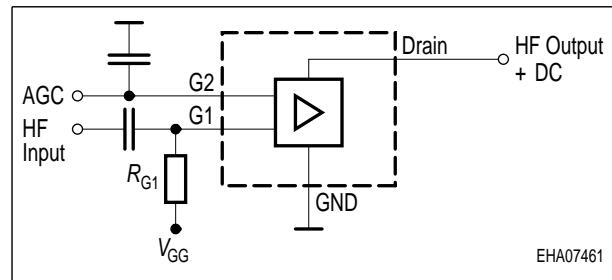
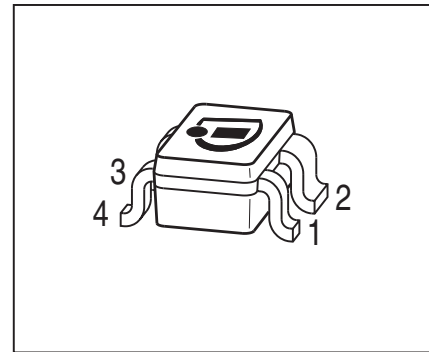


**Silicon N-Channel MOSFET Tetrode**

- 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	°C
Channel temperature	$T_{ch}$	150	

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Channel - soldering point <sup>1)</sup> BF5020, BF5020R BF5020W	$R_{thchs}$	≤ 370 ≤ 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 $I_D = 20 \mu\text{A}$ , $V_{G1S} = 0$ , $V_{G2S} = 0$	$V_{(BR)DS}$	12	-	-	V
Gate1-source breakdown voltage $+I_{G1S} = 10 \text{ mA}$ , $V_{G2S} = 0$ , $V_{DS} = 0$	$+V_{(BR)G1SS}$	6	-	15	
Gate2-source breakdown voltage $+I_{G2S} = 10 \text{ mA}$ , $V_{G1S} = 0$ , $V_{DS} = 0$	$+V_{(BR)G2SS}$	6	-	15	
Gate1-source leakage current $V_{G1S} = 6 \text{ V}$ , $V_{G2S} = 0$ , $V_{DS} = 0$	$+I_{G1SS}$	-	-	50	nA
Gate2-source leakage current $V_{G2S} = 6 \text{ V}$ , $V_{G1S} = 0$ , $V_{DS} = 0$	$+I_{G2SS}$	-	-	50	
Drain current $V_{DS} = 5 \text{ V}$ , $V_{G1S} = 0$ , $V_{G2S} = 4 \text{ V}$	$I_{DSS}$	-	-	100	
Drain-source current $V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $R_{G1} = 120 \text{ k}\Omega$	$I_{DSX}$	-	14	-	mA
Gate1-source pinch-off voltage $V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $I_D = 20 \mu\text{A}$	$V_{G1S(p)}$	-	0.7	-	V
Gate2-source pinch-off voltage $V_{DS} = 5 \text{ V}$ , $I_D = 20 \mu\text{A}$ , $V_{G1S} = 2 \text{ V}$	$V_{G2S(p)}$	-	0.7	-	

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

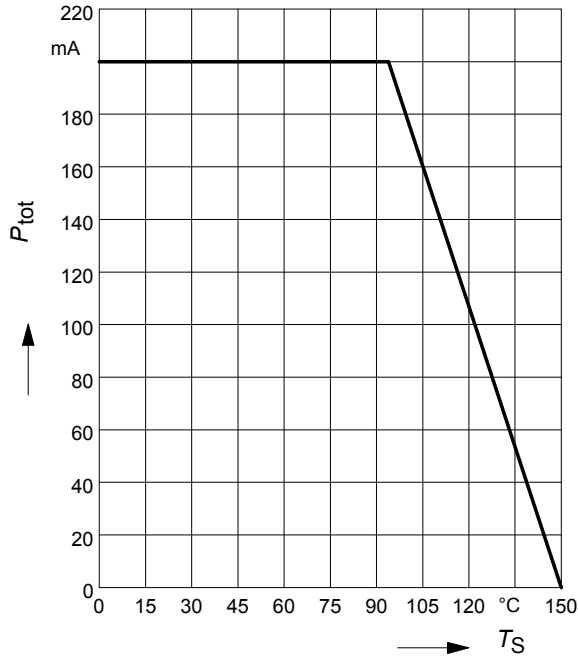
**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

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

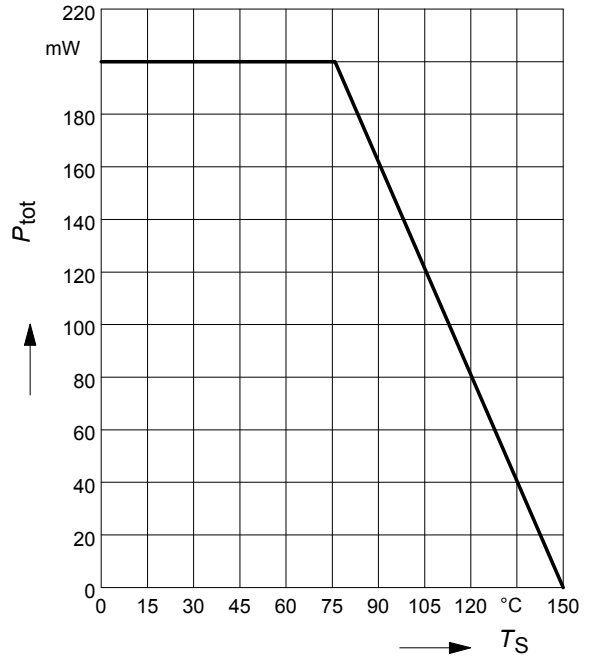
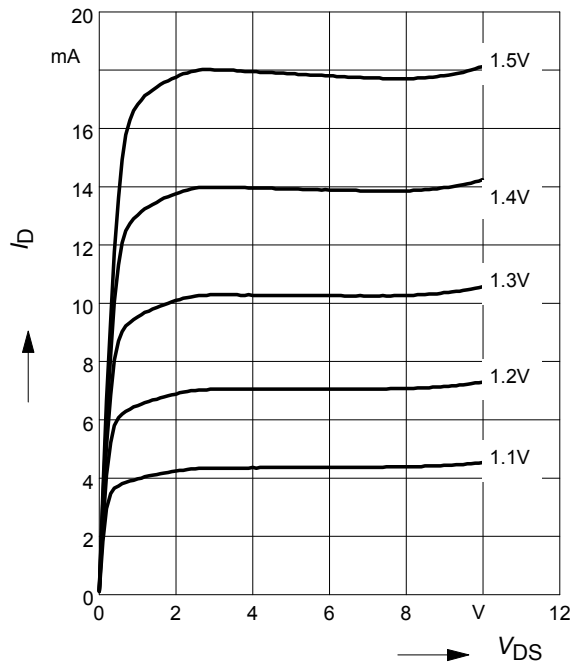
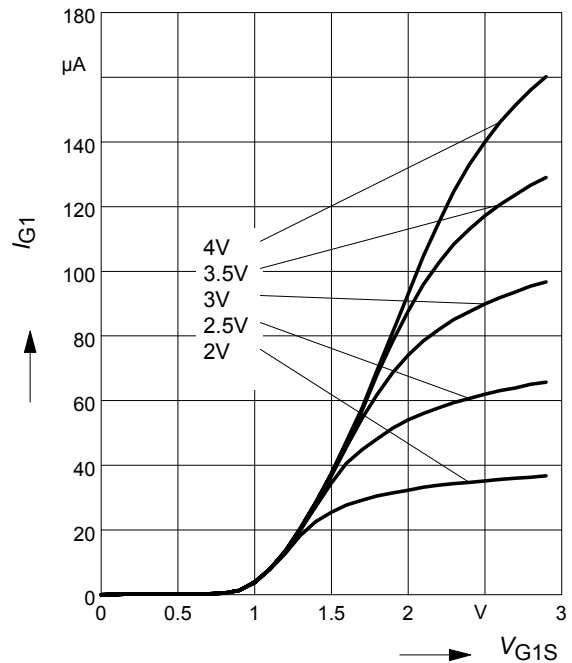
<sup>1</sup>Input level for  $k = 1\%$ ;  $f_w = 50\text{ MHz}$ ,  $f_{unw} = 60\text{ MHz}$

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

BF5020W

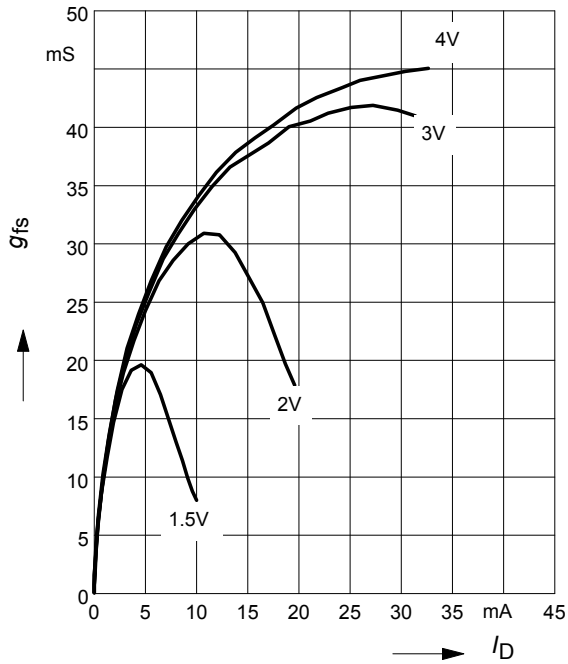
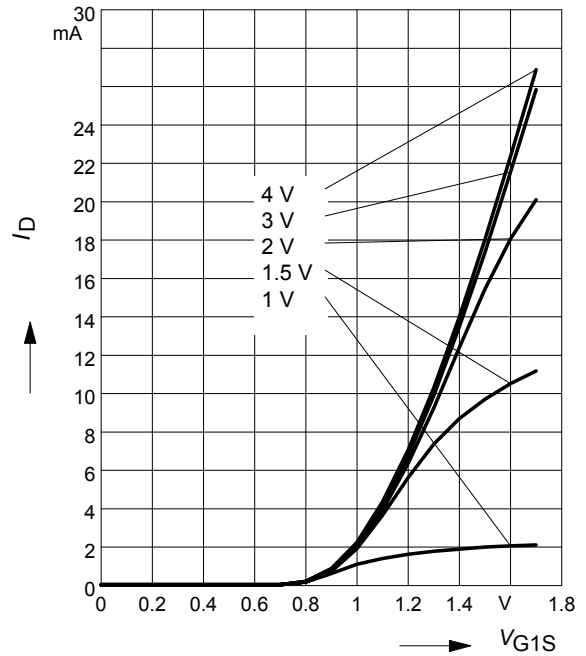

**Total power dissipation  $P_{tot} = f(T_S)$** 

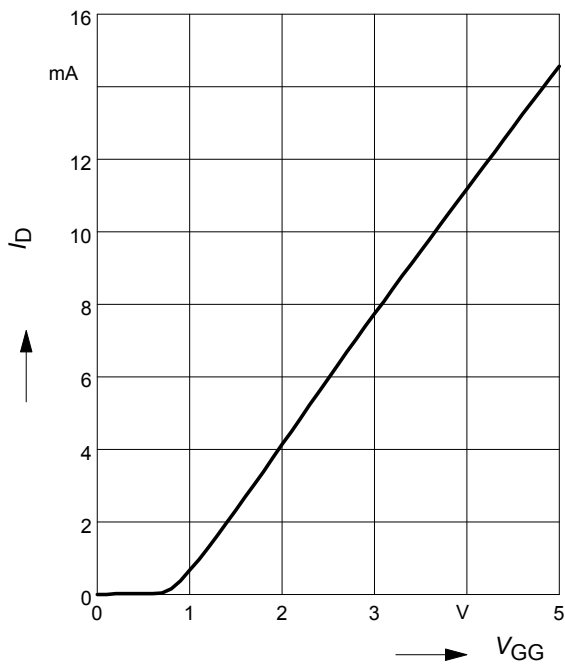
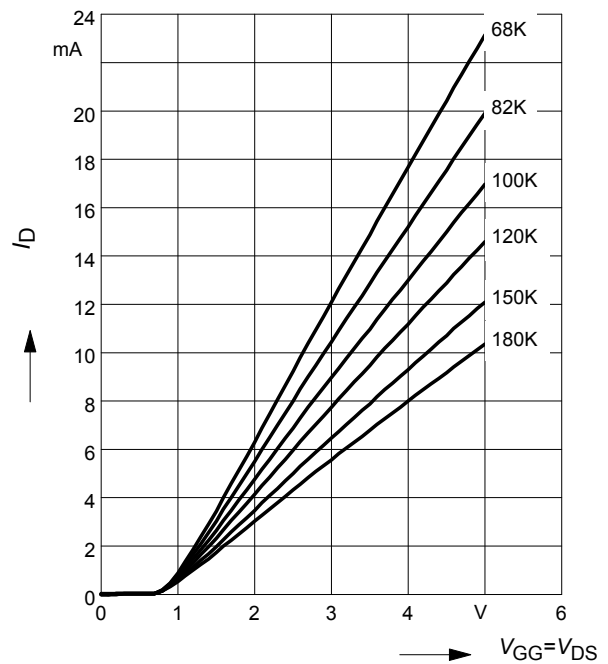
BF5020, BF5020R


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

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


**Gate 1 forward transconductance**

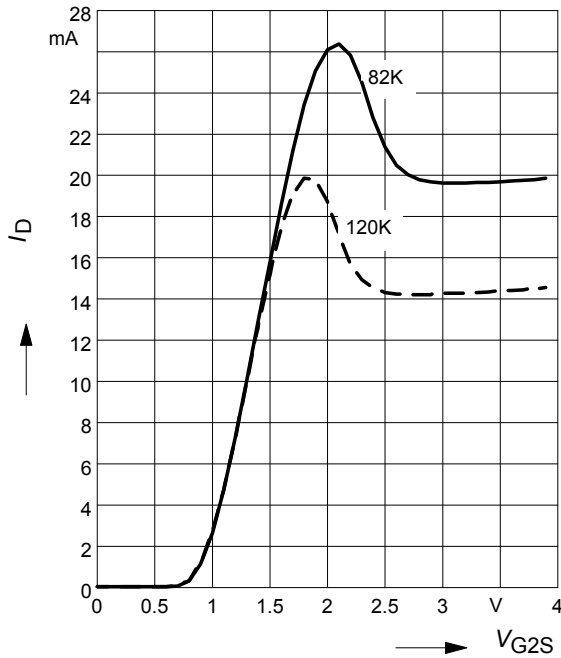
$$g_{fs} = f(I_D)$$

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

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

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

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

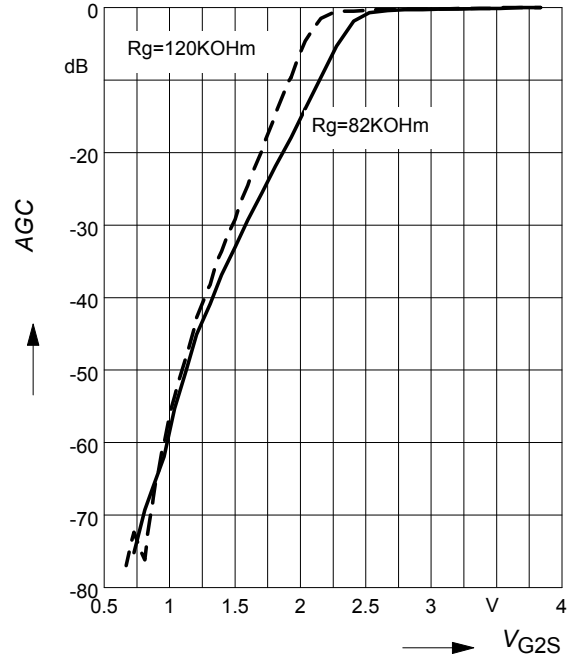
$V_{DS} = 5\text{ V}$ ,  $R_{G1} = \text{Parameter in k}\Omega$



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

$f = 50\text{ MHz}$

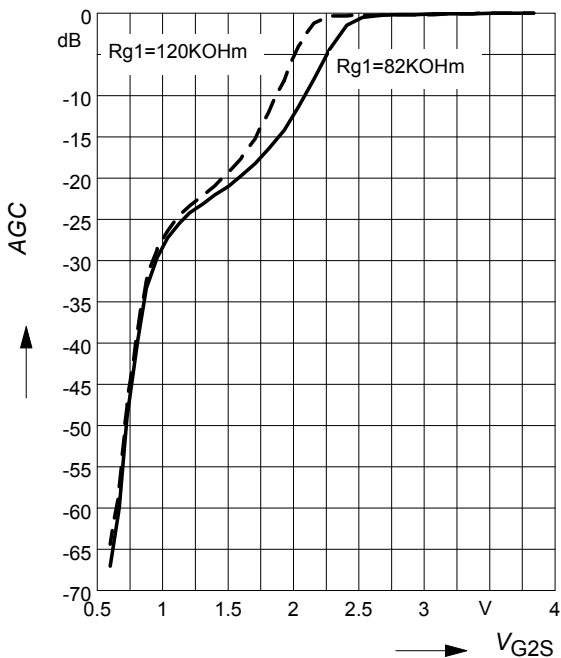
measured in test circuit, see page 7



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

$f = 800\text{ MHz}$

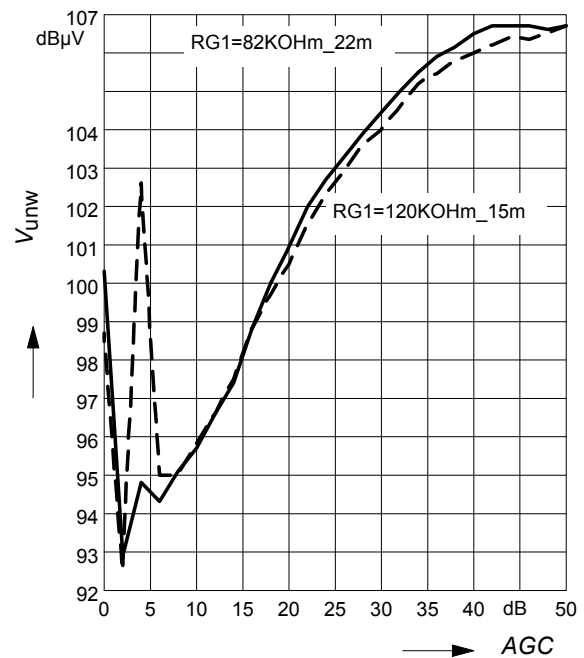
measured in test circuit, see page 7



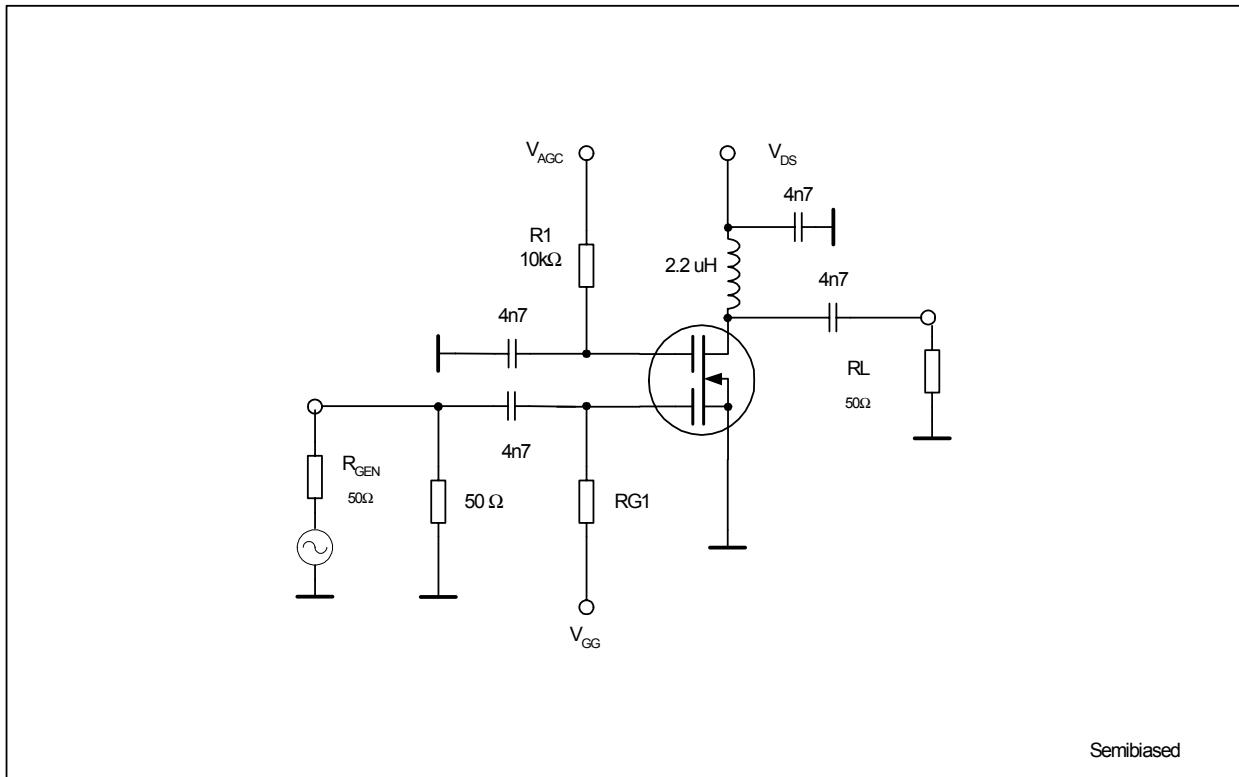
**Crossmodulation  $V_{unw} = (AGC)$**

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

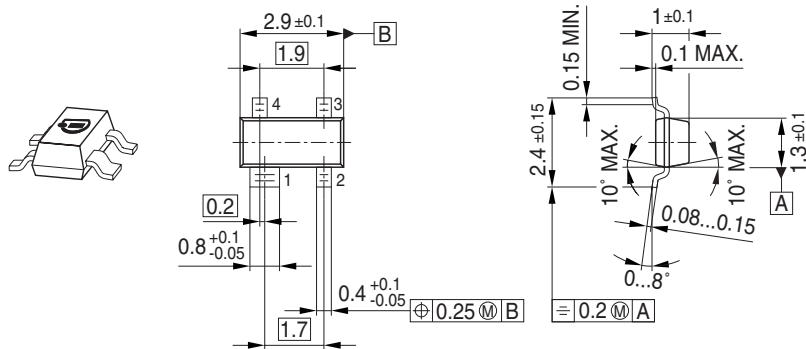
measured in test circuit, see page 7



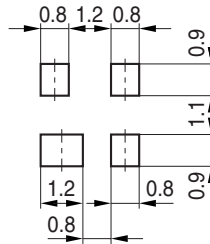
Test circuit for Crossmodulation / AGC



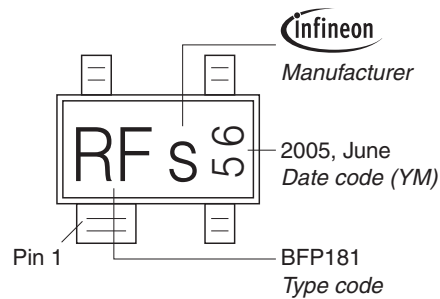
Package Outline



Foot Print

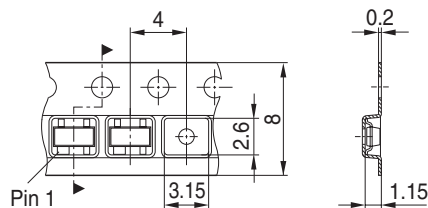


Marking Layout (Example)



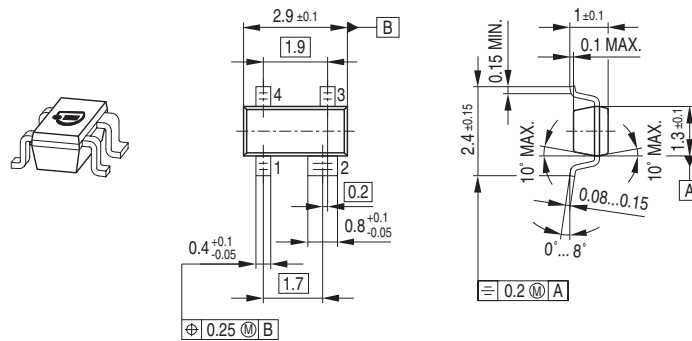
Standard Packing

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

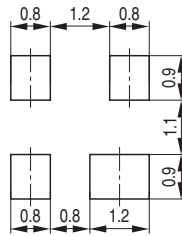




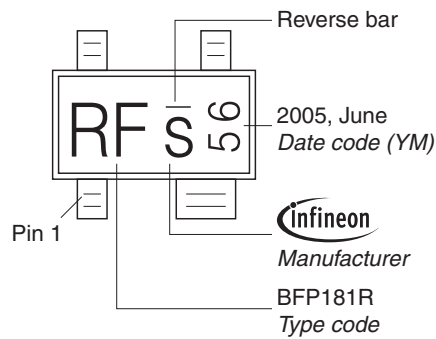
Package Outline



Foot Print

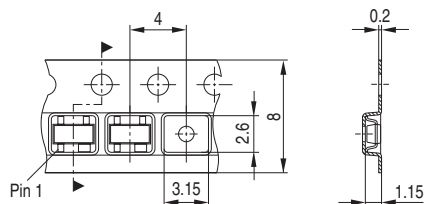


Marking Layout (Example)

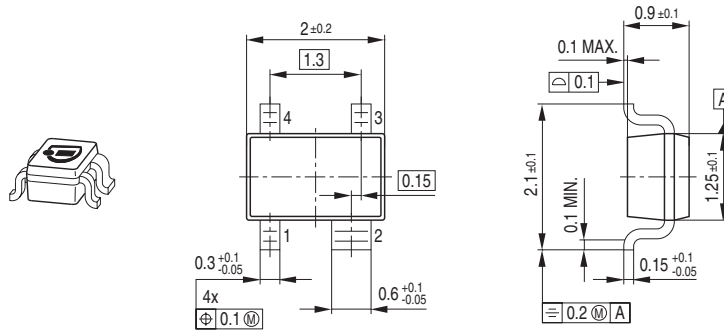


Standard Packing

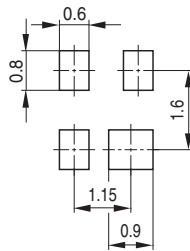
Reel ø180 mm = 3.000 Pieces/Reel  
 Reel ø330 mm = 10.000 Pieces/Reel



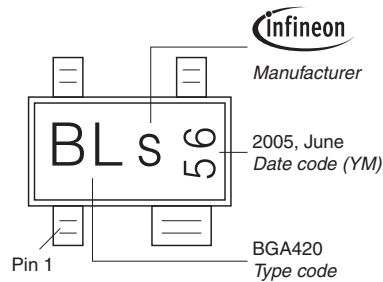
Package Outline



Foot Print

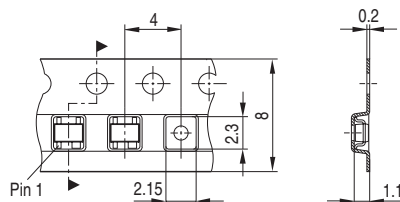


Marking Layout (Example)



Standard Packing

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



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