

NEC[®]**NPN SILICON HIGH
FREQUENCY TRANSISTOR****NE219
SERIES****FEATURES**

- HIGH f_T : 8 GHz
- LOW NOISE:
1 dB at 0.5 GHz
2.2 dB at 2 GHz
- HIGH COLLECTOR CURRENT: 80 mA
- HIGH OSCILLATOR POWER OUTPUT:
100 mW at 6 GHz
- EXCELLENT GENERAL PURPOSE TRANSISTOR

DESCRIPTION AND APPLICATIONS

The NE219 series of NPN silicon bipolar transistors is designed for small signal amplifier and oscillator applications up to 6 GHz. The series employs arsenic doped emitters and NEC's hi-rel platinum-gold metallization system which permits reliable operation at high temperature operation (100°C) at rated dissipation. The series is available in either chip form (NE21900) or in a variety of packages. Low noise and high current capability provides wide dynamic range and economical solutions to a wide variety of microstrip thick and thin film applications. Quality, performance, uniformity and reliability are assured by NEC's quality assurance program which is patterned after MIL-S-19500. The NE219 is available in Grade C (JANTXV equivalent), Grade CX (JANTX equivalent), and Grade D.

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CB0}	Collector to Base Voltage	V	20
V_{CE0}	Collector to Emitter Voltage	V	10 ¹
V_{EB0}	Emitter to Base Voltage	V	1.5
I_C	Collector Current	mA	80
T_J	Junction Temperature	°C	200 ²
T_{STG}	Storage Temperature	°C	-65 to +200 ³

Notes:

1. Typical $V_{CE0} = 20$ V for $R = 10 \Omega$.
2. $T_J = 150^\circ\text{C}$ for NE21936 and NE21937.
3. $T_{STG} = -65$ to $+150^\circ\text{C}$ for NE21936, NE21937 and NE21935 Grade D.

NE21935 TYPICAL NOISE PARAMETERS $V_{CE} = 8$ V, $I_C = 5$ mA

FREQUENCY (MHz)	NF_{min} (dB)	G_n dB	OPT SOURCE	$R_n/50 \Omega$
500	1.3	20.7	.15 \angle 100°	.15
1000	1.4	16.2	.31 \angle 146°	.12
1500	2.1	13.5	.49 \angle 178°	.04
2000	2.3	11.8	.48 \angle -172°	.07
2500	2.7	9.6	.53 \angle -155°	.13
3000	3.4	9.6	.58 \angle -133°	.26
3500	3.6	8.0	.66 \angle -128°	.36

 $V_{CE} = 8$ V, $I_C = 20$ mA

500	1.6	22.0	.14 \angle 132°	.17
1000	2.0	17.3	.30 \angle 176°	.13
1500	2.6	14.9	.47 \angle -167°	.08
2000	2.9	13.0	.53 \angle -159°	.12
2500	3.2	11.4	.56 \angle -150°	.19
3000	3.9	11.4	.58 \angle -127°	.36
3500	4.3	9.2	.68 \angle -123°	.28

*Input tuned for minimum Noise Figure, output tuned for Maximum Gain.

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

PART NUMBER EIAJ1 REGISTERED NUMBER		PACKAGE OUTLINE		NE21903 2SC22174		NE21908 2SC2218		NE21912		NE21935 2SC2367		NE21937 2SC2869		NE21987	
SYMBOLS		PARAMETERS AND CONDITIONS		03		08		12		35		37		87	
fr		Gain Bandwidth Product at $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$		MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
$ S_{21E} ^2$		Insertion Power Gain at $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$, $f = 0.5\text{ GHz}$ $f = 1\text{ GHz}$ $f = 2\text{ GHz}$			8.0		8.0				8.0		8.0		
NF _{MIN}		Minimum Noise Figure ² at $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$, $f = 0.5\text{ GHz}$ $f = 1\text{ GHz}$ $f = 2\text{ GHz}$			21.0 15.5 8.0		21.0 15.5 8.0				15.5 9.0		13.0 7.0		
MAG		Maximum Available Gain ³ at $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$, $f = 0.5\text{ GHz}$ $f = 1\text{ GHz}$ $f = 2\text{ GHz}$			1.3 2.2 3.5		1.3 2.2 3.5				1.3 2.2 3.5		1.2 2.2		2.5
GNF		Associated Gain at Optimum Noise Figure, $V_{CE} = 8\text{ V}$, $I_C = 5\text{ mA}$, $f = 0.5\text{ GHz}$ $f = 1\text{ GHz}$ $f = 2\text{ GHz}$			25.0 18.4 12.6		25.0 18.4 12.6				25.0 18.4 12.6		16.0 10.0		
Posc		Oscillator Power Output at $V_{CE} = 8\text{ V}$, $I_C = 40\text{ mA}$, $f = 6\text{ GHz}$			15.0 13.0 8.0		15.0 13.0 8.0				15.0 13.0 8.0		12.0		100

Notes:

1. Electronics 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, $MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$ K = $\frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{21}||S_{12}|}$ $\Delta = S_{11}S_{22} - S_{21}S_{12}$
4. EIAJ registered number refers to grade C versions of these devices.

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

PART NUMBER EIAJ1 REGISTERED NUMBER		PACKAGE OUTLINE		NE21903 2SC22174		NE21908 2SC22184		NE21912		NE21935 2SC2367		NE21937 2SC2869		NE21987	
SYMBOLS		PARAMETERS AND CONDITIONS		03		08		12		35		37		87	
UNITS				MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
I _{CB0}		Collector Cutoff Current at $V_{CB} = 8\text{ V}$, $I_E = 0$			1.0		1.0		1.0		1.0		1.0		1.0
I _{EB0}		Emitter Cutoff Current at $V_{EB} = 1\text{ V}$, $I_C = 0$			1.0		1.0		1.0		1.0		1.0		1.0
h _{FE}		Forward Current Gain at $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$		30	100	300	30	100	300	30	100	300	30	100	300
C _{CB}		Collector to Base Capacitance ² at $V_{CB} = 8\text{ V}$, $I_E = 0$			0.4	1.0		0.4	1.0		0.4	1.0		0.4	1.0
R _{TH}		Thermal Resistance (J-C)			70		90		90		80		500 ³		70
PT		Total Power Dissipation ($T_A = 25^\circ\text{C}$)			580		350		600		580		250		700

Notes:

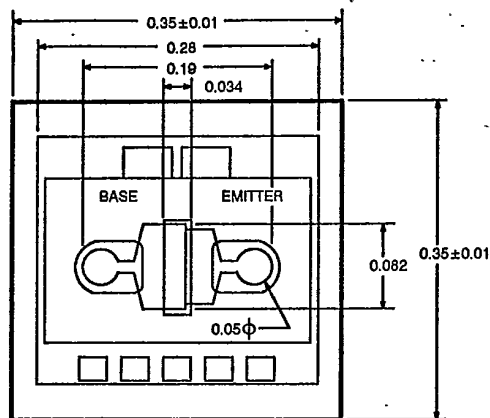
1. Electronic Industrial Association of Japan.
2. C_{CB} measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
3. R_{TH}(J-A)
4. EIAJ registered number refers to grade C versions of these devices.

NE219 SERIES

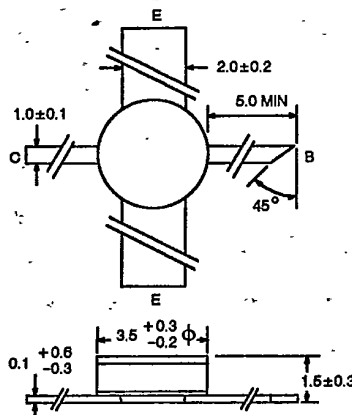
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T-31-23

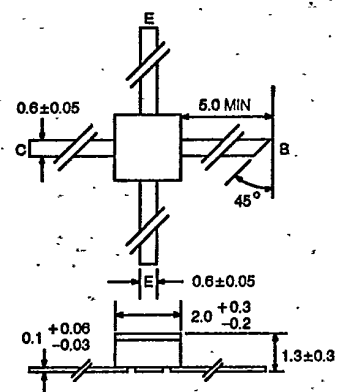
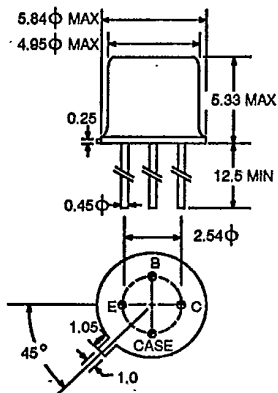
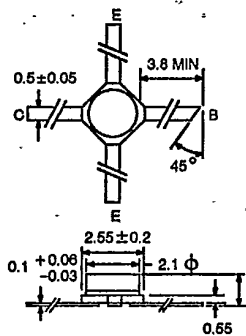
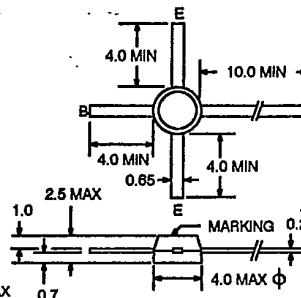
OUTLINE DIMENSIONS (Units in mm)

NE21900 (CHIP)
(Chip Thickness: 140 μ m)

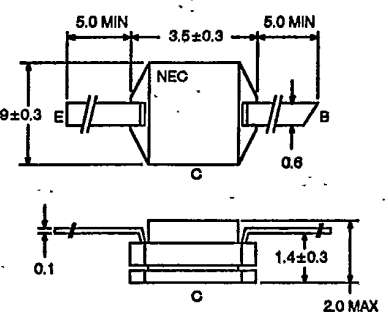
OUTLINE 03



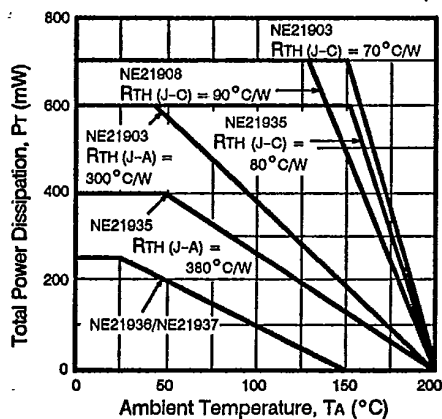
OUTLINE 08

OUTLINE 12
(TO-72)OUTLINE 35
(MICRO-X)OUTLINE 37
(DISK-MOLD)

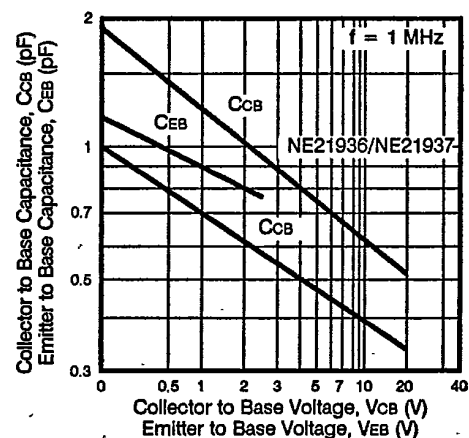
OUTLINE 87

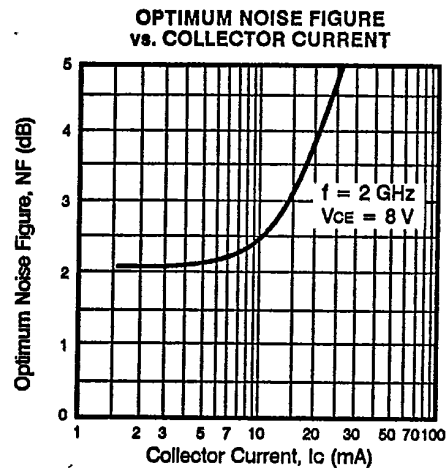
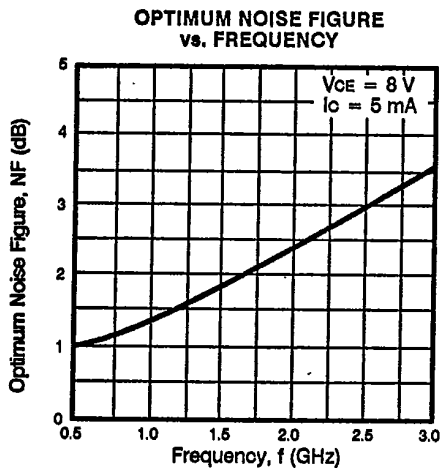
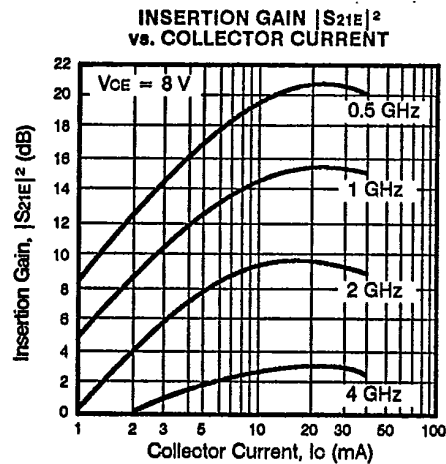
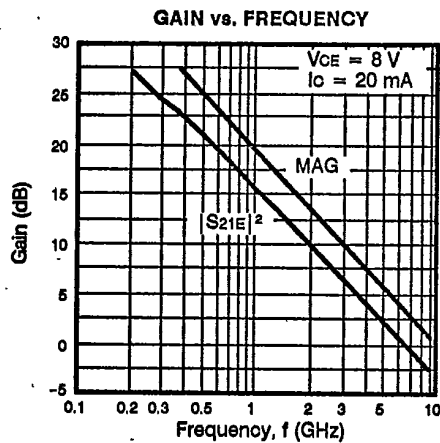
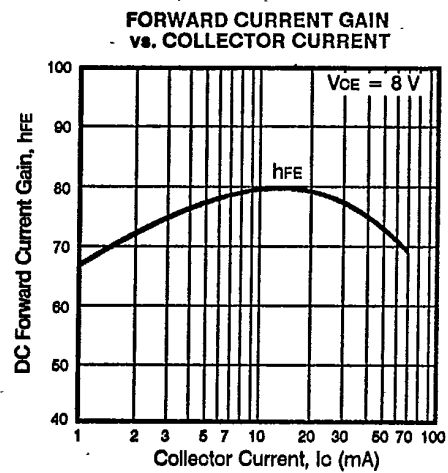
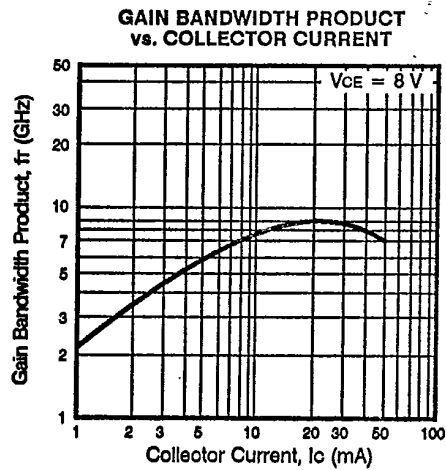
TYPICAL DEVICE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

POWER DERATING CURVES



DEVICE CAPACITANCE



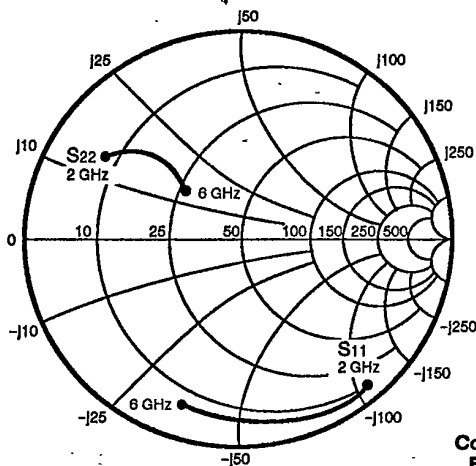
TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

NE219 SERIES

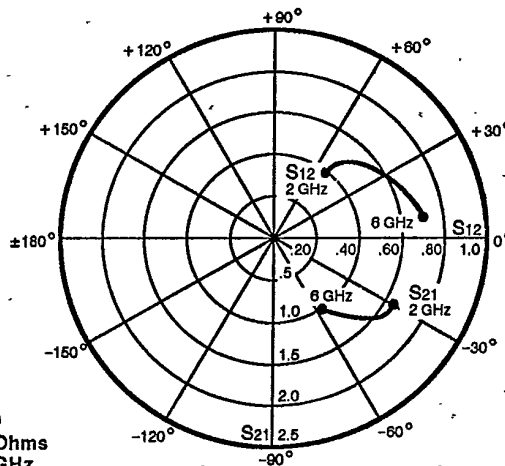
T-31-21

T-31-23

TYPICAL COMMON COLLECTOR SCATTERING PARAMETERS



NE21900
Coordinates in Ohms
Frequency in GHz
(VCE = 8 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 8 V, IC = 10 mA

FREQUENCY (MHz)

	S11	S21	S12	S22
2000	.88 -56	1.57 -29	.44 47	.64 143
2500	.87 -67	1.50 -34	.52 41	.60 139
3000	.83 -77	1.39 -42	.58 31	.54 128
3500	.82 -85	1.26 -44	.60 27	.46 131
4000	.80 -93	1.18 -49	.64 21	.43 124
4500	.79 -98	1.12 -52	.67 14	.38 125
5000	.79 -103	1.02 -53	.68 11	.32 130
5500	.77 -109	1.00 -55	.72 7	.31 126
6000	.78 -113	.93 -57	.72 4	.25 142

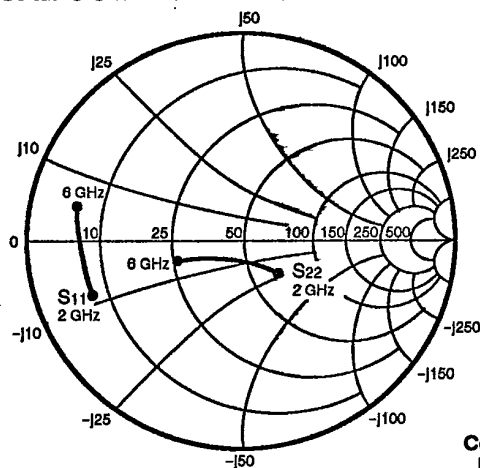
VCE = 8 V, IC = 20 mA

	S11	S21	S12	S22
2000	.91 -53	1.66 -29	.40 51	.71 147
2500	.90 -64	1.59 -34	.47 45	.68 143
3000	.87 -74	1.47 -42	.53 35	.62 132
3500	.86 -82	1.35 -43	.55 32	.54 135
4000	.84 -90	1.26 -49	.60 26	.52 128
4500	.84 -95	1.20 -52	.63 19	.47 129
5000	.83 -101	1.09 -54	.64 16	.41 131
5500	.82 -107	1.07 -56	.64 12	.40 127
6000	.82 -111	.99 -59	.69 9	.34 138

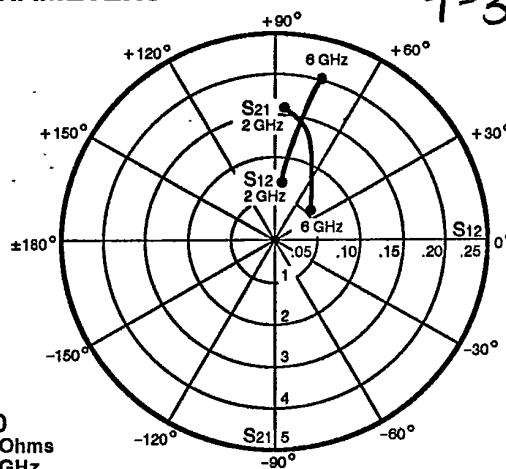
VCE = 8 V, IC = 30 mA

	S11	S21	S12	S22
2000	.91 -52	1.67 -29	.39 52	.74 148
2500	.91 -64	1.61 -34	.47 46	.70 144
3000	.87 -74	1.49 -42	.52 36	.64 133
3500	.87 -82	1.36 -44	.55 33	.57 136
4000	.84 -90	1.28 -50	.59 27	.54 129
4500	.85 -95	1.22 -53	.62 20	.50 129
5000	.84 -100	1.10 -55	.64 17	.43 131
5500	.83 -107	1.08 -57	.69 13	.42 127
6000	.84 -111	1.00 -59	.69 11	.36 137

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21900
Coordinates in Ohms
Frequency in GHz
($V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$)



S-MAGN AND ANGLES:

 $V_{CE} = 8\text{ V}$, $I_C = 10\text{ mA}$

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
2000	.70	-155	2.78	89	.08	72	.32	-44
2500	.68	-167	2.31	78	.09	72	.27	-45
3000	.72	-173	1.99	70	.11	74	.24	-42
3500	.74	-174	1.77	67	.12	77	.20	-58
4000	.70	176	1.57	55	.14	71	.13	-80
4500	.72	176	1.38	52	.15	74	.15	-101
5000	.76	172	1.26	46	.17	73	.19	-128
5500	.72	168	1.13	41	.19	71	.26	-143
6000	.73	168	.99	38	.19	72	.33	-148

 $V_{CE} = 8\text{ V}$, $I_C = 20\text{ mA}$

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
2000	.69	-159	3.03	88	.07	81	.26	-46
2500	.67	-170	2.51	78	.09	79	.21	-44
3000	.72	-175	2.15	70	.11	79	.19	-39
3500	.74	-176	1.90	67	.13	81	.14	-58
4000	.69	175	1.68	56	.15	74	.08	-90
4500	.73	174	1.46	53	.16	77	.11	-115
5000	.76	172	1.34	47	.18	74	.16	-143
5500	.72	167	1.21	42	.19	73	.23	-154
6000	.73	167	1.07	40	.20	74	.30	-155

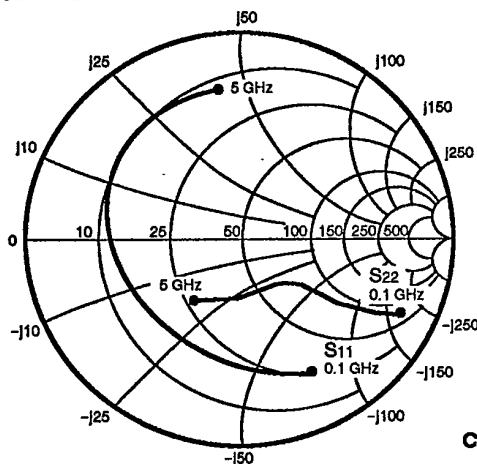
 $V_{CE} = 8\text{ V}$, $I_C = 30\text{ mA}$

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
2000	.69	-161	3.07	87	.07	84	.25	-45
2500	.67	-171	2.53	77	.09	82	.20	-42
3000	.72	-176	2.16	70	.11	82	.18	-36
3500	.74	-177	1.92	67	.13	83	.13	-55
4000	.70	174	1.68	56	.15	75	.07	-86
4500	.73	174	1.49	52	.16	78	.09	-115
5000	.77	171	1.36	47	.18	75	.15	-144
5500	.73	167	1.22	41	.19	74	.22	-154
6000	.73	166	1.08	40	.20	74	.29	-155

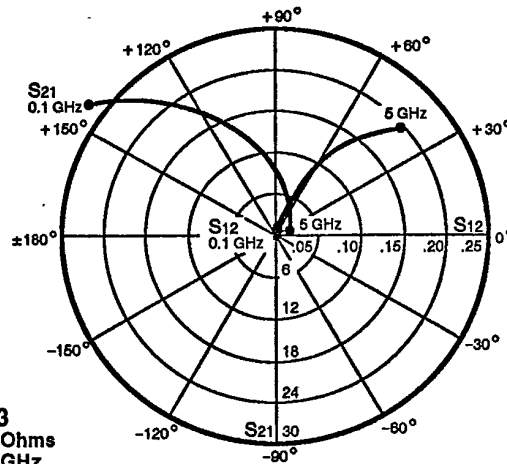
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NE219 SERIES

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21903
Coordinates In Ohms
Frequency In GHz
(VCE = 8 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 8 V, IC = 10 mA
FREQUENCY (MHz)

	S11		S21		S12		S22	
100	.79	-45	22.62	152	.01	77	.91	-18
500	.63	-140	9.88	102	.04	39	.47	-41
1000	.62	-173	5.30	81	.05	40	.36	-44
1500	.62	169	3.59	67	.07	43	.35	-49
2000	.62	156	2.68	57	.09	51	.35	-57
2500	.64	143	2.17	45	.10	51	.31	-69
3000	.67	134	1.88	35	.13	51	.32	-82
3500	.68	122	1.58	25	.14	44	.32	-94
4000	.70	114	1.40	13	.15	43	.34	-106
4500	.70	106	1.18	6	.17	39	.36	-116
5000	.71	98	1.10	-2	.19	38	.38	-124

VCE = 8 V, IC = 20 mA

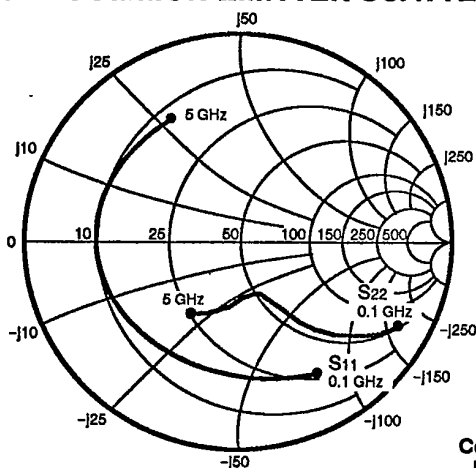
	S11		S21		S12		S22	
100	.69	-64	32.32	144	.01	71	.84	-24
500	.60	-166	11.17	96	.03	46	.37	-42
1000	.61	178	5.81	78	.04	53	.28	-44
1500	.61	164	3.92	66	.06	55	.28	-50
2000	.62	151	2.93	56	.09	59	.29	-59
2500	.64	140	2.38	46	.11	55	.25	-72
3000	.67	130	2.06	35	.13	51	.25	-85
3500	.68	120	1.73	26	.15	48	.26	-96
4000	.69	112	1.54	14	.16	44	.28	-108
4500	.69	105	1.32	7	.18	42	.31	-115
5000	.70	96	1.19	0	.20	40	.33	-125

VCE = 8 V, IC = 40 mA

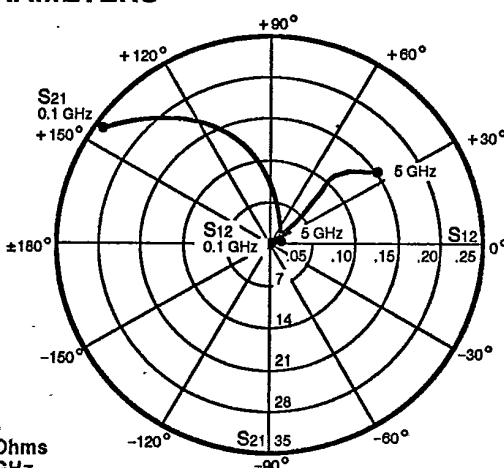
	S11		S21		S12		S22	
100	.62	-84	39.23	136	.01	57	.76	-29
500	.60	-166	11.61	92	.02	54	.32	-39
1000	.61	173	5.94	76	.04	62	.25	-40
1500	.62	160	3.99	64	.06	59	.26	-47
2000	.62	149	2.98	55	.09	62	.27	-56
2500	.65	138	2.43	45	.11	56	.24	-70
3000	.66	129	2.11	34	.13	55	.24	-83
3500	.68	120	1.78	25	.15	51	.25	-94
4000	.70	112	1.59	13	.16	46	.27	-106
4500	.70	104	1.35	6	.18	43	.30	-113
5000	.71	97	1.26	-1	.20	39	.31	-124

NE219 SERIES

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21908
Coordinates in Ohms
Frequency in GHz
(VCE = 8 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 8 V, IC = 5 mA

FREQUENCY (MHz)

S11

S21

S12

S22

100

.91

-29

14.21

160

.01

79

.96

-13

500

.73

-112

8.27

113

.07

38

.61

-40

1000

.68

-149

4.84

89

.08

26

.46

-53

1500

.67

-169

3.34

73

.08

22

.44

-58

2000

.67

180

2.53

62

.08

24

.43

-66

2500

.67

168

2.01

50

.09

24

.42

-76

3000

.67

158

1.73

40

.09

27

.44

-86

3500

.67

149

1.48

30

.10

29

.46

-94

4000

.67

141

1.34

20

.11

30

.49

-103

4500

.66

134

1.16

10

.12

30

.52

-110

5000

.66

125

1.06

3

.13

30

.55

-118

VCE = 8 V, IC = 10 mA

100

.84

-42

23.68

153

.01

78

.91

-19

500

.67

-132

10.89

105

.05

37

.45

-50

1000

.65

-163

5.90

84

.05

33

.32

-58

1500

.63

-178

4.00

71

.07

37

.31

-64

2000

.64

173

3.02

62

.08

42

.32

-71

2500

.65

160

2.47

50

.08

37

.31

-82

3000

.65

152

2.13

41

.09

40

.33

-91

3500

.65

143

1.82

32

.11

40

.35

-98

4000

.66

137

1.64

22

.12

38

.38

-107

4500

.65

130

1.44

13

.13

36

.41

-113

5000

.65

121

1.31

5

.14

32

.44

-121

VCE = 8 V, IC = 20 mA

100

.75

-59

34.58

145

.01

71

.84

-27

500

.65

-148

12.53

99

.03

43

.34

-58

1000

.65

-171

6.56

81

.04

43

.24

-65

1500

.64

176

4.44

69

.06

44

.24

-69

2000

.64

168

3.36

61

.07

49

.25

-77

2500

.65

156

2.73

51

.08

47

.24

-87

3000

.65

149

2.37

42

.10

47

.27

-95

3500

.65

141

2.02

32

.11

46

.30

-101

4000

.66

134

1.82

23

.13

42

.33

-109

4500

.65

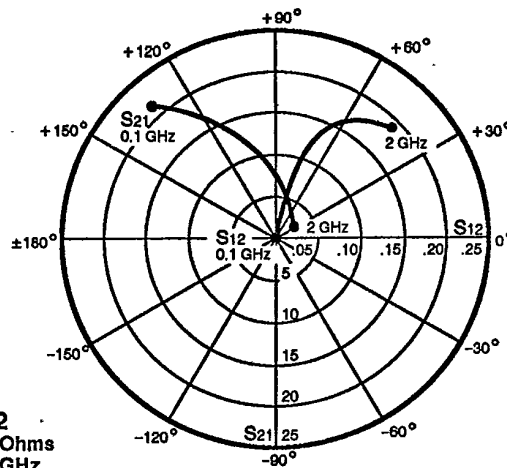
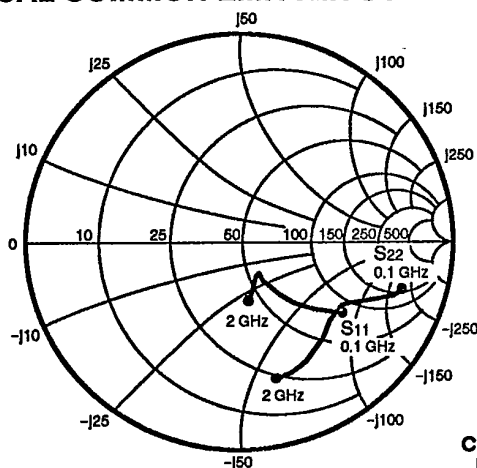
127

1.58

13

.14

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21912
Coordinates in Ohms
Frequency in GHz
(VCE = 8 V, IC = 20 mA)

S-MAGN AND ANGLES:

VCE = 8 V, IC = 5 mA
FREQUENCY (MHz)

	S11		S21		S12		S22	
100	.80	-27	12.30	149	.01	74	.92	-13
200	.67	-46	9.87	130	.03	66	.83	-20
500	.37	-78	5.45	97	.07	62	.68	-31
1000	.19	-97	3.03	71	.11	62	.63	-43
1500	.16	-97	2.14	51	.15	57	.66	-59
2000	.20	-98	1.62	31	.16	46	.71	-78

VCE = 8 V, IC = 10 mA

	S11		S21		S12		S22	
100	.69	-31	17.67	140	.01	74	.86	-15
200	.53	-47	12.60	120	.02	67	.76	-22
500	.29	-66	6.18	92	.07	70	.64	-29
1000	.17	-73	3.34	69	.12	65	.59	-41
1500	.19	-76	2.33	51	.17	56	.62	-58
2000	.26	-87	1.75	31	.18	44	.69	-77

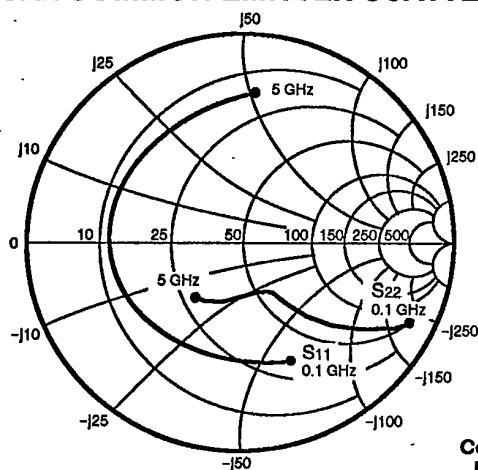
VCE = 8 V, IC = 20 mA

	S11		S21		S12		S22	
100	.58	-34	22.03	131	.01	70	.80	-17
200	.43	-47	14.19	112	.02	70	.70	-21
500	.24	-60	6.53	88	.07	71	.60	-29
1000	.17	-61	3.49	67	.13	66	.58	-40
1500	.20	-67	2.42	50	.17	56	.61	-57
2000	.29	-84	1.81	30	.18	43	.68	-77

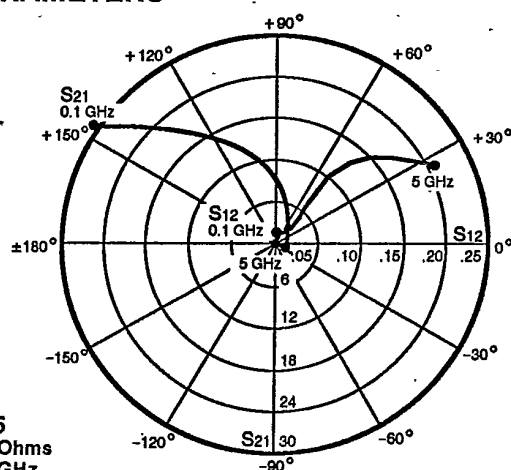
VCE = 8 V, IC = 30 mA

	S11		S21		S12		S22	
100	.52	-36	23.55	126	.01	70	.77	-17
200	.38	-46	14.52	109	.02	71	.67	-20
500	.22	-58	6.54	86	.07	70	.59	-28
1000	.16	-58	3.48	66	.13	66	.58	-40
1500	.20	-65	2.41	49	.17	56	.61	-58
2000	.28	-83	1.80	29	.18	42	.68	-78

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21935
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 8 V, I_C = 20 mA)



S-MAGN AND ANGLES:

V_{CE} = 8 V, I_C = 5 mA
FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.80	-30	13.74	160	.01	80	.96	-12
500	.65	-117	8.05	112	.07	40	.62	-40
1000	.62	-159	4.72	86	.07	30	.45	-50
1500	.62	178	3.24	69	.08	30	.42	-56
2000	.62	162	2.44	56	.09	34	.42	-64
2500	.64	146	1.95	42	.10	28	.39	-76
3000	.65	133	1.67	30	.11	33	.40	-87
3500	.66	120	1.39	20	.13	33	.42	-97
4000	.67	109	1.27	9	.14	32	.43	-108
4500	.68	99	1.11	-1	.16	29	.45	-117
5000	.69	89	1.02	-10	.18	25	.48	-127

V_{CE} = 8 V, I_C = 10 mA

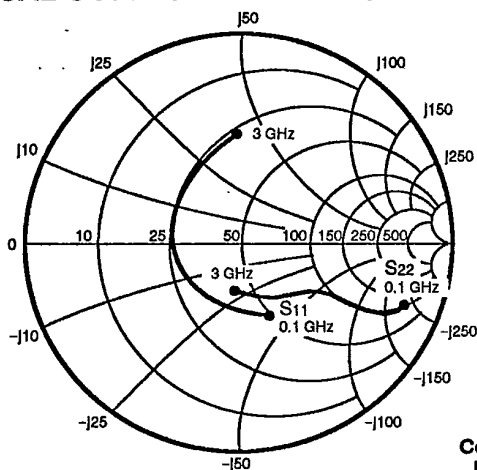
	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.67	-44	22.00	153	.01	76	.92	-18
500	.59	-139	10.21	104	.04	42	.48	-48
1000	.60	-173	5.57	82	.05	41	.34	-55
1500	.59	169	3.78	67	.07	42	.32	-61
2000	.60	155	2.86	56	.09	45	.32	-68
2500	.62	140	2.29	43	.11	43	.30	-80
3000	.63	129	1.96	31	.12	41	.31	-91
3500	.64	117	1.68	22	.14	39	.32	-101
4000	.65	107	1.50	11	.16	35	.34	-112
4500	.66	98	1.30	1	.18	29	.36	-121
5000	.67	87	1.20	-8	.19	25	.38	-131

V_{CE} = 8 V, I_C = 20 mA

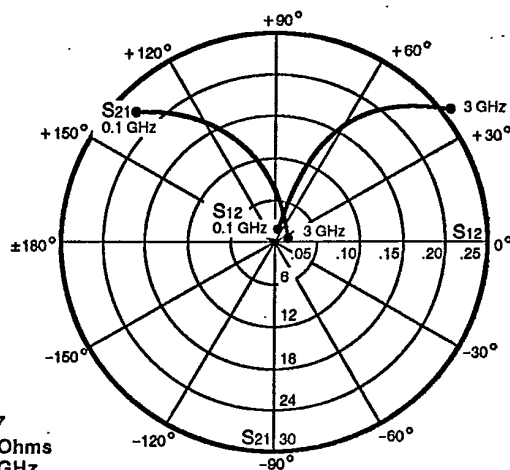
	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.55	-66	31.47	146	.01	70	.86	-25
500	.57	-157	11.59	98	.03	48	.37	-52
1000	.59	177	6.10	79	.05	51	.26	-58
1500	.59	162	4.13	65	.07	53	.25	-63
2000	.59	150	3.09	55	.09	55	.26	-71
2500	.61	136	2.49	43	.11	46	.24	-84
3000	.62	125	2.13	32	.13	45	.26	-94
3500	.63	114	1.78	22	.15	42	.27	-104
4000	.65	105	1.62	12	.17	37	.29	-115
4500	.66	95	1.41	2	.19	31	.31	-123
5000	.67	85	1.31	-7	.20	26	.33	-132

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TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE21937
Coordinates in Ohms
Frequency in GHz
(VCE = 8 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 8 V, IC = 5 mA

FREQUENCY (MHz)

	S11		S21		S12		S22	
100	.67	-36	12.58	154	.01	76	.95	-13
200	.56	-69	10.71	135	.03	58	.84	-21
500	.43	-132	6.19	102	.06	50	.60	-31
1000	.42	177	3.49	75	.09	51	.49	-40
1500	.44	148	2.41	56	.12	51	.46	-48
2000	.49	125	1.84	42	.16	52	.44	-60
2500	.54	105	1.50	26	.19	45	.37	-71
3000	.59	96	1.29	16	.24	42	.35	-95

VCE = 8 V, IC = 10 mA

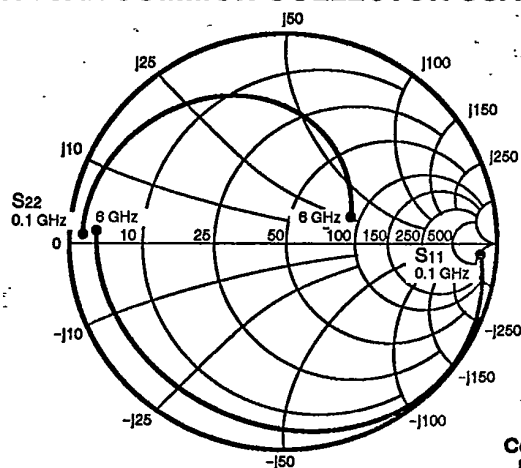
	S11		S21		S12		S22	
100	.53	-52	19.37	146	.01	72	.89	-17
200	.42	-91	14.71	125	.02	56	.73	-27
500	.36	-153	7.39	95	.05	58	.49	-32
1000	.38	165	3.98	72	.09	60	.41	-38
1500	.41	140	2.71	56	.13	57	.39	-47
2000	.45	122	2.07	42	.17	54	.36	-60
2500	.50	105	1.70	27	.21	47	.31	-73
3000	.55	93	1.44	14	.26	40	.28	-95

VCE = 8 V, IC = 20 mA

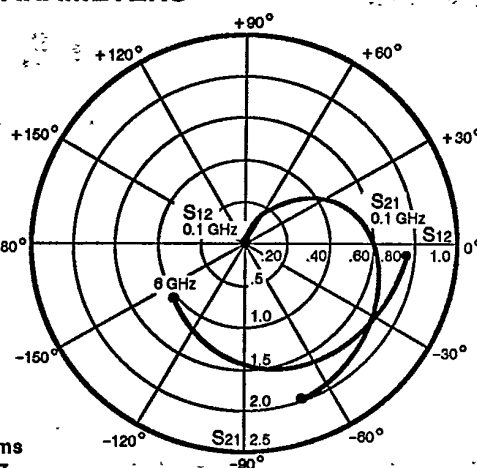
	S11		S21		S12		S22	
100	.39	-71	26.29	137	.01	74	.81	-23
200	.32	-118	17.89	116	.01	60	.62	-30
500	.32	-170	8.16	90	.05	66	.42	-30
1000	.36	156	4.28	70	.09	65	.36	-37
1500	.39	135	2.91	54	.14	59	.34	-46
2000	.43	118	2.22	42	.18	55	.31	-60
2500	.49	102	1.80	27	.22	46	.26	-77
3000	.53	91	1.53	14	.26	38	.23	-96

NE219 SERIES

TYPICAL COMMON COLLECTOR SCATTERING PARAMETERS



NE21987

Coordinates in Ohms
Frequency in GHz
(VCE = 8 V, IC = 20 mA)

S-MAGN AND ANGLES:

VCE = 8 V, IC = 10 mA
FREQUENCY (MHz)

	S11	S21	S12	S22
100	.97 -4	1.81 -3	.03 55	.85 177
500	.96 -20	1.84 -15	.15 65	.86 163
1000	.98 -42	1.82 -30	.29 52	.83 147
1500	.95 -62	1.75 -42	.40 38	.78 133
2000	.91 -80	1.60 -56	.50 22	.70 118
2500	.86 -96	1.51 -67	.59 10	.64 103
3000	.85 -113	1.42 -78	.66 -4	.57 89
3500	.84 -129	1.32 -91	.70 -17	.49 75
4000	.82 -144	1.21 -100	.73 -32	.42 63
4500	.79 -158	1.15 -110	.76 -42	.36 51
5000	.77 -173	1.06 -120	.79 -55	.31 38
5500	.76 -176	1.02 -131	.80 -66	.26 24
6000	.73 -163	.94 -140	.81 -79	.21 10

VCE = 8 V, IC = 20 mA

	S11	S21	S12	S22
100	.98 -3	1.87 -3	.03 48	.91 177
500	.97 -19	1.89 -15	.13 64	.91 165
1000	1.00 -39	1.88 -28	.24 54	.88 150
1500	.99 -58	1.81 -40	.34 42	.85 138
2000	.94 -75	1.64 -55	.44 27	.78 123
2500	.91 -90	1.60 -66	.52 16	.74 109
3000	.91 -107	1.51 -77	.59 2	.68 95
3500	.90 -122	1.42 -90	.63 -11	.60 82
4000	.89 -137	1.31 -100	.69 -24	.54 70
4500	.87 -150	1.26 -111	.71 -35	.48 59
5000	.85 -165	1.16 -121	.75 -48	.43 46
5500	.84 -176	1.11 -133	.77 -59	.37 34
6000	.82 -171	1.02 -143	.78 -72	.32 21

VCE = 8 V, IC = 40 mA

	S11	S21	S12	S22
100	.97 -3	1.88 -3	.03 41	.94 178
500	.97 -19	1.92 -14	.11 64	.93 165
1000	1.00 -38	1.91 -28	.22 55	.91 152
1500	.99 -57	1.85 -39	.32 44	.89 139
2000	.95 -75	1.63 -54	.41 29	.82 125
2500	.93 -91	1.66 -66	.49 19	.79 111
3000	.93 -110	1.59 -78	.57 5	.73 98
3500	.93 -127	1.51 -92	.62 -7	.65 85
4000	.91 -143	1.39 -102	.67 -21	.59 73
4500	.90 -158	1.33 -114	.71 -32	.53 62
5000	.88 -175	1.21 -125	.75 -45	.48 50
5500	.88 -172	1.16 -138	.77 -57	.42 36
6000	.85 -158	1.04 -148	.79 -70	.35 24