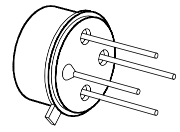
SIEMENS

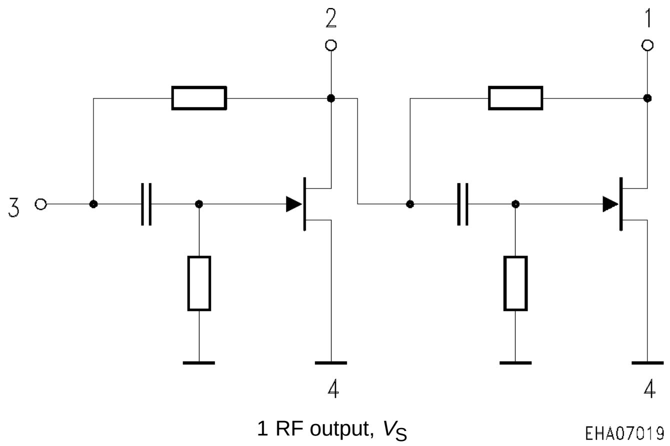
GaAs MMIC

CGY 31

- Two-stage monolithic microwave IC (MMIC amplifier)
- All-gold metallization
- Chip fully passivated
- Operating voltage range: 3 to 6 V
- 50 Ω input/output; RL_{IN} RL_{OUT} > 10 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: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Ordering Code	Circuit Diagram (Pin Configuration)	Package¹⁾
CGY 31	Q68000-A6887	 1 RF output, V_S 2 Interstage, V_S 3 RF input 4 RF and DC ground, case	TO-12

[1] For detailed information see chapter Package Outlines.

Maximum Ratings

Parameter	Symbol	Values	Unit
Supply voltage, $T_C \leq 80$ ˚C	V_S	6	V
Total power dissipation, $T_C \leq 50$ ˚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

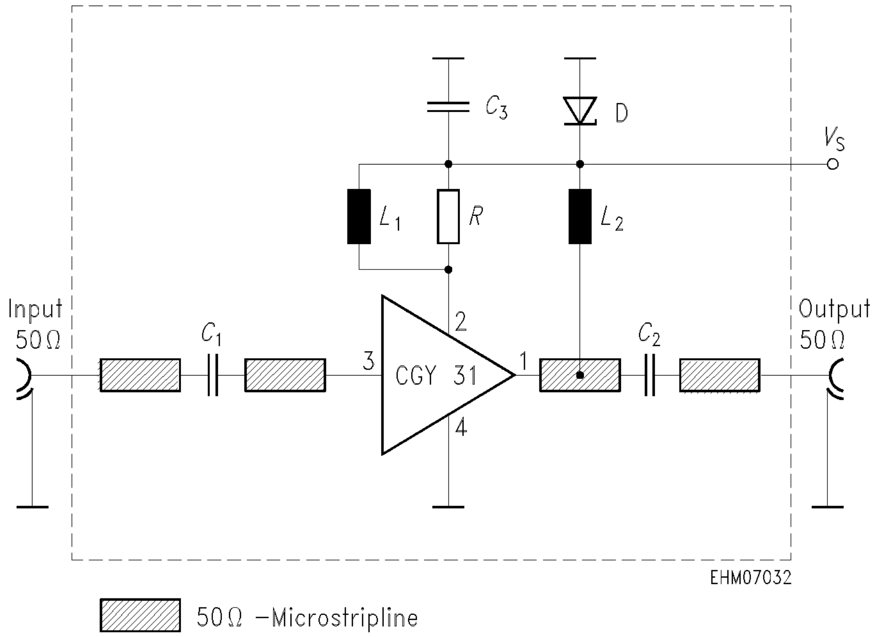
Note: Exceeding any of the maximum ratings may cause permanent damage to the device. Appropriate handling procedures are required to protect the electrostatic sensitive IC against degradation due to excess voltage or excess current spikes. Excellent ground connection of lead 4 and the package (e. g. 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 ˚C, V_S = 4.5 V, R_S = R_L = 50 Ω, 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 MHz to 1800 MHz	G	15	18	–	dB
Gain flatness f = 800 MHz to 1800 MHz	ΔG	–	2.0	2.5	
Noise figure f = 800 MHz to 1800 MHz	F	–	4.0	5.0	
Input return loss f = 800 MHz to 1800 MHz	RL_{IN}	–	13	9.5	
Output return loss f = 800 MHz to 1800 MHz	RL_{OUT}	–	12	9.5	
Third order intercept point two-tone intermodulation test f_1 = 806 MHz, f_2 = 810 MHz, P_o = 10 dBm (both carriers)	IP_3	31	32.5	–	dBm
1 dB gain compression f = 800 MHz to 1800 MHz	P_{1dB}	–	19	–	

Application Circuit

f = 800 MHz to 1800 MHz

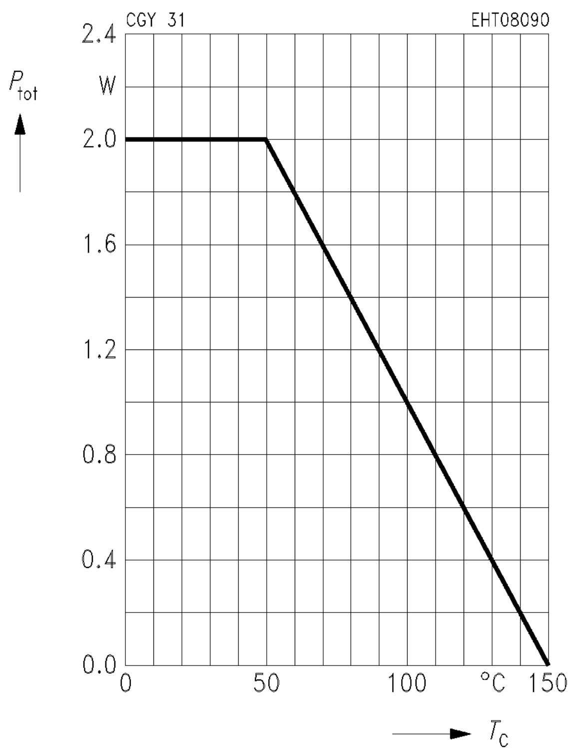


Legend of components

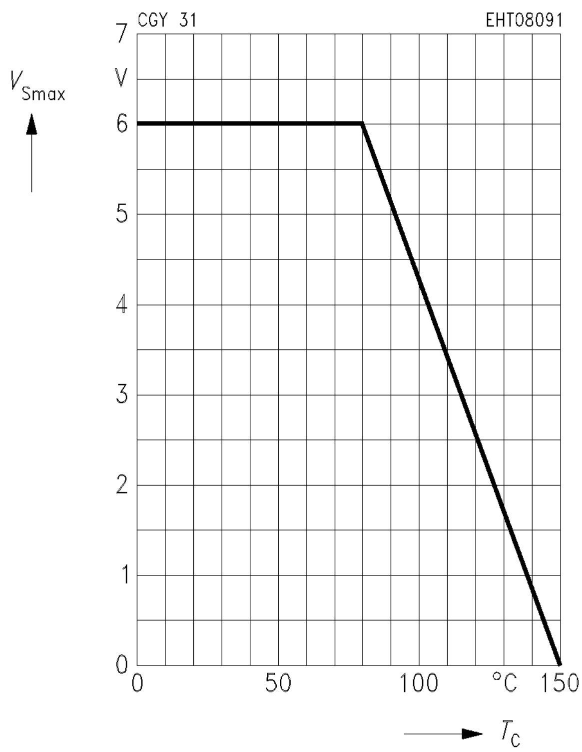
C_1, C_2, C_3	: 100 pF : 1 nF	Chip capacitors
R_1 L_1	39 Ω 70 nH	Resistor, e.g. l = 4 mm; ∅1.8 mm with axial leads Inductance, e.g. 8 turns, 0.25 mm enamelled copper wire wound on R. The geometrical combination of L_1 and R influences the frequency response.
L_2	40 nH	Inductance, e.g. 5 turns, 0.25 enamelled 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 … 900 MHz) the performance of CGY 31 is comparable to that of CGY 21, if an interstage circuit with L_1 = 1 µH is connected.

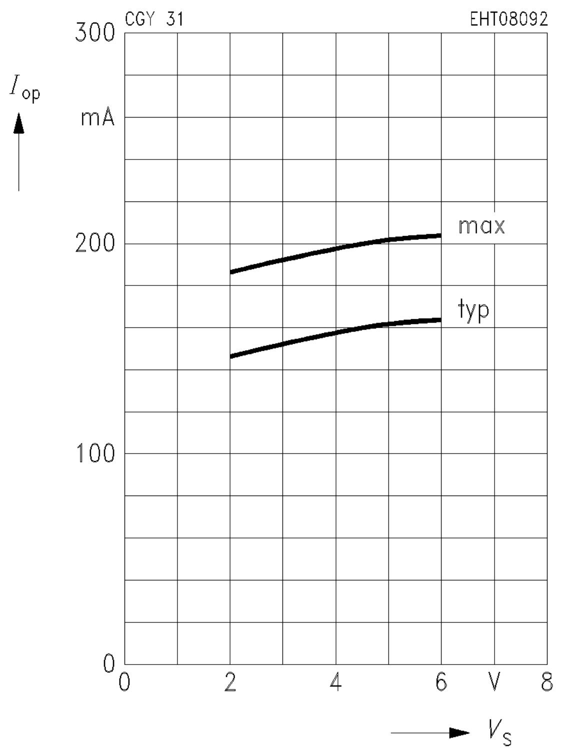
Total power dissipation $P_{tot} = f(T_C)$



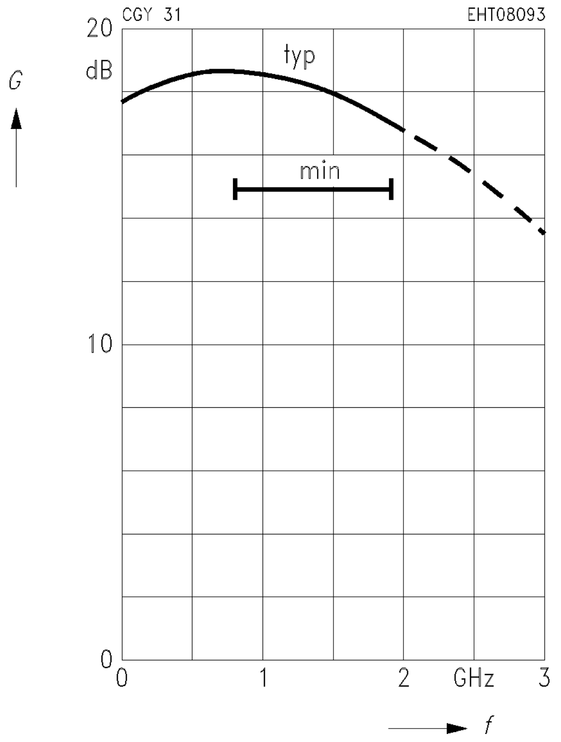
Max. supply voltage $V_{Smax} = f(T_C)$



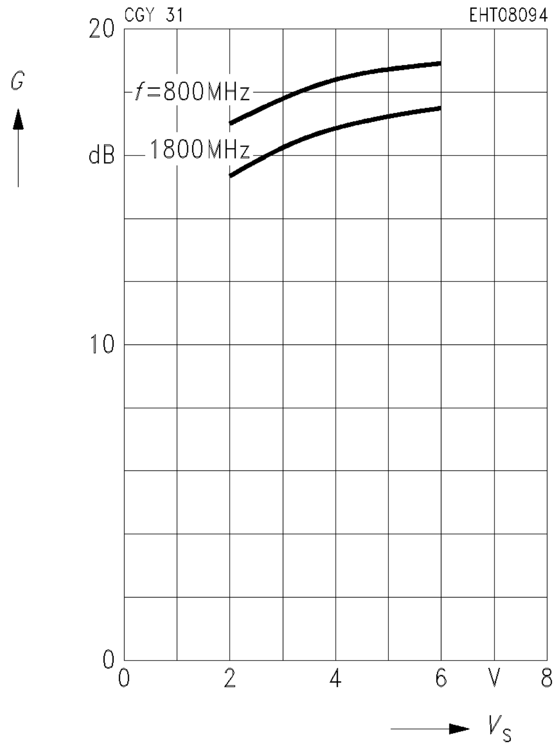
Operating current $I_{op} = f(V_S)$



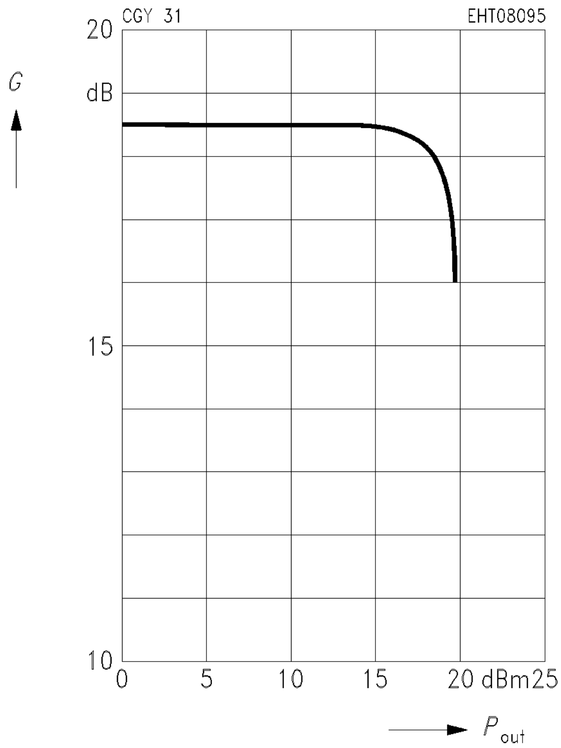
Power gain $G = f(f)$
$V_S = 4.5$ V, $R_S = R_L = 50\ \Omega$



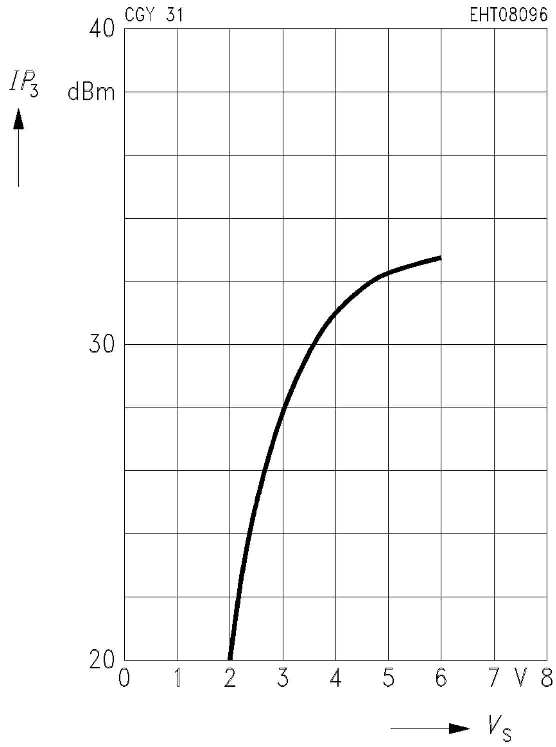
Power gain $G = f(V_S)$
$R_S = R_L = 50\ \Omega$



Power output $G = f(P_{out})$
$V_S = 4.5$ V, $R_S = R_L = 50\ \Omega$
f= 0.8 GHz



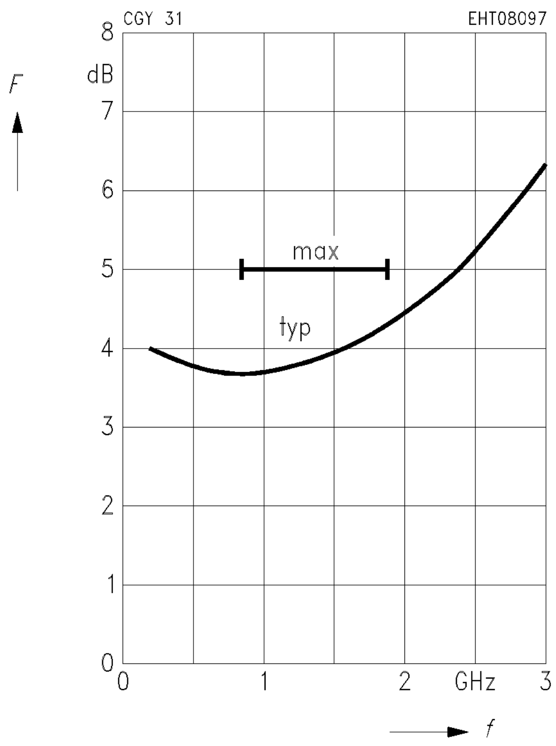
Third order intercept point $IP_3 = f(V_S)$
$f = 0.8$ GHz, $R_S = R_L = 50\ \Omega$



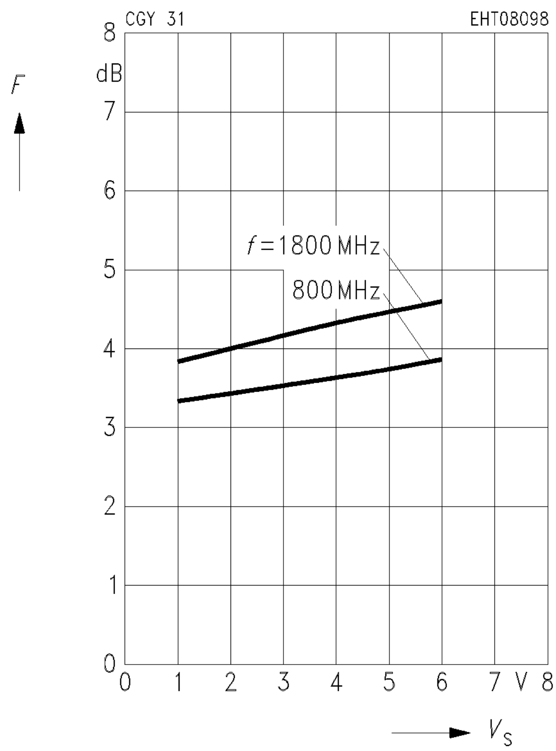
The intermodulation ratio d_{IM} can easily be determined.
$d_{IM} = 2\ (IP_3 - P_0)$

IP_3 = Intercept point
d_{IM} = Intermodulation ratio
P_0 = Power level of each carrier in dBm

Noise figure $F = f(f)$
$V_S = 4.5$ V, $R_S = R_L = 50\ \Omega$



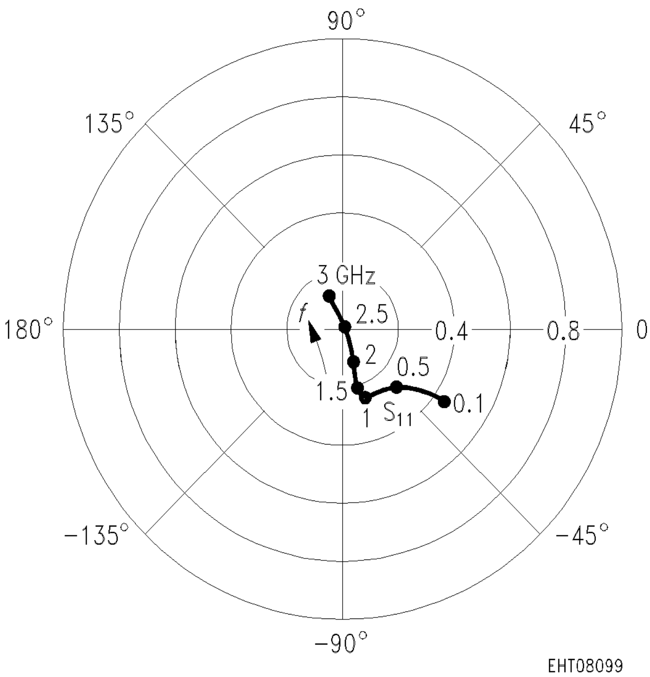
Noise figure $F = f(V_S)$
$R_S = R_L = 50\ \Omega$



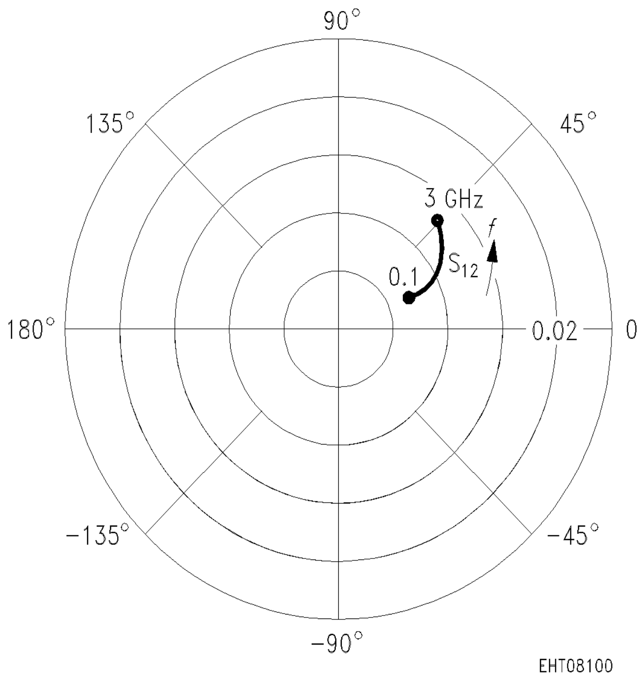
S Parameters

f	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
V_S = 4.5 V, Z_0 = 50 Ω								
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 V, Z_0 = 50 Ω

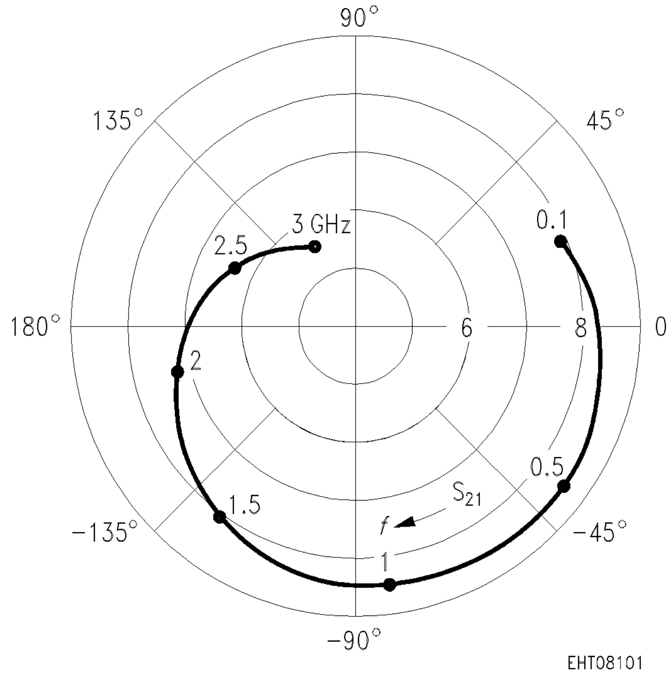


S_{12} = *f* (*f*)
V_S = 4.5 V, Z_0 = 50 Ω



S Parameters (continued)

***S_{21}* = *f* (*f*)**
V_S = 4.5 V, Z_0 = 50 Ω



***S_{22}* = *f* (*f*)**
V_S = 4.5 V, Z_0 = 50 Ω