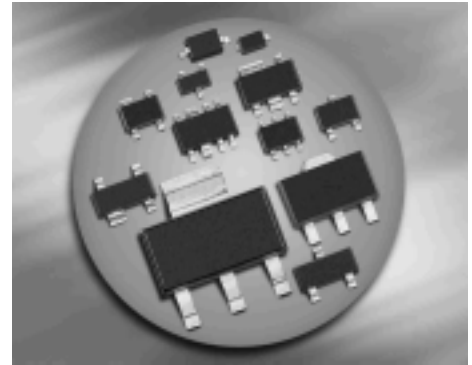


**Silicon N-Channel MOSFET Tetrode**

- For low noise , high gain controlled input stages up to 1GHz
- Operating voltage 5 V
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



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

| Type    | Package | Pin Configuration |     |      |      |   |   | Marking |
|---------|---------|-------------------|-----|------|------|---|---|---------|
| BF2040  | SOT143  | 1=S               | 2=D | 3=G2 | 4=G1 | - | - | NFs     |
| BF2040R | SOT143R | 1=D               | 2=S | 3=G1 | 4=G2 | - | - | NFs     |
| BF2040W | SOT343  | 1=D               | 2=S | 3=G1 | 4=G2 | - | - | NFs     |

**Maximum Ratings**

| Parameter  | Symbol           | Value       | Unit             |
|--|------------------|-------------|------------------|
| Drain-source voltage                                   | $V_{DS}$         | 8           | V                |
| Continuous drain current                               | $I_D$            | 40          | mA               |
| Gate 1/ gate 2-source current                          | $\pm I_{G1/2SM}$ | 10          |                  |
| Gate 1 (external biasing)                              | $+V_{G1SE}$      | 7           | V                |
| Total power dissipation                                | $P_{tot}$        |             | mW               |
| $T_S \leq 76 \text{ }^\circ\text{C}$ , BF2040, BF2040R |                  | 200         |                  |
| $T_S \leq 94 \text{ }^\circ\text{C}$ , BF2040W         |                  | 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> | $R_{thchs}$ |            | K/W  |
| BF2040, BF2040R                         |             | $\leq 370$ |      |
| BF2040W                                 |             | $\leq 280$ |      |

<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

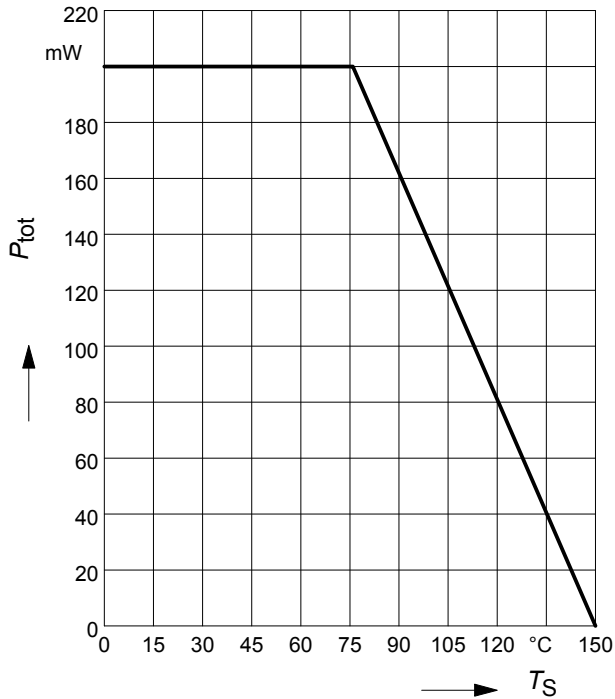
| Parameter   | Symbol          | Values |      |      | Unit          |
|---|-----------------|--------|------|------|---------------|
|   |                 | min.   | typ. | max. |               |
| <b>DC Characteristics</b>   |                 |        |      |      |               |
| Drain-source breakdown voltage<br>$I_D = 20 \mu\text{A}$ , $V_{G1S} = 0$ , $V_{G2S} = 0$                    | $V_{(BR)DS}$    | 10     | -    | -    | 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>$V_{G1S} = 5 \text{ V}$ , $V_{G2S} = 0$ , $V_{DS} = 0$                      | $+I_{G1SS}$     | -      | -    | 50   | nA            |
| Gate2-source leakage current<br>$V_{G2S} = 5 \text{ V}$ , $V_{G1S} = 0$ , $V_{DS} = 0$                      | $+I_{G2SS}$     | -      | -    | 50   |               |
| Drain current<br>$V_{DS} = 5 \text{ V}$ , $V_{G1S} = 0$ , $V_{G2S} = 4 \text{ V}$                           | $I_{DSS}$       | -      | -    | 50   | $\mu\text{A}$ |
| Drain-source current<br>$V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $R_{G1} = 100 \text{ k}\Omega$   | $I_{DSX}$       | -      | 15   | -    | mA            |
| Gate1-source pinch-off voltage<br>$V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $I_D = 20 \mu\text{A}$ | $V_{G1S(p)}$    | 0.3    | 0.6  | -    | V             |
| Gate2-source pinch-off voltage<br>$V_{DS} = 5 \text{ V}$ , $I_D = 20 \mu\text{A}$                           | $V_{G2S(p)}$    | 0.3    | 0.7  | -    |               |

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

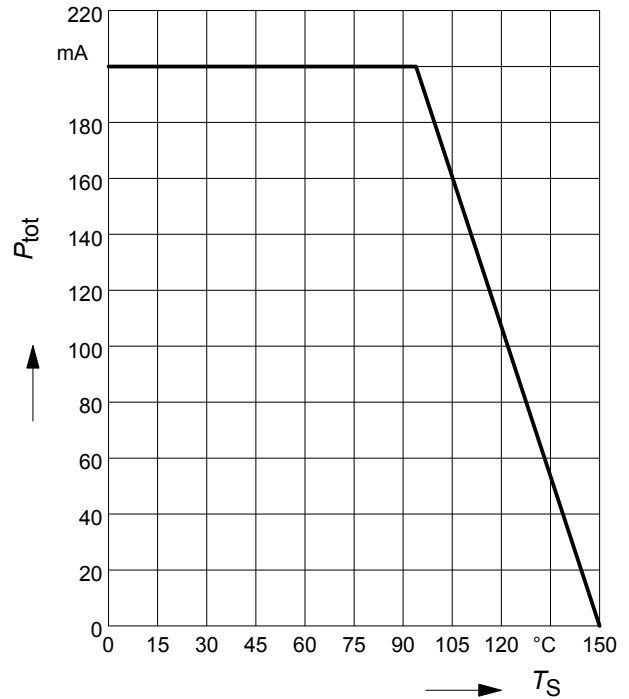
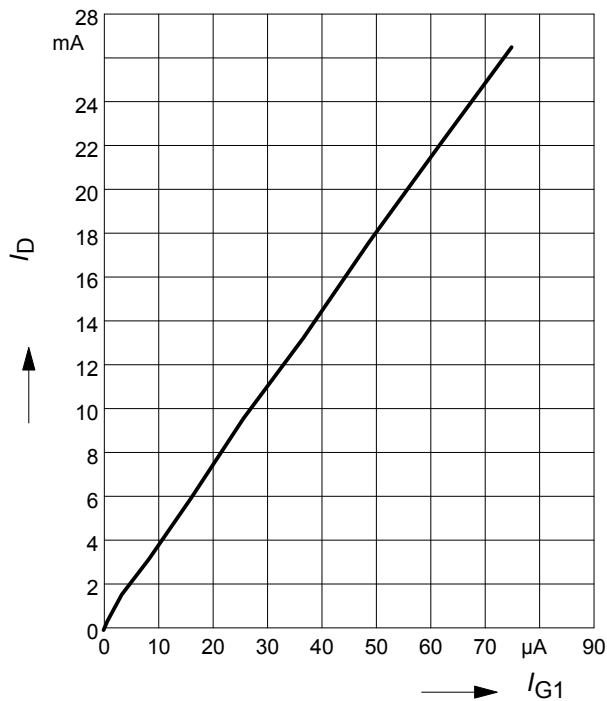
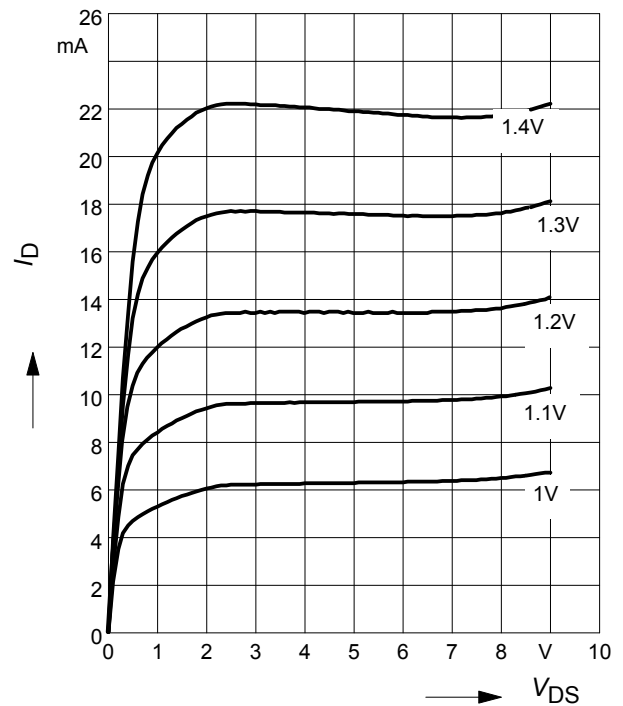
| Parameter  | Symbol       | Values |      |      | Unit |
|--|--------------|--------|------|------|------|
|  |              | min.   | typ. | max. |      |
| <b>AC Characteristics - (verified by random sampling)</b>  |              |        |      |      |      |
| Forward transconductance<br>$V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V}$                        | $g_{fs}$     | 37     | 42   | -    | mS   |
| Gate1 input capacitance<br>$V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V},$<br>$f = 10\text{ MHz}$ | $C_{g1ss}$   | -      | 2.9  | 3.4  | pF   |
| Output capacitance<br>$V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V},$<br>$f = 10\text{ MHz}$      | $C_{dss}$    | -      | 1.6  | -    |      |
| Power gain<br>$V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V},$<br>$f = 800\text{ MHz}$             | $G_p$        | 20     | 23   | -    | dB   |
| Noise figure<br>$V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V},$<br>$f = 800\text{ MHz}$           | $F$          | -      | 1.6  | 2.2  | dB   |
| Gain control range<br>$V_{DS} = 5\text{ V}, V_{G2S} = 4 \dots 0\text{ V}, f = 800\text{ GHz}$                      | $\Delta G_p$ | 45     | 50   | -    |      |

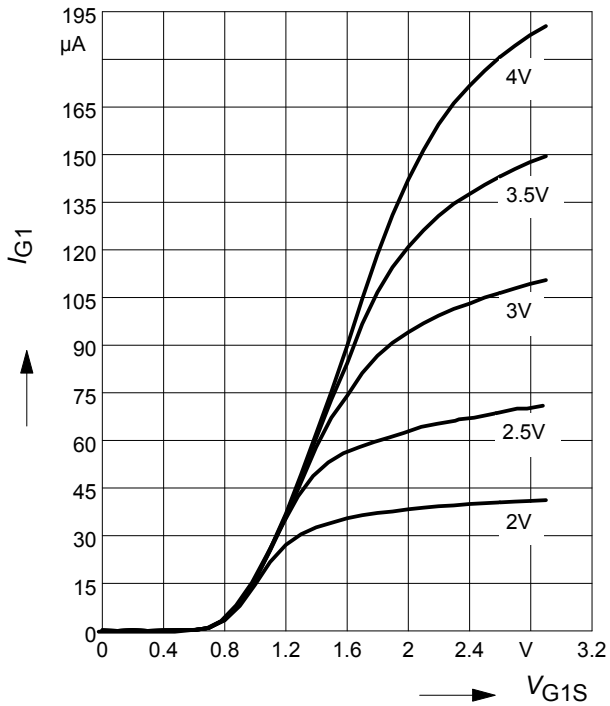
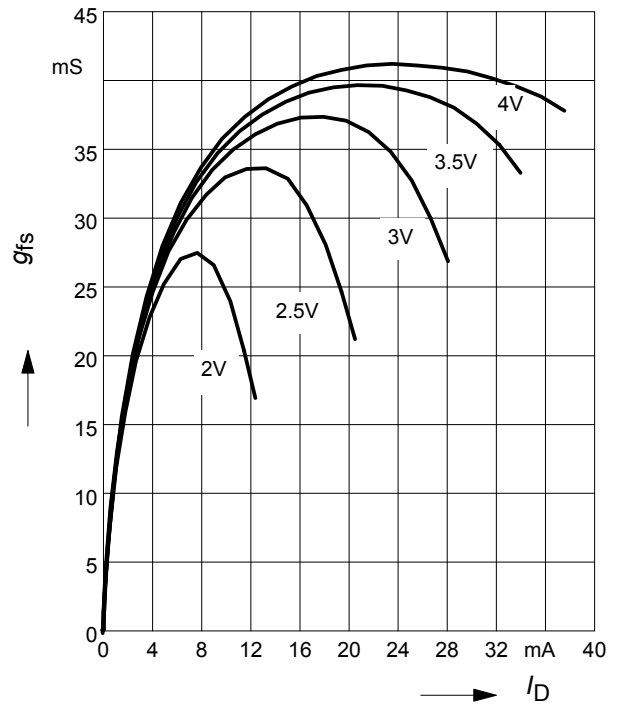
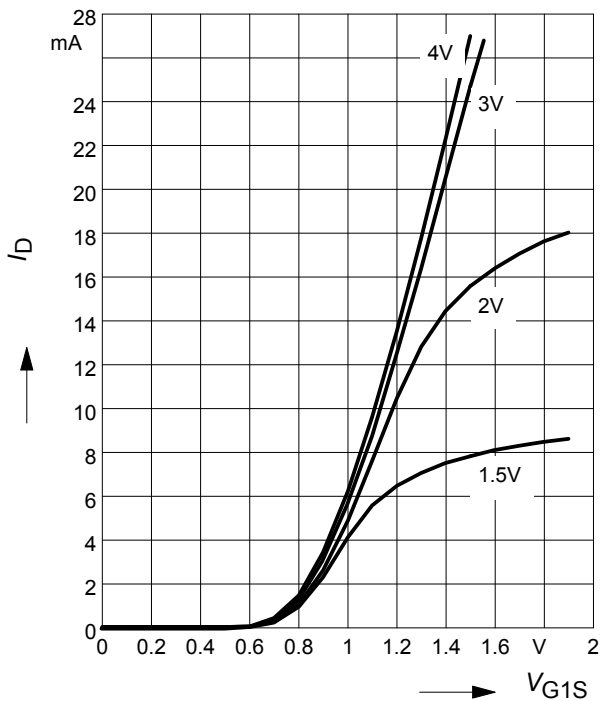
**Total power dissipation  $P_{tot} = f(T_S)$** 

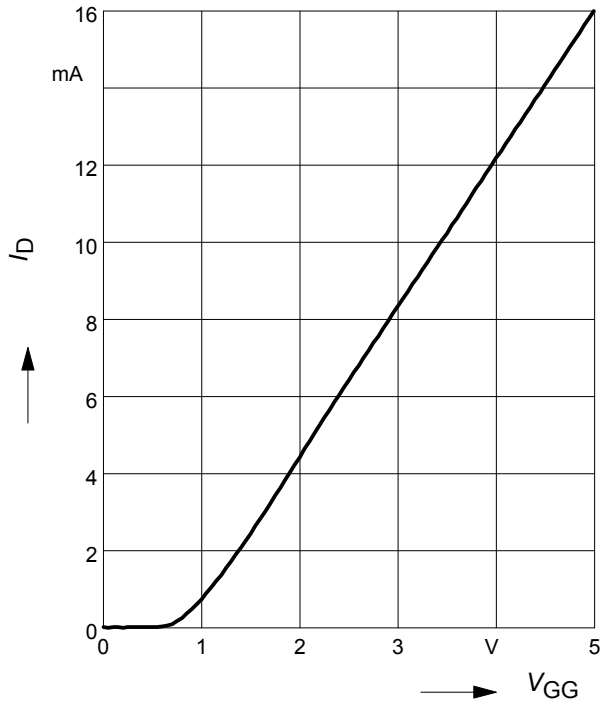
BF2040, BFD2040R

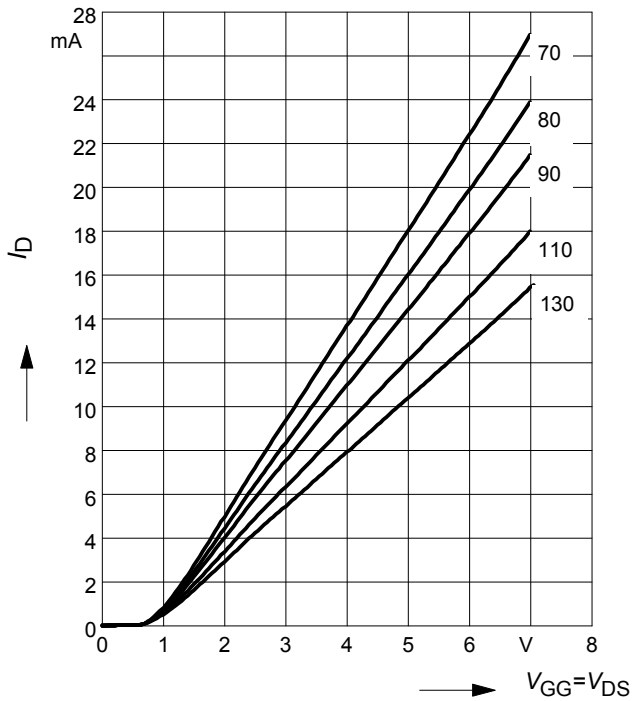
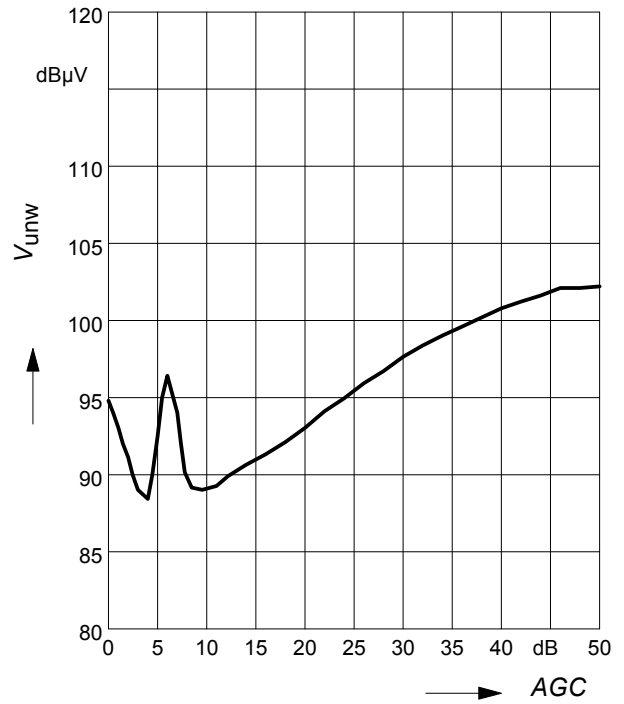

**Total power dissipation  $P_{tot} = f(T_S)$** 

BF2040W

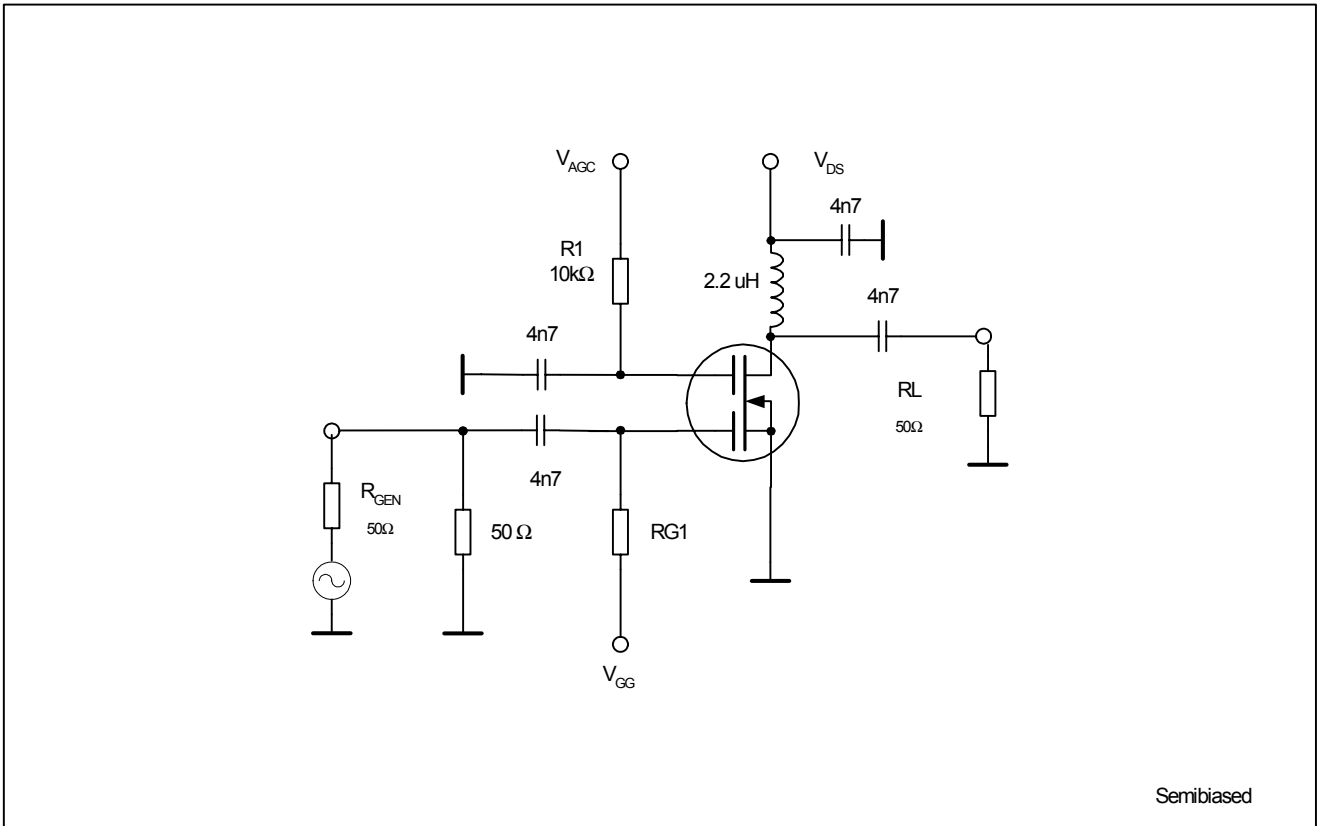

**Drain current  $I_D = f(I_{G1})$** 
 $V_{G2S} = 4V$ 

**Output characteristics  $I_D = f(V_{DS})$** 
 $V_{G2S} = 4V$ 
 $V_{G1S} = \text{Parameter}$ 


**Gate 1 current  $I_{G1} = f(V_{G1S})$** 
 $V_{DS} = 5V$ 
 $V_{G2S} = \text{Parameter}$ 

**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  $I_D = f(V_{GG})$** 
 $V_{DS} = 5V, V_{G2S} = 4V, R_{G1} = 80k\Omega$ 

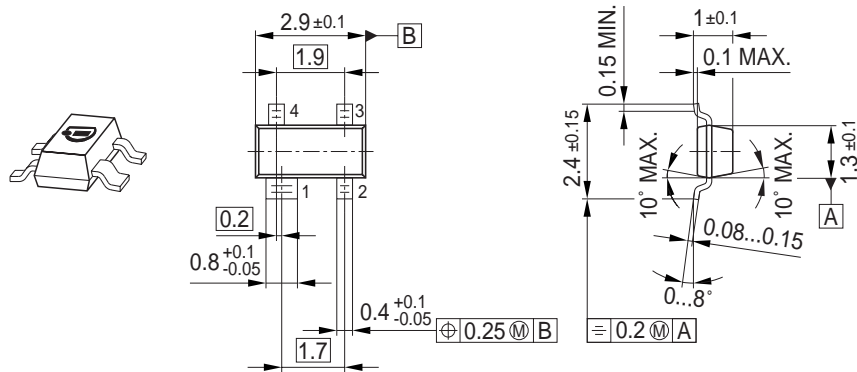
 (connected to  $V_{GG}$ ,  $V_{GG} = \text{gate1 supply voltage}$ )


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

**Crossmodulation  $V_{unw} = (AGC)$** 
 $V_{DS} = 5V$ 


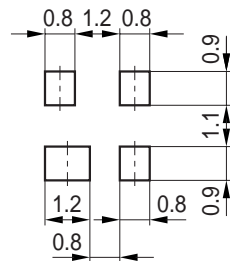
Cossmodulation test circuit



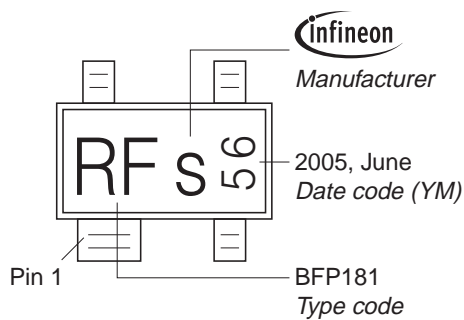
Package Outline



Foot Print

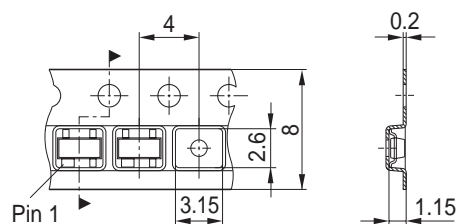


Marking Layout (Example)



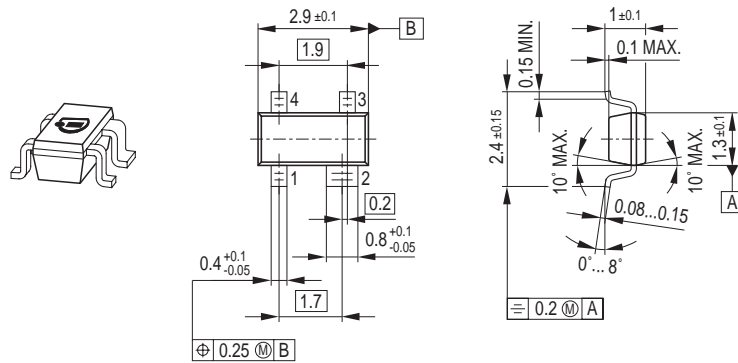
Standard Packing

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

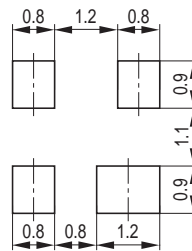




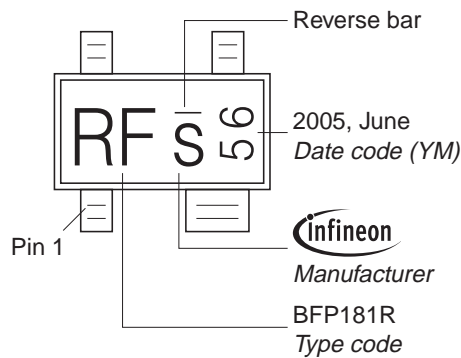
Package Outline



Foot Print

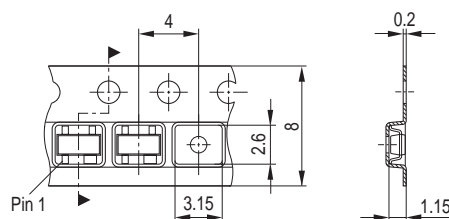


Marking Layout (Example)

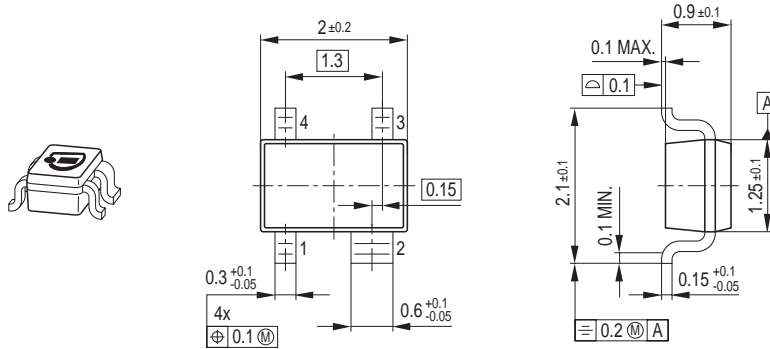


Standard Packing

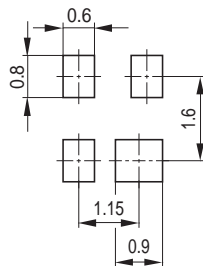
Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



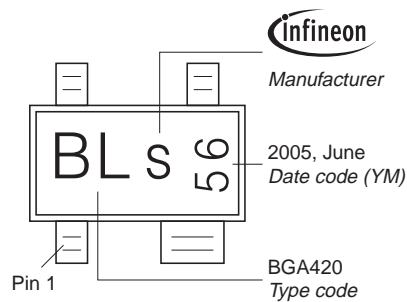
Package Outline



Foot Print

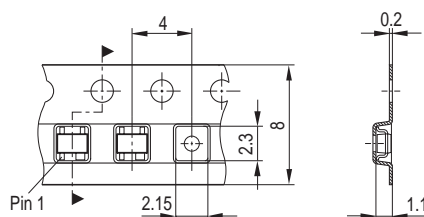


Marking Layout (Example)



Standard Packing

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



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