



查询"NE68718-T1-A"供应商

# SURFACE MOUNT NPN SILICON HIGH FREQUENCY TRANSISTOR

## NE687 SERIES

### FEATURES

- **LOW NOISE:** 1.3 dB AT 2.0 GHz
- **LOW VOLTAGE OPERATION**
- **EASY TO MATCH**
- **HIGH GAIN BANDWIDTH PRODUCT:** ft of 13 GHz
- **AVAILABLE IN SIX LOW COST PLASTIC SURFACE MOUNT PACKAGE STYLES**

### DESCRIPTION

NEC's NE687 series of NPN epitaxial silicon transistors are designed for low cost, low noise applications. Excellent performance at low voltage/low current makes this series an ideal choice for portable wireless applications at 1.6, 1.9 and 2.4 GHz. The NE687 die is available in six different low cost plastic surface mount package styles.



### ELECTRICAL CHARACTERISTICS (TA = 25°C)

| PART NUMBER <sup>1</sup><br>EIAJ <sup>2</sup> REGISTERED NUMBER<br>PACKAGE OUTLINE |                                                                 |       | NE68718<br>2SC5185<br>18 |     |     | NE68719<br>2SC5186<br>19 |     |      | NE68730<br>2SC5184<br>30 |     |     | NE68733<br>2SC5182<br>33 |     |     | NE68739/39R<br>2SC5183/83R<br>39/39R |     |     |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------|--------------------------|-----|-----|--------------------------|-----|------|--------------------------|-----|-----|--------------------------|-----|-----|--------------------------------------|-----|-----|
| SYMBOLS                                                                            | PARAMETERS AND CONDITIONS                                       | UNITS | MIN                      | TYP | MAX | MIN                      | TYP | MAX  | MIN                      | TYP | MAX | MIN                      | TYP | MAX | MIN                                  | TYP | MAX |
| ft                                                                                 | Gain Bandwidth Product at<br>VCE = 2 V, IC = 20 mA, f = 2.0 GHz | GHz   | 10                       | 13  |     | 9                        | 11  |      | 9                        | 11  |     | 9                        | 12  |     | 7.5                                  | 10  |     |
| ft                                                                                 | Gain Bandwidth Product at<br>VCE = 1 V, IC = 10 mA, f = 2.0 GHz | GHz   | 8                        | 11  |     | 7                        | 9   |      | 7                        | 9   |     | 7                        | 10  |     | 7                                    | 8.5 |     |
| NFMIN                                                                              | Minimum Noise Figure at<br>VCE = 2 V, IC = 3 mA, f = 2.0 GHz    | dB    |                          | 1.3 | 2.0 |                          | 1.3 | 2.0  |                          | 1.3 | 2.0 |                          | 1.3 | 2.0 |                                      | 1.3 | 2.0 |
| NFMIN                                                                              | Minimum Noise Figure at<br>VCE = 1 V, IC = 3 mA, f = 2.0 GHz    | dB    |                          | 1.3 | 2.0 |                          | 1.3 | 2.0  |                          | 1.3 | 2.0 |                          | 1.3 | 2.0 |                                      | 1.3 | 2.0 |
| IS21e12                                                                            | Insertion Power Gain at<br>VCE = 2 V, IC = 20 mA, f = 2.0 GHz   | dB    | 8                        | 11  |     | 8.5                      | 10  |      | 7                        | 8.5 |     | 7                        | 8.5 |     | 7.5                                  | 10  |     |
| IS21e12                                                                            | Insertion Power Gain at<br>VCE = 1 V, IC = 10 mA, f = 2.0 GHz   | dB    | 7.5                      | 9   |     | 6                        | 7.5 |      | 6                        | 7.5 |     | 6                        | 7.5 |     | 7                                    | 8.5 |     |
| hFE                                                                                | Forward Current Gain <sup>3</sup> at<br>VCE = 2 V, IC = 20 mA   |       | 70                       |     | 140 | 70                       |     | 140  | 70                       |     | 140 | 70                       |     | 140 | 70                                   |     | 140 |
| ICBO                                                                               | Collector Cutoff Current<br>at VCB = 5 V, IE = 0 mA             | nA    |                          |     | 100 |                          |     | 100  |                          |     | 100 |                          |     | 100 |                                      |     | 100 |
| IEBO                                                                               | Emitter Cutoff Current<br>at VEB = 1 V, IC = 0 mA               | nA    |                          |     | 100 |                          |     | 100  |                          |     | 100 |                          |     | 100 |                                      |     | 100 |
| CRE <sup>4</sup>                                                                   | Feedback Capacitance at<br>VCB = 2 V, IE = 0 mA, f = 1 MHz      | pF    |                          | 0.3 | 0.6 |                          | 0.4 | 0.8  |                          | 0.4 | 0.8 |                          | 0.4 | 0.8 |                                      | 0.4 | 0.8 |
| PT                                                                                 | Total Power Dissipation                                         | mW    |                          |     | 90  |                          |     | 90   |                          |     | 90  |                          |     | 90  |                                      |     | 90  |
| RTH(J-A)                                                                           | Thermal Resistance<br>(Junction to Ambient)                     | °C/W  |                          |     | 833 |                          |     | 1250 |                          |     | 833 |                          |     | 625 |                                      |     | 625 |
| RTH(J-C)                                                                           | Thermal Resistance<br>(Junction to Case)                        | °C/W  |                          |     |     |                          |     |      |                          |     |     |                          |     |     |                                      |     |     |

Notes:

1. Precaution: Devices are ESD sensitive. Use proper handling procedures.
2. Electronic Industrial Association of Japan.

3. Pulsed measurement, PW ≤ 350 μs, duty cycle ≤ 2%.

4. The emitter terminal should be connected to the ground terminal of the 3 terminal capacitance bridge.

California Eastern Laboratories

NE687 SERIES

ABSOLUTE MAXIMUM RATINGS<sup>1</sup> (T<sub>A</sub> = 25°C)

| SYMBOLS          | PARAMETERS                     | UNITS | RATINGS     |
|------------------|--------------------------------|-------|-------------|
| V <sub>CBO</sub> | Collector to Base Voltage      | V     | 5           |
| V <sub>CEO</sub> | Collector to Emitter Voltage   | V     | 3           |
| V <sub>EBO</sub> | Emitter to Base Voltage        | V     | 2           |
| I <sub>C</sub>   | Collector Current              | mA    | 30          |
| T <sub>J</sub>   | Operating Junction Temperature | °C    | 150         |
| T <sub>STG</sub> | Storage Temperature            | °C    | -65 to +150 |

Note:

1. Operation in excess of any one of these parameters may result in permanent damage.

NE68718

TYPICAL NOISE PARAMETERS (T<sub>A</sub> = 25°C)

| FREQ.<br>(MHz)           | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|--------------------------|---------------------------|------------|------------------|------|-------|
|                          |                           |            | MAG              | ANG  |       |
| VCE = 0.5 V, IC = 0.5 mA |                           |            |                  |      |       |
| 500                      | 1.10                      | 13.07      | 0.72             | 30   | 1.00  |
| 800                      | 1.31                      | 11.23      | 0.67             | 54   | 0.65  |
| 1000                     | 1.41                      | 9.36       | 0.65             | 67   | 0.55  |
| VCE = 1.0 V, IC = 1.0 mA |                           |            |                  |      |       |
| 500                      | 0.93                      | 16.53      | 0.63             | 27   | 0.56  |
| 800                      | 1.08                      | 13.44      | 0.59             | 47   | 0.39  |
| 1000                     | 1.20                      | 12.21      | 0.55             | 62   | 0.36  |
| 1500                     | 1.48                      | 8.53       | 0.46             | 83   | 0.34  |
| 2000                     | 1.72                      | 6.50       | 0.37             | 107  | 0.28  |
| VCE = 1.0 V, IC = 3 mA   |                           |            |                  |      |       |
| 500                      | 1.10                      | 18.68      | 0.48             | 23   | 0.28  |
| 800                      | 1.15                      | 15.74      | 0.40             | 48   | 0.25  |
| 1000                     | 1.20                      | 13.90      | 0.36             | 58   | 0.24  |
| 1500                     | 1.38                      | 10.63      | 0.28             | 81   | 0.21  |
| 2000                     | 1.60                      | 8.43       | 0.21             | 104  | 0.20  |
| 2500                     | 1.82                      | 7.04       | 0.14             | 151  | 0.18  |
| 3000                     | 2.00                      | 5.84       | 0.16             | -167 | 0.13  |
| VCE = 2 V, IC = 3 mA     |                           |            |                  |      |       |
| 500                      | 1.10                      | 19.83      | 0.50             | 21   | 0.26  |
| 800                      | 1.15                      | 16.61      | 0.42             | 39   | 0.26  |
| 1000                     | 1.20                      | 14.85      | 0.38             | 48   | 0.25  |
| 1500                     | 1.38                      | 11.83      | 0.29             | 74   | 0.24  |
| 2000                     | 1.60                      | 9.49       | 0.23             | 91   | 0.22  |
| 2500                     | 1.82                      | 8.16       | 0.14             | 135  | 0.20  |
| 3000                     | 2.00                      | 6.93       | 0.13             | 177  | 0.12  |
| VCE = 2 V, IC = 10 mA    |                           |            |                  |      |       |
| 500                      | 1.60                      | 22.57      | 0.13             | 19   | 0.27  |
| 800                      | 1.62                      | 18.75      | 0.11             | 48   | 0.26  |
| 1000                     | 1.65                      | 16.91      | 0.09             | 67   | 0.25  |
| 1500                     | 1.73                      | 13.52      | 0.07             | 100  | 0.24  |
| 2000                     | 1.80                      | 11.17      | 0.06             | 143  | 0.22  |
| 2500                     | 2.00                      | 9.48       | 0.08             | -161 | 0.20  |
| 3000                     | 2.19                      | 8.18       | 0.13             | -133 | 0.16  |

NE68730

TYPICAL NOISE PARAMETERS (T<sub>A</sub> = 25°C)

| FREQ.<br>(MHz)            | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|---------------------------|---------------------------|------------|------------------|------|-------|
|                           |                           |            | MAG              | ANG  |       |
| VCE = 1.0 V, IC = 3.0 mA  |                           |            |                  |      |       |
| 500                       | 1.10                      | 17.66      | 0.47             | 15   | 0.28  |
| 800                       | 1.19                      | 14.48      | 0.39             | 33   | 1.20  |
| 1000                      | 1.25                      | 12.93      | 0.34             | 45   | 0.28  |
| 1500                      | 1.36                      | 9.61       | 0.29             | 57   | 0.27  |
| 2000                      | 1.50                      | 7.52       | 0.24             | 73   | 0.27  |
| VCE = 2.0 V, IC = 3.0 mA  |                           |            |                  |      |       |
| 500                       | 1.10                      | 18.60      | 0.40             | 12   | 0.30  |
| 800                       | 1.19                      | 15.10      | 0.35             | 24   | 0.22  |
| 1000                      | 1.25                      | 13.40      | 0.31             | 33   | 0.26  |
| 1500                      | 1.36                      | 10.30      | 0.26             | 44   | 0.28  |
| 2000                      | 1.50                      | 8.10       | 0.23             | 58   | 0.28  |
| VCE = 2.0 V, IC = 20.0 mA |                           |            |                  |      |       |
| 500                       | 2.00                      | 20.30      | 0.02             | -170 | 0.23  |
| 800                       | 2.06                      | 16.70      | 0.06             | 171  | 0.15  |
| 1000                      | 2.10                      | 15.00      | 0.08             | 172  | 0.28  |
| 1500                      | 2.20                      | 11.90      | 0.12             | 178  | 0.24  |
| 2000                      | 2.34                      | 9.80       | 0.14             | -175 | 0.24  |
| 2500                      | 2.46                      | 6.70       | 0.18             | -160 | 0.23  |

NE68739

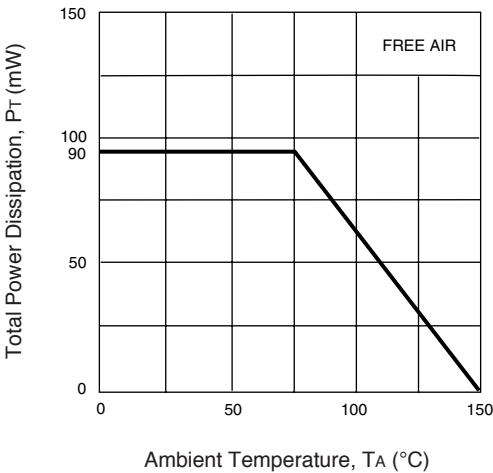
TYPICAL NOISE PARAMETERS (T<sub>A</sub> = 25°C)

| FREQ.<br>(MHz)            | NF <sub>OPT</sub><br>(dB) | G <sub>A</sub><br>(dB) | Γ <sub>OPT</sub> |      | R <sub>n/50</sub> |
|---------------------------|---------------------------|------------------------|------------------|------|-------------------|
|                           |                           |                        | MAG              | ANG  |                   |
| VCE = 0.5 V, IC = 0.5 mA  |                           |                        |                  |      |                   |
| 500                       | 1.23                      | 15.7                   | 0.77             | 36   | 0.61              |
| 800                       | 1.37                      | 10.9                   | 0.71             | 46   | 0.61              |
| 1000                      | 1.45                      | 8.7                    | 0.60             | 64   | 0.50              |
| VCE = 1.0 V, IC = 3.0 mA  |                           |                        |                  |      |                   |
| 500                       | 1.07                      | 18.0                   | 0.48             | 30   | 0.31              |
| 800                       | 1.13                      | 14.8                   | 0.39             | 49   | 0.28              |
| 1000                      | 1.18                      | 13.2                   | 0.32             | 60   | 0.26              |
| 1500                      | 1.30                      | 10.5                   | 0.23             | 76   | 0.24              |
| 2000                      | 1.50                      | 8.0                    | 0.12             | 120  | 0.20              |
| 2500                      | 1.66                      | 7.0                    | 0.16             | -172 | 0.15              |
| VCE = 2.0 V, IC = 3.0 mA  |                           |                        |                  |      |                   |
| 500                       | 1.07                      | 18.6                   | 0.46             | 26   | 0.28              |
| 800                       | 1.13                      | 15.5                   | 0.37             | 38   | 0.28              |
| 1000                      | 1.18                      | 14.0                   | 0.32             | 46   | 0.26              |
| 1500                      | 1.30                      | 11.2                   | 0.20             | 66   | 0.25              |
| 2000                      | 1.50                      | 9.3                    | 0.12             | 113  | 0.19              |
| 2500                      | 1.66                      | 7.8                    | 0.14             | 177  | 0.17              |
| 3000                      | 1.86                      | 6.6                    | 0.23             | -157 | 0.10              |
| VCE = 2.0 V, IC = 20.0 mA |                           |                        |                  |      |                   |
| 500                       | 1.93                      | 21.2                   | 0.08             | -150 | 0.22              |
| 800                       | 1.95                      | 17.6                   | 0.14             | -138 | 0.17              |
| 1000                      | 2.00                      | 16.0                   | 0.16             | -134 | 0.17              |
| 1500                      | 2.15                      | 12.9                   | 0.21             | -127 | 0.24              |
| 2000                      | 2.30                      | 10.6                   | 0.26             | -123 | 0.25              |
| 2500                      | 2.40                      | 9.0                    | 0.31             | -121 | 0.25              |
| 3000                      | 2.52                      | 7.7                    | 0.46             | -114 | 0.24              |

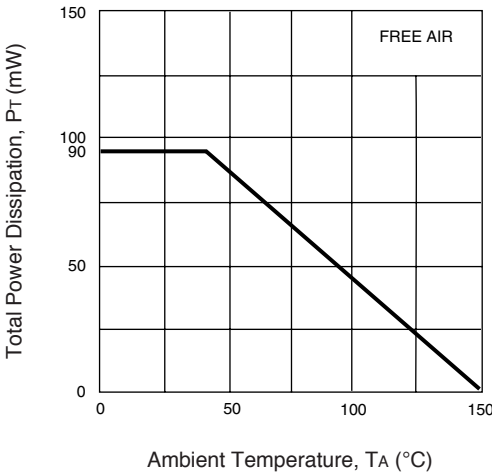
TYPICAL PERFORMANCE CURVES (TA = 25°)

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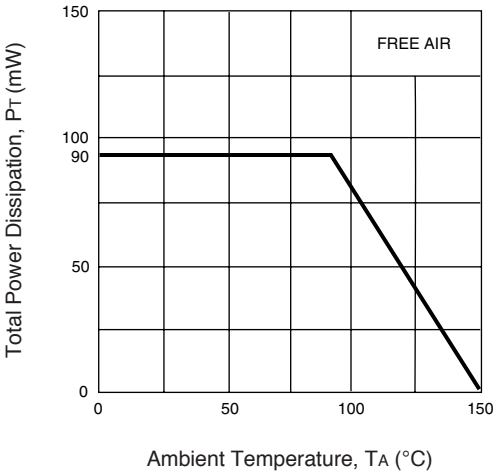
NE68718, NE68730  
D.C. POWER DERATING CURVE



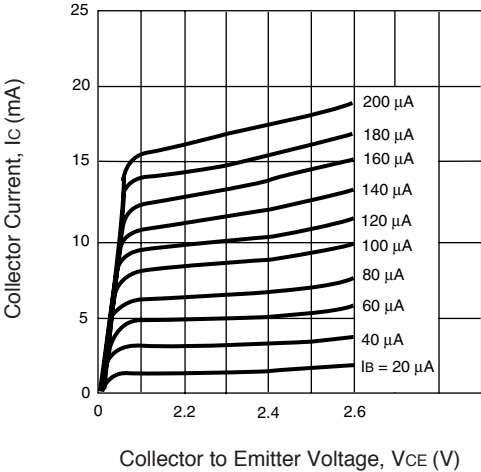
NE68719  
D.C. POWER DERATING CURVE



NE68733, NE68739  
D.C. POWER DERATING CURVE

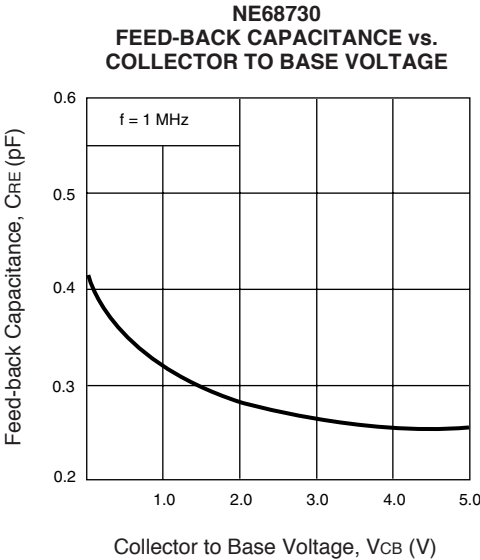
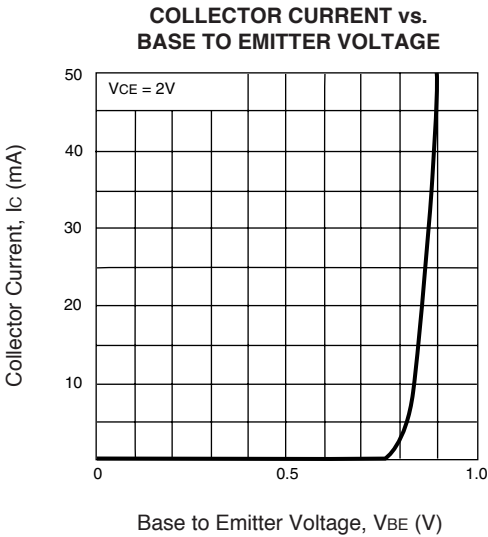
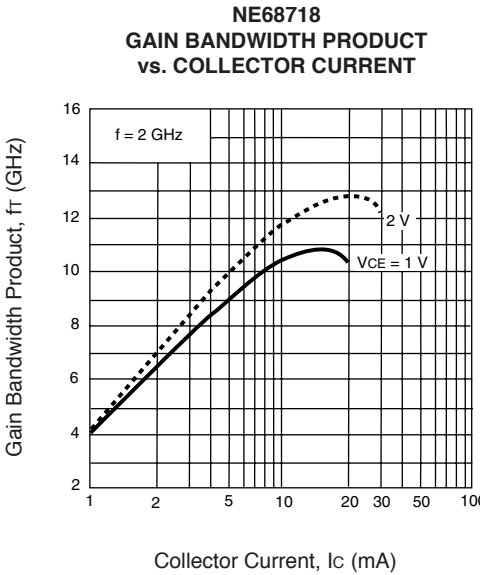
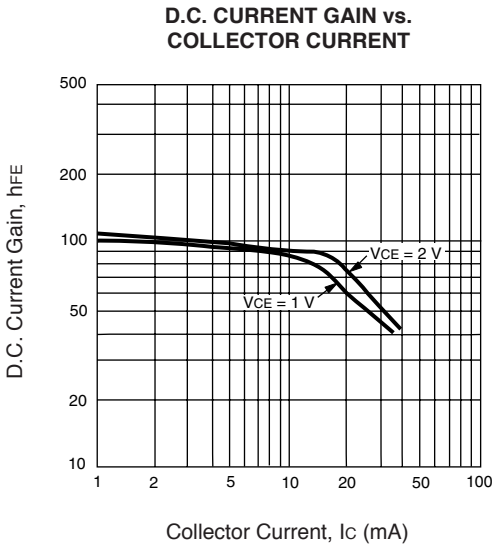
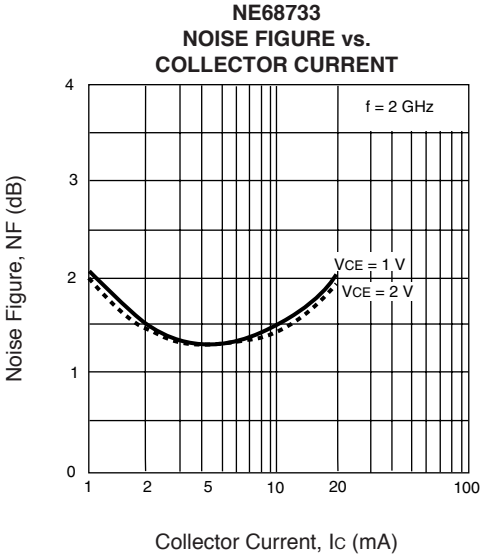
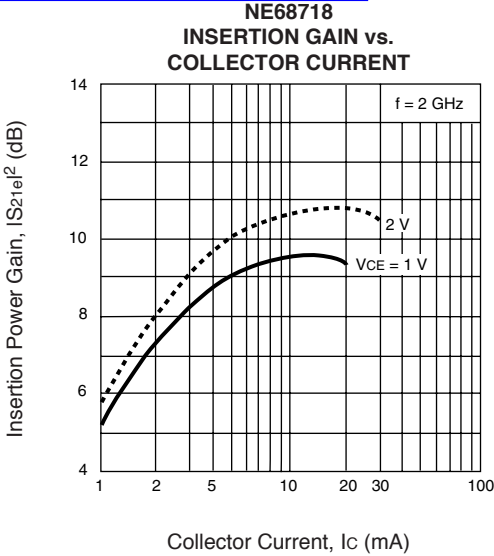


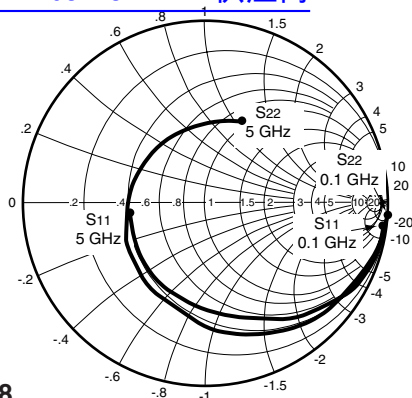
COLLECTOR CURRENT vs.  
COLLECTOR TO EMITTER VOLTAGE



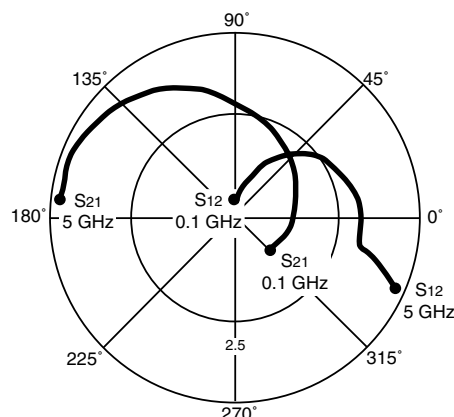
TYPICAL PERFORMANCE CURVES (TA = 25°C)

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TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)[查询“NE68718-T1-A”供应商](#)

Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 1 V, I<sub>C</sub> = 1 mA)



## NE68718

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 1.0 mA

| FREQUENCY<br>GHz | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |         | S <sub>22</sub> |          | K     | MAG <sup>1</sup><br>(dB) |
|------------------|-----------------|----------|-----------------|---------|-----------------|---------|-----------------|----------|-------|--------------------------|
|                  | MAG             | ANG      | MAG             | ANG     | MAG             | ANG     | MAG             | ANG      |       |                          |
| 0.1              | 0.962           | -8.100   | 3.385           | 168.800 | 0.023           | 81.800  | 0.993           | -6.700   | 0.122 | 21.678                   |
| 0.4              | 0.893           | -38.800  | 3.278           | 144.800 | 0.091           | 62.800  | 0.944           | -25.400  | 0.160 | 15.566                   |
| 0.8              | 0.755           | -73.500  | 2.809           | 114.700 | 0.152           | 40.300  | 0.831           | -45.900  | 0.321 | 12.667                   |
| 1.0              | 0.689           | -89.000  | 2.566           | 101.800 | 0.170           | 31.300  | 0.776           | -54.200  | 0.399 | 11.788                   |
| 1.5              | 0.559           | -124.000 | 2.063           | 74.800  | 0.192           | 13.700  | 0.666           | -71.100  | 0.593 | 10.312                   |
| 2.0              | 0.481           | -154.200 | 1.704           | 52.700  | 0.197           | 2.300   | 0.599           | -84.300  | 0.787 | 9.370                    |
| 2.5              | 0.440           | 178.000  | 1.461           | 33.400  | 0.195           | -5.200  | 0.560           | -96.200  | 0.968 | 8.746                    |
| 3.0              | 0.417           | 152.500  | 1.288           | 16.800  | 0.195           | -9.700  | 0.531           | -107.700 | 1.131 | 5.997                    |
| 4.0              | 0.434           | 103.700  | 1.083           | -13.500 | 0.215           | -14.400 | 0.473           | -133.500 | 1.264 | 3.931                    |
| 5.0              | 0.512           | 63.400   | 0.929           | -42.700 | 0.270           | -23.500 | 0.410           | -174.700 | 1.201 | 2.658                    |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 3.0 mA

|     |       |          |       |         |       |         |       |          |       |        |
|-----|-------|----------|-------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.872 | -14.000  | 8.998 | 165.400 | 0.023 | 80.600  | 0.971 | -11.300  | 0.117 | 25.924 |
| 0.4 | 0.710 | -60.600  | 7.542 | 130.500 | 0.079 | 55.100  | 0.807 | -39.500  | 0.288 | 19.799 |
| 0.8 | 0.501 | -104.700 | 5.258 | 99.100  | 0.114 | 37.200  | 0.595 | -61.600  | 0.543 | 16.639 |
| 1.0 | 0.438 | -122.100 | 4.463 | 87.700  | 0.124 | 32.100  | 0.527 | -68.900  | 0.653 | 15.562 |
| 1.5 | 0.354 | -159.700 | 3.211 | 65.100  | 0.144 | 24.100  | 0.425 | -82.000  | 0.875 | 13.483 |
| 2.0 | 0.321 | 170.800  | 2.502 | 46.800  | 0.164 | 18.400  | 0.377 | -92.400  | 1.025 | 10.866 |
| 2.5 | 0.312 | 145.400  | 2.064 | 30.300  | 0.186 | 12.900  | 0.352 | -101.800 | 1.112 | 8.414  |
| 3.0 | 0.311 | 123.000  | 1.777 | 15.400  | 0.210 | 6.800   | 0.334 | -111.500 | 1.160 | 6.851  |
| 4.0 | 0.361 | 83.600   | 1.438 | -12.600 | 0.263 | -7.700  | 0.280 | -136.000 | 1.163 | 4.930  |
| 5.0 | 0.461 | 51.700   | 1.206 | -40.100 | 0.315 | -25.300 | 0.211 | 177.500  | 1.140 | 3.560  |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 10.0 mA

|     |       |          |        |         |       |         |       |          |       |        |
|-----|-------|----------|--------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.645 | -29.400  | 21.295 | 155.400 | 0.019 | 74.200  | 0.892 | -21.300  | 0.247 | 30.495 |
| 0.4 | 0.392 | -95.800  | 12.537 | 110.900 | 0.055 | 55.600  | 0.541 | -57.100  | 0.618 | 23.578 |
| 0.8 | 0.270 | -144.400 | 7.101  | 85.100  | 0.085 | 50.500  | 0.347 | -73.800  | 0.884 | 19.219 |
| 1.0 | 0.252 | -161.700 | 5.792  | 76.200  | 0.100 | 48.600  | 0.303 | -79.000  | 0.948 | 17.628 |
| 1.5 | 0.234 | 164.600  | 3.980  | 58.000  | 0.136 | 42.200  | 0.249 | -89.300  | 1.037 | 13.489 |
| 2.0 | 0.234 | 140.600  | 3.042  | 42.500  | 0.174 | 34.400  | 0.226 | -98.900  | 1.069 | 10.825 |
| 2.5 | 0.235 | 121.100  | 2.489  | 27.900  | 0.212 | 25.600  | 0.215 | -107.400 | 1.079 | 8.983  |
| 3.0 | 0.242 | 103.100  | 2.127  | 14.200  | 0.249 | 16.000  | 0.207 | -117.800 | 1.080 | 7.590  |
| 4.0 | 0.300 | 73.800   | 1.705  | -12.200 | 0.318 | -4.300  | 0.161 | -151.100 | 1.065 | 5.736  |
| 5.0 | 0.414 | 47.400   | 1.421  | -38.700 | 0.374 | -25.800 | 0.141 | 133.500  | 1.054 | 4.375  |

V<sub>CE</sub> = 2.0 V, I<sub>C</sub> = 3.0 mA

|     |       |          |       |         |       |         |       |          |       |        |
|-----|-------|----------|-------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.881 | -12.200  | 9.094 | 166.600 | 0.017 | 79.500  | 0.977 | -9.600   | 0.142 | 27.283 |
| 0.4 | 0.736 | -52.900  | 7.869 | 134.300 | 0.066 | 58.400  | 0.844 | -34.300  | 0.280 | 20.764 |
| 0.8 | 0.527 | -92.900  | 5.706 | 103.400 | 0.099 | 40.800  | 0.653 | -54.800  | 0.521 | 17.607 |
| 1.0 | 0.454 | -109.000 | 4.901 | 91.900  | 0.109 | 35.700  | 0.586 | -61.700  | 0.629 | 16.529 |
| 1.5 | 0.344 | -144.400 | 3.575 | 69.100  | 0.128 | 27.300  | 0.485 | -74.400  | 0.847 | 14.461 |
| 2.0 | 0.294 | -174.000 | 2.789 | 50.900  | 0.146 | 21.700  | 0.434 | -84.700  | 1.002 | 12.525 |
| 2.5 | 0.274 | 159.700  | 2.308 | 34.500  | 0.166 | 16.500  | 0.410 | -94.000  | 1.087 | 9.632  |
| 3.0 | 0.264 | 136.200  | 1.980 | 19.800  | 0.189 | 11.100  | 0.393 | -103.600 | 1.134 | 7.975  |
| 4.0 | 0.306 | 94.100   | 1.605 | -7.800  | 0.241 | -2.400  | 0.343 | -126.700 | 1.130 | 6.042  |
| 5.0 | 0.407 | 59.500   | 1.356 | -35.700 | 0.296 | -19.700 | 0.264 | -167.400 | 1.102 | 4.663  |

Note:

1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}|^2}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

## NE687 SERIES

### TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)

[查询“NE68718-T1-A”供应商](#)

#### NE68718

V<sub>CE</sub> = 2.0 V, I<sub>C</sub> = 7.0 mA

| FREQUENCY | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |         | S <sub>22</sub> |          | K     | MAG <sup>1</sup> |
|-----------|-----------------|----------|-----------------|---------|-----------------|---------|-----------------|----------|-------|------------------|
| GHz       | MAG             | ANG      | MAG             | ANG     | MAG             | ANG     | MAG             | ANG      |       | (dB)             |
| 0.1       | 0.745           | -19.300  | 17.318          | 160.600 | 0.017           | 74.400  | 0.942           | -14.900  | 0.242 | 30.080           |
| 0.4       | 0.501           | -72.400  | 12.131          | 119.600 | 0.053           | 57.300  | 0.677           | -44.600  | 0.500 | 23.596           |
| 0.8       | 0.306           | -114.500 | 7.399           | 91.300  | 0.080           | 48.800  | 0.471           | -60.500  | 0.790 | 19.661           |
| 1.0       | 0.257           | -131.700 | 6.113           | 81.600  | 0.092           | 46.600  | 0.419           | -65.300  | 0.877 | 18.225           |
| 1.5       | 0.202           | -168.800 | 4.245           | 62.300  | 0.123           | 40.700  | 0.354           | -74.800  | 0.995 | 15.380           |
| 2.0       | 0.181           | 160.000  | 3.252           | 46.200  | 0.155           | 34.000  | 0.326           | -84.000  | 1.051 | 11.842           |
| 2.5       | 0.177           | 134.700  | 2.655           | 31.300  | 0.187           | 26.200  | 0.315           | -92.700  | 1.073 | 9.870            |
| 3.0       | 0.182           | 113.100  | 2.269           | 17.600  | 0.219           | 17.800  | 0.305           | -102.300 | 1.080 | 8.424            |
| 4.0       | 0.236           | 78.300   | 1.820           | -8.500  | 0.284           | -0.500  | 0.257           | -127.400 | 1.065 | 6.508            |
| 5.0       | 0.356           | 50.600   | 1.530           | -35.200 | 0.343           | -21.000 | 0.175           | -178.000 | 1.049 | 5.142            |

V<sub>CE</sub> = 2.0 V, I<sub>C</sub> = 20.0 mA

|     |       |          |        |         |       |         |       |          |       |        |
|-----|-------|----------|--------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.491 | -34.600  | 29.872 | 150.600 | 0.014 | 74.200  | 0.851 | -22.900  | 0.370 | 33.291 |
| 0.4 | 0.259 | -102.300 | 15.243 | 105.900 | 0.042 | 63.500  | 0.479 | -52.400  | 0.781 | 25.598 |
| 0.8 | 0.174 | -151.900 | 8.321  | 82.800  | 0.072 | 59.100  | 0.327 | -62.200  | 0.966 | 20.628 |
| 1.0 | 0.160 | -169.400 | 6.748  | 74.700  | 0.087 | 56.600  | 0.296 | -65.700  | 1.004 | 18.526 |
| 1.5 | 0.158 | 155.900  | 4.599  | 57.900  | 0.125 | 48.700  | 0.262 | -74.300  | 1.040 | 14.437 |
| 2.0 | 0.163 | 131.600  | 3.497  | 43.300  | 0.163 | 39.800  | 0.249 | -83.500  | 1.053 | 11.911 |
| 2.5 | 0.169 | 112.200  | 2.843  | 29.400  | 0.199 | 30.300  | 0.246 | -92.200  | 1.057 | 10.084 |
| 3.0 | 0.173 | 95.000   | 2.416  | 16.300  | 0.235 | 20.300  | 0.242 | -102.400 | 1.058 | 8.648  |
| 4.0 | 0.228 | 69.700   | 1.929  | -9.100  | 0.303 | 0.001   | 0.196 | -130.200 | 1.044 | 6.752  |
| 5.0 | 0.349 | 46.900   | 1.611  | -35.100 | 0.361 | -21.600 | 0.127 | 164.300  | 1.035 | 5.346  |

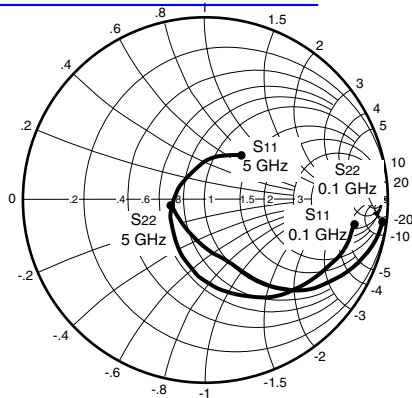
Note:

1. Gain Calculations:

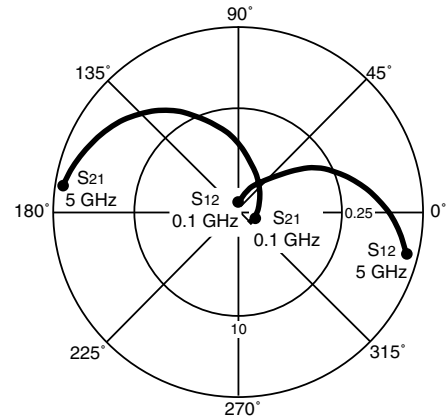
$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL SCATTERING PARAMETERS ( $T_A = 25^\circ\text{C}$ )[查询“NE68718-T1-A”供应商](#)

Coordinates in Ohms  
Frequency in GHz  
( $V_{CE} = 2\text{ V}$ ,  $I_C = 5\text{ mA}$ )



## NE68719

 $V_{CE} = 1.0\text{ V}$ ,  $I_C = 1.0\text{ mA}$ 

| FREQUENCY | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |         | S <sub>22</sub> |          | K     | MAG <sup>1</sup> |
|-----------|-----------------|----------|-----------------|---------|-----------------|---------|-----------------|----------|-------|------------------|
| GHz       | MAG             | ANG      | MAG             | ANG     | MAG             | ANG     | MAG             | ANG      |       | (dB)             |
| 0.1       | 0.945           | -9.900   | 3.475           | 168.900 | 0.027           | 82.500  | 0.992           | -6.900   | 0.085 | 21.096           |
| 0.4       | 0.890           | -39.700  | 3.213           | 143.800 | 0.097           | 62.200  | 0.936           | -25.900  | 0.174 | 15.201           |
| 0.8       | 0.748           | -74.800  | 2.705           | 114.000 | 0.158           | 40.600  | 0.817           | -45.200  | 0.336 | 12.335           |
| 1.0       | 0.682           | -89.600  | 2.449           | 101.900 | 0.176           | 32.300  | 0.764           | -52.500  | 0.417 | 11.435           |
| 1.5       | 0.559           | -122.400 | 1.957           | 76.300  | 0.197           | 17.100  | 0.658           | -65.800  | 0.624 | 9.971            |
| 2.0       | 0.488           | -150.400 | 1.629           | 55.800  | 0.203           | 7.800   | 0.589           | -75.500  | 0.822 | 9.044            |
| 2.5       | 0.441           | -176.700 | 1.427           | 38.000  | 0.206           | 2.300   | 0.540           | -84.200  | 0.994 | 8.406            |
| 3.0       | 0.411           | -158.700 | 1.288           | 22.100  | 0.210           | -0.600  | 0.494           | -94.200  | 1.148 | 5.541            |
| 4.0       | 0.408           | 110.100  | 1.113           | -7.200  | 0.247           | -4.600  | 0.409           | -123.800 | 1.233 | 3.628            |
| 5.0       | 0.457           | 64.500   | 0.959           | -35.600 | 0.319           | -14.700 | 0.393           | -171.200 | 1.147 | 2.454            |

 $V_{CE} = 1.0\text{ V}$ ,  $I_C = 3.0\text{ mA}$ 

|     |       |          |       |         |       |         |       |          |       |        |
|-----|-------|----------|-------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.854 | -15.800  | 9.251 | 165.000 | 0.026 | 79.100  | 0.969 | -11.700  | 0.132 | 25.512 |
| 0.4 | 0.694 | -60.500  | 7.411 | 129.600 | 0.082 | 55.800  | 0.792 | -40.000  | 0.312 | 19.561 |
| 0.8 | 0.485 | -102.100 | 5.078 | 99.200  | 0.117 | 40.200  | 0.582 | -60.000  | 0.575 | 16.375 |
| 1.0 | 0.425 | -118.200 | 4.308 | 88.600  | 0.128 | 36.100  | 0.517 | -65.700  | 0.683 | 15.271 |
| 1.5 | 0.332 | -150.100 | 3.098 | 67.200  | 0.152 | 30.200  | 0.421 | -74.600  | 0.902 | 13.092 |
| 2.0 | 0.294 | -176.000 | 2.442 | 50.200  | 0.177 | 25.900  | 0.368 | -80.500  | 1.034 | 10.273 |
| 2.5 | 0.277 | 160.700  | 2.052 | 34.700  | 0.207 | 21.200  | 0.331 | -86.100  | 1.093 | 8.101  |
| 3.0 | 0.266 | 140.200  | 1.795 | 20.500  | 0.240 | 15.400  | 0.295 | -94.200  | 1.123 | 6.608  |
| 4.0 | 0.304 | 97.300   | 1.486 | -6.400  | 0.312 | 0.800   | 0.212 | -127.000 | 1.108 | 4.780  |
| 5.0 | 0.386 | 55.900   | 1.263 | -33.100 | 0.379 | -17.300 | 0.215 | 172.500  | 1.074 | 3.562  |

 $V_{CE} = 1.0\text{ V}$ ,  $I_C = 10.0\text{ mA}$ 

|     |       |          |        |         |       |         |       |          |       |        |
|-----|-------|----------|--------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.621 | -32.800  | 21.498 | 153.900 | 0.022 | 74.000  | 0.883 | -22.400  | 0.255 | 29.900 |
| 0.4 | 0.376 | -98.600  | 11.952 | 109.600 | 0.057 | 56.500  | 0.514 | -57.600  | 0.651 | 23.216 |
| 0.8 | 0.257 | -144.700 | 6.684  | 85.200  | 0.089 | 52.900  | 0.325 | -71.000  | 0.916 | 18.756 |
| 1.0 | 0.233 | -161.000 | 5.451  | 76.800  | 0.105 | 51.400  | 0.284 | -74.100  | 0.980 | 17.153 |
| 1.5 | 0.206 | 169.800  | 3.754  | 59.800  | 0.146 | 45.700  | 0.231 | -78.100  | 1.055 | 12.670 |
| 2.0 | 0.195 | 148.100  | 2.890  | 45.100  | 0.187 | 38.600  | 0.204 | -81.300  | 1.085 | 10.111 |
| 2.5 | 0.190 | 130.800  | 2.374  | 31.500  | 0.230 | 30.200  | 0.184 | -84.500  | 1.092 | 8.288  |
| 3.0 | 0.192 | 116.700  | 2.055  | 18.600  | 0.272 | 21.200  | 0.159 | -91.900  | 1.090 | 6.956  |
| 4.0 | 0.258 | 84.100   | 1.666  | -6.900  | 0.353 | 1.600   | 0.087 | -145.200 | 1.069 | 5.134  |
| 5.0 | 0.369 | 47.400   | 1.402  | -31.900 | 0.414 | -19.100 | 0.170 | 137.600  | 1.048 | 3.958  |

 $V_{CE} = 2.0\text{ V}$ ,  $I_C = 3.0\text{ mA}$ 

|     |       |          |       |         |       |         |       |          |       |        |
|-----|-------|----------|-------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.875 | -14.200  | 9.368 | 165.600 | 0.022 | 79.800  | 0.975 | -10.200  | 0.134 | 26.292 |
| 0.4 | 0.713 | -54.800  | 7.686 | 132.000 | 0.070 | 57.900  | 0.817 | -35.100  | 0.322 | 20.406 |
| 0.8 | 0.503 | -92.800  | 5.388 | 101.900 | 0.103 | 42.800  | 0.615 | -53.100  | 0.587 | 17.186 |
| 1.0 | 0.429 | -107.500 | 4.581 | 91.300  | 0.113 | 38.800  | 0.551 | -58.300  | 0.704 | 16.079 |
| 1.5 | 0.325 | -137.400 | 3.322 | 70.100  | 0.136 | 32.800  | 0.453 | -66.500  | 0.924 | 13.879 |
| 2.0 | 0.270 | -163.000 | 2.611 | 53.200  | 0.159 | 28.900  | 0.402 | -72.600  | 1.063 | 10.615 |
| 2.5 | 0.241 | 175.400  | 2.175 | 38.300  | 0.185 | 24.600  | 0.368 | -78.200  | 1.140 | 8.432  |
| 3.0 | 0.226 | 155.900  | 1.903 | 24.700  | 0.216 | 19.600  | 0.337 | -85.800  | 1.160 | 7.024  |
| 4.0 | 0.247 | 111.400  | 1.588 | -1.600  | 0.288 | 6.100   | 0.256 | -113.400 | 1.125 | 5.264  |
| 5.0 | 0.328 | 65.600   | 1.369 | -28.500 | 0.359 | -11.900 | 0.245 | -168.700 | 1.062 | 4.288  |

See note on previous page.

NE687 SERIES

TYPICAL SCATTERING PARAMETERS (TA = 25°C)

[查询"NE68718-T1-A"供应商](#)

NE68719

VCE = 2.0 V, IC = 5.0 mA

| FREQUENCY |  | S11   |          | S21    |         | S12   |         | S22   |          | K     | MAG <sup>1</sup> |
|-----------|--|-------|----------|--------|---------|-------|---------|-------|----------|-------|------------------|
| GHz       |  | MAG   | ANG      | MAG    | ANG     | MAG   | ANG     | MAG   | ANG      |       | (dB)             |
| 0.1       |  | 0.795 | -18.000  | 13.956 | 162.300 | 0.020 | 76.300  | 0.954 | -13.300  | 0.200 | 28.437           |
| 0.4       |  | 0.577 | -66.300  | 10.170 | 123.500 | 0.062 | 56.800  | 0.721 | -41.500  | 0.440 | 22.149           |
| 0.8       |  | 0.364 | -106.100 | 6.431  | 94.800  | 0.090 | 46.900  | 0.508 | -57.100  | 0.740 | 18.540           |
| 1.0       |  | 0.303 | -120.700 | 5.350  | 85.100  | 0.102 | 44.900  | 0.452 | -61.000  | 0.844 | 17.198           |
| 1.5       |  | 0.224 | -151.800 | 3.763  | 65.800  | 0.132 | 40.100  | 0.377 | -66.900  | 1.000 | 14.550           |
| 2.0       |  | 0.187 | -178.500 | 2.912  | 49.900  | 0.163 | 35.300  | 0.340 | -71.600  | 1.079 | 10.809           |
| 2.5       |  | 0.171 | 159.500  | 2.403  | 35.700  | 0.197 | 29.100  | 0.316 | -76.100  | 1.108 | 8.858            |
| 3.0       |  | 0.165 | 139.500  | 2.086  | 22.700  | 0.233 | 22.100  | 0.291 | -83.000  | 1.112 | 7.483            |
| 4.0       |  | 0.212 | 96.600   | 1.712  | -2.900  | 0.309 | 5.600   | 0.207 | -110.900 | 1.087 | 5.641            |
| 5.0       |  | 0.319 | 53.600   | 1.460  | -29.000 | 0.378 | -14.000 | 0.192 | -174.900 | 1.047 | 4.538            |

VCE = 2.0 V, IC = 20.0 mA

|     |       |          |        |         |       |         |       |          |       |        |
|-----|-------|----------|--------|---------|-------|---------|-------|----------|-------|--------|
| 0.1 | 0.469 | -38.900  | 29.942 | 148.800 | 0.016 | 71.900  | 0.835 | -24.600  | 0.390 | 32.722 |
| 0.4 | 0.247 | -106.600 | 14.412 | 104.600 | 0.045 | 64.000  | 0.448 | -53.100  | 0.809 | 25.055 |
| 0.8 | 0.166 | -153.400 | 7.775  | 82.800  | 0.077 | 61.100  | 0.303 | -59.500  | 0.987 | 20.042 |
| 1.0 | 0.148 | -169.000 | 6.300  | 75.200  | 0.094 | 58.900  | 0.276 | -60.900  | 1.018 | 17.433 |
| 1.5 | 0.129 | 161.600  | 4.295  | 59.400  | 0.135 | 51.600  | 0.246 | -63.500  | 1.056 | 13.584 |
| 2.0 | 0.122 | 139.700  | 3.279  | 45.600  | 0.176 | 43.500  | 0.232 | -66.900  | 1.069 | 11.099 |
| 2.5 | 0.115 | 124.900  | 2.678  | 32.900  | 0.217 | 34.400  | 0.223 | -70.400  | 1.072 | 9.271  |
| 3.0 | 0.116 | 114.300  | 2.304  | 20.600  | 0.258 | 25.300  | 0.205 | -77.100  | 1.069 | 7.908  |
| 4.0 | 0.187 | 85.100   | 1.857  | -3.600  | 0.337 | 5.700   | 0.120 | -110.500 | 1.053 | 6.005  |
| 5.0 | 0.307 | 47.800   | 1.572  | -28.300 | 0.403 | -15.200 | 0.137 | 160.100  | 1.032 | 4.822  |

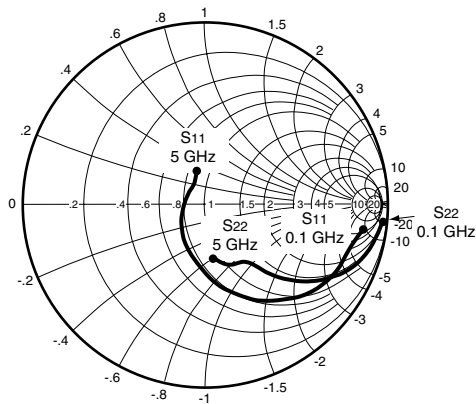
Note:

1. Gain Calculations:

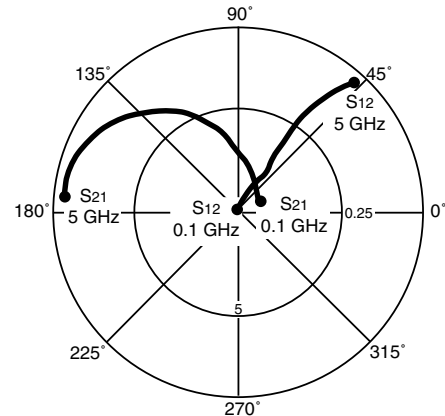
$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$
. When  $K \leq 1$ , MAG is undefined and MSG values are used.  $MSG = \frac{|S_{21}|}{|S_{12}|}$ ,  $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}$ ,  $\Delta = S_{11} S_{22} - S_{21} S_{12}$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)[查询"NE68718-T1-A"供应商](#)

Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 2 V, I<sub>c</sub> = 3 mA)



## NE68730

V<sub>CE</sub> = 1.0 V, I<sub>c</sub> = 1.0 mA

| FREQUENCY | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |        | S <sub>22</sub> |         | K     | MAG <sup>1</sup> |
|-----------|-----------------|----------|-----------------|---------|-----------------|--------|-----------------|---------|-------|------------------|
| GHz       | MAG             | ANG      | MAG             | ANG     | MAG             | ANG    | MAG             | ANG     |       | (dB)             |
| 0.1       | 0.942           | -7.800   | 3.487           | 169.100 | 0.028           | 84.900 | 0.991           | -5.800  | 0.098 | 20.953           |
| 0.4       | 0.870           | -35.400  | 3.178           | 146.800 | 0.103           | 67.200 | 0.924           | -21.300 | 0.208 | 14.893           |
| 0.8       | 0.714           | -65.000  | 2.676           | 120.900 | 0.167           | 51.600 | 0.791           | -36.200 | 0.392 | 12.048           |
| 1.0       | 0.639           | -77.100  | 2.433           | 110.800 | 0.185           | 46.500 | 0.732           | -41.300 | 0.484 | 11.190           |
| 1.5       | 0.493           | -103.600 | 1.944           | 90.400  | 0.207           | 39.200 | 0.621           | -50.400 | 0.707 | 9.727            |
| 2.0       | 0.400           | -125.900 | 1.621           | 75.500  | 0.216           | 38.200 | 0.557           | -56.400 | 0.905 | 8.753            |
| 2.5       | 0.334           | -147.500 | 1.412           | 63.200  | 0.224           | 41.400 | 0.520           | -61.600 | 1.063 | 6.464            |
| 3.0       | 0.298           | -169.000 | 1.269           | 53.200  | 0.242           | 46.600 | 0.495           | -66.800 | 1.139 | 4.930            |
| 4.0       | 0.268           | 145.900  | 1.085           | 38.200  | 0.325           | 53.700 | 0.455           | -77.900 | 1.108 | 3.231            |
| 5.0       | 0.328           | 110.600  | 0.990           | 26.400  | 0.449           | 51.000 | 0.389           | -96.200 | 1.016 | 2.652            |

V<sub>CE</sub> = 1.0 V, I<sub>c</sub> = 3.0 mA

|     |       |          |       |         |       |        |       |         |       |        |
|-----|-------|----------|-------|---------|-------|--------|-------|---------|-------|--------|
| 0.1 | 0.853 | -14.800  | 9.270 | 164.300 | 0.026 | 81.700 | 0.963 | -11.100 | 0.134 | 25.521 |
| 0.4 | 0.653 | -55.800  | 7.088 | 131.200 | 0.087 | 61.800 | 0.758 | -35.400 | 0.385 | 19.110 |
| 0.8 | 0.430 | -89.900  | 4.754 | 105.400 | 0.126 | 54.000 | 0.541 | -49.200 | 0.670 | 15.767 |
| 1.0 | 0.361 | -102.200 | 4.019 | 97.100  | 0.141 | 53.300 | 0.477 | -52.300 | 0.778 | 14.549 |
| 1.5 | 0.260 | -128.600 | 2.893 | 81.600  | 0.177 | 54.200 | 0.388 | -56.600 | 0.951 | 12.134 |
| 2.0 | 0.207 | -150.800 | 2.283 | 70.200  | 0.215 | 55.000 | 0.348 | -59.300 | 1.037 | 9.084  |
| 2.5 | 0.173 | -173.200 | 1.916 | 60.600  | 0.255 | 55.100 | 0.330 | -62.000 | 1.073 | 7.114  |
| 3.0 | 0.159 | 165.900  | 1.681 | 52.200  | 0.298 | 54.300 | 0.322 | -65.400 | 1.072 | 5.880  |
| 4.0 | 0.166 | 126.100  | 1.394 | 38.600  | 0.387 | 50.200 | 0.302 | -74.700 | 1.049 | 4.212  |
| 5.0 | 0.239 | 103.800  | 1.242 | 26.600  | 0.476 | 43.700 | 0.235 | -92.200 | 1.020 | 3.302  |

V<sub>CE</sub> = 1.0 V, I<sub>c</sub> = 10.0 mA

|     |       |          |        |         |       |        |       |         |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|---------|-------|--------|
| 0.1 | 0.590 | -30.900  | 20.999 | 151.700 | 0.022 | 75.800 | 0.864 | -21.900 | 0.319 | 29.798 |
| 0.4 | 0.314 | -84.600  | 10.808 | 111.200 | 0.064 | 66.400 | 0.479 | -48.700 | 0.749 | 22.276 |
| 0.8 | 0.184 | -120.500 | 5.986  | 92.200  | 0.107 | 68.000 | 0.312 | -53.100 | 0.950 | 17.478 |
| 1.0 | 0.155 | -133.700 | 4.891  | 86.500  | 0.129 | 68.100 | 0.279 | -53.400 | 0.988 | 15.788 |
| 1.5 | 0.119 | -163.200 | 3.377  | 75.100  | 0.184 | 66.800 | 0.239 | -53.900 | 1.030 | 11.572 |
| 2.0 | 0.100 | 170.800  | 2.615  | 66.300  | 0.239 | 63.900 | 0.225 | -55.300 | 1.043 | 9.127  |
| 2.5 | 0.098 | 146.300  | 2.171  | 58.300  | 0.292 | 60.600 | 0.223 | -57.600 | 1.040 | 7.483  |
| 3.0 | 0.099 | 129.000  | 1.884  | 50.900  | 0.342 | 56.800 | 0.224 | -61.100 | 1.035 | 6.265  |
| 4.0 | 0.121 | 99.700   | 1.545  | 38.800  | 0.435 | 48.800 | 0.211 | -72.200 | 1.024 | 4.560  |
| 5.0 | 0.193 | 95.100   | 1.366  | 27.400  | 0.516 | 40.200 | 0.140 | -95.100 | 1.012 | 3.565  |

Note:

1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

NE687 SERIES

TYPICAL SCATTERING PARAMETERS (TA = 25°C)

[查询"NE68718-T1-A"供应商](#)

NE68730

VCE = 2.0 V, IC = 3.0 mA

| FREQUENCY<br>GHz | S11   |          | S21   |         | S12   |        | S22   |         | K     | MAG <sup>1</sup><br>(dB) |
|------------------|-------|----------|-------|---------|-------|--------|-------|---------|-------|--------------------------|
|                  | MAG   | ANG      | MAG   | ANG     | MAG   | ANG    | MAG   | ANG     |       |                          |
| 0.1              | 0.850 | -12.800  | 9.307 | 165.200 | 0.023 | 81.500 | 0.970 | -9.600  | 0.158 | 26.071                   |
| 0.4              | 0.678 | -49.700  | 7.314 | 133.800 | 0.076 | 64.100 | 0.792 | -30.800 | 0.381 | 19.833                   |
| 0.8              | 0.450 | -80.500  | 5.036 | 108.200 | 0.114 | 56.500 | 0.587 | -43.100 | 0.659 | 16.452                   |
| 1.0              | 0.375 | -91.900  | 4.279 | 99.900  | 0.128 | 55.900 | 0.526 | -45.800 | 0.763 | 15.241                   |
| 1.5              | 0.256 | -114.600 | 3.094 | 84.300  | 0.162 | 56.700 | 0.439 | -49.300 | 0.939 | 12.810                   |
| 2.0              | 0.187 | -135.300 | 2.436 | 73.000  | 0.197 | 57.600 | 0.402 | -51.700 | 1.027 | 9.908                    |
| 2.5              | 0.141 | -156.700 | 2.040 | 63.500  | 0.236 | 58.000 | 0.385 | -54.100 | 1.060 | 7.874                    |
| 3.0              | 0.115 | 179.500  | 1.782 | 55.100  | 0.276 | 57.500 | 0.379 | -57.300 | 1.062 | 6.578                    |
| 4.0              | 0.110 | 127.300  | 1.466 | 41.900  | 0.362 | 54.300 | 0.365 | -65.400 | 1.039 | 4.866                    |
| 5.0              | 0.184 | 103.000  | 1.305 | 30.400  | 0.453 | 48.700 | 0.305 | -78.400 | 1.004 | 4.201                    |

VCE = 2.0 V, IC = 5.0 mA

|     |       |          |        |         |       |        |       |         |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|---------|-------|--------|
| 0.1 | 0.781 | -17.800  | 13.806 | 161.000 | 0.021 | 80.300 | 0.945 | -12.700 | 0.194 | 28.178 |
| 0.4 | 0.531 | -58.400  | 9.434  | 124.700 | 0.067 | 64.700 | 0.683 | -36.000 | 0.533 | 21.486 |
| 0.8 | 0.313 | -86.300  | 5.827  | 101.200 | 0.103 | 62.400 | 0.482 | -44.100 | 0.816 | 17.526 |
| 1.0 | 0.250 | -96.500  | 4.846  | 94.100  | 0.120 | 62.900 | 0.433 | -45.200 | 0.894 | 16.062 |
| 1.5 | 0.160 | -117.000 | 3.408  | 80.700  | 0.163 | 63.600 | 0.371 | -46.600 | 0.998 | 13.203 |
| 2.0 | 0.104 | -136.200 | 2.651  | 70.800  | 0.208 | 62.900 | 0.348 | -48.200 | 1.037 | 9.874  |
| 2.5 | 0.067 | -163.800 | 2.205  | 62.300  | 0.253 | 61.400 | 0.340 | -50.400 | 1.047 | 8.077  |
| 3.0 | 0.053 | 164.400  | 1.913  | 54.600  | 0.298 | 59.300 | 0.339 | -53.700 | 1.041 | 6.833  |
| 4.0 | 0.069 | 98.700   | 1.562  | 42.300  | 0.386 | 53.800 | 0.328 | -62.200 | 1.027 | 5.072  |
| 5.0 | 0.143 | 93.700   | 1.390  | 31.200  | 0.474 | 47.100 | 0.265 | -75.500 | 1.002 | 4.419  |

VCE = 2.0 V, IC = 20.0 mA

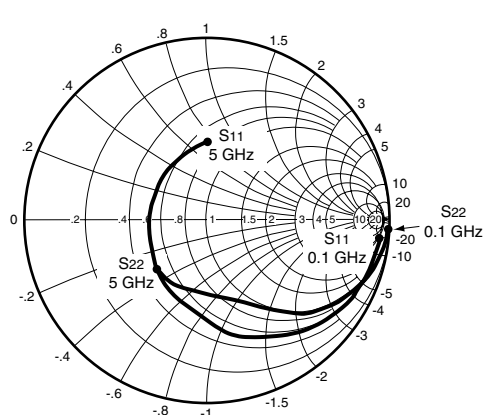
|     |       |          |        |         |       |        |       |         |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|---------|-------|--------|
| 0.1 | 0.447 | -35.800  | 28.663 | 146.000 | 0.017 | 76.400 | 0.808 | -24.200 | 0.451 | 32.269 |
| 0.4 | 0.200 | -84.600  | 12.701 | 106.600 | 0.052 | 72.800 | 0.422 | -43.500 | 0.876 | 23.878 |
| 0.8 | 0.103 | -117.300 | 6.817  | 90.300  | 0.096 | 74.000 | 0.301 | -42.600 | 0.989 | 18.513 |
| 1.0 | 0.081 | -131.600 | 5.544  | 85.300  | 0.117 | 73.500 | 0.280 | -42.000 | 1.010 | 16.144 |
| 1.5 | 0.054 | -168.200 | 3.795  | 75.300  | 0.171 | 70.900 | 0.258 | -42.600 | 1.028 | 12.443 |
| 2.0 | 0.046 | 154.600  | 2.921  | 67.300  | 0.224 | 67.400 | 0.253 | -44.500 | 1.030 | 10.086 |
| 2.5 | 0.049 | 118.800  | 2.407  | 59.900  | 0.274 | 63.700 | 0.256 | -47.300 | 1.029 | 8.397  |
| 3.0 | 0.057 | 99.400   | 2.076  | 53.200  | 0.322 | 59.900 | 0.261 | -51.500 | 1.023 | 7.169  |
| 4.0 | 0.086 | 75.300   | 1.681  | 41.800  | 0.410 | 52.100 | 0.255 | -61.800 | 1.014 | 5.396  |
| 5.0 | 0.140 | 86.000   | 1.478  | 31.200  | 0.490 | 44.000 | 0.187 | -77.200 | 1.005 | 4.368  |

Note:

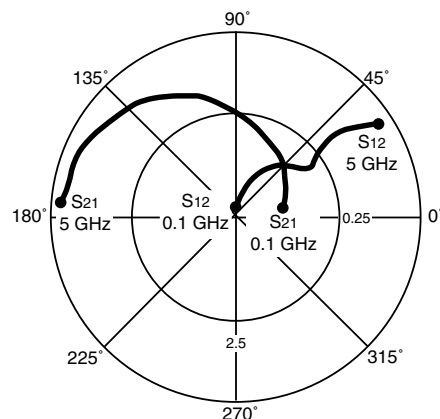
1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$
. When  $K \leq 1$ , MAG is undefined and MSG values are used.  $\text{MSG} = \frac{|S_{21}|}{|S_{12}|}$ ,  $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}$ ,  $\Delta = S_{11} S_{22} - S_{21} S_{12}$

MAG = Maximum Available Gain  
MSG = Maximum Stable Gain

TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)[查询"NE68718-T1-A"供应商](#)

Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 1 V, I<sub>C</sub> = 1 mA)



## NE68733

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 1.0 mA

| FREQUENCY | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |        | S <sub>22</sub> |          | K     | MAG <sup>1</sup> |
|-----------|-----------------|----------|-----------------|---------|-----------------|--------|-----------------|----------|-------|------------------|
| GHz       | MAG             | ANG      | MAG             | ANG     | MAG             | ANG    | MAG             | ANG      |       | (dB)             |
| 0.1       | 0.953           | -8.300   | 3.433           | 170.300 | 0.031           | 83.500 | 0.990           | -6.200   | 0.090 | 20.443           |
| 0.4       | 0.864           | -36.800  | 3.200           | 144.900 | 0.111           | 66.000 | 0.921           | -23.100  | 0.221 | 14.598           |
| 0.8       | 0.688           | -68.700  | 2.683           | 117.400 | 0.180           | 48.900 | 0.778           | -39.800  | 0.412 | 11.733           |
| 1.0       | 0.608           | -82.600  | 2.432           | 106.200 | 0.200           | 42.900 | 0.713           | -45.900  | 0.504 | 10.849           |
| 1.5       | 0.451           | -114.800 | 1.958           | 83.500  | 0.223           | 34.100 | 0.583           | -57.200  | 0.732 | 9.435            |
| 2.0       | 0.359           | -145.300 | 1.631           | 66.000  | 0.232           | 31.500 | 0.501           | -65.800  | 0.939 | 8.470            |
| 2.5       | 0.323           | -175.700 | 1.415           | 51.400  | 0.242           | 33.100 | 0.451           | -74.500  | 1.081 | 5.930            |
| 3.0       | 0.320           | 158.100  | 1.261           | 40.000  | 0.263           | 36.500 | 0.421           | -84.700  | 1.145 | 4.499            |
| 4.0       | 0.365           | 117.200  | 1.059           | 21.900  | 0.351           | 39.100 | 0.399           | -107.700 | 1.076 | 3.119            |
| 5.0       | 0.433           | 87.400   | 0.935           | 7.700   | 0.470           | 32.500 | 0.383           | -134.500 | 1.001 | 2.817            |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 3.0 mA

|     |       |          |       |         |       |        |       |          |       |        |
|-----|-------|----------|-------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.856 | -15.400  | 8.971 | 165.000 | 0.029 | 80.500 | 0.964 | -11.600  | 0.130 | 24.904 |
| 0.4 | 0.631 | -56.900  | 6.949 | 128.500 | 0.092 | 60.700 | 0.751 | -37.200  | 0.416 | 18.781 |
| 0.8 | 0.389 | -93.700  | 4.599 | 101.200 | 0.135 | 52.500 | 0.525 | -52.300  | 0.704 | 15.323 |
| 1.0 | 0.318 | -108.300 | 3.874 | 92.100  | 0.152 | 51.400 | 0.458 | -56.200  | 0.808 | 14.063 |
| 1.5 | 0.216 | -145.300 | 2.790 | 74.600  | 0.193 | 50.400 | 0.358 | -62.900  | 0.972 | 11.600 |
| 2.0 | 0.184 | 179.400  | 2.201 | 61.200  | 0.237 | 49.100 | 0.304 | -69.100  | 1.045 | 8.375  |
| 2.5 | 0.199 | 149.200  | 1.849 | 49.400  | 0.282 | 46.900 | 0.271 | -77.400  | 1.065 | 6.610  |
| 3.0 | 0.220 | 127.900  | 1.617 | 39.800  | 0.328 | 43.800 | 0.252 | -88.300  | 1.065 | 5.366  |
| 4.0 | 0.285 | 99.500   | 1.336 | 22.800  | 0.420 | 35.600 | 0.242 | -114.500 | 1.032 | 3.937  |
| 5.0 | 0.360 | 80.300   | 1.167 | 8.000   | 0.505 | 25.700 | 0.231 | -144.300 | 1.005 | 3.210  |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 10.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.587 | -32.000  | 19.990 | 152.200 | 0.025 | 75.900 | 0.862 | -22.700  | 0.306 | 29.029 |
| 0.4 | 0.295 | -88.800  | 10.311 | 108.800 | 0.068 | 65.200 | 0.471 | -50.700  | 0.762 | 21.808 |
| 0.8 | 0.163 | -132.400 | 5.665  | 88.600  | 0.115 | 65.600 | 0.302 | -57.000  | 0.957 | 16.925 |
| 1.0 | 0.140 | -152.000 | 4.610  | 82.100  | 0.139 | 64.900 | 0.266 | -58.500  | 0.994 | 15.207 |
| 1.5 | 0.133 | 167.700  | 3.194  | 68.900  | 0.199 | 61.600 | 0.215 | -63.300  | 1.029 | 11.009 |
| 2.0 | 0.151 | 139.000  | 2.478  | 58.200  | 0.257 | 56.900 | 0.185 | -70.200  | 1.040 | 8.616  |
| 2.5 | 0.183 | 121.800  | 2.060  | 48.100  | 0.313 | 51.600 | 0.166 | -80.800  | 1.035 | 7.030  |
| 3.0 | 0.210 | 108.600  | 1.786  | 39.700  | 0.364 | 46.100 | 0.156 | -95.500  | 1.033 | 5.802  |
| 4.0 | 0.263 | 90.500   | 1.466  | 24.000  | 0.457 | 34.700 | 0.163 | -129.300 | 1.017 | 4.267  |
| 5.0 | 0.330 | 75.600   | 1.279  | 9.700   | 0.531 | 23.300 | 0.169 | -164.800 | 1.007 | 3.319  |

Note:

1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

NE687 SERIES

TYPICAL SCATTERING PARAMETERS (TA = 25°C)

[查询"NE68718-T1-A"供应商](#)

NE68733

VCE = 2.0 V, Ic = 3.0 mA

| FREQUENCY | S11   |          | S21   |         | S12   |        | S22   |          | K     | MAG <sup>1</sup> |
|-----------|-------|----------|-------|---------|-------|--------|-------|----------|-------|------------------|
|           | MAG   | ANG      | MAG   | ANG     | MAG   | ANG    | MAG   | ANG      |       |                  |
| GHz       |       |          |       |         |       |        |       |          |       | (dB)             |
| 0.1       | 0.860 | -13.200  | 8.984 | 165.800 | 0.024 | 83.200 | 0.970 | -9.900   | 0.113 | 25.733           |
| 0.4       | 0.653 | -51.000  | 7.149 | 131.000 | 0.081 | 63.300 | 0.781 | -32.600  | 0.413 | 19.458           |
| 0.8       | 0.403 | -82.900  | 4.837 | 103.900 | 0.123 | 55.400 | 0.570 | -45.700  | 0.702 | 15.947           |
| 1.0       | 0.324 | -95.500  | 4.091 | 94.600  | 0.139 | 54.300 | 0.507 | -49.000  | 0.804 | 14.688           |
| 1.5       | 0.198 | -127.200 | 2.967 | 77.100  | 0.179 | 53.400 | 0.409 | -54.500  | 0.964 | 12.195           |
| 2.0       | 0.141 | -164.900 | 2.341 | 63.700  | 0.221 | 52.200 | 0.358 | -59.700  | 1.037 | 9.073            |
| 2.5       | 0.139 | 156.600  | 1.971 | 52.100  | 0.266 | 50.200 | 0.325 | -66.500  | 1.054 | 7.271            |
| 3.0       | 0.164 | 130.300  | 1.715 | 42.300  | 0.311 | 47.300 | 0.305 | -75.900  | 1.053 | 6.005            |
| 4.0       | 0.230 | 98.200   | 1.414 | 25.400  | 0.405 | 39.400 | 0.286 | -99.000  | 1.018 | 4.597            |
| 5.0       | 0.311 | 79.300   | 1.236 | 10.300  | 0.495 | 29.800 | 0.264 | -125.800 | 0.988 | 3.974            |

VCE = 2.0 V, Ic = 7.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.704 | -21.900  | 16.558 | 158.400 | 0.023 | 77.300 | 0.922 | -16.100  | 0.248 | 28.573 |
| 0.4 | 0.410 | -66.900  | 10.214 | 116.700 | 0.066 | 65.000 | 0.600 | -41.100  | 0.649 | 21.897 |
| 0.8 | 0.209 | -97.700  | 5.923  | 94.000  | 0.107 | 63.900 | 0.409 | -47.800  | 0.898 | 17.432 |
| 1.0 | 0.157 | -110.500 | 4.860  | 86.800  | 0.128 | 63.700 | 0.365 | -49.200  | 0.954 | 15.794 |
| 1.5 | 0.092 | -152.600 | 3.391  | 72.900  | 0.180 | 61.700 | 0.305 | -52.500  | 1.016 | 11.986 |
| 2.0 | 0.086 | 157.500  | 2.635  | 61.900  | 0.233 | 58.100 | 0.271 | -57.400  | 1.034 | 9.404  |
| 2.5 | 0.113 | 127.700  | 2.193  | 51.700  | 0.284 | 53.800 | 0.248 | -64.800  | 1.035 | 7.738  |
| 3.0 | 0.143 | 110.900  | 1.896  | 43.100  | 0.333 | 49.000 | 0.233 | -75.300  | 1.031 | 6.477  |
| 4.0 | 0.203 | 89.100   | 1.551  | 27.500  | 0.425 | 39.000 | 0.220 | -101.500 | 1.013 | 4.921  |
| 5.0 | 0.270 | 76.200   | 1.353  | 13.100  | 0.506 | 28.400 | 0.202 | -130.800 | 0.998 | 4.271  |

VCE = 2.0 V, Ic = 20.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.437 | -34.500  | 26.620 | 145.800 | 0.018 | 76.800 | 0.809 | -24.400  | 0.461 | 31.699 |
| 0.4 | 0.179 | -90.400  | 11.869 | 104.400 | 0.056 | 72.600 | 0.424 | -43.100  | 0.880 | 23.262 |
| 0.8 | 0.082 | -134.900 | 6.340  | 86.700  | 0.102 | 71.800 | 0.306 | -43.200  | 0.996 | 17.935 |
| 1.0 | 0.067 | -160.200 | 5.143  | 80.900  | 0.126 | 70.500 | 0.282 | -43.800  | 1.012 | 15.430 |
| 1.5 | 0.077 | 149.800  | 3.531  | 69.100  | 0.184 | 66.200 | 0.248 | -47.500  | 1.027 | 11.828 |
| 2.0 | 0.106 | 123.200  | 2.732  | 59.200  | 0.241 | 60.900 | 0.225 | -53.300  | 1.027 | 9.541  |
| 2.5 | 0.137 | 109.800  | 2.254  | 50.000  | 0.295 | 55.400 | 0.207 | -62.300  | 1.024 | 7.889  |
| 3.0 | 0.165 | 99.000   | 1.946  | 41.700  | 0.346 | 49.700 | 0.194 | -74.900  | 1.019 | 6.645  |
| 4.0 | 0.221 | 83.800   | 1.594  | 26.700  | 0.437 | 38.400 | 0.185 | -105.800 | 1.006 | 5.161  |
| 5.0 | 0.290 | 73.400   | 1.379  | 12.300  | 0.515 | 27.000 | 0.172 | -139.300 | 0.994 | 4.278  |

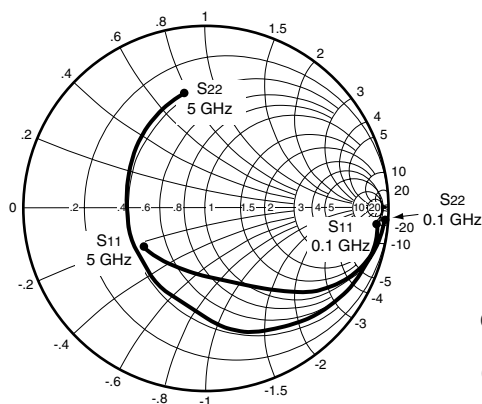
Note:

1. Gain Calculations:

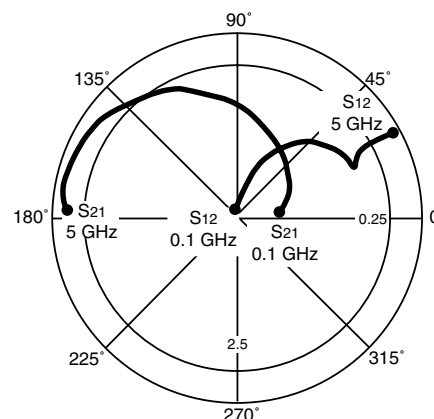
$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)[查询“NE68718-T1-A”供应商](#)

Coordinates in Ohms  
Frequency in GHz  
(V<sub>CE</sub> = 1 V, I<sub>C</sub> = 1 mA)



## NE68739

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 1.0 mA

| FREQUENCY | S <sub>11</sub> |          | S <sub>21</sub> |         | S <sub>12</sub> |        | S <sub>22</sub> |          | K     | MAG <sup>1</sup> |
|-----------|-----------------|----------|-----------------|---------|-----------------|--------|-----------------|----------|-------|------------------|
| GHz       | MAG             | ANG      | MAG             | ANG     | MAG             | ANG    | MAG             | ANG      |       | (dB)             |
| 0.1       | 0.960           | -7.500   | 3.509           | 172.000 | 0.024           | 85.500 | 0.993           | -4.600   | 0.055 | 21.650           |
| 0.4       | 0.888           | -34.300  | 3.358           | 149.700 | 0.091           | 68.900 | 0.941           | -17.900  | 0.181 | 15.670           |
| 0.8       | 0.734           | -67.000  | 2.974           | 123.500 | 0.157           | 51.100 | 0.815           | -32.000  | 0.362 | 12.774           |
| 1.0       | 0.651           | -82.900  | 2.738           | 112.400 | 0.178           | 44.300 | 0.751           | -37.600  | 0.440 | 11.870           |
| 1.5       | 0.496           | -122.300 | 2.250           | 88.500  | 0.205           | 31.600 | 0.602           | -49.100  | 0.642 | 10.404           |
| 2.0       | 0.436           | -159.300 | 1.842           | 69.200  | 0.210           | 24.400 | 0.500           | -58.700  | 0.834 | 9.431            |
| 2.5       | 0.441           | 169.800  | 1.566           | 53.700  | 0.207           | 22.000 | 0.428           | -69.200  | 1.006 | 8.323            |
| 3.0       | 0.473           | 147.900  | 1.339           | 40.900  | 0.208           | 23.300 | 0.384           | -81.700  | 1.146 | 5.769            |
| 4.0       | 0.565           | 119.100  | 1.047           | 20.800  | 0.233           | 28.500 | 0.358           | -113.400 | 1.192 | 3.876            |
| 5.0       | 0.651           | 99.800   | 0.852           | 5.200   | 0.287           | 28.500 | 0.399           | -147.500 | 1.074 | 3.064            |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 3.0 mA

|     |       |          |       |         |       |        |       |          |       |        |
|-----|-------|----------|-------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.869 | -14.000  | 9.245 | 166.800 | 0.023 | 81.300 | 0.971 | -9.100   | 0.122 | 26.042 |
| 0.4 | 0.690 | -53.600  | 7.614 | 134.500 | 0.078 | 62.400 | 0.800 | -31.100  | 0.345 | 19.895 |
| 0.8 | 0.453 | -94.600  | 5.373 | 106.500 | 0.116 | 50.400 | 0.572 | -46.200  | 0.620 | 16.658 |
| 1.0 | 0.376 | -113.100 | 4.571 | 96.900  | 0.129 | 47.900 | 0.493 | -50.700  | 0.730 | 15.494 |
| 1.5 | 0.295 | -157.100 | 3.303 | 78.500  | 0.158 | 45.000 | 0.359 | -59.700  | 0.923 | 13.203 |
| 2.0 | 0.312 | 168.300  | 2.556 | 64.100  | 0.185 | 43.300 | 0.277 | -70.300  | 1.032 | 10.301 |
| 2.5 | 0.359 | 145.700  | 2.105 | 52.000  | 0.213 | 41.400 | 0.223 | -85.000  | 1.080 | 8.224  |
| 3.0 | 0.409 | 130.200  | 1.785 | 41.700  | 0.240 | 39.200 | 0.193 | -104.300 | 1.105 | 6.745  |
| 4.0 | 0.510 | 109.500  | 1.385 | 24.100  | 0.294 | 33.400 | 0.202 | -147.000 | 1.084 | 4.963  |
| 5.0 | 0.599 | 94.300   | 1.134 | 8.900   | 0.341 | 26.000 | 0.276 | -178.000 | 1.038 | 4.019  |

V<sub>CE</sub> = 1.0 V, I<sub>C</sub> = 10.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.629 | -29.300  | 21.353 | 155.300 | 0.021 | 76.600 | 0.887 | -19.700  | 0.262 | 30.072 |
| 0.4 | 0.370 | -90.900  | 12.179 | 114.000 | 0.058 | 61.700 | 0.521 | -50.300  | 0.658 | 23.222 |
| 0.8 | 0.247 | -141.800 | 6.904  | 92.100  | 0.092 | 60.500 | 0.313 | -61.900  | 0.907 | 18.753 |
| 1.0 | 0.237 | -162.500 | 5.624  | 85.300  | 0.109 | 60.200 | 0.261 | -66.100  | 0.964 | 17.126 |
| 1.5 | 0.268 | 163.600  | 3.862  | 71.900  | 0.151 | 57.800 | 0.182 | -80.300  | 1.027 | 13.064 |
| 2.0 | 0.323 | 143.700  | 2.930  | 60.700  | 0.191 | 54.000 | 0.143 | -103.800 | 1.052 | 10.469 |
| 2.5 | 0.380 | 130.100  | 2.384  | 50.800  | 0.229 | 49.500 | 0.137 | -132.500 | 1.053 | 8.763  |
| 3.0 | 0.428 | 120.400  | 2.000  | 42.200  | 0.262 | 45.000 | 0.158 | -157.100 | 1.060 | 7.334  |
| 4.0 | 0.526 | 105.100  | 1.537  | 27.100  | 0.320 | 35.700 | 0.231 | -173.700 | 1.040 | 5.586  |
| 5.0 | 0.609 | 92.600   | 1.256  | 13.600  | 0.362 | 26.600 | 0.314 | -157.000 | 1.018 | 4.590  |

Note:

1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

NE687 SERIES

TYPICAL SCATTERING PARAMETERS (TA = 25°C)

[查询“NE68718-T1-A”供应商](#)

NE68739

VCE = 2.0 V, IC = 3.0 mA

| FREQUENCY<br>GHz | S11   |          | S21   |         | S12   |        | S22   |          | K     | MAG <sup>1</sup><br>(dB) |
|------------------|-------|----------|-------|---------|-------|--------|-------|----------|-------|--------------------------|
|                  | MAG   | ANG      | MAG   | ANG     | MAG   | ANG    | MAG   | ANG      |       |                          |
| 0.1              | 0.877 | -12.300  | 9.280 | 167.700 | 0.020 | 85.100 | 0.976 | -8.000   | 0.076 | 26.665                   |
| 0.4              | 0.717 | -48.900  | 7.832 | 137.800 | 0.070 | 64.500 | 0.829 | -27.700  | 0.321 | 20.488                   |
| 0.8              | 0.484 | -87.400  | 5.716 | 110.300 | 0.107 | 52.300 | 0.618 | -41.900  | 0.581 | 17.277                   |
| 1.0              | 0.404 | -104.800 | 4.907 | 100.700 | 0.119 | 49.500 | 0.542 | -46.100  | 0.685 | 16.153                   |
| 1.5              | 0.299 | -147.400 | 3.585 | 82.300  | 0.145 | 46.300 | 0.409 | -54.200  | 0.883 | 13.931                   |
| 2.0              | 0.301 | 176.200  | 2.784 | 67.900  | 0.169 | 44.900 | 0.327 | -62.800  | 1.000 | 12.168                   |
| 2.5              | 0.340 | 151.300  | 2.293 | 56.000  | 0.194 | 43.500 | 0.271 | -74.100  | 1.058 | 9.251                    |
| 3.0              | 0.393 | 134.900  | 1.939 | 45.800  | 0.219 | 42.000 | 0.236 | -88.400  | 1.083 | 7.716                    |
| 4.0              | 0.495 | 113.600  | 1.500 | 28.400  | 0.270 | 37.300 | 0.219 | -124.100 | 1.064 | 5.902                    |
| 5.0              | 0.587 | 98.400   | 1.227 | 13.100  | 0.316 | 30.900 | 0.265 | -157.500 | 1.015 | 5.141                    |

VCE = 2.0 V, IC = 5.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.804 | -15.700  | 13.813 | 163.800 | 0.018 | 81.700 | 0.956 | -10.300  | 0.165 | 28.850 |
| 0.4 | 0.570 | -55.800  | 10.275 | 128.600 | 0.058 | 65.000 | 0.736 | -31.100  | 0.481 | 22.484 |
| 0.8 | 0.326 | -91.000  | 6.655  | 102.800 | 0.090 | 59.200 | 0.522 | -40.500  | 0.774 | 18.689 |
| 1.0 | 0.252 | -108.300 | 5.559  | 94.500  | 0.104 | 58.500 | 0.458 | -42.800  | 0.864 | 17.280 |
| 1.5 | 0.179 | -155.100 | 3.937  | 78.900  | 0.138 | 57.200 | 0.355 | -48.000  | 0.991 | 14.553 |
| 2.0 | 0.201 | 165.000  | 3.040  | 66.500  | 0.173 | 55.100 | 0.287 | -56.000  | 1.044 | 11.167 |
| 2.5 | 0.257 | 142.400  | 2.504  | 55.800  | 0.208 | 52.100 | 0.234 | -67.800  | 1.058 | 9.338  |
| 3.0 | 0.311 | 127.700  | 2.124  | 46.400  | 0.242 | 48.600 | 0.196 | -84.500  | 1.064 | 7.885  |
| 4.0 | 0.423 | 109.600  | 1.657  | 29.800  | 0.304 | 40.600 | 0.177 | -129.000 | 1.041 | 6.124  |
| 5.0 | 0.524 | 96.000   | 1.366  | 14.900  | 0.356 | 31.800 | 0.234 | -167.600 | 1.006 | 5.353  |

VCE = 2.0 V, IC = 20.0 mA

|     |       |          |        |         |       |        |       |          |       |        |
|-----|-------|----------|--------|---------|-------|--------|-------|----------|-------|--------|
| 0.1 | 0.473 | -29.900  | 29.491 | 150.100 | 0.014 | 80.300 | 0.843 | -20.300  | 0.405 | 33.236 |
| 0.4 | 0.222 | -83.800  | 14.470 | 109.000 | 0.044 | 70.800 | 0.475 | -40.400  | 0.838 | 25.170 |
| 0.8 | 0.113 | -135.400 | 7.915  | 90.200  | 0.079 | 70.200 | 0.321 | -42.300  | 0.987 | 20.008 |
| 1.0 | 0.106 | -164.400 | 6.422  | 84.300  | 0.097 | 69.200 | 0.283 | -43.300  | 1.012 | 17.550 |
| 1.5 | 0.145 | 153.400  | 4.407  | 72.500  | 0.140 | 65.200 | 0.217 | -49.700  | 1.038 | 13.780 |
| 2.0 | 0.209 | 135.300  | 3.357  | 62.200  | 0.182 | 60.400 | 0.163 | -63.400  | 1.046 | 11.350 |
| 2.5 | 0.269 | 123.800  | 2.745  | 53.000  | 0.222 | 55.000 | 0.124 | -86.400  | 1.043 | 9.652  |
| 3.0 | 0.329 | 116.000  | 2.314  | 44.500  | 0.258 | 49.600 | 0.110 | -119.900 | 1.041 | 8.283  |
| 4.0 | 0.437 | 102.500  | 1.786  | 29.200  | 0.321 | 38.900 | 0.161 | -173.100 | 1.027 | 6.450  |
| 5.0 | 0.535 | 90.900   | 1.461  | 15.100  | 0.368 | 28.600 | 0.254 | 162.100  | 1.008 | 5.429  |

Note:

1. Gain Calculations:

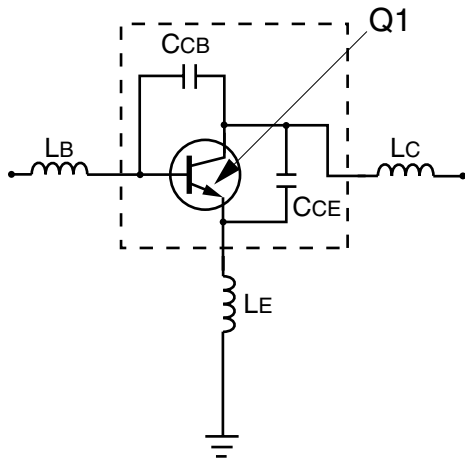
$$MAG = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right), \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } MSG = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

NE68700 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS <sup>(1)</sup>

| Parameters | Q1        | Parameters | Q1      |
|------------|-----------|------------|---------|
| IS         | 8.0e-17   | MJC        | 0.53    |
| BF         | 128       | XCJC       | 0.27    |
| NF         | 1.0       | CJS        | 0       |
| VAF        | 17        | VJS        | 0.75    |
| IKF        | 0.18      | MJS        | 0       |
| ISE        | 3.3e-15   | FC         | 0.37    |
| NE         | 1.48      | TF         | 6.0e-12 |
| BR         | 9.05      | XTF        | 11.9    |
| NR         | 1.05      | VTF        | 9.55    |
| VAR        | 4.3       | ITF        | 1.78    |
| IKR        | 0.009     | PTF        | 69.1    |
| ISC        | 4.0e-15   | TR         | 1.0e-9  |
| NC         | 1.5       | EG         | 1.11    |
| RE         | 0.8       | XTB        | 0       |
| RB         | 1.11      | XTI        | 3       |
| RBM        | 2.46      | KF         | 0       |
| IRB        | 0.017     | AF         | 1       |
| RC         | 7.5       |            |         |
| CJE        | 0.415e-12 |            |         |
| VJE        | 0.68      |            |         |
| MJE        | 0.53      |            |         |
| CJC        | 0.102e-12 |            |         |
| VJC        | 0.29      |            |         |

(1) Gummel-Poon Model

UNITS

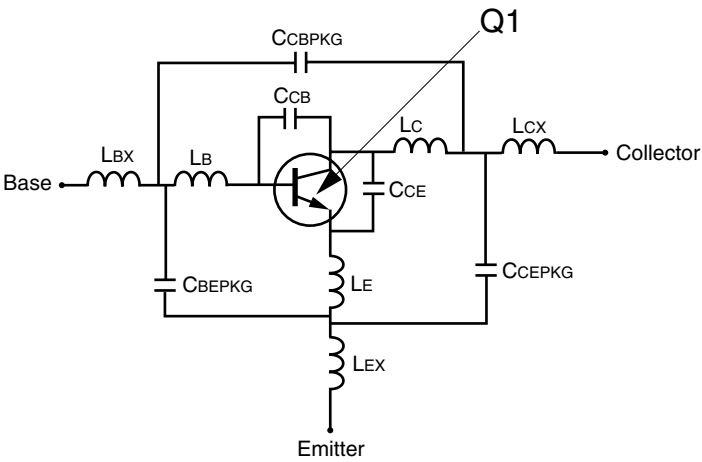
| Parameter   | Units   |
|-------------|---------|
| time        | seconds |
| capacitance | farads  |
| inductance  | henries |
| resistance  | ohms    |
| voltage     | volts   |
| current     | amps    |

| Parameters | 68700    |
|------------|----------|
| CCB        | 0.26e-12 |
| CCE        | 0.19e-12 |
| LB         | 0.49e-9  |
| Lc         | 0.70e-9  |
| LE         | 0.26e-9  |

MODEL RANGE  
Frequency: 0.1 to 6.0 GHz  
Bias: VCE = 1 V to 3V, IC = 1 mA to 10 xmA  
PIdB: 3 V, 10 mA, 2 GHz

NE68718 NON-LINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS <sup>(1)</sup>

| Parameters | Q1        | Parameters | Q1      |
|------------|-----------|------------|---------|
| IS         | 8.0e-17   | MJC        | 0.53    |
| BF         | 128       | XCJC       | 0.27    |
| NF         | 1.0       | CJS        | 0       |
| VAF        | 17        | VJS        | 0.75    |
| IKF        | 0.18      | MJS        | 0       |
| ISE        | 3.3e-15   | FC         | 0.37    |
| NE         | 1.48      | TF         | 6.0e-12 |
| BR         | 9.05      | XTF        | 11.9    |
| NR         | 1.05      | VTF        | 9.55    |
| VAR        | 4.3       | ITF        | 1.78    |
| IKR        | 0.009     | PTF        | 69.1    |
| ISC        | 4.0e-15   | TR         | 1.0e-9  |
| NC         | 1.5       | EG         | 1.11    |
| RE         | 0.8       | XTB        | 0       |
| RB         | 11.1      | XTI        | 3       |
| RBM        | 2.46      | KF         | 0       |
| IRB        | 0.017     | AF         | 1       |
| RC         | 7.5       |            |         |
| CJE        | 0.415e-12 |            |         |
| VJE        | 0.68      |            |         |
| MJE        | 0.53      |            |         |
| CJC        | 0.102e-12 |            |         |
| VJC        | 0.29      |            |         |

(1) Gummel-Poon Model

UNITS

| Parameter   | Units   |
|-------------|---------|
| time        | seconds |
| capacitance | farads  |
| inductance  | henries |
| resistance  | ohms    |
| voltage     | volts   |
| current     | amps    |

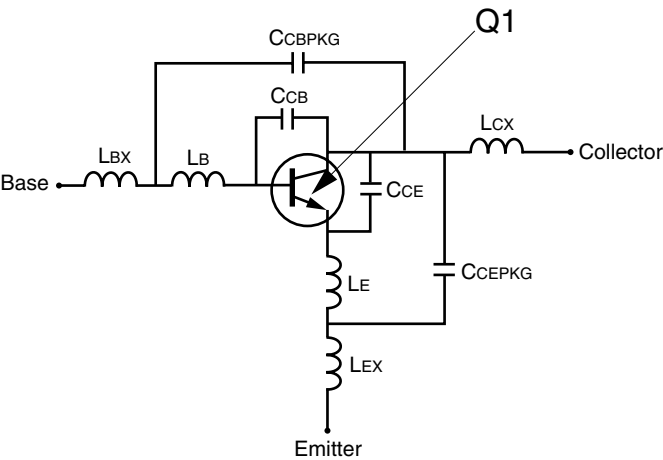
ADDITIONAL PARAMETERS

| Parameters | 68718     |
|------------|-----------|
| CCB        | 0.26e-12  |
| CCE        | 0.19e-12  |
| LB         | 1.51e-9   |
| LC         | 1.18e-9   |
| LE         | 0.71e-9   |
| CCBPKG     | 0.063e-12 |
| CCEPKG     | 0.409e-12 |
| CBEPKG     | 0.361e-12 |
| LBX        | 0.18e-9   |
| LCX        | 0.18e-9   |
| LEX        | 0.09e-9   |

MODEL RANGE  
Frequency: 0.05 to 5.0 GHz  
Bias: VCE = 1 V to 2 V, IC = 1 mA to 10 mA

NE68719 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS(1)

| Parameters | Q1        | Parameters | Q1      |
|------------|-----------|------------|---------|
| IS         | 8.0e-17   | MJC        | 0.53    |
| BF         | 128       | XCJC       | 0.27    |
| NF         | 1.0       | CJS        | 0       |
| VAF        | 17        | VJS        | 0.75    |
| IKF        | 0.18      | MJS        | 0       |
| ISE        | 3.3e-15   | FC         | 0.37    |
| NE         | 1.48      | TF         | 6.0e-12 |
| BR         | 9.05      | XTF        | 11.9    |
| NR         | 1.05      | VTF        | 9.55    |
| VAR        | 4.3       | ITF        | 1.78    |
| IKR        | 0.009     | PTF        | 69.1    |
| ISC        | 4.0e-15   | TR         | 1.0e-9  |
| NC         | 1.5       | EG         | 1.11    |
| RE         | 0.8       | XTB        | 0       |
| RB         | 11.1      | XTI        | 3       |
| RBM        | 2.46      | KF         | 0       |
| IRB        | 0.017     | AF         | 1       |
| RC         | 7.5       |            |         |
| CJE        | 0.415e-12 |            |         |
| VJE        | 0.68      |            |         |
| MJE        | 0.53      |            |         |
| CJC        | 0.102e-12 |            |         |
| VJC        | 0.29      |            |         |

(1) Gummel-Poon Model

UNITS

| Parameter   | Units   |
|-------------|---------|
| time        | seconds |
| capacitance | farads  |
| inductance  | henries |
| resistance  | ohms    |
| voltage     | volts   |
| current     | amps    |

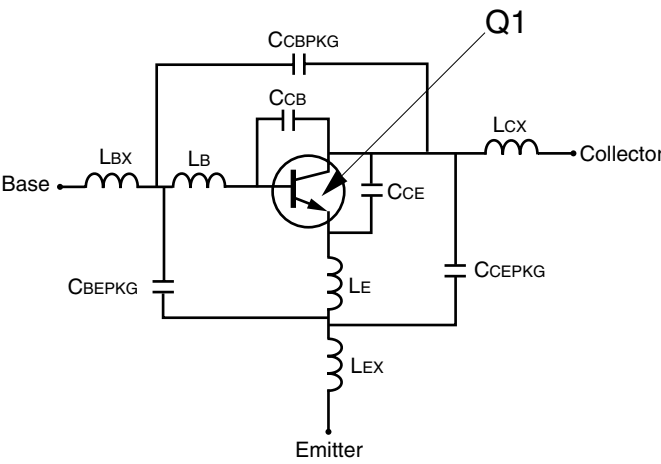
ADDITIONAL PARAMETERS

| Parameters | 68719    |
|------------|----------|
| CCB        | 0.26e-12 |
| CCE        | 0.19e-12 |
| LB         | 0.81e-9  |
| LE         | 0.85e-9  |
| CCBPKG     | 0.17e-12 |
| CCEPKG     | 0.21e-12 |
| LBX        | 0.19e-9  |
| LCX        | 0.19e-9  |
| LEX        | 0.19e-9  |

MODEL TEST CONDITIONS  
Frequency: 0.05 to 3.0 GHz  
Bias: VCE = 1 V to 2 V, IC = 1 mA to 10 mA

NE68730 BJT NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

| Parameters | Q1        | Parameters | Q1    |
|------------|-----------|------------|-------|
| IS         | 8e-17     | MJC        | 0.53  |
| BF         | 128       | XCJC       | 0.27  |
| NF         | 1         | CJS        | 0     |
| VAF        | 17        | VJS        | 0.75  |
| IKF        | 0.18      | MJS        | 0     |
| ISE        | 3.3e-15   | FC         | 0.37  |
| NE         | 1.48      | TF         | 6e-12 |
| BR         | 9.05      | XTF        | 11.9  |
| NR         | 1.05      | VTF        | 9.55  |
| VAR        | 4.3       | ITF        | 1.78  |
| IKR        | 0.009     | PTF        | 69.1  |
| ISC        | 4e-15     | TR         | 1e-9  |
| NC         | 1.5       | EG         | 1.11  |
| RE         | 0.8       | XTB        | 0     |
| RB         | 11.1      | XTI        | 3     |
| RBM        | 2.46      | KF         | 0     |
| IRB        | 0.017     | AF         | 1     |
| RC         | 7.5       |            |       |
| CJE        | 0.415e-12 |            |       |
| VJE        | 0.68      |            |       |
| MJE        | 0.53      |            |       |
| CJC        | 0.102e-12 |            |       |
| VJC        | 0.29      |            |       |

(1) Gummel-Poon Model

UNITS

| Parameter   | Units   |
|-------------|---------|
| time        | seconds |
| capacitance | farads  |
| inductance  | henries |
| resistance  | ohms    |
| voltage     | volts   |
| current     | amps    |

ADDITIONAL PARAMETERS

| Parameters | 68730    |
|------------|----------|
| CCB        | 0.26e-12 |
| CCE        | 0.19e-12 |
| LB         | 0.5e-9   |
| LE         | 1.07e-9  |
| CCBPKG     | 0.08e-12 |
| CCEPKG     | 0.04e-12 |
| CBEPKG     | 0.04e-12 |
| LBX        | 0.2e-9   |
| LCX        | 0.1e-9   |
| LEX        | 0.2e-9   |

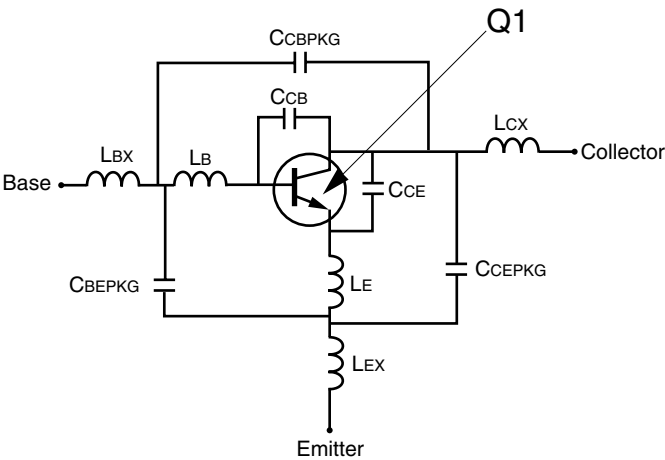
MODEL RANGE

Frequency: 0.05 to 3.0 GHz  
Bias: VCE = 1 V to 2 V, IC = 1 mA to 10 mA  
Date: 10/25/96

NE68733 NONLINEAR MODEL

[查询"NE68718-T1-A"供应商](#)

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

| Parameters | Q1        | Parameters | Q1    |
|------------|-----------|------------|-------|
| IS         | 8e-17     | MJC        | 0.53  |
| BF         | 128       | XCJC       | 0.27  |
| NF         | 1         | CJS        | 0     |
| VAF        | 17        | VJS        | 0.75  |
| IKF        | 0.18      | MJS        | 0     |
| ISE        | 3.3e-15   | FC         | 0.37  |
| NE         | 1.48      | TF         | 6e-12 |
| BR         | 9.05      | XTF        | 11.9  |
| NR         | 1.05      | VTF        | 9.55  |
| VAR        | 4.3       | ITF        | 1.78  |
| IKR        | 0.009     | PTF        | 69.1  |
| ISC        | 4e-15     | TR         | 1e-9  |
| NC         | 1.5       | EG         | 1.11  |
| RE         | 0.8       | XTB        | 0     |
| RB         | 11.1      | XTI        | 3     |
| RBM        | 2.46      | KF         | 0     |
| IRB        | 0.017     | AF         | 1     |
| RC         | 7.5       |            |       |
| CJE        | 0.415e-12 |            |       |
| VJE        | 0.68      |            |       |
| MJE        | 0.53      |            |       |
| CJC        | 0.102e-12 |            |       |
| VJC        | 0.29      |            |       |

(1) Gummel-Poon Model

UNITS

| Parameter   | Units   |
|-------------|---------|
| time        | seconds |
| capacitance | farads  |
| inductance  | henries |
| resistance  | ohms    |
| voltage     | volts   |
| current     | amps    |

ADDITIONAL PARAMETERS

| Parameters | 68733    |
|------------|----------|
| CCB        | 0.26e-12 |
| CCE        | 0.19e-12 |
| LB         | 0.96e-9  |
| LE         | 1.05e-9  |
| CCBPKG     | 0.15e-12 |
| CCEPKG     | 0.09e-12 |
| CBEPKG     | 0.09e-12 |
| LBX        | 0.3e-9   |
| LCX        | 0.3e-9   |
| LEX        | 0.3e-9   |

MODEL RANGE

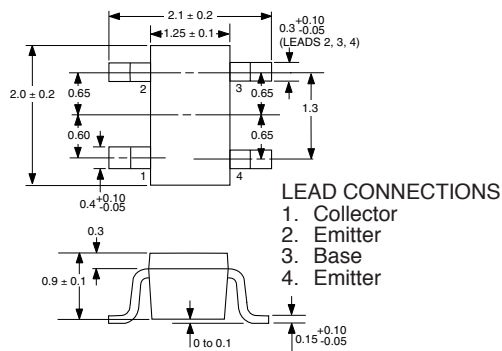
Frequency: 0.05 to 5.0 GHz  
Bias: VCE = 1 V to 2 V, IC = 1 mA to 10 mA  
Date: 7/97

Note:  
This nonlinear model utilized the latest data available. See our Design Parameter Library at [www.cel.com](http://www.cel.com) for this data.

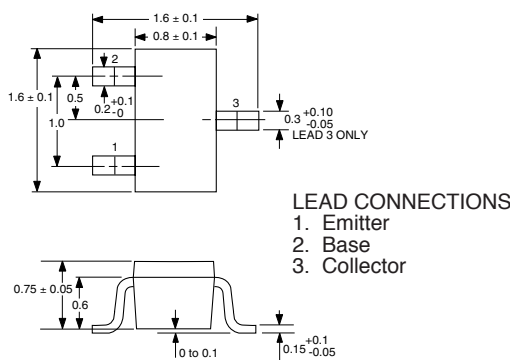
OUTLINE DIMENSIONS<sup>1</sup> (Units in mm)

[查询“NE68718-T1-A”供应商](#)

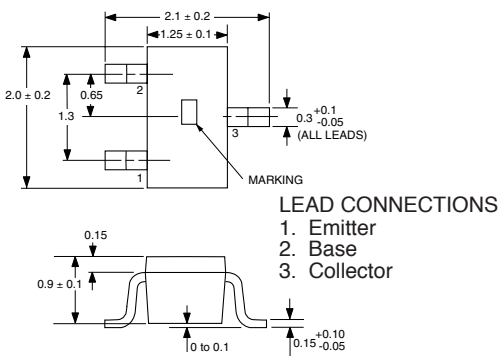
PACKAGE OUTLINE 18  
(SOT-343)



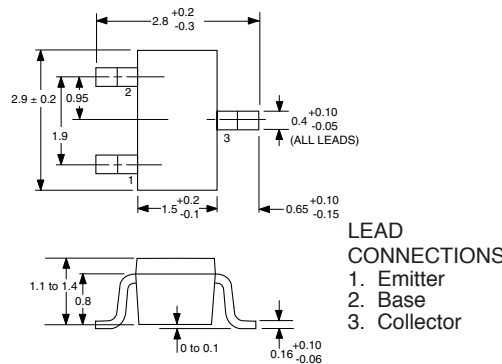
PACKAGE OUTLINE 19



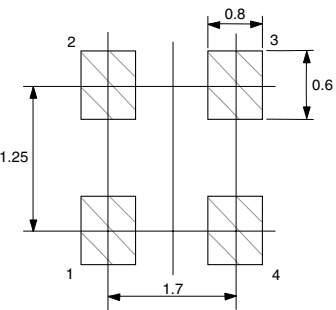
PACKAGE OUTLINE 30  
(SOT-323)



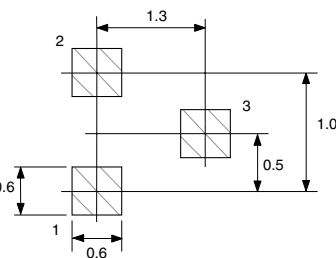
PACKAGE OUTLINE 33  
(SOT-23)



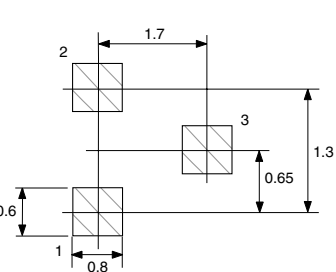
OUTLINE 18  
RECOMMENDED P.C.B. LAYOUT



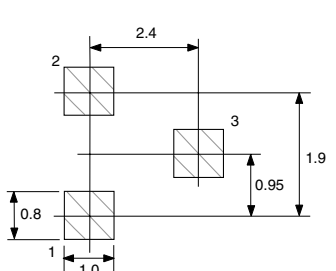
OUTLINE 19  
RECOMMENDED P.C.B. LAYOUT



OUTLINE 30  
RECOMMENDED P.C.B. LAYOUT



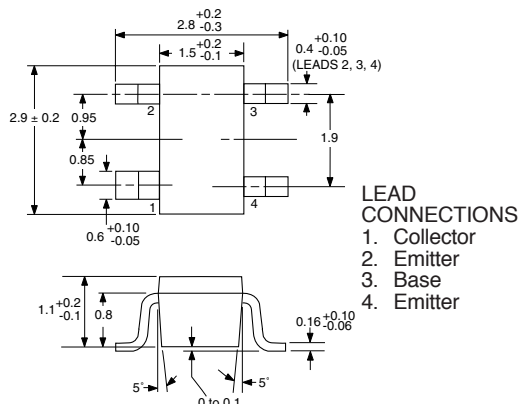
OUTLINE 33  
RECOMMENDED P.C.B. LAYOUT



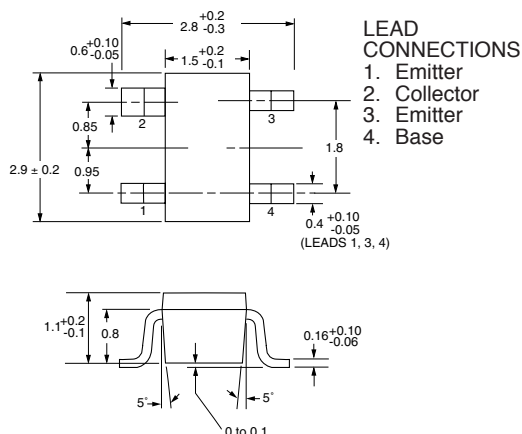
# OUTLINE DIMENSIONS<sup>1</sup> (Units in mm)

[查询“NE68718-T1-A”供应商](#)

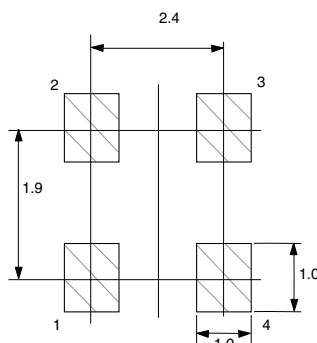
**PACKAGE OUTLINE 39**  
(SOT-143)



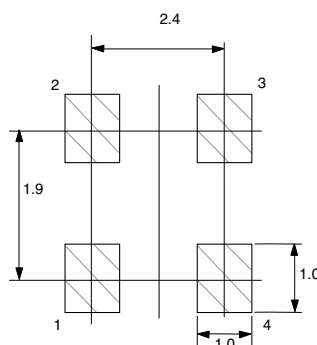
**PACKAGE OUTLINE 39R**  
(SOT-143)



**OUTLINE 39**  
**RECOMMENDED P.C.B. LAYOUT**



**OUTLINE 39R**  
**RECOMMENDED P.C.B. LAYOUT**



## ORDERING INFORMATION

| PART NUMBER  | QUANTITY | PACKAGING   |
|--------------|----------|-------------|
| NE68718-T1-A | 3000     | Tape & Reel |
| NE68719-T1-A | 3000     | Tape & Reel |
| NE68730-T1   | 3000     | Tape & Reel |
| NE68733-T1   | 3000     | Tape & Reel |
| NE68739-T1   | 3000     | Tape & Reel |
| NE68739R-T1  | 3000     | Tape & Reel |

Note:

- Lead material: Cu  
Lead plating: PbSn

### Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

EXCLUSIVE NORTH AMERICAN AGENT FOR NEC RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS

**CEL** CALIFORNIA EASTERN LABORATORIES • Headquarters • 4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • Telex 34-6393 • FAX (408) 988-0279  
DATA SUBJECT TO CHANGE WITHOUT NOTICE

Internet: <http://WWW.CEL.COM>

04/24/2002

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance<br>per RoHS | Concentration Limit per RoHS<br>(values are not yet fixed) | Concentration contained<br>in CEL devices |     |
|----------------------------------|------------------------------------------------------------|-------------------------------------------|-----|
|                                  |                                                            | -A                                        | -AZ |
| Lead (Pb)                        | < 1000 PPM                                                 | Not Detected                              | (*) |
| Mercury                          | < 1000 PPM                                                 | Not Detected                              |     |
| Cadmium                          | < 100 PPM                                                  | Not Detected                              |     |
| Hexavalent Chromium              | < 1000 PPM                                                 | Not Detected                              |     |
| PBB                              | < 1000 PPM                                                 | Not Detected                              |     |
| PBDE                             | < 1000 PPM                                                 | Not Detected                              |     |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

**Important Information and Disclaimer:** Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL's liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.