

NEC[®]**NPN SILICON GENERAL
PURPOSE TRANSISTOR****NE734
SERIES****FEATURES**

- **LOW NOISE FIGURE:** < 3 dB at 500 MHz
- **HIGH GAIN:** 15 dB at 500 MHz
- **HIGH GAIN BANDWIDTH PRODUCT:** 2 GHz
(3 GHz for the NE73435)
- **SMALL COLLECTOR CAPACITANCE:** 1 pF
- **DUAL CHIP CONFIGURATIONS**
- **HIGH RELIABILITY METALLIZATION**

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CB0}	Collector to Base Voltage	V	30
V _{CE0}	Collector to Emitter Voltage	V	14
V _{EB0}	Emitter to Base Voltage	V	3
I _C	Collector Current	mA	50
T _J	Junction Temperature	°C	200
T _{stg}	Storage Temperature	°C	-65 to +200*

*Maximum Case Temperature for the

NE73432: T_{stg} = -55° to 150°CNE73433: T_{stg} = -55° to 150°CNE73435 Grade D: T_{stg} = -65° to 150°CNE73435 Grade C: T_{stg} = -65° to 200°CNE73437: T_{stg} = -65° to 150°C**DESCRIPTION AND APPLICATIONS**

The NE734 series of NPN silicon general purpose UHF transistors provide the designer with a wide selection of reliable transistors for high speed logic and wide-band low noise amplifier applications. The series uses NEC's highly reliable platinum-silicide, titanium, platinum, and gold metallization system to assure uniform performance and reliability. Besides the chip form (NE73400), several package styles are available in both single and dual chip configurations. While the series is designed for industrial applications, the NE734 is also available in Grade C (JANTXV equivalent) and Grade CX (JANTX equivalent). The NE73432 is packaged in the popular TO-92 plastic package and is available in two lead configurations. The NE73433 is in the plastic Mini-Mold package designed for high-speed automated assembly operations for large volume hybrid IC's. The NE73436 and NE73437 are packaged in the plastic Disk-Mold stripline package. For hybrid MIC applications requiring more performance, the NE73435 is recommended. This device is packaged in the economical metal-ceramic, hermetic Micro-X package.

NE73435 TYPICAL NOISE PARAMETERSV_{CE} = 10 V, I_C = 3 mA

FREQUENCY (MHz)	NF min (dB)	G _a (dB)	OPT. SOURCE	R _N /50 Ω
500	2.0	16.1	.30 ∠ 80°	.63
1000	3.1	11.2	.43 ∠ 126°	.33
1500	4.2	9.2	.54 ∠ 168°	.19
2000	5.1	7.1	.56 ∠ 178°	.20

V_{CE} = 10 V, I_C = 15 mA

500	3.3	17.5	.34 ∠ 120°	.36
1000	4.7	13.5	.47 ∠ 168°	.27
1500	6.5	10.8	.67 ∠ -174°	.13
2000	7.4	9.2	.64 ∠ -163°	.46

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

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER			PACKAGE OUTLINE										NE73440A, B 2SC1926 2SC1927 40											
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	NE73412 2SC1275(Grd C) 2SC1424(Grd D)			NE73416 2SC1733(Grd C)			NE73432E 2SC2026			NE73432B 2SC2037			NE73433 2SC2759			NE73435 2SC2148			NE73437 2SC2368			
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Γ	Gain Bandwidth Product at VCE = 10 V, IC = 10 mA	GHz	1.5	2		1.5	2		1.5	2		1.5	2		1.5	2		1.5	3		2.8		1.5	2
S21E ²	Insertion Power Gain at VCE = 10 V, IC = 10 mA, f = 0.5 GHz f = 1 GHz	dB dB	5	12 6					13 8			12 7						16 9.3			13	14.5		
NFMIN	Minimum Noise Figure ² at VCE = 10 V, IC = 3 mA f = 0.5 GHz	dB		3	4					3	4		3	4		3	4		2.1	3.5		2.3	3.5	
MAG	Maximum Available Gain ³ at VCE = 10 V, IC = 10 mA, f = 0.5 GHz f = 1 GHz	dB dB	13	15 8					13	15 9		11	13		17			18 13				17 11		

Notes:

- Electronic Industrial Association of Japan.
- Input and output are tuned for optimum noise figures.
- Maximum Available Gain (MAG) is calculated for 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 (T_A = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER			PACKAGE OUTLINE										NE73432E 2SC2026										NE73432B 2SC2037				NE73433 2SC2759				NE73435 2SC2148				NE73437 2SC2368				NE73440A, B 2SC1926 2SC1927			
SYMBOLS			PARAMETERS AND CONDITIONS			UNITS			NE73412 2SC1275(Grd CX) 2SC1424(Grd D)			NE73416 2SC1733(Grd C)			32E			32B			33			35			37			40												
									MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX							
ICBO			Collector Cutoff Current at VCB = 15 V, IE = 0			μA					.05			.05			.01			.01																						
ICES			Collector Cutoff Current at VCE = 15 V, RBE = 0			μA					.05			.05																		0.5										
IEBO			Emitter Cutoff Current at VEB = 2 V, IC = 0			μA											0.1			0.1											.05											
hFE			Forward Current Gain Ratio at VCE = 10 V, IC = 10 mA						25	100	200	25	100	200	25	100	200	25	100	200	25	100	200	25	100	200	25	100	200													
ΔhFE1 ΔhFE2			Forward Current Gain Ratio at VCE = 10 V, IC = 10 mA									0.8	1																			1										
ΔVBE			Base to Emitter Voltage at VCE = 10 V, IC = 10 mA			mV							30																													
CCB			Collector to Base Capacitance ² at VCB = 10 V, IC = 0 mA, f = 1 MHz			pF					1.1	1.5		1.1	1.5		0.75	1.1		0.9	1.3		1	1.5								30										
RTH			Thermal Resistance (J-C) ³			°C/W					180	300		95	150		130											0.7	1		1.1	1.5										
PC			Collector Dissipation			mW/Chip							200																			55										
PT			Total Power Dissipation			mW					250								250						200							200										

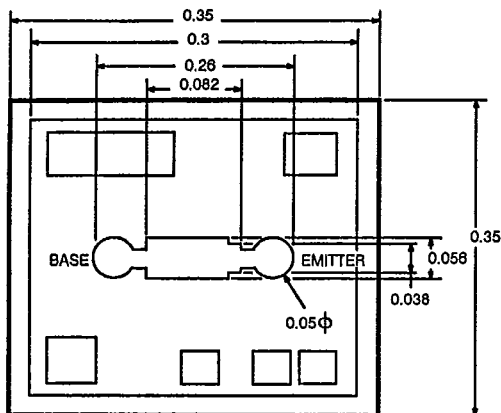
Notes:

- Electronic Industrial Association of Japan.
- CCB measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
- RTH for dual chip devices (°C/W): Per Chip
Total

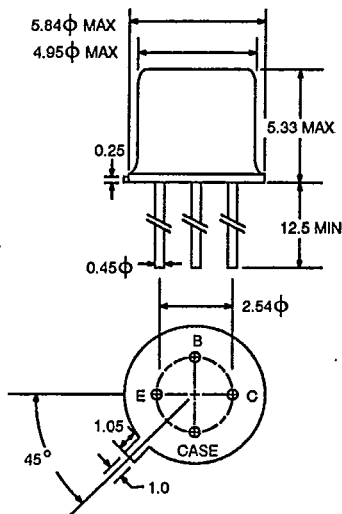
NE73416:	
RTH (J-A)	875
RTH (J-C)	300
NE73440:	
RTH (J-A)	500
RTH (J-C)	110

OUTLINE DIMENSIONS (Units in mm)

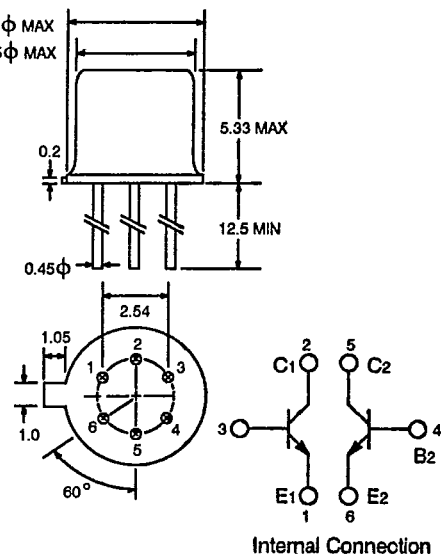
NE73400 (CHIP)
Chip Thickness: 160 μ m TYP



OUTLINE 12
(TO-72)

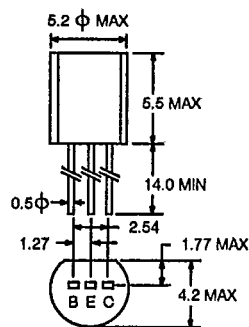


OUTLINE 16



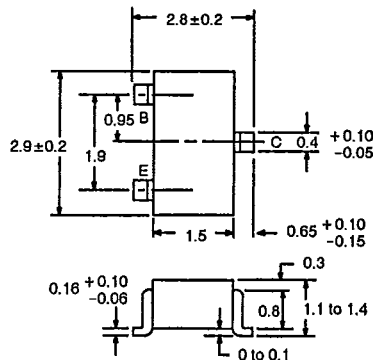
Internal Connection

OUTLINE 32
(TO-92)

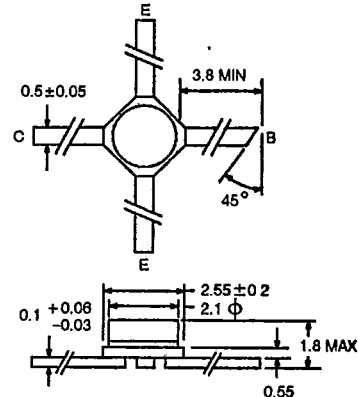


*32B has emitter base reversed.

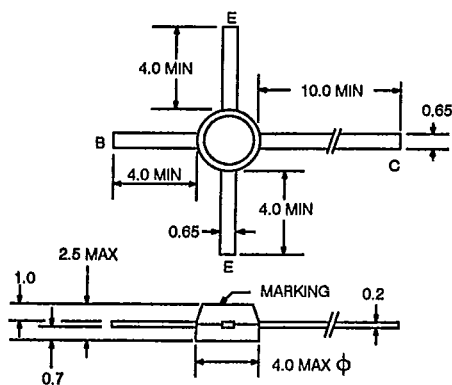
OUTLINE 33
(SOT-23)



OUTLINE 35
(MICRO-X)

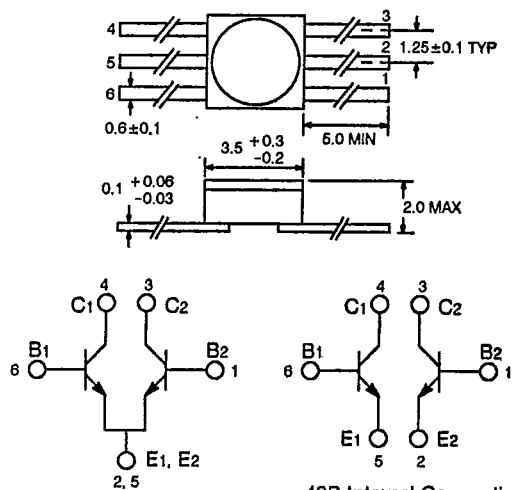


OUTLINE 37



*36 package is available with only the bottom emitter lead.

OUTLINE 40

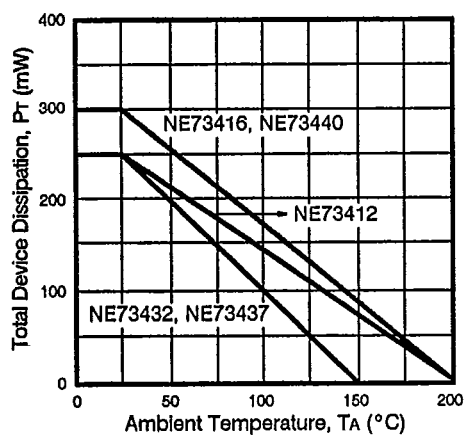
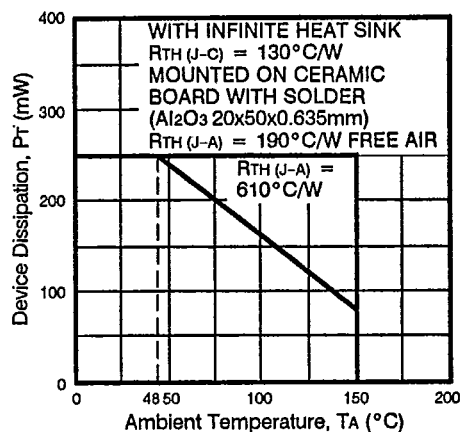
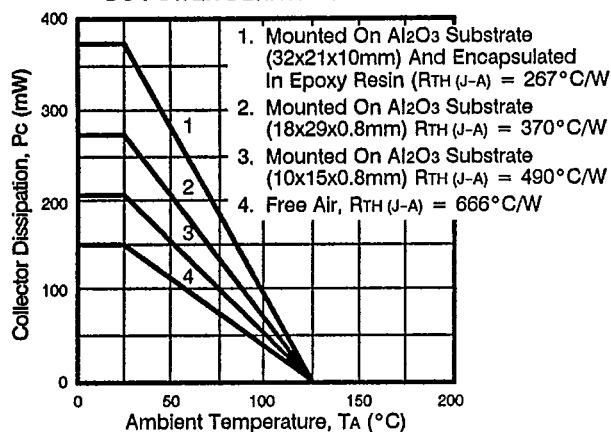


40A Internal Connection

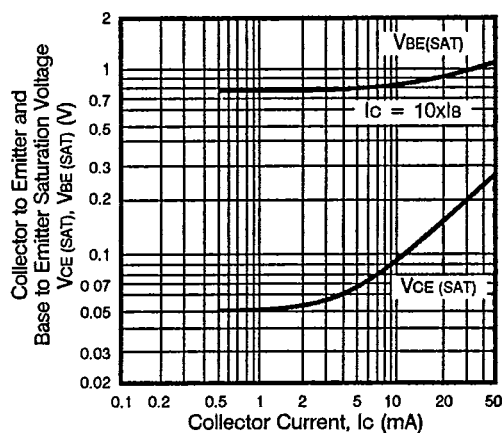
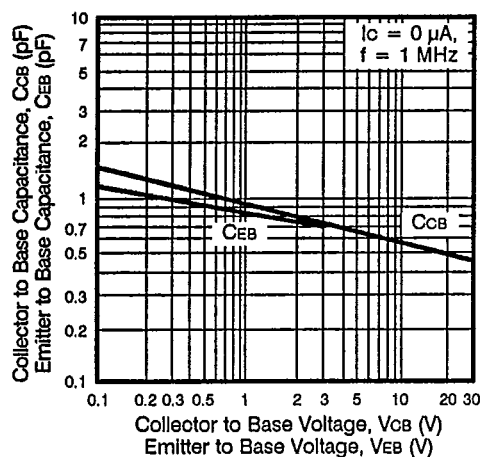
40B Internal Connection

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

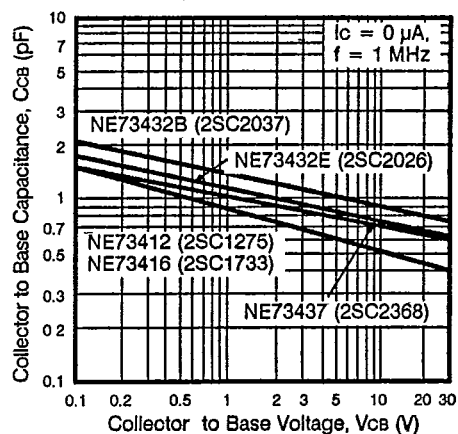
DC POWER DERATING CURVES

NE73435
DC POWER DERATING CURVESNE73433
DC POWER DERATING CURVES

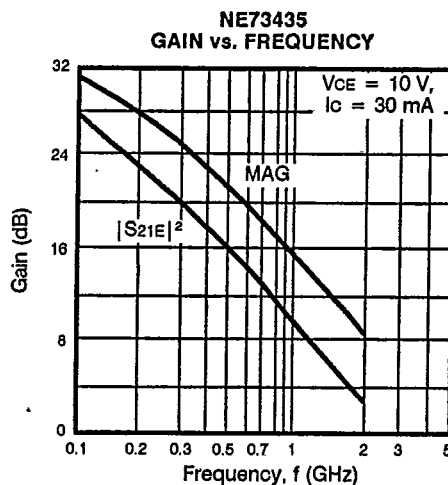
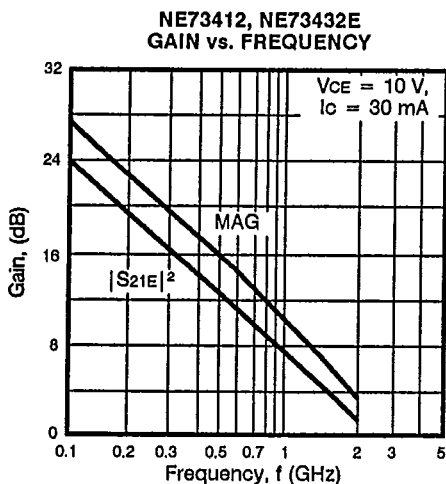
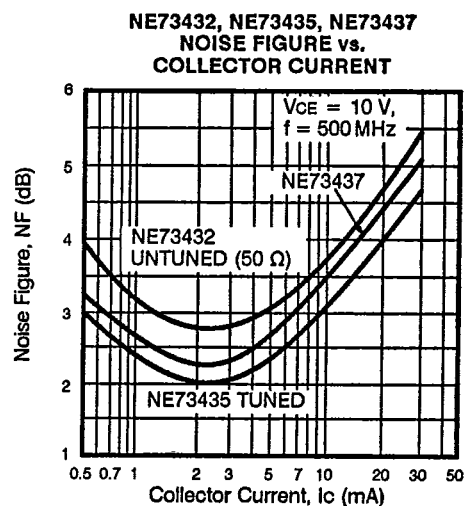
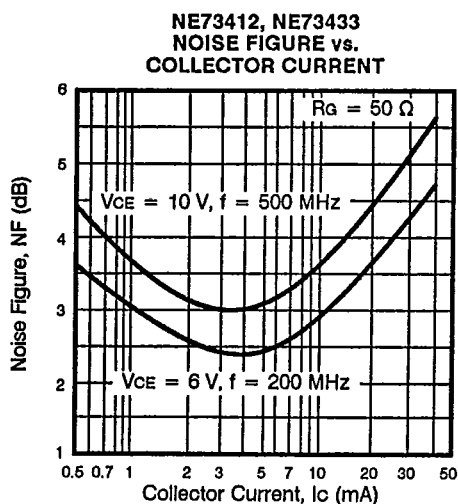
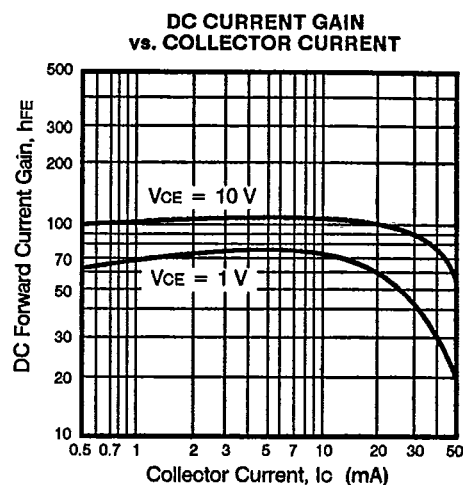
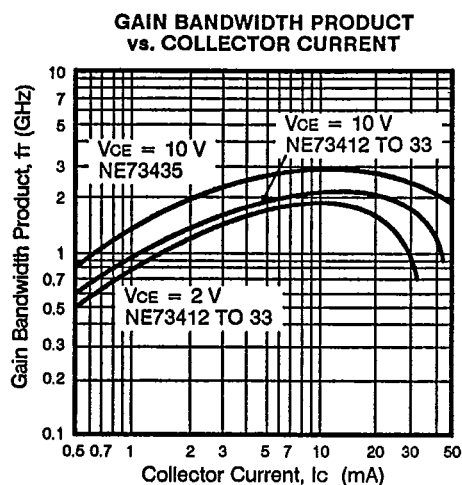
SATURATION VOLTAGE vs. COLLECTOR CURRENT

NE73435
DEVICE CAPACITANCE

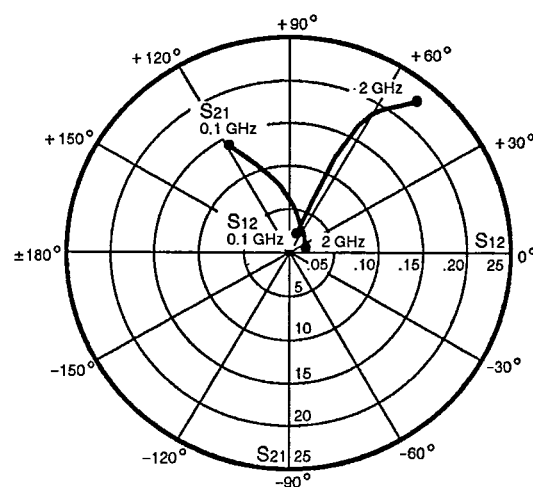
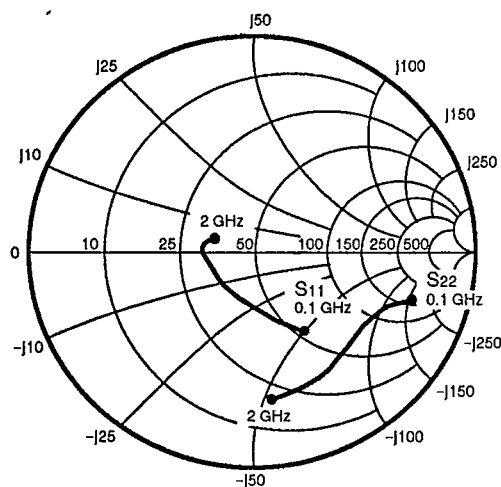
COLLECTOR TO BASE CAPACITANCE



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



TYPICAL COMMON EMITTER SCATTERING PARAMETERS



NE73412
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	.71	-41	10.28	138	.02	66	.87	-15
200	.53	-66	7.51	116	.04	60	.77	-22
500	.30	-105	3.74	85	.08	61	.66	-30
1000	.21	-146	2.08	58	.13	62	.63	-45
1500	.19	-171	1.52	36	.18	57	.67	-64
2000	.15	174	1.16	14	.22	51	.73	-84

VCE = 10 V, IC = 10 mA

	S11		S21		S12		S22	
100	.56	-50	13.44	128	.02	67	.81	-17
200	.39	-73	8.71	108	.04	67	.70	-21
500	.23	-112	4.03	80	.08	66	.63	-29
1000	.19	-151	2.21	56	.14	63	.61	-43
1500	.18	-175	1.59	34	.19	58	.65	-63
2000	.14	170	1.22	13	.22	50	.71	-84

VCE = 10 V, IC = 20 mA

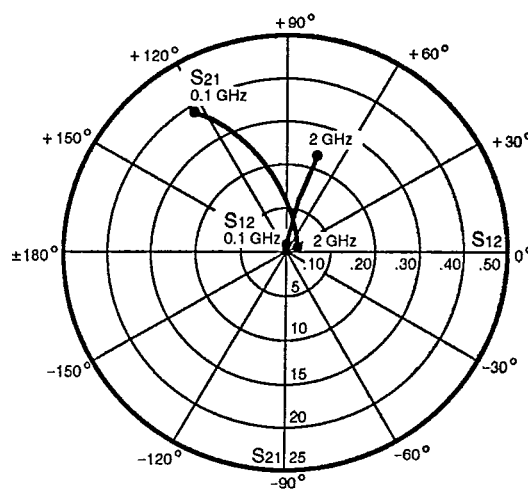
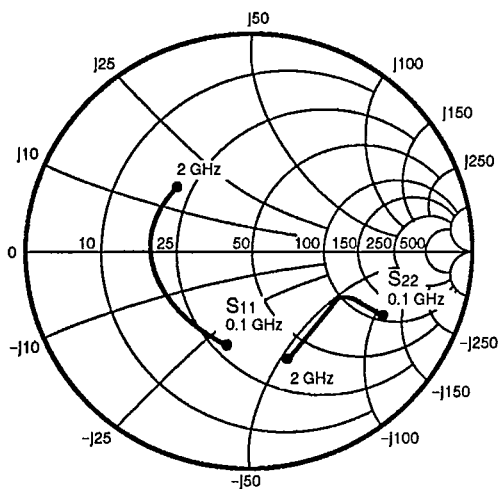
	S11		S21		S12		S22	
100	.42	-60	14.98	119	.02	71	.75	-17
200	.29	-82	9.07	102	.03	69	.67	-19
500	.19	-121	4.03	77	.08	70	.63	-26
1000	.19	-164	2.18	54	.14	66	.61	-42
1500	.19	170	1.57	33	.19	60	.66	-62
2000	.13	153	1.20	11	.23	50	.71	-84

VCE = 10 V, IC = 30 mA

	S11		S21		S12		S22	
100	.36	-68	14.51	115	.02	71	.74	-15
200	.26	-95	8.52	98	.03	69	.67	-17
500	.20	-137	3.71	76	.08	69	.64	-25
1000	.22	-178	2.01	52	.13	67	.63	-43
1500	.22	156	1.45	31	.19	63	.67	-63
2000	.16	130	1.11	9	.23	53	.72	-85

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TYPICAL COMMON EMITTER SCATTERING PARAMETERS (Cont'd.)



NE73432E
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	.73 -51	12.00 143	.03 71	.86 -20
200	.57 -87	8.36 119	.04 56	.69 -29
500	.41 -141	4.13 89	.09 58	.51 -36
1000	.37 -178	2.20 61	.13 59	.50 -48
1500	.36 157	1.56 42	.19 65	.49 -63
2000	.36 133	1.21 26	.25 61	.51 -77

VCE = 10 V, IC = 10 mA

	S11	S21	S12	S22
100	.58 -75	16.56 132	.03 71	.74 -25
200	.46 -112	10.15 109	.03 54	.57 -30
500	.40 -157	4.57 84	.07 67	.45 -32
1000	.38 179	2.37 60	.13 66	.47 -43
1500	.38 161	1.68 43	.18 73	.48 -57
2000	.36 140	1.28 28	.25 67	.52 -72

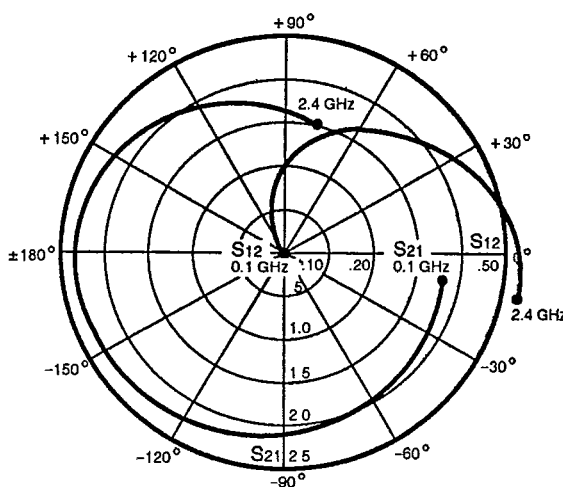
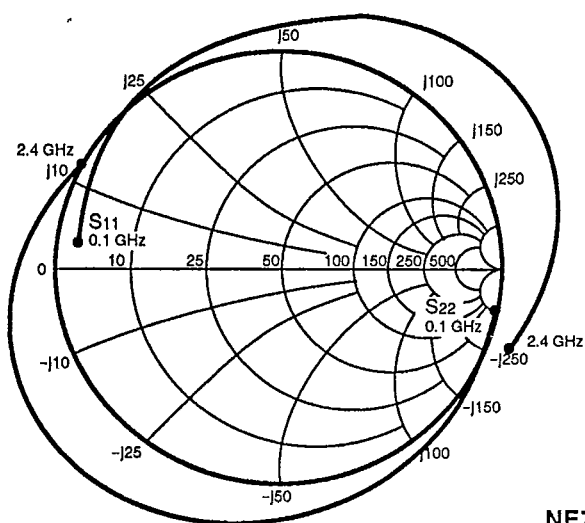
VCE = 10 V, IC = 20 mA

	S11	S21	S12	S22
100	.44 -101	19.27 122	.03 65	.66 -26
200	.39 -136	10.79 102	.03 64	.52 -26
500	.40 -169	4.62 81	.07 72	.44 -27
1000	.40 172	2.36 57	.13 72	.47 -40
1500	.41 153	1.65 41	.19 75	.49 -57
2000	.40 134	1.25 26	.25 71	.53 -71

VCE = 10 V, IC = 30 mA

	S11	S21	S12	S22
100	.42 -120	19.34 117	.03 69	.62 -24
200	.40 -150	10.48 99	.03 68	.51 -23
500	.42 -174	4.41 78	.06 77	.46 -25
1000	.43 167	2.25 55	.12 75	.49 -40
1500	.44 150	1.54 39	.18 79	.52 -56
2000	.44 129	1.17 25	.26 75	.54 -72

TYPICAL COMMON BASE SCATTERING PARAMETERS (Cont'd.)



NE73432B
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	.78 174	1.73 -10	.001 70	1.00 -7
200	.78 169	1.77 -17	.002 115	1.01 -14
500	.82 150	1.79 -43	.028 110	1.04 -36
1000	.88 114	1.90 -91	.105 97	1.14 -73
1500	1.05 67	1.89 -153	.261 64	1.26 -116
2000	1.14 16	1.72 136	.425 18	1.22 -166
2400	.99 -17	1.36 81	.511 -17	1.01 151

VCE = 10 V, IC = 10 mA

	S11	S21	S12	S22
100	.87 174	1.82 -9	.001 73	1.00 -7
200	.87 169	1.86 -17	.002 130	1.01 -14
500	.92 150	1.90 -42	.026 121	1.04 -36
1000	.99 114	2.06 -89	.108 103	1.15 -72
1500	1.20 69	2.14 -150	.278 67	1.30 -115
2000	1.30 15	1.98 137	.455 19	1.26 -168
2400	1.09 -19	1.52 82	.535 -18	1.02 149

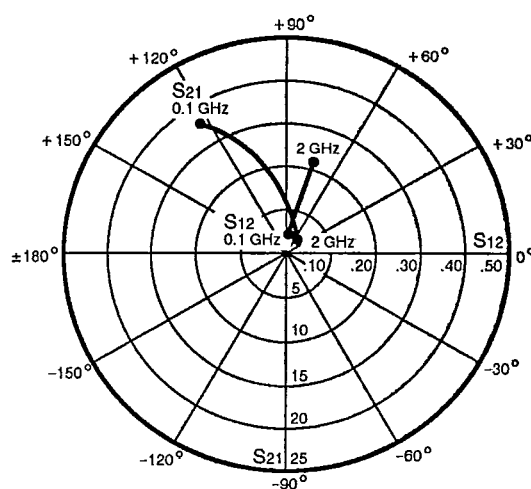
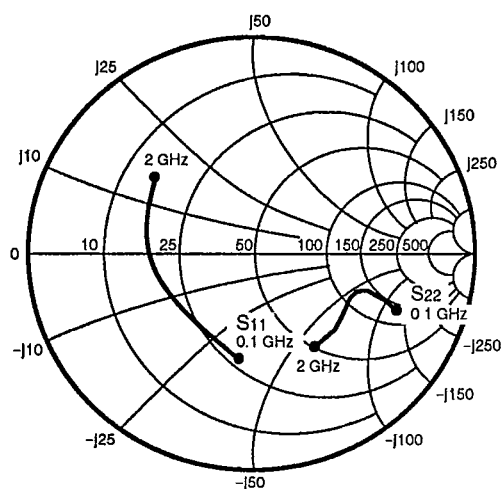
VCE = 10 V, IC = 20 mA

	S11	S21	S12	S22
100	.91 174	1.85 -9	.001 77	1.00 -7
200	.91 169	1.91 -17	.001 143	1.01 -14
500	.97 151	1.94 -41	.026 126	1.04 -36
1000	1.06 115	2.16 -89	.111 106	1.16 -72
1500	1.30 69	2.27 -152	.292 69	1.32 -116
2000	1.37 13	2.06 133	.471 18	1.25 -170
2400	1.12 -21	1.54 78	.541 -19	.99 147

VCE = 10 V, IC = 30 mA

	S11	S21	S12	S22
100	.93 174	1.87 -10	.001 79	1.00 -7
200	.93 169	1.92 -17	.001 149	1.01 -14
500	.98 150	1.97 -42	.026 127	1.04 -36
1000	1.08 114	2.19 -92	.114 107	1.17 -73
1500	1.32 67	2.27 -158	.301 68	1.31 -118
2000	1.34 11	1.96 126	.467 16	1.19 -172
2400	1.08 -21	1.45 72	.530 -20	.93 146

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (Cont'd.)



NE73433
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	-53	11.71	143	.02	68	.89	-17
200	.57	-88	8.26	120	.03	57	.72	-22
500	.43	-144	4.04	90	.07	59	.57	-25
1000	.42	-178	2.17	65	.11	62	.55	-33
1500	.44	159	1.55	50	.17	67	.52	-45
2000	.49	142	1.23	35	.22	67	.51	-60

VCE = 10 V, IC = 10 mA

	S11		S21		S12		S22	
100	.57	-71	15.95	132	.02	66	.80	-20
200	.44	-109	9.93	110	.02	57	.62	-21
500	.39	-157	4.42	86	.07	68	.53	-23
1000	.40	175	2.31	63	.11	67	.52	-31
1500	.44	156	1.65	48	.17	70	.49	-43
2000	.49	138	1.30	33	.22	69	.49	-59

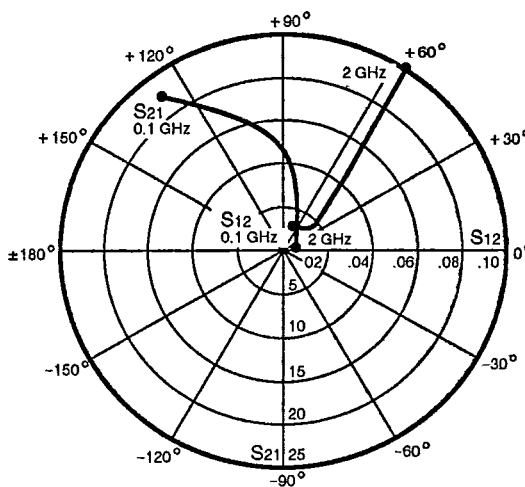
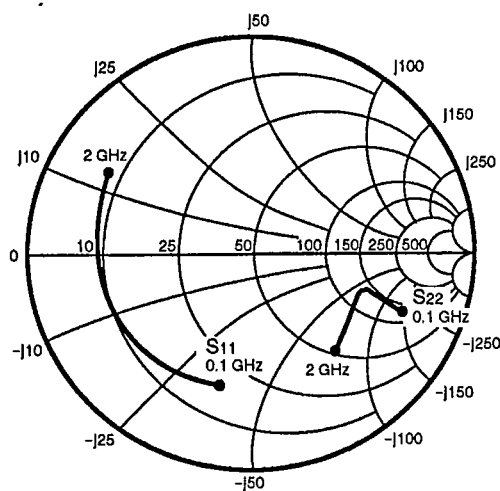
VCE = 10 V, IC = 20 mA

	S11		S21		S12		S22	
100	.47	-93	18.06	122	.02	69	.72	-20
200	.38	-130	10.35	103	.02	56	.58	-19
500	.38	-167	4.39	82	.06	75	.51	-18
1000	.42	171	2.27	60	.12	69	.52	-28
1500	.46	153	1.61	46	.17	72	.51	-41
2000	.52	137	1.26	31	.23	70	.49	-58

VCE = 10 V, IC = 30 mA

	S11		S21		S12		S22	
100	.43	-111	16.72	116	.02	82	.70	-19
200	.39	-144	9.20	99	.02	54	.60	-16
500	.41	-173	3.85	79	.06	73	.56	-17
1000	.46	167	1.99	58	.11	72	.57	-28
1500	.51	149	1.41	43	.17	77	.55	-42
2000	.57	133	1.10	29	.23	73	.53	-60

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (Cont'd.)



NE73435
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	.80 -48	12.50 148	.02 73	.93 -15
200	.73 -85	9.76 128	.03 46	.77 -24
500	.65 -142	5.17 94	.06 37	.59 -31
1000	.64 -175	2.78 68	.07 35	.53 -38
1500	.63 169	1.83 49	.09 36	.54 -50
2000	.66 156	1.39 36	.10 40	.56 -61

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

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.67 -72	18.41 138	.01 65	.85 -20
200	.64 -114	12.50 116	.01 45	.65 -26
500	.64 -159	5.78 87	.04 43	.51 -28
1000	.65 175	3.00 64	.06 45	.49 -35
1500	.65 165	1.97 47	.08 44	.50 -47
2000	.68 153	1.47 33	.10 48	.54 -59

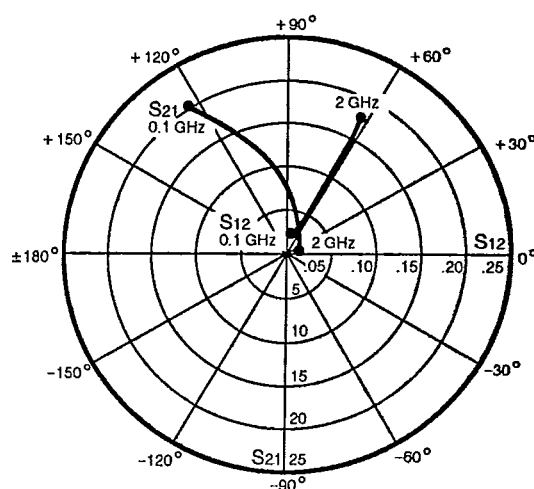
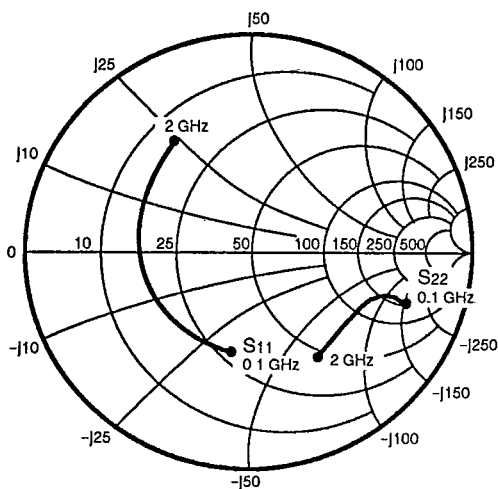
V_{CE} = 10 V, I_C = 20 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.58 -101	22.55 127	.01 63	.75 -22
200	.62 -139	13.67 107	.01 31	.57 -23
500	.65 -171	5.88 83	.03 51	.49 -23
1000	.68 170	2.98 60	.05 54	.49 -30
1500	.68 160	1.93 43	.07 52	.52 -44
2000	.72 148	1.42 30	.10 57	.56 -56

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

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
100	.56 -120	22.89 122	.01 55	.71 -21
200	.62 -151	13.21 102	.01 42	.56 -20
500	.67 -176	5.52 80	.02 54	.51 -20
1000	.70 168	2.78 58	.04 59	.52 -29
1500	.70 158	1.78 41	.06 55	.56 -43
2000	.74 146	1.31 28	.09 63	.59 -57

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (Cont'd.)



NE73437
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	.75 -48	12.09 147	.03 68	.91 -14
200	.63 -84	9.19 129	.03 52	.77 -22
500	.48 -146	4.66 89	.06 48	.61 -27
1000	.47 171	2.51 62	.09 54	.56 -34
1500	.52 148	1.69 42	.13 54	.55 -45
2000	.56 126	1.33 26	.17 56	.55 -62

VCE = 10 V, IC = 10 mA

	S11	S21	S12	S22
100	.58 -70	17.20 135	.02 72	.84 -18
200	.50 -111	11.27 113	.02 51	.67 -22
500	.45 -165	5.12 83	.05 56	.55 -24
1000	.47 162	2.68 59	.09 63	.53 -31
1500	.54 143	1.80 39	.13 58	.53 -43
2000	.58 124	1.39 24	.17 58	.53 -59

VCE = 10 V, IC = 20 mA

	S11	S21	S12	S22
100	.47 -96	20.34 125	.02 68	.75 -19
200	.44 -137	12.01 104	.02 51	.61 -19
500	.46 -176	5.14 79	.04 65	.54 -20
1000	.49 157	2.66 56	.09 68	.54 -29
1500	.56 141	1.75 36	.12 62	.54 -41
2000	.60 122	1.34 21	.17 62	.55 -58

VCE = 10 V, IC = 30 mA

	S11	S21	S12	S22
100	.45 -117	20.05 119	.02 75	.72 -17
200	.45 -150	11.32 100	.02 52	.62 -17
500	.49 179	4.72 77	.04 67	.57 -18
1000	.53 155	2.42 53	.08 71	.57 -28
1500	.61 139	1.59 34	.12 66	.58 -41
2000	.64 120	1.20 19	.17 66	.58 -58