AUK Semiconductor

STC918SF

NPN Silicon Transistor

Features

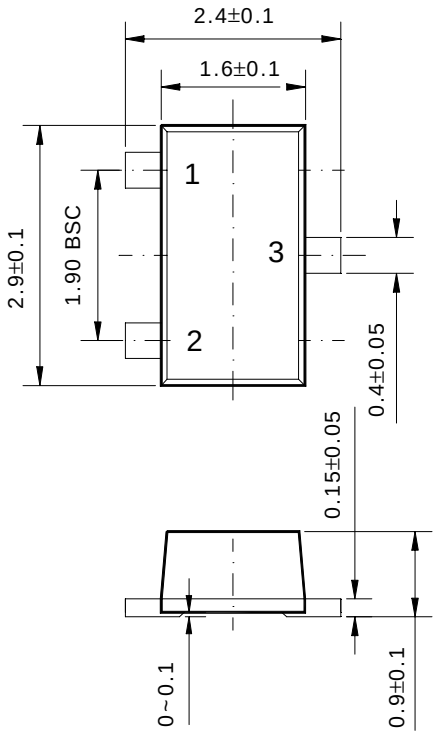
- High current transition frequency
  f_T=9.0 GHz(Typ.) @V_{CE}=6V, I_C=15mA
- Low Noise Figure
  NF_{min}=1.4dB(Typ.) @1.0 GHz, V_{CE}=8V, I_C=3mA
- Maximum Stable Gain(MSG)=19dB @1.0 GHz, V_{CE}=6V, I_C=10mA
- Output third order intercept output(IP_3)=29dBm @ 1.0 GHz,V_{CE}=6V, I_C=10mA

Ordering Information

Type NO.	Marking	Package Code
STC918SF	RF2	SOT-23F

Outline Dimensions

unit : mm



PIN Connections
1. Base
2. Emitter
3. Collector

Absolute maximum ratings

Ta=25°C

Characteristic	Symbol	Ratings	Unit
Collector-Base voltage	V_{CBO}	20	V
Collector-Emitter voltage	V_{CEO}	10	V
Emitter-base voltage	V_{EBO}	1.5	V
Collector current	I_C	50	mA
Collector dissipation	P_C	200	mW
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	-55~150	°C

Electrical Characteristics

T_C=25°C

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Collector-Base breakdown voltage	BV_{CBO} *1	I_C=100μA, I_E=0	20	-	-	V
Collector-Emitter breakdown voltage	BV_{CEO} *1	I_C=100uA, I_B=0	10	-	-	V
Collector cut-off current	I_{CBO} *1	V_{CB}=10V, I_E=0	-	-	0.1	μA
Emitter cut-off current	I_{EBO} *1	V_{EB}=1V, I_C=0	-	-	0.1	μA
DC current gain	h_{FE} *1	V_{CE}=6V, I_C=5mA	50	-	-	-
Transition frequency	f_T	V_{CE}=6V, I_E=15mA	-	9	-	GHz
Collector output capacitance	C_{ob}	V_{CB}=1V, I_E=0, f=1MHz	-	0.4	-	pF
		V_{CB}=5V, I_E=0, f=1MHz	-	0.3	-	

Performance Characteristics

T_C=25°C

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Insertion Gain	$\|S_{21}\|^2$	V_{CE}=1V, I_C=1mA, f=1GHz	-	7	-	dB
		V_{CE}=6V, I_C=15mA, f=1GHz	-	15	-	
Maximum Unilateral Gain	Gu_{MAX} *2	V_{CE}=1V, I_C=1mA, f=1GHz	-	13	-	dB
		V_{CE}=6V, I_C=15mA, f=1GHz	-	17	-	
Maximum Available Gain	MAG*3	V_{CE}=6V, I_C=15mA, f=1GHz	-	18	-	dB
Maximum Stable Gain	MSG*4	V_{CE}=1V, I_C=1mA, f=1GHz	-	12	-	
Noise Figure(Minimum)	NF_{MIN}	V_{CE}=1V, I_C=1mA, f=1GHz	-	1.6	-	dB
		V_{CE}=6V, I_C=5mA, f=1GHz	-	1.4		
Noise Resistance	R_N	V_{CE}=1V, I_C=1mA, f=1GHz	-	24	-	Ω
		V_{CE}=6V, I_C=5mA, f=1GHz	-	19	-	
Associated Gain at Minimum NF	G_{NF}	V_{CE}=1V, I_C=1mA, f=1GHz		10		dB
		V_{CE}=6V, I_C=5mA, f=1GHz		15		
Output Power at 1.0dB Gain Compression	P_{1dB}	V_{CE}=6V, I_C=15mA, f=1GHz	-	13	-	dBm
Output 3'rd Intercept	OIP_3 *5	V_{CE}=6V, I_C=15mA, f=1GHz	-	28	-	dBm

*1 : Pulse width ≤ 300us, Duty cycle ≤ 2% pulsed.

*2 : Maximum unilaterial gain $(Gu_{MAX}) = \dfrac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$

*3 : Maximum Avaible Gain(MAG) = $\left|\dfrac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{(K^2-1)}\right)\right|$, if K>1

*4 : Maximum Stable Gain(MSG) = $\left|\dfrac{|S_{21}|}{|S_{12}|}\right|$, if K<1

*5 : Zin=50Ω and matched for optimum IP_3

Electrical Characteristic Curves

Fig. 1 C_T-V_{CB}

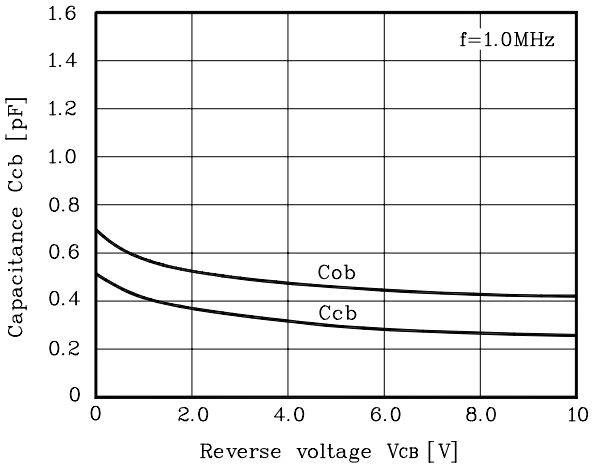


Fig. 2 C_{IB}-V_{EB}

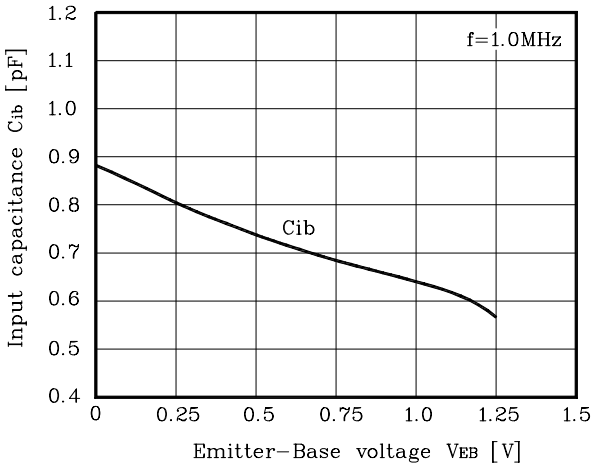


Fig. 3 h_{FE}-I_C

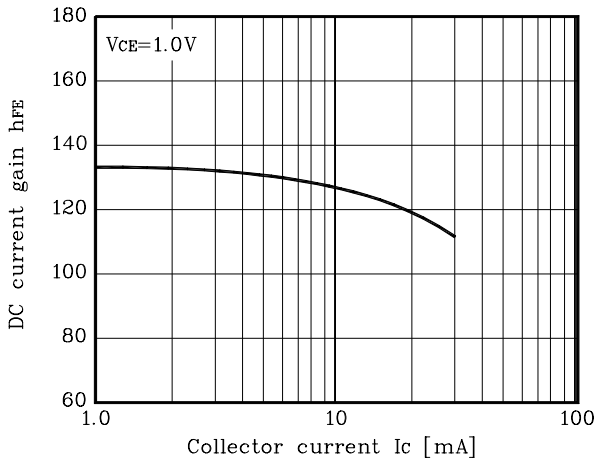


Fig. 4 f_T-I_C

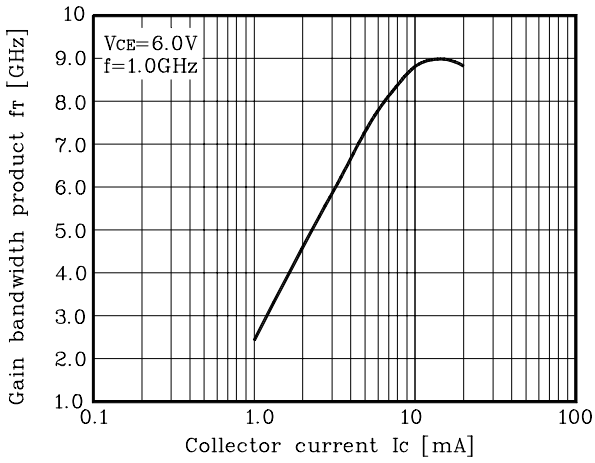
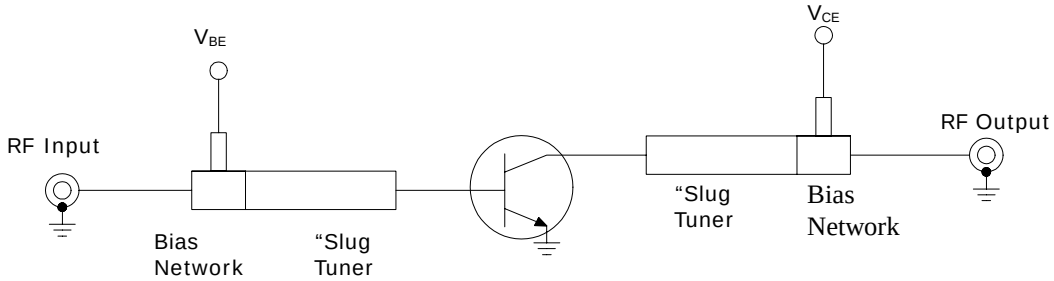


Fig. 5 Functional circuit schematic



Electrical Characteristic Curves

Fig. 6 MSG,MAG-f_T

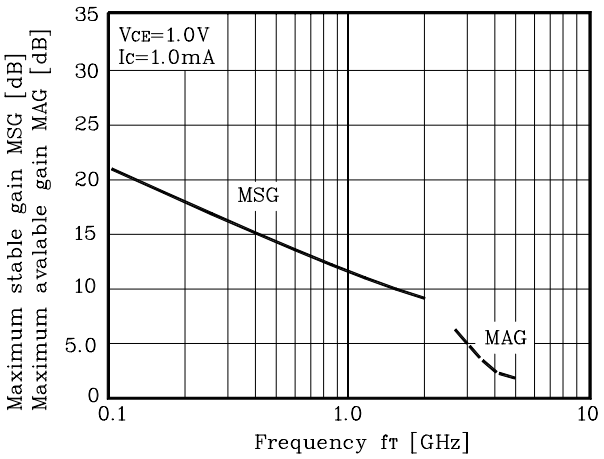


Fig. 7 MSG.MAG-f_T

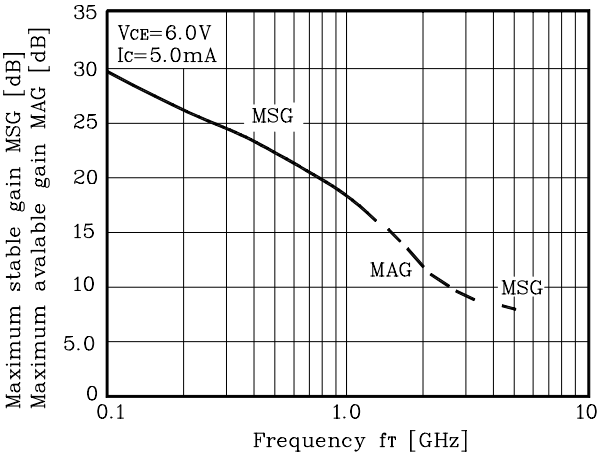


Fig. 8 $|S_{21}|^2$,G_{Umax}-f_T

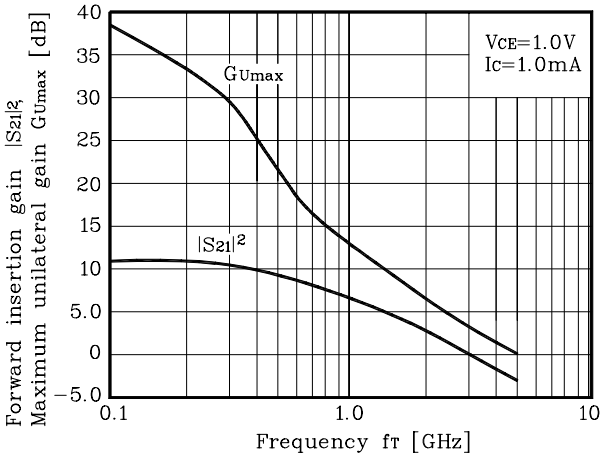


Fig. 9 $|S_{21}|^2$,G_{Umax}-f_T

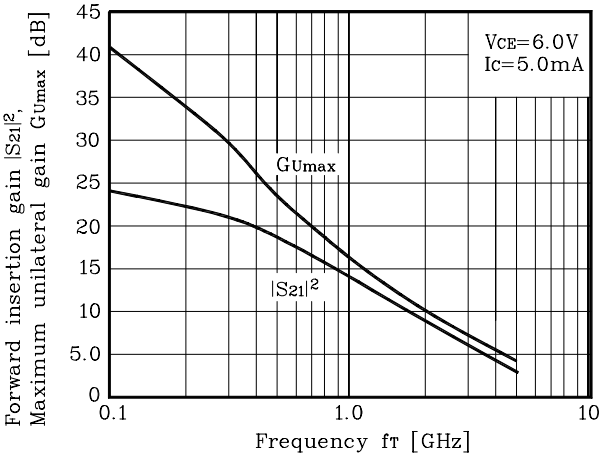


Fig. 10 $|S_{21}|^2$,G_{Umax}-I_C

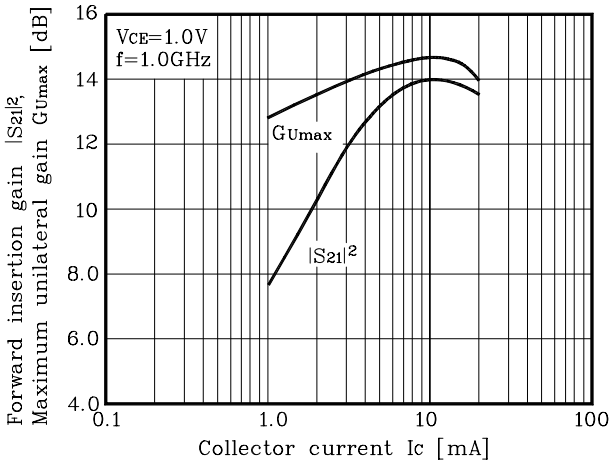
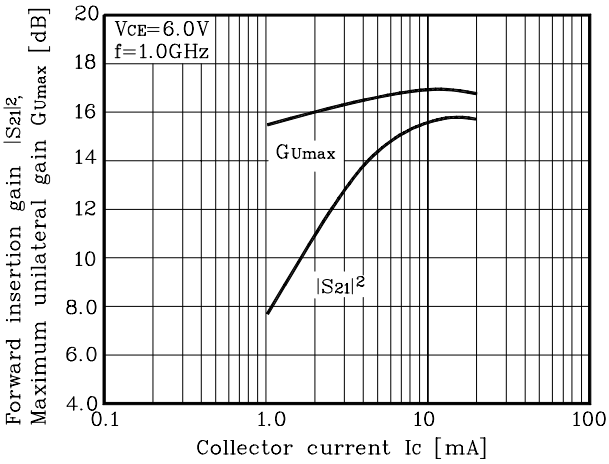


Fig. 11 $|S_{21}|^2$,G_{Umax}-I_C



Electrical Characteristic Curves

Fig. 12 MSG,MAG-I_C

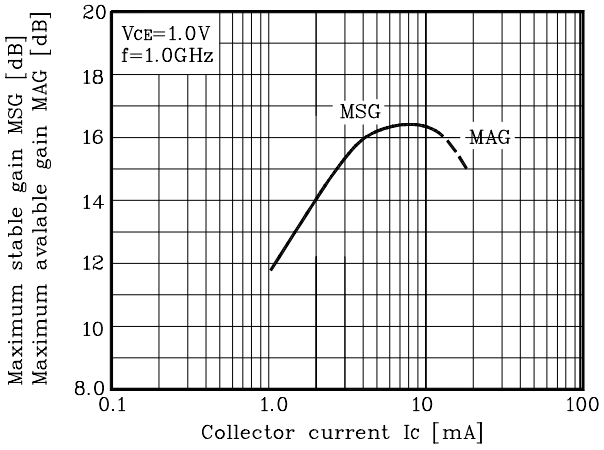


Fig. 13 MSG,MAG-I_C

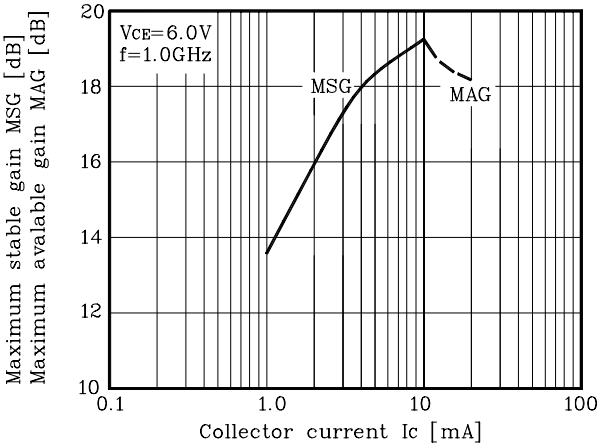


Fig. 14 NF_{min},G_{NF}-f_T

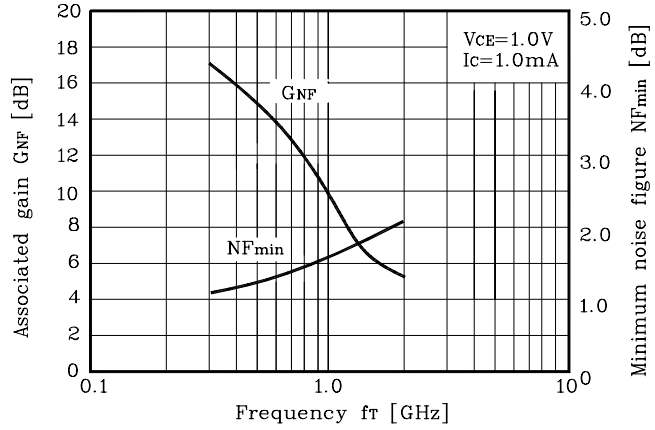


Fig. 15 NF_{min},G_{NF} -f_T

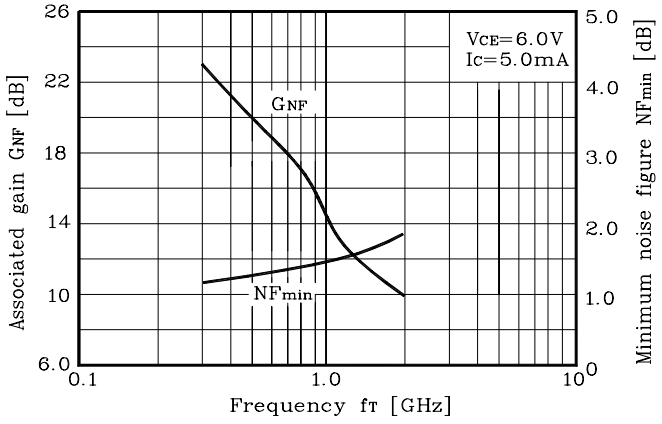


Fig. 16 NF_{min},G_{NF}-I_C

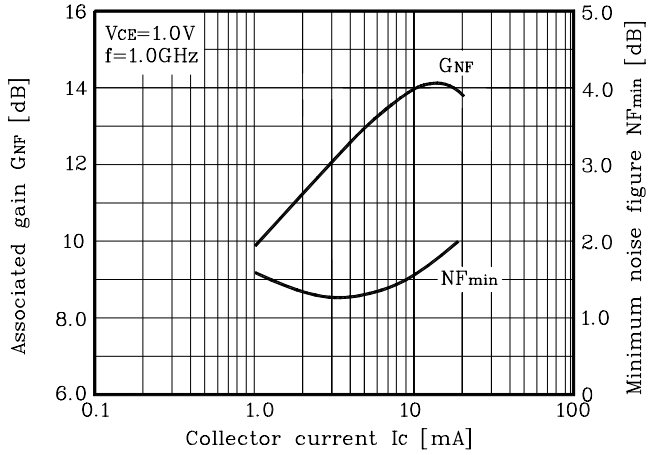
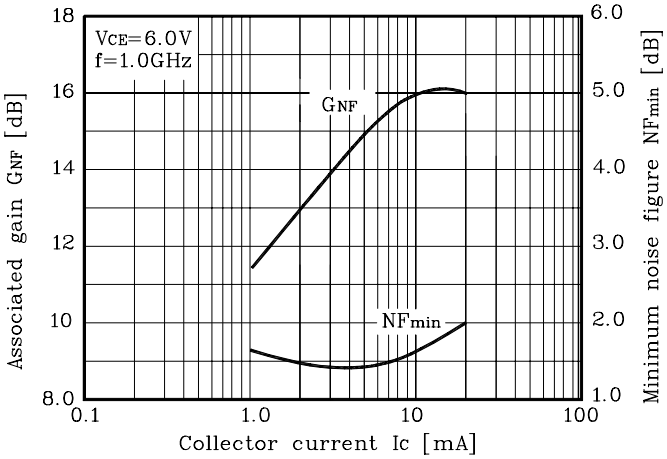
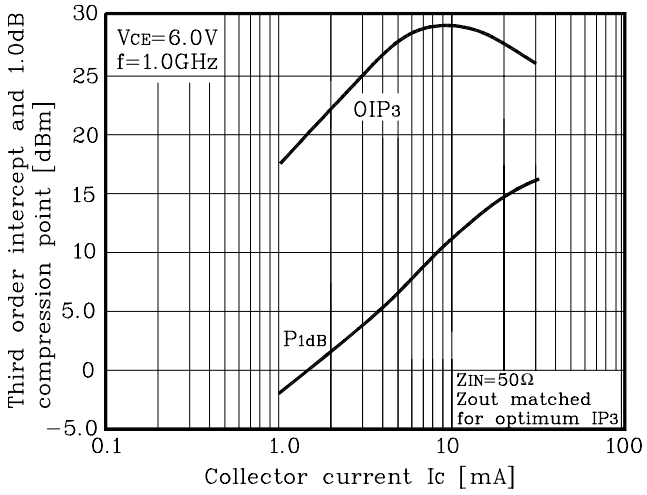


Fig. 17 NF_{min},G_{NF}-I_C



Electrical Characteristic Curves

Fig. 18 OIP_3,P_{1dB}-I_C



■ Common Emitter S-Parameter Data (1/3)

V_{CE}[V]	I_C[mA]	f[GHz]	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	∠ϕ	$\|S_{21}\|$	∠ϕ	$\|S_{12}\|$	∠ϕ	$\|S_{22}\|$	∠ϕ
1.0	1.0	0.1	0.964	-12	3.62	171	0.028	82	0.989	-6
		0.3	0.926	-36	3.41	152	0.078	69	0.950	-17
		0.5	0.872	-55	2.98	135	0.115	56	0.878	-24
		0.7	0.773	-73	2.67	121	0.140	47	0.811	-31
		0.9	0.701	-89	2.40	110	0.157	40	0.751	-37
		1.0	0.672	-96	2.27	105	0.163	37	0.725	-39
		1.3	0.605	-116	1.95	90	0.172	31	0.660	-44
		1.5	0.579	-127	1.77	83	0.176	27	0.631	-48
		2.0	0.537	-152	1.43	66	0.173	24	0.584	-56
		2.5	0.521	-173	1.22	52	0.168	25	0.555	-65
		3.0	0.520	171	1.06	41	0.168	31	0.542	-74
		3.5	0.529	157	0.94	31	0.179	38	0.542	-84
		4.0	0.543	145	0.84	24	0.205	45	0.543	-95
		4.5	0.552	133	0.79	17	0.248	48	0.525	-106
		5.0	0.571	123	0.72	13	0.296	48	0.527	-117
	3.0	0.1	0.896	-20	9.79	165	0.027	79	0.960	-12
		0.3	0.780	-57	8.17	138	0.068	61	0.826	-29
		0.5	0.653	-80	6.36	120	0.089	51	0.680	-38
		0.7	0.551	-101	5.11	107	0.103	46	0.578	-43
		0.9	0.488	-117	4.23	97	0.113	43	0.510	-47
		1.0	0.468	-125	3.89	93	0.117	43	0.484	-48
		1.3	0.431	-143	3.14	82	0.128	43	0.425	-51
		1.5	0.420	-153	2.78	77	0.137	43	0.401	-54
		2.0	0.410	-174	2.16	63	0.157	44	0.364	-60
		2.5	0.415	169	1.80	52	0.179	45	0.343	-68
		3.0	0.426	157	1.55	43	0.205	46	0.332	-76
		3.5	0.439	146	1.37	34	0.234	46	0.332	-85
		4.0	0.454	137	1.24	26	0.265	45	0.329	-95
		4.5	0.470	128	1.13	19	0.302	44	0.323	-105
		5.0	0.492	119	1.05	12	0.339	41	0.324	-116
	5.0	0.1	0.831	-27	14.66	160	0.026	75	0.929	-16
		0.3	0.668	-72	10.92	129	0.059	57	0.719	-37
		0.5	0.530	-97	7.88	112	0.075	51	0.556	-44
		0.7	0.450	-118	6.06	100	0.087	49	0.458	-48
		0.9	0.409	-133	4.89	92	0.098	49	0.400	-50
		1.0	0.397	-140	4.47	88	0.103	50	0.379	-51
		1.3	0.378	-157	3.55	79	0.119	51	0.331	-53
		1.5	0.376	-166	3.12	74	0.131	51	0.312	-56
		2.0	0.378	177	2.41	62	0.159	52	0.283	-62
		2.5	0.392	162	1.99	52	0.190	51	0.266	-70
		3.0	0.402	151	1.71	43	0.221	50	0.258	-78
		3.5	0.417	141	1.51	35	0.253	48	0.257	-87
		4.0	0.433	133	1.36	27	0.286	46	0.254	-97
		4.5	0.451	125	1.25	20	0.321	43	0.250	-107 -
		5.0	0.469	117	1.16	13	0.356	40	0.251	118

■ Common Emitter S-Parameter Data (2/3)

V_{CE}[V]	I_C[mA]	f[GHz]	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	∠ϕ	$\|S_{21}\|$	∠ϕ	$\|S_{12}\|$	∠ϕ	$\|S_{22}\|$	∠ϕ
3.0	3.0	0.1	0.909	-17	9.75	166	0.019	80	0.972	-9
		0.3	0.805	-48	8.43	142	0.051	65	0.874	-22
		0.5	0.680	-70	6.76	124	0.070	55	0.756	-29
		0.7	0.567	-89	5.55	111	0.082	51	0.669	-33
		0.9	0.490	-104	4.65	102	0.091	48	0.608	-36
		1.0	0.464	-111	4.30	98	0.095	48	0.587	-37
		1.3	0.408	-130	3.49	86	0.105	48	0.534	-39
		1.5	0.391	-141	3.10	81	0.113	48	0.513	-41
		2.0	0.366	-163	2.42	68	0.131	50	0.479	-46
		2.5	0.365	178	2.01	56	0.151	52	0.459	-52
		3.0	0.371	164	1.73	47	0.175	53	0.448	-59
		3.5	0.385	152	1.52	38	0.202	54	0.446	-67
		4.0	0.404	142	1.37	30	0.232	54	0.443	-75
		4.5	0.420	132	1.26	23	0.268	53	0.436	-83
		5.0	0.443	124	1.16	16	0.307	51	0.434	-92
	5.0	0.1	0.853	-22	14.73	162	0.019	78	0.950	-12
		0.3	0.697	-60	11.59	134	0.045	62	0.791	-27
		0.5	0.547	-82	8.62	116	0.060	56	0.652	-32
		0.7	0.447	-102	6.75	104	0.070	54	0.565	-35
		0.9	0.386	-117	5.50	96	0.080	54	0.513	-37
		1.0	0.368	-124	5.03	92	0.085	54	0.494	-37
		1.3	0.332	-142	4.02	83	0.099	55	0.453	-39
		1.5	0.323	-152	3.54	78	0.109	56	0.436	-40
		2.0	0.315	-173	2.74	66	0.134	57	0.408	-45
		2.5	0.323	170	2.26	56	0.161	57	0.392	-51
		3.0	0.334	158	1.93	47	0.189	56	0.384	-58
		3.5	0.348	147	1.70	38	0.218	55	0.380	-65
		4.0	0.369	138	1.53	31	0.249	53	0.376	-73
		4.5	0.387	130	1.40	24	0.283	51	0.371	-81
		5.0	0.410	122	1.30	17	0.319	49	0.367	-89
	10.0	0.1	0.730	-33	23.83	154	0.017	74	0.896	-17
		0.3	0.518	-80	15.52	122	0.037	61	0.647	-33
		0.5	0.382	-103	10.52	106	0.049	60	0.517	-34
		0.7	0.319	-122	7.89	96	0.060	61	0.450	-35
		0.9	0.287	-137	6.28	89	0.072	62	0.414	-35
		1.0	0.279	-144	5.71	86	0.078	63	0.402	-35
		1.3	0.268	-159	4.49	79	0.096	64	0.374	-36
		1.5	0.269	-168	3.94	74	0.108	64	0.362	-38
		2.0	0.278	176	3.02	64	0.139	63	0.343	-42
		2.5	0.294	161	2.48	55	0.171	61	0.331	-49
		3.0	0.311	151	2.12	47	0.202	59	0.323	-56
		3.5	0.329	142	1.86	39	0.233	56	0.319	-63
		4.0	0.347	134	1.68	31	0.265	53	0.314	-71
		4.5	0.367	127	1.53	24	0.298	51	0.309	-79
		5.0	0.390	120	1.42	18	0.332	47	0.305	-87

■ Common Emitter S-Parameter Data (3/3)

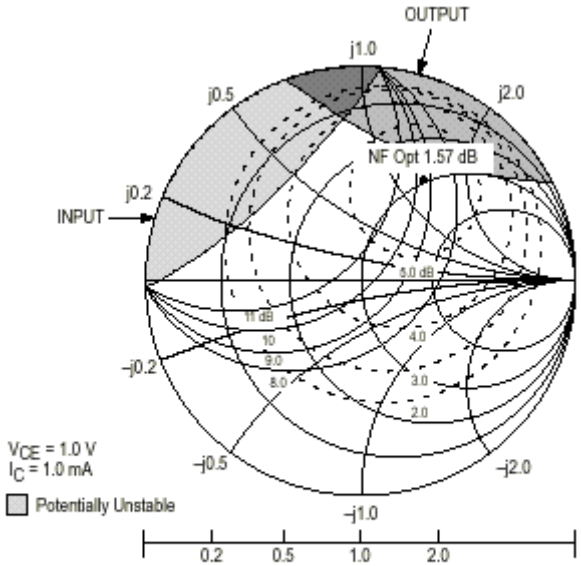
V_{CE}[V]	I_C[mA]	f[GHz]	S_{11}		S_{21}		S_{12}		S_{22}	
			$\|S_{11}\|$	∠ϕ	$\|S_{21}\|$	∠ϕ	$\|S_{12}\|$	∠ϕ	$\|S_{22}\|$	∠ϕ
6.0	5.0	0.1	0.870	-20	14.57	163	0.016	79	0.958	-10
		0.3	0.719	-55	11.68	136	0.040	64	0.822	-23
		0.5	0.566	-76	8.81	118	0.053	58	0.697	-28
		0.7	0.457	-94	6.96	106	0.063	56	0.619	-30
		0.9	0.387	-109	5.69	98	0.072	56	0.571	-31
		1.0	0.365	-115	5.22	94	0.076	56	0.554	-32
		1.3	0.320	-133	4.18	84	0.089	57	0.516	-33
		1.5	0.306	-143	3.69	79	0.098	58	0.501	-35
		2.0	0.291	-164	2.86	67	0.121	59	0.476	-39
		2.5	0.293	178	2.35	57	0.146	60	0.462	-45
		3.0	0.304	165	2.02	48	0.171	59	0.454	-51
		3.5	0.319	154	1.78	40	0.198	59	0.452	-58
		4.0	0.339	145	1.60	32	0.228	58	0.449	-65
		4.5	0.359	136	1.46	25	0.261	56	0.445	-72
		5.0	0.384	128	1.35	18	0.297	54	0.442	-80
	10.0	0.1	0.698	-37	28.78	150	0.014	74	0.877	-17
		0.3	0.465	-84	17.38	118	0.030	63	0.627	-29
		0.5	0.331	-105	11.47	103	0.041	64	0.525	-28
		0.7	0.274	-123	8.50	95	0.052	66	0.478	-27
		0.9	0.248	-137	6.74	88	0.063	67	0.543	-27
		1.0	0.241	-143	6.12	85	0.069	67	0.443	-27
		1.3	0.232	-158	4.80	78	0.086	68	0.425	-28
		1.5	0.235	-165	4.20	74	0.098	68	0.415	-30
		2.0	0.247	179	3.22	64	0.127	66	0.400	-34
		2.5	0.264	165	2.64	55	0.156	64	0.390	-41
		3.0	0.279	156	2.25	48	0.185	62	0.385	-47
		3.5	0.297	148	1.98	40	0.214	60	0.381	-54
		4.0	0.317	141	1.78	33	0.245	57	0.376	-61
		4.5	0.338	134	1.62	26	0.276	55	0.371	-69
		5.0	0.361	127	1.50	19	0.310	52	0.366	-76
	15.0	0.1	0.550	-54	35.24	141	0.012	70	0.801	-20
		0.3	0.351	-107	17.63	109	0.024	66	0.562	-25
		0.5	0.267	-130	11.12	97	0.035	70	0.506	-21
		0.7	0.246	-147	8.12	90	0.047	72	0.481	-21
		0.9	0.239	-158	6.39	84	0.058	72	0.467	-22
		1.0	0.239	-163	5.79	82	0.064	73	0.462	-22
		1.3	0.245	-174	4.52	75	0.082	72	0.450	-24
		1.5	0.253	-180	3.96	71	0.094	72	0.444	-26
		2.0	0.272	168	3.04	62	0.123	70	0.433	-32
		2.5	0.296	156	2.48	53	0.152	68	0.425	-39
		3.0	0.315	148	2.12	45	0.182	66	0.421	-46
		3.5	0.339	140	1.86	38	0.213	64	0.417	-54
		4.0	0.358	134	1.67	31	0.245	62	0.414	-61
		4.5	0.381	127	1.52	24	0.279	59	0.410	-69
		5.0	0.406	120	1.40	18	0.317	56	0.406	-77

■ Common Emitter Noise Parameter Data (1/1)

V_{CE}[V]	I_C[mA]	f[GHz]	NF_{MIN} [dB]	Γo		R_N [Ω]	R_N	G_{NF} [dB]
				MAG	∠ϕ			
1.0	1.0	0.3	1.14	0.67	16	29	0.58	17.3
		0.5	1.24	0.63	28	28	0.56	14.8
		0.7	1.35	0.60	40	27	0.53	12.5
		0.9	1.50	0.57	52	25	0.51	10.6
		1.0	1.57	0.56	58	24	0.49	9.7
		1.5	1.86	0.51	89	19	0.39	6.5
		2.0	2.08	0.50	120	13	0.26	5.2
3.0	3.0	0.3	1.04	0.57	12	21	0.42	21.5
		0.5	1.12	0.53	21	20	0.41	18.8
		0.7	1.21	0.50	31	19	0.39	16.4
		0.9	1.30	0.47	42	19	0.38	14.3
		1.0	1.34	0.45	47	18	0.37	13.4
		1.5	1.57	0.41	77	15	0.31	9.9
		2.0	1.80	0.40	110	12	0.24	8.4
6.0	5.0	0.3	1.22	0.54	11	22	0.44	23.1
		0.5	1.27	0.51	19	21	0.42	20.3
		0.7	1.32	0.48	28	20	0.41	17.8
		0.9	1.38	0.45	38	20	0.39	15.7
		1.0	1.41	0.44	43	19	0.38	14.7
		1.5	1.61	0.40	71	17	0.33	11.2
		2.0	1.86	0.38	103	13	0.26	9.5

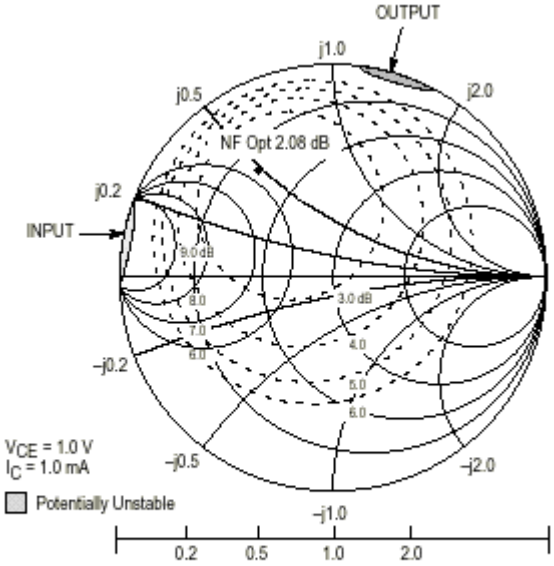
Electrical Characteristic Curves

Fig. 19 Constant Gain & Noise Figure Coutours



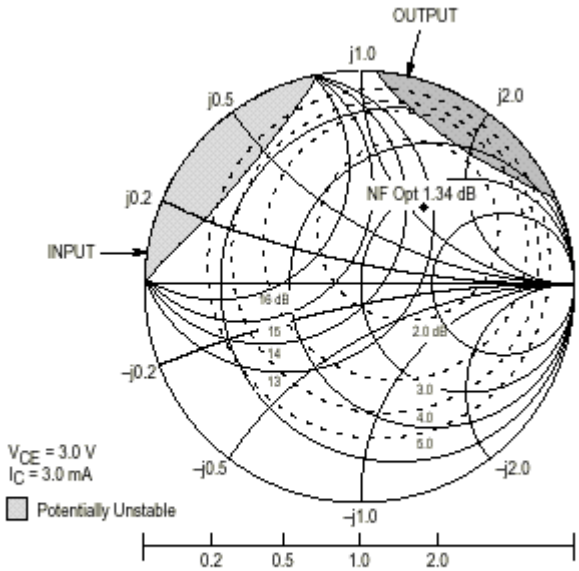
f (GHz)	NF Opt (dB)	Γ_o	Rn	K
1.0	1.57	0.56 ∠ 57.7°	24.2	0.48

Fig. 20 Constant Gain & Noise Figure Coutours



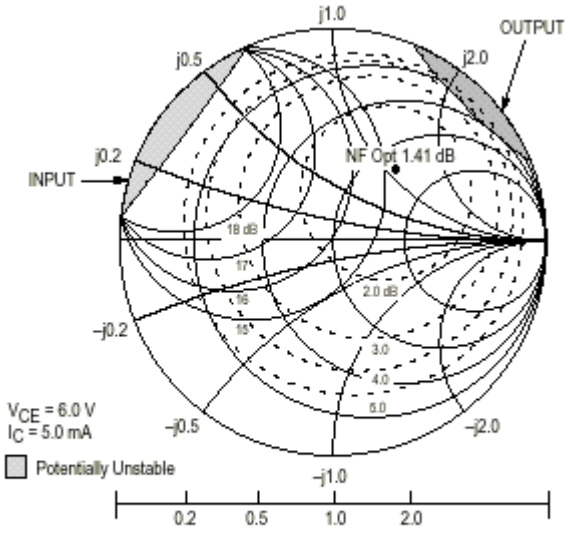
f (GHz)	NF Opt (dB)	Γ_o	Rn	K
2.0	2.08	0.50 ∠ 119.8°	13	0.93

Fig. 21 Constant Gain & Noise Figure Coutours



f (GHz)	NF Opt (dB)	Γ_o	Rn	K
1.0	1.34	0.45 ∠ 47.3°	18.2	0.73

Fig. 22 Constant Gain & Noise Figure Coutours



f (GHz)	NF Opt (dB)	Γ_o	Rn	K
1.0	1.41	0.44 ∠ 42.9°	19	0.86