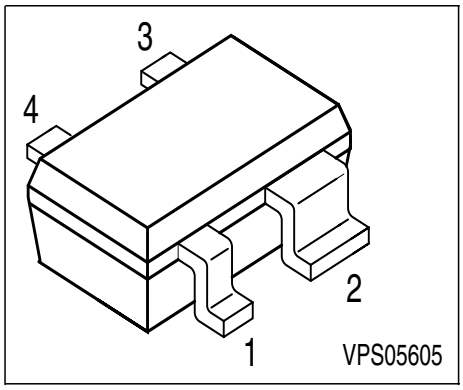
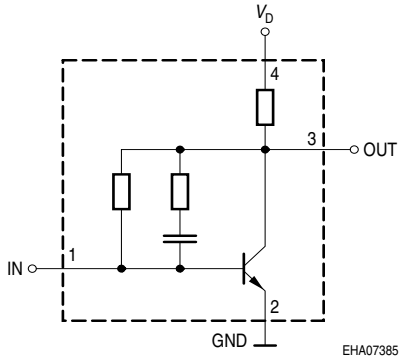
Si-MMIC-Amplifier in SIEGET 25-Technologie



- Cascadable 50 Ω-gain block
- Unconditionally stable
- Gain $|S_{21}|^2$ = 13 dB at 1.8 GHz
  IP_{3out} = +13 dBm at 1.8 GHz
  (V_D = 3 V, I_D = typ. 6.7 mA)
- Noise figure *NF* = 2.3 dB at 1.8 GHz
- Reverse isolation > 28 dB and
  return loss *IN* / *OUT* > 12 dB at 1.8 GHz

Circuit Diagram



ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precaution!

Type	Marking	Pin Configuration				Package
BGA420	BLs	1, IN	2, GND	3, OUT	4, VD	SOT343

Maximum Ratings

Parameter	Symbol	Value	Unit
Device current	I_D	15	mA
Device voltage	V_D	6	V
Total power dissipation T_S = 110 °C	P_{tot}	90	mW
RF input power	P_{RFin}	0	dBm
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

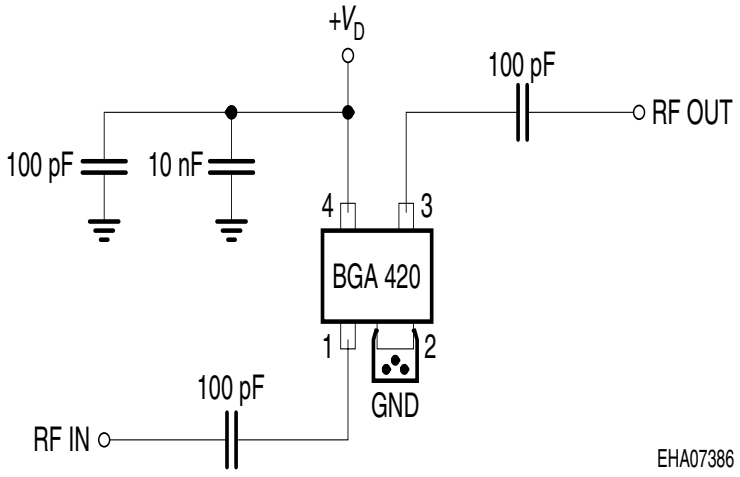
Junction - soldering point[1)]	R_{thJS}	≤ 410	K/W

[1)] For calculation of R_{thJA} please refer to Application Note Thermal Resistance

Electrical Characteristics at T_A = 25 °C, unless otherwise specified.

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC characteristics V_D = 3 V, Z_o = 50 Ω					
Device current	I_D	5.4	6.7	8	mA
Insertion power gain	$\|S_{21}\|^2$				dB
f = 0.1 GHz		17	19	-	
f = 1 GHz		15	17	-	
f = 1.8 GHz		11	13	-	
Reverse isolation f = 1.8 GHz	S12	25	28	-	
Noise figure	NF				
f = 0.1 GHz		-	1.9	2.3	
f = 1 GHz		-	2.2	2.6	
f = 1.8 GHz		-	2.3	2.7	
Intercept point at the output f = 1 GHz	IP_{3out}	10	13	-	dBm
1dB compression point f = 1 GHz	P_{-1dB}	-6	-2.5	-	
Return loss input f = 1.8 GHz	RL_{in}	8	11	-	dB
Return loss output f = 1.8 GHz	RL_{out}	12	16	-	

Typical biasing configuration

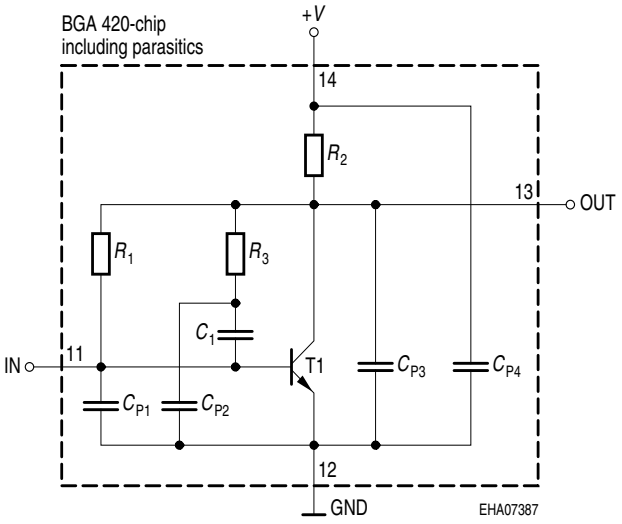


Note: 1) Large-value capacitors should be connected from pin 4 to ground right at the device to provide a low impedance path.
2) The use of plated through holes right at pin 2 is essential for pc-board-applications. Thin boards are recommended to minimize the parasitic inductance to ground.

Typical S-Parameters at T_A = 25 °C

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
V_D = 3 V, Z_o = 50 Ω								
0.1	0.5686	-8.5	9.314	170.6	0.0268	12.7	0.2808	-8.6
0.5	0.5066	-19.2	8.393	149.4	0.0248	11.7	0.2613	-3.8
0.8	0.4404	-28.7	7.352	135.2	0.0236	25.6	0.2361	-6.7
1	0.3904	-34.6	6.69	126.8	0.024	35.9	0.2144	-9
1.5	0.2841	-50.5	5.244	111.1	0.0314	57.2	0.1398	-15
1.8	0.2343	-60.6	4.567	104	0.0378	63.5	0.0979	-18.2
1.9	0.2136	-64.1	4.355	102	0.0406	66.1	0.0838	-21.5
2	0.2062	-68.4	4.165	99.7	0.0426	67.2	0.0689	-22.2
2.4	0.1688	-89.7	3.417	91.7	0.0549	71.4	0.0224	-48
3	0.1558	-104.9	2.861	85.3	0.0682	73.1	0.0284	-147.5

Spice-model BGA 420



T1	T501
R_1	14.5kΩ
R_2	140Ω
R_3	2.4kΩ
C_1	2.3pF
C_{P1}	0.2pF
C_{P2}	0.2pF
C_{P3}	0.6pF
C_{P4}	0.1pF

Transistor Chip Data T1 (Berkley-SPICE 2G.6 Syntax) :

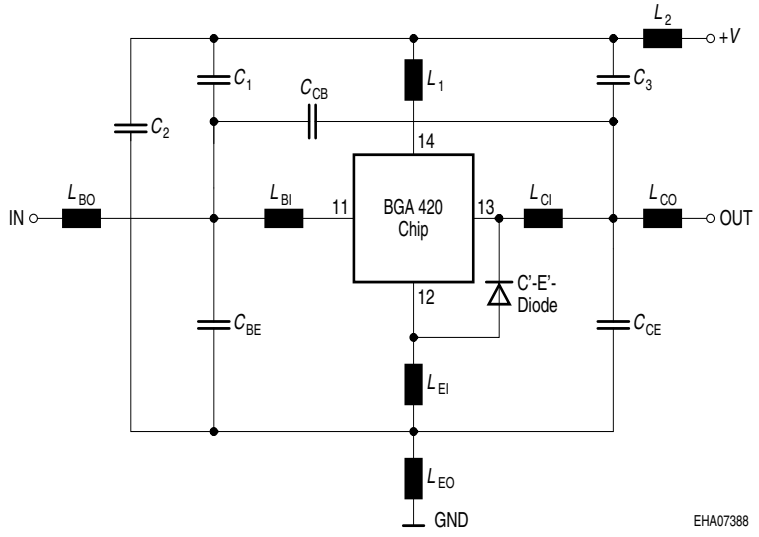
IS =	0.21024	fA	BF =	83.23	-	NF =	1.0405	-
VAF =	39.251	V	IKF =	0.16493	A	ISE =	15.761	fA
NE =	1.7763	-	BR =	10.526	-	NR =	0.96647	-
VAR =	34.368	V	IKR =	0.25052	A	ISC =	0.037223	fA
NC =	1.3152	-	RB =	15	Ω	IRB =	0.21215	A
RBM =	1.3491	Ω	RE =	1.9289		RC =	0.12691	Ω
CJE =	3.7265	fF	VJE =	0.70367	V	MJE =	0.37747	-
TF =	4.5899	ps	XTF =	0.3641	-	VTF =	0.19762	V
ITF =	1.3364	mA	PTF =	0	deg	CJC =	96.941	fF
VJC =	0.99532	V	MJC =	0.48652	-	XCJC =	0.08161	-
TR =	1.4935	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	XTB =	0	-	EG =	1.11	eV
XTI =	3	-	FC =	0.99469	-	TNOM	300	K

C'-E'-Diode Data (Berkley-SPICE 2G.6 Syntax) :

IS =	2	fA	N =	1.02	-	RS =	20	Ω

All parameters are ready to use, no scaling is necessary

Package Equivalent Circuit:



L_{BI} =	0.36	nH
L_{BO} =	0.4	nH
L_{EI} =	0.3	nH
L_{EO} =	0.15	nH
L_{CI} =	0.36	nH
L_{CO} =	0.4	nH
C_{BE} =	95	fF
C_{CB} =	6	fF
C_{CE} =	132	fF
C_1 =	28	fF
C_2 =	88	fF
C_3 =	8	fF
L_1 =	0.6	nH
L_2 =	0.4	nH

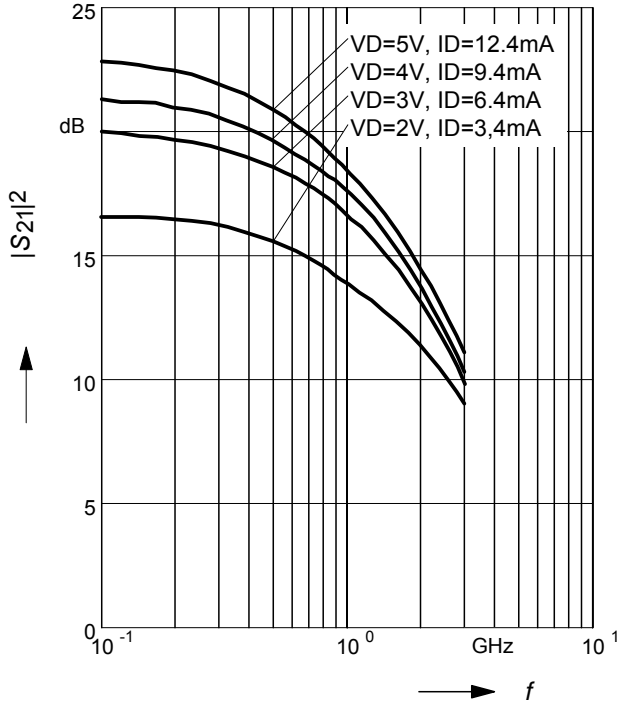
Valid up to 3GHz

Extracted on behalf of Infineon Technologies AG by:
Institut für Mobil-und Satellitentechnik (IMST)

For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet:
http://www.infineon.com/silicondiscretes

Insertion power gain $|S_{21}|^2 = f(f)$

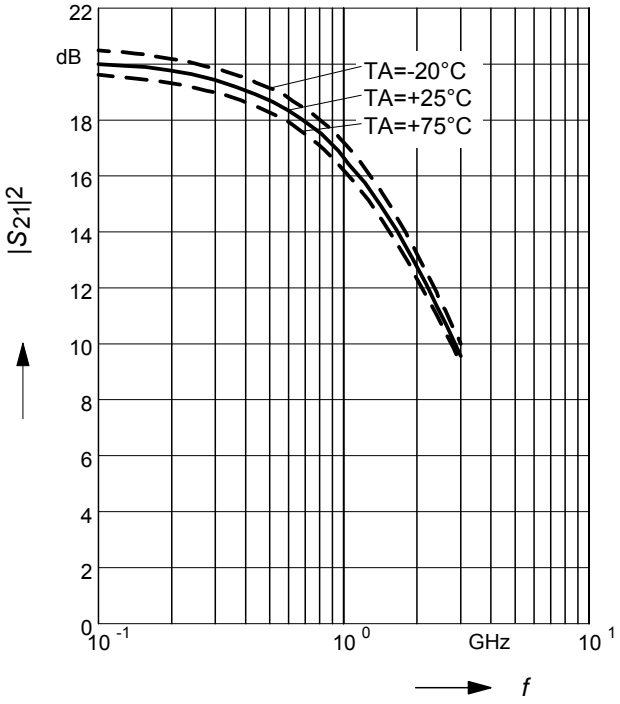
V_D, I_D = parameter



Insertion power gain $|S_{21}|^2 = f(f)$

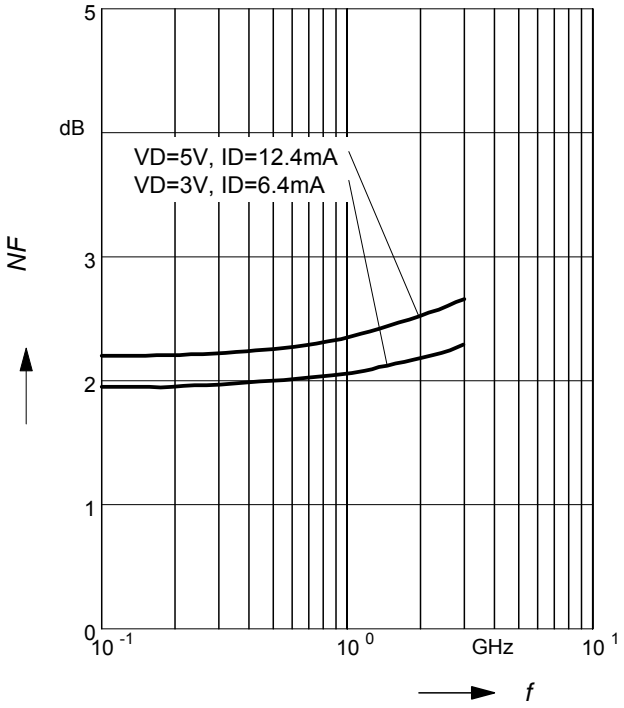
V_D = 3 V

T_A = parameter



Noise figure $NF = f(f)$

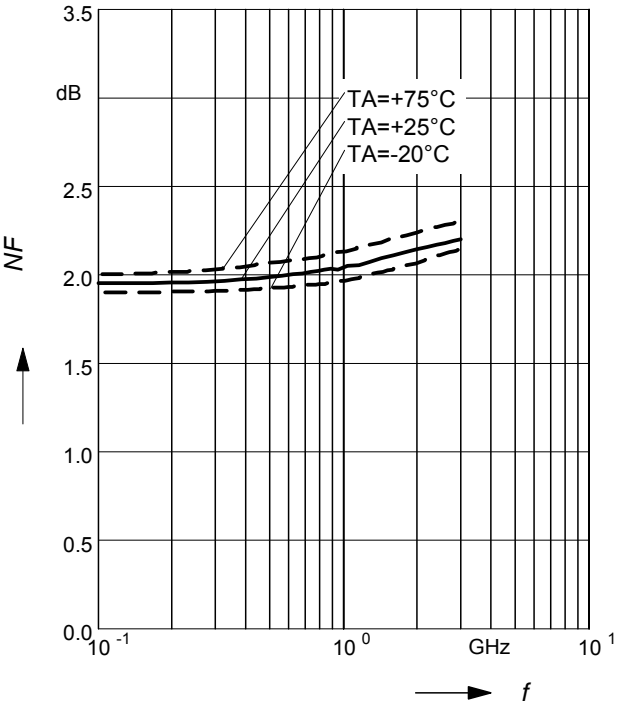
V_D,I_D = parameter



Noise figure $NF = f(f)$

V_D = 3V

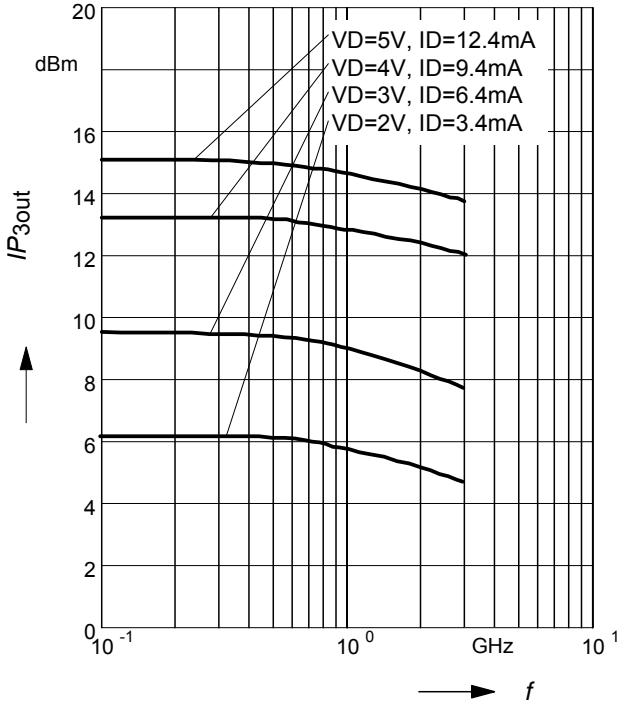
T_A = parameter



Intercept point at the output

$IP_{3out} = f(f)$

V_D, I_D = parameter



Intercept point at the output

$IP_{3out} = f(f)$, V_D = 3V

T_A = parameter