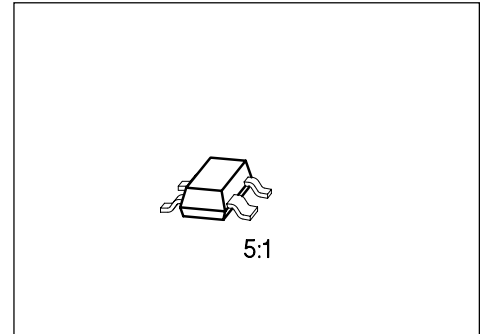


## Silicon N Channel MOSFET Tetrode

**BF 996 S**

- For input stages in UHF TV tuners
- High transconductance
- Low noise figure



| Type     | Marking | Ordering Code<br>(tape and reel) | Pin Configuration |   |                |                | Package <sup>1)</sup> |
|----------|---------|----------------------------------|-------------------|---|----------------|----------------|-----------------------|
|          |         |                                  | 1                 | 2 | 3              | 4              |                       |
| BF 996 S | MH      | Q62702-F1021                     | S                 | D | G <sub>2</sub> | G <sub>1</sub> | SOT-143               |

### Maximum Ratings

| Parameter                                         | Symbol           | Values         | Unit             |
|---------------------------------------------------|------------------|----------------|------------------|
| Drain-source voltage                              | $V_{DS}$         | 20             | V                |
| Drain current                                     | $I_D$            | 30             | mA               |
| Gate 1/gate 2 peak source current                 | $\pm I_{G1/2SM}$ | 10             |                  |
| Total power dissipation, $T_A < 76^\circ\text{C}$ | $P_{tot}$        | 200            | mW               |
| Storage temperature range                         | $T_{stg}$        | - 55 ... + 150 | $^\circ\text{C}$ |
| Channel temperature                               | $T_{ch}$         | 150            |                  |

### Thermal Resistance

|                            |             |       |     |
|----------------------------|-------------|-------|-----|
| Junction - soldering point | $R_{th JS}$ | < 370 | K/W |
|----------------------------|-------------|-------|-----|

<sup>1)</sup> For detailed information see chapter Package Outlines.

**Electrical Characteristics**

at  $T_A = 25\text{ °C}$ , unless otherwise specified.

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**DC Characteristics**

|                                                                                                                    |                            |     |   |     |    |
|--------------------------------------------------------------------------------------------------------------------|----------------------------|-----|---|-----|----|
| Drain-source breakdown voltage<br>$I_D = 10\text{ }\mu\text{A}$ , $-V_{G1S} = -V_{G2S} = 4\text{ V}$               | $V_{(BR)\text{ DS}}$       | 20  | — | —   | V  |
| Gate 1 source breakdown voltage<br>$\pm I_{G1S} = 10\text{ mA}$ , $V_{G2S} = V_{DS} = 0$                           | $\pm V_{(BR)\text{ G1SS}}$ | 8.5 | — | 14  |    |
| Gate 2 source breakdown voltage<br>$\pm I_{G2S} = 10\text{ mA}$ , $V_{G1S} = V_{DS} = 0$                           | $\pm V_{(BR)\text{ G2SS}}$ | 8.5 | — | 14  |    |
| Gate 1 source leakage current<br>$\pm V_{G1S} = 5\text{ V}$ , $V_{G2S} = V_{DS} = 0$                               | $\pm I_{G1SS}$             | —   | — | 50  | nA |
| Gate 2 source leakage current<br>$\pm V_{G2S} = 5\text{ V}$ , $V_{G1S} = V_{DS} = 0$                               | $\pm I_{G2SS}$             | —   | — | 50  |    |
| Drain current<br>$V_{DS} = 15\text{ V}$ , $V_{G1S} = 0$ , $V_{G2S} = 4\text{ V}$                                   | $I_{DSS}$                  | 2   | — | 20  | mA |
| Gate 1 source pinch-off voltage<br>$V_{DS} = 15\text{ V}$ , $V_{G2S} = 4\text{ V}$ , $I_D = 20\text{ }\mu\text{A}$ | $-V_{G1S\text{ (p)}}$      | —   | — | 2.5 | V  |
| Gate 2 source pinch-off voltage<br>$V_{DS} = 15\text{ V}$ , $V_{G1S} = 0$ , $I_D = 20\text{ }\mu\text{A}$          | $-V_{G2S\text{ (p)}}$      | —   | — | 2.0 |    |

**Electrical Characteristics**

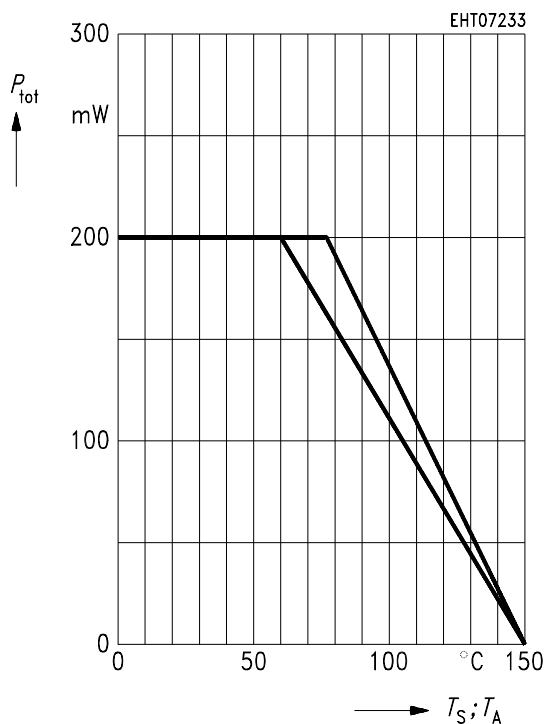
 at  $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified.

| Parameter | Symbol | Values |      |      | Unit |
|-----------|--------|--------|------|------|------|
|           |        | min.   | typ. | max. |      |

**AC Characteristics**

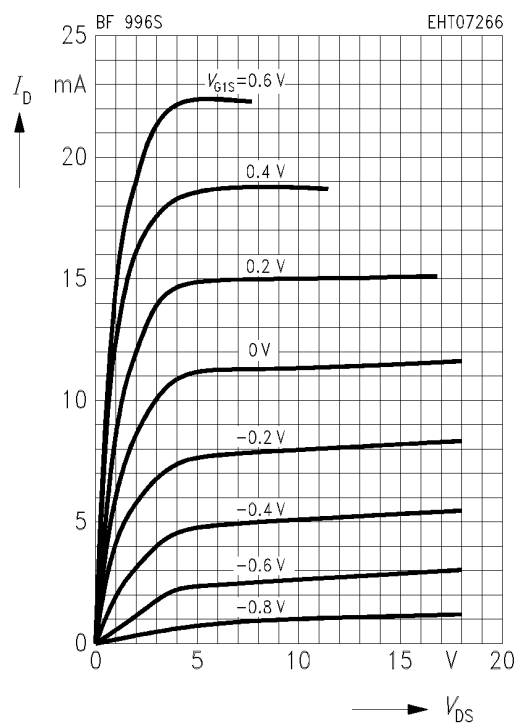
|                                                                                                                                                           |                 |    |     |   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----|-----|---|----|
| Forward transconductance<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ , $f = 1\text{ kHz}$                                   | $g_{fs}$        | 15 | 18  | – | mS |
| Gate 1 input capacitance<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ , $f = 1\text{ MHz}$                                   | $C_{g1ss}$      | –  | 2.3 | – | pF |
| Gate 2 input capacitance<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ , $f = 1\text{ MHz}$                                   | $C_{g2ss}$      | –  | 1.1 | – |    |
| Feedback capacitance<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ , $f = 1\text{ MHz}$                                       | $C_{dg1}$       | –  | 25  | – | fF |
| Output capacitance<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$ , $V_{G2S} = 4\text{ V}$ , $f = 1\text{ MHz}$                                         | $C_{dss}$       | –  | 0.8 | – | pF |
| Power gain<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$<br>$f = 200\text{ MHz}$ , $G_G = 2\text{ mS}$ , $G_L = 0.5\text{ mS}$<br>(test circuit 1)     | $G_{ps}$        | –  | 25  | – | dB |
| Power gain<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$<br>$f = 800\text{ MHz}$ , $G_G = 2.5\text{ mS}$ , $G_L = 0.8\text{ mS}$<br>(test circuit 2)   | $G_{ps}$        | –  | 18  | – |    |
| Noise figure<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$<br>$f = 200\text{ MHz}$ , $G_G = 2\text{ mS}$ , $G_L = 0.5\text{ mS}$<br>(test circuit 1)   | $F$             | –  | 1   | – |    |
| Noise figure<br>$V_{DS} = 15\text{ V}$ , $I_D = 10\text{ mA}$<br>$f = 800\text{ MHz}$ , $G_G = 2.5\text{ mS}$ , $G_L = 0.8\text{ mS}$<br>(test circuit 2) | $F$             | –  | 1.8 | – |    |
| Gain control range<br>$V_{DS} = 15\text{ V}$ , $V_{G2S} = 4 \dots -2\text{ V}$ , $f = 800\text{ MHz}$<br>(test circuit 2)                                 | $\Delta G_{ps}$ | 40 | –   | – |    |

**Total power dissipation  $P_{\text{tot}} = f(T_A)$**



**Output characteristics  $I_D = f(V_{DS})$**

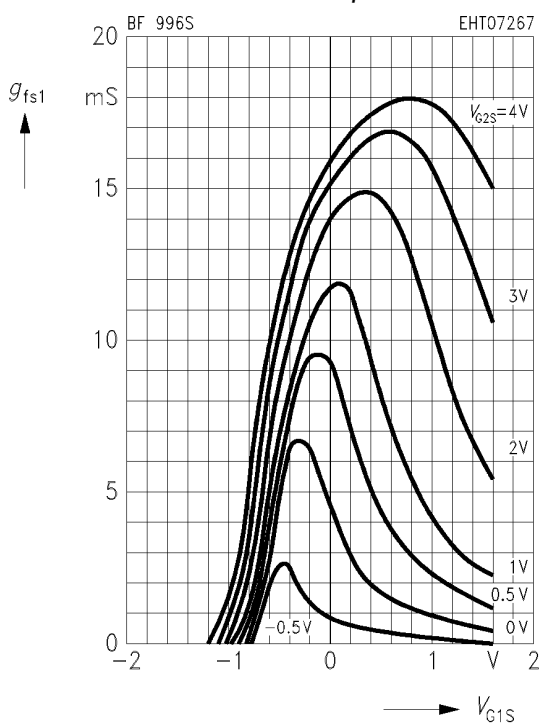
$V_{G2S} = 4 \text{ V}$



**Gate 1 forward transconductance  $g_{fs1} = f(V_{G1S})$**

$g_{fs1} = f(V_{G1S})$

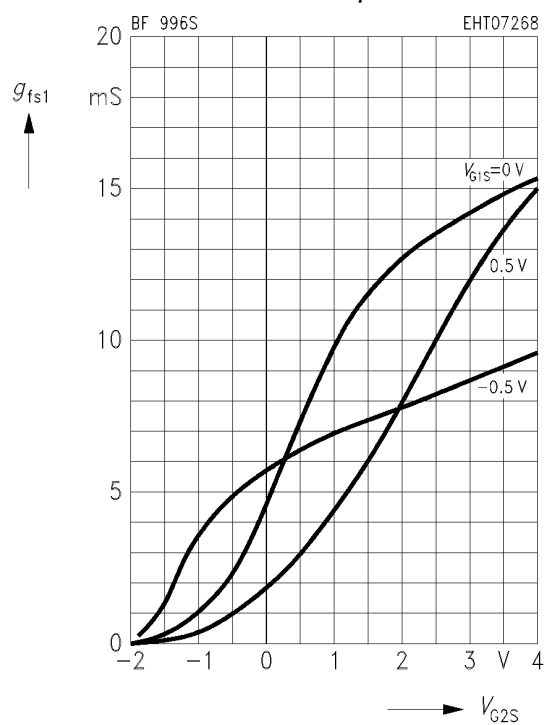
$V_{DS} = 15 \text{ V}, I_{DSS} = 10 \text{ mA}, f = 1 \text{ kHz}$



**Gate 1 forward transconductance  $g_{fs1} = f(V_{G2S})$**

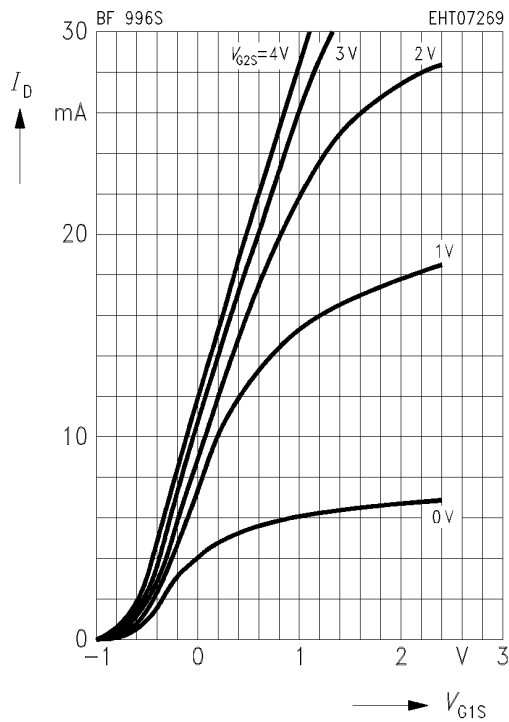
$g_{fs1} = f(V_{G2S})$

$V_{DS} = 15 \text{ V}, I_{DSS} = 10 \text{ mA}, f = 1 \text{ kHz}$



## Drain current $I_D = f(V_{G1S})$

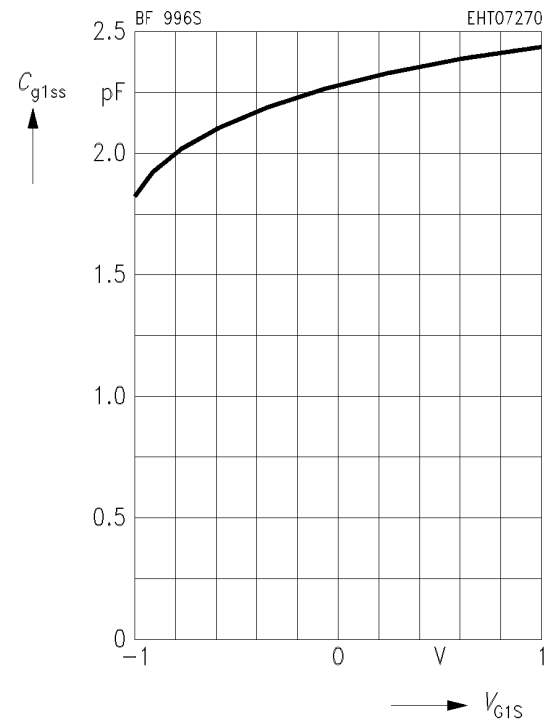
$V_{DS} = 15 \text{ V}$



## Gate 1 input capacitance $C_{g1ss} = f(V_{G1S})$

$V_{G2S} = 4 \text{ V}$ ,  $V_{DS} = 15 \text{ V}$

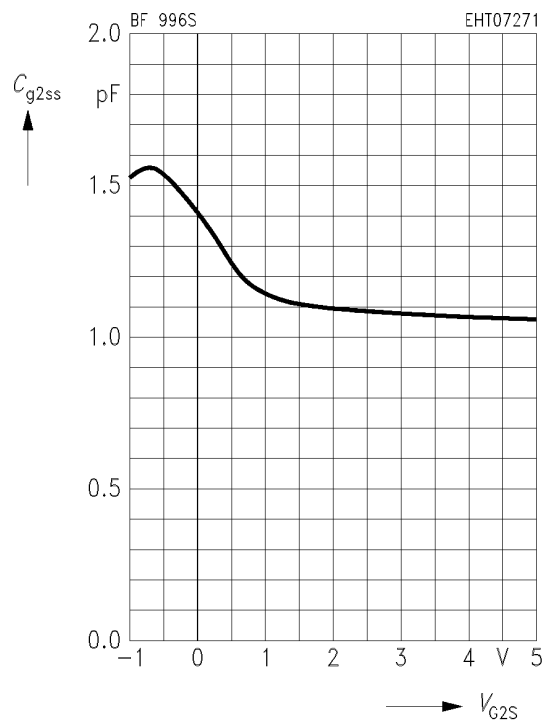
$I_{DSS} = 10 \text{ mA}$ ,  $f = 1 \text{ MHz}$



## Gate 2 input capacitance $C_{g2ss} = f(V_{G2S})$

$V_{G1S} = 0 \text{ V}$ ,  $V_{DS} = 15 \text{ V}$

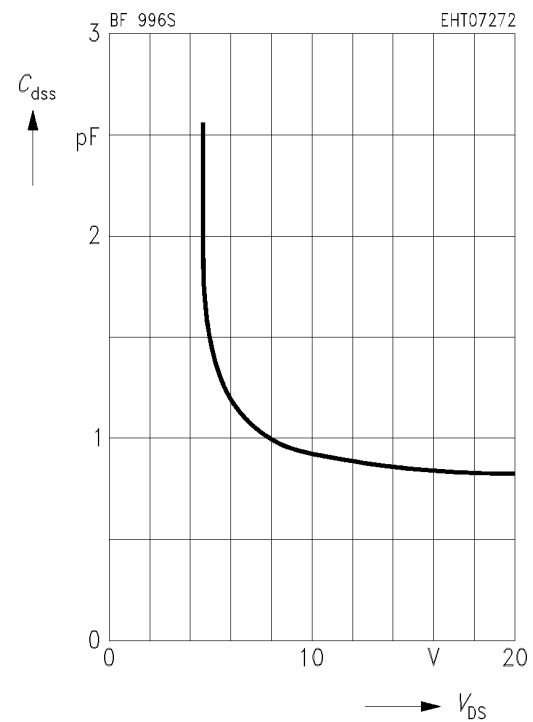
$I_{DSS} = 10 \text{ mA}$ ,  $f = 1 \text{ MHz}$



## Output capacitance $C_{dss} = f(V_{DS})$

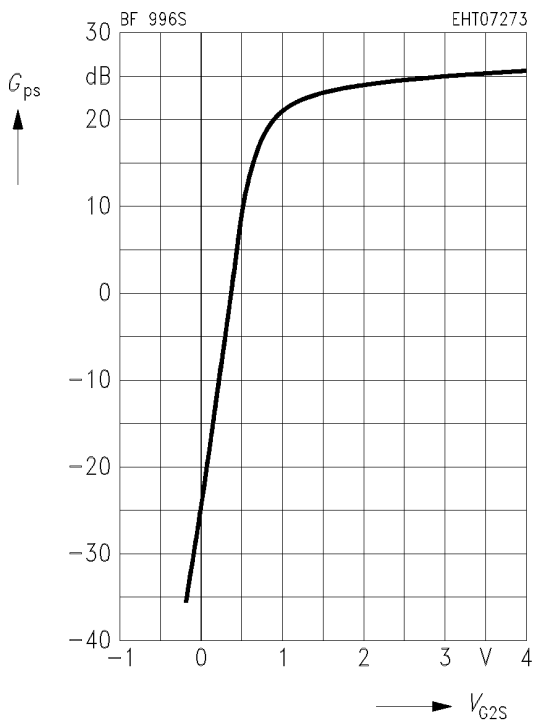
$V_{G1S} = 0 \text{ V}$ ,  $V_{G2S} = 4 \text{ V}$

$I_{DSS} = 10 \text{ mA}$ ,  $f = 1 \text{ MHz}$



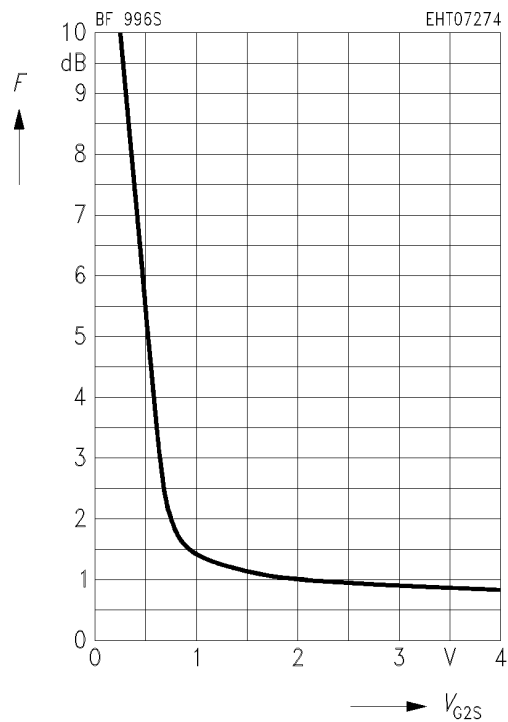
## Power gain $G_{ps} = f(V_{G2S})$

$V_{DS} = 15 \text{ V}$ ,  $V_{G1S} = 0 \text{ V}$ ,  $I_{DSS} = 10 \text{ mA}$   
 $f = 200 \text{ MHz}$  (see test circuit 1)



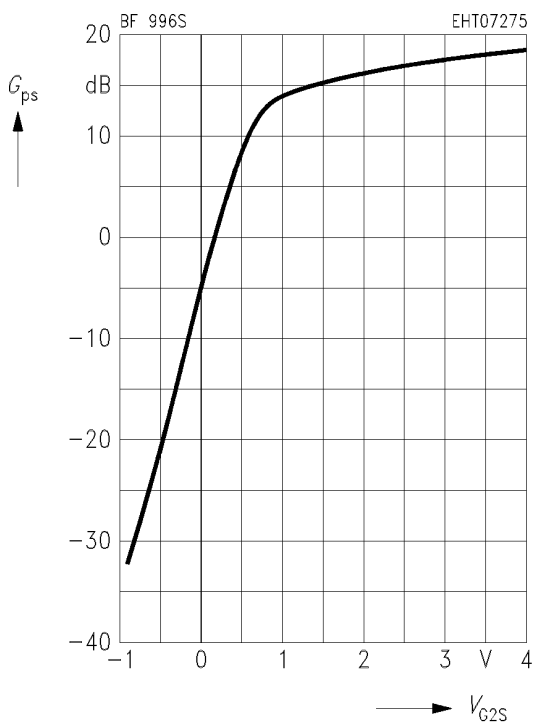
## Noise figure $F = f(V_{G2S})$

$V_{DS} = 15 \text{ V}$ ,  $V_{G1S} = 0 \text{ V}$ ,  $I_{DSS} = 10 \text{ mA}$   
 $f = 200 \text{ MHz}$  (see test circuit 1)



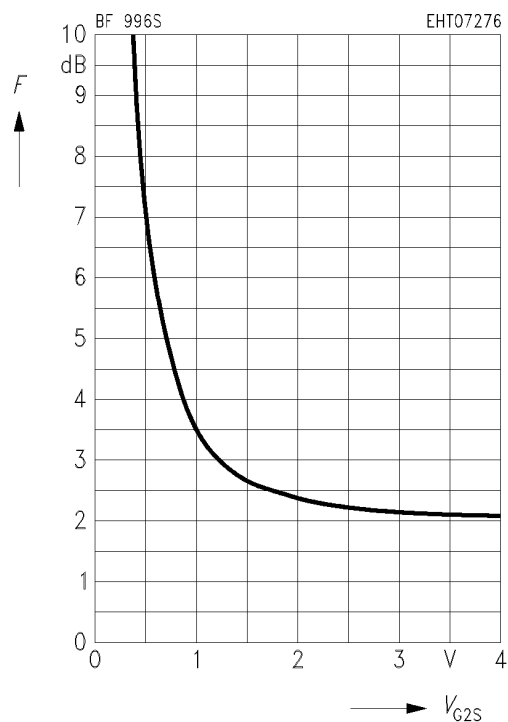
## Power gain $G_{ps} = f(V_{G2S})$

$V_{DS} = 15 \text{ V}$ ,  $V_{G1S} = 0 \text{ V}$ ,  $I_{DSS} = 10 \text{ mA}$   
 $f = 800 \text{ MHz}$  (see test circuit 2)



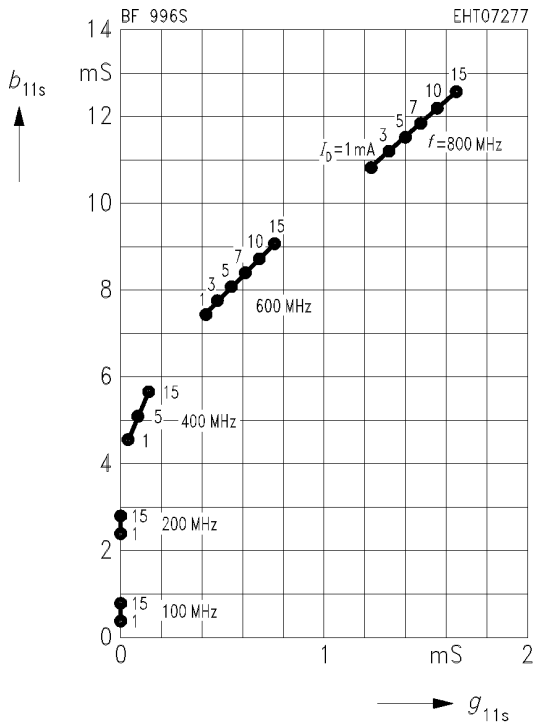
## Noise figure $F = f(V_{G2S})$

$V_{DS} = 15 \text{ V}$ ,  $V_{G1S} = 0 \text{ V}$ ,  $I_{DSS} = 10 \text{ mA}$   
 $f = 800 \text{ MHz}$  (see test circuit 2)



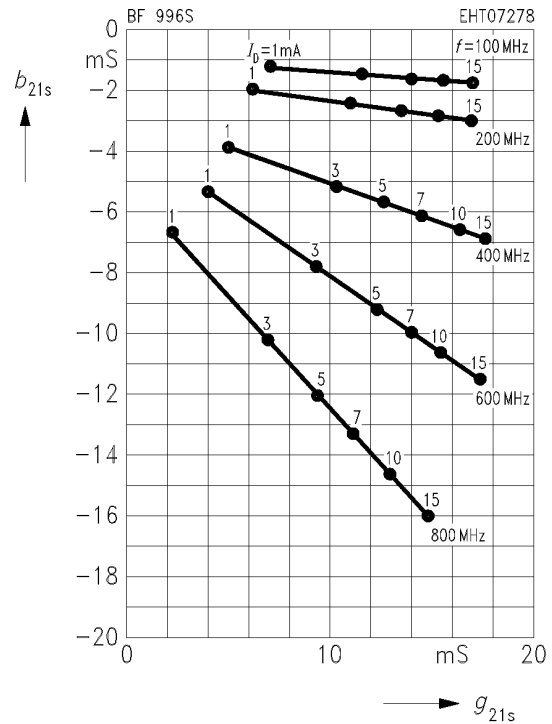
## Gate 1 input admittance $y_{11s}$

$V_{DS} = 15 \text{ V}$ ,  $V_{G2S} = 4 \text{ V}$   
(common source)



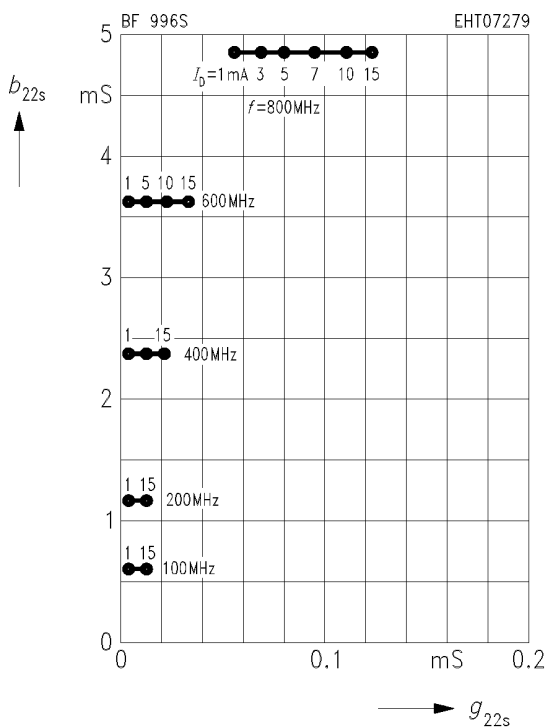
## Gate 1 forward transfer admittance $y_{21s}$

$V_{DS} = 15 \text{ V}$ ,  $V_{G2S} = 4 \text{ V}$   
(common source)



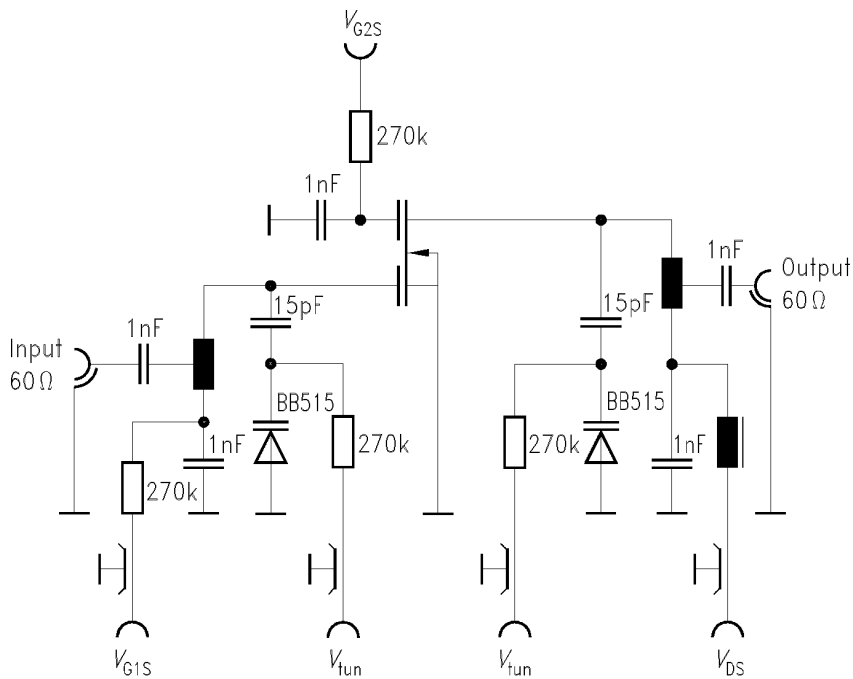
## Output admittance $y_{22s}$

$V_{DS} = 15 \text{ V}$ ,  $V_{G2S} = 4 \text{ V}$   
(common source)



## Test circuit 1 for power gain and noise figure

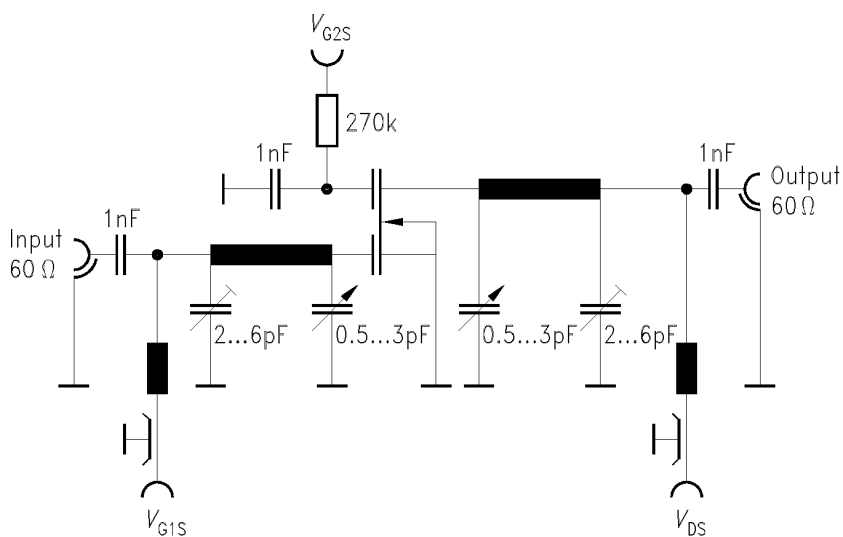
$f = 200 \text{ MHz}$ ,  $G_G = 2 \text{ mS}$ ,  $G_L = 0.5 \text{ mS}$



EHM07019

## Test circuit 2 for power gain, noise figure and cross modulation

$f = 800 \text{ MHz}$ ,  $G_G = 2.5 \text{ mS}$ ,  $G_L = 0.8 \text{ mS}$



EHM07020