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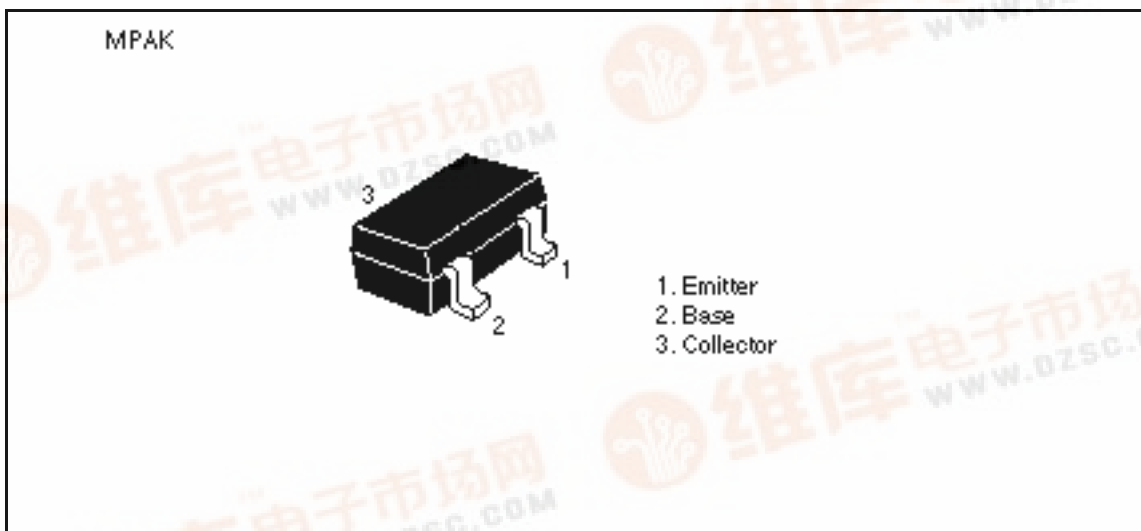
Silicon NPN Epitaxial

HITACHI

Application

UHF frequency converter, wide band amplifier

Outline



Absolute Maximum Ratings (Ta = 25°C)

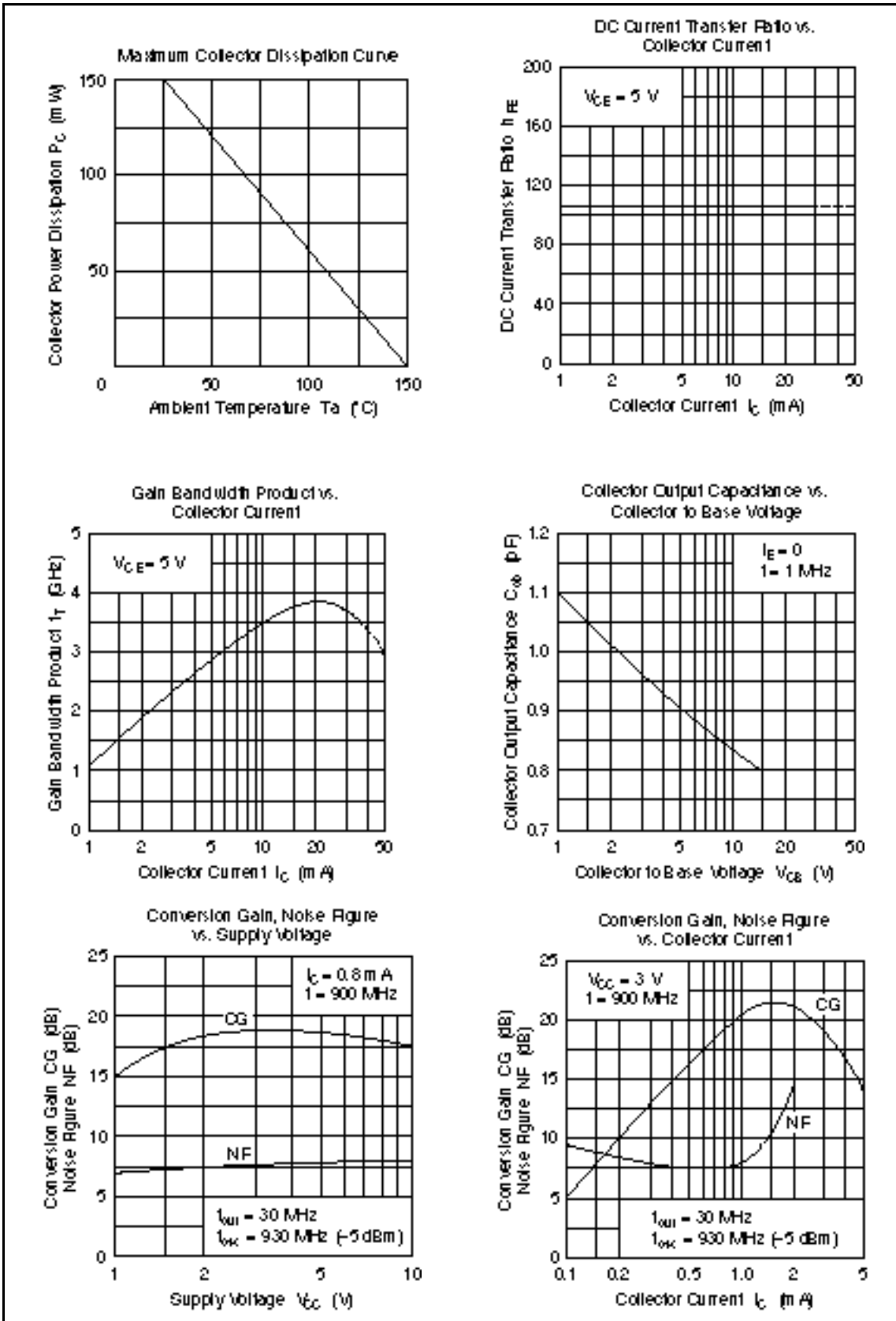
Item	Symbol	Ratings	Unit
Collector to base voltage	V_{CBO}	25	V
Collector to emitter voltage	V_{CEO}	13	V
Emitter to base voltage	V_{EBO}	3	V
Collector current	I_C	50	mA
Collector power dissipation	P_C	150	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to +150	°C

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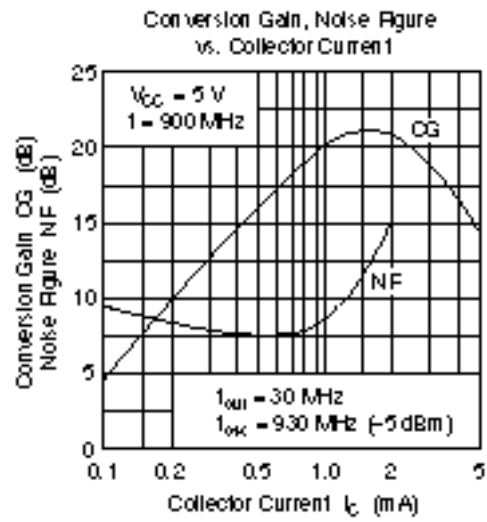
Electrical Characteristics (Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	25	—	—	V	$I_C = 10 \mu A, I_E = 0$
Collector cutoff current	I_{CBO}	—	—	0.1	μA	$V_{CB} = 15 V, I_E = 0$
Collector cutoff current	I_{CEO}	—	—	10	μA	$V_{CE} = 13 V, R_{BE} =$
Emitter cutoff current	I_{EBO}	—	—	0.3	μA	$V_{EB} = 3 V, I_C = 0$
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	—	0.3	V	$I_C = 20 mA, I_B = 4 mA$
DC current transfer ratio	h_{FE}	50	—	180		$V_{CE} = 5 V, I_C = 5 mA$
Collector output capacitance	C_{ob}	—	0.85	1.3	pF	$V_{CB} = 10 V, I_E = 0, f = 1MHz$
Gain bandwidth product	f_T	3.0	3.8	—	GHz	$V_{CE} = 5 V, I_C = 20 mA$
Conversion gain	CG	—	19	—	dB	$V_{CC} = 5 V, I_C = 0.8 mA,$ $f_{in} = 900 MHz$
Noise figure	NF	—	8	—	dB	$f_{osc} = 930 MHz (-5dBm),$ $f_{out} = 30 MHz$

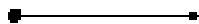

Note: Marking is "TI-".

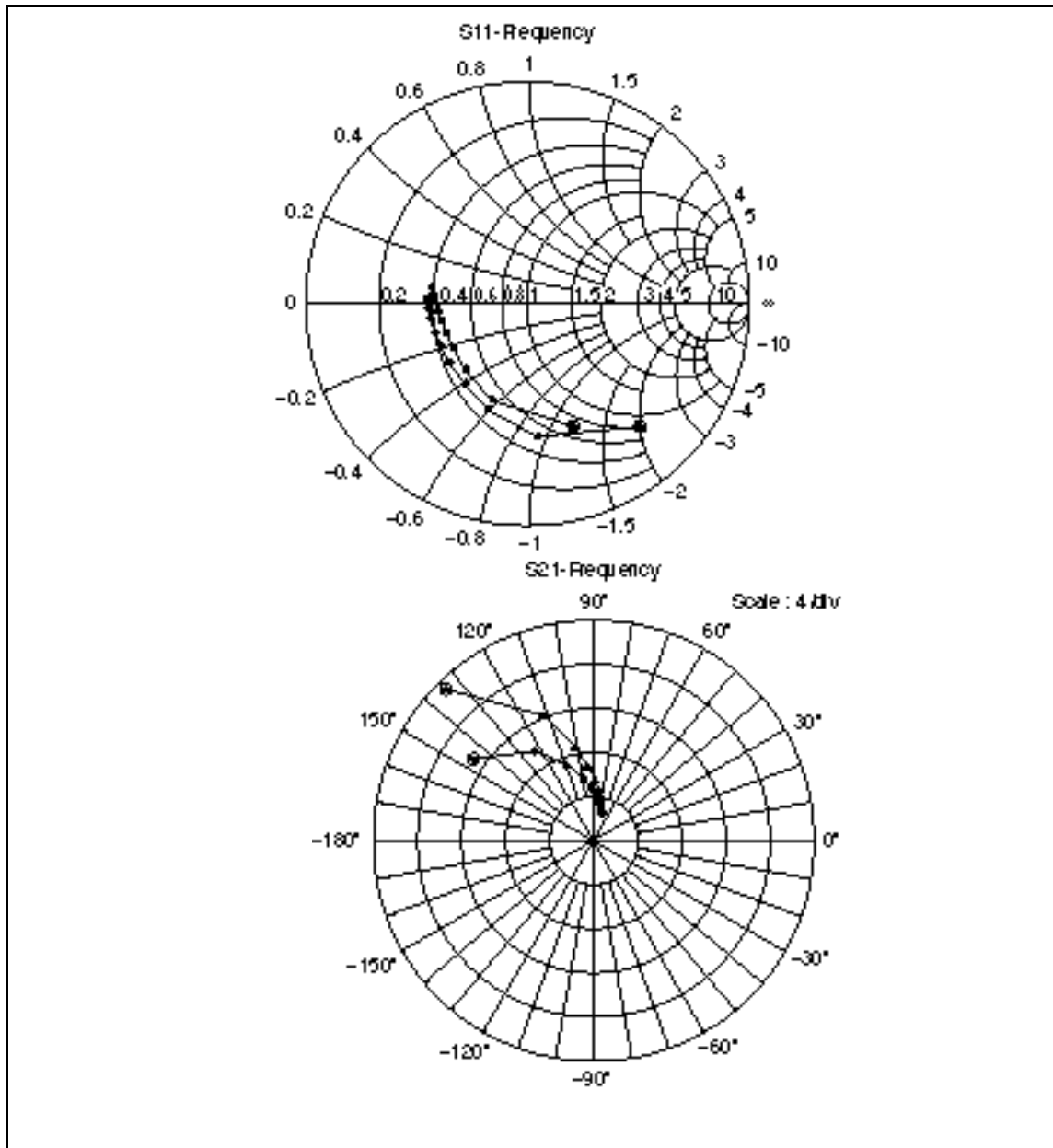


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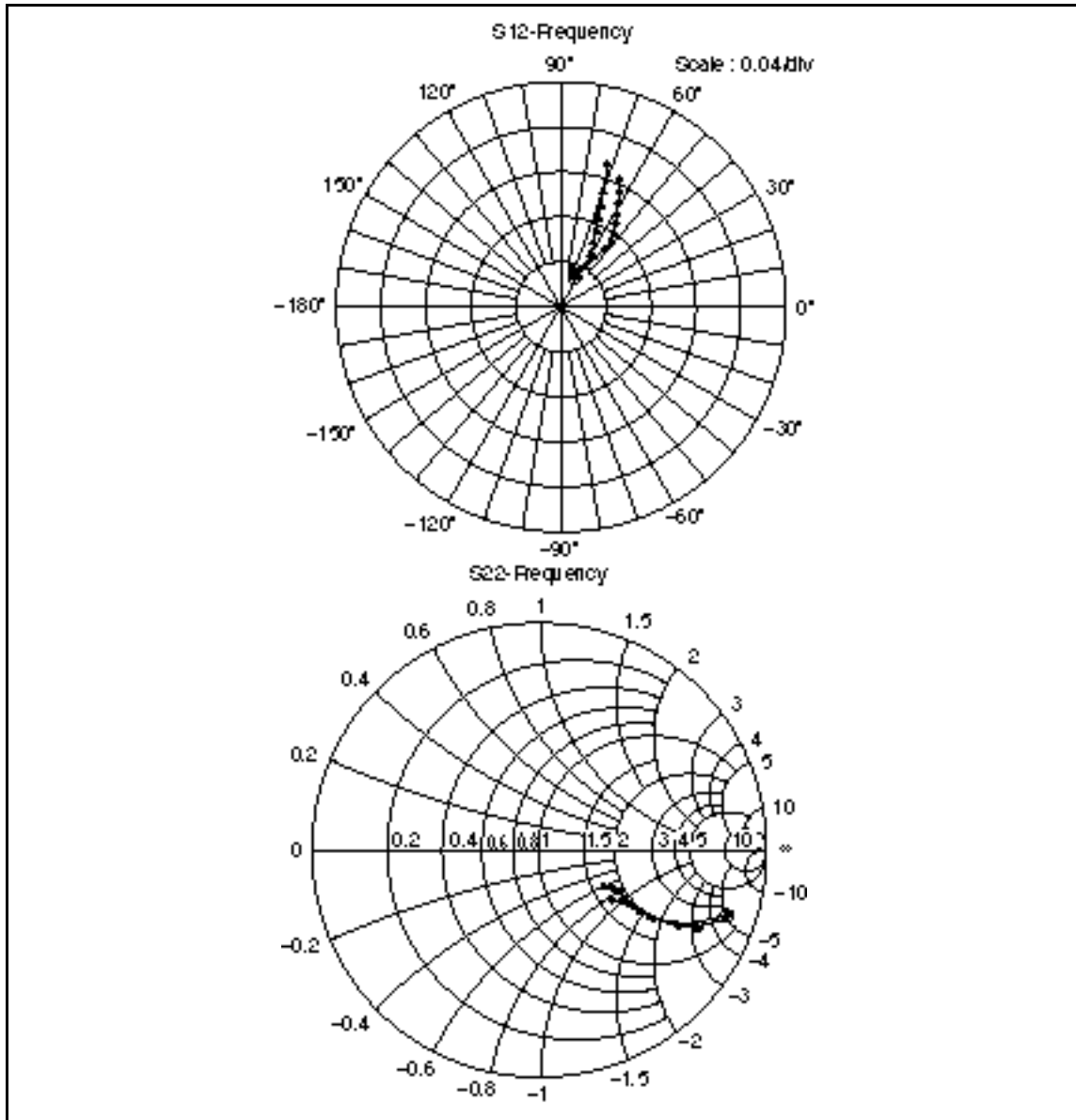


S Parameters (Emitter Common)

Test Condition $V_{CE} = 5\text{ V}$, 100 MHz to 1000 MHz (100 MHz Step), $Z_o = 50$
 $I_C = 5\text{ mA}$ 
 $I_C = 10\text{ mA}$ 



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S Parameters (Emitter Common)**Test Condition** $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $Z_O = 50$

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.744	-48.4	13.142	145.9	0.034	67.5	0.876	-19.1
200	0.599	-85.5	9.669	123.5	0.053	55.9	0.702	-28.2
300	0.506	-110.7	7.201	109.5	0.064	52.6	0.586	-30.9
400	0.457	-128.9	5.696	100.6	0.072	52.7	0.520	-31.2
500	0.440	-143.5	4.687	93.9	0.079	54.3	0.480	-31.2
600	0.430	-155.1	3.977	88.1	0.087	57.1	0.452	-31.5
700	0.437	-163.2	3.453	83.5	0.095	59.4	0.432	-31.7
800	0.441	-170.9	3.070	79.1	0.104	61.3	0.417	-32.4
900	0.452	-177.1	2.746	75.4	0.113	63.6	0.402	-33.4
1000	0.462	177.5	2.508	71.9	0.122	65.6	0.390	-34.5

Test Condition $V_{CE} = 5\text{ V}$, $I_C = 10\text{ mA}$, $Z_O = 50$

Freq. (MHz)	S11		S21		S12		S22	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
100	0.585	-69.3	19.233	134.4	0.028	63.8	0.768	-25.6
200	0.460	-110.1	12.238	112.6	0.041	58.1	0.564	-31.4
300	0.408	-133.9	8.571	101.3	0.052	60.0	0.468	-30.5
400	0.390	-149.7	6.608	94.5	0.062	62.9	0.420	-29.1
500	0.390	-160.7	5.348	88.7	0.073	65.3	0.394	-28.1
600	0.391	-169.8	4.503	84.4	0.084	67.7	0.375	-27.8
700	0.404	-176.7	3.884	80.3	0.095	69.1	0.361	-27.7
800	0.411	178.0	3.446	76.8	0.107	70.3	0.350	-28.2
900	0.426	173.1	3.069	73.4	0.119	71.5	0.339	-29.0
1000	0.436	169.8	2.803	70.7	0.131	72.2	0.330	-29.7

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Y Parameters (Emitter Common)

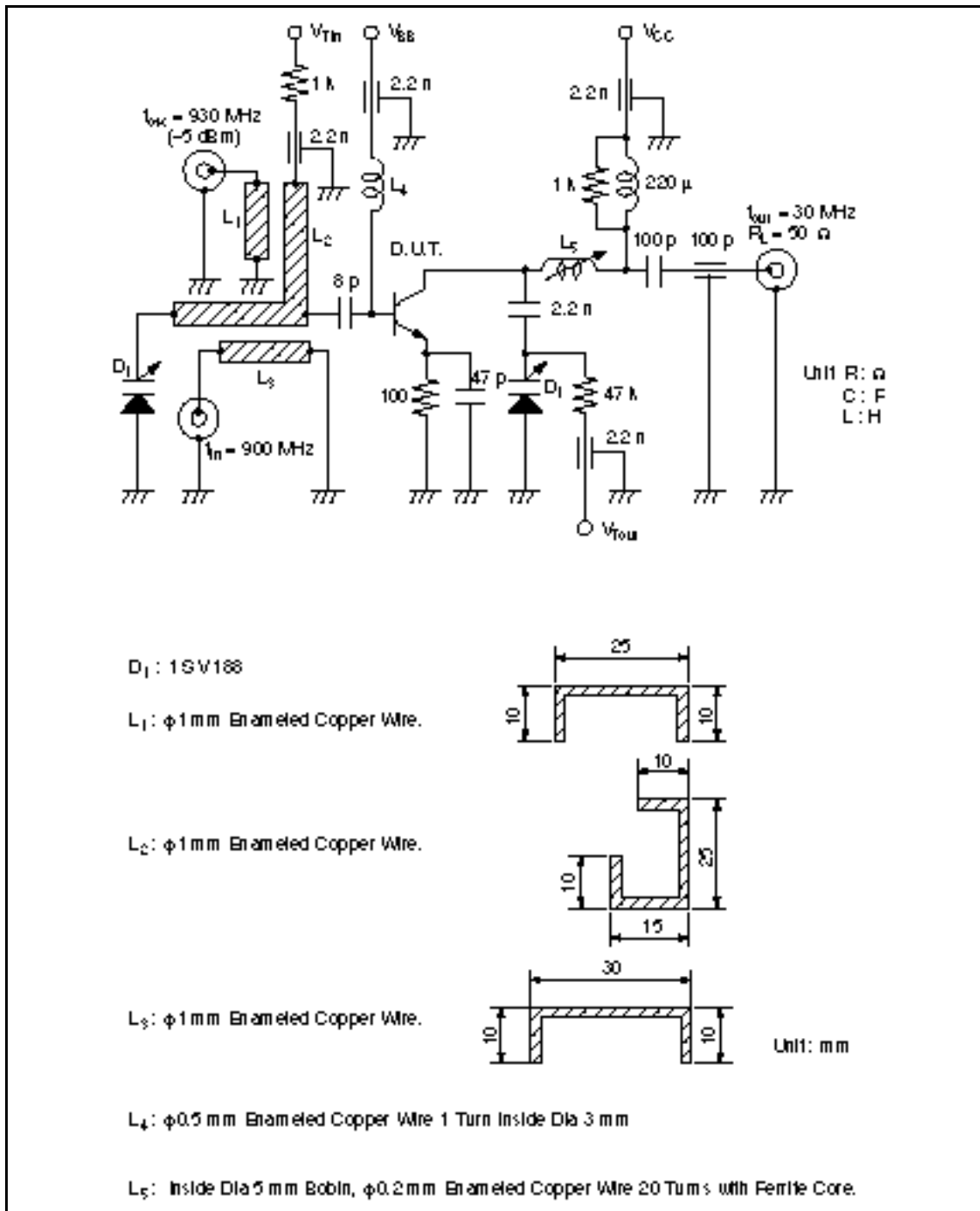
Test Condition $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$

Freq. (MHz)	Yie (mS)		Yfe (mS)		Yre (mS)		Yoe (mS)	
	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.
100	2.663	5.357	161.804	-34.193	-0.002	-0.425	0.055	0.627
200	5.558	10.174	147.899	-63.499	-0.012	-0.880	0.025	1.270
300	9.651	13.450	125.634	-87.205	-0.041	-1.354	0.026	2.024
400	14.160	15.066	102.261	-102.289	-0.093	-1.820	0.044	2.772
500	18.753	15.624	80.041	-110.827	-0.150	-2.309	0.048	3.510
600	23.019	14.727	57.826	-114.923	-0.214	-2.798	0.124	4.301
700	26.444	13.908	40.437	-113.783	-0.263	-3.305	0.211	4.964
800	29.378	12.040	24.049	-111.316	-0.379	-3.822	0.268	5.828
900	31.931	9.960	10.602	-106.726	-0.466	-4.371	0.407	6.578
1000	33.671	7.667	-0.922	-101.485	-0.586	-4.913	0.524	7.381

Test Condition $V_{CE} = 5\text{ V}$, $I_C = 10\text{ mA}$

Freq. (MHz)	Yie (mS)		Yfe (mS)		Yre (mS)		Yoe (mS)	
	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.	REAL	IMAG.
100	5.212	6.660	273.909	-97.915	-0.002	-0.430	0.029	0.527
200	10.124	10.767	208.225	-154.453	-0.015	-0.876	0.011	1.307
300	15.094	11.730	141.558	-172.198	-0.044	-1.347	0.047	2.035
400	18.933	10.991	93.174	-169.490	-0.089	-1.817	0.064	2.735
500	21.811	10.074	58.181	-158.809	-0.133	-2.299	0.096	3.501
600	23.927	8.389	32.829	-146.284	-0.195	-2.785	0.173	4.226
700	25.848	7.170	15.188	-134.592	-0.276	-3.302	0.224	5.010
800	26.851	5.955	2.733	-123.322	-0.353	-3.808	0.282	5.760
900	28.097	4.633	-7.642	-113.209	-0.443	-4.375	0.394	6.551
1000	28.686	3.829	-13.979	-104.651	-0.523	-4.908	0.466	7.215

Conversion Gain and Noise Figure Test Circuit



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