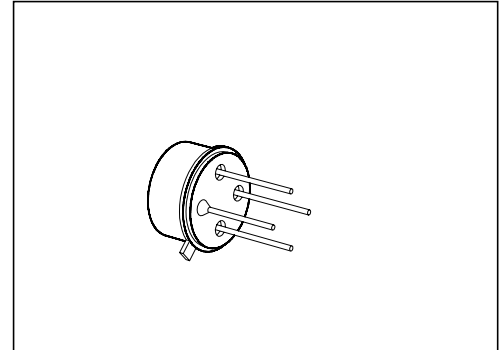


GaAs MMIC

CGY 31

- Two-stage monolithic microwave IC (MMIC amplifier)
- All-gold metallization
- Chip fully passivated
- Operating voltage range: 3 to 6 V
- $50\ \Omega$ input/output; $RL_{IN} RL_{OUT} > 10\ \text{dB}$
- Gain: 18 dB at 1.6 GHz
- Low noise figure: 4 dB at 1.6 GHz
- 3 dB bandwidth: 2 GHz
- Hermetically sealed package



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Ordering Code	Circuit Diagram (Pin Configuration)	Package ¹⁾
CGY 31	Q68000-A6887	<p>1 RF output, V_S 2 Interstage, V_S 3 RF input 4 RF and DC ground, case</p> <p>EHA07019</p>	TO-12

¹⁾ For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values	Unit
Supply voltage, $T_c \leq 80 \text{ }^\circ\text{C}$	V_S	6	V
Total power dissipation, $T_c \leq 50 \text{ }^\circ\text{C}$	P_{tot}	2	W
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	- 55 ... + 150	

Thermal Resistance

Channel - case	R_{thchC}	50	K/W
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Note: Exceeding any of the maximum ratings may cause permanent damage to the device. Appropriate handling procedures are required to protect the electrostatic sensitive IC against degradation due to excess voltage or excess current spikes. Excellent ground connection of lead 4 and the package (e. g. soldered on microstripline laminate) is required to achieve guaranteed RF performance and stable operation conditions and provides adequate heat sink. Low parasitic capacitance of the bias network to port 2 gives optimum gain and flatness. Input and output connections must be DC isolated by coupling capacitors.

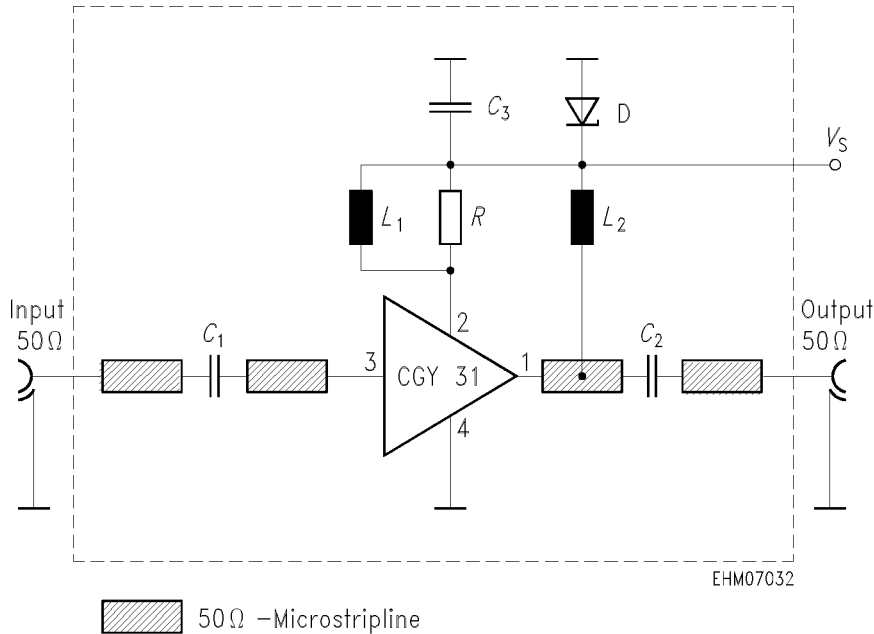
Electrical Characteristics

at $T_A = 25\text{ °C}$, $V_S = 4.5\text{ V}$, $R_S = R_L = 50\text{ }\Omega$, unless otherwise specified,
(for application circuit see next page).

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Operating current	I_{op}	–	160	200	mA
Power gain $f = 800\text{ MHz to }1800\text{ MHz}$	G	15	18	–	dB
Gain flatness $f = 800\text{ MHz to }1800\text{ MHz}$	ΔG	–	2.0	2.5	
Noise figure $f = 800\text{ MHz to }1800\text{ MHz}$	F	–	4.0	5.0	
Input return loss $f = 800\text{ MHz to }1800\text{ MHz}$	RL_{IN}	–	13	9.5	
Output return loss $f = 800\text{ MHz to }1800\text{ MHz}$	RL_{OUT}	–	12	9.5	
Third order intercept point two-tone intermodulation test $f = 806\text{ MHz}$, $f = 810\text{ MHz}$, $P_o = 10\text{ dBm}$ (both carriers)	IP_3	31	32.5	–	dBm
1 dB gain compression $f = 800\text{ MHz to }1800\text{ MHz}$	P_{1dB}	–	19	–	

Application Circuit

$f = 800 \text{ MHz to } 1800 \text{ MHz}$

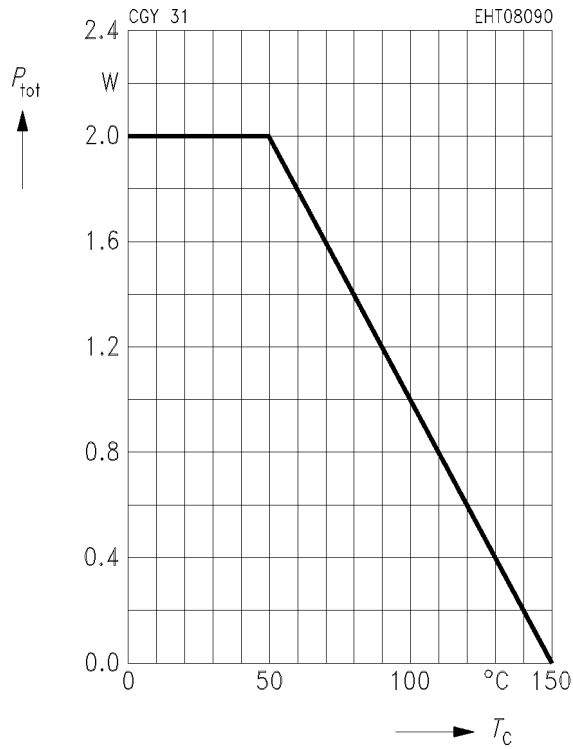


Legend of components

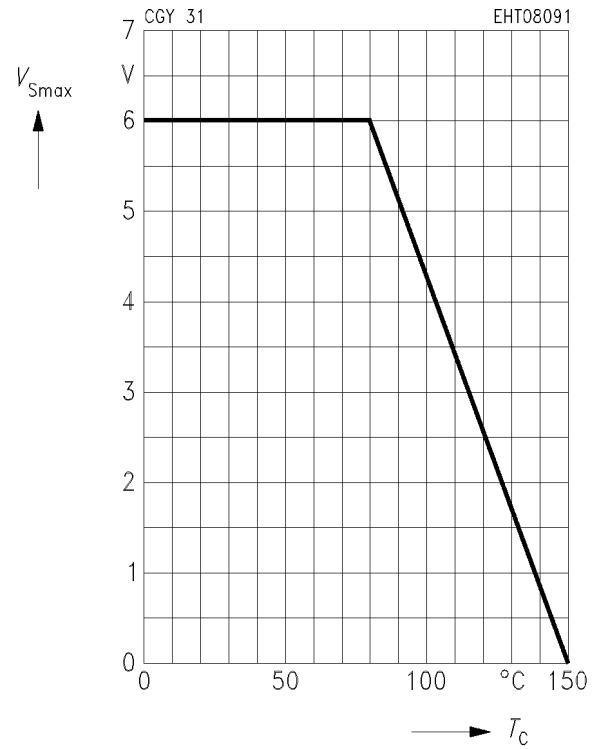
C_1, C_2, C_3	: 100 pF : 1 nF	} Chip capacitors
R_1	39 Ω	
L_1	70 nH	Resistor, e.g. $l = 4 \text{ mm}$; $\varnothing 1.8 \text{ mm}$ with axial leads Inductance, e.g. 8 turns, 0.25 mm enamelled copper wire wound on R . The geometrical combination of L_1 and R influences the frequency response.
L_2	40 nH	Inductance, e.g. 5 turns, 0.25 enamelled copper wire wound on M3-nylon rod.
D	6 V 2	Zener diode, 1.3 W (type BZW 22 C 6 V 2).

Note: For lower frequencies ($f = 100 \dots 900 \text{ MHz}$) the performance of CGY 31 is comparable to that of CGY 21, if an interstage circuit with $L_1 = 1 \mu\text{H}$ is connected.

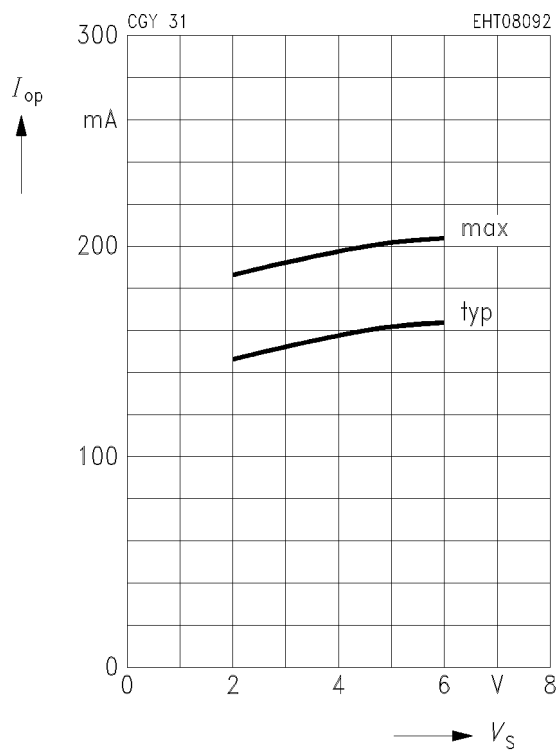
Total power dissipation $P_{tot} = f(T_c)$



Max. supply voltage $V_{Smax} = f(T_c)$

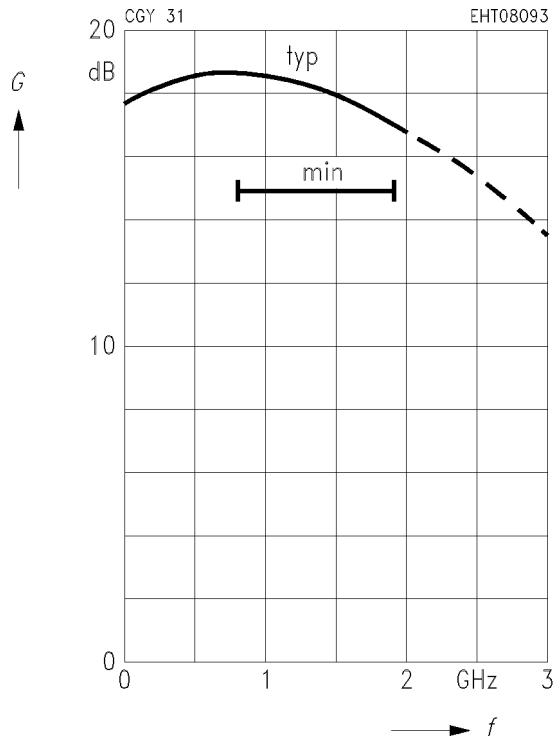


Operating current $I_{op} = f(V_s)$



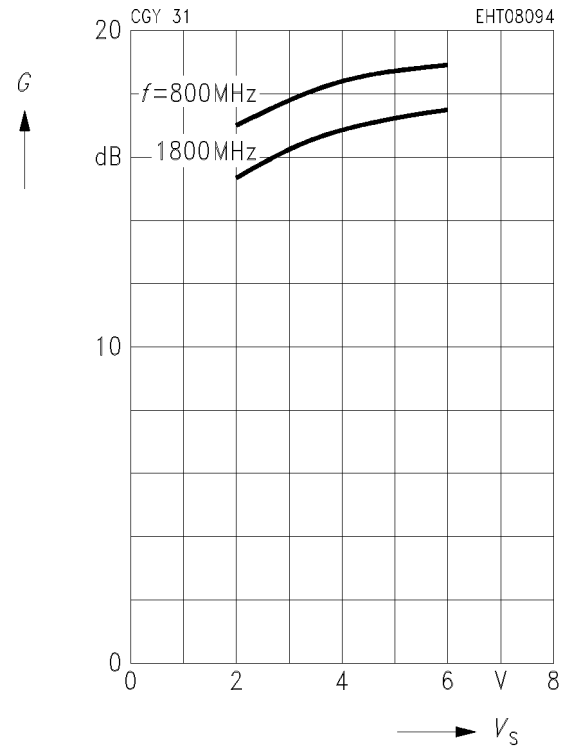
Power gain $G = f(f)$

$V_s = 4.5 \text{ V}, R_s = R_L = 50 \Omega$



Power gain $G = f(V_s)$

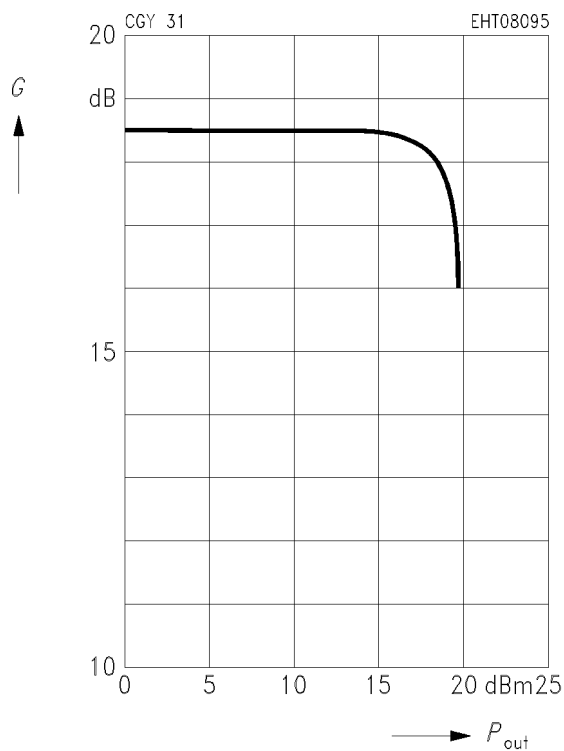
$R_s = R_L = 50 \Omega$



Power output $G = f(P_{out})$

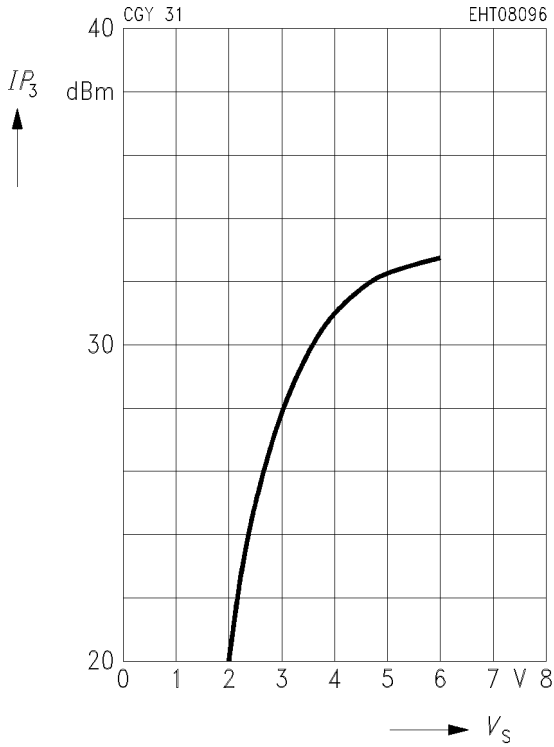
$V_s = 4.5 \text{ V}, R_s = R_L = 50 \Omega$

$f = 0.8 \text{ GHz}$



Third order intercept point $IP_3 = f(V_s)$

$f = 0.8 \text{ GHz}, R_s = R_L = 50 \Omega$



The intermodulation ratio d_{IM} can easily be determined.

$$d_{IM} = 2 (IP_3 - P_0)$$

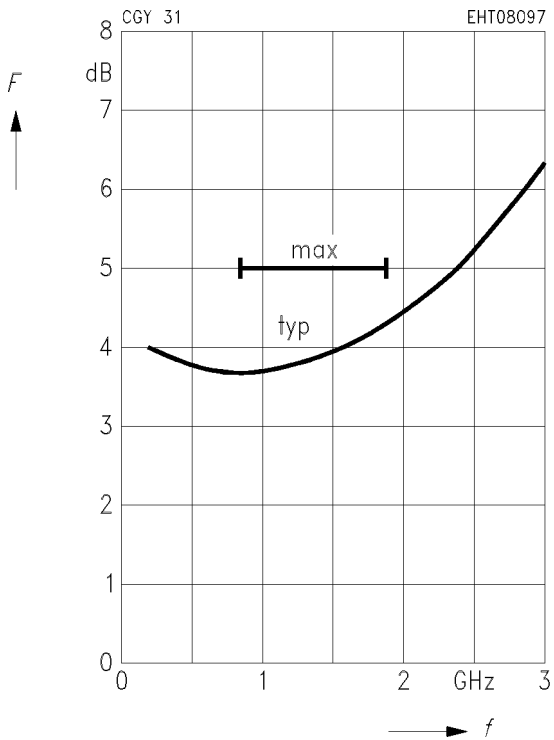
IP_3 = Intercept point

d_{IM} = Intermodulation ratio

P_0 = Power level of each carrier in dBm

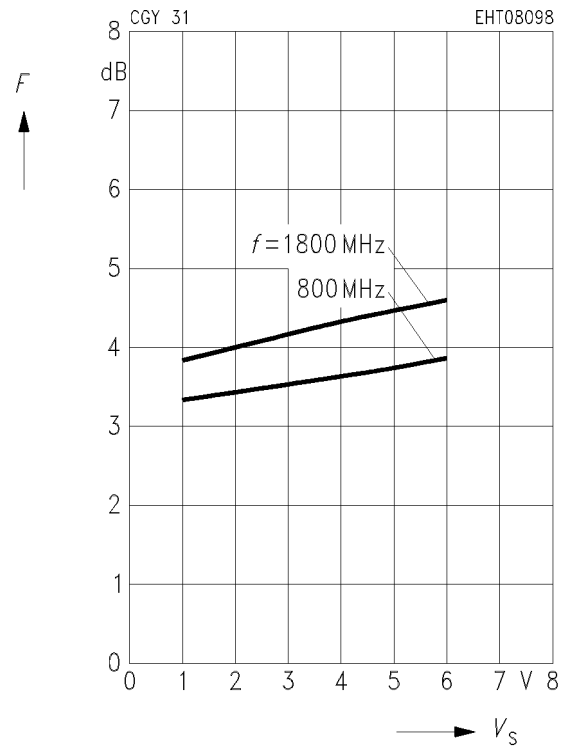
Noise figure $F = f(f)$

$V_s = 4.5 \text{ V}, R_s = R_L = 50 \Omega$



Noise figure $F = f(V_s)$

$R_s = R_L = 50 \Omega$

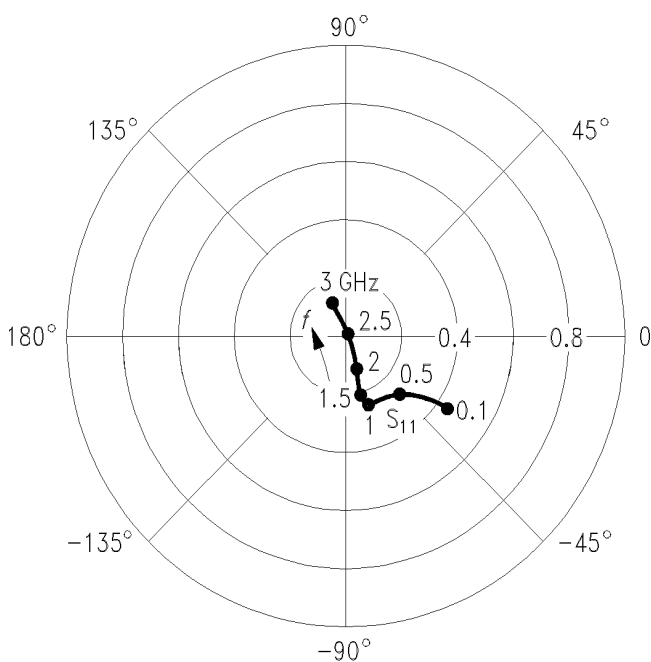


S Parameters

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHZ	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
$V_s = 4.5\text{ V}, Z_0 = 50\ \Omega$								
0.1	0.42	- 35	7.77	23	0.007	31	0.25	- 19
0.3	0.28	- 42	8.93	- 12	0.008	21	0.21	- 20
0.5	0.26	- 51	9.04	- 34	0.008	21	0.21	- 23
0.7	0.25	- 64	9.16	- 52	0.009	22	0.22	- 30
0.9	0.24	- 72	9.15	- 71	0.009	28	0.23	- 34
1.1	0.24	- 76	8.99	- 90	0.010	27	0.24	- 36
1.3	0.23	- 78	8.62	- 109	0.010	29	0.25	- 35
1.5	0.22	- 77	8.15	- 127	0.011	30	0.27	- 31
1.7	0.19	- 73	7.52	- 145	0.011	29	0.30	- 26
1.9	0.16	- 71	6.80	- 162	0.011	32	0.33	- 22
2.1	0.12	- 66	6.06	- 179	0.012	33	0.35	- 17
2.3	0.06	- 56	5.45	165	0.011	35	0.36	- 13
2.5	0.02	- 8	4.81	150	0.012	36	0.36	- 11
2.7	0.06	107	4.15	135	0.012	36	0.35	- 10
2.9	0.11	108	3.43	121	0.012	41	0.34	- 13
3.1	0.15	111	2.68	110	0.014	40	0.33	- 20

$S_{11} = f(f)$

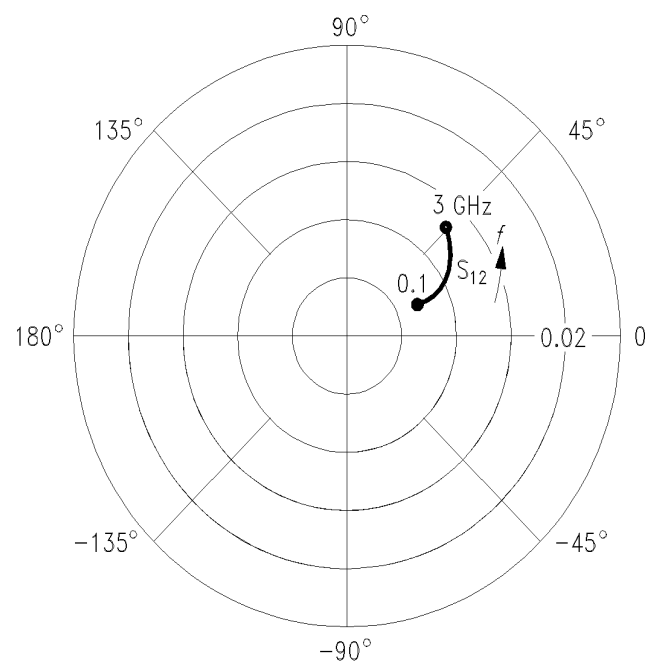
$V_s = 4.5\text{ V}, Z_0 = 50\ \Omega$



EHT08099

$S_{12} = f(f)$

$V_s = 4.5\text{ V}, Z_0 = 50\ \Omega$

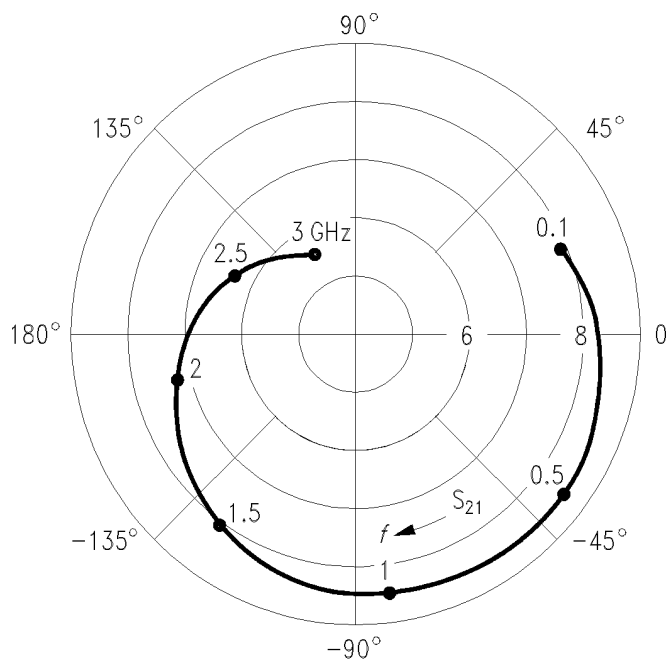


EHT08100

S Parameters (continued)

$$S_{21} = f(f)$$

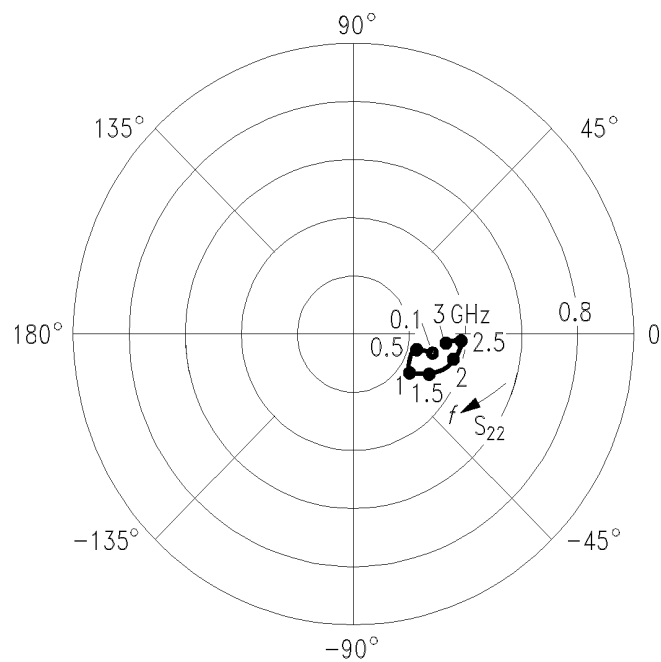
$V_s = 4.5 \text{ V}, Z_0 = 50 \ \Omega$



EHT08101

$$S_{22} = f(f)$$

$V_s = 4.5 \text{ V}, Z_0 = 50 \ \Omega$



EHT08102