

NEC®**NPN MEDIUM POWER
UHF-VHF TRANSISTOR****NE416
SERIES**T-31-17
T-31-21
T-33-05**FEATURES**

- **LOW NOISE FIGURE:** 1 dB at 70 MHz
- **HIGH RELIABILITY METALLIZATION**
- **LINEAR POWER OUTPUT:** 200 mW at 2 GHz
- **LOW COST**

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	100
T _J	Junction Temperature	°C	200*
T _{STG}	Storage Temperature	°C	-65 to +200**

*Maximum Junction Temperature for NE41632 is 150°C.

Maximum Storage Temperature (T_{STG}) for the NE41632 and NE41635 is -65°C to 150°C. The leads of the NE41635 are Sn plated and may tarnish above 150°C. Once soldered into a circuit, the unit can be stored at 200°C.DESCRIPTION AND APPLICATIONS**

The NE416 series of NPN silicon transistors is one of the most versatile and widely used of NEC's microwave transistors. The series provides economical solutions to a wide range of amplifier and oscillator problems. Low noise figures, high gain and high current capability achieve wide dynamic range and excellent linearity. The NE416 series is available in a wide selection of package styles and in chip form for thin and thick film circuits. Most package styles are available with Grade C (JANTXV equivalent) and Grade CX (JANTX equivalent) screening. The NE41615 and NE41603 have been space qualified. The series is volume produced, using the latest techniques and production controls patterned after MIL-S-19500. Of special importance is the use of NEC's high reliability metallization system (Pt-Si-Ti-Pt-Au) which offers the utmost in performance, reliability, and permits high temperature operation (100°C) at rated dissipation. The NE416 series offers superior performance and reliability at prices usually lower than less reliable moly-gold or aluminum transistors.

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NE41635 TYPICAL NOISE PARAMETERSV_{CE} = 10 V, I_C = 5 mA

FREQUENCY (MHz)	NF min (dB)	Ga/dB	OPT SOURCE	RN/50 Ω
500	1.8	15.3	.40 ∠ 128°	.17
1000	3.0	11.1	.58 ∠ 171°	.10
1500	4.2	8.3	.69 ∠ -174°	.14
2000	4.8	6.7	.68 ∠ -162°	.26

V_{CE} = 10 V, I_C = 20 mA

500	2.4	17.5	.42 ∠ 159°	.13
1000	3.6	12.7	.59 ∠ 180°	.10
1500	4.9	9.8	.67 ∠ -169°	.15
2000	5.6	8.8	.73 ∠ -159°	.50

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

NE PART NUMBER		NE41603		NE41607		NE41612-1 ²		NE41615		NE41620		NE41632-1		NE41635	
EIAJ ¹ REGISTERED NUMBER		2SC1949 (Grd C)				NE41612-1 ²		2SC1426 (Grd CQ)		2SC1255 (Grd C)		NE41632-2			
PACKAGE OUTLINE		03		07		12 (TO-72)		15 (TO-39)		20		32 (TO-92)		35 (MICRO-X)	
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN
ICBO	Collector Cutoff Current at V _{CB} = 20 V, I _E = 0	μA			0.1			0.1			0.1			0.5	0.1
IEBO	Emitter Current Gain at V _{EB} = 2 V, I _C = 0	μA			0.1			0.1			0.1			0.5	0.1
hFE	Forward Current Gain ⁴ at V _{CB} = 5 V, I _C = 25 mA														
OCB	Collector to Base Capacitance ⁵ at V _{CB} = 5 V, I _E = 0, f = 1 MHz	pF													
RTH	Thermal Resistance (Junction-to-Case)	°C/W			50			50			50			130	50
PT	Total Power Dissipation (T _A = 25°C)	W			.58			.58			3.5			.80	.29

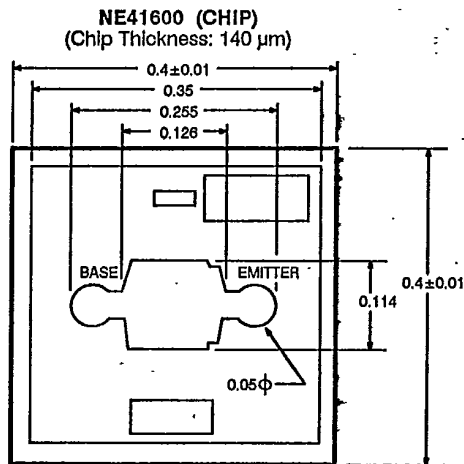
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

NE PART NUMBER		NE41603		NE41607		NE41612-1 ²		NE41615		NE41620		NE41632-1		NE41635	
EIAJ ¹ REGISTERED NUMBER		2SC1949 (Grd C)				NE41612-1 ²		2SC1426 (Grd CQ)		2SC1255 (Grd C)		NE41632-2			
PACKAGE OUTLINE		03		07		12 (TO-72)		15 (TO-39)		20		32 (TO-92)		35 (MICRO-X)	
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN
f _T	Gain Bandwidth Product at V _{CE} = 5 V, I _C = 25 mA	GHz	2	3.5		1.5	2.7		2	3.5		2	3.5		2
S _{21E} ²	Insertion Power Gain at V _{CE} = 10 V, I _C = 30 mA, f = 0.5 GHz	dB	7	9.5			13	8							
NFMIN	Minimum Noise Figure at V _{CE} = 10 V, I _C = 5 mA, R _G = 50 Ω, f = 0.2 GHz	dB					2.3	4							
MAG	Maximum Available Gain ⁶ at V _{CE} = 10 V, I _C = 30 mA, f = 0.5 GHz	dB					2.3	4							
GP	Power Gain at V _{CE} = 15 V, I _C = 50 mA, P _{IN} = 10 dBm, f = 2 GHz	dB					15.5	10							
POUT	Power Output at V _{CE} = 15 V, I _C = 50 mA, P _{IN} = 15 dBm, f = 2 GHz	dBm					15.5	10							

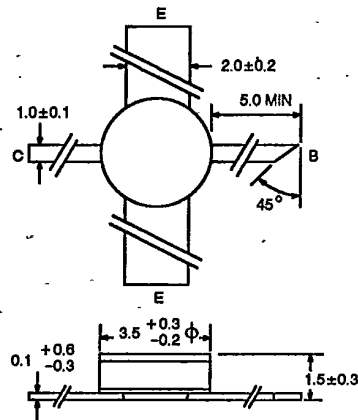
Notes:

- Electronic Industrial Association of Japan.
- NE41612-1 (NC921) is selected for low noise.
- NE41632-1 (2SC2407) is selected for power and the NE41632-2 (2SC2408) is selected for small signal applications.
- Pulse measurement Duty Cycle ≤ 2%, P_W ≤ 30 ns.
- CCB measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
- MAG = |S_{21E}|² / (1 - S_{11E})² (1 - S_{22E})²

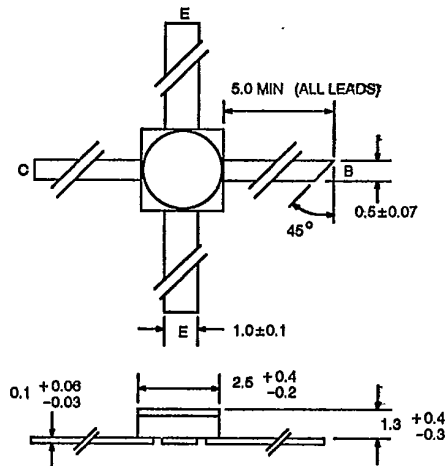
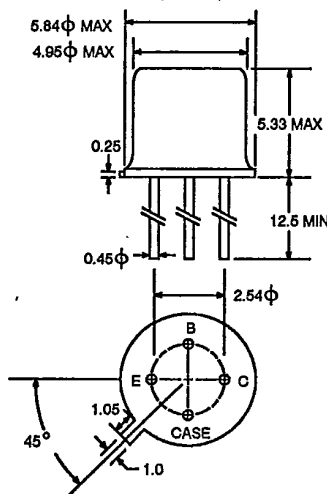
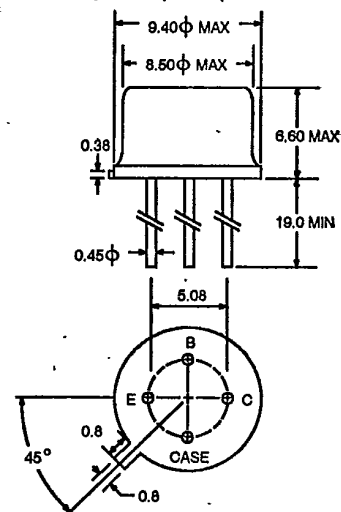
OUTLINE DIMENSIONS (Units in mm)



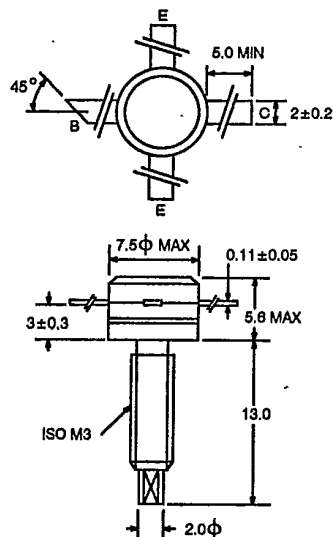
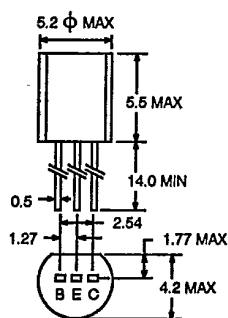
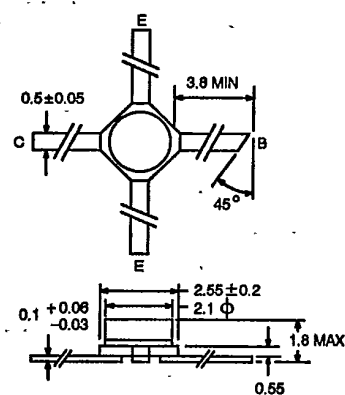
OUTLINE 03



OUTLINE 07

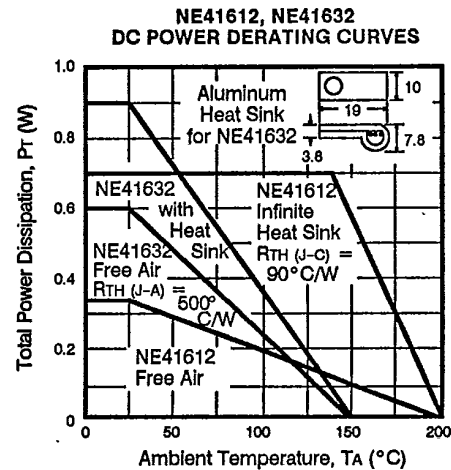
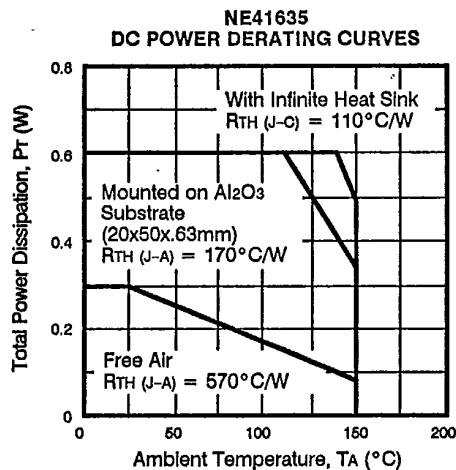
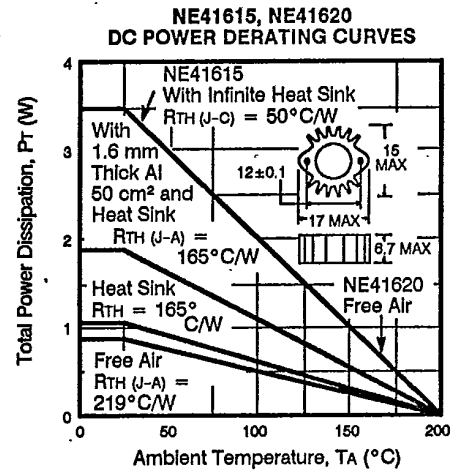
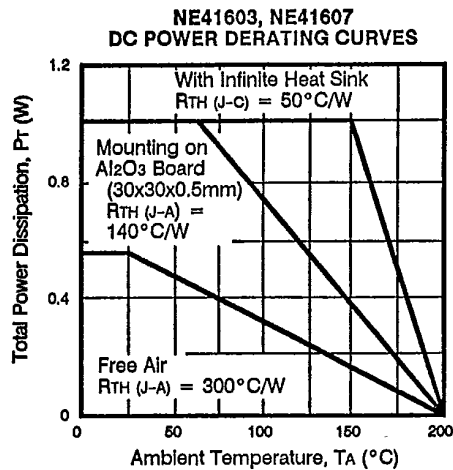
OUTLINE 12
(TO-72)OUTLINE 15
(TO-33)

OUTLINE 20

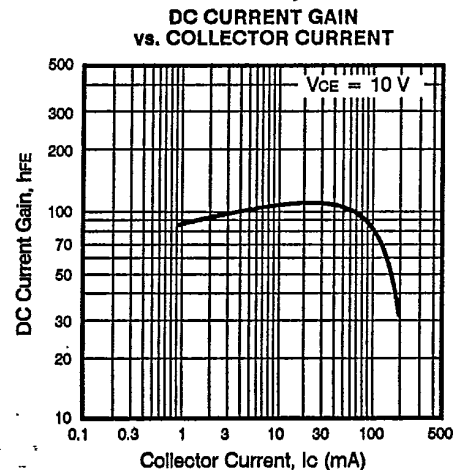
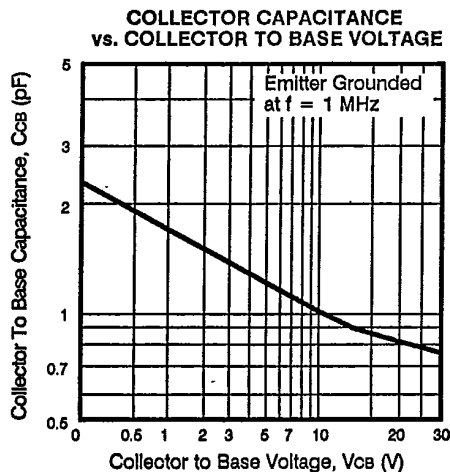
OUTLINE 32
(TO-92)OUTLINE 35
(MICRO-X)

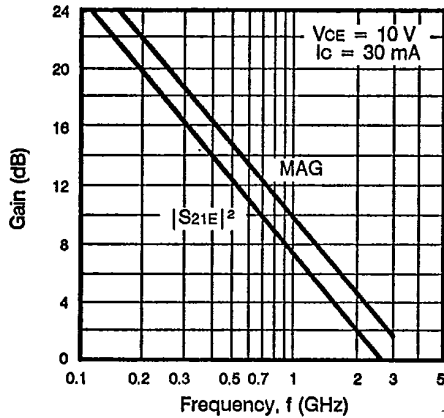
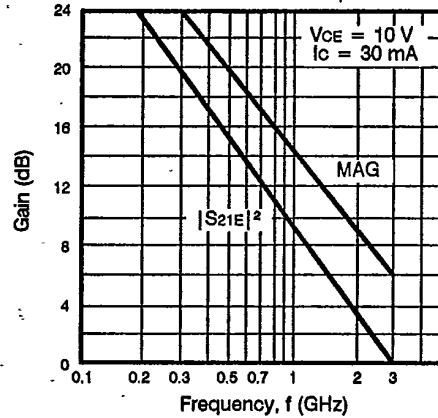
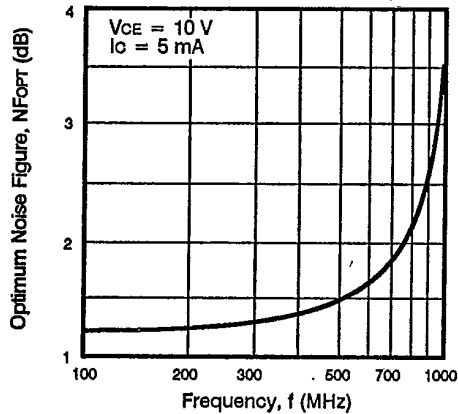
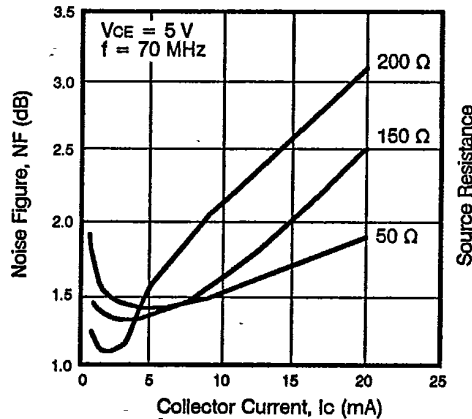
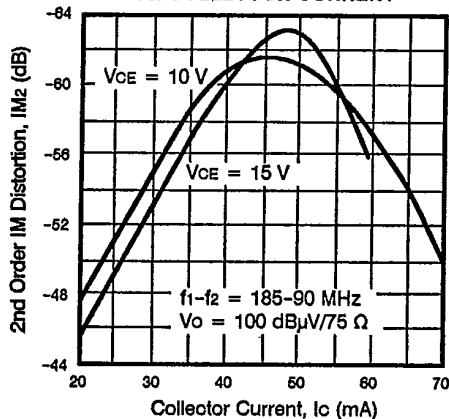
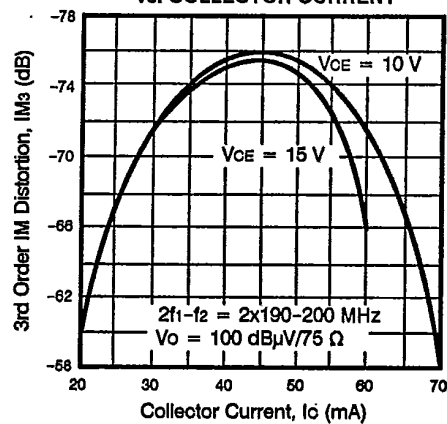
32B is available with
center lead the base.

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

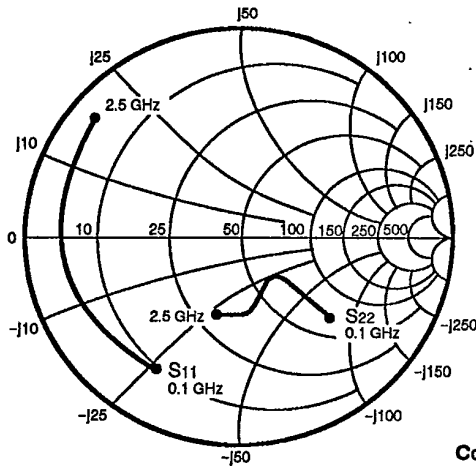


TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

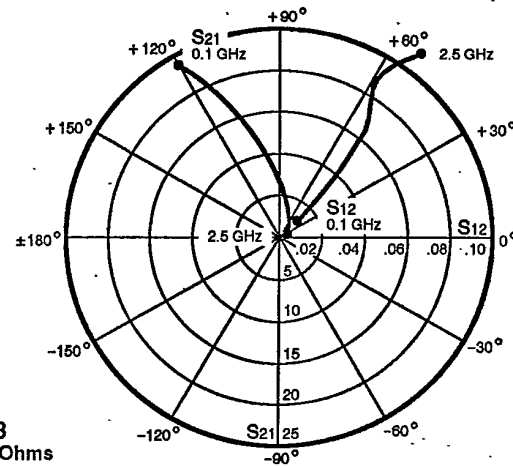


T-31-21
T-33-05TYPICAL PERFORMANCE CHARACTERISTICS ($T_A = 25^\circ\text{C}$)NE41612, NE41615 AND NE41632-2
FORWARD INSERTION GAIN
AND MAXIMUM AVAILABLE GAIN
vs. FREQUENCYNE41603 AND NE41607
FORWARD INSERTION GAIN
AND MAXIMUM AVAILABLE GAIN
vs. FREQUENCYNE41603, NE41607 AND NE41632-2
NOISE FIGURE vs. FREQUENCYNE41612-1
NOISE FIGURE vs.
COLLECTOR CURRENT AND
SOURCE RESISTANCENE41615
SECOND ORDER IM DISTORTION
vs. COLLECTOR CURRENTNE41615
THIRD ORDER IM DISTORTION
vs. COLLECTOR CURRENT

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE41603
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_C = 20 mA)



S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 5 mA

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.82	-73	12.33	139	.03	57	.84	-24
500	.79	-160	4.01	87	.07	24	.47	-36
1000	.78	178	2.08	63	.06	24	.44	-49
1500	.79	166	1.40	45	.07	30	.49	-65
2000	.80	155	1.03	31	.08	40	.52	-81
2500	.81	143	.80	16	.10	42	.53	-100

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

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.75	-99	18.56	129	.02	50	.72	-32
500	.77	-171	4.95	84	.04	32	.35	-38
1000	.77	172	2.51	63	.05	39	.33	-51
1500	.78	162	1.69	46	.07	42	.38	-67
2000	.79	152	1.25	32	.09	49	.43	-81
2500	.81	142	.97	19	.10	48	.43	-101

V_{CE} = 10 V, I_C = 20 mA

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.72	-125	23.98	119	.01	46	.57	-41
500	.78	-177	5.62	82	.03	44	.24	-42
1000	.78	169	2.83	63	.05	52	.23	-54
1500	.79	160	1.90	47	.07	52	.28	-69
2000	.80	152	1.40	34	.09	55	.34	-83
2500	.82	142	1.10	21	.11	53	.36	-101

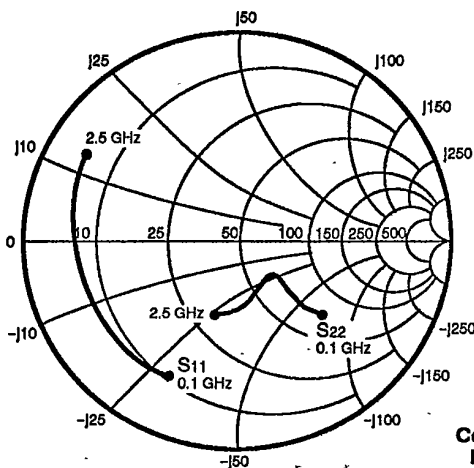
V_{CE} = 10 V, I_C = 30 mA

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.72	-137	26.27	115	.01	47	.51	-45
500	.78	-180	5.87	81	.03	52	.20	-44
1000	.78	169	2.95	62	.05	55	.20	-55
1500	.79	160	1.97	48	.07	55	.25	-70
2000	.81	152	1.46	35	.09	58	.31	-84
2500	.82	140	1.14	20	.11	55	.33	-101

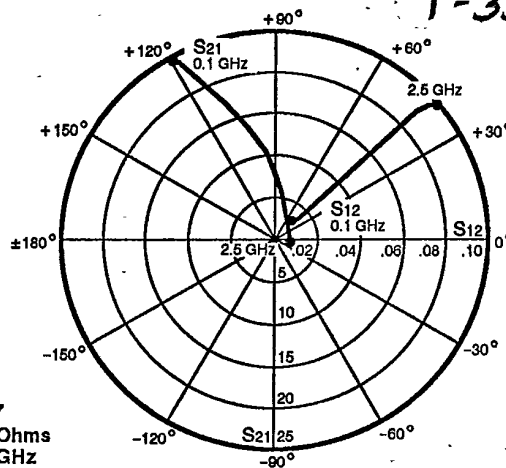
V_{CE} = 10 V, I_C = 50 mA

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.72	-150	27.80	110	.01	49	.44	-47
500	.79	178	5.96	80	.02	60	.18	-42
1000	.79	168	2.98	62	.05	61	.19	-54
1500	.80	159	1.99	47	.07	59	.24	-68
2000	.81	151	1.47	35	.09	61	.30	-83
2500	.83	141	1.14	22	.11	58	.32	-103

TYPICAL COMMON EMITTER SCATTERING PARAMETERS

T-31-21
T-33-05

NE41607
Coordinates in Ohms
Frequency in GHz
(VCE = 10 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 10 V, IC = 5 mA

FREQUENCY (MHz)

FREQUENCY (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.86	-68	12.47	139	.03	59	.84	-25
500	.76	-154	4.15	87	.07	24	.44	-41
1000	.76	-175	2.16	62	.08	20	.42	-57
1500	.76	175	1.46	43	.09	22	.47	-73
2000	.77	167	1.08	27	.09	22	.51	-91
2500	.78	157	.83	11	.10	22	.55	-106

VCE = 10 V, IC = 10 mA

100	.79	-92	18.90	129	.02	51	.71	-35
500	.76	-165	5.11	84	.05	31	.30	-46
1000	.76	179	2.60	62	.06	34	.30	-59
1500	.76	171	1.76	44	.08	32	.35	-75
2000	.77	164	1.30	29	.09	34	.40	-91
2500	.78	155	1.01	14	.10	30	.46	-106

VCE = 10 V, IC = 20 mA

100	.75	-117	24.58	119	.01	45	.57	-45
500	.76	-172	5.80	81	.03	40	.20	-51
1000	.77	176	2.92	62	.06	44	.21	-63
1500	.77	169	1.97	46	.08	42	.27	-77
2000	.78	162	1.45	31	.09	43	.32	-94
2500	.79	151	1.13	16	.10	36	.39	-107

VCE = 10 V, IC = 30 mA

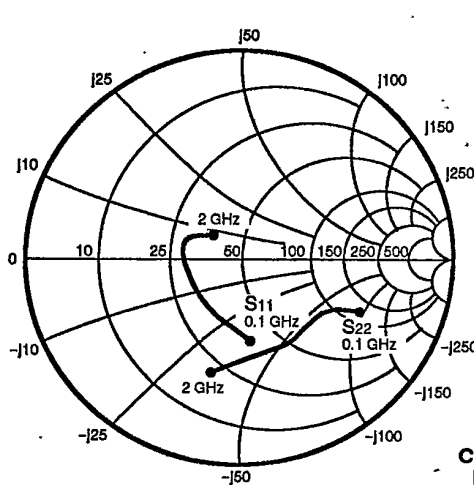
100	.73	-130	26.90	114	.01	47	.50	-49
500	.76	-175	6.05	80	.03	45	.17	-53
1000	.77	175	3.02	62	.05	48	.18	-64
1500	.78	168	2.03	46	.07	44	.25	-78
2000	.79	162	1.50	32	.09	45	.30	-95
2500	.79	150	1.16	17	.10	40	.37	-109

VCE = 10 V, IC = 50 mA

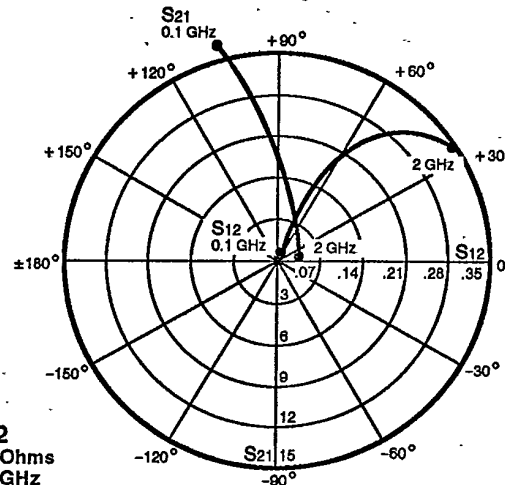
100	.73	-142	27.99	110	.01	43	.43	-50
500	.78	-178	6.03	79	.02	53	.16	-49
1000	.78	173	3.00	61	.05	51	.18	-62
1500	.79	167	2.01	46	.07	49	.24	-77
2000	.81	160	1.49	32	.08	50	.30	-94
2500	.81	151	1.16	19	.10	45	.36	-110



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE41612
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_C = 20 mA)



S-MAGN AND ANGLES:

V_{CE} = 5 V, I_C = 2 mA

FREQUENCY (MHz)

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.83 -52	6.06 141	.05 58	.89 -20
200	.69 -87	4.45 118	.09 49	.76 -31
500	.52 -143	2.25 81	.12 39	.59 -46
1000	.49 172	1.31 49	.16 54	.55 -69
1500	.44 139	.97 28	.25 59	.59 -92
2000	.35 108	.82 12	.36 48	.60 -115

V_{CE} = 10 V, I_C = 5 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.68 -60	10.41 132	.03 62	.80 -22
200	.51 -95	6.94 110	.06 54	.65 -30
500	.37 -148	3.24 79	.10 57	.53 -40
1000	.34 170	1.79 52	.17 61	.51 -59
1500	.30 145	1.32 30	.25 58	.55 -82
2000	.22 122	1.05 9	.32 46	.60 -104

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

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.52 -73	13.86 122	.02 62	.69 -25
200	.38 -105	8.38 102	.05 59	.56 -31
500	.29 -155	3.71 77	.11 63	.46 -39
1000	.27 169	2.02 51	.19 61	.45 -57
1500	.24 149	1.48 30	.26 53	.50 -80
2000	.17 135	1.18 9	.32 41	.56 -100

V_{CE} = 10 V, I_C = 20 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.39 -83	16.25 114	.02 62	.60 -27
200	.29 -114	9.23 98	.04 65	.49 -30
500	.25 -159	3.97 75	.11 67	.42 -38
1000	.24 168	2.15 51	.20 60	.41 -56
1500	.20 152	1.57 30	.28 51	.46 -78
2000	.14 145	1.24 9	.33 37	.53 -98

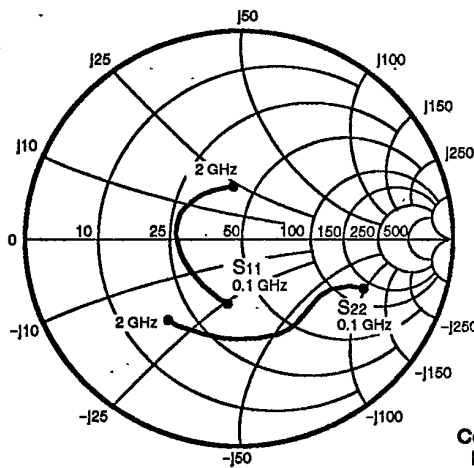
V_{CE} = 10 V, I_C = 30 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.34 -89	16.82 111	.02 65	.56 -27
200	.26 -119	9.37 96	.04 66	.47 -28
500	.24 -162	4.00 74	.11 68	.41 -37
1000	.23 167	2.16 51	.20 61	.41 -56
1500	.20 152	1.57 30	.28 51	.45 -78
2000	.14 145	1.24 8	.33 36	.52 -98

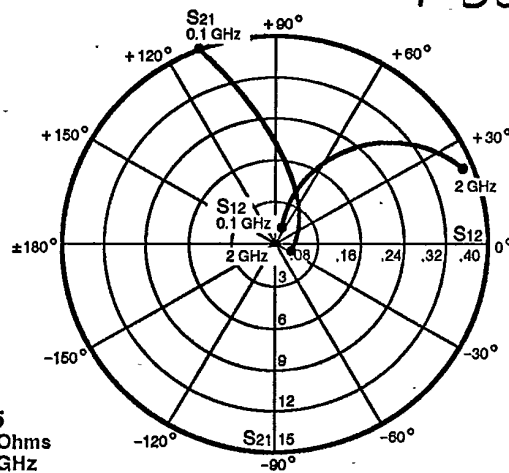
TYPICAL COMMON EMITTER SCATTERING PARAMETERS

T-31-21

T-33-05



NE41615
Coordinates in Ohms
Frequency in GHz
(VCE = 10 V, IC = 20 mA)

**S-MAGN AND ANGLES:**

VCE = 10 V, IC = 5 mA

FREQUENCY (MHz)

	S11	S21	S12	S22
100	.59 -74	9.98 126	.03 58	.78 -22
200	.46 -112	6.28 103	.05 52	.66 -30
500	.39 -160	2.91 72	.09 57	.59 -46
1000	.37 164	1.71 39	.17 57	.62 -78
1500	.36 133	1.30 10	.27 46	.62 -109
2000	.31 91	1.07 -16	.38 31	.59 -136

VCE = 10 V, IC = 10 mA

	S11	S21	S12	S22
100	.42 -89	13.14 116	.02 60	.68 -25
200	.33 -124	7.57 97	.04 61	.57 -29
500	.31 -165	3.33 70	.10 65	.53 -46
1000	.31 164	1.93 39	.19 55	.56 -78
1500	.31 135	1.47 10	.28 41	.56 -107
2000	.26 96	1.20 -16	.38 27	.54 -133

VCE = 10 V, IC = 20 mA

	S11	S21	S12	S22
100	.29 -104	15.31 110	.02 63	.59 -26
200	.25 -135	8.44 93	.04 68	.51 -18
500	.27 -167	3.64 69	.11 67	.48 -46
1000	.28 165	2.09 39	.20 53	.51 -78
1500	.27 138	1.57 11	.29 39	.52 -106
2000	.22 98	1.29 -16	.38 23	.50 -131

VCE = 10 V, IC = 30 mA

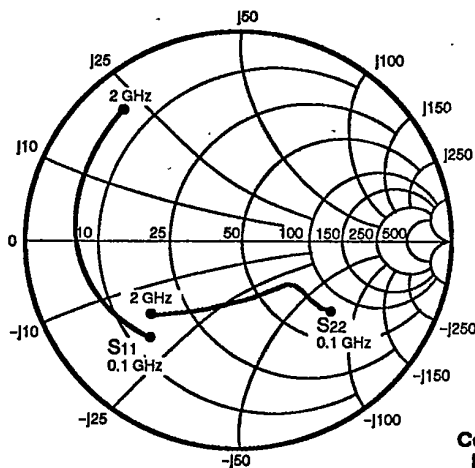
	S11	S21	S12	S22
100	.24 -112	16.22 107	.01 69	.56 -25
200	.22 -140	8.77 92	.04 73	.49 -28
500	.25 -168	3.76 69	.11 67	.46 -46
1000	.26 167	2.14 39	.21 53	.49 -78
1500	.26 139	1.61 11	.30 38	.50 -106
2000	.21 100	1.32 -15	.38 22	.48 -130

VCE = 10 V, IC = 50 mA

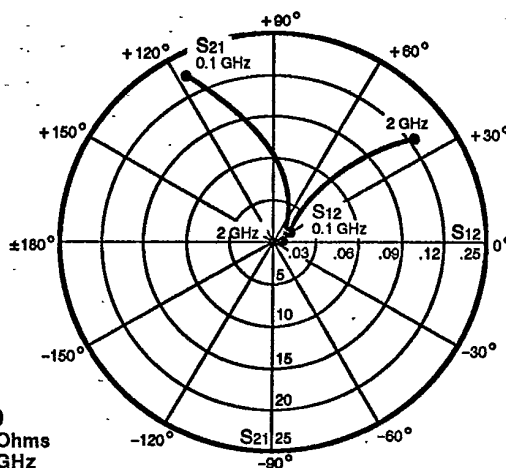
	S11	S21	S12	S22
100	.19 -126	16.89 104	.01 72	.53 -25
200	.20 -148	8.99 90	.04 73	.47 -27
500	.24 -170	3.83 68	.11 68	.45 -46
1000	.26 166	2.18 39	.21 52	.48 -78
1500	.26 139	1.63 11	.30 37	.48 -106
2000	.20 99	1.34 -16	.38 21	.47 -129

2

TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE41620
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_C = 20 mA)



S-MAGN AND ANGLES:

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

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.71	-104	17.66	125	.03	51	.69	-36
200	.72	-142	10.59	103	.03	33	.49	-41
500	.75	-177	4.49	74	.04	32	.37	-52
1000	.75	159	2.29	45	.05	40	.38	-79
1500	.78	143	1.50	21	.08	36	.44	-106
2000	.78	130	1.10	-1	.12	35	.53	-132

V_{CE} = 10 V, I_C = 20 mA

100	.66	-130	22.48	116	.02	42	.56	-43
200	.72	-158	12.57	97	.02	30	.38	-45
500	.75	176	5.11	72	.04	47	.28	-53
1000	.75	156	2.60	45	.06	49	.31	-81
1500	.77	142	1.70	22	.09	42	.37	-108
2000	.78	129	1.27	0	.12	38	.46	-132

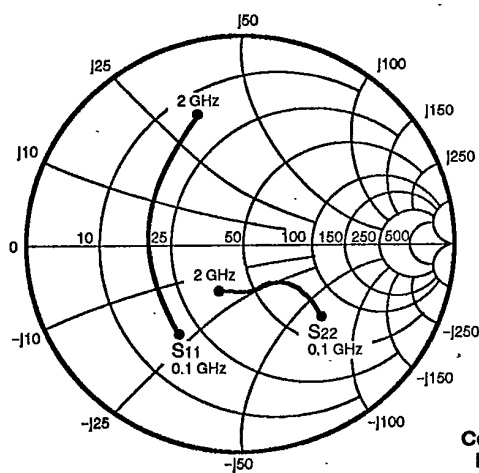
V_{CE} = 10 V, I_C = 30 mA

100	.67	-143	24.33	112	.02	58	.49	-46
200	.71	-165	13.33	95	.02	49	.33	-46
500	.75	174	5.36	71	.04	53	.25	-55
1000	.75	155	2.72	45	.06	62	.27	-81
1500	.77	141	1.78	22	.08	44	.34	-108
2000	.78	129	1.31	2	.12	39	.43	-132

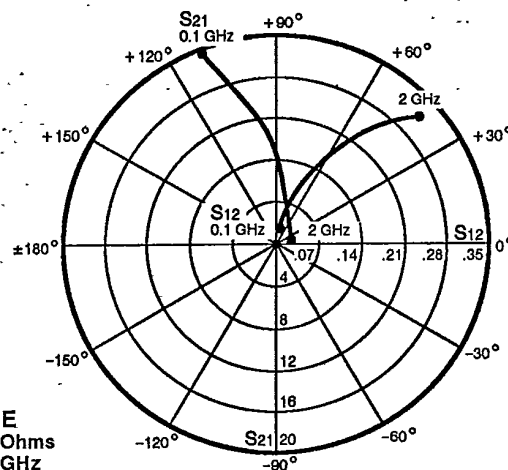
V_{CE} = 10 V, I_C = 50 mA

100	.67	-153	25.61	108	.02	64	.43	-47
200	.72	-171	13.75	92	.02	47	.29	-46
500	.76	172	5.46	70	.03	54	.23	-52
1000	.76	154	2.76	45	.06	56	.26	-80
1500	.78	141	1.80	22	.09	47	.33	-108
2000	.79	128	1.34	1	.12	40	.42	-131

TYPICAL COMMON EMITTER SCATTERING PARAMETERS

T-31-21
T-33-05

NE41632E
Coordinates in Ohms
Frequency in GHz
(VCE = 10 V, IC = 20 mA)



S-MAGN AND ANGLES:

VCE = 10 V, IC = 5 mA

FREQUENCY (MHz)

	S11		S21		S12		S22	
100	.72	-73	11.39	132	.04	59	.78	-28
200	.58	-117	7.45	109	.06	43	.58	-38
500	.54	-167	3.51	79	.09	48	.40	-48
1000	.57	156	1.90	49	.14	55	.37	-65
1500	.62	130	1.37	27	.21	56	.36	-89
2000	.70	108	1.11	8	.30	47	.36	-117

VCE = 10 V, IC = 10 mA

	S11		S21		S12		S22	
100	.59	-97	15.52	121	.03	57	.64	-35
200	.50	-139	9.01	101	.04	49	.44	-41
500	.50	-178	4.00	76	.09	59	.32	-48
1000	.54	151	2.14	49	.16	58	.30	-64
1500	.60	127	1.54	28	.23	54	.28	-89
2000	.66	107	1.25	8	.31	45	.30	-118

VCE = 10 V, IC = 20 mA

	S11		S21		S12		S22	
100	.49	-125	18.93	111	.02	60	.50	-40
200	.46	-159	10.20	95	.03	58	.34	-41
500	.48	173	4.35	74	.09	67	.25	-47
1000	.52	147	2.31	49	.17	60	.24	-63
1500	.58	126	1.66	28	.24	54	.23	-89
2000	.65	107	1.35	9	.32	43	.24	-118

VCE = 10 V, IC = 30 mA

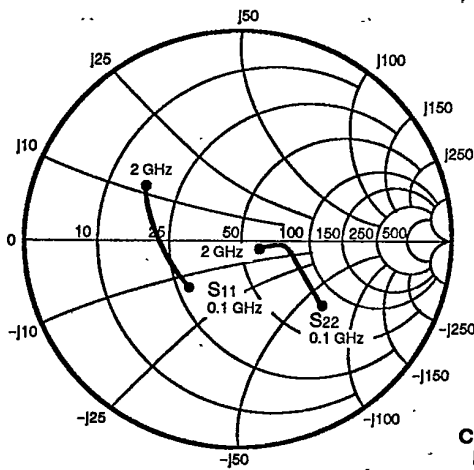
	S11		S21		S12		S22	
100	.46	-139	20.01	107	.01	66	.45	-40
200	.46	-166	10.52	93	.02	63	.30	-40
500	.48	171	4.45	73	.09	70	.23	-46
1000	.51	146	2.34	49	.17	62	.23	-63
1500	.56	126	1.67	29	.25	55	.22	-91
2000	.64	107	1.36	10	.33	44	.24	-118

VCE = 10 V, IC = 50 mA

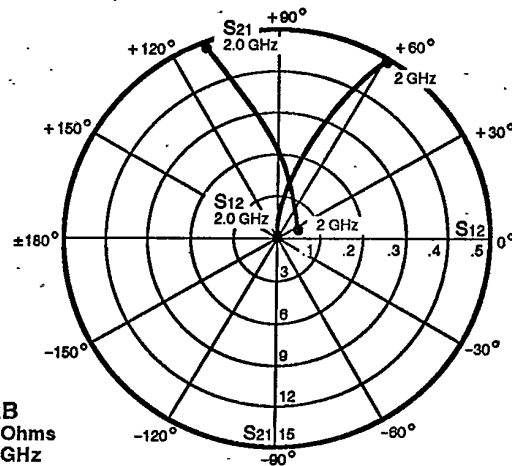
	S11		S21		S12		S22	
100	.45	-152	20.48	104	.01	68	.40	-38
200	.46	-173	10.53	90	.03	69	.28	-36
500	.48	169	4.44	72	.09	72	.23	-43
1000	.52	145	2.33	48	.17	63	.23	-61
1500	.57	125	1.66	28	.25	56	.22	-88
2000	.65	107	1.34	9	.33	45	.24	-116



TYPICAL COMMON BASE SCATTERING PARAMETERS



NE41632B
Coordinates in Ohms
Frequency in GHz
(V_{CB} = 10 V, I_C = 20 mA)



S-MAGN AND ANGLES:

V_{CB} = 10 V, I_C = 5 mA

FREQUENCY (MHz)

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.55 -81	9.59 128	.04 59	.74 -28
200	.47 -122	6.03 106	.06 52	.55 -33
500	.45 -160	2.83 80	.12 68	.38 -29
1000	.45 176	1.64 55	.22 75	.30 -31
1500	.48 160	1.29 40	.35 73	.20 -40
2000	.51 146	1.17 27	.49 65	.13 -57

V_{CB} = 10 V, I_C = 10 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.41 -109	12.53 118	.03 66	.61 -32
200	.38 -144	7.12 100	.05 64	.44 -32
500	.40 -168	3.18 77	.13 75	.31 -23
1000	.41 172	1.81 55	.24 74	.26 -20
1500	.44 160	1.42 39	.36 69	.20 -23
2000	.48 148	1.27 26	.49 62	.14 -33

V_{CB} = 10 V, I_C = 20 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.33 -136	14.61 111	.02 72	.51 -34
200	.34 -160	7.85 95	.05 74	.36 -30
500	.36 -173	3.41 76	.13 78	.27 -17
1000	.38 171	1.93 55	.26 73	.24 -11
1500	.42 161	1.50 40	.37 67	.20 -11
2000	.46 150	1.34 26	.48 60	.15 -18

V_{CB} = 10 V, I_C = 30 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.31 -151	15.38 108	.02 78	.46 -34
200	.33 -168	8.10 94	.05 78	.33 -29
500	.35 -176	3.50 75	.14 79	.25 -14
1000	.37 170	1.98 55	.26 73	.24 -7
1500	.41 161	1.53 40	.37 66	.20 -6
2000	.46 151	1.37 25	.48 60	.16 -14

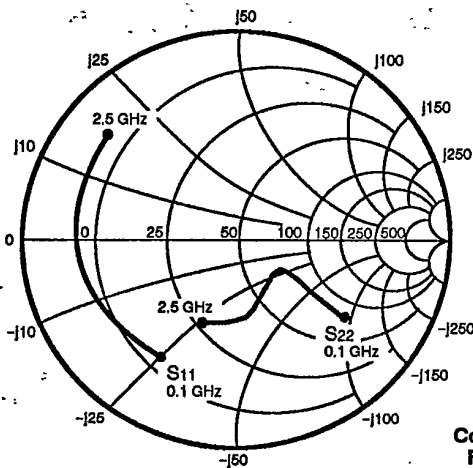
V_{CB} = 10 V, I_C = 50 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.32 -163	15.78 105	.02 79	.43 -33
200	.34 -175	8.21 92	.05 80	.32 -27
500	.35 -178	3.52 75	.14 80	.25 -11
1000	.37 169	1.99 54	.26 73	.24 -4
1500	.41 161	1.54 39	.37 66	.21 -4
2000	.46 150	1.37 25	.48 59	.16 -13

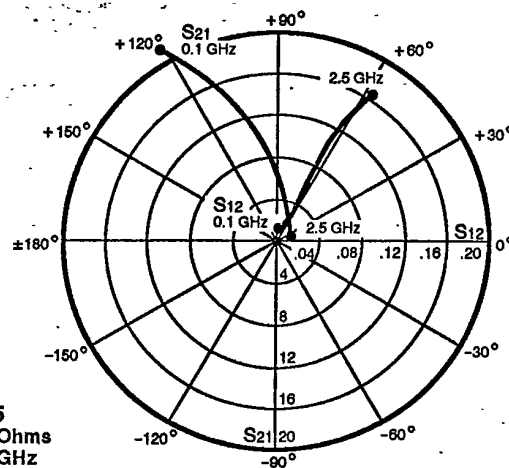
TYPICAL COMMON EMITTER SCATTERING PARAMETERS

T-31-21

T-33-05



NE41635
Coordinates in Ohms
Frequency in GHz
(V_{CE} = 10 V, I_C = 20 mA)



S-MAGN AND ANGLES:

V_{CE} = 10 V, I_C = 5 mA

FREQUENCY (MHz)

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.76	-72	11.56	140	.03	59	.85	-23
500	.75	-161	3.86	88	.06	27	.48	-38
1000	.75	178	2.00	62	.07	33	.45	-54
1500	.76	162	1.36	44	.08	44	.48	-72
2000	.77	151	1.01	31	.10	54	.52	-87
2500	.79	138	.80	17	.15	56	.51	-110

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

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.70	-102	17.26	129	.02	53	.73	-32
500	.76	-171	4.68	85	.04	36	.36	-41
1000	.76	171	2.39	63	.06	45	.35	-56
1500	.76	161	1.61	47	.08	52	.39	-73
2000	.78	151	1.21	33	.11	58	.43	-89
2500	.78	137	.96	18	.23	63	.42	-110

V_{CE} = 10 V, I_C = 20 mA

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.65	-125	21.75	120	.01	51	.62	-37
500	.73	-178	5.24	82	.03	52	.28	-42
1000	.73	167	2.65	61	.06	60	.26	-57
1500	.75	157	1.80	45	.09	60	.30	-74
2000	.76	147	1.35	33	.12	62	.35	-88
2500	.77	135	1.07	18	.16	58	.37	-110

V_{CE} = 10 V, I_C = 30 mA

	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
100	.65	-137	23.60	117	.01	53	.55	-41
500	.73	179	5.45	81	.04	57	.24	-42
1000	.73	166	2.75	61	.07	63	.24	-57
1500	.74	156	1.86	45	.10	62	.28	-74
2000	.76	147	1.39	33	.13	62	.32	-88
2500	.78	136	1.10	19	.17	58	.34	-110