

**MOTOROLA**  
**SEMICONDUCTOR**  
**TECHNICAL DATA**

T-31-01  
**2N5835**  
**2N5836**  
**2N5837**

**2**

**The RF Line**

**NPN SILICON HIGH-FREQUENCY TRANSISTORS**

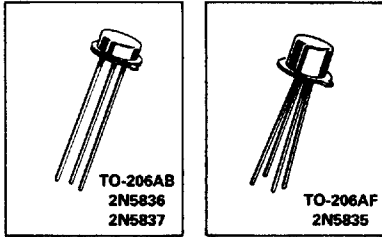
... designed primarily for use in fact current-mode switching circuits in military and industrial equipment. Suitable for use in general high-frequency amplifier applications to 1.5 GHz.

- 2N5835 — 10 mAdc, 6.0 Vdc Characteristics  
 $f_T = 2.5$  GHz (Min)  
 $r_b'C_c = 5.0$  ps (Typ)  
 $t_r = 250$  ps (Typ)
- 2N5836 — 50 mAdc, 6.0 Vdc Characteristics —  
 $f_T = 2.0$  GHz (Min)  
 $r_b'C_c = 6.0$  ps (Typ)  
 $t_r = 320$  ps (Typ)
- 2N5837 — 100 mAdc, 3.0 Vdc Characteristics —  
 $f_T = 1.7$  GHz (Min)  
 $r_b'C_c = 6.0$  ps (Typ)  
 $t_r = 650$  ps (Typ)
- MIL-S-19500 Processed Versions Available as MRF5836HX, MRF5836HXV

2.5 GHz @ 10 mAdc — 2N5835  
 2.0 GHz @ 50 mAdc — 2N5836  
 1.7 GHz @ 100 mAdc — 2N5837

**HIGH FREQUENCY TRANSISTORS**

**NPN SILICON**



**\*MAXIMUM RATINGS**

Rating	Symbol	2N5835	2N5836	2N5837	Unit
Collector-Emitter Voltage	$V_{CE0}$	10	10	5.0	Vdc
Collector-Base Voltage	$V_{CB0}$	15	15	10	Vdc
Emitter-Base Voltage	$V_{EB0}$	3.5	3.5	3.5	Vdc
Collector Current — Continuous	$I_C$	15	200	300	mAdc
Total Device Dissipation @ $T_A = 25^\circ C$ Derate above $25^\circ C$	$P_D$	200 1.14	300 —	300 —	mW mW/ $^\circ C$
Total Device Dissipation @ $T_C = 100^\circ C$ Derate above $100^\circ C$	$P_D$	—	0.75 7.5	0.75 7.5	Watts mW/ $^\circ C$
Storage Temperature Range	$T_{stg}$	-65 to +200			$^\circ C$

\*Indicates JEDEC Registered Data

**STYLE 1**  
 PIN 1 EMITTER  
 2 BASE  
 3 COLLECTOR

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	1.65	2.16	0.065	0.085
D	0.406	0.533	0.016	0.021
E	—	1.02	—	0.040
F	0.305	0.483	0.012	0.019
G	2.54 BSC	—	0.100 BSC	—
H	0.914	1.17	0.036	0.046
J	0.711	1.22	0.028	0.048
K	12.70	—	0.500	—
L	6.35	—	0.250	—
M	45° BSC	—	45° BSC	—
N	1.27 BSC	—	0.050 BSC	—
P	—	1.27	—	0.050

**CASE 20-03**  
**TO-206AF**  
**(TO-72)**

**CASE 26-03**  
**TO-206AB**  
**(TO-46)**

**STYLE 10**  
 PIN 1 EMITTER  
 2 BASE  
 3 COLLECTOR  
 4 CASE

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.41	0.53	0.016	0.021
E	—	0.75	—	0.030
F	0.41	0.48	0.016	0.019
G	2.54 BSC	—	0.100 BSC	—
H	0.91	1.17	0.036	0.046
J	0.71	1.22	0.028	0.048
K	12.70	—	0.500	—
L	6.35	—	0.250	—
M	45° BSC	—	45° BSC	—
N	1.27 BSC	—	0.050 BSC	—
P	—	1.27	—	0.050

**CASE 20-03**  
**TO-206AF**  
**(TO-72)**

NOTE: ALL RULES AND NOTES ASSOCIATED WITH TO 72 OUTLINE SHALL APPLY

\*ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

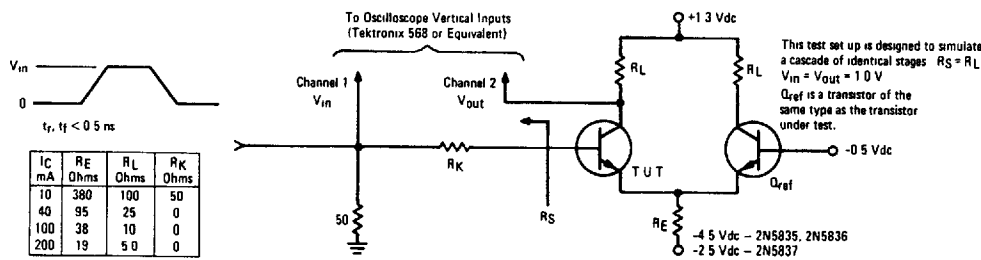
Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector-Base Breakdown Voltage (I <sub>C</sub> = 10 μAdc, I <sub>E</sub> = 0)	V(BR)CBO	15	—	—	Vdc
(I <sub>C</sub> = 100 μAdc, I <sub>E</sub> = 0)		15	—	—	
		10	—	—	
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 100 μAdc, I <sub>C</sub> = 0)	V(BR)EBO	3.5	—	—	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 7.5 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	—	0.01	μAdc
(V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0)		—	—	10	
(V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0)		—	—	10	
Emitter Cutoff Current (V <sub>EB</sub> = 3.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	—	100	μAdc
<b>ON CHARACTERISTICS</b>					
DC Current Gain (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 6.0 Vdc)	h <sub>FE</sub>	25	—	—	—
(I <sub>C</sub> = 50 mAdc, V <sub>CE</sub> = 6.0 Vdc)		25	—	—	
(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 3.0 Vdc)		25	—	—	
Base-Emitter On Voltage (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 6.0 Vdc)	V <sub>BE(on)</sub>	—	—	0.9	Vdc
(I <sub>C</sub> = 50 mAdc, V <sub>CE</sub> = 6.0 Vdc)		—	—	0.9	
(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 3.0 Vdc)		—	—	0.9	
<b>DYNAMIC CHARACTERISTICS</b>					
Current-Gain-Bandwidth Product ① (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 6.0 Vdc, f = 200 MHz)	f <sub>T</sub>	2.5	—	—	GHz
(I <sub>C</sub> = 50 mAdc, V <sub>CE</sub> = 6.0 Vdc, f = 200 MHz)		2.0	—	—	
(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 3.0 Vdc, f = 200 MHz)		1.7	—	—	
Collector-Base Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 0.1 to 1.0 MHz)	C <sub>cb</sub>	—	—	0.8	pF
(V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 0.1 to 1.0 MHz)		—	—	3.5	
(V <sub>CB</sub> = 5.0 Vdc, I <sub>E</sub> = 0, f = 0.1 to 1.0 MHz)		—	—	5.0	
Collector-Base Time Constant ② (I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 6.0 Vdc, f = 63.6 MHz)	τ <sub>b</sub> C <sub>c</sub>	—	5.0	—	ps
(I <sub>C</sub> = 50 mAdc, V <sub>CE</sub> = 6.0 Vdc, f = 63.6 MHz)		—	6.0	—	
(I <sub>C</sub> = 100 mAdc, V <sub>CE</sub> = 3.0 Vdc, f = 63.6 MHz)		—	6.0	—	
<b>SWITCHING CHARACTERISTICS ②</b>					
Rise Time (See Figure 1) (I <sub>C</sub> = 10 mAdc)	t <sub>r</sub>	—	250	—	ps
(I <sub>C</sub> = 40 mAdc)		—	320	—	
(I <sub>C</sub> = 100 mAdc)		—	650	—	

\* Indicates JEDEC Registered Data

① f<sub>T</sub> is defined as the frequency at which |h<sub>FE</sub>| extrapolates to unity

② Typical values shown in addition to JEDEC Registered Data

FIGURE 1 - SWITCHING TIME TEST CIRCUIT



2N5835, 2N5836, 2N5837

MOTOROLA SC (XSTRS/R F) 46E D 6367254 0094097 1 MOT6

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FIGURE 2 - SWITCHING TIME

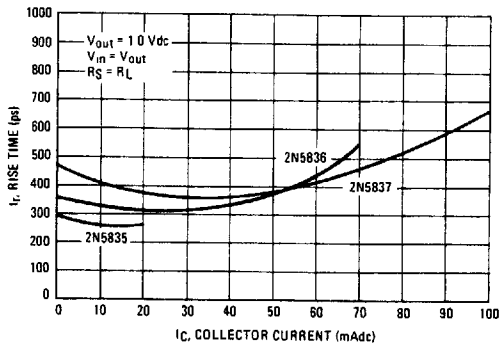


FIGURE 3 - CURRENT-GAIN-BANDWIDTH PRODUCT

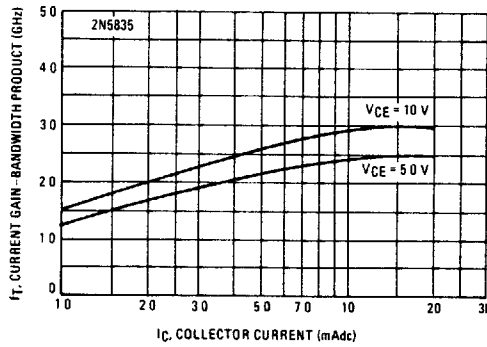


FIGURE 4 - CURRENT-GAIN-BANDWIDTH PRODUCT

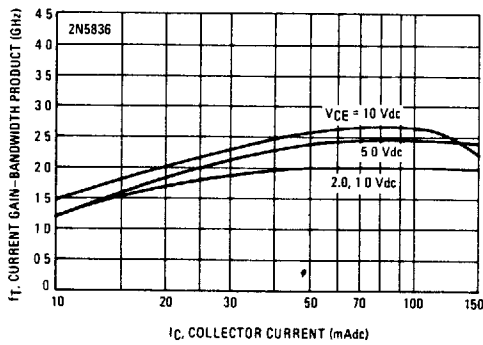


FIGURE 5 - CURRENT-GAIN-BANDWIDTH PRODUCT

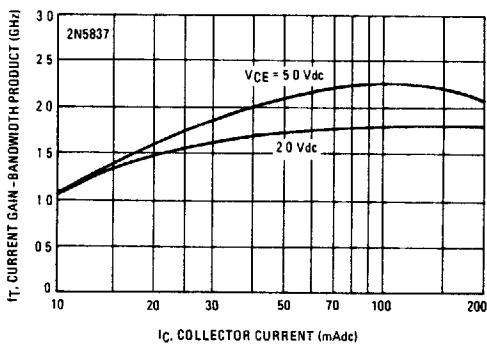


FIGURE 6 - COLLECTOR-BASE TIME CONSTANT

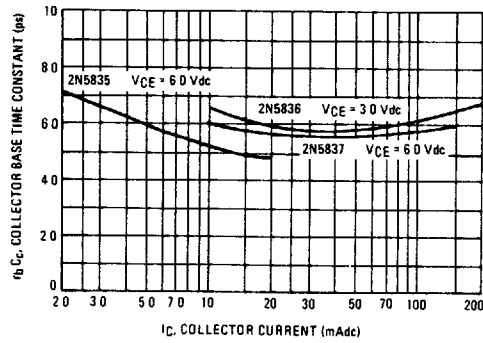
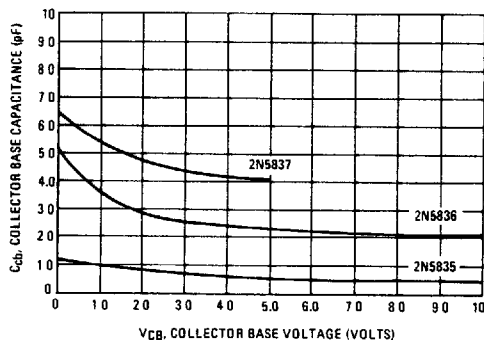


FIGURE 7 - COLLECTOR-BASE CAPACITANCE



2N5835, 2N5836, 2N5837

MOTOROLA SC (XSTRS/R F) 4E D 6367254 0094098 3 MOT6

2N5835 SCATTERING PARAMETERS  
( $I_C = 5.0$  mAdc,  $V_{CE} = 6.0$  Vdc,  $Z_G = Z_L = 50$  Ohms)

FIGURE 8 -  $S_{11}$ , INPUT REFLECTION COEFFICIENT

FIGURE 9 -  $S_{22}$ , OUTPUT REFLECTION COEFFICIENT

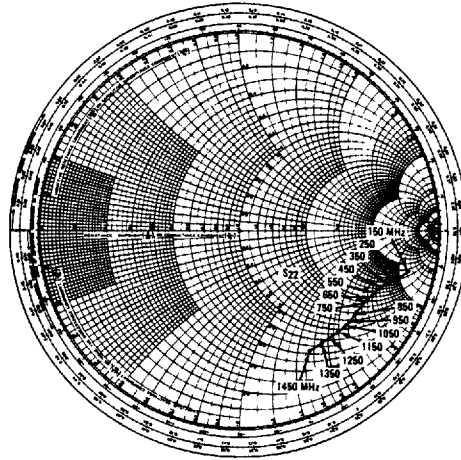
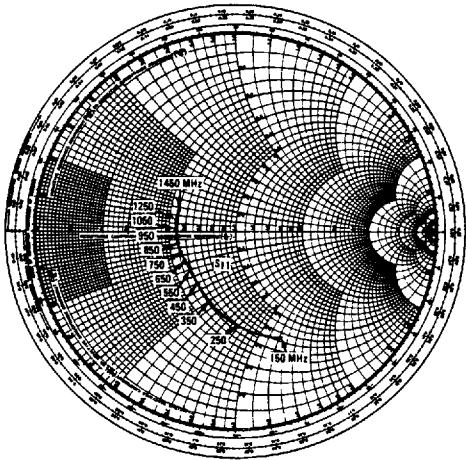
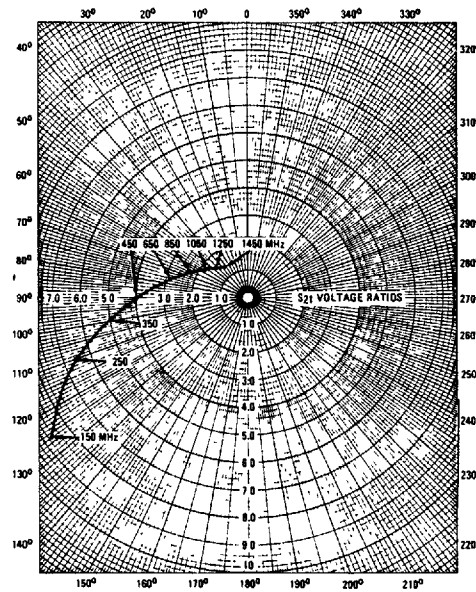
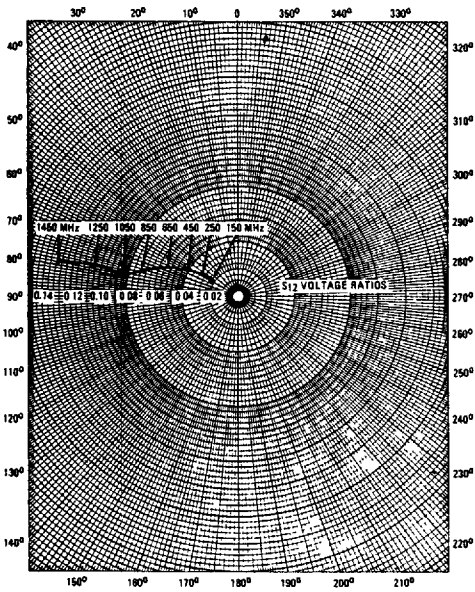


FIGURE 10 -  $S_{12}$ , REVERSE TRANSMISSION COEFFICIENT

FIGURE 11 -  $S_{21}$ , FORWARD TRANSMISSION COEFFICIENT



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2N5835, 2N5836, 2N5837

MOTOROLA SC (XSTRS/R F) 46E D ■ 6367254 0094099 5 ■ M0T6

2N5836 SCATTERING PARAMETERS  
( $I_C = 100 \text{ mA dc}$ ,  $V_{CE} = 10 \text{ V dc}$ ,  $Z_G = Z_L = 50 \text{ Ohms}$ )

FIGURE 12 –  $S_{11}$ , INPUT REFLECTION COEFFICIENT

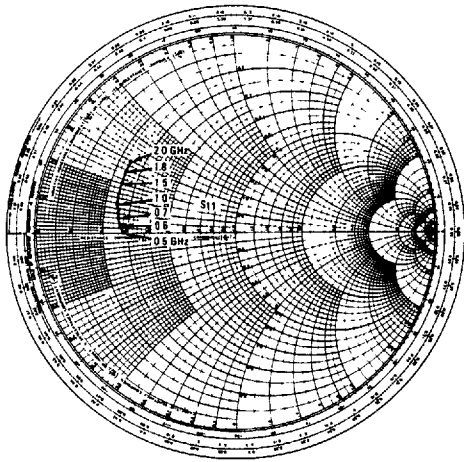
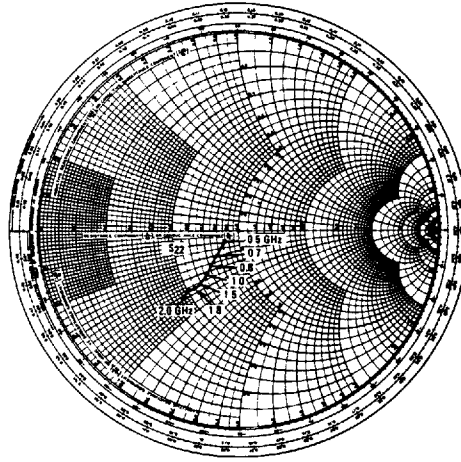


FIGURE 13 –  $S_{22}$ , OUTPUT REFLECTION COEFFICIENT



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FIGURE 14 –  $S_{12}$ , REVERSE TRANSMISSION COEFFICIENT

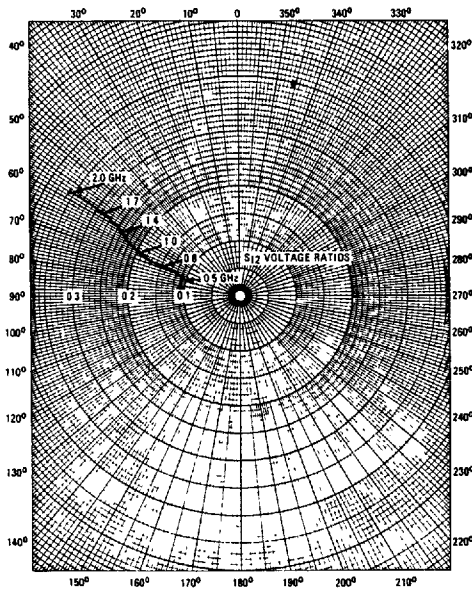
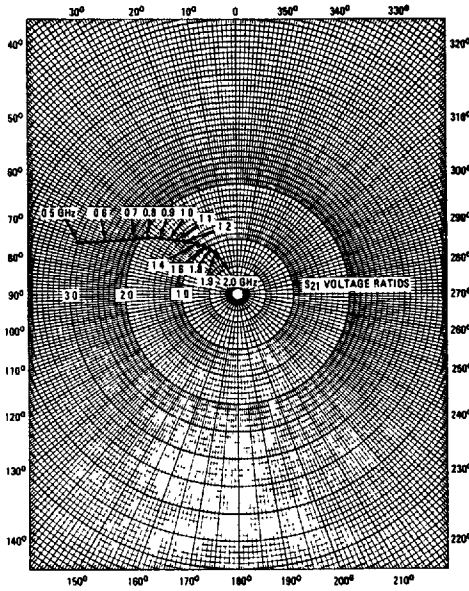


FIGURE 15 –  $S_{21}$ , FORWARD TRANSMISSION COEFFICIENT



2N5835, 2N5836, 2N5837

MOTOROLA SC (XSTRS/R F) 46E D 6367254 0094100 & MOT6

2N5837 SCATTERING PARAMETERS  
( $I_C = 100 \text{ mA dc}$ ,  $V_{CE} = 3.0 \text{ V dc}$ ,  $Z_G = Z_L = 50 \text{ Ohms}$ )

FIGURE 16 -  $S_{11}$ , INPUT REFLECTION COEFFICIENT

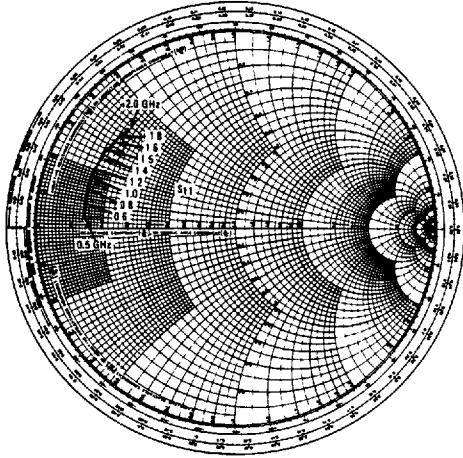


FIGURE 17 -  $S_{22}$ , OUTPUT REFLECTION COEFFICIENT

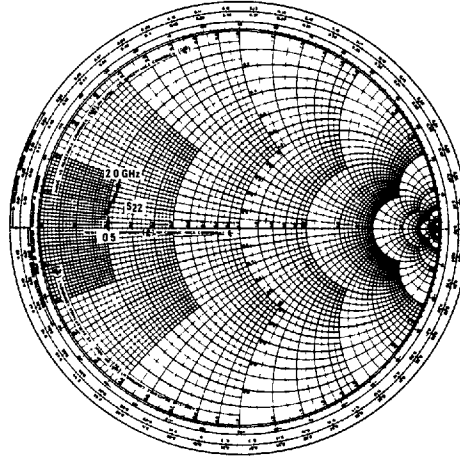


FIGURE 18 -  $S_{12}$ , REVERSE TRANSMISSION COEFFICIENT

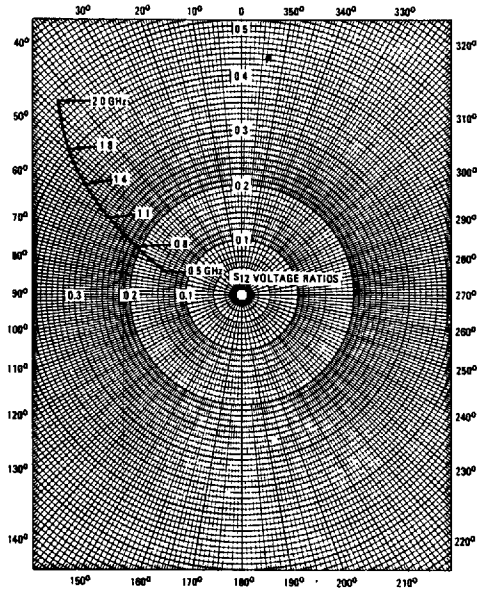


FIGURE 19 -  $S_{21}$ , FORWARD TRANSMISSION COEFFICIENT

