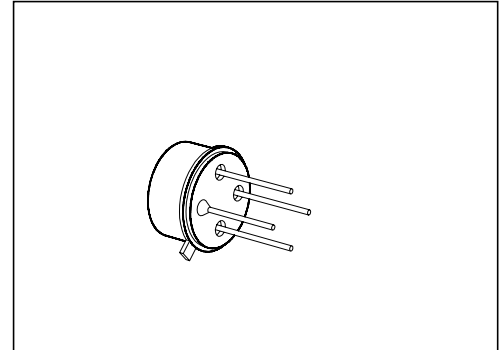


## GaAs MMIC

**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 <sup>1)</sup> |
|--------|---------------|--|-----------------------|
| CGY 31 | Q68000-A6887  | <p>1 RF output, <math>V_S</math><br/>                 2 Interstage, <math>V_S</math><br/>                 3 RF input<br/>                 4 RF and DC ground, case</p> <p>EHA07019</p> | TO-12                 |

<sup>1)</sup> 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, $T_c \leq 50 \text{ }^\circ\text{C}$ | $P_{\text{tot}}$ | 2              | W    |
| Channel temperature   | $T_{\text{ch}}$  | 150            | °C   |
| Storage temperature range                                     | $T_{\text{stg}}$ | - 55 ... + 150 |      |

**Thermal Resistance**

|                |                    |    |     |
|----------------|--------------------|----|-----|
| Channel - case | $R_{\text{thchC}}$ | 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.

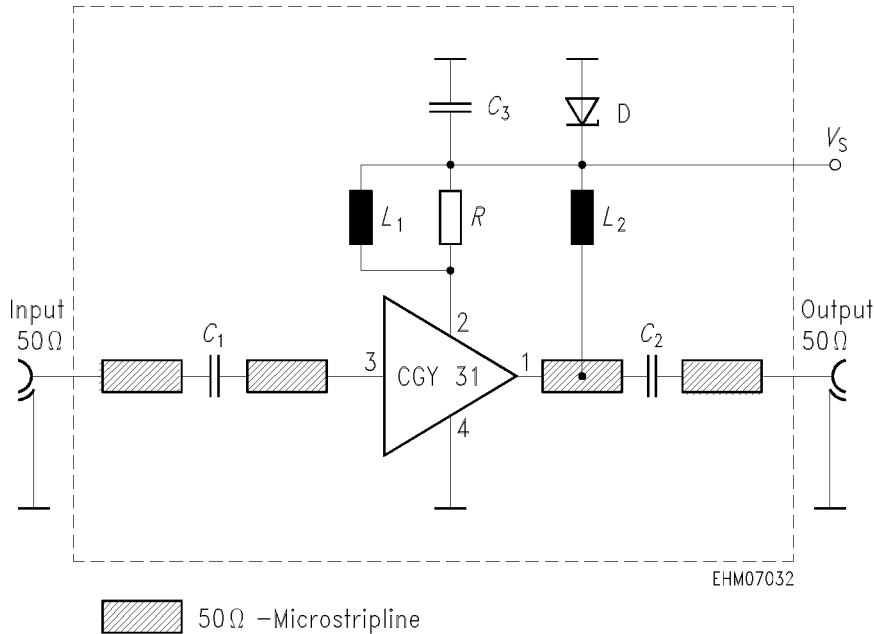
## Electrical Characteristics

at  $T_A = 25\text{ °C}$ ,  $V_S = 4.5\text{ V}$ ,  $R_S = R_L = 50\ \Omega$ , 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<br>$f = 800\text{ MHz to }1800\text{ MHz}$  | $G$        | 15     | 18   | –    | dB   |
| Gain flatness<br>$f = 800\text{ MHz to }1800\text{ MHz}$   | $\Delta G$ | –      | 2.0  | 2.5  |      |
| Noise figure<br>$f = 800\text{ MHz to }1800\text{ MHz}$  | $F$        | –      | 4.0  | 5.0  |      |
| Input return loss<br>$f = 800\text{ MHz to }1800\text{ MHz}$   | $RL_{IN}$  | –      | 13   | 9.5  |      |
| Output return loss<br>$f = 800\text{ MHz to }1800\text{ MHz}$  | $RL_{OUT}$ | –      | 12   | 9.5  |      |
| Third order intercept point<br>two-tone intermodulation test<br>$f = 806\text{ MHz}$ , $f = 810\text{ MHz}$ ,<br>$P_o = 10\text{ dBm}$ (both carriers) | $IP_3$     | 31     | 32.5 | –    | dBm  |
| 1 dB gain compression<br>$f = 800\text{ MHz to }1800\text{ MHz}$   | $P_{1dB}$  | –      | 19   | –    |      |

**Application Circuit**

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

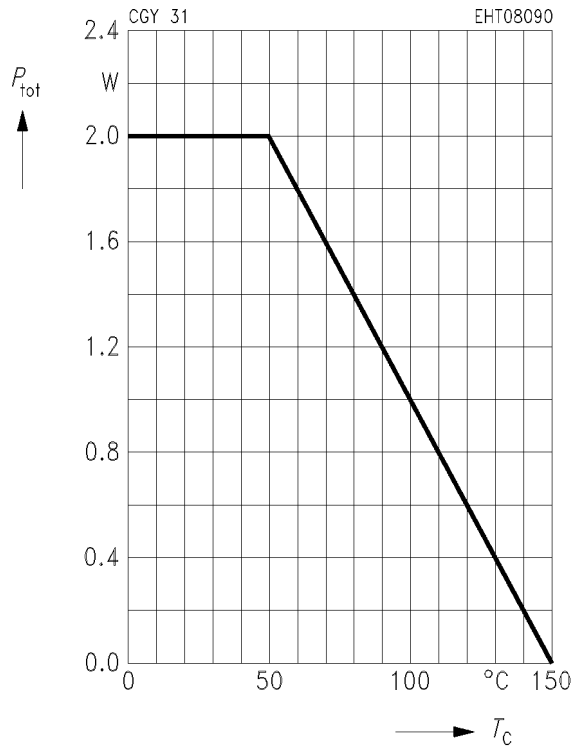


**Legend of components**

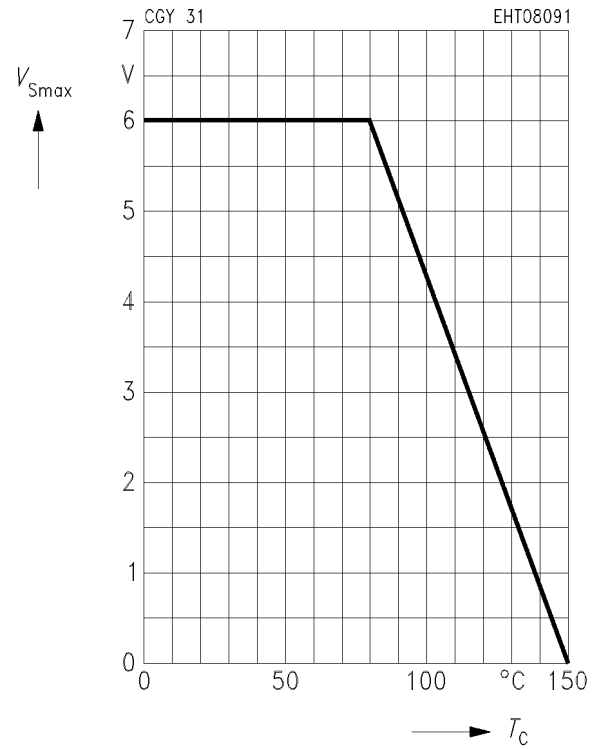
|                 |                    |   |
|-----------------|--------------------|---|
| $C_1, C_2, C_3$ | : 100 pF<br>: 1 nF | } Chip capacitors   |
| $R_1$           | 39 Ω               |   |
| $L_1$           | 70 nH              | Resistor, e.g. $l = 4 \text{ mm}$ ; $\varnothing 1.8 \text{ mm}$ with axial leads<br>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.

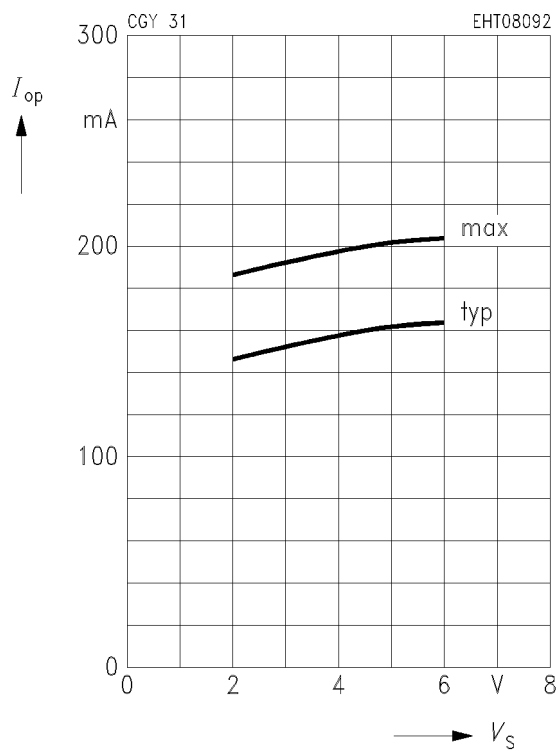
### Total power dissipation $P_{tot} = f(T_c)$



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

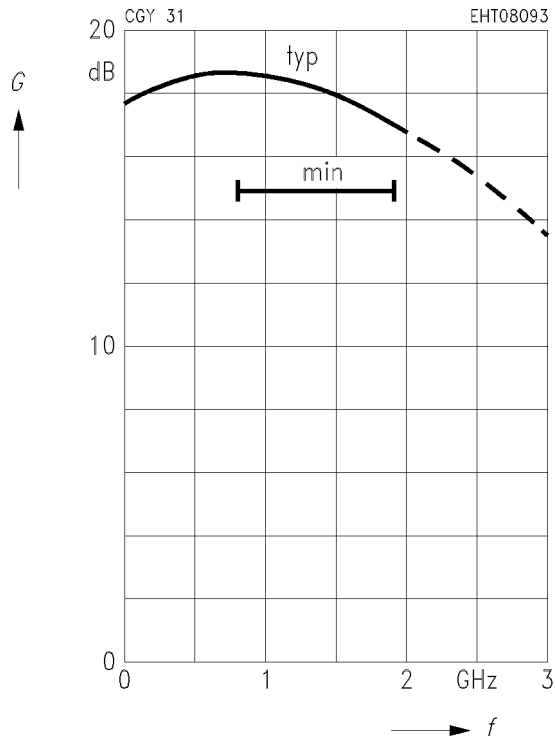


### Operating current $I_{op} = f(V_s)$



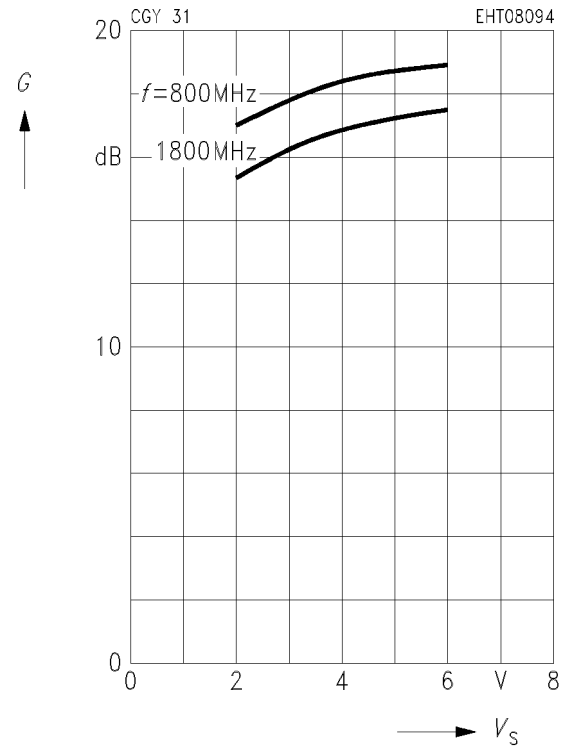
### Power gain $G = f(f)$

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



### Power gain $G = f(V_s)$

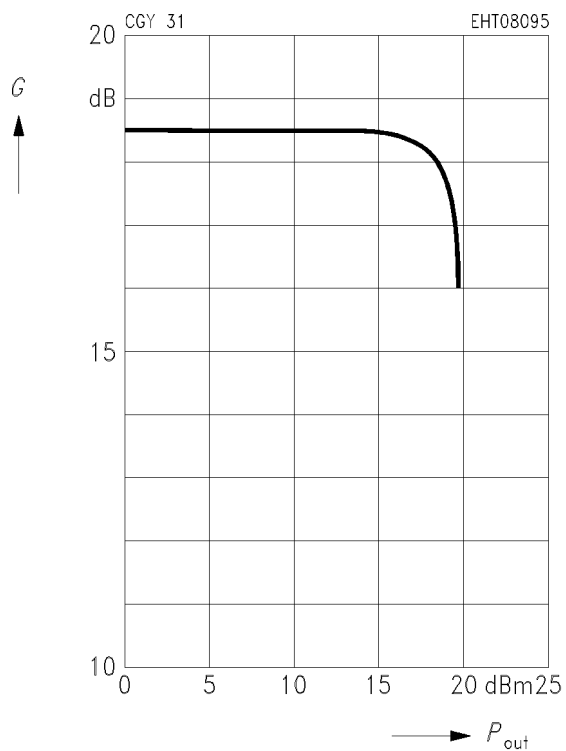
$R_s = R_L = 50 \Omega$



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

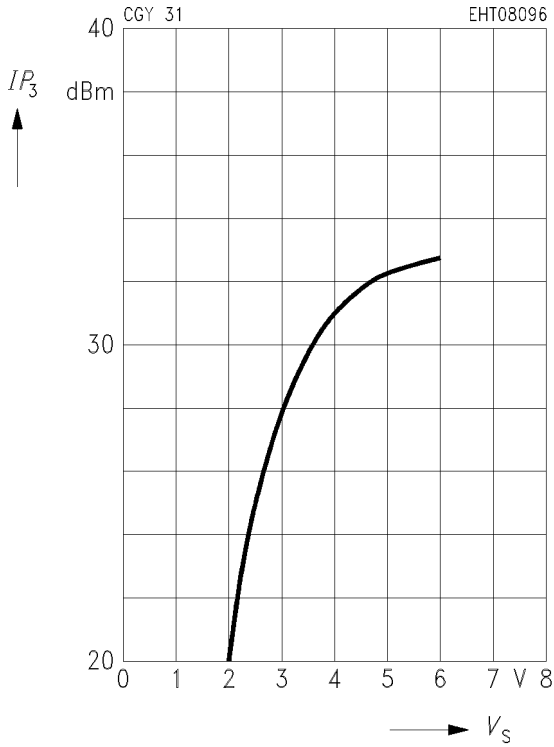
$V_s = 4.5 \text{ V}, R_s = R_L = 50 \Omega$

$f = 0.8 \text{ GHz}$



**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.

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

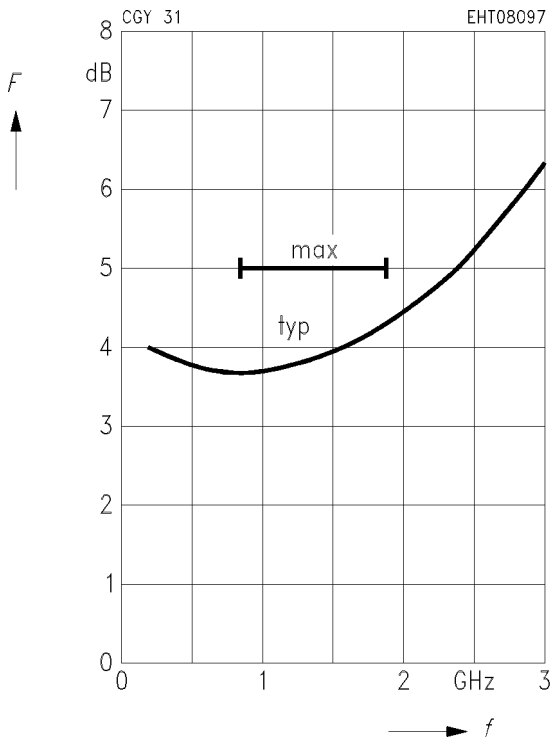
$IP_3$  = Intercept point

$d_{IM}$  = Intermodulation ratio

$P_0$  = Power level of each carrier in dBm

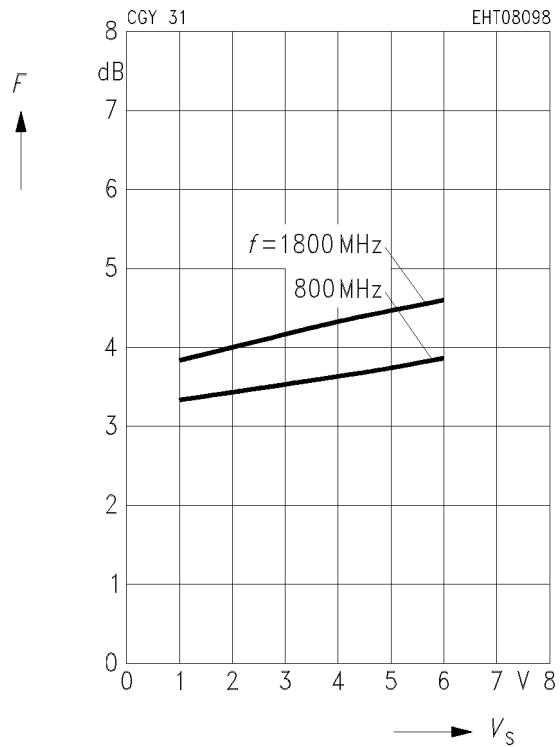
**Noise figure  $F = f(f)$**

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



**Noise figure  $F = f(V_s)$**

$R_s = R_L = 50 \Omega$

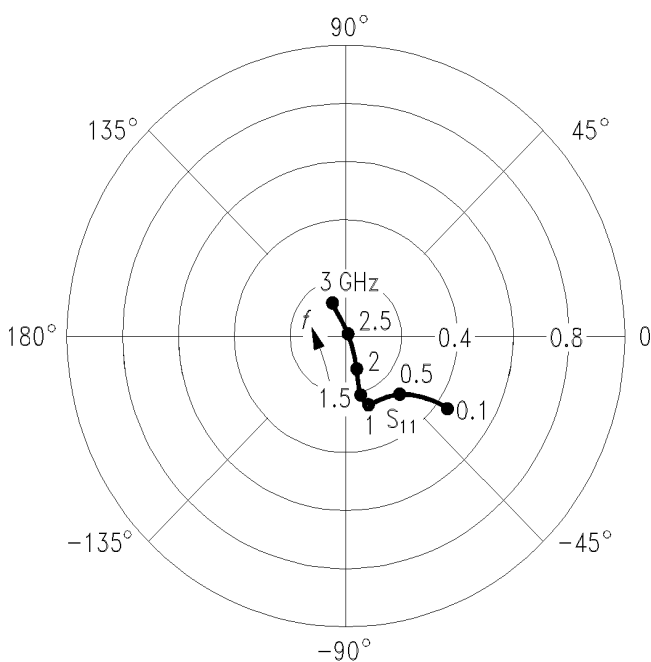


S Parameters

| $f$                                    | $S_{11}$ |      | $S_{21}$ |       | $S_{12}$ |     | $S_{22}$ |      |
|--|----------|------|----------|-------|----------|-----|----------|------|
| 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 |

$S_{11} = f(f)$

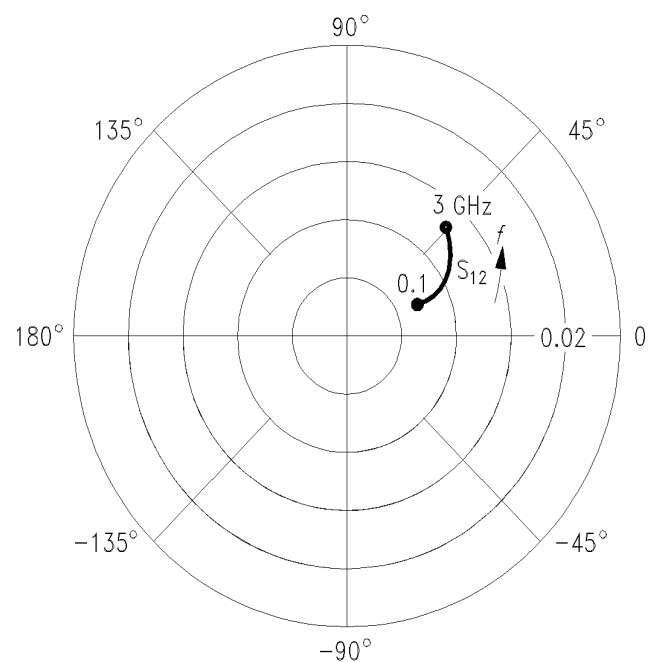
$V_s = 4.5 \text{ V}, Z_0 = 50 \Omega$



EHT08099

$S_{12} = f(f)$

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

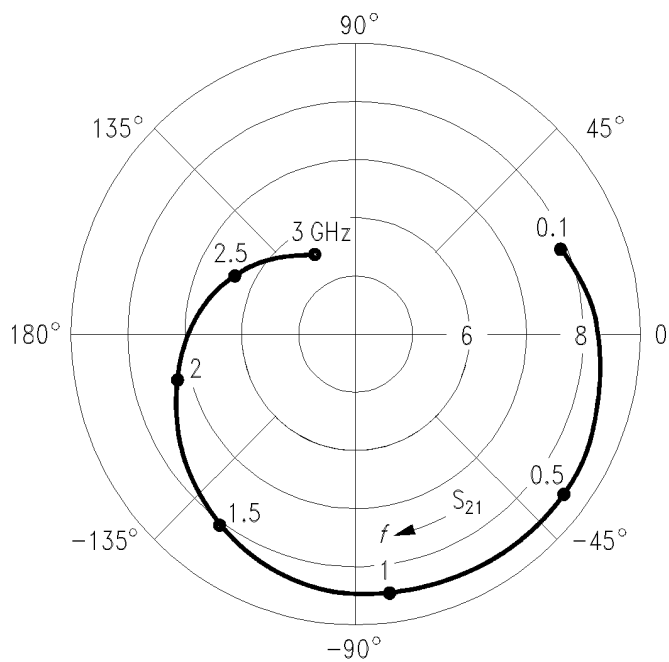


EHT08100

## S Parameters (continued)

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

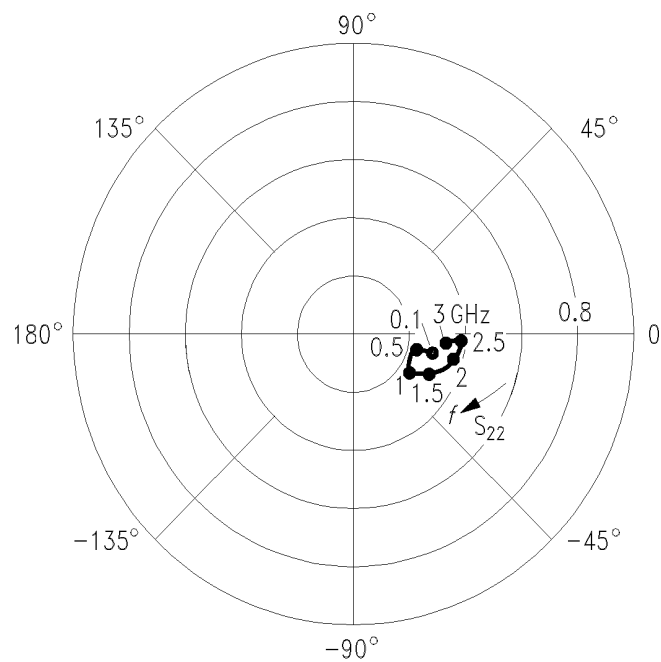
$V_s = 4.5 \text{ V}, Z_0 = 50 \text{ } \Omega$



EHT08101

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

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



EHT08102



LittleDiode supplies new, hard to find or obsolete electronic components and semiconductors all over the world.

With over two million different components listed you are sure to find the part you need.

Feel free to visit us today at our online store:

[LittleDiode.com](http://LittleDiode.com)

Looking forward to providing you with the best possible service.