

FEATURES

- **HIGH GAIN BANDWIDTH PRODUCT:** $f_T = 2.2$ GHz
- **EXCELLENT INTERMODULATION CHARACTERISTICS AT HIGH OUTPUT LEVELS**
- **LOW NOISE FIGURE:** 3.5 dB at 200 MHz
- **EXCELLENT WIDE BAND CATV AMPLIFIER**

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CB0}	Collector to Base Voltage	V	45
V _{CE0}	Collector to Emitter Voltage	V	25
V _{EB0}	Emitter to Base Voltage	V	3
I _c	Collector Current	mA	300
T _J	Junction Temperature	°C	200
T _{STG}	Storage Temperature	°C	-65 to +175

DESCRIPTION AND APPLICATIONS

The NE740 series of NPN silicon transistors is designed for wide bandwidth VHF and UHF amplifiers. Excellent intermodulation characteristics and low noise make the series a widely used general purpose low to medium power transistor. (The NE90115 is the PNP complement.) The series is available as a chip and in a variety of reliable packages. The NE74014 (2SC1253) and NE74020 (2SC1251) are screened to NEC's Grade C level of reliability which make the devices very attractive for military and industrial applications requiring MTBF's greater than 10⁶ hours. The series reliability is assured by NEC's Pt-Si/Ti/Pt/Au metallization system and quality control procedures which are patterned after MIL-S-19500.

PERFORMANCE SPECIFICATIONS ($T_A = 25^\circ\text{C}$)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE74000 00 (CHIP)			NE74014 2SC1253 14 (TO-39)			NE74020 2SC1251 20		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f _r	Gain Bandwidth Product at V _{CE} = 15 V, I _c = 50 mA	GHz	1.8	2.2		1.8	2		1.8	2.2	
S _{21E} ²	Insertion Power Gain at V _{CE} = 10 V, I _c = 50 mA, f = 0.2 GHz f = 0.5 GHz f = 1 GHz	dB		17 10 5			17 10 5			17 10 5	
NF _{MIN}	Minimum Noise Figure at V _{CE} = 15 V, I _c = 50 mA, R _G = 50 Ω, f = 200 MHz at V _{CE} = 16 V, I _c = 5 mA ² , f = 200 MHz	dB		3.5	4		3.5	4		3.5	4
MAG	Maximum Available Gain ³ at V _{CE} = 15 V, I _c = 50 mA f = 0.2 GHz f = 0.5 GHz f = 1 GHz	dB	14	18 11 6		14	18 11 6		14	18 11 6	
P _{1dB}	Power Output at 1 dB Compression Point at V _{CE} = 15 V, I _c = 100 mA, f = 1 GHz	dBm		29						29	

Notes:

1. Electronic Industrial Association of Japan.
2. Input and output are tuned for optimum noise figure.
3. Maximum Available Gain (MAG) is calculated from the device S-Parameters using the equation, $MAG = |S_{21E}|^2 \cdot \frac{1}{1 - |S_{11E}|^2} \cdot \frac{1}{1 - |S_{22E}|^2}$

ELECTRICAL CHARACTERISTICS (TA = 25°C)

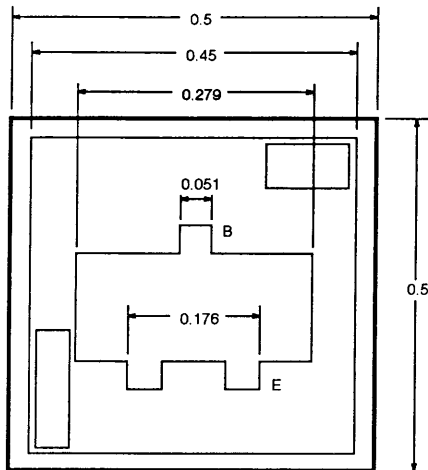
PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE74000 00 (CHIP)			NE74014 2SC1253 14 (TO-39)			NE74020 2SC1251 20		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
ICBO	Collector Cutoff Current at VCB = 30 V, IE = 0	μA			0.1			0.1			0.1
IEBO	Emitter Cutoff Current at VEB = 2 V, IC = 0	μA			0.5			0.5			0.5
hFE	Forward Current Gain ² at VCE = 10 V, IC = 50 mA		20	100	200	20	100	200	20	100	200
COB	Output Capacitance ³ at VCB = 15 V, IE = 0, f = 1 MHz	pF		2	3		2	3		2	3
RTH	Thermal Resistance (Junction-to-Case)	°C/W			22			30			35
PT	Total Power Dissipation ⁴ (Tc = 25°C)	W			7			5			5

Notes:

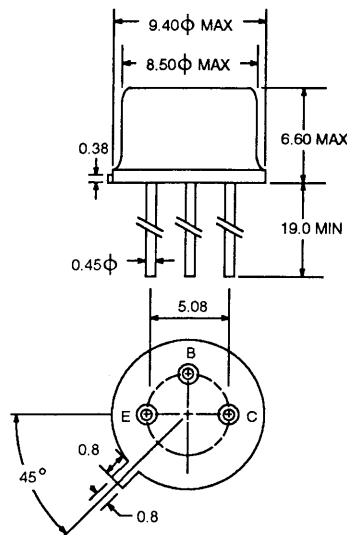
1. Electronic Industrial Association of Japan.
2. Pulse Width ≤ .350 μs, Duty Cycle ≤ 2%/pulsed.
3. The emitter and stud are grounded.

OUTLINE DIMENSIONS (Units in mm)

NE74000 (CHIP)

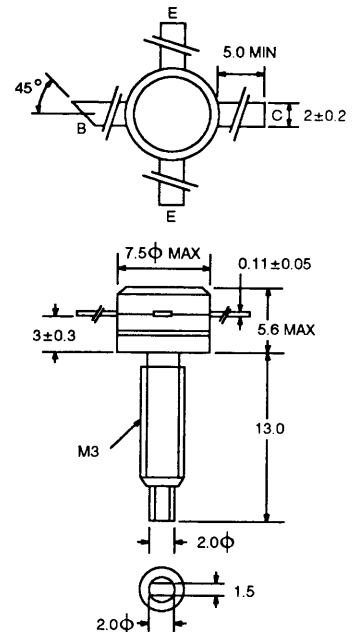


OUTLINE 14 (TO-39)



All leads insulated from case.

OUTLINE 20

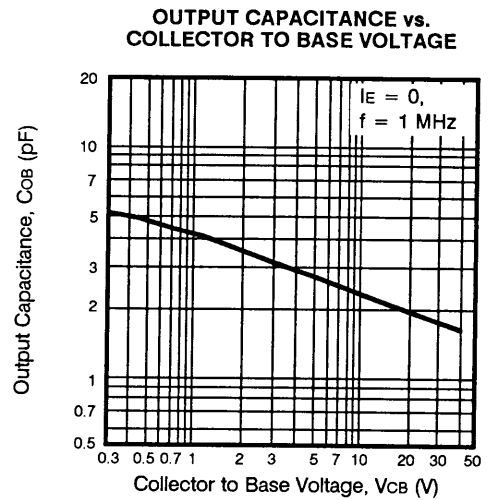
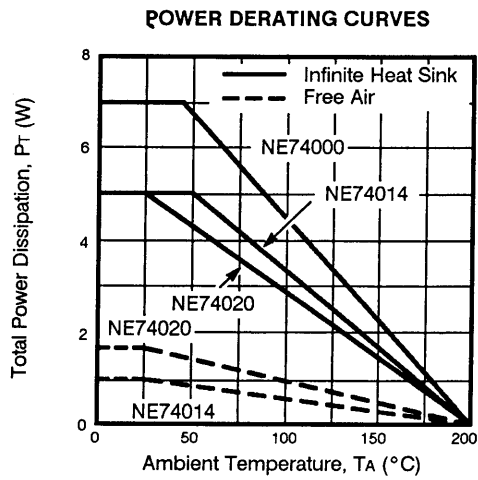


All leads insulated from stud.

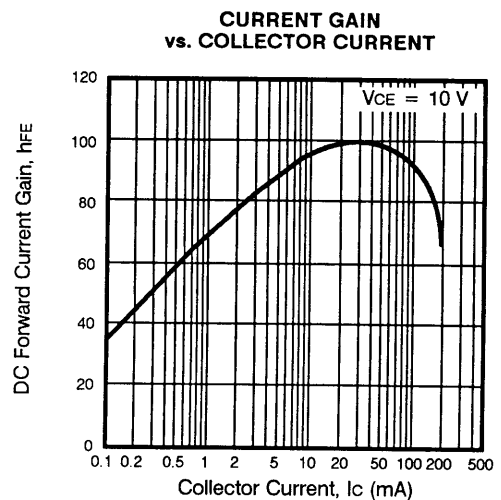
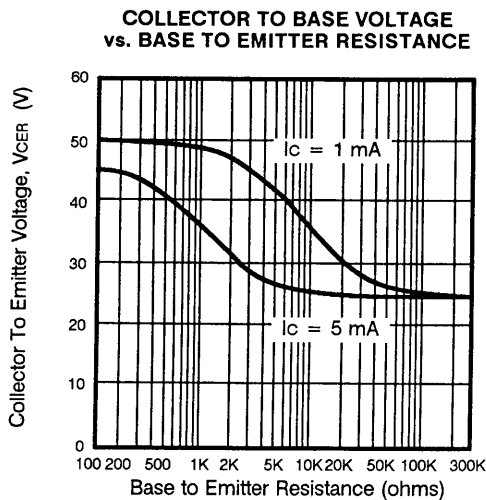
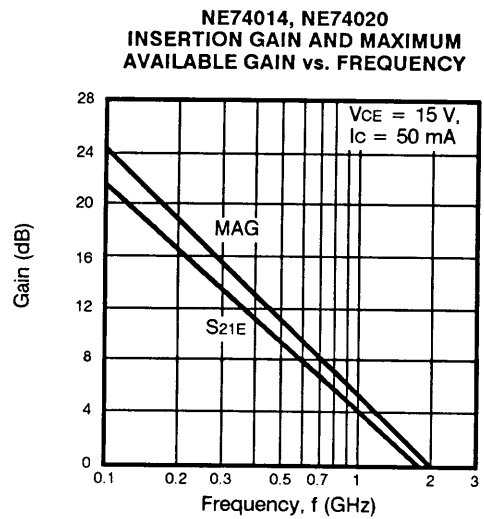
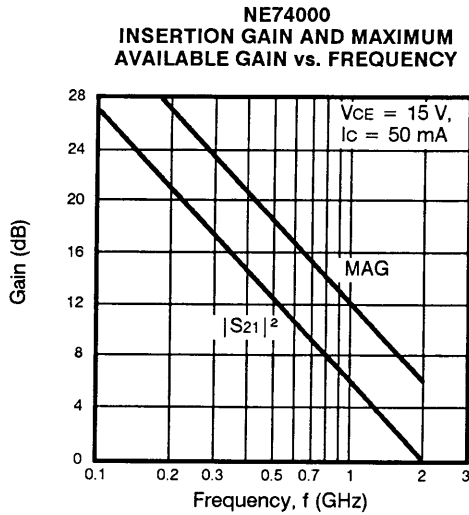


NE74000, NE74014, NE74020

TYPICAL DEVICE CHARACTERISTICS (TA = 25°C)

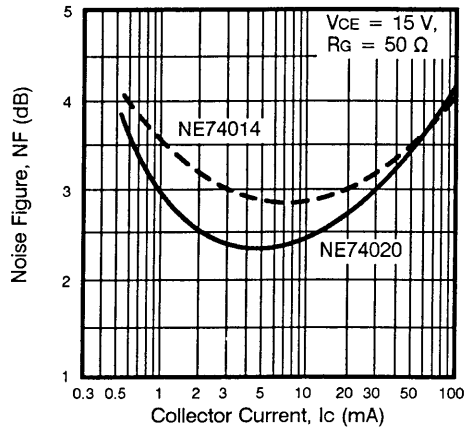


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

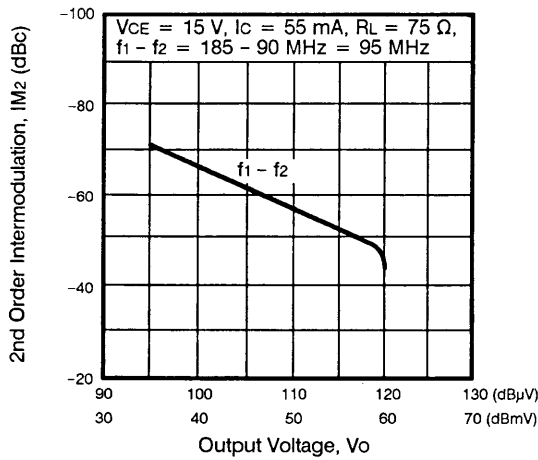


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

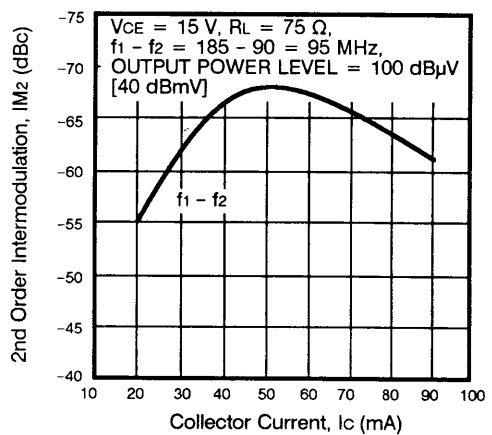
NOISE FIGURE vs. COLLECTOR CURRENT



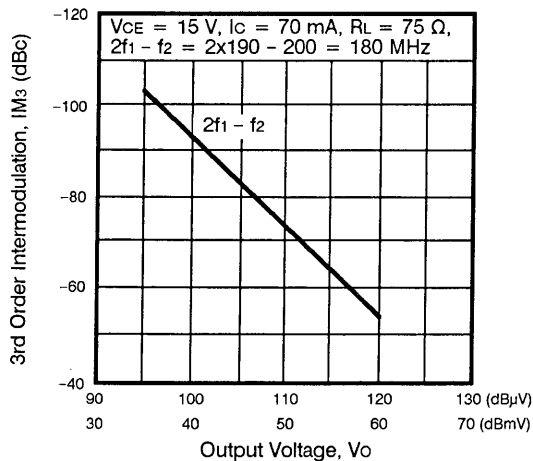
NE74014
2ND ORDER INTERMODULATION
DISTORTION vs. OUTPUT VOLTAGE



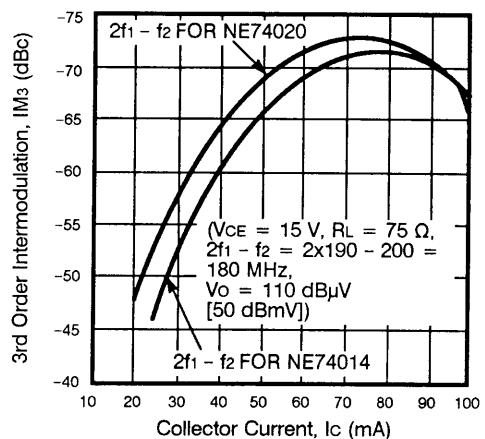
NE74020
2ND ORDER INTERMODULATION
DISTORTION vs. COLLECTOR CURRENT



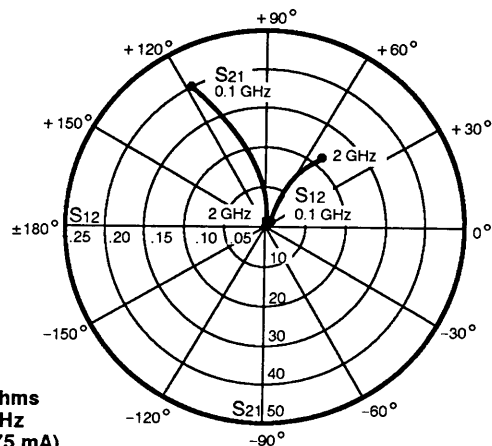
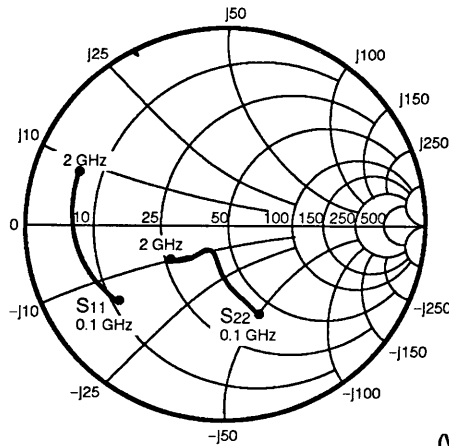
NE74020
3RD ORDER INTERMODULATION
DISTORTION vs. OUTPUT VOLTAGE



NE74014, NE74020
3RD ORDER INTERMODULATION
DISTORTION vs. COLLECTOR CURRENT



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE74000
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_C = 75 mA)

S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 25 mA

FREQUENCY (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.72	-144	19.85	109	.03	37	.39	-74
200	.74	-163	10.40	95	.03	39	.22	-92
400	.75	-175	5.26	82	.04	47	.16	-106
600	.75	180	3.52	73	.06	50	.16	-113
800	.75	176	2.65	64	.07	50	.17	-116
1000	.76	173	2.11	57	.08	49	.19	-120
1200	.76	170	1.76	49	.09	47	.22	-123
1400	.76	168	1.50	43	.10	46	.25	-127
1600	.76	166	1.31	35	.11	44	.28	-132
1800	.76	163	1.17	29	.11	42	.31	-136
2000	.76	161	1.04	23	.12	40	.34	-141

V_{CE} = 10 V, I_C = 50 mA

100	.73	-158	21.47	104	.02	39	.30	-89
200	.76	-170	10.93	92	.02	46	.18	-110
400	.76	-178	5.49	81	.04	56	.15	-127
600	.77	178	3.67	73	.05	57	.16	-131
800	.77	175	2.75	65	.06	56	.17	-133
1000	.77	172	2.20	58	.07	54	.19	-134
1200	.76	169	1.83	51	.08	52	.21	-136
1400	.77	167	1.56	44	.09	51	.24	-139
1600	.77	164	1.36	37	.10	49	.27	-142
1800	.77	162	1.21	32	.11	47	.29	-145
2000	.77	159	1.09	25	.12	46	.32	-149

V_{CE} = 10 V, I_C = 75 mA

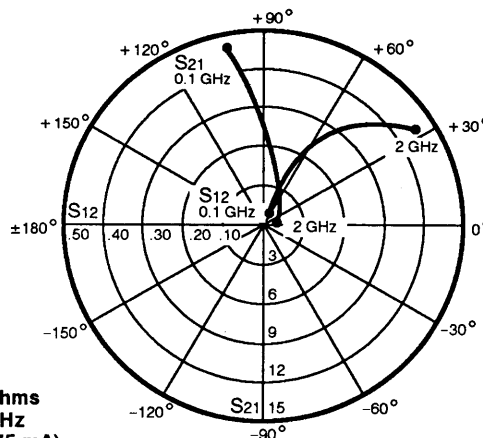
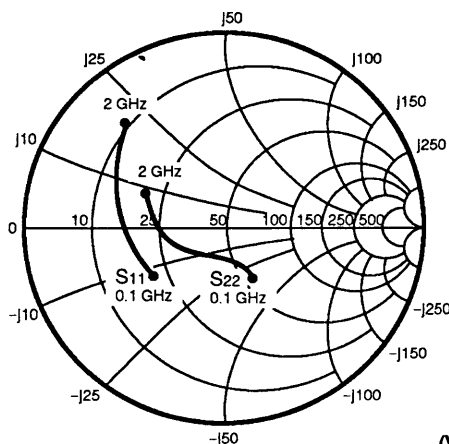
100	.74	-163	21.34	102	.02	43	.26	-92
200	.76	-173	10.78	91	.02	52	.17	-113
400	.77	-179	5.42	81	.03	59	.14	-128
600	.77	177	3.62	73	.05	60	.16	-131
800	.78	174	2.73	65	.06	58	.17	-133
1000	.78	171	2.19	58	.07	57	.19	-135
1200	.78	169	1.82	51	.08	55	.22	-137
1400	.78	166	1.55	44	.09	53	.24	-140
1600	.78	164	1.36	37	.10	51	.27	-144
1800	.78	161	1.20	32	.11	50	.30	-147
2000	.78	159	1.09	26	.11	48	.32	-150

V_{CE} = 10 V, I_C = 100 mA

100	.74	-166	20.15	101	.01	45	.24	-87
200	.76	-174	10.14	91	.02	54	.15	-104
400	.77	-180	5.10	81	.03	61	.14	-119
600	.78	177	3.43	73	.05	61	.16	-124
800	.78	174	2.59	65	.06	59	.18	-127
1000	.79	171	2.06	58	.07	57	.20	-131
1200	.79	169	1.72	51	.08	56	.22	-134
1400	.79	166	1.48	44	.09	54	.25	-138
1600	.79	164	1.30	38	.10	53	.28	-142
1800	.78	161	1.15	31	.10	51	.31	-145
2000	.79	159	1.03	25	.11	49	.33	-149

NOTE: S-Parameters include bond wires.
 BASE: Total 1 wire (s), 1 per bond pad, 0.0250" (636 μm) long each wire.
 COLLECTOR: Total 1 wire (s), 1 per bond pad, 0.0182" (463 μm) long each wire.
 EMITTER: Total 2 wire (s), 1 per side, 0.0456" (1157 μm) long each wire.
 WIRE: 0.0007" (17.7 μm) dia., gold.

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE74014
Coordinates in Ohms
Frequency in GHz
(Vce = 10 V, Ic = 75 mA)

S-MAGN AND ANGLES:

VCE = 10 V, IC = 25 mA

FREQUENCY (MHz)	S11		S21		S12		S22	
100	.44	-132	13.68	105	.03	56	.36	-59
200	.46	-155	7.33	90	.07	61	.24	-70
400	.48	-173	3.86	75	.12	64	.17	-86
600	.50	178	2.69	63	.17	63	.18	-105
800	.53	171	2.10	52	.22	59	.20	-123
1000	.56	164	1.78	42	.26	54	.23	-139
1200	.60	157	1.55	34	.31	50	.26	-154
1400	.63	150	1.39	25	.35	45	.30	-170
1600	.65	143	1.25	18	.38	41	.34	179
1800	.68	136	1.15	11	.41	36	.39	165
2000	.72	130	1.06	6	.44	32	.44	155

VCE = 10 V, IC = 50 mA

100	.43	-143	14.34	102	.03	60	.30	-62
200	.45	-161	7.59	88	.06	64	.20	-74
400	.48	-176	3.96	74	.12	67	.15	-91
600	.50	177	2.74	63	.17	64	.16	-109
800	.53	170	2.14	52	.22	60	.19	-127
1000	.56	164	1.81	42	.26	55	.22	-141
1200	.60	157	1.57	35	.31	50	.25	-155
1400	.63	150	1.41	26	.35	46	.29	-170
1600	.65	144	1.28	18	.38	41	.33	179
1800	.68	137	1.17	12	.41	36	.38	166
2000	.71	130	1.09	7	.44	32	.43	156

VCE = 10 V, IC = 75 mA

100	.43	-147	14.06	100	.02	60	.28	-60
200	.46	-163	7.39	87	.06	67	.19	-70
400	.48	-177	3.88	74	.12	67	.15	-86
600	.51	176	2.68	62	.17	65	.16	-104
800	.53	170	2.08	52	.22	60	.19	-123
1000	.57	163	1.77	41	.26	55	.22	-137
1200	.60	156	1.53	33	.30	51	.26	-152
1400	.64	149	1.37	25	.35	46	.29	-168
1600	.66	143	1.24	17	.38	41	.34	-179
1800	.68	136	1.14	11	.41	37	.38	167
2000	.72	129	1.05	6	.44	33	.43	157

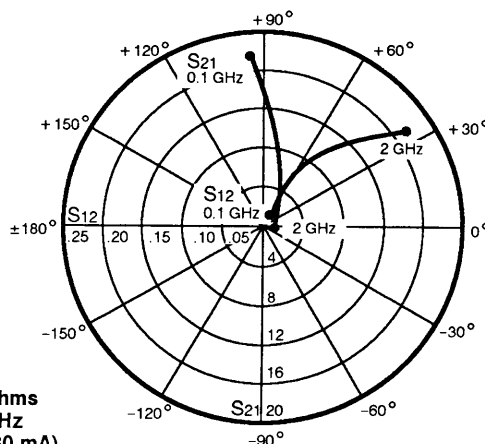
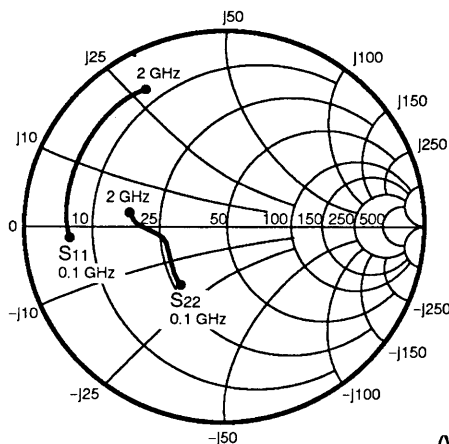
VCE = 10 V, IC = 100 mA

100	.45	-154	12.87	99	.02	62	.29	-49
200	.48	-167	6.77	87	.06	66	.22	-55
400	.50	-180	3.55	73	.11	69	.18	-72
600	.53	174	2.47	61	.16	67	.20	-91
800	.55	167	1.92	50	.21	62	.23	-112
1000	.58	161	1.64	40	.26	57	.26	-130
1200	.62	154	1.42	32	.30	53	.30	-146
1400	.65	147	1.27	24	.35	48	.33	-163
1600	.67	141	1.14	16	.39	43	.37	-176
1800	.70	134	1.05	10	.41	39	.42	170
2000	.73	127	.97	5	.44	34	.47	158



NE74000, NE74014, NE74020

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE74020
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_c = 80 mA)

S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 40 mA

FREQUENCY (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.76	-169	16.57	97	.02	42	.37	-116
200	.79	179	8.66	84	.03	53	.29	-141
400	.79	168	4.35	70	.05	56	.27	-158
600	.79	161	2.89	60	.07	54	.28	-164
800	.78	154	2.16	49	.09	53	.31	-165
1000	.79	147	1.74	39	.11	49	.32	-169
1200	.78	142	1.47	31	.13	45	.35	-171
1400	.79	136	1.29	22	.14	44	.38	-176
1600	.78	130	1.13	14	.16	38	.41	-177
1800	.78	126	1.01	8	.18	35	.43	-180
2000	.78	120	.93	1	.21	32	.46	-178

V_{CE} = 10 V, I_C = 60 mA

100	.77	-174	17.09	95	.02	47	.36	-124
200	.80	177	8.87	84	.02	57	.30	-148
400	.80	166	4.45	70	.05	60	.29	-163
600	.80	160	2.94	60	.07	57	.30	-168
800	.78	153	2.21	49	.09	55	.32	-170
1000	.79	147	1.78	40	.11	52	.33	-173
1200	.79	142	1.51	32	.13	49	.36	-175
1400	.79	136	1.32	23	.14	44	.37	-179
1600	.79	130	1.16	15	.17	39	.41	-180
1800	.78	125	1.04	9	.18	37	.43	-177
2000	.79	120	.96	2	.21	34	.45	-176

V_{CE} = 10 V, I_C = 80 mA

100	.77	-177	17.30	94	.02	47	.35	-127
200	.79	176	8.92	83	.02	62	.30	-152
400	.80	166	4.48	70	.05	65	.29	-165
600	.79	160	2.96	60	.07	59	.30	-171
800	.79	153	2.23	50	.09	57	.32	-172
1000	.79	146	1.79	40	.11	53	.34	-175
1200	.79	141	1.51	32	.13	48	.36	-177
1400	.81	136	1.33	23	.14	45	.38	-180
1600	.79	130	1.17	16	.16	40	.41	-179
1800	.80	125	1.05	10	.19	38	.43	-176
2000	.79	120	.97	3	.21	35	.45	-174

V_{CE} = 10 V, I_C = 100 mA

100	.78	-178	17.26	94	.01	54	.35	-130
200	.80	175	8.93	83	.02	61	.30	-153
400	.80	166	4.45	70	.05	63	.29	-166
600	.80	159	2.94	60	.07	59	.30	-171
800	.80	153	2.21	50	.09	58	.32	-172
1000	.80	147	1.77	40	.11	54	.33	-176
1200	.80	141	1.50	33	.13	49	.36	-177
1400	.81	136	1.32	23	.15	46	.38	-179
1600	.79	130	1.15	16	.16	41	.41	-178
1800	.79	125	1.04	10	.19	39	.43	-176
2000	.79	119	.96	3	.21	35	.45	-174

FEATURES

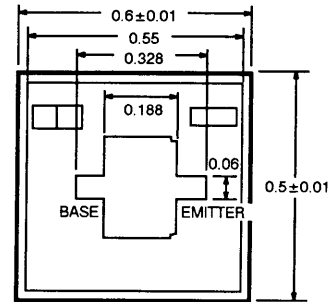
- HIGH GAIN BANDWIDTH PRODUCT: $f_r = 1.7$ GHz
- LOW NOISE FIGURE AT 200 MHz: $NF = 2.7$ dB
- LOW DISTORTION
- HIGH POWER GAIN
- RELIABLE

DESCRIPTION AND APPLICATIONS

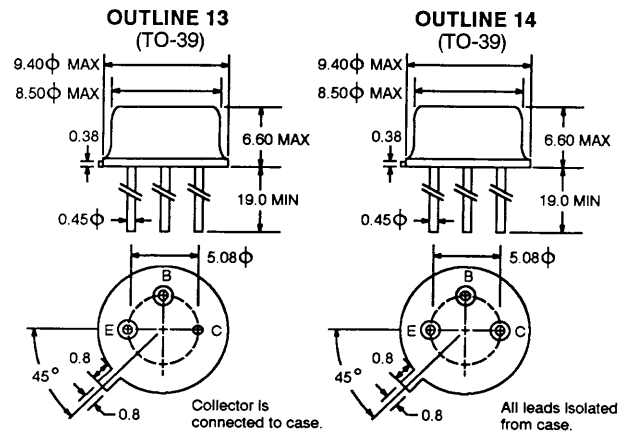
The NE741 series of NPN epitaxial silicon transistors is designed for wide bandwidth UHF and VHF amplifiers. Its low distortion and noise figures make it an excellent choice for CATV and MATV applications, especially those requiring higher than normal reliability. Besides the chip (NE74100) the series comes packaged in two versions of the TO-39 can. The NE74113 has the collector connected to the case whereas the NE74114 has all leads insulated from the case. The series is normally screened to NEC's Grade D level of reliability, but higher reliability screening is available depending upon customer requirements. Performance and quality are assured by QC procedures patterned after MIL-S-19500 and NEC's exclusive Pt-Si/Ti/Pt/Au metallization.

OUTLINE DIMENSIONS (Units in mm)

NE74100 (CHIP)



Chip Thickness: 140 μ m



*All dimensions typical unless noted.

PERFORMANCE SPECIFICATIONS ($T_A = 25$ °C)

SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	NE74113 2SC1365 13 (TO-39)			NE74114 2SC1252 14 (TO-39)		
			MIN	TYP	MAX	MIN	TYP	MAX
f_r	Gain Bandwidth Product at $V_{CE} = 15$ V, $I_c = 70$ mA	GHz	1.4	1.7		1.4	1.7	
$ S_{21E} ^2$	Insertion Power Gain at $V_{CE} = 15$ V, $I_c = 80$ mA $f = 0.2$ GHz $f = 0.5$ GHz $f = 1$ GHz	dB dB dB		15 8 3			15 8 3	
NF _{MIN}	Minimum Noise Figure at $V_{CE} = 15$ V, $I_c = 30$ mA, $R_G = 50$ Ω $f = 200$ MHz $V_{CE} = 15$ V, $I_c = 10$ mA ² $f = 200$ MHz	dB dB		3 2.7	4		3 2.7	4
MAG	Maximum Available Gain at $V_{CE} = 15$ V, $I_c = 50$ mA ⁹ $f = 200$ MHz	dB	15	17		15	17	

Notes:

1. Electronic Industrial Association of Japan.
2. Input and output are tuned for optimum noise figure.
3. Maximum Available Gain (MAG) is calculated from the device S-Parameters using the equation,

$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1}) \quad K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{21}| |S_{12}|} \quad \Delta = S_{11} S_{22} - S_{21} S_{12}$$

ELECTRICAL CHARACTERISTICS (TA = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE74113 2SC1365 13 (TO-39)			NE74114 2SC1252 14 (TO-39)		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
ICBO	Collector Cutoff Current at VCB = 30 V, IE = 0	μA			0.1			0.1
IEBO	Emitter Cutoff Current at VEB = 2 V, IC = 0	μA			0.5			0.5
hFE	Forward Current Gain at VCE = 10 V ² , IC = 50 mA		20	80	200	20	80	200
COB	Output Capacitance at VCB = 15 V, IE = 0, f = 1 MHz ³	pF		2	3		2	3
RTH	Thermal Resistance (Junction to Case)	°C/W			35			35
PT	Total Power Dissipation (Tc = 25°C)	W			5 ⁴			5 ⁴

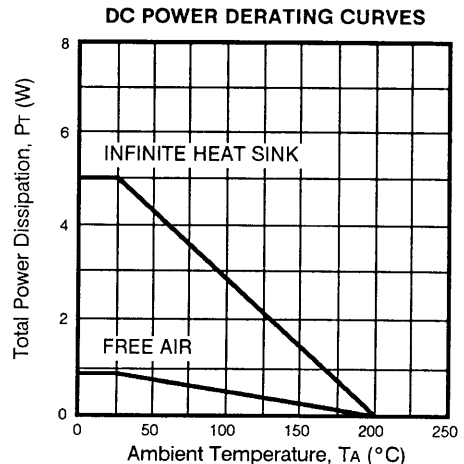
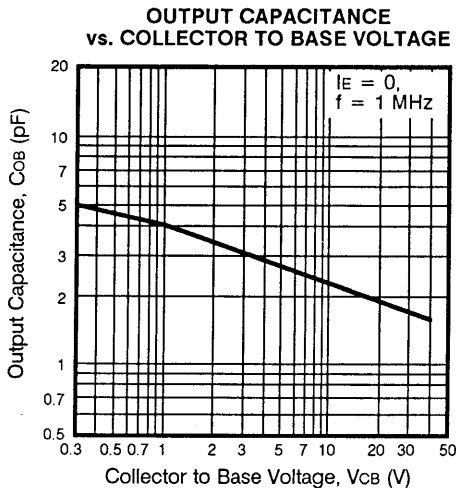
Notes:

1. Electronic Industrial Association of Japan.
2. Pulse Width ≤ 350 μs, Duty Cycle ≤ 2%/pulsed.
3. The emitter is grounded.
4. PT = 3.2 W at Tc = 88°C.

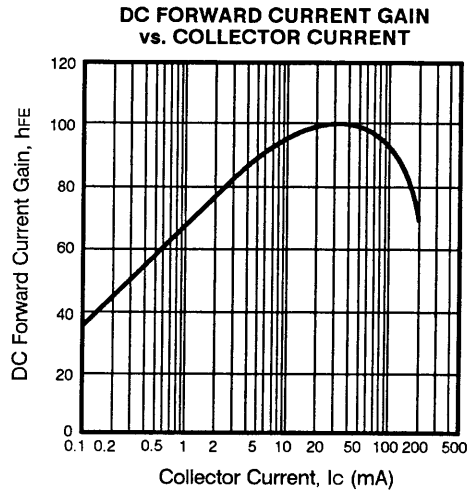
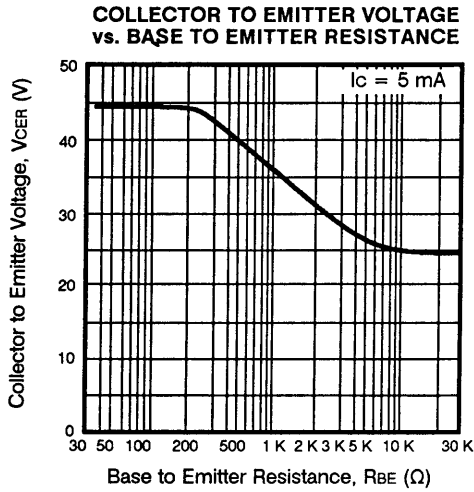
ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
VcBO	Collector to Base Voltage	V	45
VcEO	Collector to Emitter Voltage	V	25
VEBO	Emitter to Base Voltage	V	3
IC	Collector Current	mA	300
TJ	Junction Temperature	°C	200
TSTG	Storage Temperature	°C	-65 to +200

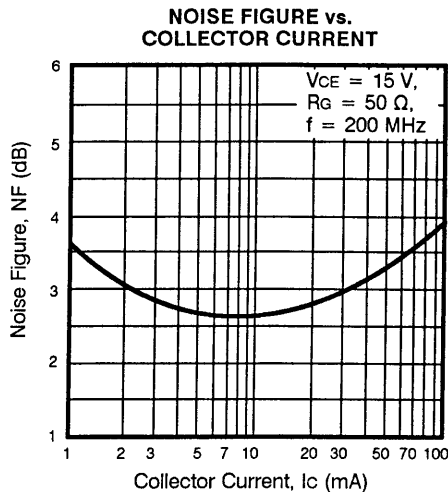
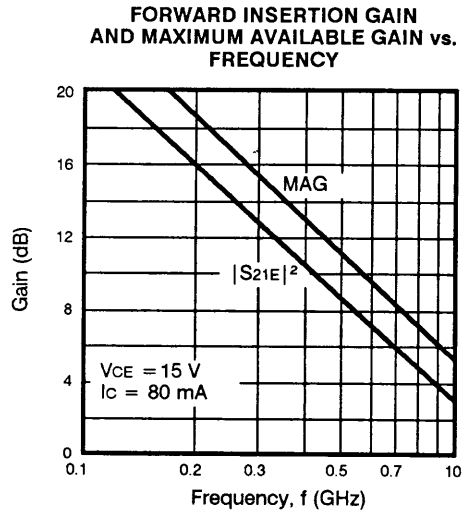
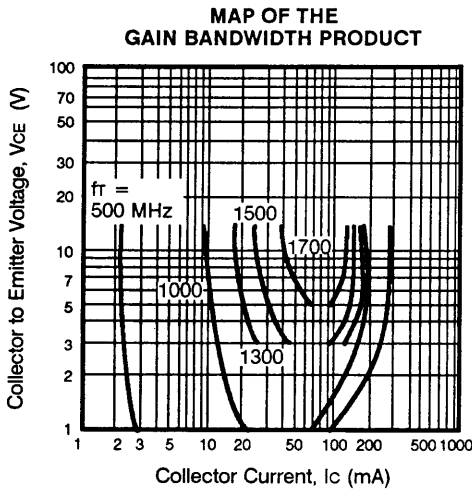
TYPICAL DEVICE CHARACTERISTICS (TA = 25°C)



TYPICAL DEVICE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

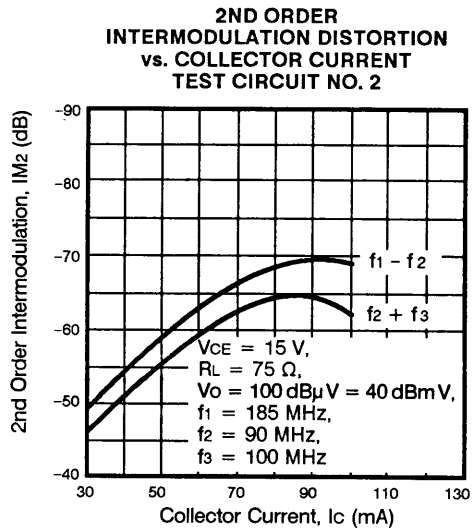
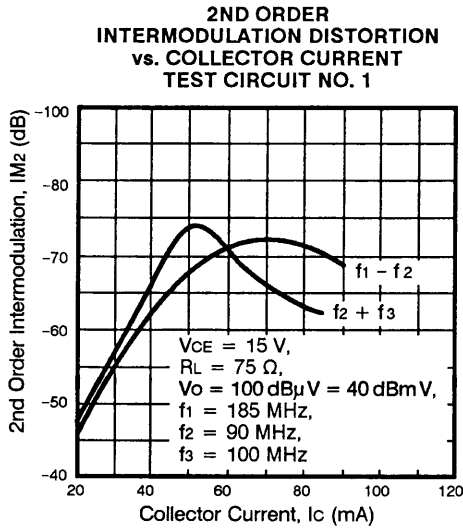
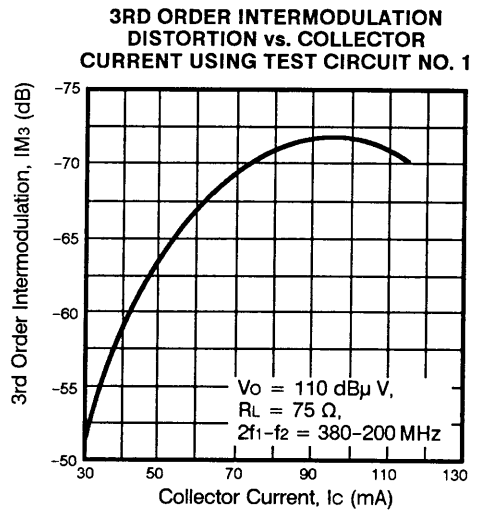
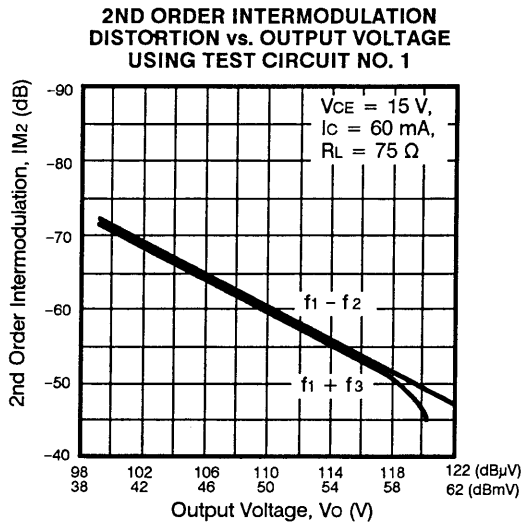


TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)



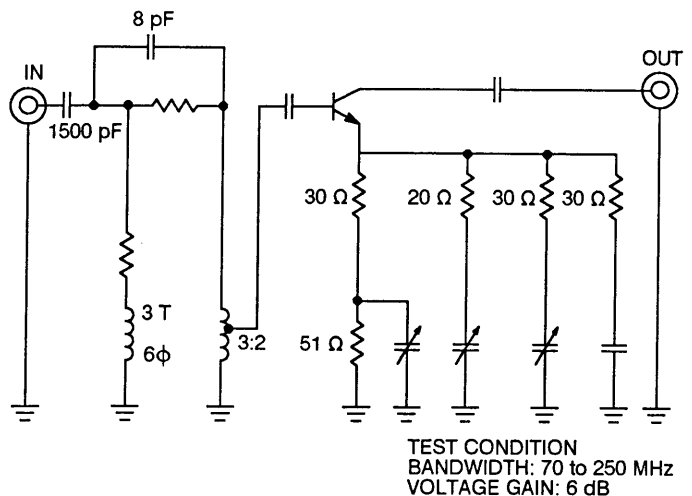
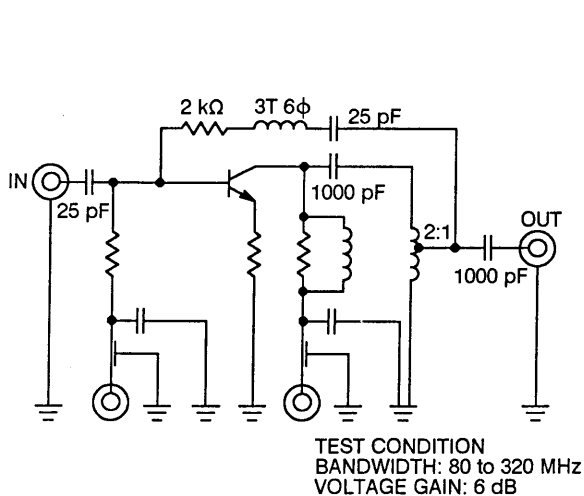
2

TYPICAL INTERMODULATION DISTORTION CHARACTERISTICS (TA = 25°C)

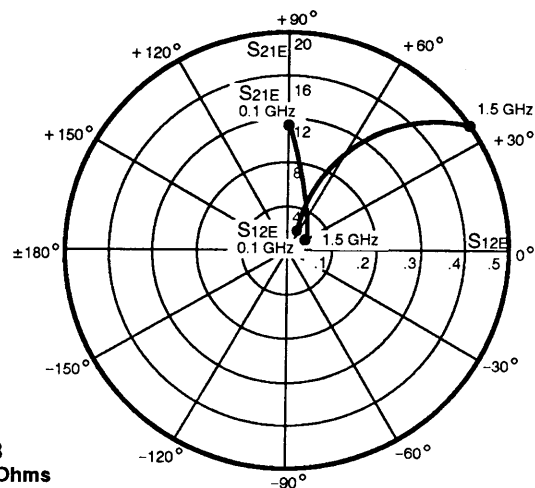
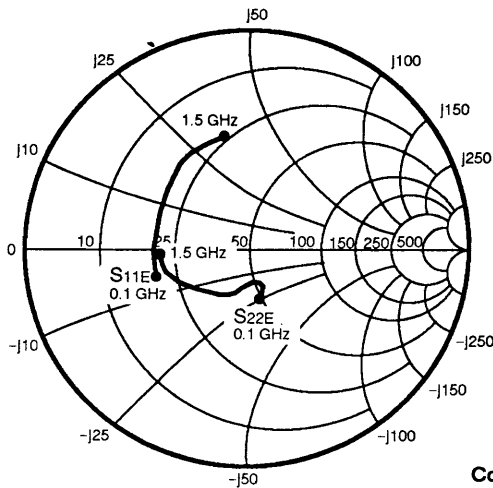


IM TEST CIRCUIT 1

IM TEST CIRCUIT 2



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE74113
Coordinates in Ohms
Frequency in GHz
(VCE = 15 V, IC = 60 mA)

S-MAGN AND ANGLES:

VCE = 15 V, IC = 20 mA

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.42	-149	9.75	96	.05	62	.31	-54
200	.42	-172	5.08	81	.09	68	.24	-58
500	.45	158	2.15	56	.21	68	.24	-87
1000	.51	126	1.25	27	.39	55	.33	-135
1500	.56	100	.96	8	.56	40	.43	-174

VCE = 15 V, IC = 40 mA

100	.39	-158	10.48	93	.05	68	.25	-60
200	.39	-177	5.40	80	.09	72	.19	-65
500	.42	157	2.29	57	.22	68	.20	-94
1000	.48	126	1.33	28	.40	53	.29	-140
1500	.54	102	1.03	8	.55	39	.39	-176

VCE = 15 V, IC = 60 mA

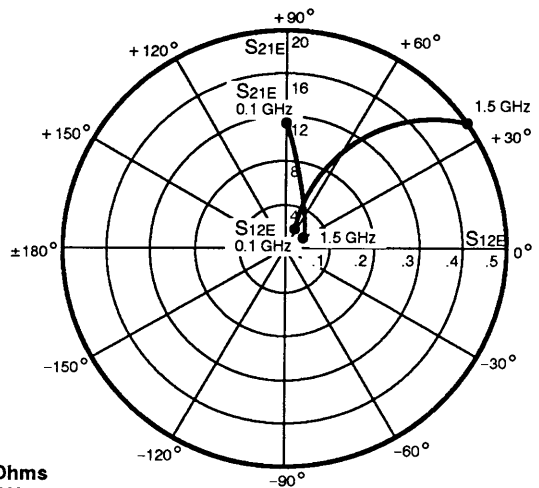
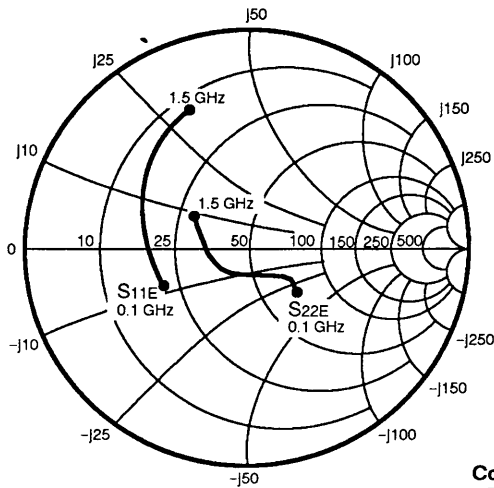
100	.38	-162	10.75	92	.05	70	.23	-72
200	.38	-178	5.52	80	.09	72	.18	-68
500	.41	156	2.33	57	.22	67	.19	-97
1000	.47	127	1.36	28	.40	52	.27	-142
1500	.53	103	1.05	8	.54	38	.37	-176

VCE = 15 V, IC = 80 mA

100	.37	-163	10.79	92	.05	71	.21	-63
200	.38	-179	5.55	80	.10	73	.17	-70
500	.41	156	2.34	57	.22	67	.18	-99
1000	.47	127	1.37	28	.40	51	.27	-143
1500	.53	103	1.05	7	.55	38	.36	-177



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE74114
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 15 V, I_C = 60 mA)

S-MAGN AND ANGLES:

V_{CE} = 15 V, I_C = 20 mA

FREQUENCY (MHz)

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.45 -145	10.29 97	.04 60	.38 -36
200	.44 -168	5.40 83	.07 67	.31 -34
500	.48 164	2.28 57	.17 70	.25 -51
1000	.58 134	1.33 25	.34 57	.19 -121
1500	.70 107	.98 0	.51 37	.32 153

V_{CE} = 15 V, I_C = 40 mA

100	.40 -153	11.22 95	.04 65	.32 -38
200	.41 -172	5.82 82	.07 71	.25 -35
500	.45 164	2.45 57	.18 69	.19 -51
1000	.56 135	1.42 25	.34 54	.13 -128
1500	.69 109	1.04 0	.50 35	.28 147

V_{CE} = 15 V, I_C = 60 mA

100	.39 -156	11.55 94	.04 68	.29 -39
200	.40 -173	5.98 81	.08 71	.23 -36
500	.44 164	2.51 57	.18 68	.17 -50
1000	.56 136	1.45 26	.34 53	.11 -134
1500	.69 109	1.07 0	.49 35	.27 143

V_{CE} = 15 V, I_C = 80 mA

100	.38 -157	11.70 93	.04 68	.27 -40
200	.39 -173	6.04 81	.08 72	.21 -36
500	.44 164	2.53 57	.18 68	.16 -50
1000	.56 136	1.46 26	.34 52	.10 -138
1500	.69 109	1.07 0	.49 34	.26 141

FEATURES

- 2 WATTS POWER OUTPUT (CLASS C) AT 2 GHz
- 1.2 WATTS OSCILLATOR POWER OUTPUT
- LOW NOISE FIGURE

DESCRIPTION AND APPLICATIONS

The NE773 series of NPN medium power silicon transistors is especially designed for broadband VHF and UHF amplifiers where very wide dynamic range and reliability are required. Low second and third order distortion, combined with a low-noise figure at high bias currents, are characteristics which make this series extremely desirable for multi-channel systems and linear amplifiers. The series is available in chip form or in two packages; the TO-46 can (NE77310) and the stud-stripline (NE77320). The NE77310 is ideal for economical oscillator applications. The series employs Pt-Si/Ti/Pt/Au metallization which allows high temperature, reliable operation even at rated dissipation. The NE773 series is an ideal choice for oscillators and Class C amplifiers up to 2 GHz requiring economy, performance and reliability.

PERFORMANCE SPECIFICATIONS (TA = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE77300 00 (CHIP)			NE77310 10			NE77320 2SC1594 20		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
fr	Gain Bandwidth Product at VCE = 10 V, Ic = 100 mA	GHz	2	2.5		2	2.5		2	2.5	
S21E ²	Insertion Power Gain at VCE = 10 V, Ic = 100 mA f = 0.2 GHz f = 0.5 GHz f = 1 GHz	dB		18			16.5			18	
		dB		10			9			10	
		dB		4			4			4	
NFMIN	Minimum Noise Figure ² at VCE = 10 V Ic = 10 mA, RB = 50 Ω f = 0.2 GHz at VCE = 10 V, Ic = 100 mA f = 0.2 GHz	dB		2.3			2.3			2.3	
		dB		4			4			4	
MAG	Maximum Available Gain ³ at VCE = 10 V, Ic = 100 mA f = 0.2 GHz f = 0.5 GHz f = 1 GHz	dB		24			21			24	
		dB		16			14.5		9.5	16	
		dB		11			9.5		9.5	11	
GPE	Power Gain at VCC = 18 V, PIN = +30 dBm f = 2.3 GHz	dB					3			3.5	
POUT	Power Output at VCC = 2 V, PIN = +26 dBm f = 475 MHz, Class C	dBm		32			30			32	
POSC	Oscillator Power Output at VCC = 18 V, Ic = 225 mA f = 2.3 GHz	W		1.2						1.2	

Notes:

1. Electronic Industrial Association of Japan.
2. Input and output are tuned for optimum noise figure.
3. Maximum Available Gain (MAG) is calculated from the device S-Parameters using the equation, $MAG = |S_{21E}|^2 \cdot \frac{1}{1 - |S_{11E}|^2} \cdot \frac{1}{1 - |S_{22E}|^2}$

NE77300, NE77310, NE77320

ELECTRICAL CHARACTERISTICS (TA = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE			NE77300			NE77310 10			NE77320T 2SC1594 20		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
ICBO	Collector Cutoff Current at V _{CB} = 20 V, I _E = 0	μA			10			10			10
IEBO	Emitter Cutoff Current at V _{EB} = 2 V, I _C = 0	μA			10			10			10
hFE	Forward Current Gain ² at V _{CE} = 10 V, I _C = 100 mA (Pulsed)		20	100	200	20	100	200	20	100	200
CCB	Collector to Base Capacitance ³ at V _{CE} = 10 V, I _E = 0, f = 1 MHz	pF		2.8	3.5		2.8	4		2.8	3.5
R _{TH}	Thermal Resistance (Junction-to-Case)	°C/W			25			40			25
P _T	Total Power Dissipation (T _C = 25°C)	W			7			4.4			7

Notes:

- Electronic Industrial Association of Japan.
- Pulse Width ≤ 350 μs, Duty Cycle ≤ 2%/pulsed.
- C_{CB} measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.

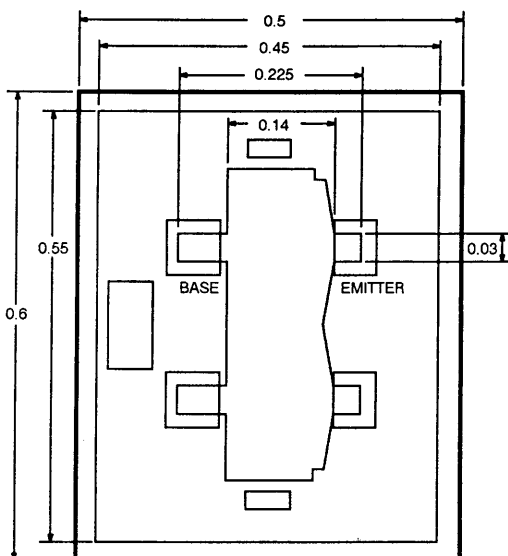
ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CB0}	Collector to Base Voltage	V	35
V _{CE0}	Collector to Emitter Voltage	V	18*
V _{EB0}	Emitter to Base Voltage	V	3
I _C	Collector Current	mA	450
T _J	Junction Temperature	°C	200
T _{STG}	Storage Temperature	°C	-65 to +200

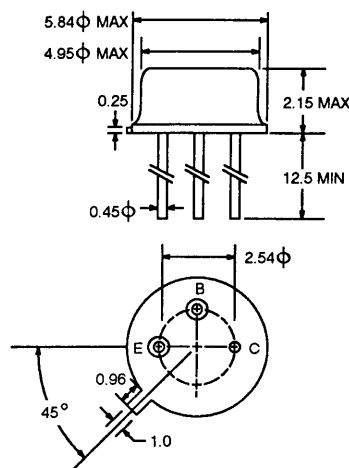
*V_{CE0} = 40 V for R ≤ 300 Ω

OUTLINE DIMENSIONS (Units in mm)

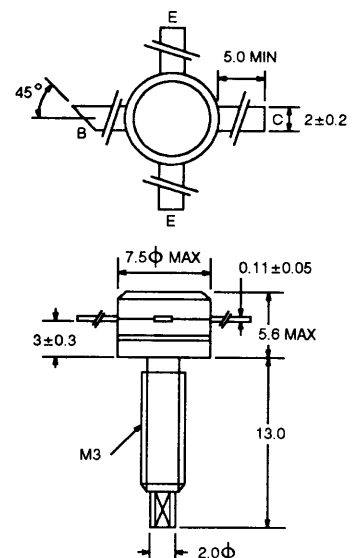
NE77300 (CHIP)



OUTLINE 10
(TO-46)

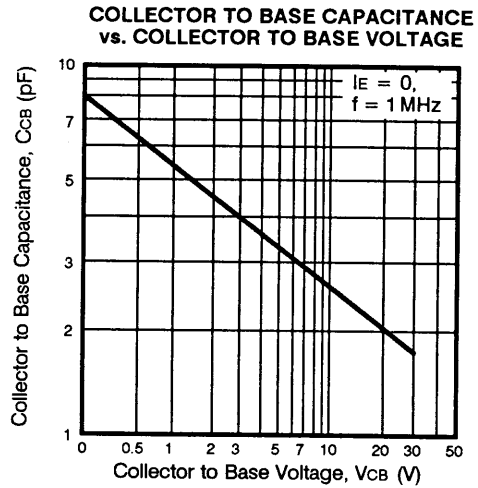
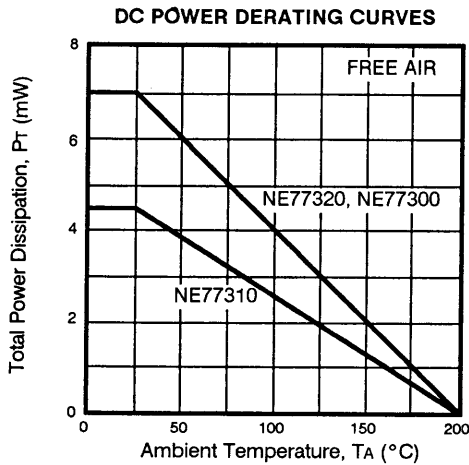


OUTLINE 20

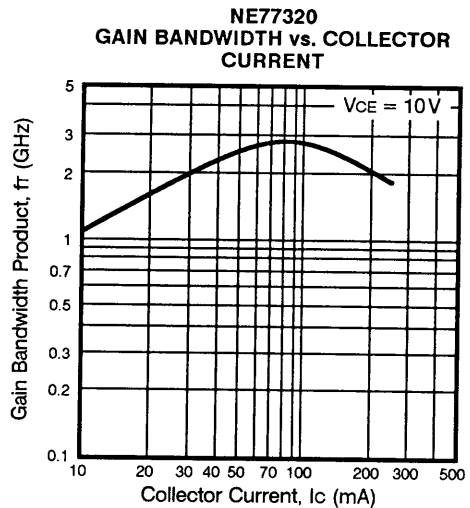
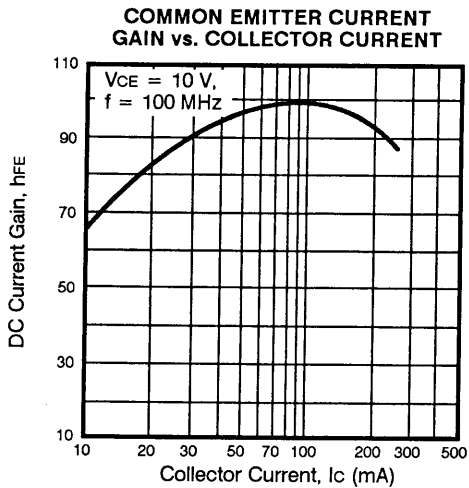
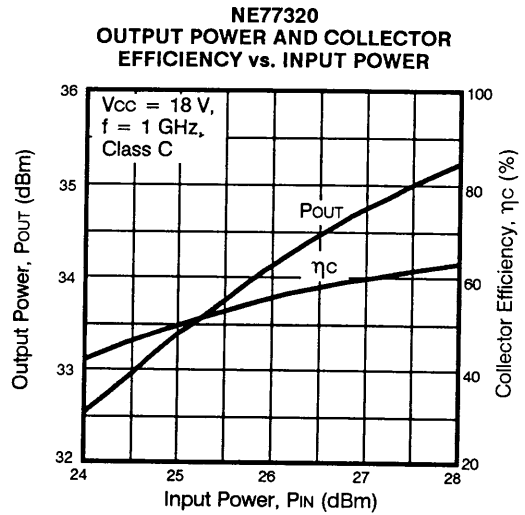
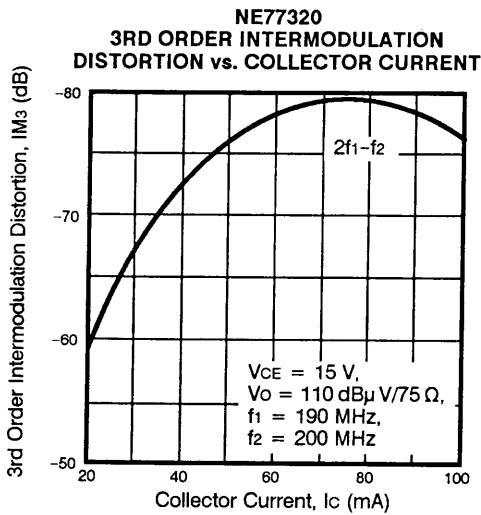


Chip Thickness: 140 μm

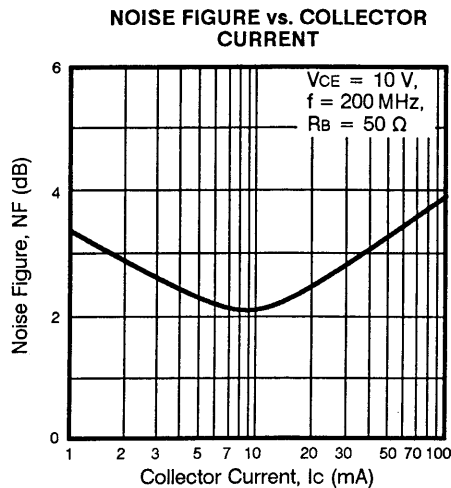
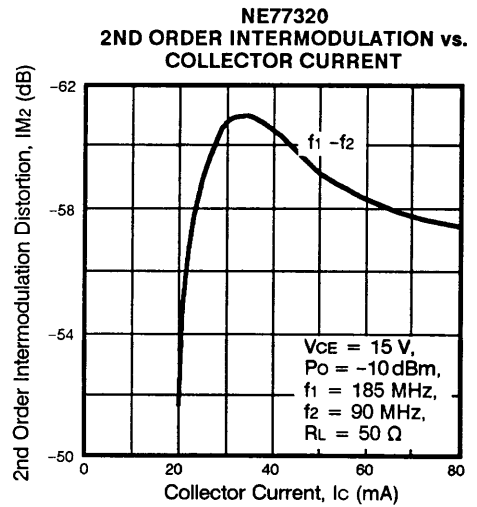
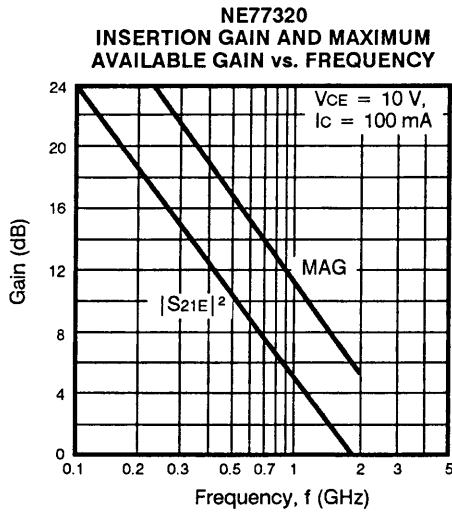
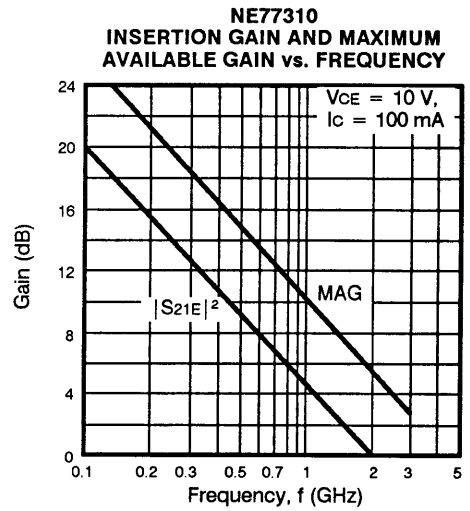
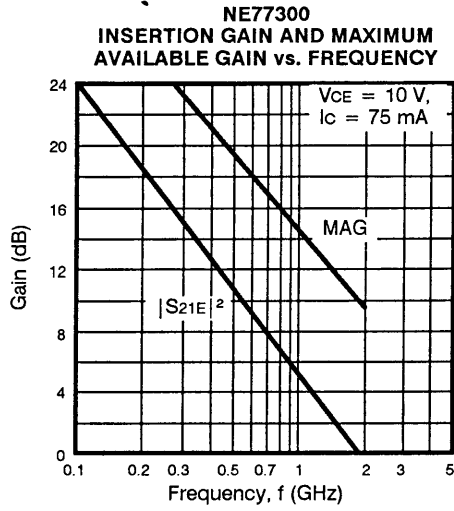
TYPICAL DEVICE CHARACTERISTICS (TA = 25°C)



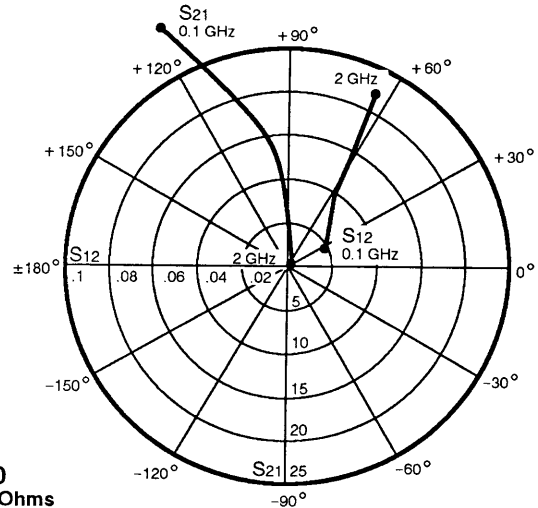
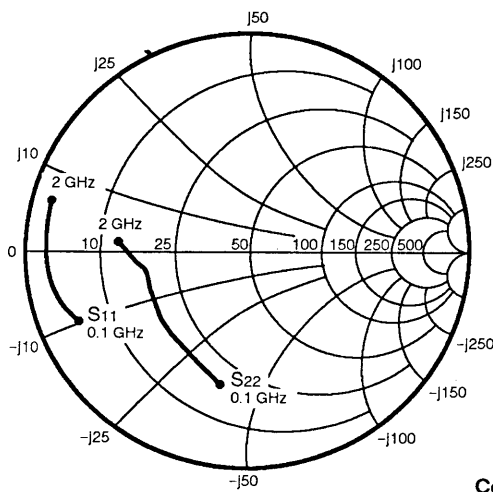
TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)



TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE77300
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_c = 50 mA)

S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 25 mA

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.85	-158	13.98	107	.03	25	.47	-110
200	.90	-170	7.23	94	.03	20	.39	-138
400	.91	-177	3.62	81	.04	26	.38	-153
600	.91	179	2.43	72	.04	31	.39	-158
800	.91	177	1.82	64	.04	38	.41	-160
1000	.92	175	1.44	56	.05	43	.44	-162
1200	.92	173	1.19	48	.05	49	.47	-164
1400	.92	171	1.01	42	.06	52	.50	-166
1600	.92	169	.87	36	.06	55	.54	-168
1800	.92	167	.76	30	.07	57	.57	-171
2000	.92	166	.67	24	.08	58	.60	-174

V_{CE} = 10 V, I_C = 50 mA

100	.88	-166	15.54	104	.02	26	.50	-128
200	.91	-174	7.90	93	.02	27	.45	-152
400	.92	-179	3.98	82	.03	37	.45	-165
600	.92	178	2.65	74	.03	45	.46	-169
800	.92	176	2.00	67	.04	51	.47	-171
1000	.92	174	1.59	59	.05	55	.48	-173
1200	.92	172	1.33	53	.05	58	.50	-174
1400	.92	170	1.13	47	.06	60	.52	-176
1600	.92	168	.99	41	.07	61	.54	-178
1800	.92	167	.87	35	.08	62	.57	-180
2000	.92	165	.77	30	.08	61	.59	-178

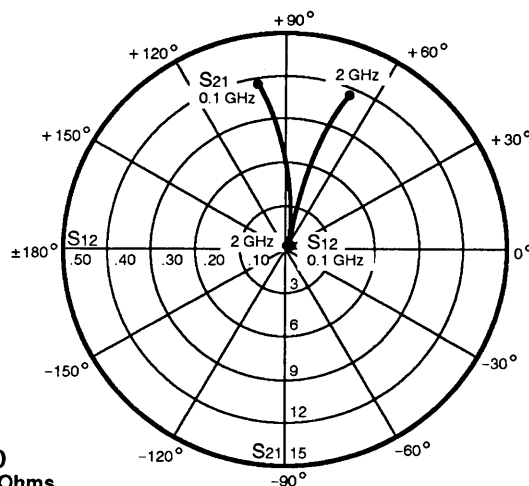
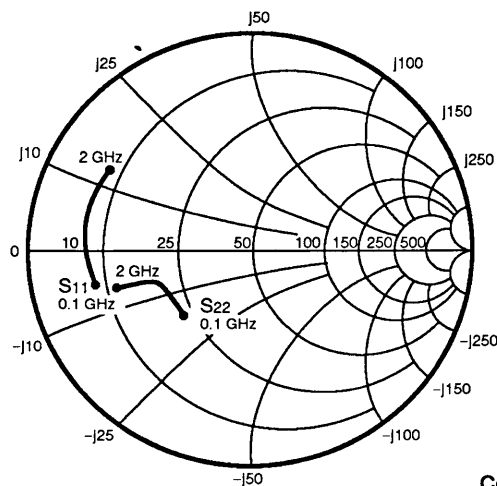
V_{CE} = 10 V, I_C = 75 mA

100	.89	-169	16.03	102	.02	27	.51	-135
200	.91	-175	8.10	92	.02	31	.48	-157
400	.92	180	4.07	82	.03	44	.48	-168
600	.93	177	2.73	74	.03	52	.48	-172
800	.92	175	2.05	67	.04	57	.49	-174
1000	.92	173	1.64	61	.05	60	.50	-176
1200	.92	171	1.37	54	.05	62	.52	-178
1400	.92	170	1.18	48	.06	62	.53	-179
1600	.92	168	1.02	42	.07	63	.55	-179
1800	.92	166	.92	36	.08	63	.57	-177
2000	.92	165	.81	32	.09	63	.59	-175

NOTE: S-Parameters include bond wires.
 BASE: Total 2 wire(s), 1 per bond pad, 0.0242" (614 μm) long each wire.
 COLLECTOR: Total 1 wire(s), 1 per bond pad, 0.0185" (470 μm) long each wire.
 EMITTER: Total 2 wire(s), 1 per side, 0.0419" (1065 μm) long each wire.
 WIRE: 0.0007" (17.7 μm) dia., gold.



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE77310
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_c = 50 mA)

S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 25 mA

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.69	-160	11.16	102	.03	46	.41	-120
200	.73	-171	5.80	90	.05	53	.38	-141
400	.73	180	2.98	80	.09	65	.39	-151
600	.75	175	2.03	71	.13	68	.43	-153
800	.74	171	1.57	64	.16	71	.46	-153
1000	.74	168	1.30	59	.20	72	.50	-153
1200	.74	164	1.14	55	.24	72	.53	-154
1400	.73	160	1.01	52	.28	71	.56	-155
1600	.72	158	.93	49	.31	71	.59	-156
1800	.73	155	.86	46	.35	69	.62	-158
2000	.71	152	.83	45	.38	68	.64	-159

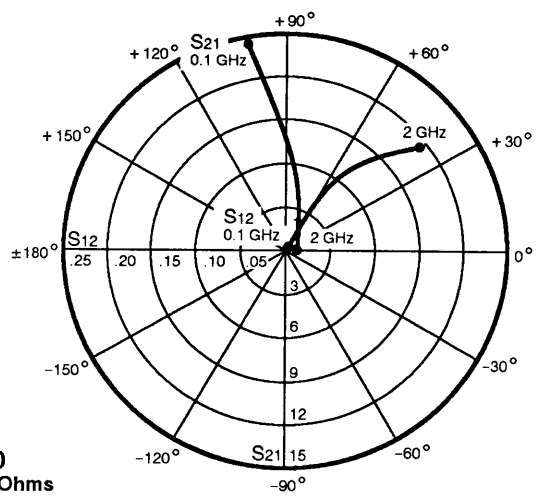
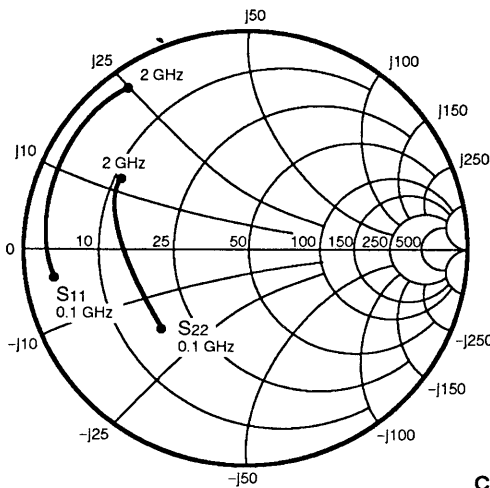
V_{CE} = 10 V, I_C = 50 mA

100	.70	-167	11.95	99	.02	53	.43	-135
200	.72	-175	6.18	89	.05	62	.42	-152
400	.73	178	3.15	80	.09	71	.42	-160
600	.74	173	2.16	73	.13	71	.46	-161
800	.74	170	1.68	67	.18	72	.48	-161
1000	.73	166	1.40	62	.21	72	.50	-160
1200	.72	163	1.22	58	.25	71	.52	-161
1400	.71	159	1.10	54	.29	70	.54	-161
1600	.70	157	1.01	51	.32	70	.56	-161
1800	.70	154	.95	48	.35	67	.58	-162
2000	.69	152	.90	46	.39	67	.60	-163

V_{CE} = 10 V, I_C = 75 mA

100	.70	-170	12.14	98	.02	53	.43	-141
200	.72	-176	6.24	89	.05	64	.42	-156
400	.72	177	3.19	81	.10	72	.43	-163
600	.74	173	2.19	73	.14	71	.46	-163
800	.73	169	1.71	67	.18	72	.48	-163
1000	.73	166	1.41	62	.22	72	.50	-162
1200	.72	162	1.25	58	.25	71	.51	-162
1400	.71	159	1.13	55	.29	70	.54	-162
1600	.69	156	1.03	51	.33	69	.56	-163
1800	.70	154	.96	48	.36	67	.58	-163
2000	.69	151	.92	47	.39	66	.59	-164

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE77320
Coordinates in Ohms
Frequency in GHz
(VCE = 10 V, IC = 50 mA)

S-MAGN AND ANGLES:

VCE = 10 V, IC = 25 mA

FREQUENCY (MHz)	S11		S21		S12		S22	
100	.82	-164	13.12	102	.02	35	.48	-119
200	.84	-176	6.72	88	.03	27	.42	-148
400	.86	172	3.46	74	.04	42	.43	-165
600	.87	166	2.28	61	.06	48	.45	-171
800	.88	159	1.73	51	.07	51	.48	-175
1000	.87	153	1.38	40	.09	50	.51	178
1200	.89	147	1.16	30	.10	49	.53	178
1400	.88	140	.96	23	.13	48	.58	171
1600	.90	135	.86	13	.15	43	.61	166
1800	.87	131	.76	10	.17	43	.62	164
2000	.87	127	.68	4	.18	39	.64	157

VCE = 10 V, IC = 50 mA

100	.84	-172	14.30	99	.01	41	.50	-134
200	.85	179	7.24	87	.01	39	.47	-158
400	.87	170	3.72	74	.03	55	.49	-173
600	.87	164	2.45	62	.06	58	.50	-179
800	.89	158	1.87	54	.07	59	.52	177
1000	.87	152	1.49	44	.10	55	.54	171
1200	.89	146	1.26	34	.11	53	.55	170
1400	.88	139	1.06	27	.14	49	.59	164
1600	.89	134	.95	17	.15	44	.61	160
1800	.87	130	.84	14	.18	43	.61	159
2000	.87	126	.77	8	.19	39	.62	151

VCE = 10 V, IC = 100 mA

100	.85	-176	14.93	98	.01	53	.52	-142
200	.87	177	7.48	87	.01	55	.50	-163
400	.87	169	3.86	74	.03	64	.52	-176
600	.88	164	2.53	63	.06	63	.53	177
800	.89	157	1.94	55	.08	62	.55	174
1000	.87	152	1.55	45	.10	58	.56	167
1200	.90	146	1.31	36	.12	55	.57	167
1400	.88	139	1.11	29	.14	49	.60	161
1600	.90	134	1.00	20	.16	45	.62	156
1800	.87	129	.89	16	.18	44	.61	155
2000	.87	126	.81	11	.20	39	.62	149

