

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

T-31-17

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

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	$^\circ\text{C}$	200
T_{STG}	Storage Temperature	$^\circ\text{C}$	-65 to +200*

*Maximum Case Temperature for the
 NE73432: $T_{STG} = -55^\circ$ to 150°C
 NE73433: $T_{STG} = -55^\circ$ to 150°C
 NE73435 Grade D: $T_{STG} = -65^\circ$ to 150°C
 NE73435 Grade C: $T_{STG} = -65^\circ$ to 200°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 screening levels through space grade. 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 ICs. 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 PARAMETERS **$V_{CE} = 10\text{ V}$, $I_C = 3\text{ mA}$**

FREQUENCY (MHz)	NF min (dB)	G_a (dB)	OPT SOURCE	$R_N/50\ \Omega$
500	2.0	16.1	.30 $\angle 80^\circ$	.63
1000	3.1	11.2	.43 $\angle 126^\circ$	.33
1500	4.2	9.2	.54 $\angle 168^\circ$	.19
2000	5.1	7.1	.56 $\angle 178^\circ$	.20

 $V_{CE} = 10\text{ V}$, $I_C = 15\text{ mA}$

500	3.3	17.5	.34 $\angle 120^\circ$	.36
1000	4.7	13.5	.47 $\angle 168^\circ$	.27
1500	6.5	10.8	.67 $\angle -174^\circ$	.13
2000	7.4	9.2	.64 $\angle -163^\circ$	.46

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

NE734 SERIES

PERFORMANCE SPECIFICATIONS (TA = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER		PACKAGE OUTLINE		NE73412 2SC1275(Ord C) 2SC1424(Ord D)		NE73416 2SC1733(Ord C)		NE73432E 2SC2026		NE73432B 2SC2037		NE73433 2SC2759		NE73435 2SC2148		NE73440A, B 2SC1928 2SC1927	
SYMBOLS		PARAMETERS AND CONDITIONS		UNITS		MIN		TYP		MAX		MIN		TYP		MAX	
f _T		Gain Bandwidth Product at VCE = 10 V, IC = 10 mA		GHz		1.5	2		1.5	2		1.5	2		1.5	2	
S _{21E} ²		Insertion Power Gain at VCE = 10 V, IC = 10 mA, f = 0.5 GHz		dB		5	12		13						16		
		f = 1 GHz		dB			6		8						9.3		
NFMIN		Minimum Noise Figure ² at VCE = 10 V, IC = 3 mA, f = 0.5 GHz		dB			3	4							2.1		
MAG		Maximum Available Gain ³ at VCE = 10 V, IC = 10 mA, f = 0.5 GHz		dB					13	15					18		
		f = 1 GHz		dB					9						13		

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 (TA = 25°C)

PART NUMBER EIAJ ¹ REGISTERED NUMBER		PACKAGE OUTLINE		NE73412 2SC1275(Ord C) 2SC1424(Ord D)		NE73416 2SC1733(Ord C)		NE73432E 2SC2026		NE73432B 2SC2037		NE73433 2SC2759		NE73435 2SC2148		NE73440A, B 2SC1928 2SC1927	
SYMBOLS		PARAMETERS AND CONDITIONS		UNITS		MIN		TYP		MAX		MIN		TYP		MAX	
ICBO		Collector Cutoff Current at VCB = 15 V, IE = 0		μA			0.5										
ICES		Collector Cutoff Current at VCE = 15 V, RBE = 0		μA			0.5										
IEBO		Emitter Cutoff Current at VEB = 2 V, IC = 0		μA													
hFE		Forward Current Gain Ratio at VCE = 10 V, IC = 10 mA				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								0.8	1
ΔVBE		Base to Emitter Voltage at VCE = 10 V, IC = 10 mA		mV													
CCB		Collector to Base Capacitance ² at VCB = 10 V, IC = 0 mA, f = 1 MHz		pF			1.1	1.5									
RTH		Thermal Resistance (J-C) ³		°C/W			100	300									
PC		Collector Dissipation		mW/Chip													
PT		Total Power Dissipation		mW			250									250	300

Notes:

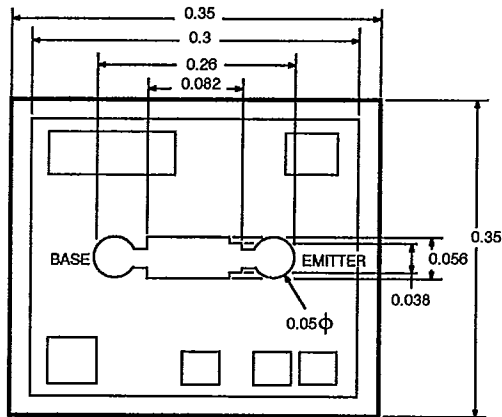
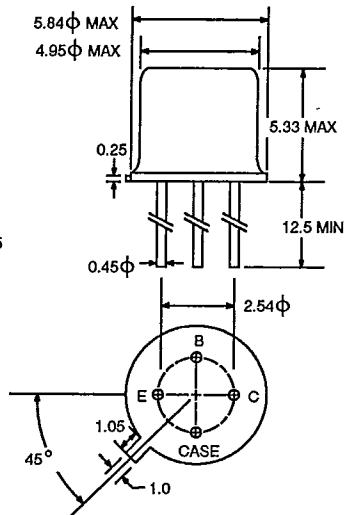
- Electronic Industrial Association of Japan.
- CCB measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
- RTH for dual chip devices (°C/W): Per Chip Total

NE73416:			
RTH (J-A)	875		583
RTH (J-C)	300		150
NE73440:			
RTH (J-A)	500		445
RTH (J-C)	110		55

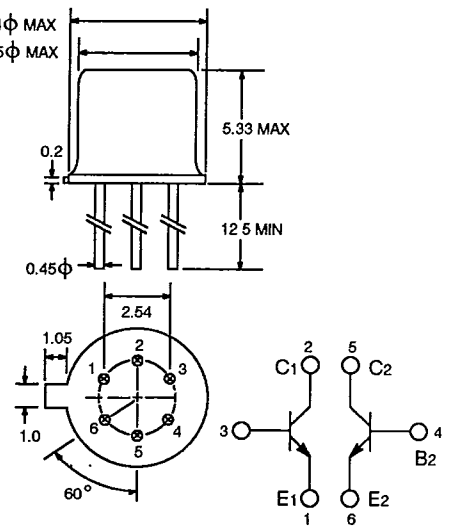
N E C/ CALIFORNIA

56E D ■ 6427414 0002461 358 ■ NECC

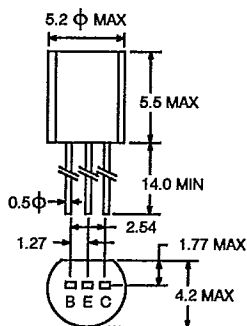
OUTLINE DIMENSIONS (Units in mm)

NE73400 (CHIP)
Chip Thickness: 160 μ m TYPOUTLINE 12
(TO-72)

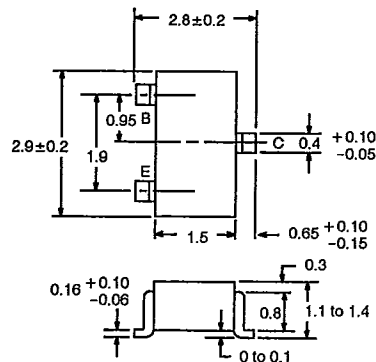
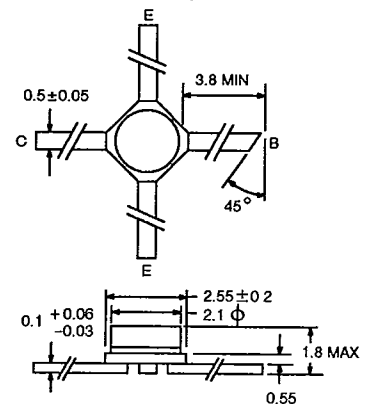
OUTLINE 16



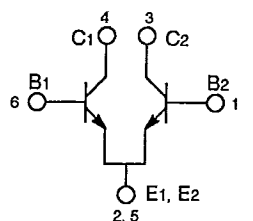
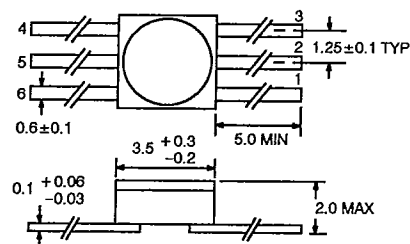
Internal Connection

OUTLINE 32
(TO-92)

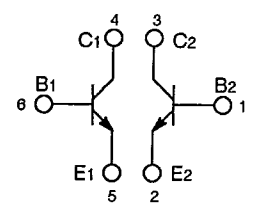
*32B has emitter base reversed.

OUTLINE 33
(SOT-23)OUTLINE 35
(MICRO-X)

OUTLINE 40

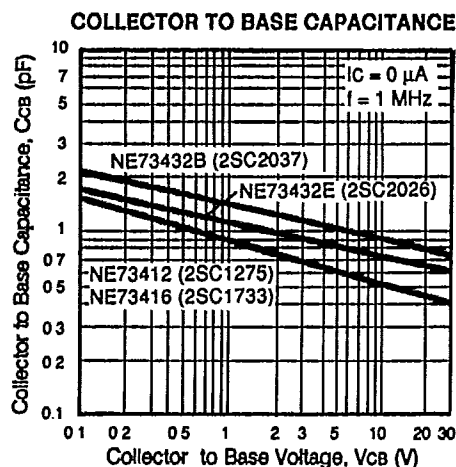
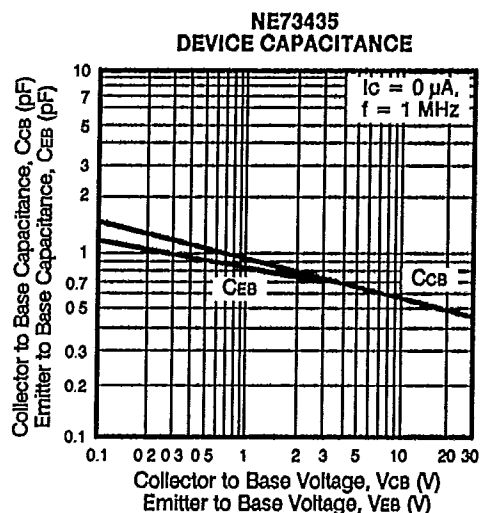
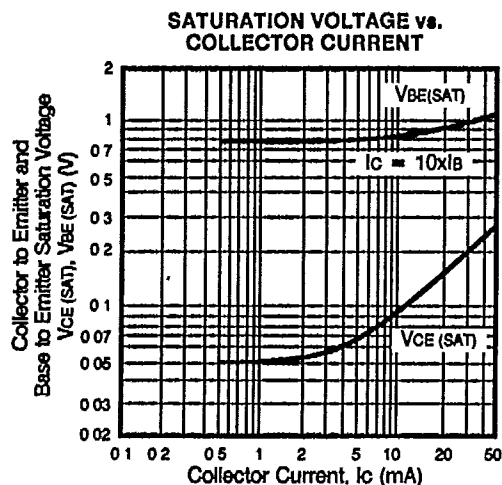
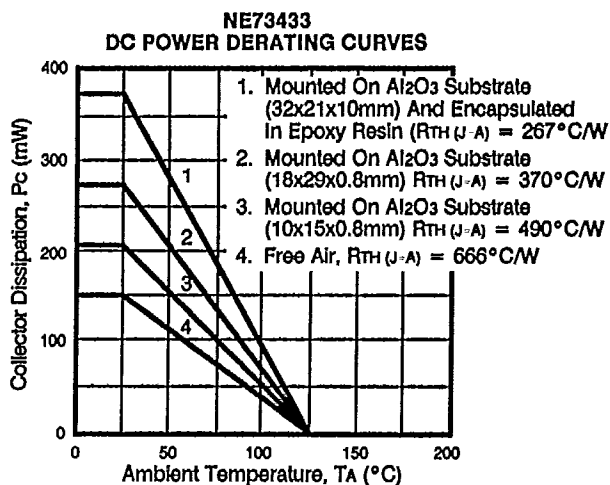
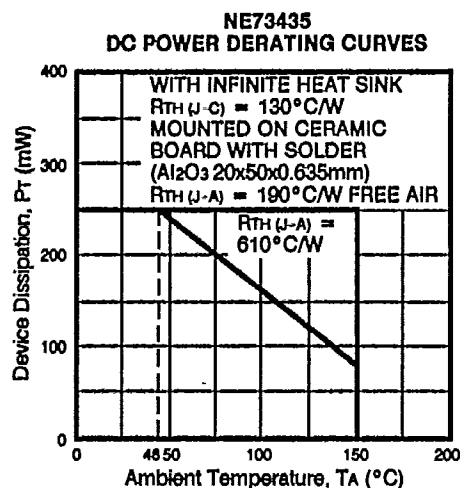
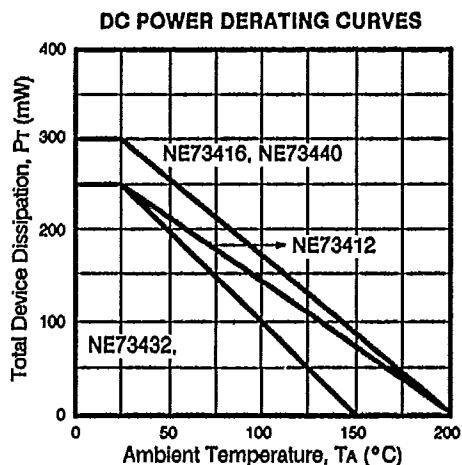


40A Internal Connection

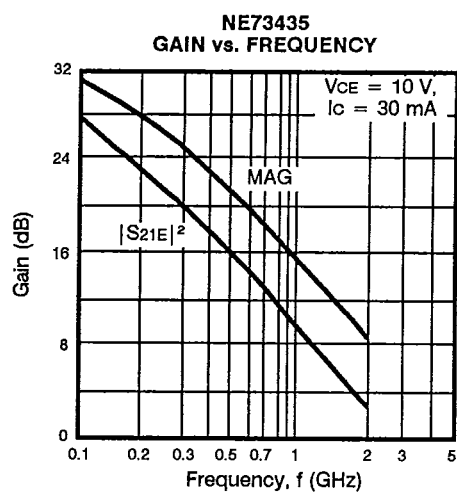
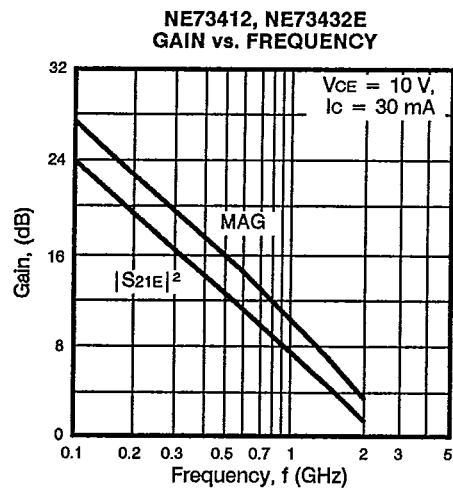
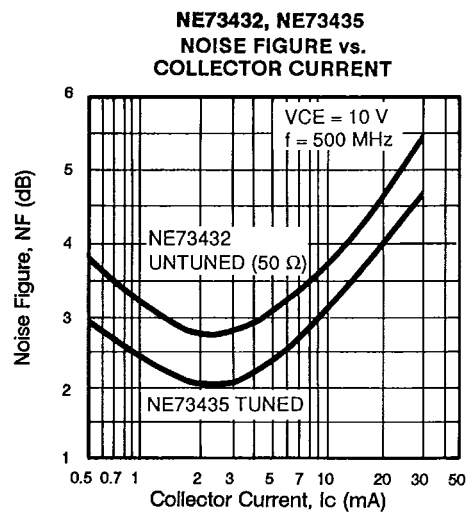
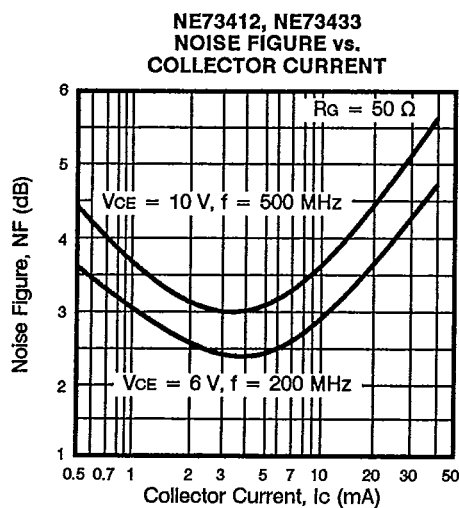
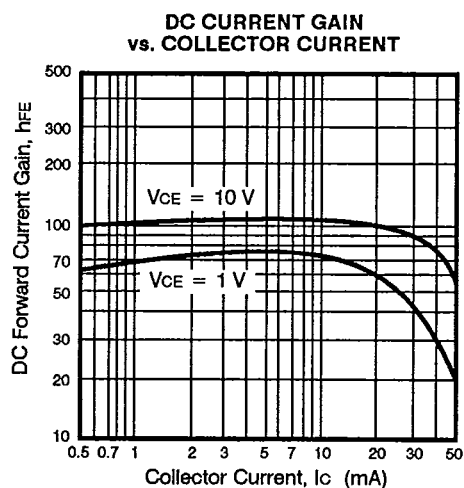
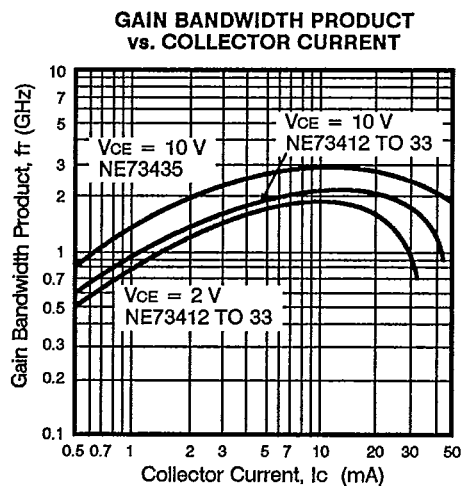


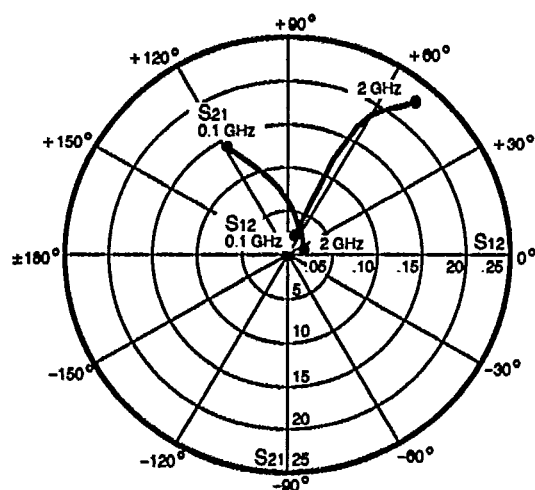
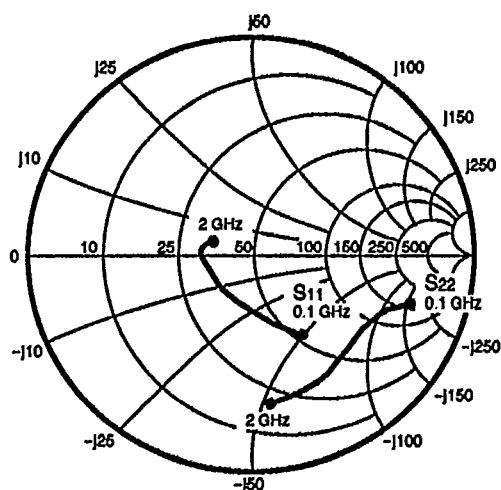
40B Internal Connection

TYPICAL DEVICE CHARACTERISTICS (T_A = 25°C)



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



NE734 SERIES**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	.68 -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

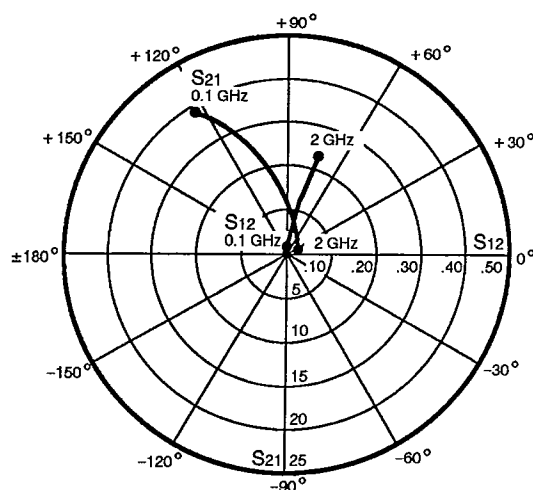
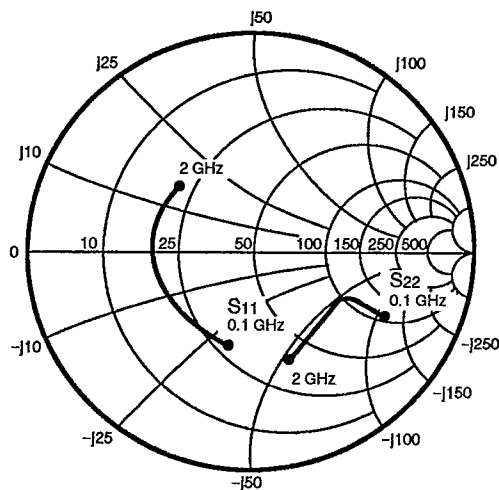
VCE = 10 V, IC = 20 mA

	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

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (Cont'd.)



NE73432E
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	.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

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

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
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

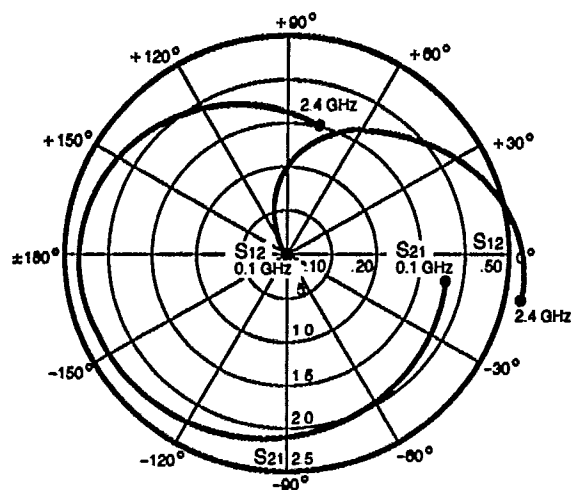
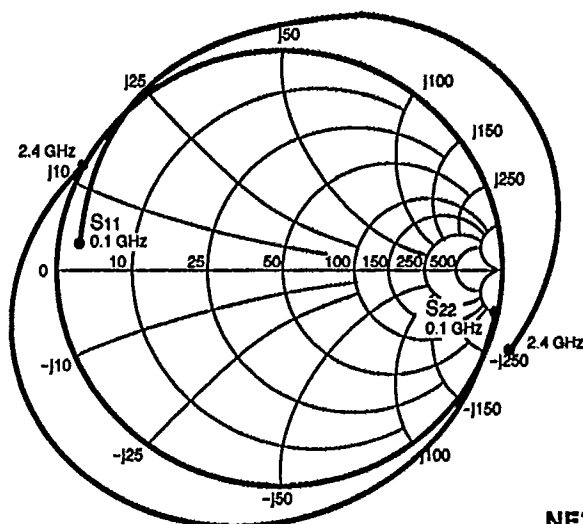
V_{CE} = 10 V, I_C = 20 mA

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
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

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

	S ₁₁	S ₂₁	S ₁₂	S ₂₂
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

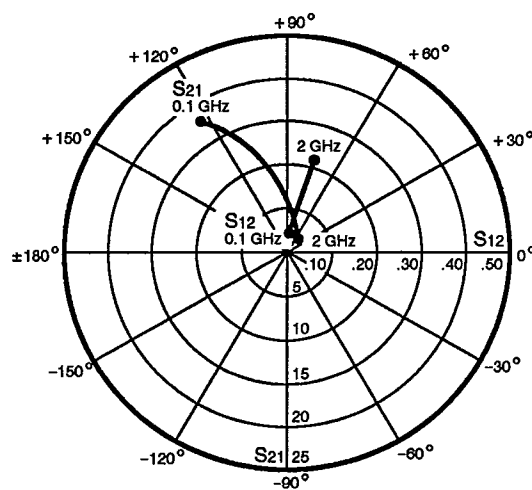
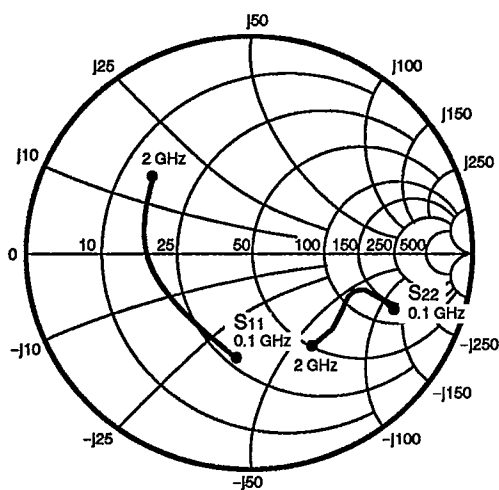
VCE = 10 V, IC = 20 mA

	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
($V_{CE} = 10\text{ V}$, $I_C = 20\text{ mA}$)

S-MAGN AND ANGLES: $V_{CE} = 10\text{ V}$, $I_C = 5\text{ mA}$

FREQUENCY (MHz)

	S_{11}	S_{21}	S_{12}	S_{22}
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

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

	S_{11}	S_{21}	S_{12}	S_{22}
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

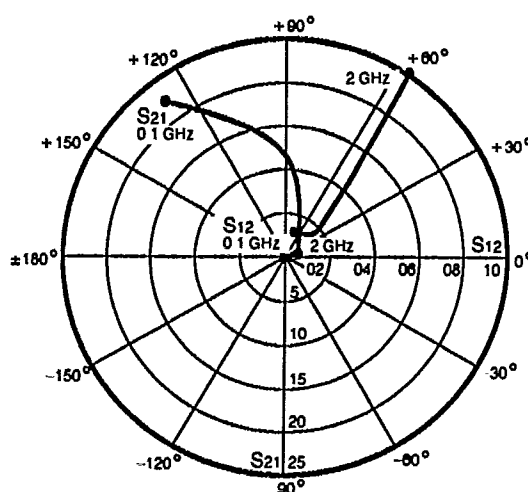
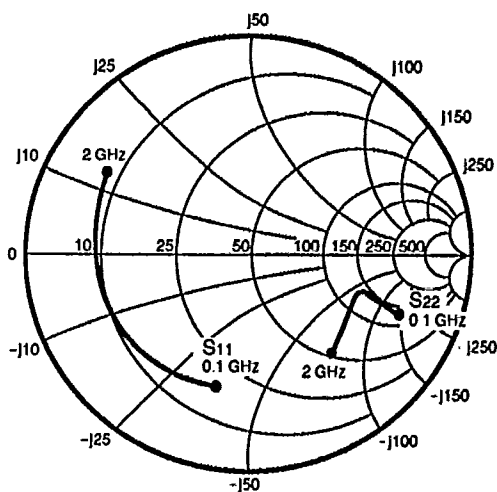
 $V_{CE} = 10\text{ V}$, $I_C = 20\text{ mA}$

	S_{11}	S_{21}	S_{12}	S_{22}
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

 $V_{CE} = 10\text{ V}$, $I_C = 30\text{ mA}$

	S_{11}	S_{21}	S_{12}	S_{22}
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
(VCE = 10 V, IC = 20 mA)

S-MAGN AND ANGLES:

VCE = 10 V, IC = 5 mA

FREQUENCY (MHz)

	S11	S21	S12	S22
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

VCE = 10 V, IC = 10 mA

	S11	S21	S12	S22
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

VCE = 10 V, IC = 20 mA

	S11	S21	S12	S22
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

VCE = 10 V, IC = 30 mA

	S11	S21	S12	S22
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