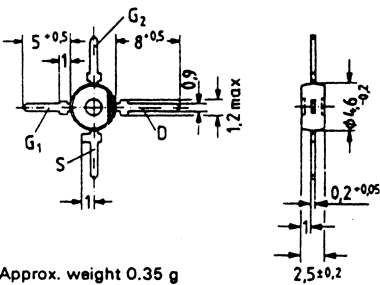
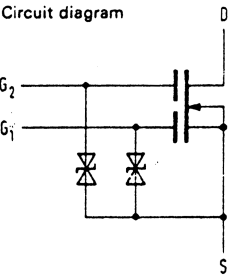


BF 960 is an ion-implanted dual gate N-channel MOS field effect transistor of the depletion type with integrated gate-protection diodes in a plastic package similar to TO 120, (50 B4 DIN 41 867). The source lead is internally connected with the substrate. The BF 960 tetrode is particularly suitable for use in TV UHF input stages and mixers as well as for universal applications throughout the frequency range between 200 MHz and 1 GHz.

Type	Ordering code
BF 960	Q62702-F499



Approx. weight 0.35 g
Dimensions in mm



Maximum ratings

- Drain-source voltage
- Drain current
- Gate 1/gate 2-source peak current
- Storage temperature range
- Channel temperature
- Total power dissipation ($T_{amb} \leq 60^{\circ}\text{C}$)

V_{DS}	20	V
I_D	30	mA
$\pm I_{G1/2SM}$	10	mA
T_{stg}	-55 to +150	$^{\circ}\text{C}$
T_{ch}	150	$^{\circ}\text{C}$
P_{tot}	200	mW

Thermal resistance

- Channel to ambient

R_{thA}	≤ 450	K/W
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Static characteristics ($T_{\text{amb}} = 25^{\circ}\text{C}$)**Drain-source breakdown voltage**($I_D = 10\ \mu\text{A}$; $-V_{G1S} = -V_{G2S} = 4\ \text{V}$)

$V_{(\text{BR})\text{DS}}$	≥ 20	V
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Gate 1 source breakdown voltage($\pm I_{G1S} = 10\ \text{mA}$; $V_{G2S} = V_{DS} = 0$)

$\pm V_{(\text{BR})\text{G1SS}}$	6 to 20	V
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Gate 2 source breakdown voltage($\pm I_{G2S} = 10\ \text{mA}$; $V_{G1S} = V_{DS} = 0$)

$\pm V_{(\text{BR})\text{G2SS}}$	6 to 20	V
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Gate 1 leakage current($\pm V_{G1S} = 5\ \text{V}$; $V_{G2S} = V_{DS} = 0$)

$\pm I_{G1SS}$	< 50	nA
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Gate 2 leakage current($\pm V_{G2S} = 5\ \text{V}$; $V_{G1S} = V_{DS} = 0$)

$\pm I_{G2SS}$	< 50	nA
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Drain current($V_{DS} = 15\ \text{V}$; $V_{G1S} = 0$; $V_{G2S} = 4\ \text{V}$)

I_{DSS}	2 to 20	mA
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Gate 1 source pinch-off voltage($V_{DS} = 15\ \text{V}$; $V_{G2S} = 4\ \text{V}$; $I_D = 20\ \mu\text{A}$)

$-V_{G1S(\text{p})}$	≤ 2.7	V
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Gate 2 source pinch-off voltage($V_{DS} = 15\ \text{V}$; $V_{G1S} = 0$; $I_D = 20\ \mu\text{A}$)

$-V_{G2S(\text{p})}$	≤ 2.7	V
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Dynamic characteristics ($T_{amb} = 25^{\circ}\text{C}$)

Forward transadmittance

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; V_{G2S} = 4\text{ V}; f = 1\text{ kHz})$

Gate 1 input capacitance

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; V_{G2S} = 4\text{ V}; f = 1\text{ MHz})$

Gate 2 input capacitance

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; V_{G2S} = 4\text{ V}; f = 1\text{ MHz})$

Reverse transfer capacitance *)

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; V_{G2S} = 4\text{ V}; f = 1\text{ MHz})$

Output capacitance

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; V_{G2S} = 4\text{ V}; f = 1\text{ MHz})$

Power gain

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA})$ at $f = 200\text{ MHz}$; $G_G = 2\text{ mS}$; $G_L = 0.5\text{ mS}$ at $f = 800\text{ MHz}$; $G_G = 2\text{ mS}$; $G_L = 1\text{ mS}$

Noise figure

 $(V_{DS} = 15\text{ V}; I_D = 7\text{ mA}; g_g = 2\text{ mS})$ at $f = 200\text{ MHz}$ at $f = 800\text{ MHz}$

Control range

 $(V_{DS} = 15\text{ V}; V_{G2} = 4\text{ to } -2\text{ V}; f = 800\text{ MHz})$

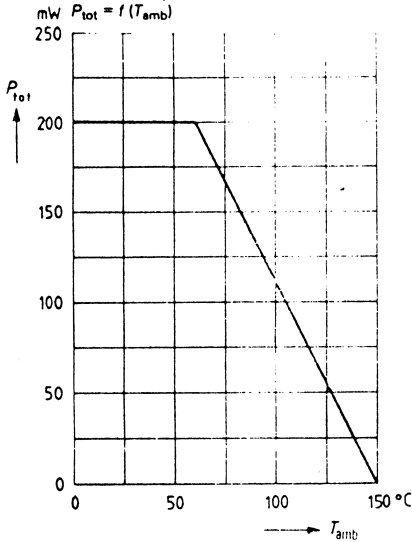
Mixer gain

 $(V_{DS} = 15\text{ V}; V_{G2} = 4\text{ V}; f = 800\text{ MHz};$ $f_{IF} = 36\text{ MHz}; 2\Delta f_{IF} = 5\text{ MHz};$ $V_{osc.} = 800\text{ mV})$

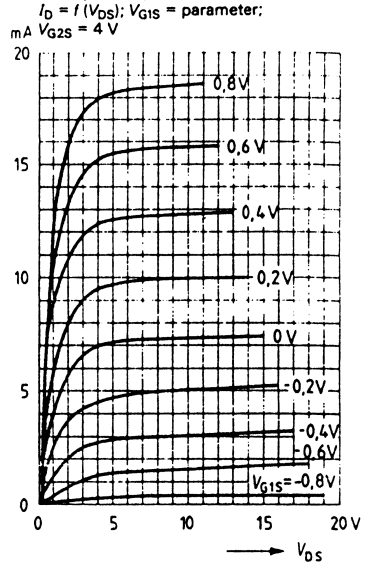
g_{ts}	12 (9.5 to 18)	mS
C_{g1ss}	1.8 (1.3 to 2.3)	pF
C_{g2ss}	1	pF
C_{dg1}	25 (<35)	fF
C_{dss}	0.8 (0.65 to 1.2)	pF
G_{ps}	23	dB
G_{ps}	16.5 (13 to 20)	dB
NF	1.6 (<2.8)	dB
NF	2.8 (<3.9)	dB
ΔG_{ps}	>40	dB
G_{psc}	16	dB

*) G_1 and S on screen potential

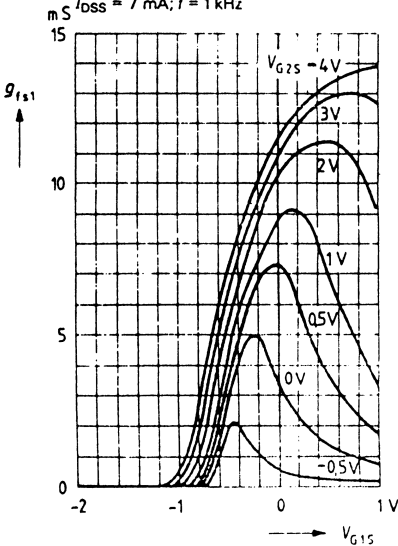
**Total perm. power dissipation
versus temperature**



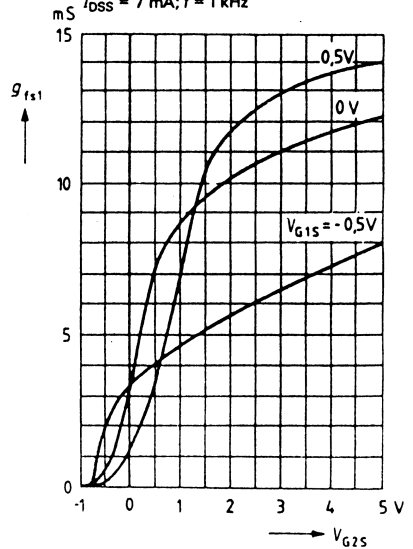
Family of output characteristics

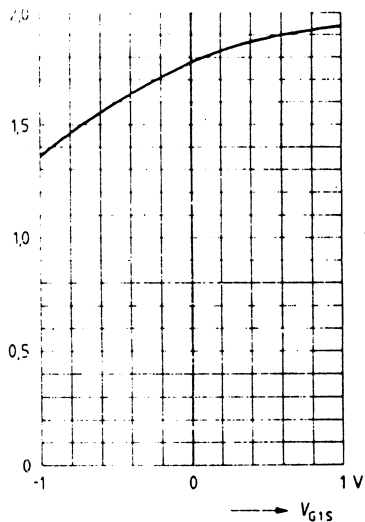
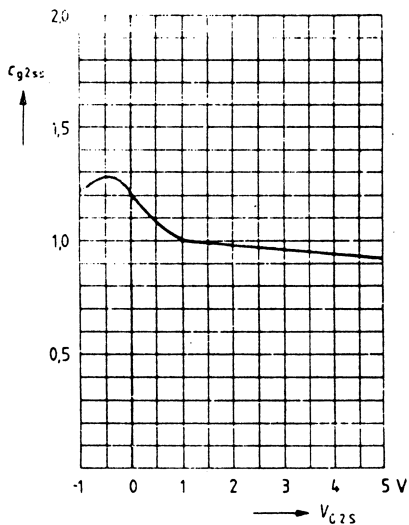
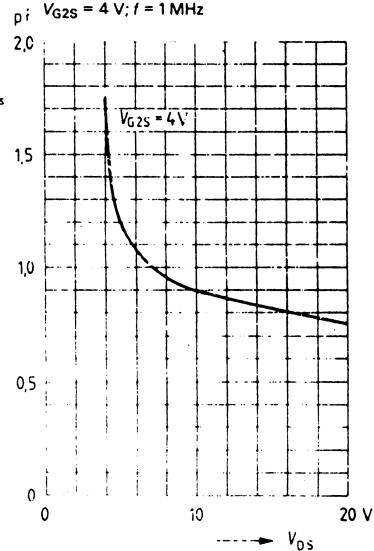


Gate 1 transadmittance $g_{fs1} = f(V_{G1S})$;
 $V_{G2S} = \text{parameter}; V_{DS} = 15 \text{ V}$
 $I_{DSS} = 7 \text{ mA}; f = 1 \text{ kHz}$

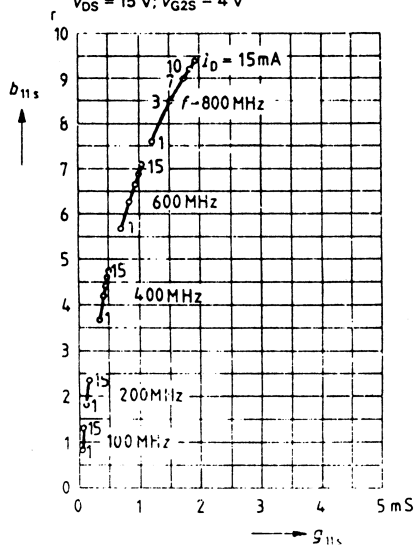


Gate 2 transadmittance $g_{fs1} = f(V_{G2S})$
 $V_{G1S} = \text{parameter}; V_{DS} = 15 \text{ V};$
 $I_{DSS} = 7 \text{ mA}; f = 1 \text{ kHz}$



Gate 1 input capacitance
 $C_{g1iss} = f(V_{G1S}), V_{G2S} = 4 \text{ V};$
 $V_{DS} = 15 \text{ V}; f = 1 \text{ MHz}$
**Gate 2 input capacitance**
 $C_{g2ss} = f(V_{G2S}), V_{G1S} = 0$
 $V_{DS} = 15 \text{ V}; f = 1 \text{ MHz}$
**Output capacitance**
 $C_{dss} = f(V_{DS}), V_{G1S} = 0$
 $V_{G2S} = 4 \text{ V}; f = 1 \text{ MHz}$
**Gate 1 input conductance y_{11s}**

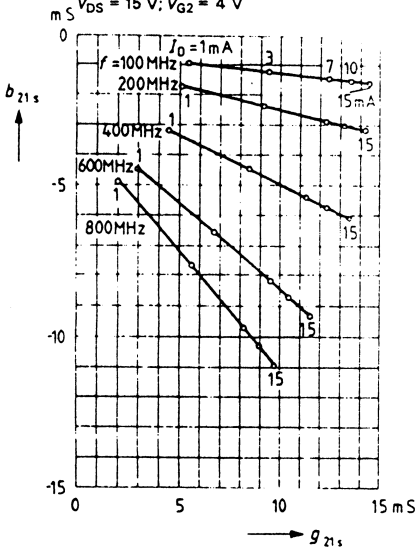
(source circuit)

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


Gate 1 transadmittance Y_{21s}

(source circuit)

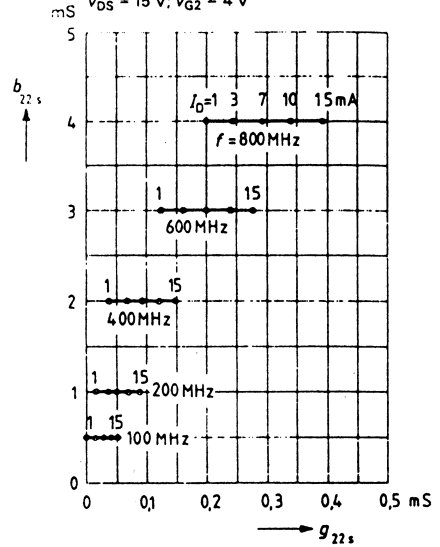
$V_{DS} = 15 \text{ V}; V_{G2} = 4 \text{ V}$



Output conductance Y_{22s}

(source circuit)

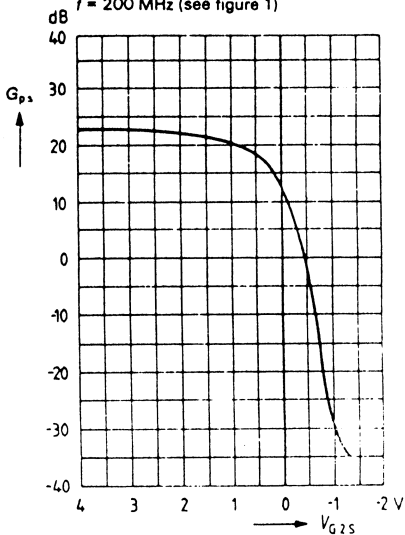
$V_{DS} = 15 \text{ V}; V_{G2} = 4 \text{ V}$



Power gain $G_{ps} = f(V_{G2s})$

$V_{DS} = 15 \text{ V}; V_{G1s} = 0; I_{DSS} = 7 \text{ mA};$

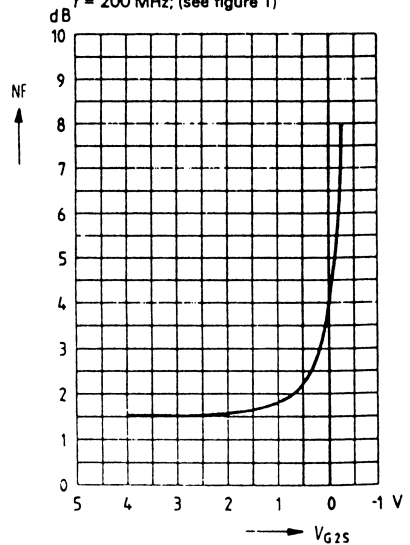
$f = 200 \text{ MHz}$ (see figure 1)



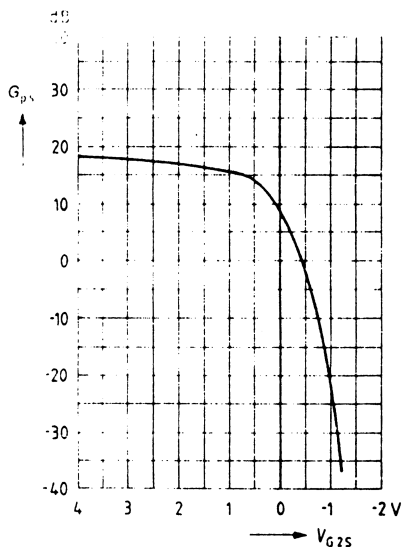
Noise figure $NF = f(V_{G2s})$

$V_{DS} = 15 \text{ V}; V_{G1s} = 0; I_{DSS} = 7 \text{ mA};$

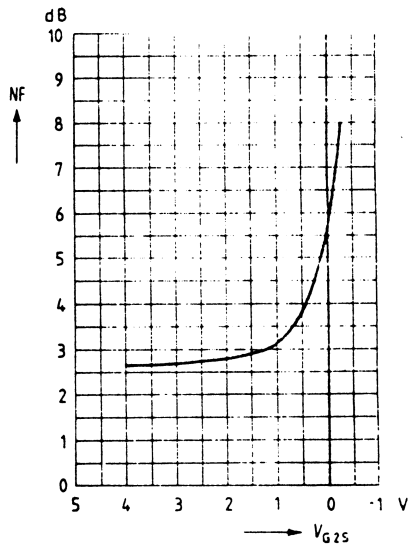
$f = 200 \text{ MHz}$ (see figure 1)



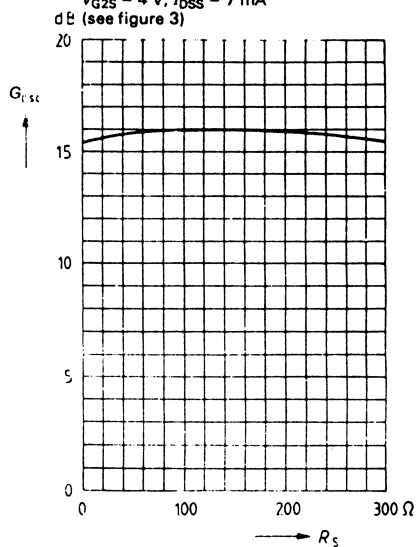
Power gain $G_{ps} = f(V_{G2S})$
 $V_{DS} = 15 \text{ V}; V_{G1S} = 0;$
 $I_{DSS} = 7 \text{ mA}; f = 800 \text{ MHz}; R_S = 0$
 (see figure 2)



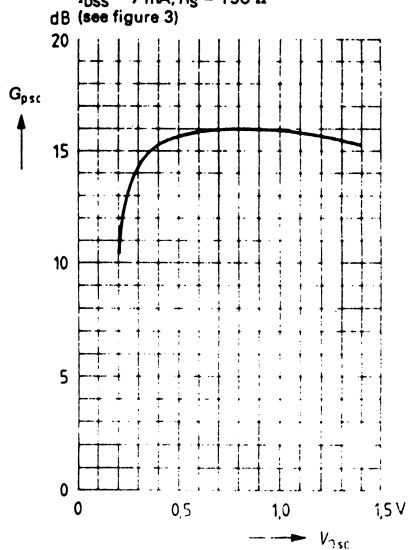
Noise figure $NF = f(V_{G2S})$
 $V_{DS} = 15 \text{ V}; V_{G1S} = 0;$
 $I_{DSS} = 7 \text{ mA}; f = 800 \text{ MHz}; R_S = 0$
 (see figure 2)

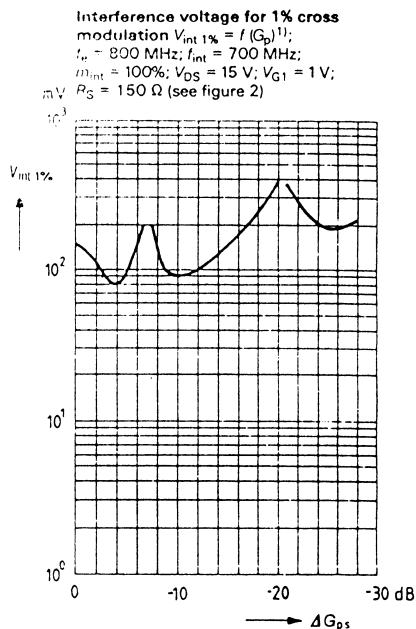
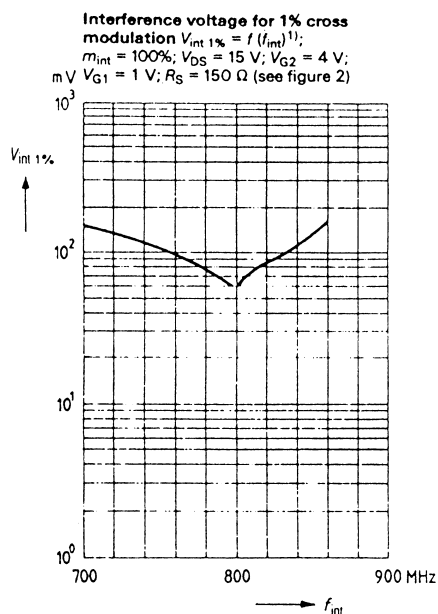


Mixer gain $G_{psc} = f(R_S)$
 $f_o = 800 \text{ MHz}; f_{osc} = 836 \text{ MHz}$
 $V_{osc} = 800 \text{ mV}; V_{DS} = 15 \text{ V}$
 $V_{G2S} = 4 \text{ V}; I_{DSS} = 7 \text{ mA}$
 (see figure 3)



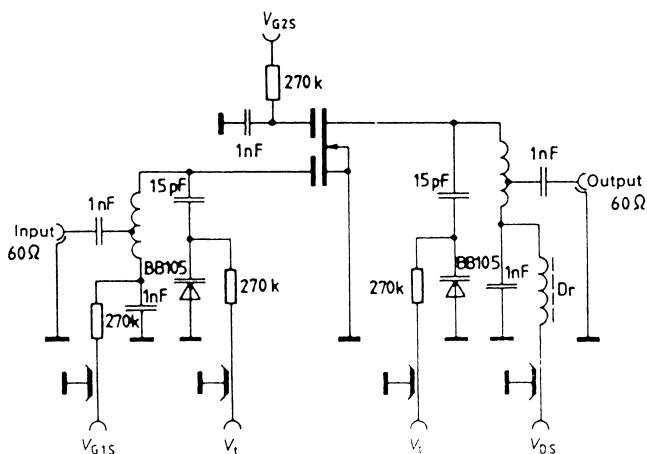
Mixer gain $G_{psc} = f(V_{G2S})$
 $f_o = 800 \text{ MHz}; f_{osc} = 836 \text{ MHz}$
 $V_{DS} = 15 \text{ V}; V_{G2S} = 4 \text{ V};$
 $I_{DSS} = 7 \text{ mA}; R_S = 150 \Omega$
 (see figure 3)





Test circuit for power gain and noise figure
 at $f = 200 \text{ MHz}$ ($G_{\text{G}} = 2 \text{ ms}$; $G_{\text{L}} = 0.5 \text{ mS}$)

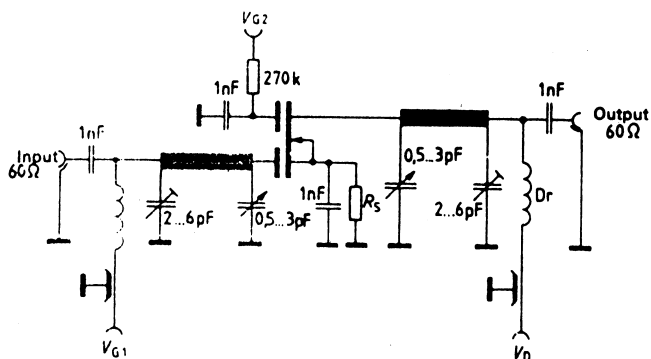
Fig. 1



- 1) $V_{\text{int}} 1\%$ is the rms value of half the EMC (terminal voltage at matching) of a 100% sine modulated TV carrier at an internal generator resistance of 60Ω , causing 1% amplitude modulation on the active carrier.

Test circuit for power gain, noise figure and cross modulation
 $f = 800 \text{ MHz}$; $G_g = 2 \text{ mS}$; $G_g = 1 \text{ mS}$.

Fig. 2



Test circuit for mixer gain $f = 800/36 \text{ MHz}$.

Fig. 3

