



FC154

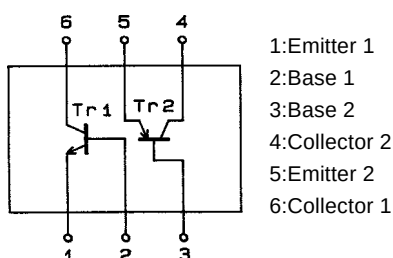
NPN/PNP Epitaxial Planar Silicon Transistor

High-Speed Switching, High-Frequency Amp Applications

Features

- Composite type with NPN transistor and a PNP transistor contained in the conventional CP package, improving the mounting efficiency greatly.
- The FC154 is formed with two chips, being equivalent to the 2SC4270 and the other the 2SA1699, placed in one package.

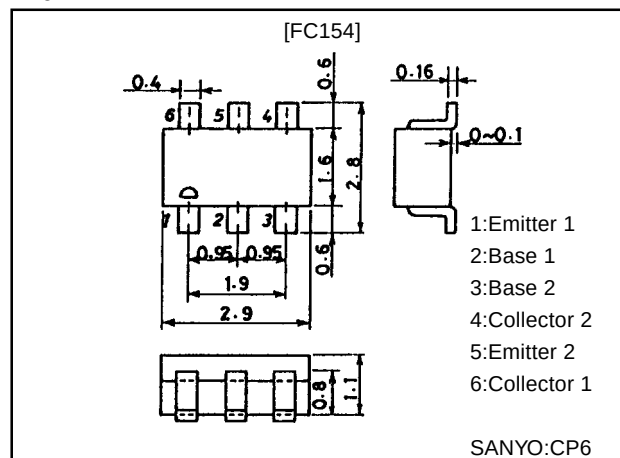
Electrical Connection



Package Dimensions

unit:mm

2104A



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
[TR1 (NPN Tr)]				
Collector-to-Base Voltage	V_{CBO}		25	V
Collector-to-Emitter Voltage	V_{CEO}		15	V
Emitter-to-Base Voltage	V_{EBO}		3	V
Collector Current	I_C		50	mA
Collector Dissipation	P_C		200	mW
[TR2 (PNPTr)]				
Collector-to-Base Voltage	V_{CBO}		-20	V
Collector-to-Emitter Voltage	V_{CEO}		-15	V
Emitter-to-Base Voltage	V_{EBO}		-3	V
Collector Current	I_C		-50	mA
Collector Dissipation	P_C		200	mW
[Common Ratings]				
Total Dissipation	P_T		300	mW
Junction Temperature	T_J		150	°C
Storage Temperature	T_{stg}		-55 to +150	°C

Marking:154

Continued on next page.

SANYO Electric Co.,Ltd. Semiconductor Bussiness Headquarters

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

52098HA (KT)/71095MO (KOTO) TA-0144 No.5099-1/7

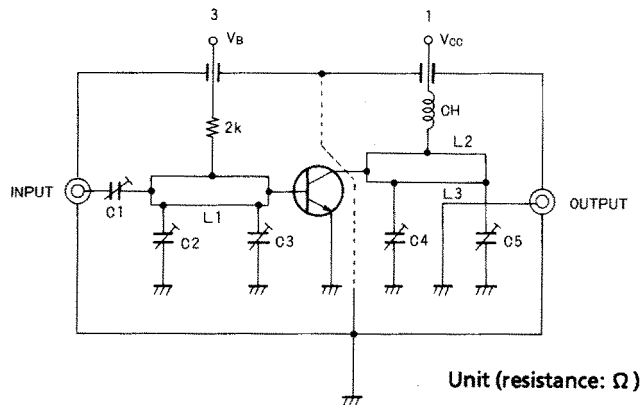
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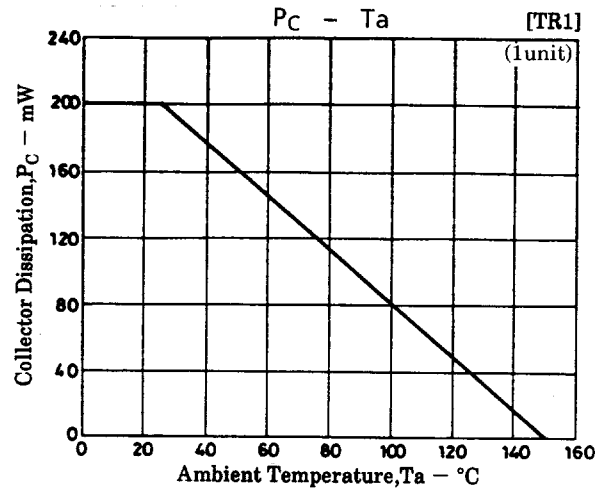
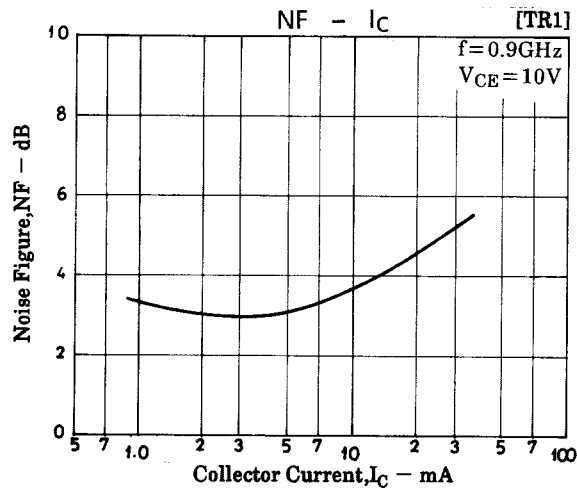
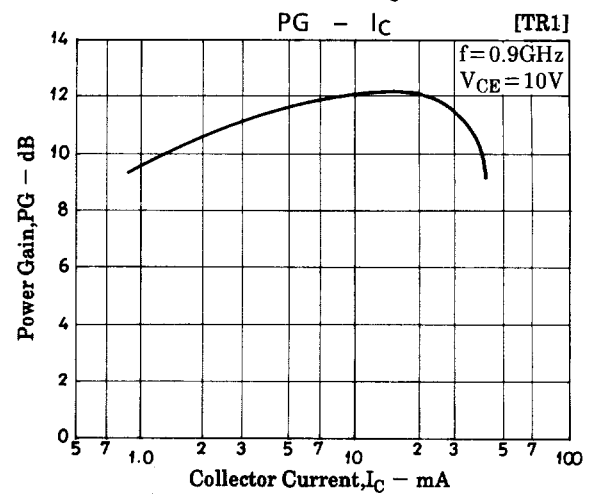
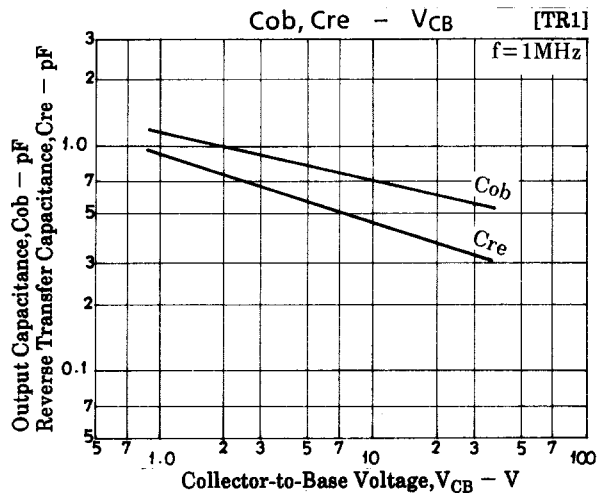
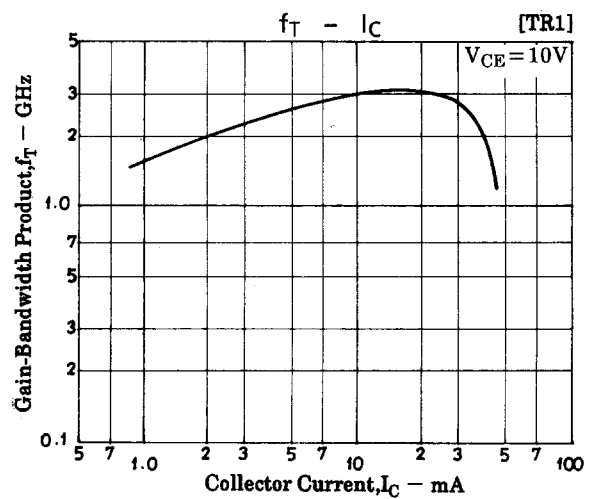
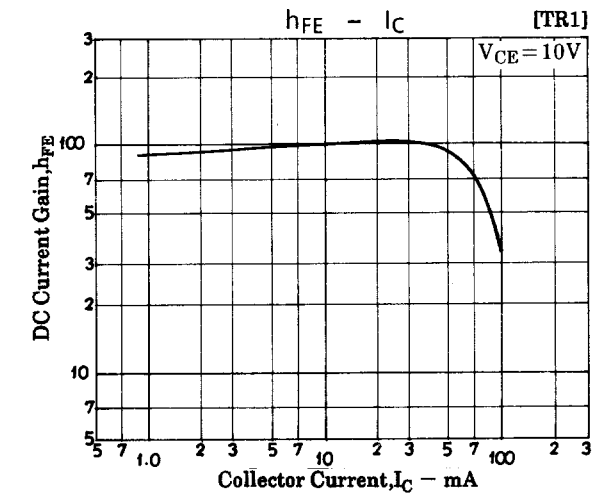
Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditons	Ratings			Unit
			min	typ	max	
[TR1 (NPN Tr)]						
Collector Cutoff Current	I _{CBO}	V _{CB} =20V, I _E =0			0.1	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} =2V, I _C =0			10	μA
DC Current Gain	h _{FE}	V _{CE} =10V, I _C =5mA	60		200	
Gain-Bandwidth Product	f _T	V _{CE} =10V, I _C =10mA	1.5	3.0		GHz
Output Capacitance	Cob	V _{CB} =10V, f=1MHz		0.7	1.0	pF
Power Gain	PG	V _{CE} =10V, I _C =10mA, f=0.9GHz		12		dB
Noise Figure	NF	V _{CE} =10V, I _C =3mA, f=0.9GHz		3.0		dB
[TR2 (PNPTr)]						
Collector Cutoff Current	I _{CBO}	V _{CB} =−15V, I _E =0			−0.1	μA
Emitter Cutoff Current	I _{EBO}	V _{EB} =−2V, I _C =0			−0.1	μA
DC Current Gain	h _{FE}	V _{CE} =−10V, I _C =−5mA	20		100	
Gain-Bandwidth Product	f _T	V _{CE} =−10V, I _C =−5mA	1.5	3.0		GHz
Output Capacitance	Cob	V _{CB} =−10V, f=1MHz		1.0	1.5	pF
Forward Transfer Gain	S _{21e} ²	V _{CE} =−10V, I _C =−5mA, f=0.9GHz	5			dB
Noise Figure	NF	V _{CE} =−10V, I _C =−3mA, f=0.9GHz		2.0		dB

PG, NF Test Circuit



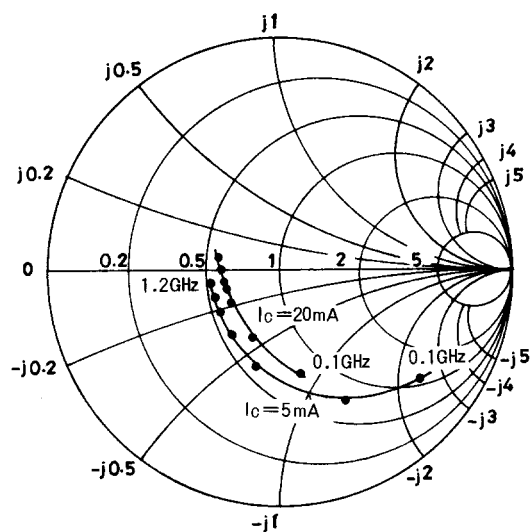
	900MHz
C1	$\sim 5\text{pF}$
C2	$\sim 10\text{pF}$
C3	$\sim 10\text{pF}$
C4	$\sim 10\text{pF}$
C5	$\sim 10\text{pF}$
L1	$W \div 1.5\text{mm}, 1 \div 25\text{mm}$ strip line
L2	$W \div 4\text{mm}, 1 \div 25\text{mm}$ strip line
L3	$0.5\phi, 1 \div 40\text{mm}$
CH	2t + bead core



S parameter [TR1]

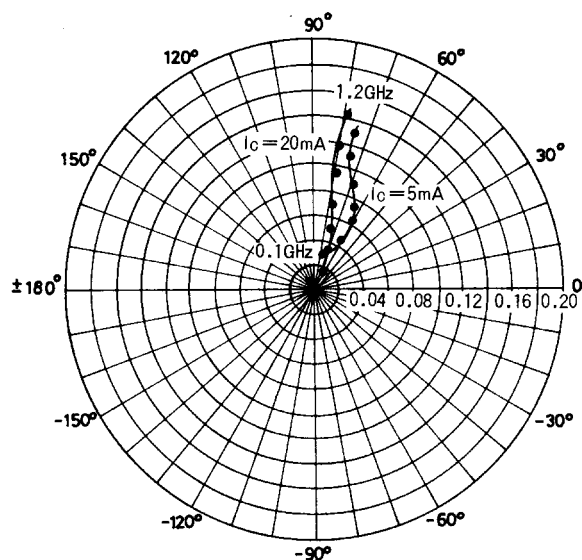
S11e : $V_{CE} = 10V$

$f = 100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$



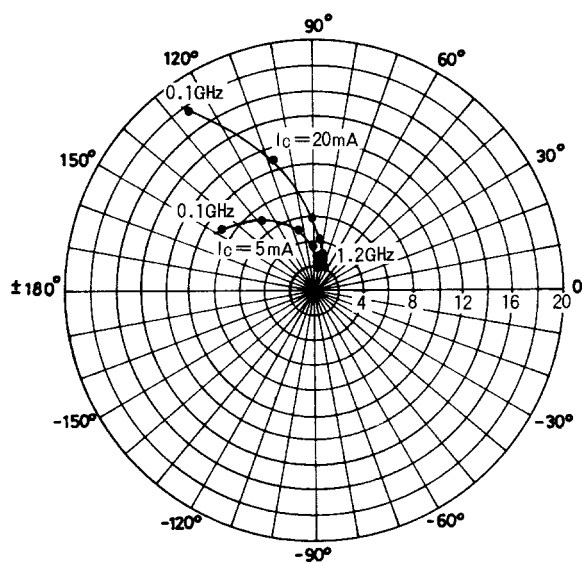
S12e : $V_{CE} = 10V$

$f = 100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$



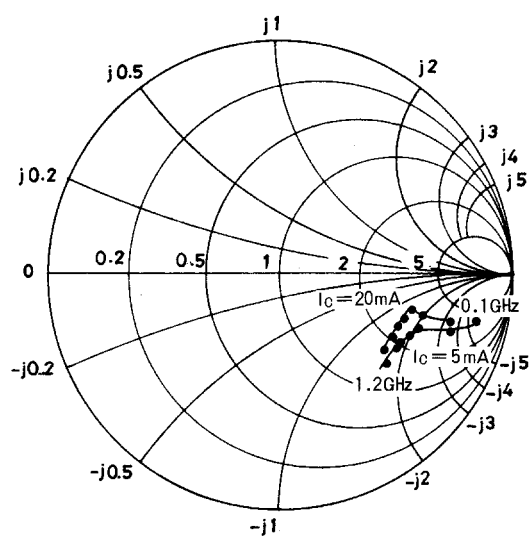
S21e : $V_{CE} = 10V$

$f = 100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$



S22e : $V_{CE} = 10V$

$f = 100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$



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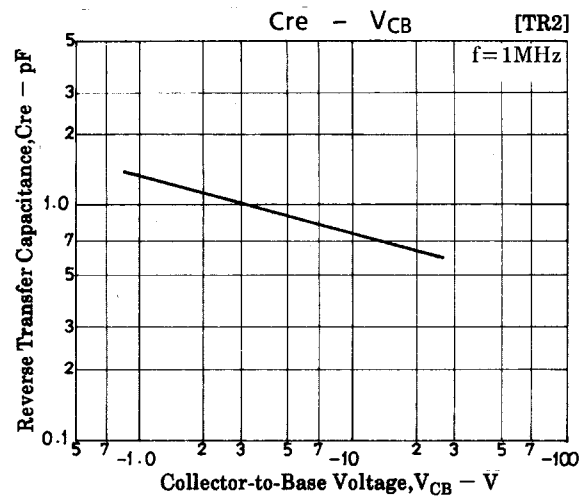
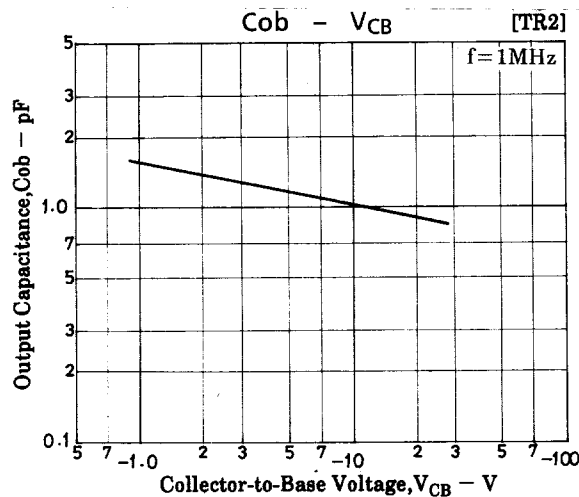
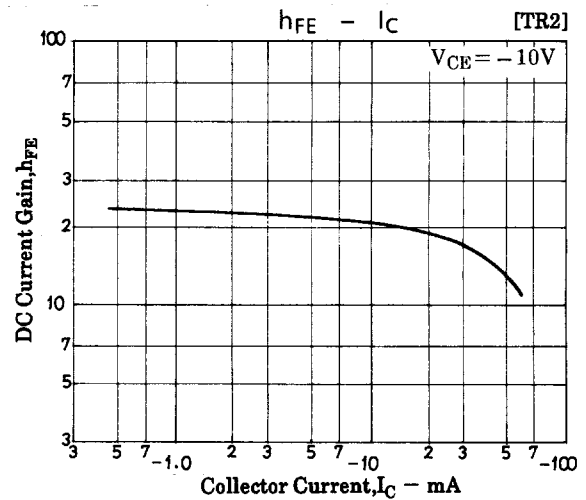
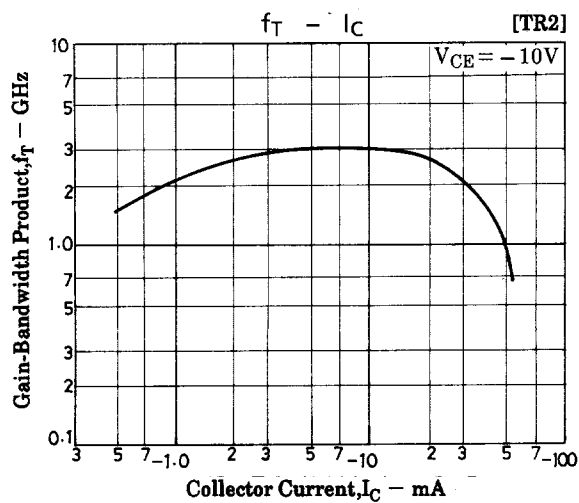
S parameter (Common emitter) [TR1]

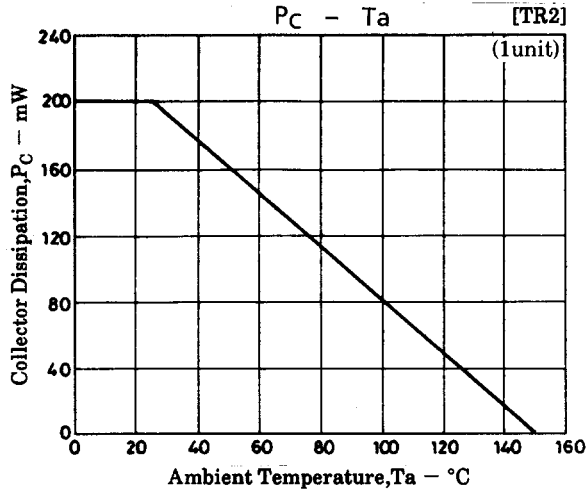
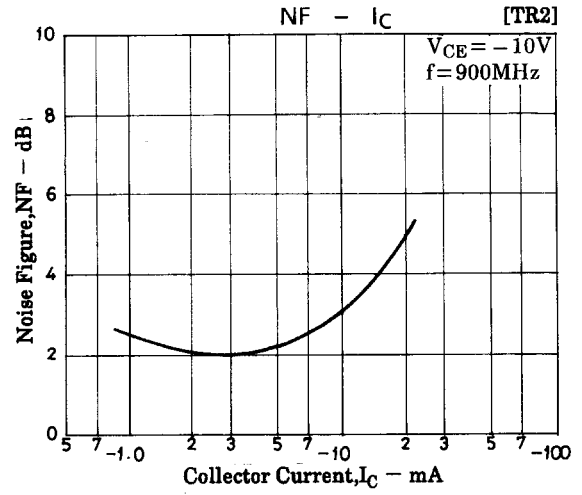
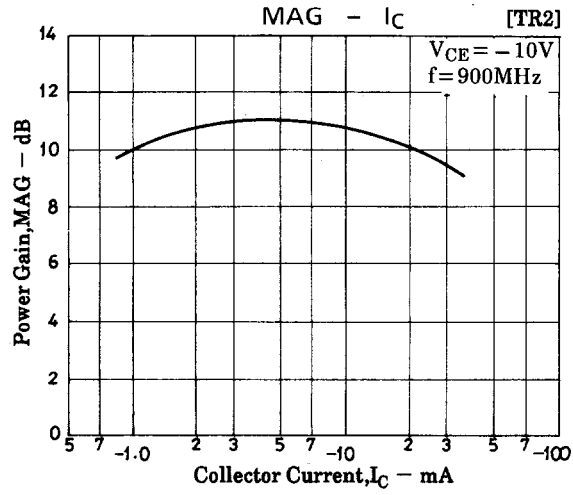
$V_{CE} = 10V, I_C = 5mA, Z_0 = 50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.771	-35.1	8.763	147.2	0.027	69.3	0.890	-14.2
200	0.613	-64.7	7.004	127.6	0.043	59.8	0.780	-19.7
400	0.429	-110.7	4.882	103.1	0.061	58.1	0.660	-22.8
600	0.361	-133.5	3.471	90.5	0.075	63.1	0.625	-25.1
800	0.355	-148.4	2.693	81.6	0.091	68.1	0.612	-28.6
900	0.331	-153.7	2.450	78.9	0.100	70.5	0.609	-29.9
1000	0.328	-158.9	2.236	75.5	0.110	72.5	0.607	-31.6
1200	0.326	-167.9	1.932	69.9	0.130	74.7	0.608	-35.7

$V_{CE} = 10V, I_C = 20mA, Z_0 = 50\Omega$

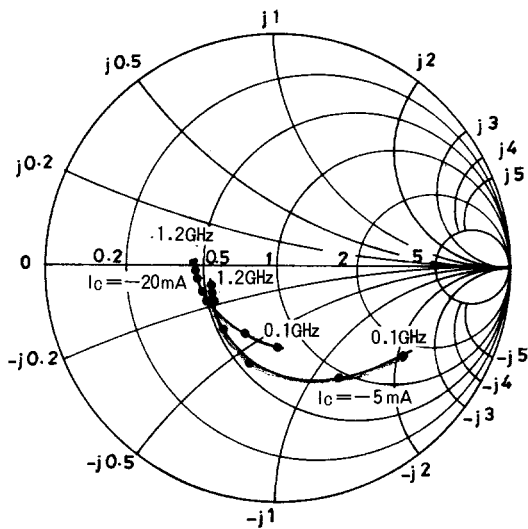
Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.447	-78.1	17.728	125.0	0.020	66.0	0.752	-18.5
200	0.338	-113.2	10.936	107.5	0.031	66.5	0.639	-18.5
400	0.290	-146.6	5.773	91.4	0.052	72.1	0.580	-18.5
600	0.281	-159.3	3.956	83.0	0.074	75.7	0.571	-21.1
800	0.285	-168.8	2.982	76.2	0.095	77.6	0.566	-25.2
900	0.289	-171.3	2.703	74.0	0.106	78.6	0.563	-26.7
1000	0.291	-174.4	2.454	71.3	0.118	79.4	0.565	-28.6
1200	0.297	-178.1	2.116	66.5	0.140	79.0	0.569	-33.1



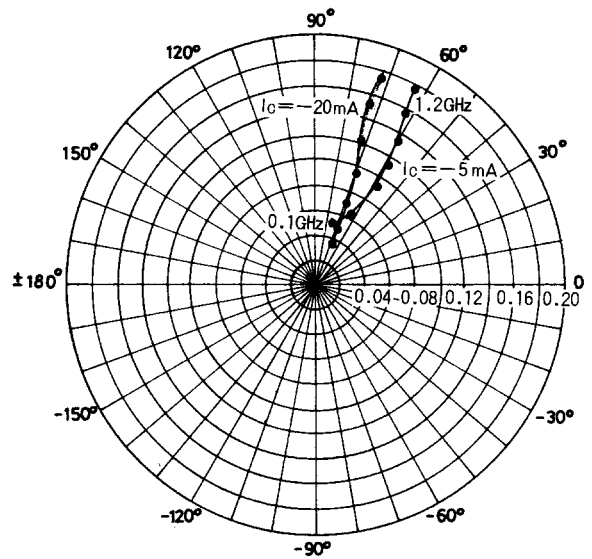


S parameter [TR2]

S11e: $V_{CE} = -10V$
 $f = 100MHz, 200$ to $1200MHz$ (200MHz step)



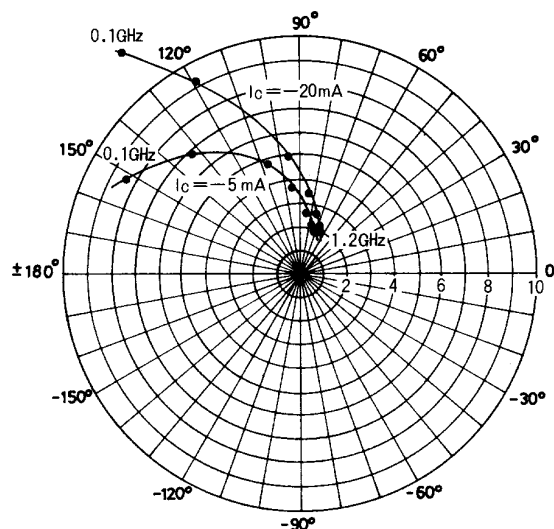
S12e: $V_{CE} = -10V$
 $f = 100MHz, 200$ to $1200MHz$ (200MHz step)



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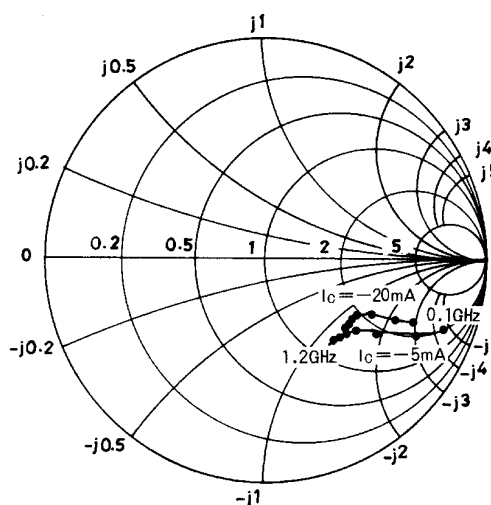
S21e: $V_{CE} = -10V$

$f = 100\text{MHz}$, 200 to 1200MHz (200MHz step)



S22e: $V_{CE} = -10V$

$f = 100\text{MHz}$, 200 to 1200MHz (200MHz step)



S parameter (Common emitter) [TR2]

$V_{CE} = -10V$, $I_C = -5\text{mA}$, $Z_0 = 50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.707	-33.1	8.215	151.1	0.043	68.6	0.856	-19.8
200	0.589	-60.3	6.763	132.2	0.059	62.0	0.761	-25.4
400	0.435	-104.7	4.810	106.5	0.089	56.4	0.584	-34.2
600	0.373	-128.1	3.503	93.2	0.110	57.3	0.508	-36.6
800	0.349	-144.4	2.728	83.4	0.130	59.5	0.474	-39.0
900	0.346	-150.1	2.492	80.0	0.142	60.9	0.464	-40.3
1000	0.344	-155.4	2.266	76.8	0.154	61.4	0.459	-41.7
1200	0.340	-163.6	1.971	70.6	0.176	62.1	0.452	-45.2

$V_{CE} = -10V$, $I_C = -20\text{mA}$, $Z_0 = 50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.348	-92.8	12.039	129.4	0.031	67.3	0.727	-22.9
200	0.330	-116.7	9.073	118.2	0.041	66.0	0.634	-24.8
400	0.350	-151.2	4.962	95.1	0.068	67.7	0.510	-26.5
600	0.353	-164.5	3.408	84.4	0.093	69.9	0.481	-28.1
800	0.360	-172.9	2.591	76.4	0.118	71.6	0.470	-31.1
900	0.366	-176.2	2.346	73.3	0.131	72.0	0.467	-32.9
1000	0.371	-178.4	2.142	70.8	0.146	71.8	0.467	-34.8
1200	0.379	176.2	1.851	65.2	0.171	71.1	0.466	-39.1

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