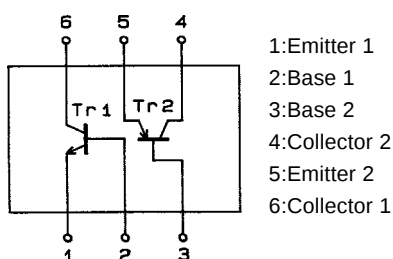


**SANYO****FC154**

NPN/PNP Epitaxial Planar Silicon Transistor

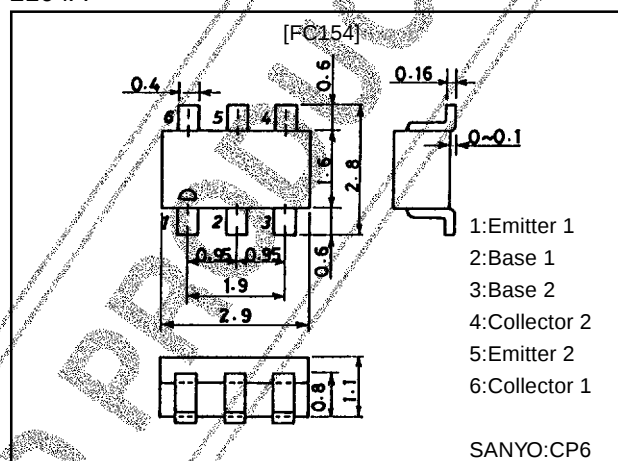
**High-Speed Switching,  
High-Frequency Amp Applications****Features**

- 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 (PNP Tr)]               |           |            |             |      |
| 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 Business Headquarters**

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

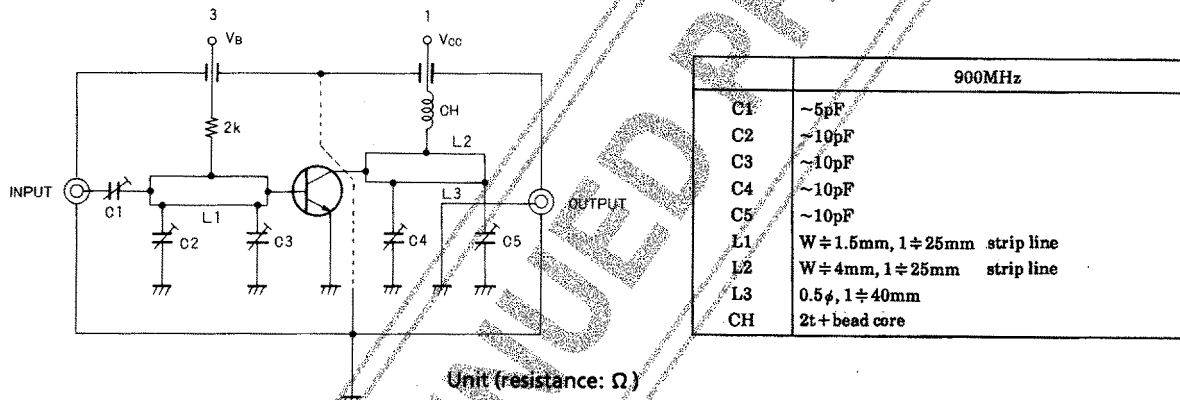
# FC154

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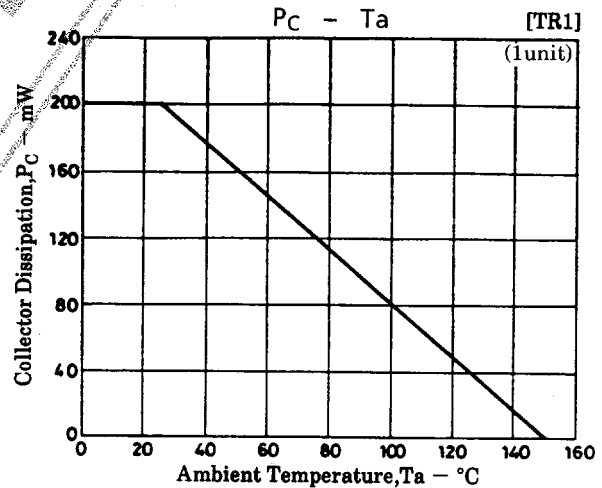
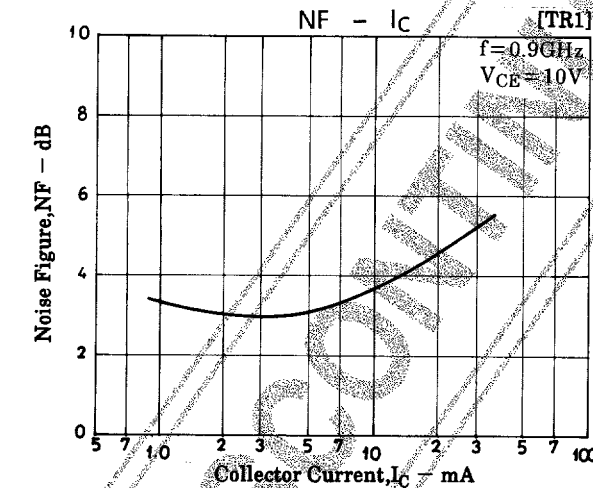
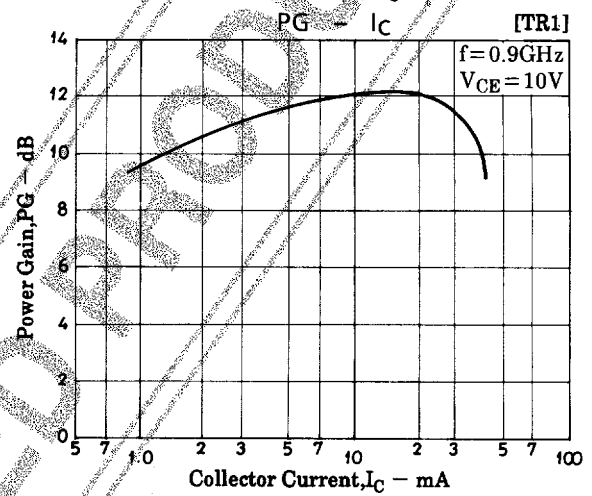
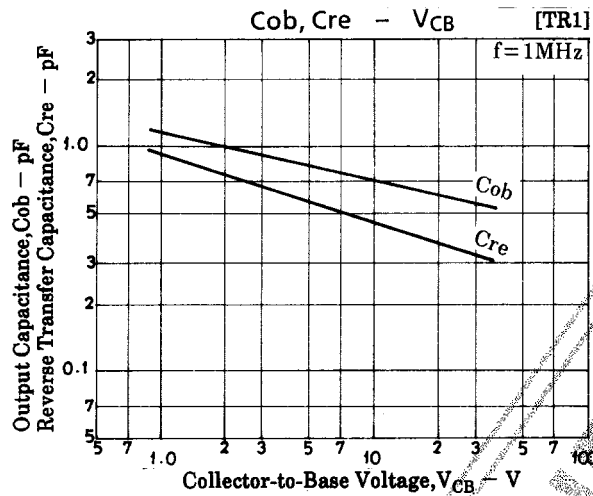
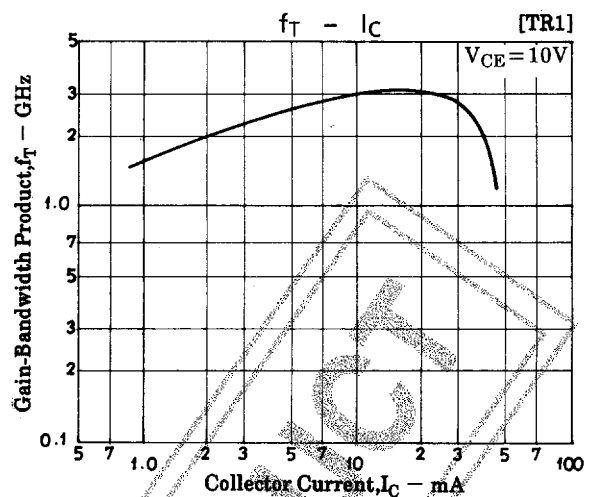
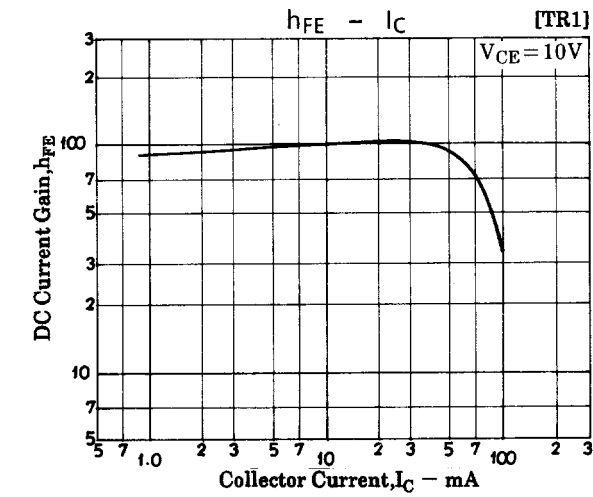
## Electrical Characteristics at Ta = 25°C

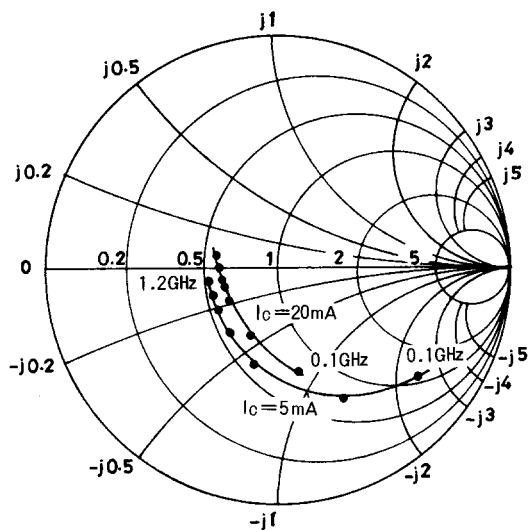
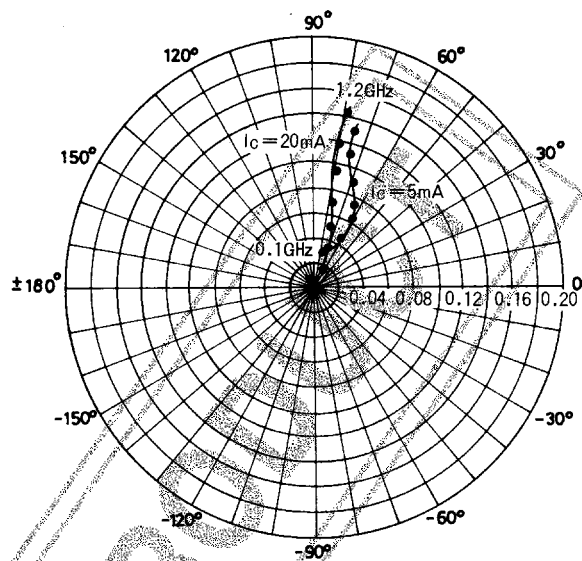
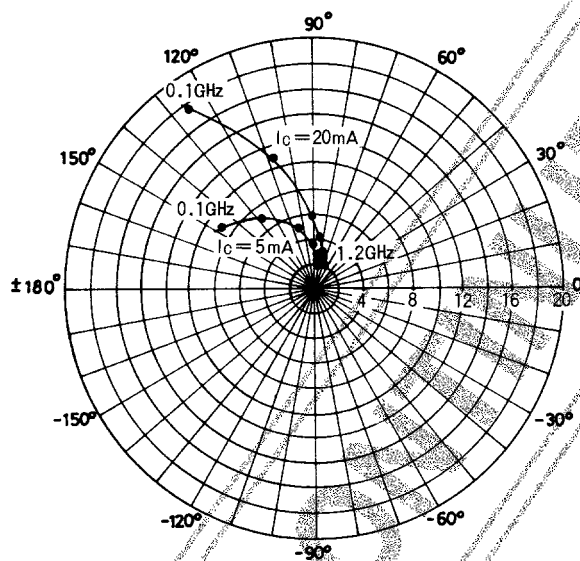
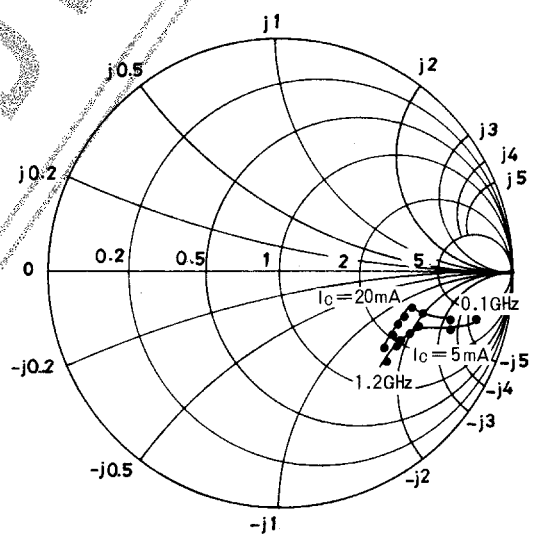
| Parameter                | Symbol                          | Conditons                                             | Ratings |     |      | Unit |
|--------------------------|---------------------------------|-------------------------------------------------------|---------|-----|------|------|
| 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

## PG, NF Test Circuit



# FC154



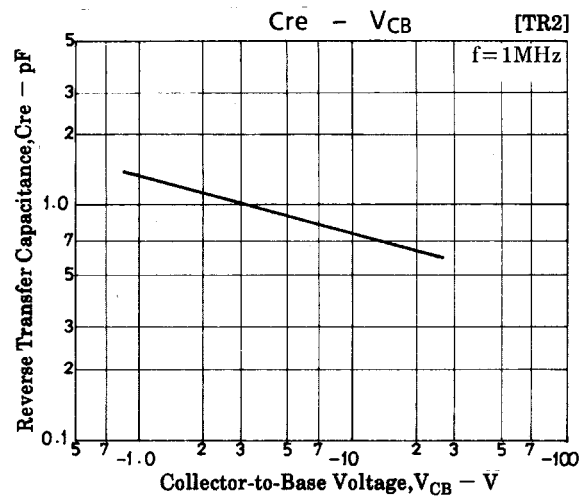
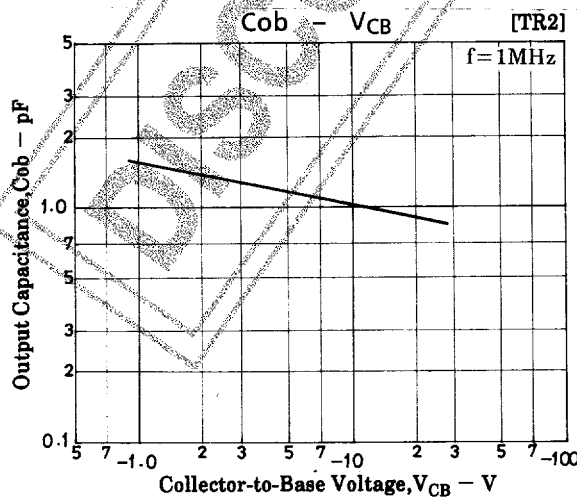
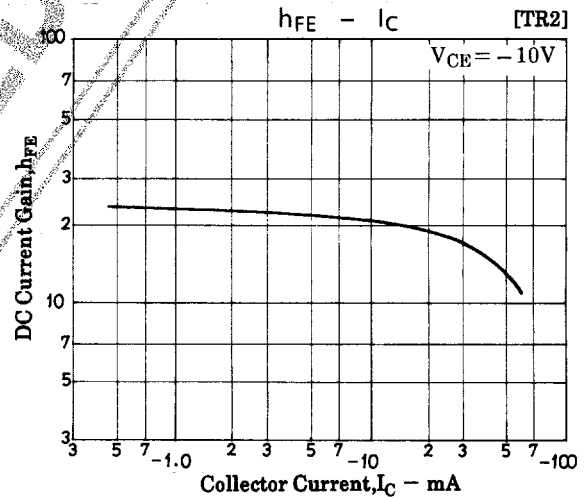
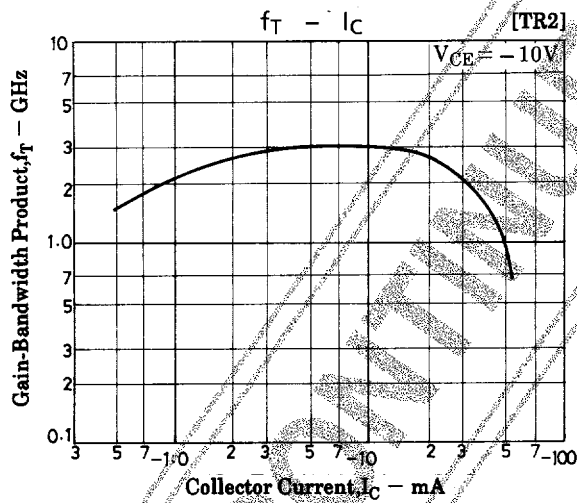
**S parameter [TR1]**S11e:  $V_{CE}=10V$  $f=100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$ S12e:  $V_{CE}=10V$  $f=100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$ S21e:  $V_{CE}=10V$  $f=100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$ S22e:  $V_{CE}=10V$  $f=100MHz, 200 \text{ to } 1200MHz (200MHz \text{ step})$ 

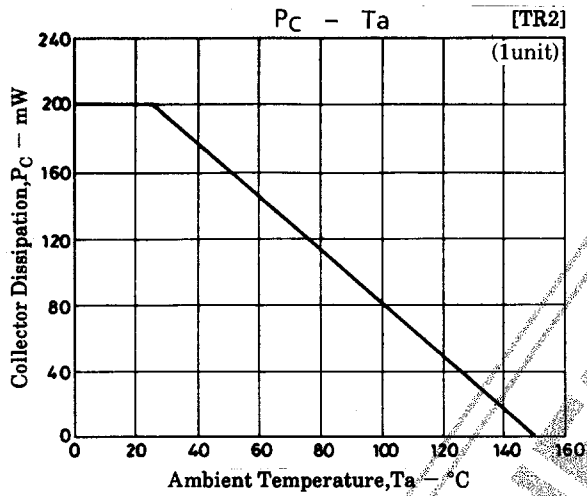
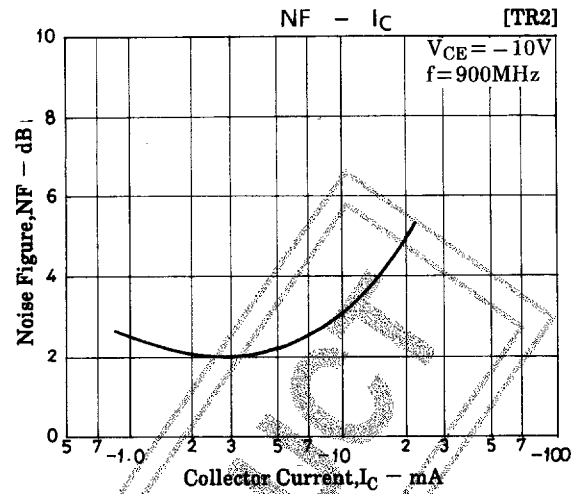
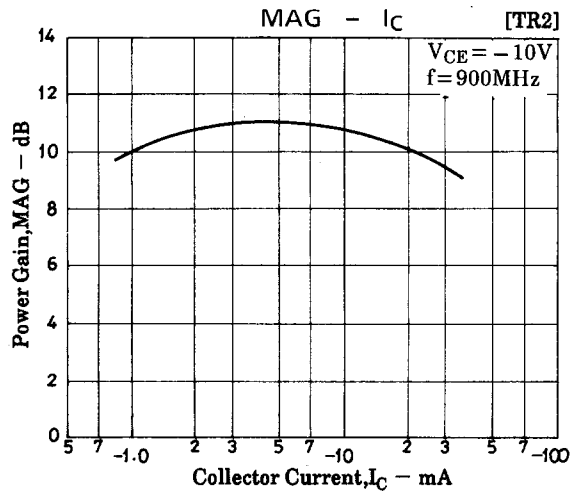
**S parameter (Common emitter) [TR1]** $V_{CE} = 10V, I_C = 5mA, Z_0 = 50\Omega$ 

| 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           |

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

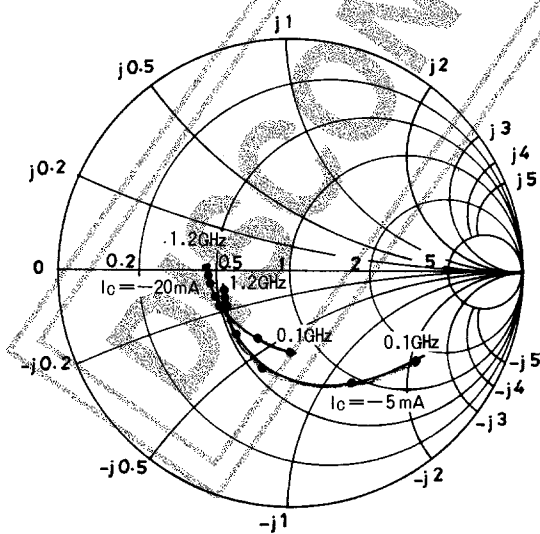
| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.447      | -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           |



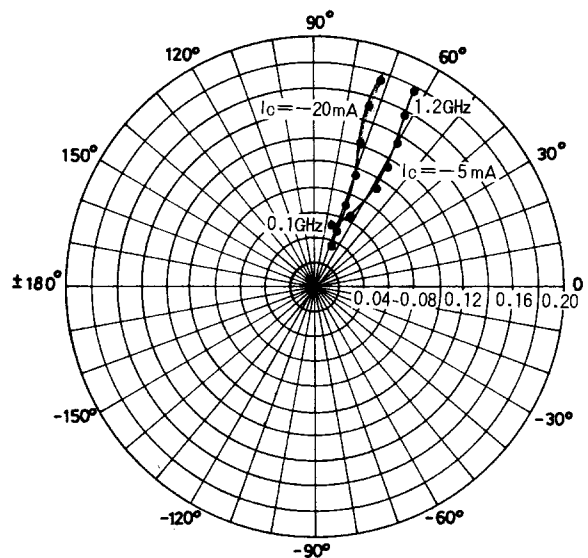


### S parameter [TR2]

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

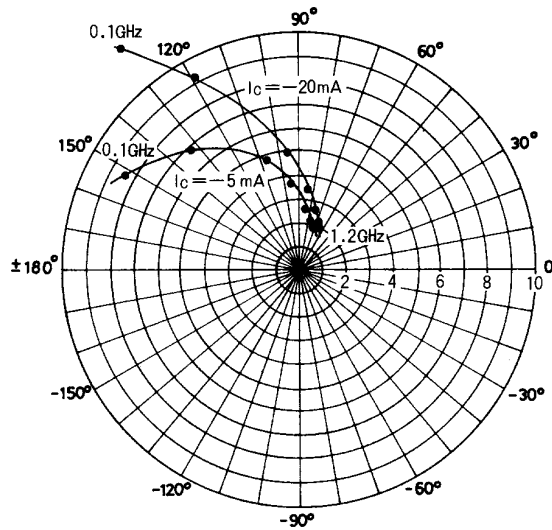


S12e:  $V_{CE} = -10V$   
 $f = 100MHz, 200$  to  $1200MHz$  (200MHz step)

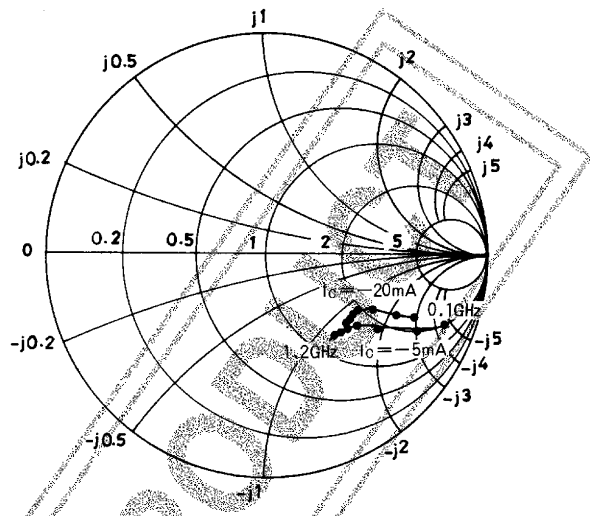


S21e:  $V_{CE} = -10V$ 

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

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

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

**S parameter (Common emitter) [TR2]** $V_{CE} = -10V, I_C = -5mA, Z_0 = 50\Omega$ 

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.707      | -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          | 4.819      | 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           |

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

| Freq (MHz) | $ S_{11} $ | $\angle S_{11}$ | $ S_{21} $ | $\angle S_{21}$ | $ S_{12} $ | $\angle S_{12}$ | $ S_{22} $ | $\angle S_{22}$ |
|------------|------------|-----------------|------------|-----------------|------------|-----------------|------------|-----------------|
| 100        | 0.348      | -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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