' as the Manufacturer, '2005, June' as the Date code (YM), 'Pin 1' as the bottom-left pin, and 'BFP181' as the Type code.

Technical drawing of a mechanical part, likely a bracket or support. The drawing shows a top view and a side view. The top view dimensions are: overall width 4, overall height 8, a central rectangular feature with a width of 3.15 and a height of 2.6, and a distance of 0.2 from the right edge to the center of the central feature. The side view shows a thickness of 1.15. A label 'Pin 1' points to a feature on the left side of the top view.

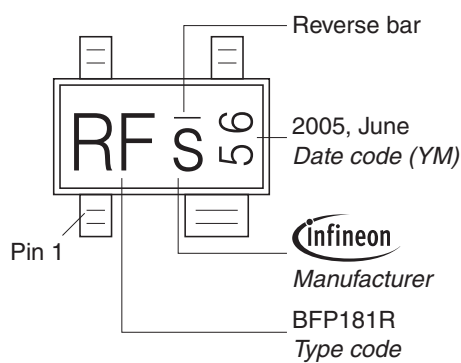
## Package Outline



## Foot Print

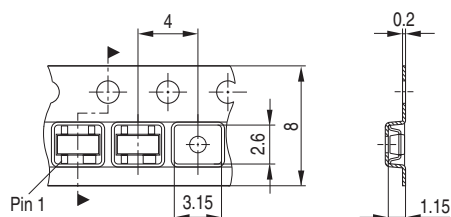


## Marking Layout (Example)

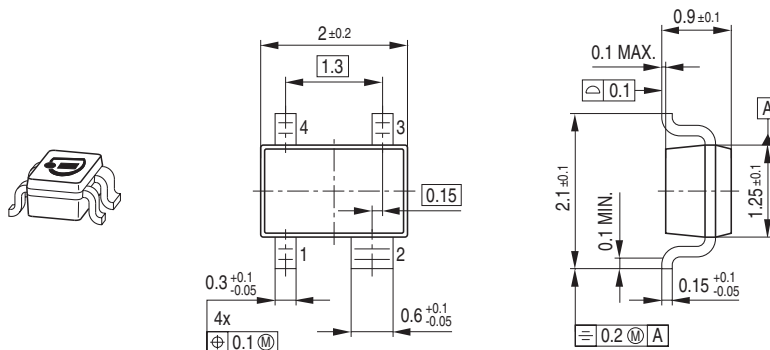


## Standard Packing

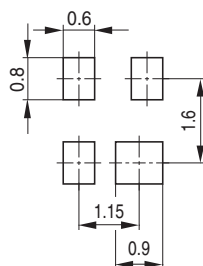
Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 mm = 10.000 Pieces/Reel



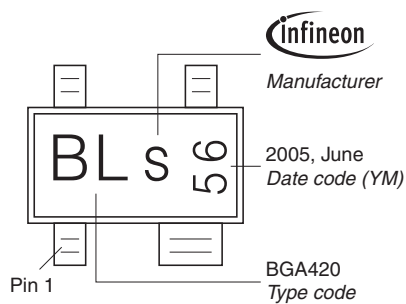
## Package Outline



## Foot Print

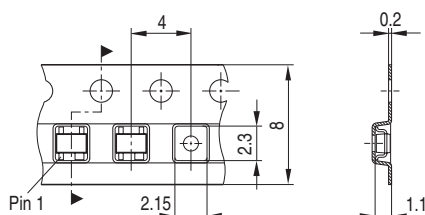


## Marking Layout (Example)



## Standard Packing

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



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