

isc Silicon NPN RF Transistor

MMBR941L

DESCRIPTION

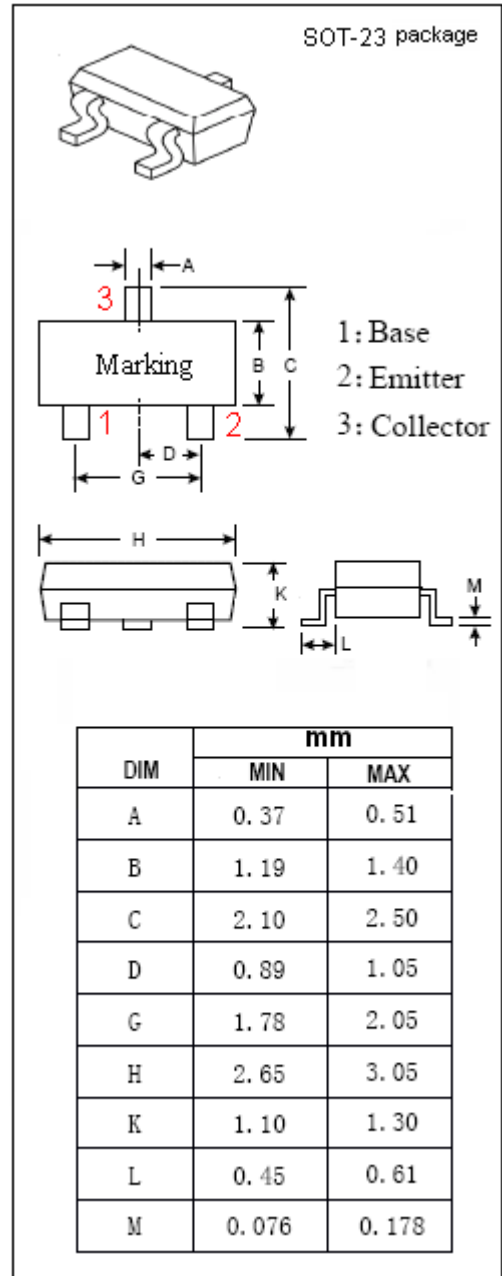
- Low Noise
- High Current-Gain Bandwidth Product

APPLICATIONS

- Designed for use in high gain , low noise small-signal amplifiers.

ABSOLUTE MAXIMUM RATINGS($T_a=25^{\circ}\text{C}$)

SYMBOL	PARAMETER	VALUE	UNIT
V_{CBO}	Collector-Base Voltage	20	V
V_{CEO}	Collector-Emitter Voltage	10	V
V_{EBO}	Emitter-Base Voltage	1.5	V
I_C	Collector Current-Continuous	50	mA
P_C	Collector Power Dissipation @ $T_C=75^{\circ}\text{C}$	0.25	W
T_J	Junction Temperature	150	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-55~150	$^{\circ}\text{C}$



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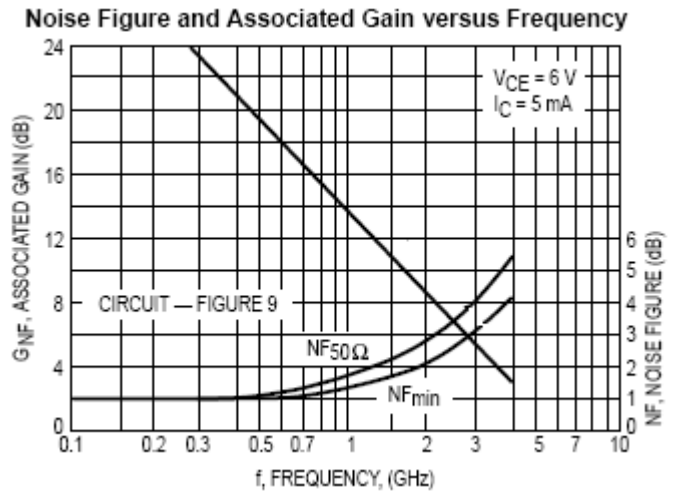
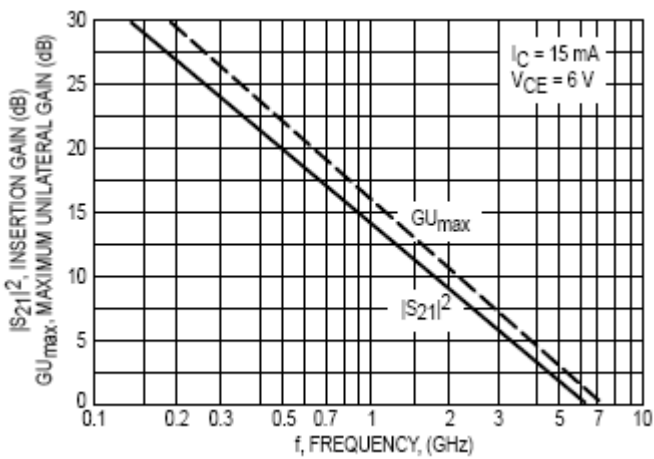
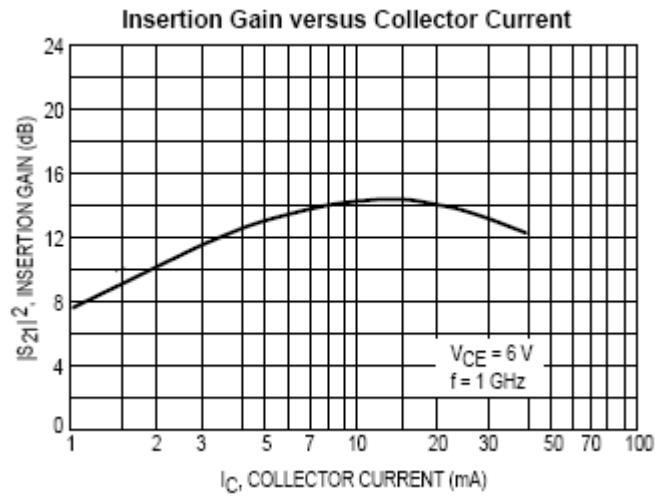
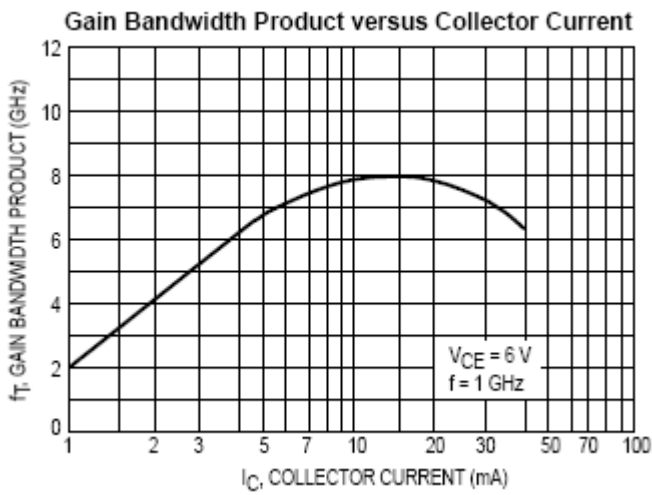
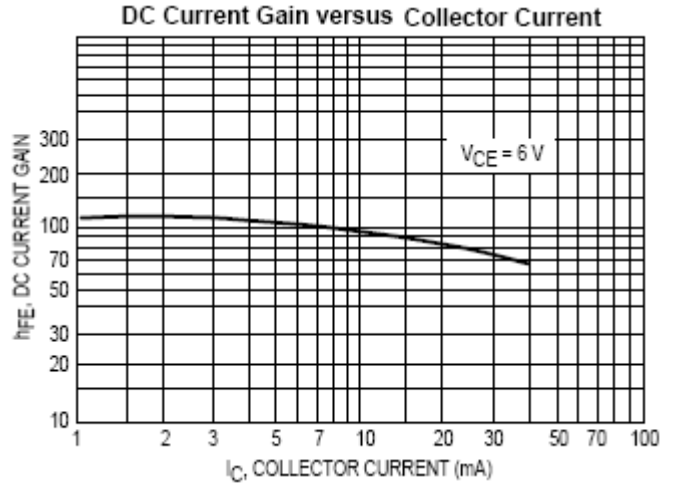
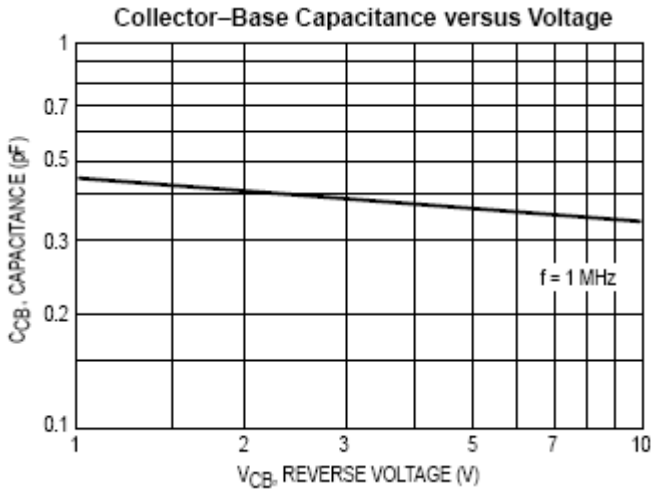
ELECTRICAL CHARACTERISTICS

 $T_C=25^{\circ}\text{C}$ unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP.	MAX	UNIT
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	$I_C=0.1\text{mA}; I_B=0$	10			V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C=0.1\text{mA}; I_E=0$	20			V
I_{EBO}	Emitter Cutoff Current	$V_{EB}=1\text{V}; I_C=0$			0.1	μA
I_{CBO}	Collector Cutoff Current	$V_{CB}=10\text{V}; I_E=0$			0.1	μA
h_{FE}	DC Current Gain	$I_C=5\text{mA}; V_{CE}=6\text{V}$	50		200	
C_{OB}	Output Capacitance	$I_E=0; V_{CB}=10\text{V}; f=1\text{MHz}$		0.35		pF
f_T	Current-Gain—Bandwidth Product	$I_C=15\text{mA}; V_{CE}=6\text{V}; f=1\text{GHz}$		8		GHz
$ S_{21e} ^2$	Insertion Power Gain	$I_C=15\text{mA}; V_{CE}=6\text{V}; f=1.0\text{GHz}$		14		dB
$ S_{21e} ^2$	Insertion Power Gain	$I_C=15\text{mA}; V_{CE}=6\text{V}; f=2.0\text{GHz}$		8.0		dB
GU max	Maximum Unilateral Gain	$I_C=15\text{mA}; V_{CE}=6\text{V}; f=1.0\text{GHz}$		16		dB
GU max	Maximum Unilateral Gain	$I_C=15\text{mA}; V_{CE}=6\text{V}; f=2.0\text{GHz}$		10		dB
NF	Noise Figure	$I_C=5\text{mA}; V_{CE}=6\text{V}; f=1\text{GHz}; R_G=50\Omega$		1.9	2.8	dB

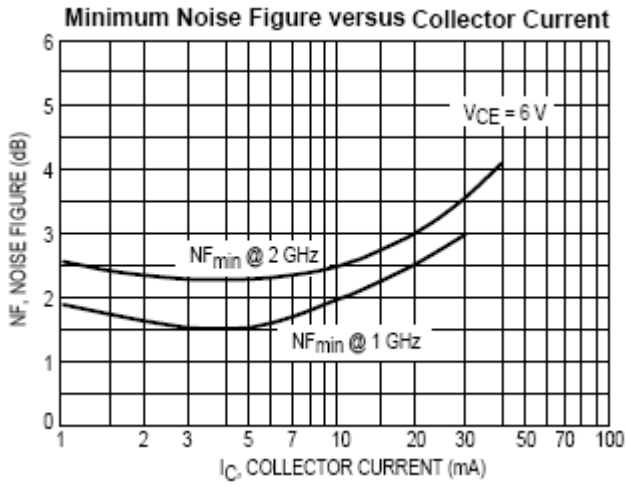
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S-PARAMETER

$V_{CE} = 1 V, I_c = 0.5 mA$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.97	-11	1.78	170	0.03	83	0.99	-4.7
200	0.96	-22	1.74	161	0.06	76	0.99	-9.1
500	0.90	-53	1.60	133	0.13	56	0.93	-21
900	0.75	-89	1.37	105	0.18	37	0.83	-33
1000	0.72	-98	1.32	100	0.18	33	0.82	-36
1500	0.63	-132	1.07	74	0.19	20	0.75	-47
2000	0.57	-163	0.89	55	0.16	15	0.72	-57
3000	0.55	-144	0.67	30	0.15	40	0.71	-76

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 $V_{CE} = 1\text{ V}$, $I_C = 1\text{ mA}$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.95	-13	3.37	169	0.03	81	0.99	-6.2
200	0.93	-27	3.27	158	0.06	73	0.98	-12
500	0.81	-62	2.85	128	0.12	52	0.86	-26
900	0.63	-101	2.21	101	0.15	37	0.73	-38
1000	0.60	-110	2.08	96	0.15	34	0.71	-40
1500	0.51	-144	1.59	73	0.16	27	0.64	-49
2000	0.46	-173	1.28	56	0.16	29	0.61	-58
3000	0.46	-138	0.95	30	0.19	44	0.60	-75

 $V_{CE} = 6\text{ V}$, $I_C = 5\text{ mA}$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.82	-25	14.6	159	0.02	77	0.94	-13
200	0.75	-47	12.6	142	0.04	68	0.85	-22
400	0.55	-79	9.2	120	0.05	61	0.69	-31
600	0.42	-98	6.9	106	0.07	60	0.60	-32
800	0.33	-114	5.3	97	0.08	61	0.56	-33
1000	0.28	-129	4.5	90	0.09	62	0.52	-33
1500	0.25	-155	3.1	77	0.13	67	0.51	-37
2000	0.16	176	2.4	66	0.16	68	0.51	-36
2500	0.21	151	2.0	57	0.20	69	0.48	-40
3000	0.18	122	1.7	50	0.23	68	0.48	-44
3500	0.30	108	1.5	42	0.27	66	0.45	-46
400	0.29	91	1.4	37	0.32	64	0.42	-53

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 $V_{CE} = 6\text{ V}$, $I_c = 10\text{ mA}$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.67	-37	23.5	149	0.02	74	0.88	-18
200	0.54	-64	18.1	129	0.03	68	0.73	-28
400	0.37	-96	11.3	108	0.05	67	0.56	-31
600	0.26	-114	8.0	98	0.06	67	0.50	-30
800	0.21	-130	6.0	91	0.08	70	0.47	-30
1000	0.18	-147	5.1	85	0.09	70	0.45	-30
1500	0.18	-167	3.4	74	0.13	72	0.46	-34
2000	0.11	159	2.6	64	0.17	71	0.46	-34
2500	0.17	140	2.2	56	0.21	69	0.44	-38
3000	0.15	107	1.8	59	0.25	67	0.45	-41
3500	0.27	100	1.7	42	0.28	65	0.42	-42
4000	0.26	85	1.5	37	0.33	61	0.39	-49

 $V_{CE} = 6\text{ V}$, $I_c = 15\text{ mA}$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.56	-46	28.6	143	0.02	73	0.83	-22
200	0.43	-75	20.2	122	0.03	67	0.65	-30
400	0.29	-107	11.8	104	0.04	70	0.50	-30
600	0.22	-125	8.2	95	0.06	74	0.46	-28
800	0.18	-141	6.2	88	0.08	74	0.45	-27
1000	0.16	-158	5.1	83	0.09	74	0.43	-28
1500	0.17	-174	3.4	72	0.13	73	0.44	-32
2000	0.11	150	2.6	63	0.17	72	0.45	-33
2500	0.17	138	2.2	55	0.21	70	0.43	-37
3000	0.15	102	1.9	49	0.25	67	0.44	-39
3500	0.28	98	1.7	42	0.29	65	0.40	-41
4000	0.25	82	1.5	37	0.32	61	0.38	-47

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 $V_{CE} = 6\text{ V}$, $I_c = 20\text{ mA}$

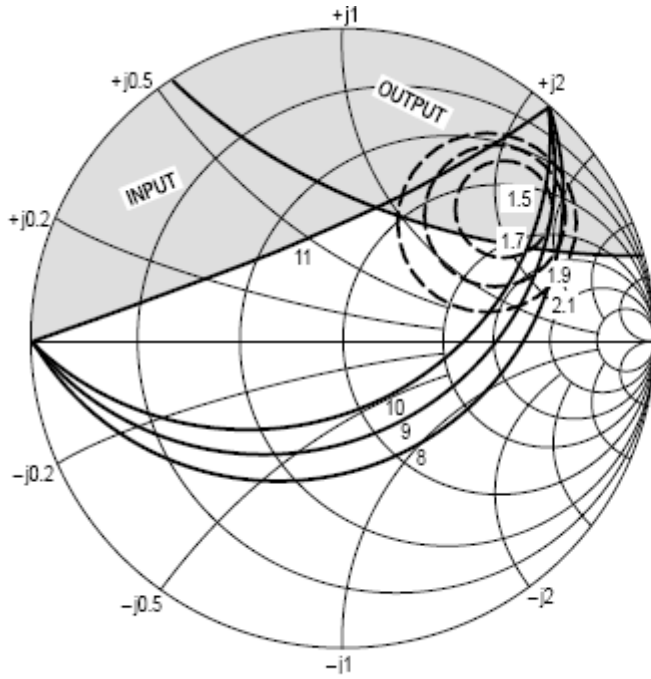
f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.49	-52	31.5	139	0.01	70	0.79	-23
200	0.36	-84	21.1	118	0.02	69	0.60	-29
400	0.25	-115	12.1	101	0.04	73	0.48	-29
600	0.20	-134	8.3	93	0.06	74	0.45	-26
800	0.16	-150	6.2	87	0.07	75	0.44	-26
1000	0.15	-166	5.1	82	0.09	75	0.42	-26
1500	0.16	-176	3.5	75	0.14	74	0.44	-31
2000	0.12	144	2.6	63	0.17	73	0.45	-32
2500	0.17	133	2.2	55	0.22	70	0.43	-36
3000	0.16	101	1.9	49	0.25	68	0.44	-39
3500	0.28	98	1.6	41	0.29	65	0.41	-40
4000	0.26	82	1.5	36	0.33	61	0.39	-47

 $V_{CE} = 6\text{ V}$, $I_c = 30\text{ mA}$

f (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.41	-65	34.3	134	0.01	70	0.74	-25
200	0.30	-99	21.6	113	0.02	70	0.56	-28
400	0.23	-131	11.9	98	0.04	76	0.47	-25
600	0.20	-147	8.1	91	0.06	76	0.45	-24
800	0.18	-163	6.1	84	0.07	78	0.44	-23
1000	0.17	-177	5.0	80	0.09	78	0.43	-24
1500	0.18	174	3.4	70	0.13	76	0.45	-30
2000	0.14	141	2.5	61	0.17	74	0.47	-31
2500	0.20	131	2.1	54	0.21	71	0.45	-36
3000	0.18	104	1.8	47	0.25	69	0.46	-39
3500	0.31	100	1.6	40	0.29	65	0.42	-42
4000	0.29	84	1.5	35	0.33	62	0.40	-48

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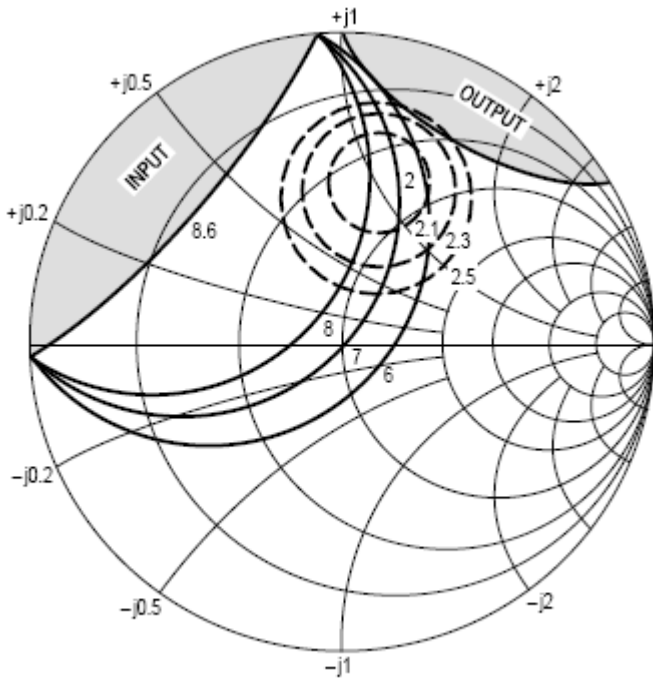
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$V_{CE} = 1.0\text{ V}$
 $I_C = 0.5\text{ mA}$
 □ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	TMS NF OPT	R_N	K
0.5	1.54	$0.71 \angle 39^\circ$	38	0.28

Constant Gain and Noise Figure Contours (f = 1.0 GHz)



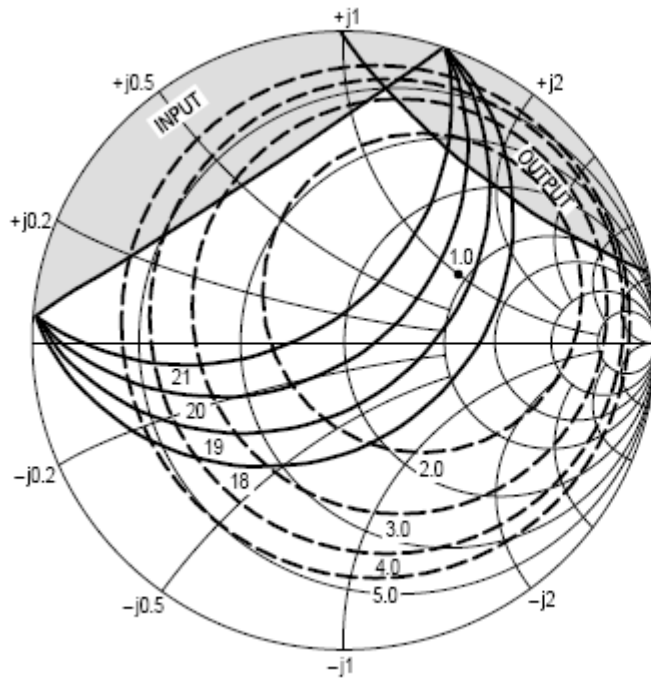
$V_{CE} = 1.0\text{ V}$
 $I_C = 0.5\text{ mA}$
 □ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	TMS NF OPT	R_N	K
1.0	1.95	$0.55 \angle 76^\circ$	28	0.51

Constant Gain and Noise Figure Contours (f = 0.5 GHz)

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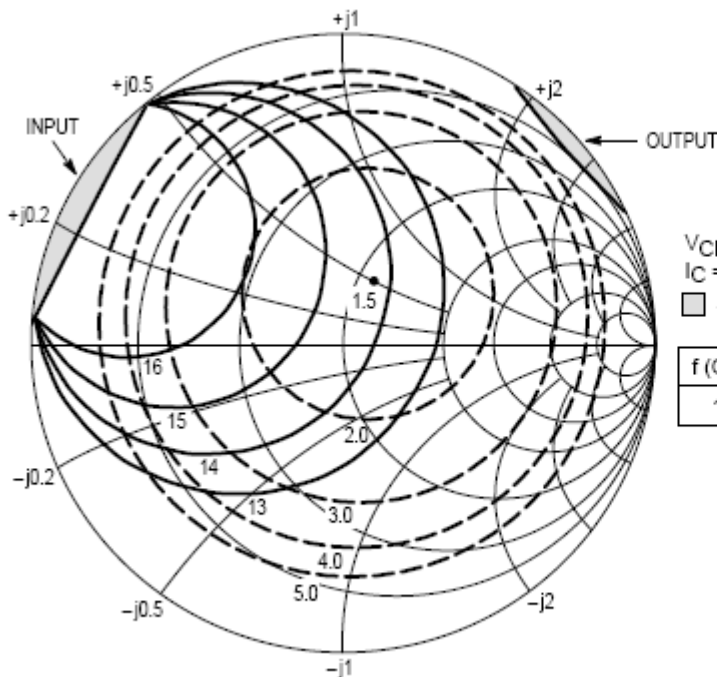
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$V_{CE} = 6.0\text{ V}$
 $I_C = 5.0\text{ mA}$
 □ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	Γ_{MS} NF OPT	R_N	K
0.5	1.0	$0.43 \angle 30^\circ$	18	0.58

Constant Gain and Noise Figure Contours (f = 0.5 GHz)



$V_{CE} = 6.0\text{ V}$
 $I_C = 5.0\text{ mA}$
 □ — AREA OF INSTABILITY

f (GHz)	NF OPT (dB)	Γ_{MS} NF OPT	R_N	K
1.0	1.5	$0.22 \angle 64^\circ$	13	0.93

Constant Gain and Noise Figure Contours (f = 1.0 GHz)