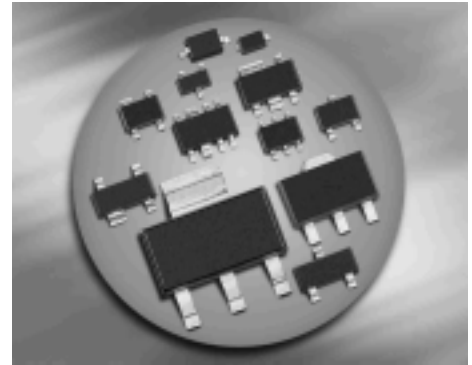


**Silicon N-Channel MOSFET Tetrode**

- 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**

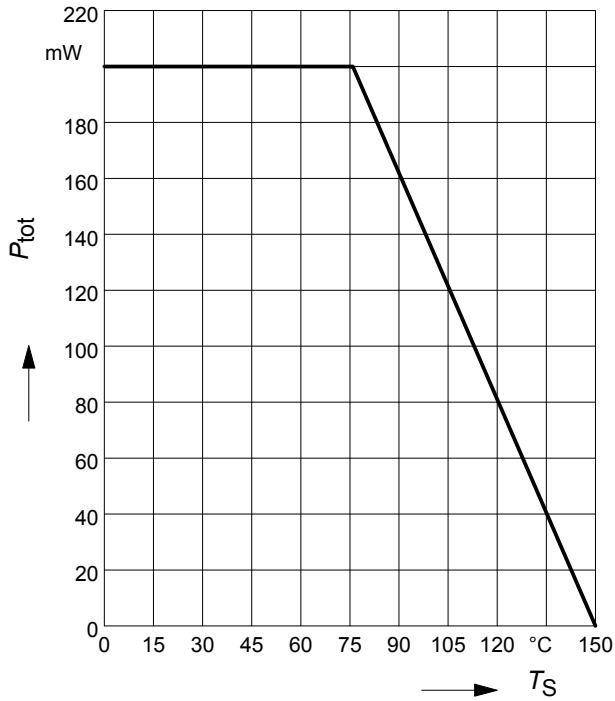
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC Characteristics</b>					
Drain-source breakdown voltage $I_D = 20 \mu\text{A}$ , $V_{G1S} = 0$ , $V_{G2S} = 0$	$V_{(BR)DS}$	10	-	-	V
Gate1-source breakdown voltage $+I_{G1S} = 10 \text{ mA}$ , $V_{G2S} = 0$ , $V_{DS} = 0$	$+V_{(BR)G1SS}$	6	-	15	
Gate2-source breakdown voltage $+I_{G2S} = 10 \text{ mA}$ , $V_{G1S} = 0$ , $V_{DS} = 0$	$+V_{(BR)G2SS}$	6	-	15	
Gate1-source leakage current $V_{G1S} = 5 \text{ V}$ , $V_{G2S} = 0$ , $V_{DS} = 0$	$+I_{G1SS}$	-	-	50	nA
Gate2-source leakage current $V_{G2S} = 5 \text{ V}$ , $V_{G1S} = 0$ , $V_{DS} = 0$	$+I_{G2SS}$	-	-	50	
Drain current $V_{DS} = 5 \text{ V}$ , $V_{G1S} = 0$ , $V_{G2S} = 4 \text{ V}$	$I_{DSS}$	-	-	50	$\mu\text{A}$
Drain-source current $V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $R_{G1} = 100 \text{ k}\Omega$	$I_{DSX}$	-	15	-	mA
Gate1-source pinch-off voltage $V_{DS} = 5 \text{ V}$ , $V_{G2S} = 4 \text{ V}$ , $I_D = 20 \mu\text{A}$	$V_{G1S(p)}$	0.3	0.6	-	V
Gate2-source pinch-off voltage $V_{DS} = 5 \text{ V}$ , $I_D = 20 \mu\text{A}$	$V_{G2S(p)}$	0.3	0.7	-	

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

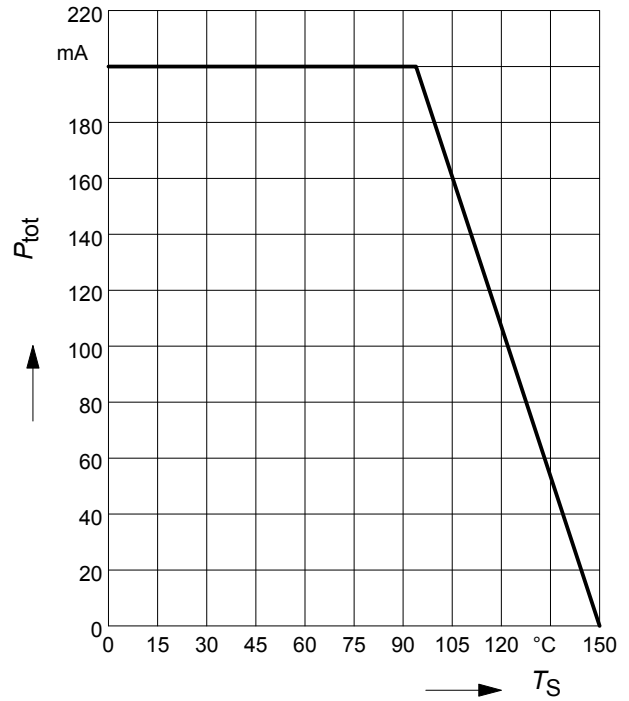
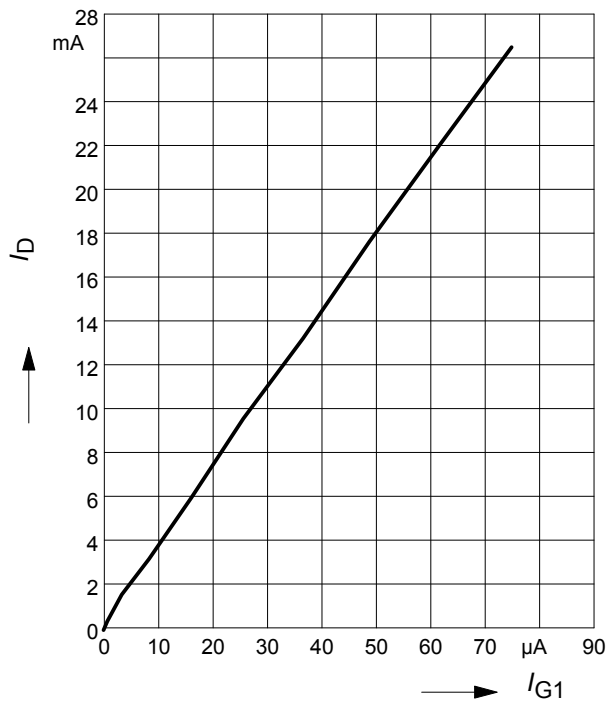
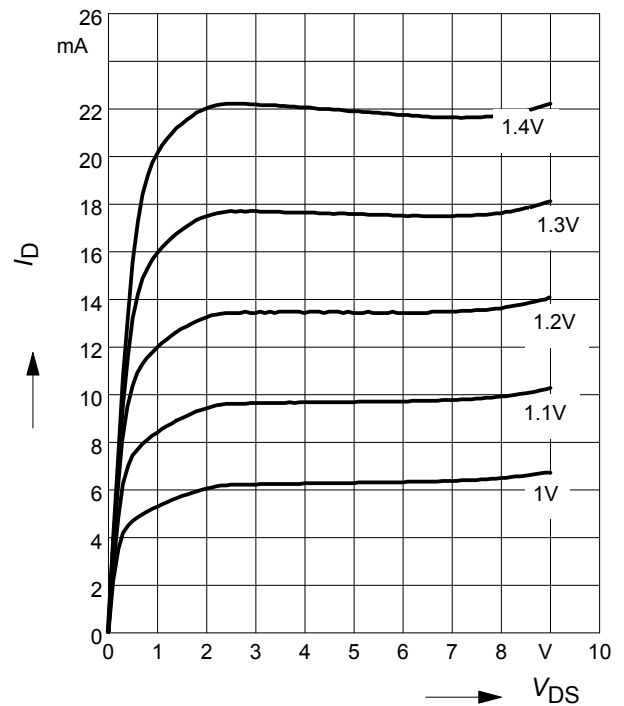
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics - (verified by random sampling)</b>					
Forward transconductance $V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{ V}$	$g_{fs}$	37	42	-	mS
Gate1 input capacitance $V_{DS} = 5\text{ V}, I_D = 15\text{ mA}, V_{G2S} = 4\text{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

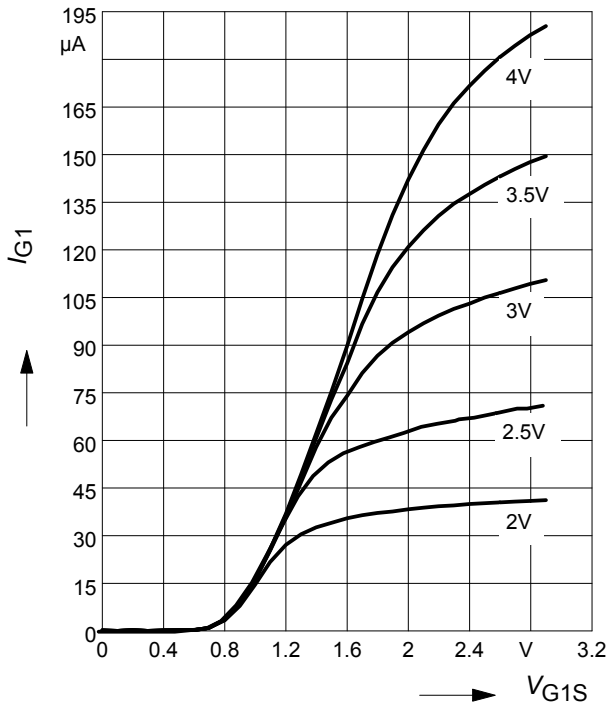
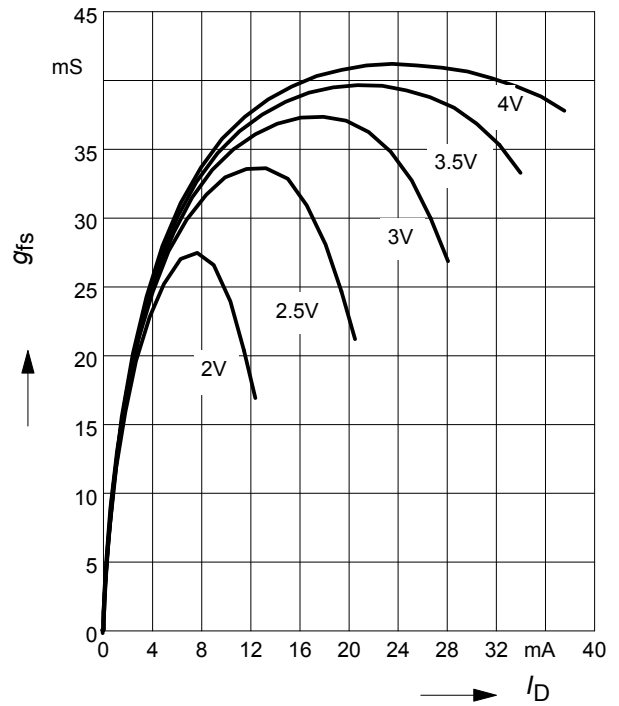
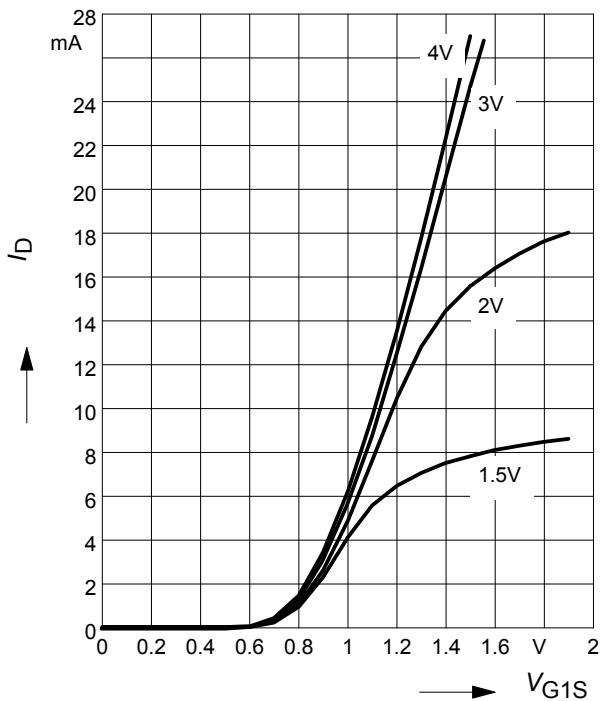
**Total power dissipation  $P_{tot} = f(T_S)$** 

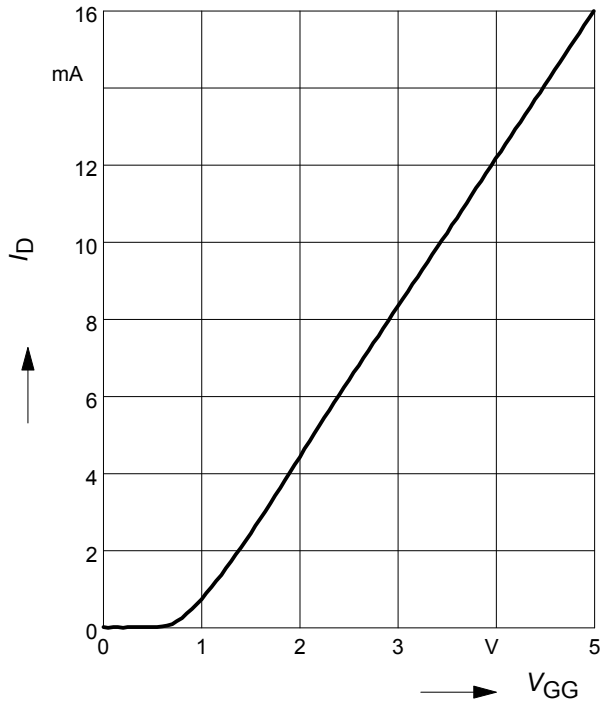
BF2040, BFD2040R

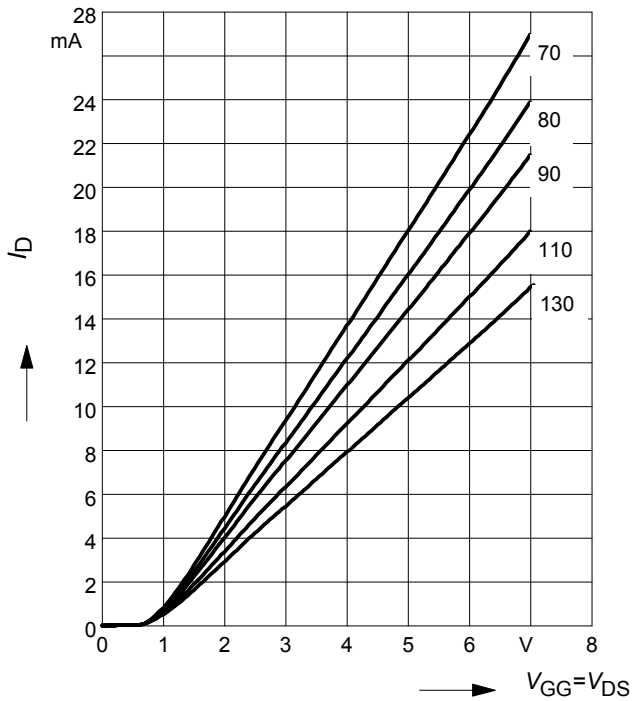
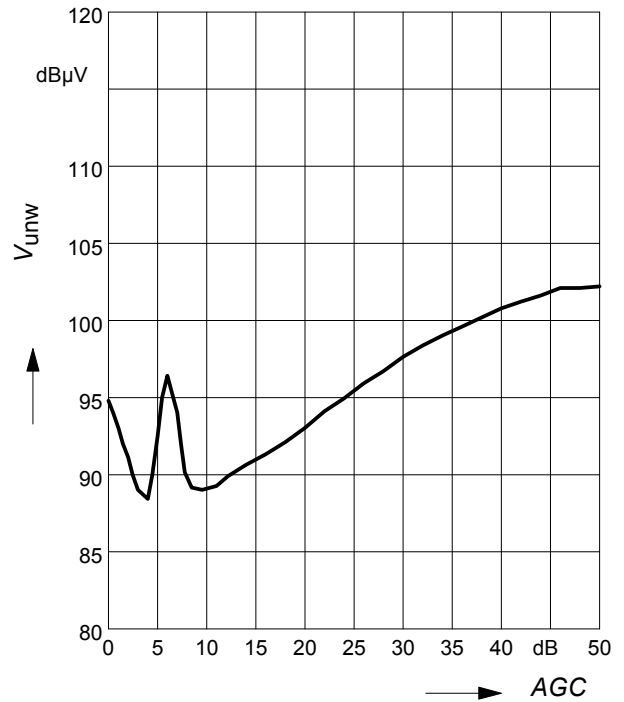

**Total power dissipation  $P_{tot} = f(T_S)$** 

BF2040W

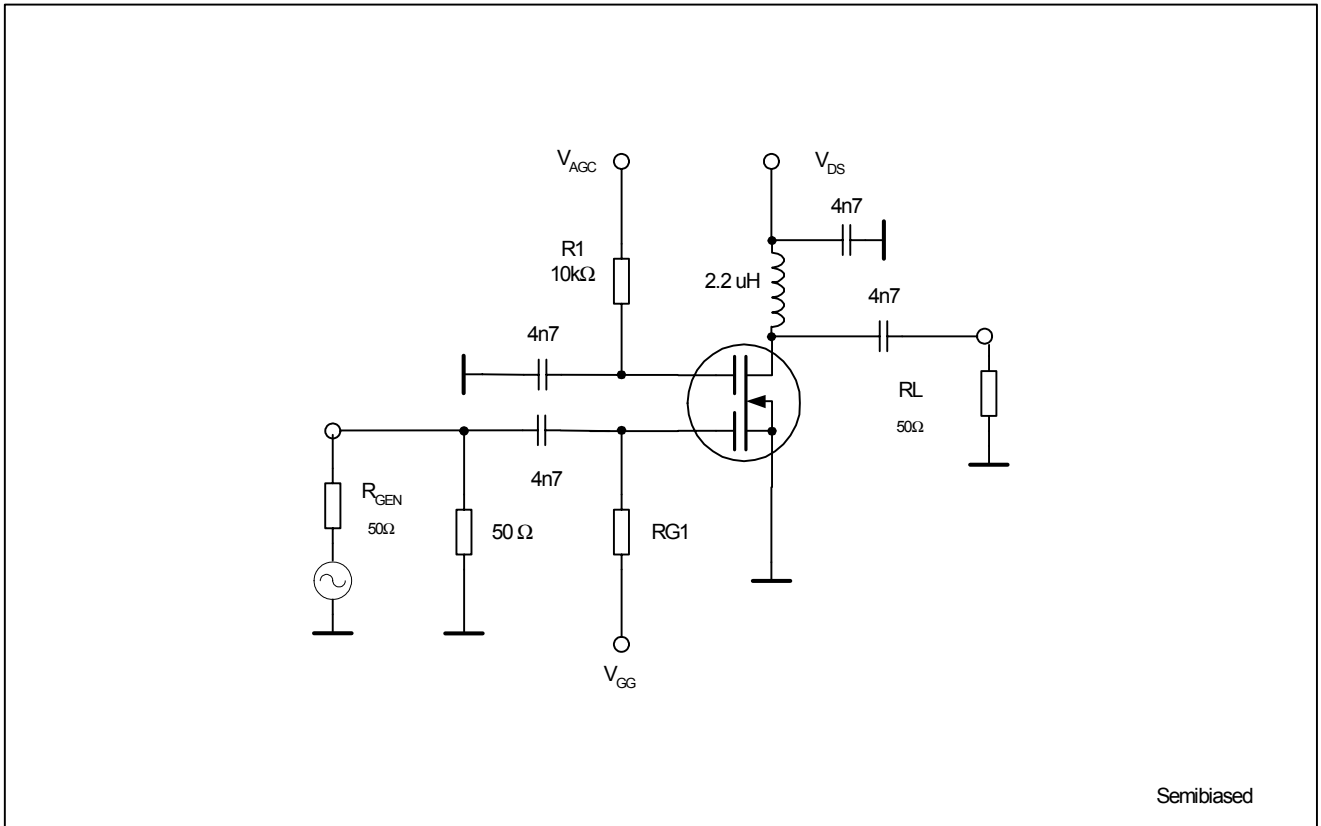

**Drain current  $I_D = f(I_{G1})$** 
 $V_{G2S} = 4V$ 

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

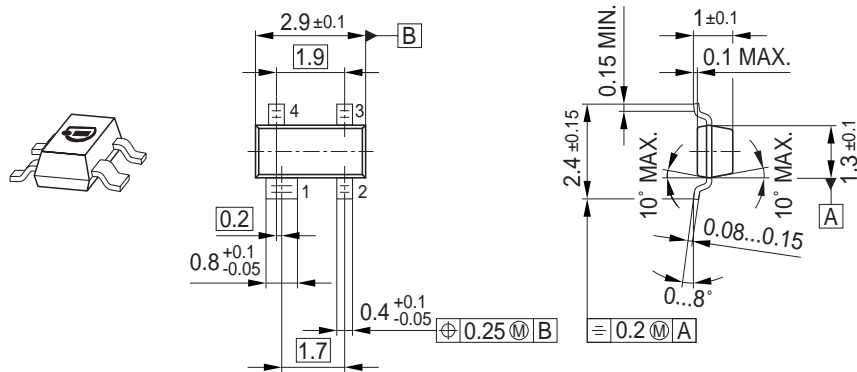
 (connected to  $V_{GG}$ ,  $V_{GG} = \text{gate1 supply voltage}$ )


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

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


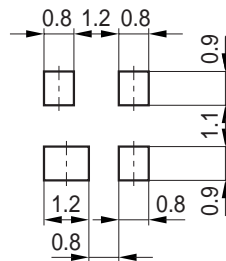
Cossmodulation test circuit



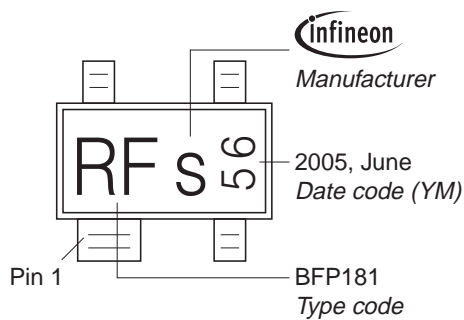
Package Outline



Foot Print

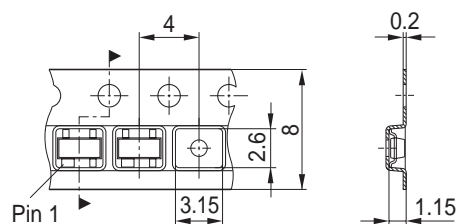


Marking Layout (Example)



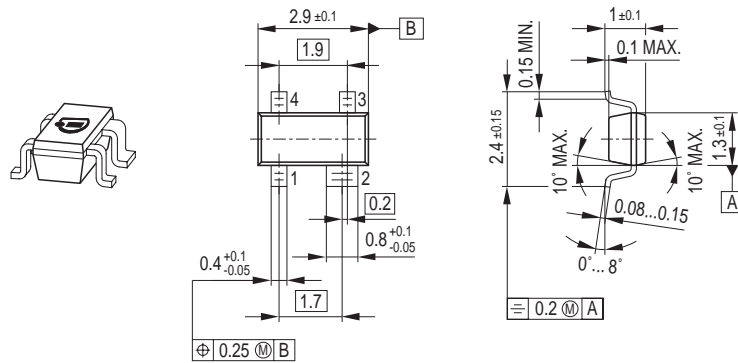
Standard Packing

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

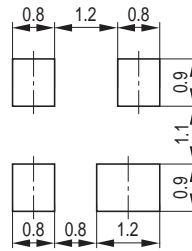




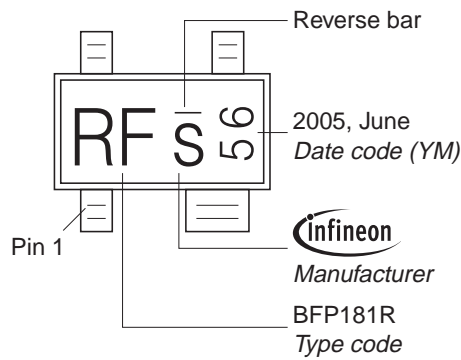
Package Outline



Foot Print

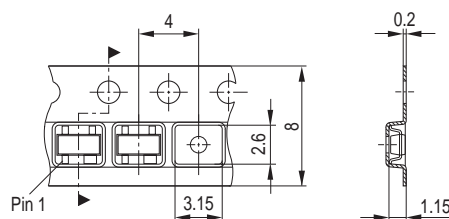


Marking Layout (Example)

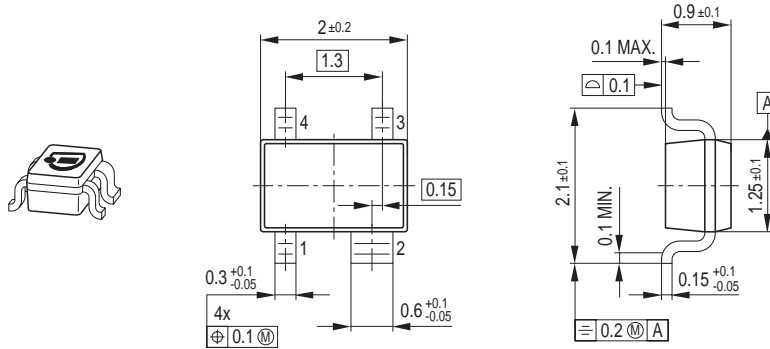


Standard Packing

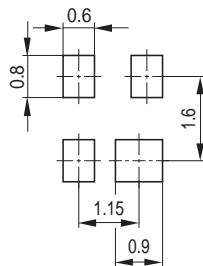
Reel  $\varnothing$ 180 mm = 3.000 Pieces/Reel  
 Reel  $\varnothing$ 330 mm = 10.000 Pieces/Reel



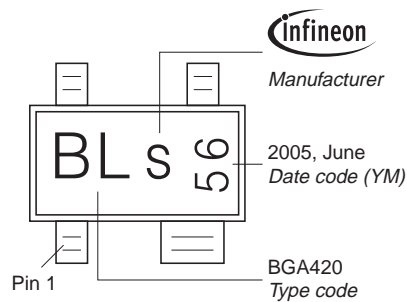
Package Outline



Foot Print

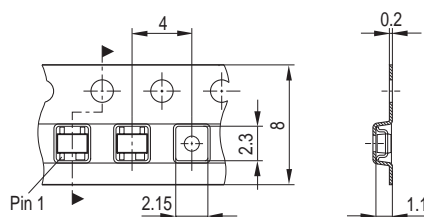


Marking Layout (Example)



Standard Packing

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



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