

Broadband Amplifier for 13 and 9 cm

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The following described amplifier is useful as a preamplifier, but also as a linear amplifier for 13 or 9cm. The transistor is a HXTR 3101. This transistor costs about 15 german mark. The box-dimensions and the technical dates are shown at fig. 1 .

The construction of the amplifier is very easy and absolutely uncritical at using. The print board is made of RT5880 Duroid, with a thickness of 0.79 mm. The layout is shown at fig. 3 and the circuit at fig. 2 .

If the amplifier is used as a preaplier the collector current has to be 10mA. The noise figure at 13cm amounts 3dB and at 9 cm about 4 dB. The gain on 13 cm is abt. 10 dB and at 9 abt. 8 dB. Fig. 4 shows the transmission characteristics from 2 - 4 GHz with the marks for 13 and 9.

Fig 5 shows the transmission characteristics from 10 MHz to 20 GHz. the line REF 1 is the marker for 0 dB gain. The mark on the transmission character shows the 0db gain point at 4519 MHz.

If the amplifier is used as a power amplifier it is possible to set the collector current to 20mA and the output is now abt. 35 mW, at 3dB compression on 13, or 30mW on 9.

HXTR 3101, board and SMA jacks are obtainable by DL 7 QY, order price list with stamped envelope.

Recommended Maximum Continuous Operating Conditions (1)

Symbol	Parameter	Value
V _{CB0}	Collector to Base Voltage	25V
V _{CE0}	Collector to Emitter Voltage	16V
V _{EB0}	Emitter to Base Voltage	1.0V
I _c	DC Collector Current	30 mA
P _T	Total Device Dissipation	300mW
T _J	Junction Temperature ⁽²⁾	200°C
T _{STG}	Storage Temperature	-65°C to +150°C

Notes

- Operation of this device in excess of any one of these conditions is likely to reduce device median time to failure MTTF to below the design goal of 1 x 10⁷ hours at T_J = 175°C based on Activation Energy = 1.5 eV.
- Total H_{JA} Junction-to-Ambient will be dependent upon the heat sinking provided in the individual application

FIG 1

Absolute Maximum Ratings*

Symbol	Parameter	Value
V _{CB0}	Collector to Base Voltage	30V
V _{CE0}	Collector to Emitter Voltage	18V
V _{EB0}	Emitter to Base Voltage	1.5V
I _c	DC Collector Current	50mA
P _T	Total Device Dissipation	600mW
T _J	Junction Temperature	200°C
T _{STG}	Storage Temperature	200°C

*Operation in excess of any one of these conditions may result in permanent damage to this device

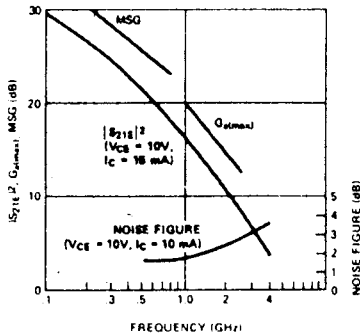


Figure 1. Typical |S₂₁|², G_{max}, Maximum Stable Gain MSG, and Noise Figure vs Frequency

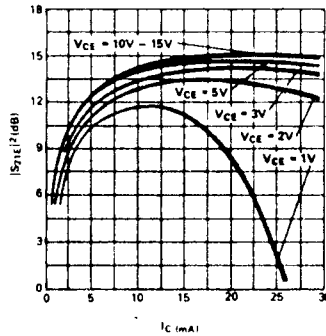


Figure 2. Typical |S₂₁|² vs Current at 1000 MHz

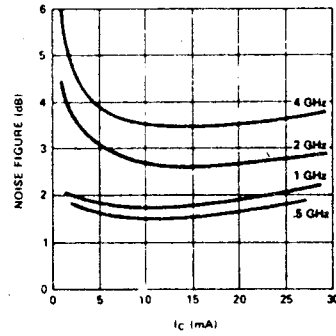


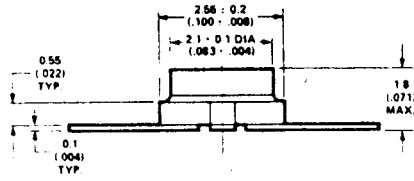
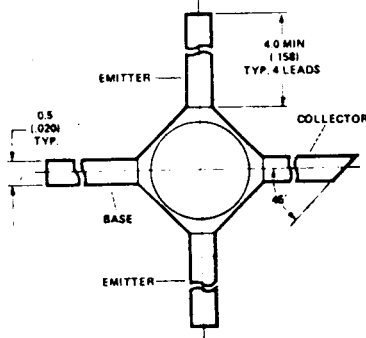
Figure 3. Typical Noise Figure vs Collector Current V_{CE} = 10V

Typical S-Parameters V_{CE} = 10 V, I_C = 10 mA

Freq. (MHz)	S ₁₁		S ₂₁			S ₁₂		S ₂₂		
	Mag.	Ang.	(dB)	Mag.	Ang.	(dB)	Mag.	Ang.	Mag.	Ang.
100	0.705	-50	27.7	24.266	149	-36.7	0.015	60	0.903	-20
300	0.606	-110	23.5	14.962	116	-30.4	0.030	43	0.624	-36
500	0.565	-139	20.1	10.116	101	-28.9	0.036	41	0.499	-40
800	0.559	-162	16.5	8.683	89	-27.4	0.043	43	0.430	-41
1000	0.571	-169	14.5	5.330	78	-25.7	0.052	44	0.408	-43
1500	0.574	174	11.2	3.627	63	-23.6	0.066	48	0.394	-48
2000	0.591	161	8.9	2.774	49	-21.9	0.080	48	0.392	-57
3000	0.619	143	5.7	1.936	25	-18.8	0.115	45	0.427	-81
4000	0.639	125	3.4	1.488	1	-16.2	0.155	39	0.470	-107

VCE = 10 V, IC = 15 mA

Freq. (MHz)	S ₁₁		S ₂₁			S ₁₂			S ₂₂	
	Mag.	Ang.	(dB)	Mag.	Ang.	(dB)	Mag.	Ang.	Mag.	Ang.
100	0.641	-90	29.5	29.854	144	-37.6	0.013	57	0.863	-23
300	0.565	-122	24.5	16.788	112	-31.8	0.026	44	0.556	-38
500	0.551	-149	20.7	10.839	98	-30.1	0.031	44	0.444	-40
800	0.553	-168	17.1	7.161	87	-28.1	0.039	50	0.387	-41
1000	0.560	-175	15.1	5.709	77	-26.4	0.048	49	0.363	-42
1500	0.564	171	11.8	3.869	62	-23.6	0.066	54	0.356	-47
2000	0.583	159	9.4	2.955	49	-21.6	0.083	52	0.354	-56
3000	0.611	142	6.3	2.058	26	-18.4	0.120	47	0.389	-81
4000	0.633	124	4.0	1.587	2	-15.9	0.160	39	0.431	-106



DIMENSIONS IN MILLIMETERS (INCHES)

OUTLINE HPAC-100X
Product Identification U

FIG. 1B

Electrical Specifications at T_{CASE} = 25°C

Symbol	Parameters and Test Conditions	MIL-STD-750 Test Method	Units	Min.	Typ.	Max.
BV _{CB0}	Collector-Base Breakdown Voltage at I _C = 100 μA	3001.1*	V	30		
I _{CB0}	Collector-Base Cutoff Current at V _{CE} = 15 V	3036.1**	nA			500
h _{FE}	Forward Current Transfer Ratio at V _{CE} = 10 V, I _C = 10 mA	3076.1*		50		180
f _T	Gain Bandwidth Product at V _{CE} = 10 V, I _C = 15 mA		GHz		6	
S _{21E} ²	Transducer Gain at 1000 MHz at V _{CE} = 10 V, I _C = 15 mA		dB		15	
F _{MIN}	Minimum Noise Figure at 1000 MHz at V _{CE} = 10 V, I _C = 10 mA		dB		1.8	
MAG	Maximum Available Gain at 1000 MHz at V _{CE} = 10 V, I _C = 15 mA		dB		19.5	

*300 μs wide pulse measurement - 2% duty cycle
**Measured under low ambient light conditions

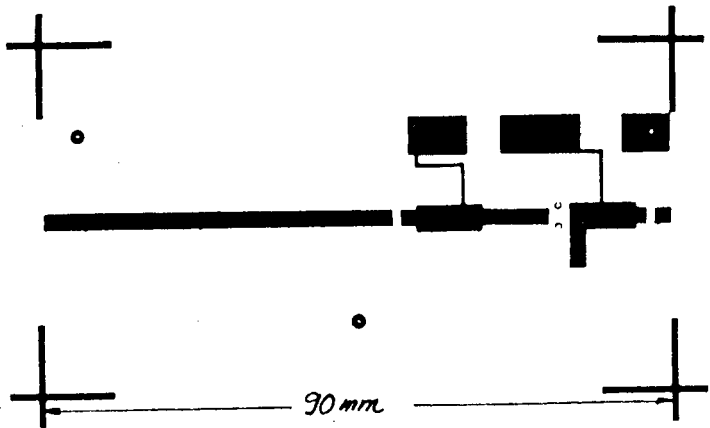
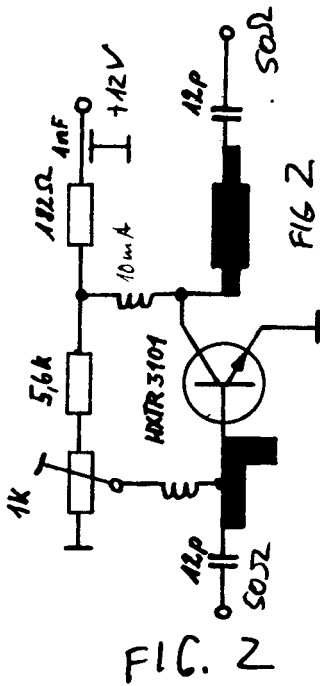


FIG. 3

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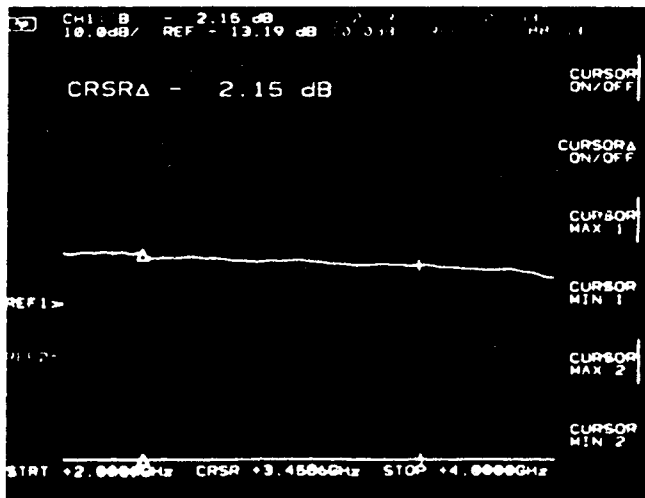


FIG. 4

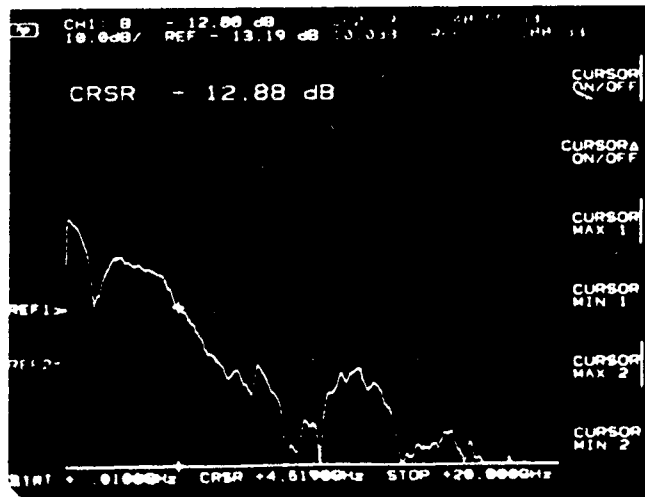


FIG. 5

DL70Y