

Ordering number:EN5099



# FC154

NPN/PNP Epitaxial Planar Silicon Transistor  
**High-Speed Switching,  
 High-Frequency Amp Applications**

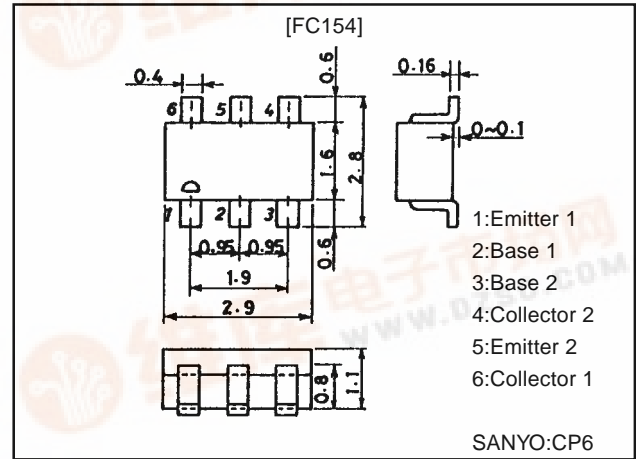
## Features

- 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.

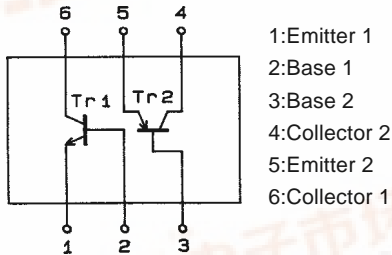
## Package Dimensions

unit:mm

2104A



## Electrical Connection



## Specifications

### Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
[TR1 (NPN Tr)]				
Collector-to-Base Voltage	V <sub>CB0</sub>		25	V
Collector-to-Emitter Voltage	V <sub>CEO</sub>		15	V
Emitter-to-Base Voltage	V <sub>EBO</sub>		3	V
Collector Current	I <sub>C</sub>		50	mA
Collector Dissipation	P <sub>C</sub>		200	mW
[TR2 (PNP Tr)]				
Collector-to-Base Voltage	V <sub>CB0</sub>		-20	V
Collector-to-Emitter Voltage	V <sub>CEO</sub>		-15	V
Emitter-to-Base Voltage	V <sub>EBO</sub>		-3	V
Collector Current	I <sub>C</sub>		-50	mA
Collector Dissipation	P <sub>C</sub>		200	mW
[Common Ratings]				
Total Dissipation	P <sub>T</sub>		300	mW
Junction Temperature	T <sub>j</sub>		150	°C
Storage Temperature	T <sub>stg</sub>		-55 to +150	°C

Marking:154

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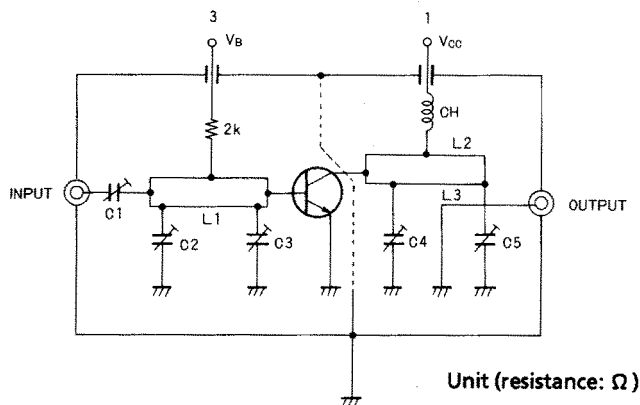
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## Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[TR1 (NPN Tr)]						
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=20\text{V}, I_E=0$			0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=2\text{V}, I_C=0$			10	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=10\text{V}, I_C=5\text{mA}$	60		200	
Gain-Bandwidth Product	$f_T$	$V_{CE}=10\text{V}, I_C=10\text{mA}$	1.5	3.0		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.7	1.0	pF
Power Gain	PG	$V_{CE}=10\text{V}, I_C=10\text{mA}, f=0.9\text{GHz}$		12		dB
Noise Figure	NF	$V_{CE}=10\text{V}, I_C=3\text{mA}, f=0.9\text{GHz}$		3.0		dB
[TR2 (PNPTr)]						
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=-15\text{V}, I_E=0$			-0.1	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=-2\text{V}, I_C=0$			-0.1	$\mu\text{A}$
DC Current Gain	$h_{FE}$	$V_{CE}=-10\text{V}, I_C=-5\text{mA}$	20		100	
Gain-Bandwidth Product	$f_T$	$V_{CE}=-10\text{V}, I_C=-5\text{mA}$	1.5	3.0		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=-10\text{V}, f=1\text{MHz}$		1.0	1.5	pF
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=-10\text{V}, I_C=-5\text{mA}, f=0.9\text{GHz}$	5			dB
Noise Figure	NF	$V_{CE}=-10\text{V}, I_C=-3\text{mA}, f=0.9\text{GHz}$		2.0		dB

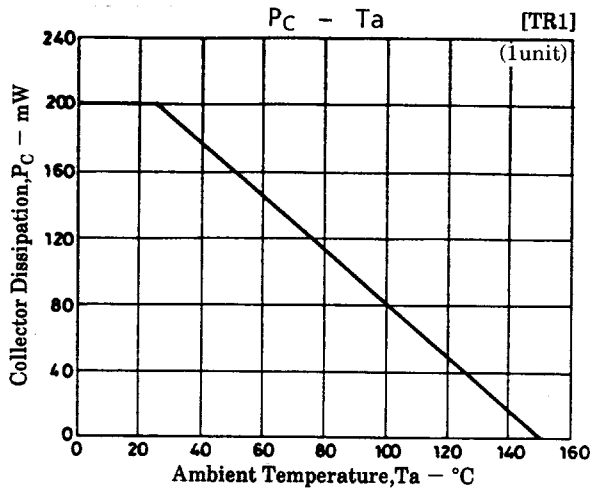
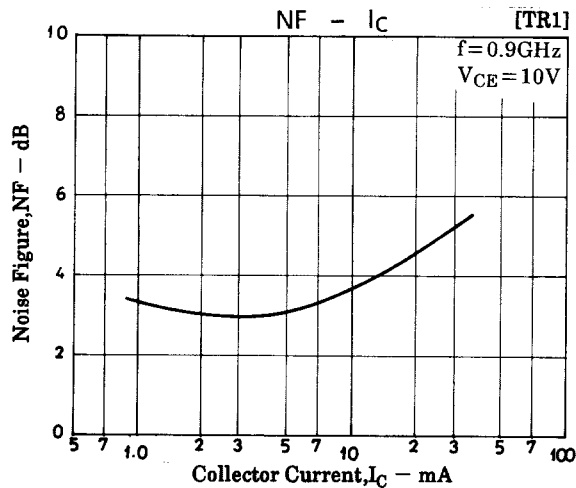
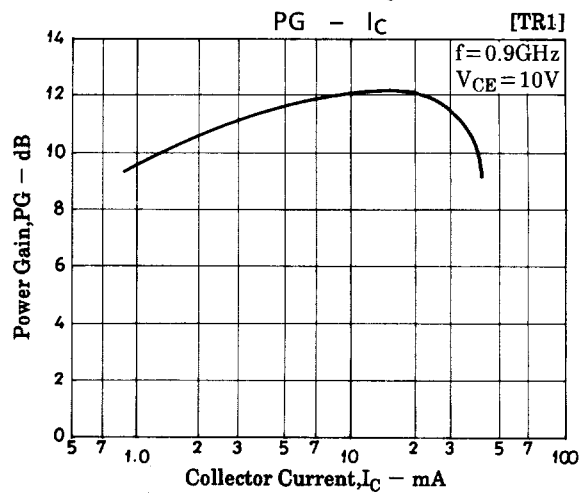
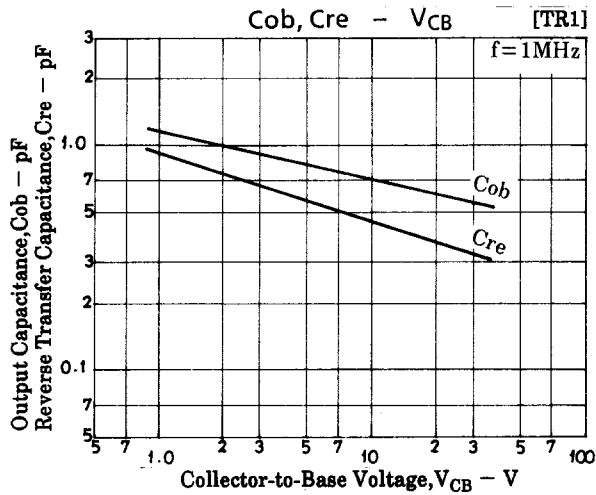
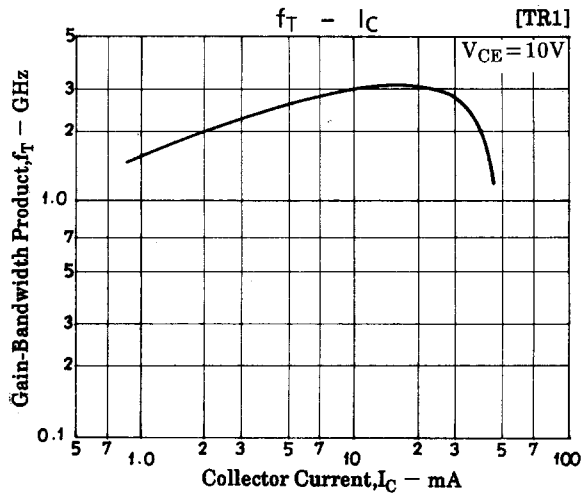
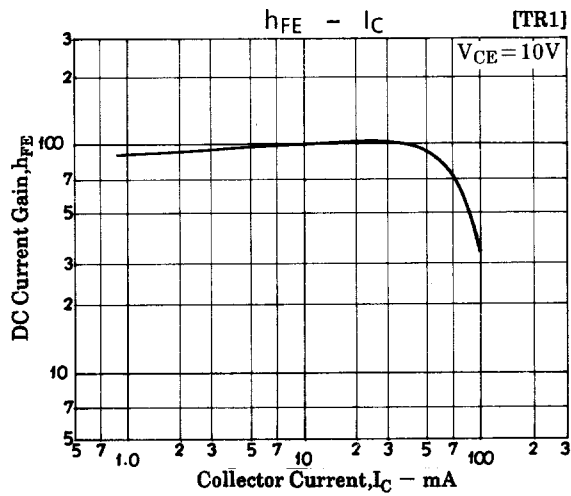
## PG, NF Test Circuit



900MHz	
C1	~5pF
C2	~10pF
C3	~10pF
C4	~10pF
C5	~10pF
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

Unit (resistance:  $\Omega$ )

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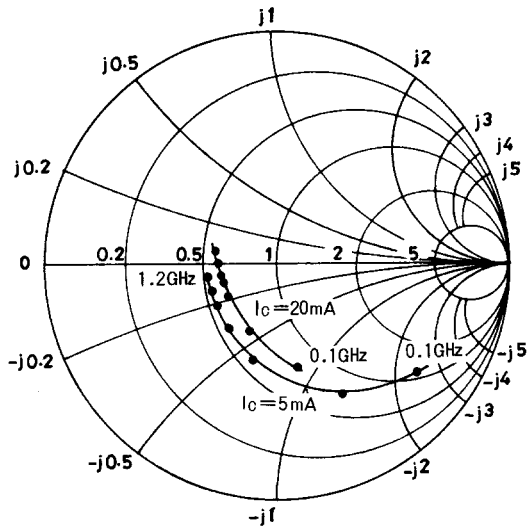


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## S parameter [TR1]

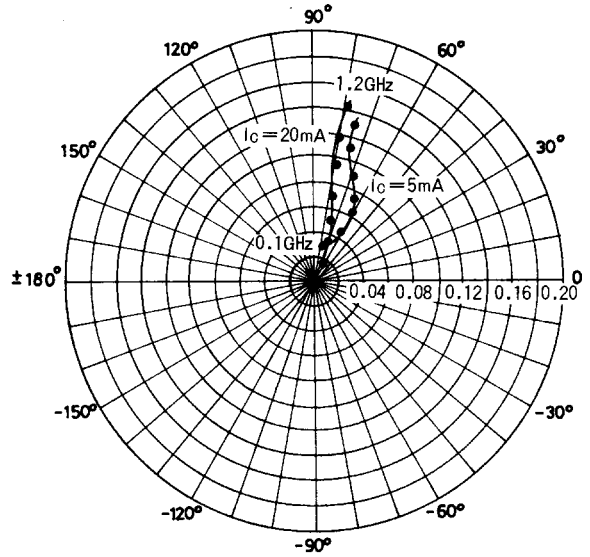
S11e :  $V_{CE} = 10V$

f = 100MHz, 200 to 1200MHz (200MHz step)



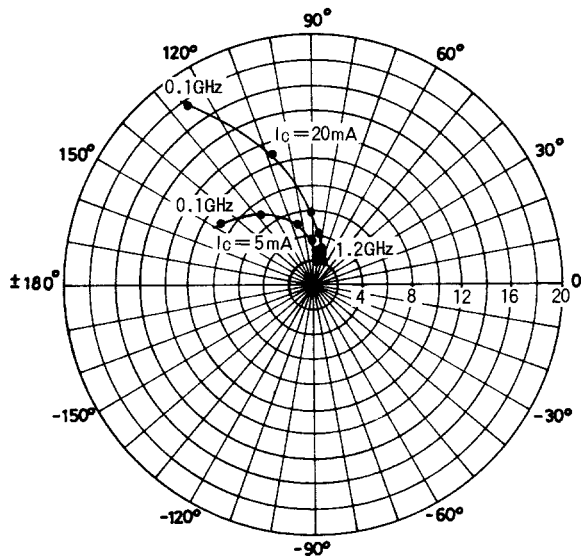
S12e :  $V_{CE} = 10V$

f = 100MHz, 200 to 1200MHz (200MHz step)



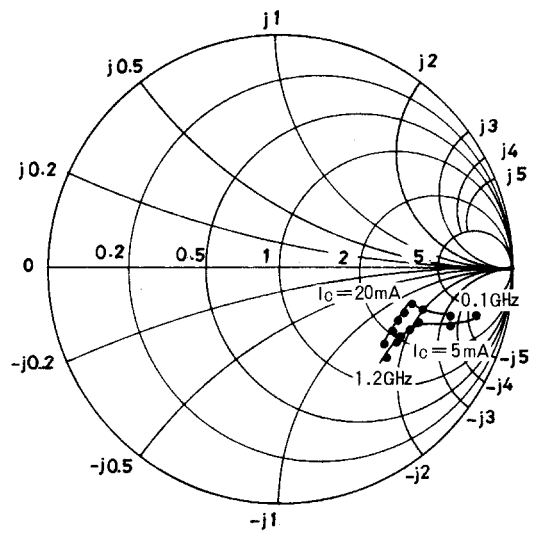
S21e :  $V_{CE} = 10V$

f = 100MHz, 200 to 1200MHz (200MHz step)



S22e :  $V_{CE} = 10V$

f = 100MHz, 200 to 1200MHz (200MHz step)



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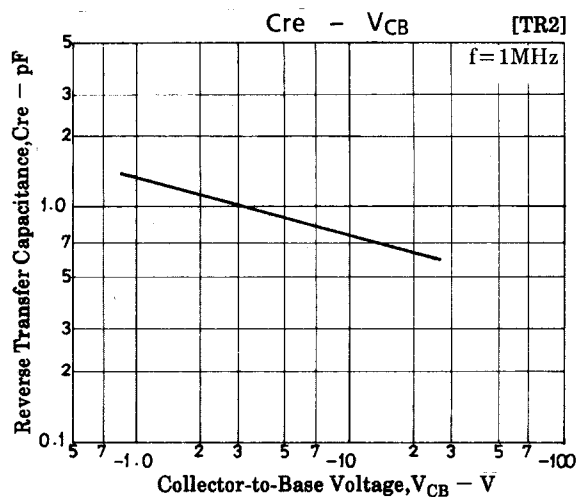
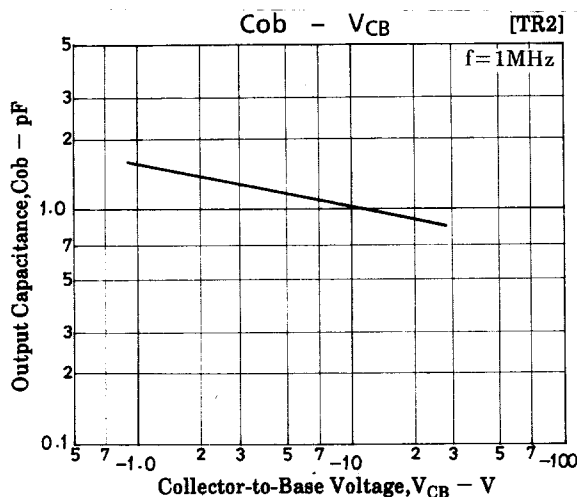
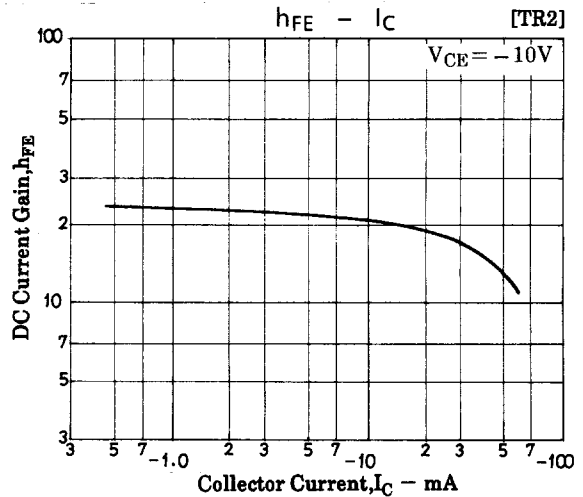
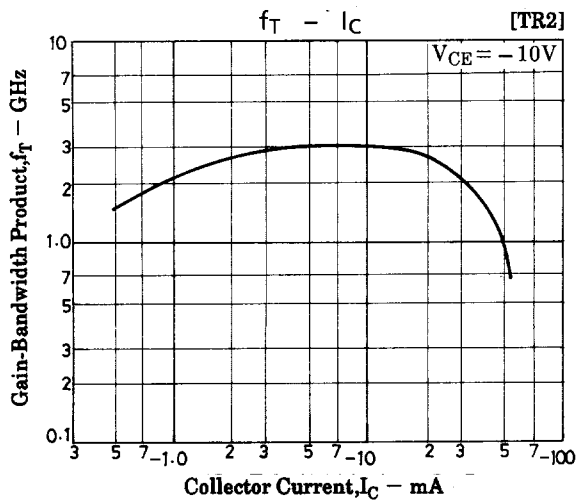
## S parameter (Common emitter) [TR1]

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

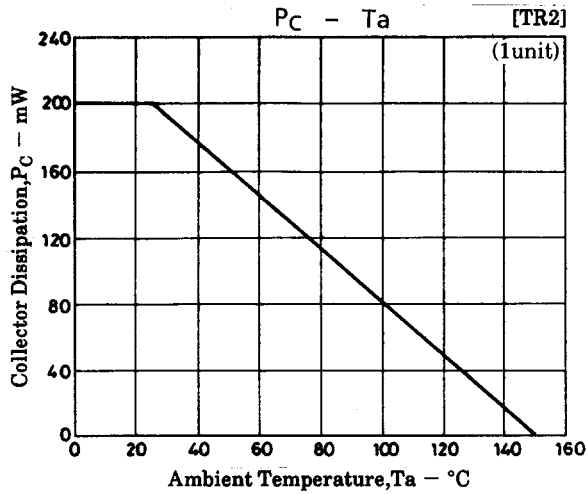
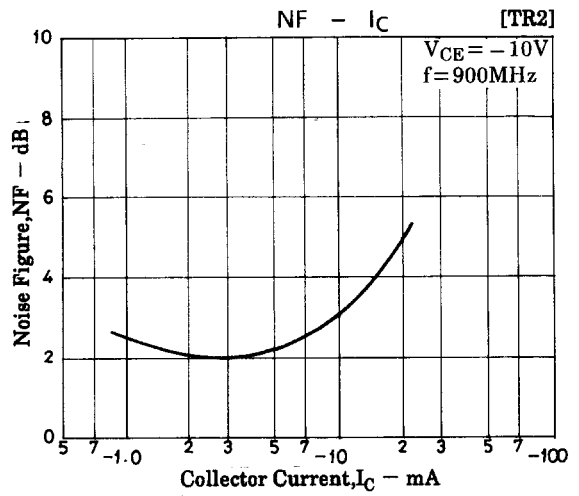
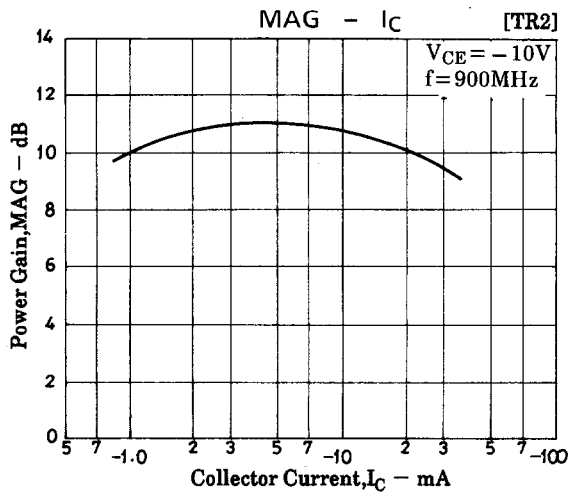
Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
100	0.771	-35.1	8.763	147.2	0.027	69.3	0.890	-14.2
200	0.613	-64.7	7.004	127.6	0.043	59.8	0.780	-19.7
400	0.429	-110.7	4.882	103.1	0.061	58.1	0.660	-22.8
600	0.361	-133.5	3.471	90.5	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



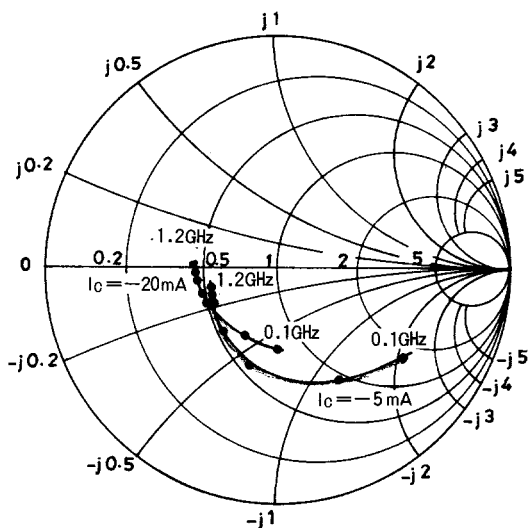
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## S parameter [TR2]

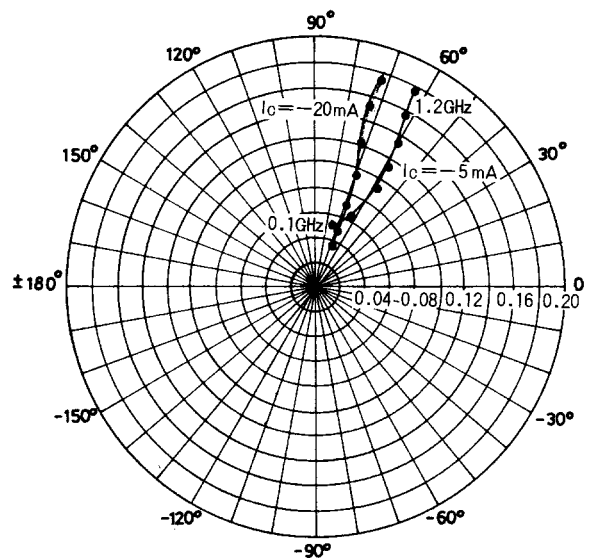
S11e:  $V_{CE} = -10V$

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



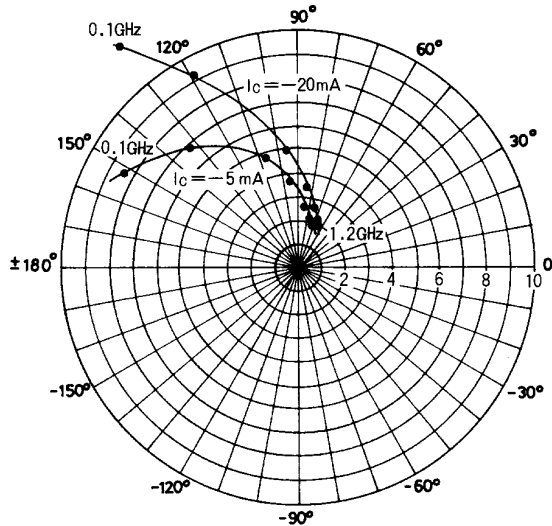
S12e:  $V_{CE} = -10V$

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

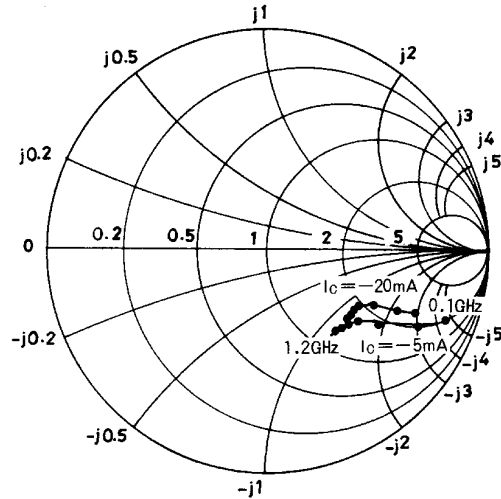


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**S21e :  $V_{CE} = -10V$   
 $f = 100\text{MHz}, 200 \text{ to } 1200\text{MHz} (200\text{MHz step})$**



**S22e :  $V_{CE} = -10V$   
 $f = 100\text{MHz}, 200 \text{ to } 1200\text{MHz} (200\text{MHz step})$**



**S parameter (Common emitter) [TR2]**

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

Freq (MHz)	S <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
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 <sub>11</sub>	∠S <sub>11</sub>	S <sub>21</sub>	∠S <sub>21</sub>	S <sub>12</sub>	∠S <sub>12</sub>	S <sub>22</sub>	∠S <sub>22</sub>
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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