

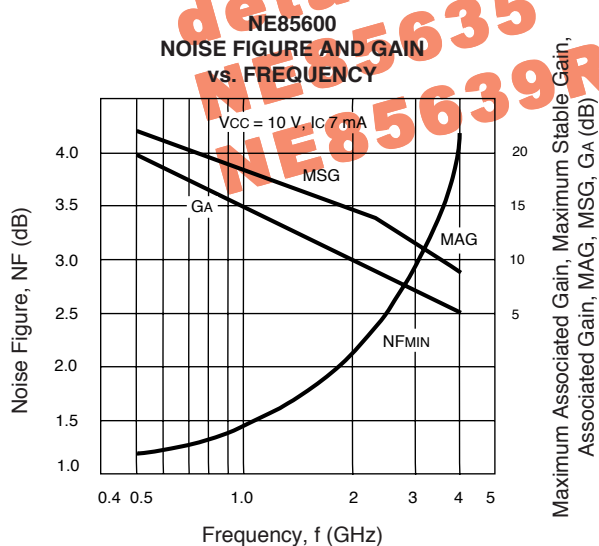
## NEC's NPN SILICON HIGH FREQUENCY TRANSISTOR

### FEATURES

- **HIGH GAIN BANDWIDTH PRODUCT:**  
 $f_T = 7 \text{ GHz}$
- **LOW NOISE FIGURE:**  
1.1 dB at 1 GHz
- **HIGH COLLECTOR CURRENT:** 100 mA
- **HIGH RELIABILITY METALLIZATION**
- **LOW COST**

### DESCRIPTION

NEC's NE856 series of NPN epitaxial silicon transistors is designed for low cost amplifier and oscillator applications. Low noise figures, high gain, and high current capability equate to wide dynamic range and excellent linearity. The NE856 series offers excellent performance and reliability at low cost. This is achieved by NEC's titanium/platinum/gold metallization system and their direct nitride passivated base surface process. The NE856 series is available in chip form and a Micro-x package for high frequency applications. It is also available in several low cost plastic package styles.



|                    |                                  |
|--------------------|----------------------------------|
|                    |                                  |
| 00 (CHIP)          | 35 (MICRO-X)                     |
|                    |                                  |
| 32 (TO-92)         | 34 (SOT 89 STYLE)                |
|                    |                                  |
| 18 (SOT 343 STYLE) | 19 (3 PIN ULTRA SUPER MINI MOLD) |
|                    |                                  |
| 30 (SOT 323 STYLE) | 33 (SOT 23 STYLE)                |
|                    |                                  |
| 39 (SOT 143 STYLE) | 39R (SOT 143R STYLE)             |

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.

**ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C)

| PART NUMBER<br>EIAJ <sup>1</sup> REGISTERED NUMBER<br>PACKAGE OUTLINE |                                                                                                                                                             |            | NE85600<br>00 (CHIP) |            |     | NE85618<br>2SC5011<br>18 |            |     | NE85619<br>2SC5006<br>19 |             |      | NE85630<br>2SC4226<br>30 |            |     | NE85632<br>2SC3355<br>32 |      |     |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------|------------|-----|--------------------------|------------|-----|--------------------------|-------------|------|--------------------------|------------|-----|--------------------------|------|-----|
| SYMBOLS                                                               | PARAMETERS AND CONDITIONS                                                                                                                                   | UNITS      | MIN                  | TYP        | MAX | MIN                      | TYP        | MAX | MIN                      | TYP         | MAX  | MIN                      | TYP        | MAX | MIN                      | TYP  | MAX |
| f <sub>T</sub>                                                        | Gain Bandwidth Product at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA<br>V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA                                 | GHz<br>GHz |                      | 7.0        |     |                          | 6.5        |     | 3.0                      | 4.5         |      |                          | 4.5        |     |                          | 6.5  |     |
| NF                                                                    | Noise Figure at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 1 GHz<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 2 GHz                     | dB<br>dB   |                      | 1.1<br>2.1 |     |                          | 1.4<br>2.1 |     |                          | 1.4<br>2.2  |      |                          | 1.3<br>2.2 |     |                          | 1.4  |     |
| GA                                                                    | Associated Gain at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 1 GHz<br>f = 2 GHz                                                                 | dB<br>dB   |                      | 10         |     |                          | 13<br>7    |     |                          | 12.5<br>6.5 |      |                          | 12<br>6    |     |                          | 10   |     |
| IS <sub>21EI</sub> <sup>2</sup>                                       | Insertion Power Gain at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA, f = 1 GHz<br>f = 2 GHz                                                           | dB<br>dB   | 7                    | 9          |     | 11                       | 13<br>7    |     |                          | 12          |      |                          | 12<br>6    |     |                          | 9.5  |     |
| h <sub>FE</sub>                                                       | Forward Current Gain <sup>2</sup> at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA<br>V <sub>CE</sub> = 3 V, I <sub>C</sub> = 7 mA                      |            | 50                   | 120        | 300 | 50                       | 120        | 300 | 80                       | 120         | 160  | 40                       | 110        | 250 | 50                       | 120  | 300 |
| I <sub>CBO</sub>                                                      | Collector Cutoff Current<br>at V <sub>CB</sub> = 15 V, I <sub>E</sub> = 0 mA                                                                                | μA         |                      |            | 1.0 |                          |            | 1.0 |                          |             | 1.0  |                          |            | 1.0 |                          |      | 1.0 |
| I <sub>EBO</sub>                                                      | Emitter Cutoff Current<br>at V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA                                                                                   | μA         |                      |            | 1.0 |                          |            | 1.0 |                          |             | 1.0  |                          |            | 1.0 |                          |      | 1.0 |
| C <sub>re</sub>                                                       | Feedback Capacitance <sup>3</sup> at<br>V <sub>CB</sub> = 3 V, I <sub>E</sub> = 0 mA, f = 1 MHz<br>V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1 MHz | pF<br>pF   |                      | 0.5        | 1.0 |                          | 0.5        | 0.9 |                          | 0.7         | 1.5  |                          | 0.7        | 1.5 |                          | 0.65 | 1.0 |
| P <sub>T</sub>                                                        | Total Power Dissipation                                                                                                                                     | mW         |                      |            | 700 |                          |            | 150 |                          |             | 100  |                          |            | 150 |                          |      | 600 |
| R <sub>TH</sub> (J-A)                                                 | Thermal Resistance (J-A)                                                                                                                                    | °C/W       |                      |            |     |                          |            | 833 |                          |             | 1000 |                          |            | 833 |                          |      | 210 |

**ELECTRICAL CHARACTERISTICS** (T<sub>A</sub> = 25°C)

| PART NUMBER<br>EIAJ <sup>1</sup> REGISTERED NUMBER<br>PACKAGE OUTLINE |                                                                                                   |          | NE85633<br>2SC3356<br>33 |      |     | NE85634<br>2SC3357<br>34 |      |                   | NE85635<br>2SC3603<br>35 |     |     | NE85639/39R<br>2SC4093<br>39 |             |     |
|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|----------|--------------------------|------|-----|--------------------------|------|-------------------|--------------------------|-----|-----|------------------------------|-------------|-----|
| SYMBOLS                                                               | PARAMETERS AND CONDITIONS                                                                         | UNITS    | MIN                      | TYP  | MAX | MIN                      | TYP  | MAX               | MIN                      | TYP | MAX | MIN                          | TYP         | MAX |
| f <sub>T</sub>                                                        | Gain Bandwidth Product at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA                       | GHz      |                          | 7.0  |     |                          | 6.5  |                   |                          | 7.0 |     |                              | 9.0         |     |
| NF                                                                    | Noise Figure at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 1 GHz<br>f = 2 GHz          | dB<br>dB |                          | 1.4  | 2.0 |                          | 1.4  |                   |                          | 2.1 | 3.4 |                              | 1.5         | 2.1 |
| GA                                                                    | Associated Gain at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 7 mA, f = 1 GHz<br>f = 2 GHz       | dB<br>dB |                          | 9    |     |                          |      |                   |                          | 10  |     |                              | 13.5<br>8.5 |     |
| IS <sub>21EI</sub> <sup>2</sup>                                       | Insertion Power Gain at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA, f = 1 GHz<br>f = 2 GHz | dB<br>dB |                          | 11.5 |     |                          | 9.5  |                   | 7                        | 9   |     |                              | 13<br>7     |     |
| h <sub>FE</sub>                                                       | Forward Current Gain <sup>2</sup> at<br>V <sub>CE</sub> = 10 V, I <sub>C</sub> = 20 mA            |          | 50                       | 120  | 300 | 50                       | 120  | 300               | 50                       | 120 | 300 | 50                           | 120         | 300 |
| I <sub>CBO</sub>                                                      | Collector Cutoff Current<br>at V <sub>CB</sub> = 15 V, I <sub>E</sub> = 0 mA                      | μA       |                          |      | 1.0 |                          |      | 1.0               |                          |     | 1.0 |                              |             | 1.0 |
| I <sub>EBO</sub>                                                      | Emitter Cutoff Current<br>at V <sub>EB</sub> = 1 V, I <sub>C</sub> = 0 mA                         | μA       |                          |      | 1.0 |                          |      | 1.0               |                          |     | 1.0 |                              |             | 1.0 |
| C <sub>re</sub>                                                       | Feedback Capacitance <sup>3</sup> at<br>V <sub>CB</sub> = 10 V, I <sub>E</sub> = 0 mA, f = 1 MHz  | pF       |                          | 0.55 | 1.0 |                          | 0.65 | 1.0               |                          | 0.5 | 1.0 |                              | 0.5         | 0.9 |
| P <sub>T</sub>                                                        | Total Power Dissipation                                                                           | mW       |                          |      | 200 |                          |      | 2000 <sup>4</sup> |                          |     | 580 |                              |             | 200 |
| R <sub>TH</sub> (J-A)                                                 | Thermal Resistance (J to A)                                                                       | °C/W     |                          |      | 625 |                          |      | 62.5 <sup>4</sup> |                          |     | 590 |                              |             | 500 |

## Notes:

- Electronic Industrial Association of Japan.
- Pulse width ≤ 350 μs, duty cycle ≤ 2% pulsed.
- C<sub>re</sub> measurement employs a three terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
- With 2.5 cm<sup>2</sup> × 0.7 mm ceramic substrate (infinite heatsink).

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** ( $T_A = 25^\circ\text{C}$ )

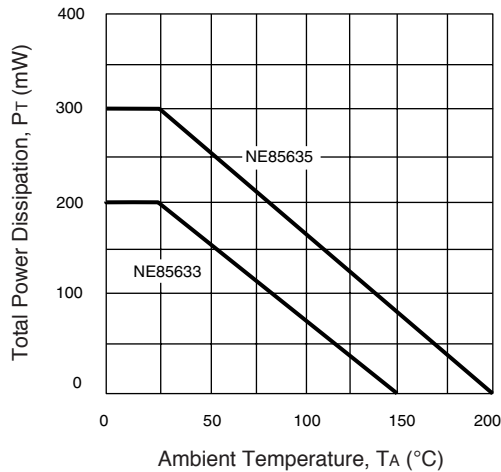
| SYMBOLS   | PARAMETERS                   | UNITS            | RATINGS          |
|-----------|------------------------------|------------------|------------------|
| $V_{CBO}$ | Collector to Base Voltage    | V                | 20               |
| $V_{CEO}$ | Collector to Emitter Voltage | V                | 12               |
| $V_{EBO}$ | Emitter to Base Voltage      | V                | 3.0              |
| $I_C$     | Collector Current            | mA               | 100              |
| $T_J$     | Junction Temperature         | $^\circ\text{C}$ | 150 <sup>2</sup> |
| $T_{STG}$ | Storage Temperature          | $^\circ\text{C}$ | -65 to +150      |

Notes:

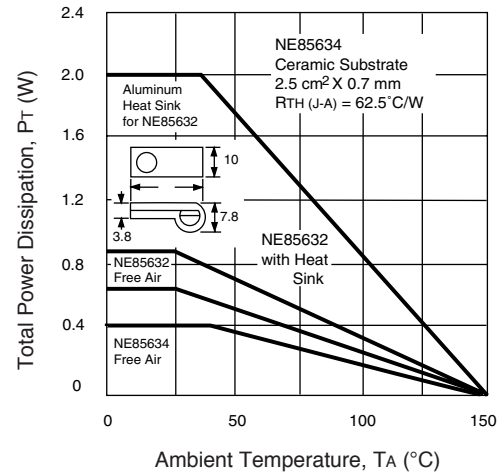
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Maximum  $T_J$  for the NE85600 and NE85635 is  $200^\circ\text{C}$ .

**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )

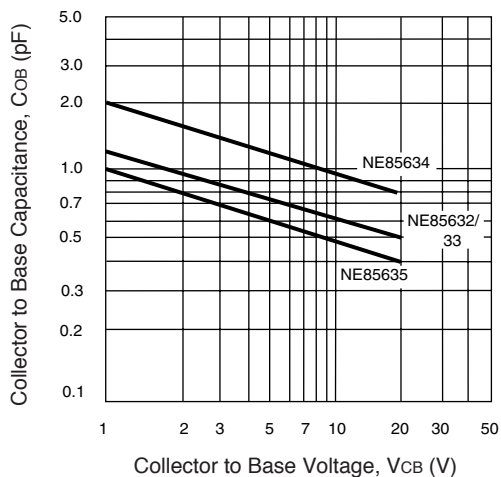
**NE85633 AND NE85635  
TOTAL POWER DISSIPATION vs.  
AMBIENT TEMPERATURE**



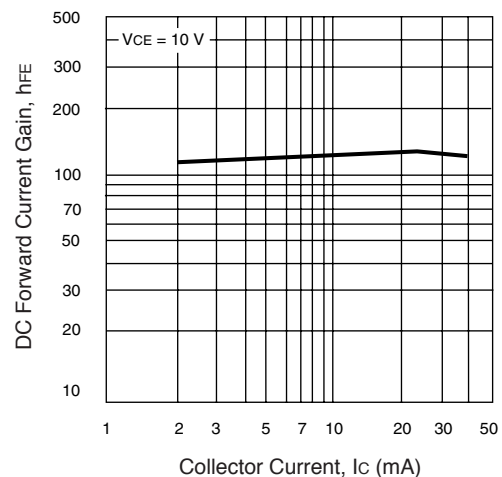
**NE85632 AND NE85634  
TOTAL POWER DISSIPATION  
vs. AMBIENT TEMPERATURE**



**COLLECTOR TO BASE  
CAPACITANCE vs. COLLECTOR  
TO BASE VOLTAGE**

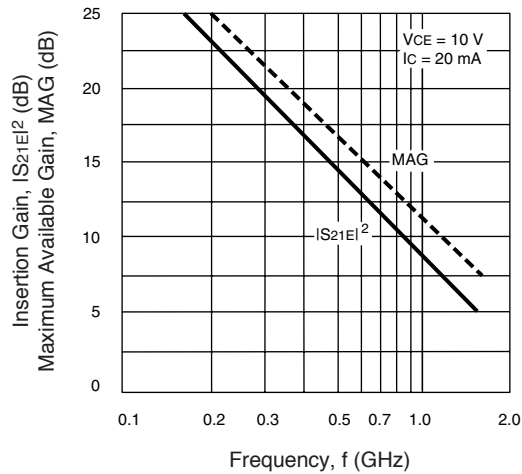


**FORWARD CURRENT GAIN  
vs. COLLECTOR CURRENT**

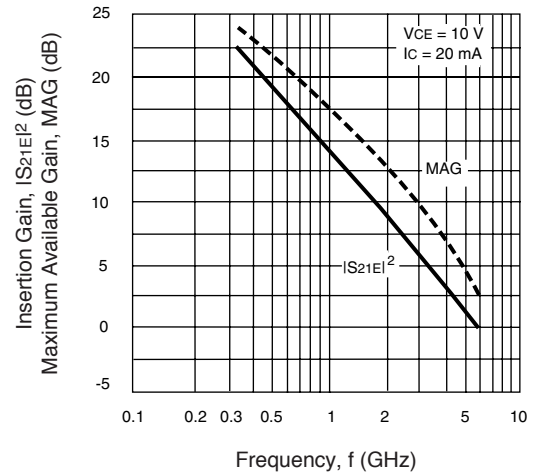


TYPICAL PERFORMANCE CURVES ( $T_A = 25^\circ\text{C}$ )

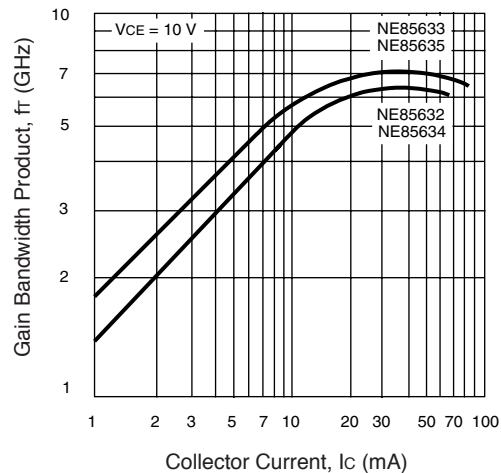
**NE85634**  
FORWARD INSERTION GAIN  
AND MAXIMUM AVAILABLE GAIN  
vs. FREQUENCY



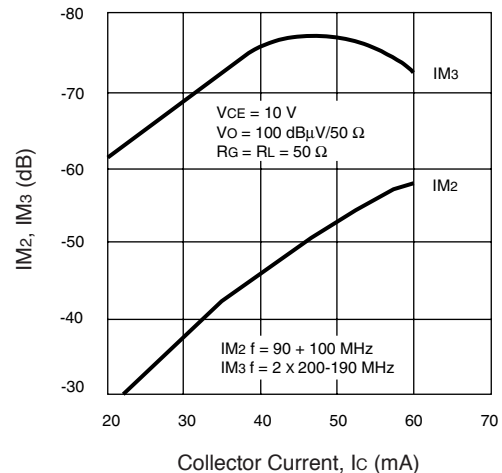
**NE85635**  
FORWARD INSERTION GAIN  
AND MAXIMUM AVAILABLE GAIN  
vs. FREQUENCY



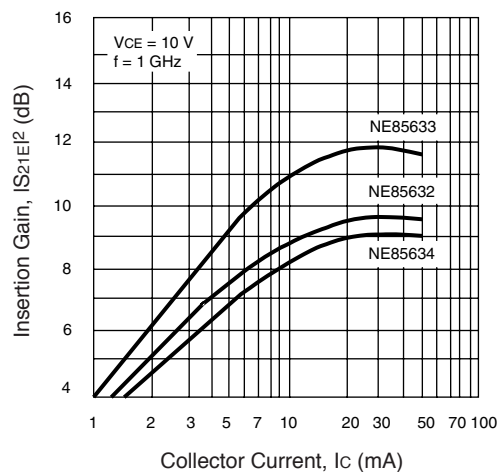
**GAIN BANDWIDTH PRODUCT  
vs. COLLECTOR CURRENT**



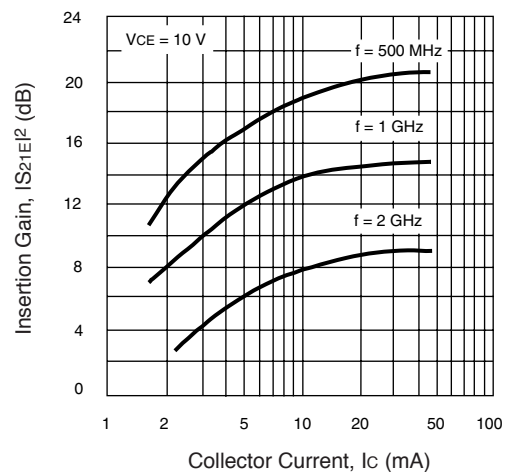
**NE85632 AND NE85634  
INTERMODULATION DISTORTION  
vs. COLLECTOR CURRENT**

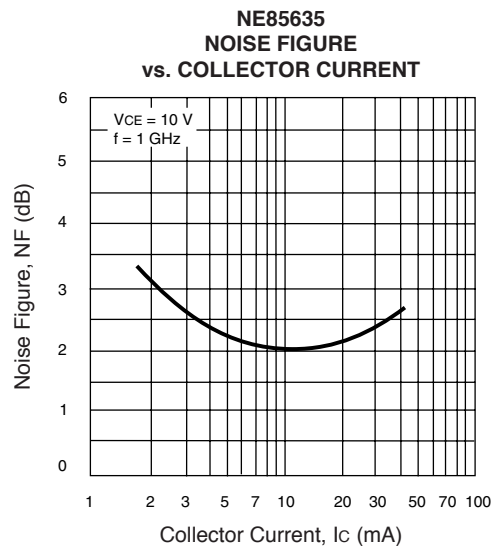
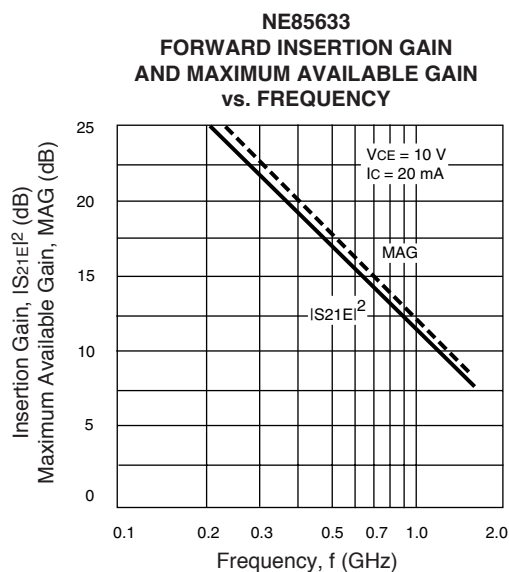


**INSERTION GAIN vs.  
COLLECTOR CURRENT**



**NE85635  
INSERTION GAIN vs.  
COLLECTOR CURRENT**



TYPICAL PERFORMANCE CURVES ( $T_A = 25^\circ\text{C}$ )

## NE85600

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)        | NFOPT<br>(dB) | GA<br>(dB) | ΓOPT |      | Rn/50 |
|-----------------------|---------------|------------|------|------|-------|
|                       |               |            | MAG  | ANG  |       |
| VCE = 10 V, Ic = 7 mA |               |            |      |      |       |
| 500                   | 1.2           | 21.86      | 0.20 | 138  | 0.13  |
| 1000                  | 1.4           | 15.82      | 0.22 | 158  | 0.19  |
| 2000                  | 2.2           | 11.87      | 0.49 | 176  | 0.23  |
| 4000                  | 4.2           | 5.75       | 0.63 | -141 | 0.47  |

## NE85630

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)           | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|--------------------------|---------------------------|------------|------------------|------|-------|
|                          |                           |            | MAG              | ANG  |       |
| VCE = 2.5 V, IC = 0.3 mA |                           |            |                  |      |       |
| 500                      | 1.88                      | 5.63       | 0.73             | 79   | 1.00  |
| 800                      | 2.63                      | 6.45       | 0.78             | 128  | 0.60  |
| 1000                     | 3.14                      | 5.03       | 0.79             | 149  | 0.17  |
| VCE = 2.5 V, IC = 1.0 mA |                           |            |                  |      |       |
| 500                      | 1.34                      | 11.08      | 0.58             | 83   | 0.33  |
| 800                      | 1.75                      | 9.97       | 0.62             | 134  | 0.17  |
| 1000                     | 1.98                      | 8.33       | 0.63             | 152  | 0.10  |
| 1500                     | 2.51                      | 5.26       | 0.71             | 176  | 0.04  |
| VCE = 2.5 V, IC = 3.0 mA |                           |            |                  |      |       |
| 500                      | 1.10                      | 14.41      | 0.37             | 92   | 0.15  |
| 800                      | 1.32                      | 11.67      | 0.44             | 143  | 0.08  |
| 1000                     | 1.50                      | 10.34      | 0.48             | 169  | 0.07  |
| 1500                     | 1.88                      | 7.04       | 0.56             | 177  | 0.05  |
| 2000                     | 2.36                      | 5.60       | 0.60             | -150 | 0.17  |
| VCE = 10 V, IC = 7.0 mA  |                           |            |                  |      |       |
| 500                      | 1.15                      | 17.20      | 0.21             | 113  | 0.09  |
| 1000                     | 1.27                      | 12.67      | 0.32             | 177  | 0.15  |
| 1500                     | 1.66                      | 9.50       | 0.46             | -141 | 0.52  |
| 2000                     | 2.22                      | 7.45       | 0.57             | -118 | 0.67  |
| 3000                     | 3.30                      | 4.62       | 0.65             | -92  | 0.70  |

## NE85619

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)                                   | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|--------------------------------------------------|---------------------------|------------|------------------|------|-------|
|                                                  |                           |            | MAG              | ANG  |       |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 0.3 mA |                           |            |                  |      |       |
| 500                                              | 1.73                      | 6.03       | 0.74             | 73   | 1.23  |
| 800                                              | 2.20                      | 4.42       | 0.74             | 113  | 0.62  |
| V <sub>CC</sub> = 2.5 V, I <sub>c</sub> = 1.0 mA |                           |            |                  |      |       |
| 500                                              | 1.15                      | 11.26      | 0.60             | 75   | 0.36  |
| 800                                              | 1.50                      | 9.15       | 0.58             | 117  | 0.20  |
| 1000                                             | 1.90                      | 7.74       | 0.60             | 136  | 0.16  |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 3.0 mA |                           |            |                  |      |       |
| 500                                              | 1.00                      | 14.83      | 0.43             | 80   | 0.17  |
| 800                                              | 1.22                      | 11.81      | 0.40             | 122  | 0.10  |
| 1000                                             | 1.35                      | 10.46      | 0.46             | 143  | 0.09  |
| 1500                                             | 1.70                      | 7.66       | 0.64             | 174  | 0.04  |
| V <sub>CE</sub> = 3 V, I <sub>c</sub> = 5.0 mA   |                           |            |                  |      |       |
| 500                                              | 1.07                      | 16.48      | 0.30             | 87   | 0.12  |
| 800                                              | 1.21                      | 13.06      | 0.31             | 129  | 0.09  |
| 1000                                             | 1.34                      | 11.56      | 0.37             | 149  | 0.08  |
| 1500                                             | 1.69                      | 8.44       | 0.46             | 171  | 0.06  |
| 2000                                             | 2.17                      | 6.99       | 0.52             | -150 | 0.14  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 7.0 mA  |                           |            |                  |      |       |
| 500                                              | 1.10                      | 18.42      | 0.27             | 83   | 0.13  |
| 800                                              | 1.24                      | 14.90      | 0.28             | 123  | 0.10  |
| 1000                                             | 1.37                      | 13.34      | 0.32             | 143  | 0.08  |
| 1500                                             | 1.72                      | 10.39      | 0.42             | 172  | 0.06  |
| 2000                                             | 2.20                      | 8.69       | 0.47             | -152 | 0.14  |
| 2500                                             | 2.75                      | 7.31       | 0.54             | -134 | 0.45  |

## NE85632

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)                                  | NF <sub>OPT</sub><br>(dB) | G <sub>A</sub><br>(dB) | Γ <sub>OPT</sub> |     | Rn/50 |
|-------------------------------------------------|---------------------------|------------------------|------------------|-----|-------|
|                                                 |                           |                        | MAG              | ANG |       |
| V <sub>CE</sub> = 4.5 V, I <sub>c</sub> = 10 mA |                           |                        |                  |     |       |
| 500                                             | 1.1                       |                        | 0.20             | 50  | 0.10  |
| 1000                                            | 1.6                       | 30.72                  | 0.34             | 159 | 0.10  |

## NE85633

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)                                   | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|--------------------------------------------------|---------------------------|------------|------------------|------|-------|
|                                                  |                           |            | MAG              | ANG  |       |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 0.3 mA |                           |            |                  |      |       |
| 500                                              | 1.62                      | 9.23       | 0.71             | 82   | 0.80  |
| 800                                              | 2.45                      | 6.11       | 0.72             | 118  | 0.55  |
| 1000                                             | 2.80                      | 5.56       | 0.74             | 142  | 0.23  |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 1.0 mA |                           |            |                  |      |       |
| 500                                              | 1.15                      | 12.70      | 0.59             | 84   | 0.33  |
| 800                                              | 1.56                      | 9.20       | 0.57             | 120  | 0.18  |
| 1000                                             | 1.80                      | 8.59       | 0.62             | 146  | 0.10  |
| 1500                                             | 2.30                      | 5.52       | 0.70             | 170  | 0.05  |
| 2000                                             | 2.88                      | 4.46       | 0.72             | -161 | 0.13  |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 3 mA   |                           |            |                  |      |       |
| 500                                              | 1.00                      | 14.74      | 0.42             | 88   | 0.16  |
| 800                                              | 1.25                      | 11.53      | 0.42             | 133  | 0.13  |
| 1000                                             | 1.40                      | 10.03      | 0.49             | 152  | 0.07  |
| 1500                                             | 1.70                      | 7.28       | 0.62             | 175  | 0.04  |
| 2000                                             | 2.05                      | 5.94       | 0.68             | -155 | 0.10  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 7.0 mA  |                           |            |                  |      |       |
| 500                                              | 1.85                      |            | 0.37             | 87   | 0.20  |
| 1000                                             | 1.90                      | 12.17      | 0.35             | 145  | 0.11  |
| 2000                                             | 2.10                      | 7.8        | 0.54             | -138 | 0.21  |
| 3000                                             | 2.70                      | 4.68       | 0.67             | -96  | 0.53  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 10 mA   |                           |            |                  |      |       |
| 500                                              | 1.29                      | 17.58      | 0.1              | 96   | 0.11  |
| 800                                              | 1.50                      | 13.41      | 0.2              | -105 | 0.15  |
| 900                                              | 1.56                      | 12.26      | 0.25             | -95  | 0.16  |
| 1000                                             | 1.63                      | 12.0       | 0.36             | -117 | 0.17  |
| 1500                                             | 1.91                      | 9.3        | 0.46             | -58  | 0.52  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 20 mA   |                           |            |                  |      |       |
| 500                                              | 1.51                      | 17.97      | 0.1              | 98   | 0.15  |
| 800                                              | 1.73                      | 13.76      | 0.21             | -93  | 0.20  |
| 900                                              | 1.80                      | 12.65      | 0.26             | -86  | 0.21  |
| 1000                                             | 1.86                      | 12.2       | 0.38             | -107 | 0.23  |
| 1500                                             | 2.13                      | 9.5        | 0.44             | -53  | 0.55  |

## NE85634

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)                                  | NF <sub>OPT</sub><br>(dB) | G <sub>A</sub><br>(dB) | Γ <sub>OPT</sub> |     | Rn/50 |
|-------------------------------------------------|---------------------------|------------------------|------------------|-----|-------|
|                                                 |                           |                        | MAG              | ANG |       |
| V <sub>CE</sub> = 4.5 V, I <sub>c</sub> = 10 mA |                           |                        |                  |     |       |
| 200                                             | 1.10                      | 20.0                   | 0.43             | 90  | 0.10  |
| 300                                             | 1.15                      | 18.7                   | 0.37             | 112 | 0.11  |
| 500                                             | 1.25                      | 15.5                   | 0.30             | 135 | 0.11  |
| 1000                                            | 1.80                      | 9.4                    | 0.22             | 170 | 0.12  |

## NE85635

TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

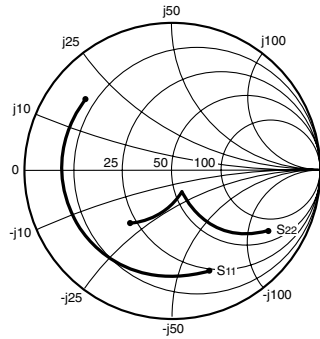
| FREQ.<br>(MHz)                                | NF <sub>OPT</sub><br>(dB) | GA<br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|-----------------------------------------------|---------------------------|------------|------------------|------|-------|
|                                               |                           |            | MAG              | ANG  |       |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 7 mA |                           |            |                  |      |       |
| 500                                           | 1.02                      | 20.24      | 0.15             | 117  | 0.12  |
| 700                                           | 1.29                      | 18.11      | 0.27             | 138  | 0.09  |
| 1000                                          | 1.38                      | 16.13      | 0.56             | 149  | 0.07  |
| 1500                                          | 1.91                      | 13.70      | 0.66             | 177  | 0.06  |
| 2000                                          | 2.31                      | 10.94      | 0.56             | -151 | 0.18  |

## NE85639

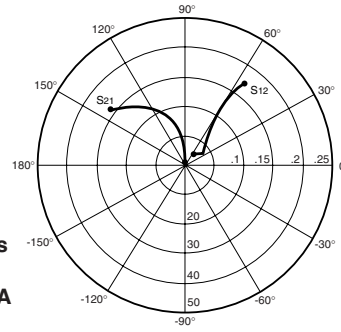
TYPICAL NOISE PARAMETERS ( $T_A = 25^\circ\text{C}$ )

| FREQ.<br>(MHz)                                   | NF <sub>OPT</sub><br>(dB) | G <sub>A</sub><br>(dB) | Γ <sub>OPT</sub> |      | Rn/50 |
|--------------------------------------------------|---------------------------|------------------------|------------------|------|-------|
|                                                  |                           |                        | MAG              | ANG  |       |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 0.3 mA |                           |                        |                  |      |       |
| 500                                              | 1.60                      | 8.65                   | 0.69             | 79   | 1.25  |
| 800                                              | 2.00                      | 6.26                   | 0.75             | 121  | 0.45  |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 1.0 mA |                           |                        |                  |      |       |
| 500                                              | 1.26                      | 13.73                  | 0.66             | 86   | 0.21  |
| 800                                              | 1.54                      | 9.96                   | 0.57             | 124  | 0.16  |
| 1000                                             | 1.75                      | 8.99                   | 0.60             | 148  | 0.09  |
| 1500                                             | 2.40                      | 6.62                   | 0.71             | -173 | 0.05  |
| V <sub>CE</sub> = 2.5 V, I <sub>c</sub> = 3.0 mA |                           |                        |                  |      |       |
| 500                                              | 1.00                      | 15.31                  | 0.44             | 83   | 0.15  |
| 800                                              | 1.13                      | 12.09                  | 0.50             | 126  | 0.09  |
| 1000                                             | 1.25                      | 11.04                  | 0.50             | 155  | 0.07  |
| 1500                                             | 1.60                      | 8.31                   | 0.59             | -170 | 0.06  |
| 2000                                             | 2.10                      | 6.47                   | 0.67             | -146 | 0.21  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 7 mA    |                           |                        |                  |      |       |
| 500                                              | 1.15                      | 18.91                  | 0.18             | 126  | 0.15  |
| 1000                                             | 1.50                      | 13.5                   | 0.32             | 169  | 0.09  |
| 1500                                             | 1.80                      | 10.5                   | 0.43             | -174 | 0.14  |
| 2000                                             | 2.10                      | 8.74                   | 0.55             | -142 | 0.20  |
| 3000                                             | 3.00                      | 5.98                   | 0.70             | -107 | 0.93  |
| V <sub>CE</sub> = 10 V, I <sub>c</sub> = 20 mA   |                           |                        |                  |      |       |
| 500                                              | 1.40                      | 19.5                   | 0.26             | 122  | 0.17  |
| 1000                                             | 1.70                      | 14.5                   | 0.35             | 175  | 0.11  |
| 1500                                             | 2.00                      | 11.5                   | 0.44             | -159 | 0.16  |
| 2000                                             | 2.30                      | 9.0                    | 0.55             | -135 | 0.23  |
| 3000                                             | 3.10                      | 6.5                    | 0.70             | -104 | 1.01  |

## TYPICAL COMMON EMITTER SCATTERING PARAMETERS



Coordinates in Ohms  
Frequency in GHz  
VCE = 10 V, IC = 20 mA



## NE85600

VCE = 10 V, IC = 7 mA

| FREQUENCY<br>(MHz) | S11   |        | S21    |       | S12   |      | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|--------|-------|-------|------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG    | ANG   | MAG   | ANG  | MAG   | ANG    |      |                          |
| 100                | 0.881 | -40.9  | 15.380 | 155.0 | 0.026 | 67.0 | 0.910 | -18.9  | 0.08 | 27.7                     |
| 200                | 0.833 | -75.0  | 13.961 | 138.0 | 0.041 | 50.7 | 0.760 | -31.5  | 0.13 | 25.3                     |
| 500                | 0.803 | -129.8 | 8.644  | 108.8 | 0.056 | 30.3 | 0.487 | -43.9  | 0.26 | 21.9                     |
| 1000               | 0.792 | -158.7 | 4.745  | 89.5  | 0.060 | 25.7 | 0.360 | -46.5  | 0.49 | 19.0                     |
| 1500               | 0.789 | -170.5 | 3.260  | 78.7  | 0.063 | 26.9 | 0.330 | -50.5  | 0.70 | 17.1                     |
| 2000               | 0.788 | -178.0 | 2.478  | 70.1  | 0.065 | 29.4 | 0.327 | -56.4  | 0.90 | 15.8                     |
| 2500               | 0.785 | 176.3  | 2.009  | 62.3  | 0.069 | 32.6 | 0.332 | -63.4  | 1.05 | 13.3                     |
| 3000               | 0.784 | 171.8  | 1.681  | 55.0  | 0.073 | 38.8 | 0.351 | -69.6  | 1.17 | 11.1                     |
| 4000               | 0.783 | 164.5  | 1.277  | 42.2  | 0.084 | 43.9 | 0.392 | -84.4  | 1.27 | 8.7                      |
| 5000               | 0.782 | 158.2  | 1.027  | 30.4  | 0.099 | 50.4 | 0.445 | -97.1  | 1.26 | 7.1                      |
| 6000               | 0.786 | 152.7  | 0.852  | 20.3  | 0.118 | 53.6 | 0.501 | -108.5 | 1.13 | 6.4                      |
| 7000               | 0.788 | 147.5  | 0.714  | 11.2  | 0.138 | 54.7 | 0.555 | -118.2 | 1.03 | 6.1                      |
| 8000               | 0.787 | 142.5  | 0.605  | 3.9   | 0.158 | 54.6 | 0.606 | -127.1 | 0.96 | 5.8                      |

## VCE = 10 V, IC = 10 mA

| FREQUENCY<br>(MHz) | S11   |        | S21    |       | S12   |      | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|--------|-------|-------|------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG    | ANG   | MAG   | ANG  | MAG   | ANG    |      |                          |
| 100                | 0.834 | -48.9  | 20.265 | 151.6 | 0.024 | 61.3 | 0.872 | -23.6  | 0.13 | 29.3                     |
| 200                | 0.800 | -87.0  | 17.509 | 133.0 | 0.036 | 46.4 | 0.691 | -38.0  | 0.15 | 26.9                     |
| 500                | 0.786 | -138.7 | 9.871  | 105.4 | 0.047 | 31.2 | 0.410 | -50.7  | 0.31 | 23.2                     |
| 1000               | 0.782 | -163.4 | 5.268  | 88.0  | 0.051 | 26.9 | 0.291 | -53.1  | 0.60 | 20.1                     |
| 1500               | 0.781 | -173.7 | 3.609  | 78.1  | 0.056 | 31.8 | 0.263 | -57.0  | 0.81 | 18.1                     |
| 2000               | 0.781 | 179.6  | 2.723  | 70.3  | 0.061 | 36.2 | 0.261 | -62.1  | 0.98 | 16.5                     |
| 2500               | 0.778 | 174.6  | 2.208  | 63.0  | 0.067 | 40.3 | 0.271 | -68.8  | 1.10 | 13.3                     |
| 3000               | 0.777 | 170.3  | 1.849  | 56.1  | 0.072 | 45.2 | 0.287 | -75.3  | 1.21 | 11.3                     |
| 4000               | 0.777 | 163.5  | 1.407  | 43.7  | 0.086 | 49.9 | 0.330 | -88.9  | 1.28 | 9.0                      |
| 5000               | 0.779 | 157.4  | 1.135  | 32.0  | 0.103 | 53.2 | 0.385 | -100.4 | 1.23 | 7.5                      |
| 6000               | 0.780 | 152.2  | 0.947  | 22.2  | 0.123 | 55.4 | 0.444 | -110.2 | 1.13 | 6.7                      |
| 7000               | 0.780 | 147.1  | 0.802  | 13.1  | 0.143 | 54.8 | 0.500 | -119.2 | 1.04 | 6.3                      |
| 8000               | 0.781 | 142.4  | 0.687  | 5.6   | 0.161 | 54.2 | 0.552 | -127.5 | 0.98 | 6.3                      |

## VCE = 10 V, IC = 20 mA

| FREQUENCY<br>(MHz) | S11   |        | S21    |       | S12   |      | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|--------|-------|-------|------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG    | ANG   | MAG   | ANG  | MAG   | ANG    |      |                          |
| 100                | 0.753 | -71.1  | 31.641 | 142.9 | 0.021 | 59.3 | 0.777 | -33.9  | 0.11 | 31.8                     |
| 200                | 0.756 | -112.3 | 23.756 | 122.7 | 0.028 | 42.9 | 0.551 | -50.5  | 0.20 | 29.3                     |
| 500                | 0.771 | -152.7 | 11.553 | 99.6  | 0.034 | 31.7 | 0.289 | -62.9  | 0.45 | 25.3                     |
| 1000               | 0.772 | -170.7 | 5.982  | 85.6  | 0.041 | 38.0 | 0.195 | -65.7  | 0.76 | 21.6                     |
| 1500               | 0.774 | -178.6 | 4.055  | 76.9  | 0.048 | 43.8 | 0.174 | -69.6  | 0.96 | 19.3                     |
| 2000               | 0.773 | 176.0  | 3.062  | 70.0  | 0.055 | 47.5 | 0.177 | -75.7  | 1.11 | 15.4                     |
| 2500               | 0.772 | 171.8  | 2.476  | 63.3  | 0.064 | 55.1 | 0.187 | -82.3  | 1.18 | 13.3                     |
| 3000               | 0.772 | 167.9  | 2.073  | 57.0  | 0.074 | 53.8 | 0.208 | -87.1  | 1.20 | 11.8                     |
| 4000               | 0.771 | 161.7  | 1.581  | 45.5  | 0.092 | 56.7 | 0.250 | -98.6  | 1.23 | 9.5                      |
| 5000               | 0.771 | 156.1  | 1.279  | 34.5  | 0.112 | 57.3 | 0.306 | -107.4 | 1.18 | 8.0                      |
| 6000               | 0.776 | 150.8  | 1.075  | 24.7  | 0.131 | 57.1 | 0.361 | -115.4 | 1.11 | 7.1                      |
| 7000               | 0.776 | 146.2  | 0.919  | 15.8  | 0.152 | 55.3 | 0.419 | -122.2 | 1.02 | 6.9                      |
| 8000               | 0.775 | 141.5  | 0.797  | 7.8   | 0.169 | 53.7 | 0.474 | -128.8 | 0.97 | 6.7                      |

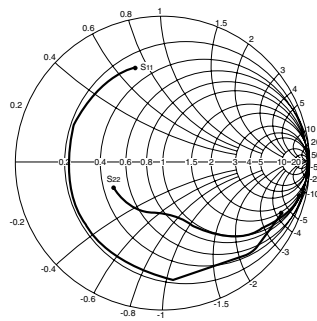
Note:

1. Gain Calculations:

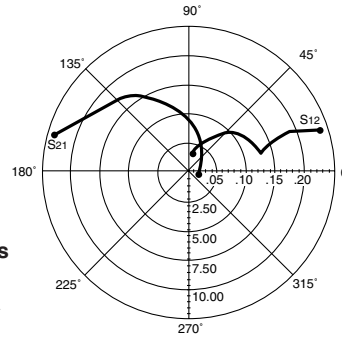
$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}| |S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

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

Coordinates in Ohms  
Frequency in GHz  
V<sub>CE</sub> = 1 V, I<sub>c</sub> = 3 mA



## NE85618

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 1 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 50                 | 0.985           | -13.1  | 3.826           | 170.4 | 0.033           | 78.1  | 0.992           | -6.5   | 0.10 | 20.6                     |
| 100                | 0.980           | -28.2  | 3.396           | 158.7 | 0.059           | 70.7  | 0.973           | -12.9  | 0.10 | 17.6                     |
| 200                | 0.906           | -59.2  | 3.234           | 139.9 | 0.107           | 55.4  | 0.909           | -23.9  | 0.10 | 14.8                     |
| 300                | 0.861           | -80.4  | 2.781           | 123.8 | 0.141           | 41.9  | 0.838           | -32.5  | 0.19 | 12.9                     |
| 400                | 0.822           | -100.4 | 2.432           | 110.5 | 0.161           | 31.6  | 0.776           | -39.3  | 0.23 | 11.8                     |
| 500                | 0.793           | -115.4 | 2.128           | 99.5  | 0.172           | 22.9  | 0.725           | -44.8  | 0.30 | 10.9                     |
| 600                | 0.769           | -128.5 | 1.886           | 89.8  | 0.178           | 16.1  | 0.690           | -49.6  | 0.36 | 10.3                     |
| 700                | 0.754           | -139.2 | 1.674           | 81.4  | 0.180           | 10.2  | 0.663           | -54.0  | 0.42 | 9.7                      |
| 800                | 0.748           | -148.5 | 1.510           | 74.0  | 0.178           | 5.2   | 0.643           | -58.3  | 0.48 | 9.3                      |
| 900                | 0.740           | -156.4 | 1.364           | 67.2  | 0.175           | 1.1   | 0.631           | -62.5  | 0.55 | 8.9                      |
| 1000               | 0.738           | -163.6 | 1.247           | 60.8  | 0.171           | -2.5  | 0.621           | -66.5  | 0.62 | 8.6                      |
| 1500               | 0.739           | 168.1  | 0.880           | 34.7  | 0.139           | -11.8 | 0.607           | -87.1  | 1.00 | 8.0                      |
| 2000               | 0.748           | 146.4  | 0.676           | 15.4  | 0.108           | -3.8  | 0.609           | -107.4 | 1.53 | 3.7                      |
| 2500               | 0.760           | 126.9  | 0.558           | 2.0   | 0.117           | 18.0  | 0.611           | -127.8 | 1.63 | 2.1                      |
| 3000               | 0.765           | 108.5  | 0.492           | -8.8  | 0.175           | 26.4  | 0.608           | -149.5 | 1.32 | 1.1                      |

V<sub>CE</sub> = 1 V, I<sub>c</sub> = 3 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 50                 | 0.899           | -23.4  | 10.689          | 164.4 | 0.032           | 76.3 | 0.962           | -12.8  | 0.09 | 25.2                     |
| 100                | 0.865           | -45.1  | 9.073           | 150.5 | 0.054           | 64.2 | 0.908           | -24.4  | 0.10 | 22.3                     |
| 200                | 0.794           | -85.0  | 7.526           | 127.5 | 0.088           | 46.7 | 0.748           | -41.5  | 0.15 | 19.3                     |
| 300                | 0.724           | -109.3 | 5.882           | 112.2 | 0.107           | 35.1 | 0.618           | -52.2  | 0.27 | 17.4                     |
| 400                | 0.699           | -128.0 | 4.787           | 100.9 | 0.114           | 27.9 | 0.528           | -59.5  | 0.34 | 16.2                     |
| 500                | 0.673           | -141.6 | 4.006           | 91.9  | 0.118           | 23.1 | 0.468           | -64.6  | 0.44 | 15.3                     |
| 600                | 0.668           | -152.4 | 3.426           | 84.5  | 0.121           | 20.0 | 0.427           | -68.8  | 0.52 | 14.5                     |
| 700                | 0.657           | -161.1 | 2.988           | 78.0  | 0.123           | 18.0 | 0.399           | -72.5  | 0.61 | 13.9                     |
| 800                | 0.656           | -168.3 | 2.654           | 72.3  | 0.123           | 16.1 | 0.380           | -76.0  | 0.69 | 13.3                     |
| 900                | 0.653           | -174.5 | 2.373           | 67.0  | 0.124           | 15.2 | 0.367           | -79.5  | 0.77 | 12.8                     |
| 1000               | 0.652           | 179.2  | 2.155           | 61.9  | 0.124           | 15.0 | 0.359           | -82.8  | 0.85 | 12.4                     |
| 1500               | 0.660           | 156.4  | 1.490           | 40.0  | 0.129           | 16.1 | 0.349           | -99.9  | 1.16 | 8.2                      |
| 2000               | 0.666           | 138.4  | 1.149           | 21.4  | 0.147           | 20.0 | 0.358           | -117.2 | 1.30 | 5.6                      |
| 2500               | 0.676           | 122.0  | 0.964           | 6.0   | 0.181           | 21.2 | 0.367           | -134.9 | 1.24 | 4.3                      |
| 3000               | 0.681           | 105.7  | 0.840           | -8.5  | 0.228           | 17.7 | 0.374           | -154.8 | 1.17 | 3.2                      |

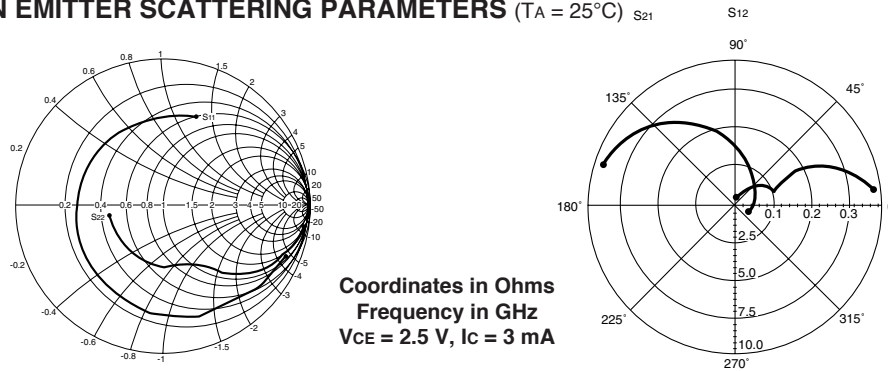
V<sub>CE</sub> = 2.5 V, I<sub>c</sub> = 1 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 50                 | 0.971           | -10.1  | 2.890           | 175.8 | 0.021           | 80.9 | 0.998           | -3.6   | 0.03 | 21.4                     |
| 100                | 0.962           | -22.4  | 2.779           | 163.2 | 0.039           | 75.9 | 0.988           | -8.2   | 0.07 | 18.5                     |
| 200                | 0.930           | -46.4  | 2.625           | 146.3 | 0.076           | 61.4 | 0.942           | -17.3  | 0.12 | 15.4                     |
| 300                | 0.895           | -68.6  | 2.462           | 131.1 | 0.104           | 48.1 | 0.893           | -24.7  | 0.17 | 13.7                     |
| 400                | 0.854           | -88.4  | 2.295           | 118.3 | 0.123           | 36.8 | 0.839           | -31.0  | 0.23 | 12.7                     |
| 500                | 0.823           | -104.9 | 2.095           | 107.2 | 0.133           | 29.1 | 0.799           | -35.9  | 0.27 | 12.0                     |
| 600                | 0.798           | -119.4 | 1.925           | 97.2  | 0.140           | 21.4 | 0.761           | -40.0  | 0.33 | 11.4                     |
| 700                | 0.774           | -131.3 | 1.767           | 89.3  | 0.142           | 16.2 | 0.738           | -44.5  | 0.38 | 10.9                     |
| 800                | 0.766           | -141.6 | 1.592           | 81.2  | 0.143           | 11.3 | 0.719           | -48.0  | 0.44 | 10.5                     |
| 900                | 0.758           | -150.6 | 1.459           | 73.9  | 0.141           | 6.6  | 0.708           | -51.6  | 0.50 | 10.1                     |
| 1000               | 0.753           | -158.9 | 1.329           | 67.1  | 0.137           | 2.7  | 0.708           | -54.9  | 0.56 | 9.9                      |
| 1500               | 0.743           | 170.2  | 0.952           | 41.5  | 0.111           | -5.6 | 0.681           | -73.7  | 0.94 | 9.3                      |
| 2000               | 0.752           | 146.5  | 0.728           | 22.1  | 0.088           | 4.7  | 0.681           | -92.0  | 1.40 | 5.4                      |
| 2500               | 0.752           | 126.1  | 0.605           | 6.9   | 0.099           | 29.8 | 0.672           | -110.5 | 1.55 | 3.5                      |
| 3000               | 0.758           | 106.7  | 0.523           | -4.0  | 0.152           | 36.7 | 0.672           | -128.3 | 1.21 | 2.6                      |

Note:

1. Gain Calculations:

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

TYPICAL COMMON EMITTER SCATTERING PARAMETERS ( $T_A = 25^\circ\text{C}$ )

## NE85619

VCE = 2.5 V, IC = 1 mA

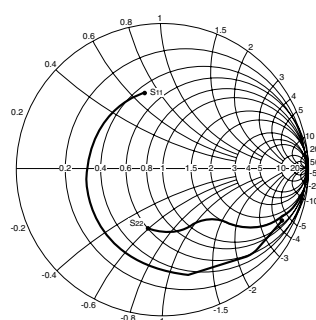
| FREQUENCY<br>(MHz) | S11   |        | S21   |       | S12   |      | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|-------|-------|-------|------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG    |      |                          |
| 50                 | 0.964 | -14.4  | 3.517 | 167.7 | 0.022 | 85.5 | 0.990 | -3.8   | 0.02 | 22.0                     |
| 100                | 0.957 | -26.7  | 3.474 | 160.8 | 0.047 | 76.1 | 0.972 | -10.5  | 0.03 | 18.7                     |
| 200                | 0.920 | -50.4  | 3.216 | 144.0 | 0.084 | 59.3 | 0.932 | -20.4  | 0.11 | 15.8                     |
| 300                | 0.871 | -71.6  | 2.886 | 129.9 | 0.116 | 47.6 | 0.881 | -27.1  | 0.17 | 14.0                     |
| 400                | 0.833 | -90.1  | 2.583 | 117.1 | 0.134 | 37.4 | 0.828 | -33.0  | 0.22 | 12.9                     |
| 500                | 0.798 | -105.2 | 2.297 | 106.5 | 0.146 | 29.9 | 0.782 | -37.6  | 0.28 | 12.0                     |
| 600                | 0.772 | -118.0 | 2.044 | 97.1  | 0.150 | 23.6 | 0.745 | -41.8  | 0.34 | 11.3                     |
| 700                | 0.754 | -129.0 | 1.839 | 89.1  | 0.153 | 17.5 | 0.721 | -45.7  | 0.40 | 10.8                     |
| 800                | 0.739 | -138.8 | 1.674 | 81.8  | 0.152 | 13.0 | 0.704 | -49.2  | 0.46 | 10.4                     |
| 900                | 0.728 | -147.1 | 1.530 | 75.1  | 0.152 | 9.1  | 0.689 | -52.4  | 0.53 | 10.0                     |
| 1000               | 0.721 | -154.8 | 1.406 | 69.2  | 0.150 | 5.2  | 0.680 | -55.7  | 0.59 | 9.7                      |
| 1500               | 0.701 | -174.1 | 1.016 | 44.4  | 0.124 | -0.4 | 0.657 | -71.1  | 0.97 | 9.1                      |
| 2000               | 0.696 | -148.5 | 0.801 | 25.3  | 0.104 | 12.6 | 0.642 | -86.1  | 1.45 | 4.9                      |
| 2500               | 0.700 | 124.4  | 0.672 | 11.1  | 0.128 | 34.2 | 0.628 | -102.3 | 1.43 | 3.3                      |
| 3000               | 0.706 | 102.3  | 0.594 | -0.2  | 0.198 | 38.6 | 0.610 | -120.9 | 1.16 | 2.3                      |

VCE = 2.5 V, IC = 3 mA

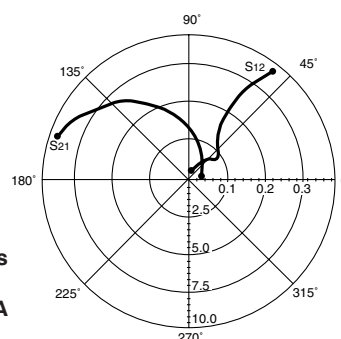
| FREQUENCY<br>(MHz) | S11   |        | S21   |       | S12   |      | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|-------|-------|-------|------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG   | ANG   | MAG   | ANG  | MAG   | ANG    |      |                          |
| 50                 | 0.891 | -22.1  | 9.720 | 163.1 | 0.022 | 83.5 | 0.980 | -7.9   | 0.03 | 26.5                     |
| 100                | 0.864 | -39.3  | 9.323 | 153.2 | 0.045 | 68.3 | 0.915 | -19.1  | 0.12 | 23.2                     |
| 200                | 0.790 | -71.8  | 7.861 | 132.7 | 0.071 | 51.0 | 0.806 | -32.8  | 0.20 | 20.4                     |
| 300                | 0.723 | -96.9  | 6.425 | 118.0 | 0.092 | 40.8 | 0.682 | -41.8  | 0.28 | 18.4                     |
| 400                | 0.676 | -116.0 | 5.336 | 106.4 | 0.097 | 33.1 | 0.602 | -47.8  | 0.37 | 17.4                     |
| 500                | 0.651 | -130.3 | 4.518 | 97.4  | 0.102 | 30.0 | 0.545 | -51.5  | 0.45 | 16.5                     |
| 600                | 0.633 | -141.5 | 3.876 | 89.8  | 0.106 | 27.5 | 0.501 | -54.6  | 0.53 | 15.6                     |
| 700                | 0.618 | -151.1 | 3.401 | 83.5  | 0.107 | 25.5 | 0.476 | -57.1  | 0.62 | 15.0                     |
| 800                | 0.608 | -159.1 | 3.031 | 77.6  | 0.109 | 24.3 | 0.456 | -59.7  | 0.71 | 14.4                     |
| 900                | 0.600 | -166.0 | 2.733 | 72.3  | 0.110 | 23.4 | 0.445 | -61.9  | 0.79 | 14.0                     |
| 1000               | 0.597 | -172.5 | 2.488 | 67.6  | 0.112 | 23.3 | 0.438 | -64.5  | 0.85 | 13.5                     |
| 1500               | 0.585 | -162.0 | 1.746 | 46.4  | 0.123 | 25.9 | 0.420 | -75.8  | 1.13 | 9.3                      |
| 2000               | 0.578 | -140.2 | 1.369 | 28.5  | 0.148 | 30.8 | 0.414 | -88.1  | 1.23 | 6.8                      |
| 2500               | 0.587 | -119.7 | 1.144 | 12.8  | 0.185 | 32.0 | 0.402 | -101.5 | 1.19 | 5.3                      |
| 3000               | 0.599 | -100.4 | 0.996 | -1.6  | 0.243 | 27.2 | 0.385 | -119.0 | 1.08 | 4.4                      |
| 3500               | 0.625 | 83.1   | 0.887 | -15.0 | 0.302 | 19.5 | 0.362 | -142.2 | 1.02 | 3.8                      |
| 4000               | 0.656 | 68.4   | 0.806 | -26.5 | 0.365 | 8.4  | 0.363 | -170.7 | 0.96 | 3.4                      |

VCE = 3 V, IC = 7 mA

| FREQUENCY<br>(MHz) | S11   |        | S21    |       | S12   |       | S22   |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-------|--------|--------|-------|-------|-------|-------|--------|------|--------------------------|
|                    | MAG   | ANG    | MAG    | ANG   | MAG   | ANG   | MAG   | ANG    |      |                          |
| 50                 | 0.751 | -31.8  | 19.537 | 157.2 | 0.021 | 80.6  | 0.935 | -14.4  | 0.10 | 29.7                     |
| 100                | 0.723 | -58.1  | 17.622 | 143.1 | 0.038 | 64.8  | 0.808 | -30.3  | 0.20 | 26.7                     |
| 200                | 0.633 | -98.5  | 12.973 | 120.5 | 0.055 | 46.8  | 0.633 | -47.2  | 0.34 | 23.7                     |
| 300                | 0.590 | -122.8 | 9.717  | 107.1 | 0.064 | 44.0  | 0.496 | -54.9  | 0.46 | 21.8                     |
| 400                | 0.560 | -139.6 | 7.662  | 97.7  | 0.069 | 40.8  | 0.417 | -59.9  | 0.58 | 20.5                     |
| 500                | 0.548 | -151.6 | 6.301  | 90.5  | 0.073 | 40.5  | 0.365 | -62.5  | 0.70 | 19.4                     |
| 600                | 0.539 | -160.4 | 5.317  | 84.3  | 0.078 | 40.2  | 0.334 | -64.4  | 0.79 | 18.3                     |
| 700                | 0.533 | -167.9 | 4.613  | 79.2  | 0.084 | 40.5  | 0.311 | -66.5  | 0.86 | 17.4                     |
| 800                | 0.525 | -174.3 | 4.074  | 74.4  | 0.089 | 41.0  | 0.299 | -68.0  | 0.93 | 16.6                     |
| 900                | 0.524 | -179.9 | 3.659  | 69.9  | 0.095 | 40.9  | 0.289 | -69.7  | 0.98 | 15.9                     |
| 1000               | 0.520 | -174.8 | 3.314  | 66.0  | 0.101 | 42.2  | 0.284 | -71.5  | 1.02 | 14.3                     |
| 1500               | 0.510 | -153.2 | 2.295  | 47.3  | 0.138 | 41.0  | 0.278 | -78.9  | 1.10 | 10.3                     |
| 2000               | 0.501 | -134.1 | 1.788  | 30.7  | 0.177 | 38.4  | 0.272 | -89.3  | 1.13 | 7.9                      |
| 2500               | 0.507 | -115.6 | 1.487  | 15.5  | 0.223 | 31.9  | 0.262 | -100.4 | 1.10 | 6.3                      |
| 3000               | 0.524 | -98.9  | 1.290  | 0.9   | 0.272 | 23.4  | 0.246 | -117.0 | 1.05 | 5.4                      |
| 3500               | 0.554 | -83.2  | 1.146  | -13.1 | 0.322 | 14.7  | 0.22  | -141.4 | 1.02 | 4.6                      |
| 4000               | 0.598 | -69.6  | 1.035  | -25.8 | 0.367 | 4.2   | 0.22  | -174.0 | 0.98 | 4.5                      |
| 4500               | 0.633 | -57.2  | 0.936  | -37.6 | 0.411 | -6.1  | 0.252 | -154.6 | 0.96 | 3.6                      |
| 5000               | 0.655 | -45.3  | 0.851  | -48.1 | 0.447 | -16.4 | 0.305 | -133.2 | 0.96 | 2.8                      |

TYPICAL COMMON EMITTER SCATTERING PARAMETERS ( $T_A = 25^\circ\text{C}$ )

Coordinates in Ohms  
Frequency in GHz  
 $V_{CE} = 2.5\text{ V}$ ,  $I_C = 3\text{ mA}$



## NE85630

 $V_{CE} = 2.5\text{ V}$ ,  $I_C = 1\text{ mA}$ 

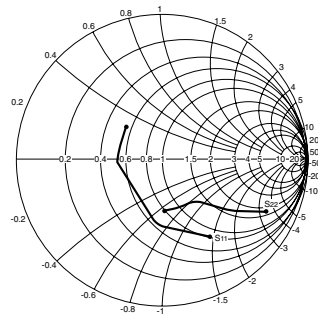
| FREQUENCY<br>(MHz) | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|------|--------------------------|
|                    | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG    |      |                          |
| 50                 | 0.931           | -14.9  | 3.753           | 166.3 | 0.025           | 85.1 | 0.997           | -5.2   | 0.03 | 21.8                     |
| 100                | 0.937           | -29.6  | 3.500           | 161.0 | 0.052           | 75.0 | 0.972           | -9.8   | 0.02 | 18.3                     |
| 200                | 0.873           | -55.1  | 3.138           | 141.0 | 0.087           | 59.1 | 0.920           | -17.8  | 0.16 | 15.6                     |
| 300                | 0.842           | -76.3  | 2.775           | 127.5 | 0.114           | 47.7 | 0.866           | -23.8  | 0.21 | 13.9                     |
| 400                | 0.793           | -95.1  | 2.460           | 115.5 | 0.127           | 39.2 | 0.806           | -28.7  | 0.27 | 12.9                     |
| 500                | 0.752           | -110.5 | 2.161           | 105.0 | 0.134           | 32.1 | 0.765           | -32.3  | 0.36 | 12.1                     |
| 600                | 0.727           | -123.0 | 1.903           | 96.5  | 0.138           | 28.1 | 0.734           | -35.5  | 0.42 | 11.4                     |
| 700                | 0.708           | -133.9 | 1.717           | 88.8  | 0.138           | 23.9 | 0.714           | -38.5  | 0.50 | 10.9                     |
| 800                | 0.696           | -143.3 | 1.555           | 82.0  | 0.134           | 22.0 | 0.700           | -41.3  | 0.58 | 10.6                     |
| 900                | 0.683           | -151.5 | 1.414           | 76.4  | 0.128           | 21.0 | 0.687           | -44.1  | 0.69 | 10.4                     |
| 1000               | 0.676           | -159.2 | 1.305           | 70.9  | 0.124           | 21.3 | 0.676           | -46.8  | 0.78 | 10.2                     |
| 1500               | 0.664           | 169.7  | 0.947           | 50.7  | 0.106           | 43.8 | 0.655           | -60.8  | 1.22 | 6.7                      |
| 2000               | 0.656           | 143.9  | 0.751           | 37.2  | 0.159           | 69.6 | 0.653           | -76.4  | 1.10 | 4.8                      |
| 2500               | 0.655           | 120.0  | 0.647           | 30.2  | 0.274           | 71.3 | 0.634           | -92.7  | 0.94 | 3.7                      |
| 3000               | 0.647           | 99.1   | 0.611           | 27.2  | 0.403           | 61.5 | 0.603           | -110.7 | 0.94 | 1.8                      |

 $V_{CE} = 2.5\text{ V}$ ,  $I_C = 3\text{ mA}$ 

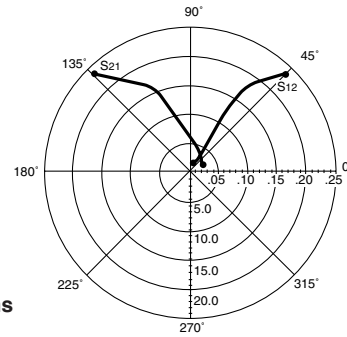
|      |       |        |       |       |       |      |       |        |      |      |
|------|-------|--------|-------|-------|-------|------|-------|--------|------|------|
| 50   | 0.884 | -22.4  | 9.820 | 161.3 | 0.028 | 71.8 | 0.967 | -10.9  | 0.22 | 25.4 |
| 100  | 0.839 | -43.0  | 9.367 | 152.3 | 0.040 | 66.4 | 0.928 | -18.5  | 0.10 | 23.7 |
| 200  | 0.731 | -76.2  | 7.387 | 129.2 | 0.074 | 53.2 | 0.779 | -30.1  | 0.26 | 20.0 |
| 300  | 0.653 | -100.3 | 5.921 | 115.2 | 0.087 | 44.5 | 0.665 | -36.1  | 0.38 | 18.3 |
| 400  | 0.600 | -119.1 | 4.846 | 105.1 | 0.093 | 41.3 | 0.587 | -39.9  | 0.49 | 17.2 |
| 500  | 0.572 | -133.0 | 4.072 | 96.5  | 0.098 | 39.3 | 0.536 | -42.0  | 0.60 | 16.2 |
| 600  | 0.552 | -143.9 | 3.496 | 90.0  | 0.102 | 39.4 | 0.503 | -43.8  | 0.70 | 15.3 |
| 700  | 0.540 | -153.0 | 3.073 | 83.9  | 0.105 | 39.6 | 0.481 | -45.5  | 0.80 | 14.7 |
| 800  | 0.529 | -160.7 | 2.716 | 78.7  | 0.110 | 41.6 | 0.467 | -47.4  | 0.88 | 13.9 |
| 900  | 0.524 | -166.9 | 2.447 | 74.3  | 0.114 | 43.4 | 0.457 | -49.3  | 0.95 | 13.3 |
| 1000 | 0.521 | -173.7 | 2.242 | 69.7  | 0.118 | 45.6 | 0.448 | -51.3  | 1.01 | 12.2 |
| 1500 | 0.517 | 161.3  | 1.589 | 52.2  | 0.157 | 56.6 | 0.431 | -61.7  | 1.10 | 8.1  |
| 2000 | 0.510 | 139.8  | 1.253 | 37.9  | 0.219 | 60.2 | 0.433 | -73.9  | 1.05 | 6.2  |
| 2500 | 0.525 | 119.5  | 1.060 | 26.8  | 0.300 | 58.2 | 0.431 | -87.6  | 0.95 | 5.5  |
| 3000 | 0.537 | 102.7  | 0.930 | 17.9  | 0.390 | 51.9 | 0.418 | -103.9 | 0.92 | 3.8  |

 $V_{CE} = 10\text{ V}$ ,  $I_C = 7\text{ mA}$ 

|      |       |        |        |       |       |      |       |       |      |      |
|------|-------|--------|--------|-------|-------|------|-------|-------|------|------|
| 50   | 0.823 | -18.6  | 15.781 | 164.3 | 0.013 | 80.1 | 0.955 | -10.2 | 0.13 | 30.8 |
| 100  | 0.768 | -39.4  | 14.539 | 149.3 | 0.025 | 69.2 | 0.885 | -18.3 | 0.23 | 27.6 |
| 200  | 0.607 | -75.7  | 11.892 | 127.5 | 0.039 | 59.0 | 0.705 | -27.2 | 0.43 | 24.8 |
| 400  | 0.441 | -121.3 | 7.582  | 102.9 | 0.055 | 56.8 | 0.538 | -29.9 | 0.74 | 21.4 |
| 600  | 0.384 | -146.2 | 5.346  | 90.3  | 0.070 | 60.5 | 0.481 | -30.3 | 0.91 | 18.8 |
| 800  | 0.360 | -163.3 | 4.104  | 81.2  | 0.084 | 62.9 | 0.457 | -31.5 | 1.02 | 16.0 |
| 1000 | 0.350 | -176.2 | 3.323  | 73.9  | 0.103 | 65.2 | 0.444 | -34.0 | 1.05 | 13.7 |
| 1200 | 0.347 | 173.0  | 2.783  | 67.0  | 0.119 | 67.0 | 0.432 | -38.0 | 1.10 | 11.8 |
| 1400 | 0.352 | 162.7  | 2.438  | 61.9  | 0.141 | 68.8 | 0.423 | -40.2 | 1.07 | 10.8 |
| 1600 | 0.358 | 153.7  | 2.174  | 56.3  | 0.161 | 68.3 | 0.429 | -43.9 | 1.04 | 10.1 |
| 1800 | 0.363 | 145.6  | 1.967  | 50.8  | 0.183 | 67.5 | 0.428 | -47.7 | 1.02 | 9.4  |
| 2000 | 0.373 | 138.4  | 1.787  | 45.6  | 0.206 | 66.4 | 0.436 | -51.9 | 0.98 | 9.4  |
| 2200 | 0.381 | 132.2  | 1.635  | 41.1  | 0.229 | 65.6 | 0.431 | -56.4 | 0.98 | 8.5  |
| 2400 | 0.388 | 125.3  | 1.535  | 36.9  | 0.252 | 64.4 | 0.430 | -60.6 | 0.95 | 7.8  |
| 2600 | 0.396 | 119.7  | 1.438  | 33.4  | 0.281 | 63.3 | 0.425 | -65.2 | 0.93 | 7.1  |
| 2800 | 0.405 | 114.2  | 1.355  | 29.4  | 0.306 | 61.2 | 0.421 | -69.9 | 0.92 | 6.5  |
| 3000 | 0.414 | 108.8  | 1.289  | 26.0  | 0.332 | 59.5 | 0.422 | -74.3 | 0.90 | 5.9  |
| 3200 | 0.427 | 103.0  | 1.228  | 22.2  | 0.359 | 57.0 | 0.417 | -79.4 | 0.89 | 5.3  |
| 3400 | 0.433 | 98.1   | 1.168  | 19.3  | 0.389 | 54.6 | 0.412 | -84.6 | 0.88 | 4.8  |
| 3600 | 0.448 | 93.7   | 1.124  | 16.2  | 0.414 | 51.9 | 0.401 | -90.2 | 0.88 | 4.3  |

TYPICAL COMMON EMITTER SCATTERING PARAMETERS ( $T_A = 25^\circ\text{C}$ )

Coordinates in Ohms  
Frequency in GHz  
 $V_{CE} = 10\text{ V}$ ,  $I_C = 10\text{ mA}$



## NE85632

 $V_{CE} = 10\text{ V}$ ,  $I_C = 7\text{ mA}$ 

| FREQUENCY<br>(MHz) | S11  |      | S21   |     | S12  |     | S22  |     | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|------|------|-------|-----|------|-----|------|-----|------|--------------------------|
|                    | MAG  | ANG  | MAG   | ANG | MAG  | ANG | MAG  | ANG |      |                          |
| 100                | 0.71 | -50  | 16.63 | 141 | 0.02 | 70  | 0.85 | -22 | 0.24 | 29.2                     |
| 200                | 0.54 | -84  | 11.97 | 119 | 0.04 | 55  | 0.66 | -34 | 0.52 | 24.8                     |
| 500                | 0.40 | -134 | 5.98  | 91  | 0.08 | 58  | 0.44 | -43 | 0.80 | 18.7                     |
| 1000               | 0.34 | -173 | 3.26  | 66  | 0.13 | 58  | 0.40 | -52 | 0.95 | 14.0                     |
| 1500               | 0.34 | 163  | 2.33  | 48  | 0.18 | 57  | 0.39 | -70 | 0.97 | 11.1                     |
| 2000               | 0.37 | 140  | 1.94  | 29  | 0.24 | 47  | 0.39 | -88 | 0.89 | 9.1                      |

 $V_{CE} = 10\text{ V}$ ,  $I_C = 10\text{ mA}$ 

|      |      |      |       |     |      |    |      |     |      |      |
|------|------|------|-------|-----|------|----|------|-----|------|------|
| 100  | 0.62 | -58  | 20.35 | 135 | 0.02 | 70 | 0.80 | -26 | 0.31 | 30.1 |
| 200  | 0.45 | -95  | 13.62 | 113 | 0.03 | 55 | 0.59 | -36 | 0.71 | 26.6 |
| 500  | 0.35 | -141 | 6.44  | 89  | 0.07 | 63 | 0.39 | -42 | 0.93 | 19.6 |
| 1000 | 0.31 | -177 | 3.46  | 65  | 0.13 | 60 | 0.36 | -51 | 0.99 | 14.3 |
| 1500 | 0.31 | 160  | 2.46  | 48  | 0.19 | 57 | 0.35 | -70 | 0.98 | 11.1 |
| 2000 | 0.34 | 138  | 2.04  | 30  | 0.25 | 46 | 0.35 | -88 | 0.91 | 9.1  |

 $V_{CE} = 10\text{ V}$ ,  $I_C = 20\text{ mA}$ 

|      |      |      |       |     |      |    |      |     |      |      |
|------|------|------|-------|-----|------|----|------|-----|------|------|
| 100  | 0.45 | -78  | 26.73 | 125 | 0.01 | 69 | 0.68 | -31 | 0.77 | 34.3 |
| 200  | 0.32 | -116 | 15.88 | 105 | 0.02 | 62 | 0.47 | -37 | 1.14 | 26.7 |
| 500  | 0.28 | -154 | 7.03  | 85  | 0.07 | 70 | 0.32 | -40 | 1.00 | 20.0 |
| 1000 | 0.27 | 175  | 3.72  | 64  | 0.14 | 63 | 0.32 | -50 | 0.97 | 14.2 |
| 1500 | 0.28 | 155  | 2.63  | 47  | 0.20 | 58 | 0.31 | -70 | 0.97 | 11.2 |
| 2000 | 0.30 | 134  | 2.17  | 30  | 0.26 | 45 | 0.31 | -88 | 0.93 | 9.2  |

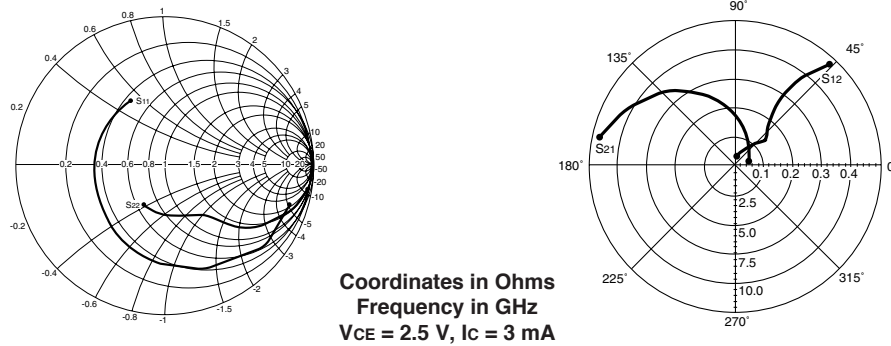
Note:

1. Gain Calculations:

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

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

## NE85633

V<sub>CE</sub> = 2.5 V, I<sub>C</sub> = 1 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 50                 | 0.960           | -12.7  | 3.696           | 173.0 | 0.028           | 83.1 | 0.988           | -4.5   | 0.01 | 21.2                     |
| 100                | 0.942           | -25.3  | 3.417           | 161.3 | 0.052           | 75.2 | 0.976           | -9.6   | 0.08 | 18.2                     |
| 200                | 0.898           | -49.1  | 3.168           | 144.6 | 0.089           | 61.8 | 0.923           | -18.5  | 0.13 | 15.5                     |
| 400                | 0.800           | -87.6  | 2.521           | 117.5 | 0.139           | 42.0 | 0.804           | -30.4  | 0.27 | 12.6                     |
| 600                | 0.717           | -115.1 | 1.995           | 98.3  | 0.155           | 30.4 | 0.720           | -38.0  | 0.43 | 11.1                     |
| 800                | 0.672           | -135.4 | 1.632           | 84.3  | 0.155           | 24.9 | 0.672           | -44.0  | 0.58 | 10.2                     |
| 1000               | 0.649           | -150.7 | 1.391           | 72.4  | 0.146           | 23.8 | 0.642           | -49.6  | 0.75 | 9.8                      |
| 1500               | 0.627           | 178.2  | 1.032           | 51.6  | 0.131           | 40.4 | 0.608           | -65.0  | 1.13 | 6.8                      |
| 2000               | 0.624           | 154.3  | 0.842           | 37.3  | 0.186           | 63.7 | 0.582           | -83.0  | 1.05 | 5.2                      |
| 2500               | 0.615           | 131.9  | 0.747           | 28.0  | 0.308           | 65.6 | 0.547           | -104.1 | 0.92 | 3.8                      |
| 3000               | 0.601           | 112.1  | 0.709           | 21.7  | 0.448           | 55.4 | 0.498           | -128.3 | 0.93 | 2.0                      |

V<sub>CE</sub> = 2.5 V, I<sub>C</sub> = 3 mA

|      |       |        |        |       |       |      |       |        |      |      |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 50   | 0.891 | -17.8  | 10.110 | 168.5 | 0.028 | 80.7 | 0.982 | -9.3   | 0.06 | 25.6 |
| 100  | 0.876 | -38.9  | 8.943  | 152.8 | 0.048 | 71.4 | 0.916 | -18.7  | 0.09 | 22.7 |
| 200  | 0.749 | -69.4  | 7.442  | 131.8 | 0.075 | 53.6 | 0.778 | -31.2  | 0.27 | 20.0 |
| 400  | 0.603 | -111.5 | 4.927  | 105.9 | 0.101 | 43.1 | 0.577 | -42.8  | 0.48 | 16.9 |
| 600  | 0.533 | -136.4 | 3.558  | 90.7  | 0.115 | 41.3 | 0.476 | -47.2  | 0.70 | 14.9 |
| 800  | 0.501 | -153.3 | 2.802  | 79.8  | 0.126 | 43.1 | 0.429 | -50.5  | 0.86 | 13.5 |
| 1000 | 0.488 | -165.9 | 2.303  | 70.6  | 0.138 | 46.3 | 0.403 | -54.1  | 0.98 | 12.2 |
| 1500 | 0.478 | 169.8  | 1.660  | 52.6  | 0.182 | 53.4 | 0.370 | -65.0  | 1.08 | 7.9  |
| 2000 | 0.483 | 151.2  | 1.337  | 37.9  | 0.249 | 56.1 | 0.348 | -78.8  | 1.02 | 6.4  |
| 2500 | 0.489 | 132.7  | 1.155  | 25.6  | 0.337 | 53.6 | 0.324 | -96.6  | 0.95 | 5.3  |
| 3000 | 0.499 | 116.9  | 1.042  | 15.4  | 0.433 | 46.2 | 0.298 | -118.9 | 0.92 | 3.8  |

V<sub>CE</sub> = 3.5 V, I<sub>C</sub> = 10 mA

|      |       |        |        |       |       |      |       |       |      |      |
|------|-------|--------|--------|-------|-------|------|-------|-------|------|------|
| 100  | 0.602 | -60.1  | 19.040 | 138.2 | 0.021 | 88.8 | 0.805 | -31.7 | 0.12 | 29.6 |
| 200  | 0.471 | -98.0  | 13.178 | 116.7 | 0.047 | 56.7 | 0.564 | -45.5 | 0.54 | 24.5 |
| 400  | 0.389 | -138.4 | 7.545  | 96.1  | 0.072 | 56.1 | 0.369 | -50.6 | 0.81 | 20.2 |
| 600  | 0.370 | -159.5 | 5.208  | 85.2  | 0.093 | 60.0 | 0.299 | -51.8 | 0.94 | 17.5 |
| 800  | 0.367 | -172.8 | 3.977  | 77.2  | 0.117 | 61.9 | 0.266 | -53.8 | 1.00 | 15.3 |
| 1000 | 0.369 | 177.5  | 3.229  | 70.0  | 0.140 | 63.4 | 0.246 | -56.3 | 1.03 | 12.6 |
| 1200 | 0.374 | 169.5  | 2.740  | 63.8  | 0.167 | 61.5 | 0.231 | -58.6 | 1.03 | 11.1 |
| 1400 | 0.379 | 163.6  | 2.386  | 58.2  | 0.191 | 61.2 | 0.222 | -61.2 | 1.04 | 9.7  |
| 1600 | 0.391 | 157.6  | 2.131  | 52.6  | 0.215 | 60.1 | 0.210 | -64.9 | 1.04 | 8.7  |
| 1800 | 0.396 | 153.1  | 1.932  | 47.8  | 0.243 | 58.6 | 0.203 | -68.7 | 1.02 | 8.1  |
| 2000 | 0.409 | 149.4  | 1.778  | 42.9  | 0.271 | 56.0 | 0.189 | -73.2 | 1.00 | 8.2  |
| 2500 | 0.425 | 141.1  | 1.512  | 31.6  | 0.337 | 51.3 | 0.165 | -83.7 | 0.97 | 6.5  |

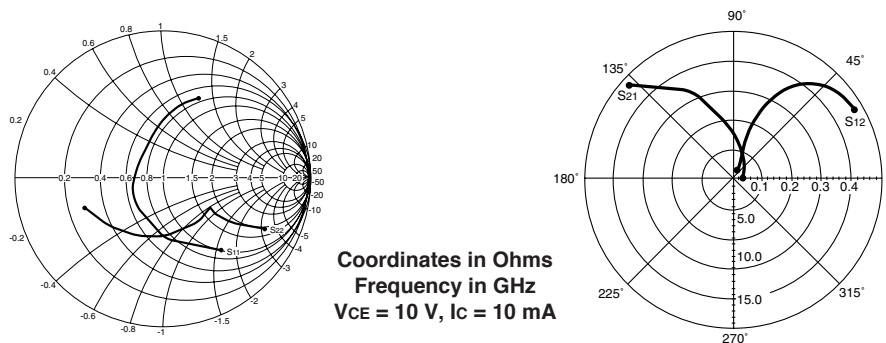
Note:

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 COMMON EMITTER SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)

## NE85634

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 7 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 100                | 0.714           | -42.6  | 14.567          | 144.0 | 0.031           | 69.3 | 0.840           | -22.1  | 0.30 | 26.7                     |
| 200                | 0.508           | -77.9  | 11.129          | 121.0 | 0.047           | 63.0 | 0.636           | -31.0  | 0.56 | 23.7                     |
| 400                | 0.326           | -119.5 | 6.585           | 98.1  | 0.072           | 65.1 | 0.478           | -33.0  | 0.85 | 19.6                     |
| 500                | 0.286           | -132.9 | 5.409           | 91.8  | 0.086           | 66.9 | 0.452           | -32.8  | 0.91 | 18.0                     |
| 600                | 0.264           | -144.5 | 4.579           | 86.5  | 0.096           | 68.7 | 0.431           | -33.3  | 0.98 | 16.8                     |
| 800                | 0.237           | -162.6 | 3.553           | 78.1  | 0.124           | 70.9 | 0.415           | -35.6  | 1.01 | 14.0                     |
| 1000               | 0.225           | -177.8 | 2.899           | 70.3  | 0.152           | 72.0 | 0.410           | -38.5  | 1.02 | 11.9                     |
| 1500               | 0.226           | 148.3  | 2.083           | 55.0  | 0.228           | 71.0 | 0.411           | -50.3  | 0.99 | 9.6                      |
| 2000               | 0.262           | 122.2  | 1.669           | 42.4  | 0.302           | 67.1 | 0.403           | -66.5  | 0.96 | 7.4                      |
| 2500               | 0.350           | 102.4  | 1.454           | 29.6  | 0.381           | 60.6 | 0.420           | -87.4  | 0.89 | 5.8                      |
| 3000               | 0.451           | 87.6   | 1.258           | 17.6  | 0.445           | 51.5 | 0.455           | -113.6 | 0.86 | 4.5                      |
| 3500               | 0.548           | 75.7   | 1.095           | 6.0   | 0.486           | 41.4 | 0.520           | -139.5 | 0.85 | 3.5                      |
| 4000               | 0.628           | 65.2   | 0.940           | -4.4  | 0.500           | 31.0 | 0.593           | -160.3 | 0.85 | 2.7                      |

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 10 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 100                | 0.616           | -50.5  | 18.431          | 138.3 | 0.028           | 68.0 | 0.777           | -25.8  | 0.39 | 28.2                     |
| 200                | 0.405           | -87.2  | 12.799          | 115.2 | 0.043           | 65.4 | 0.565           | -32.5  | 0.68 | 24.7                     |
| 400                | 0.259           | -127.0 | 7.121           | 95.1  | 0.072           | 70.0 | 0.426           | -32.5  | 0.91 | 20.0                     |
| 500                | 0.231           | -140.2 | 5.796           | 89.6  | 0.086           | 70.8 | 0.409           | -31.9  | 0.96 | 18.3                     |
| 600                | 0.214           | -150.9 | 4.893           | 84.9  | 0.098           | 71.7 | 0.391           | -32.4  | 1.00 | 17.0                     |
| 800                | 0.196           | -168.7 | 3.757           | 77.2  | 0.129           | 73.0 | 0.379           | -34.4  | 1.02 | 13.8                     |
| 1000               | 0.188           | 176.2  | 3.081           | 69.7  | 0.160           | 73.5 | 0.377           | -37.6  | 1.02 | 12.0                     |
| 1500               | 0.194           | 143.1  | 2.202           | 55.3  | 0.239           | 70.3 | 0.378           | -49.5  | 0.98 | 9.6                      |
| 2000               | 0.232           | 118.4  | 1.766           | 43.0  | 0.309           | 65.5 | 0.369           | -66.2  | 0.97 | 7.6                      |
| 2500               | 0.320           | 100.2  | 1.537           | 30.9  | 0.386           | 58.7 | 0.385           | -87.3  | 0.91 | 6.0                      |
| 3000               | 0.421           | 86.8   | 1.338           | 18.8  | 0.446           | 50.0 | 0.418           | -113.7 | 0.88 | 4.8                      |
| 3500               | 0.523           | 75.7   | 1.176           | 7.1   | 0.481           | 40.3 | 0.484           | -139.9 | 0.87 | 3.9                      |
| 4000               | 0.607           | 65.2   | 1.015           | -3.7  | 0.493           | 30.1 | 0.563           | -160.3 | 0.86 | 3.1                      |

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 20 mA

| FREQUENCY<br>(MHz) | 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    |      |                          |
| 100                | 0.410           | -68.8  | 25.453          | 126.7 | 0.024           | 71.1 | 0.650           | -31.2  | 0.57 | 30.3                     |
| 200                | 0.252           | -105.2 | 14.914          | 106.5 | 0.040           | 71.5 | 0.452           | -32.8  | 0.84 | 25.7                     |
| 400                | 0.177           | -142.5 | 7.780           | 91.2  | 0.072           | 76.3 | 0.360           | -29.6  | 0.97 | 20.3                     |
| 500                | 0.163           | -155.1 | 6.281           | 86.4  | 0.089           | 74.7 | 0.351           | -29.3  | 0.99 | 18.5                     |
| 600                | 0.155           | -164.7 | 5.279           | 82.5  | 0.103           | 76.7 | 0.339           | -29.7  | 1.01 | 16.5                     |
| 800                | 0.148           | 178.8  | 4.043           | 75.7  | 0.137           | 75.9 | 0.334           | -32.1  | 1.01 | 14.1                     |
| 1000               | 0.146           | 164.9  | 3.292           | 69.3  | 0.171           | 74.1 | 0.334           | -35.8  | 1.01 | 12.2                     |
| 1500               | 0.157           | 133.3  | 2.352           | 56.3  | 0.250           | 69.7 | 0.337           | -47.9  | 0.99 | 9.7                      |
| 2000               | 0.197           | 111.2  | 1.877           | 44.2  | 0.321           | 63.5 | 0.327           | -65.7  | 0.98 | 7.7                      |
| 2500               | 0.285           | 95.9   | 1.643           | 32.5  | 0.392           | 56.4 | 0.339           | -87.6  | 0.94 | 6.2                      |
| 3000               | 0.387           | 84.5   | 1.440           | 21.1  | 0.446           | 48.0 | 0.372           | -115.1 | 0.92 | 5.1                      |
| 3500               | 0.489           | 74.5   | 1.274           | 9.2   | 0.476           | 38.7 | 0.439           | -141.6 | 0.90 | 4.3                      |
| 4000               | 0.576           | 65.0   | 1.112           | -2.1  | 0.489           | 28.7 | 0.521           | -161.3 | 0.88 | 3.6                      |

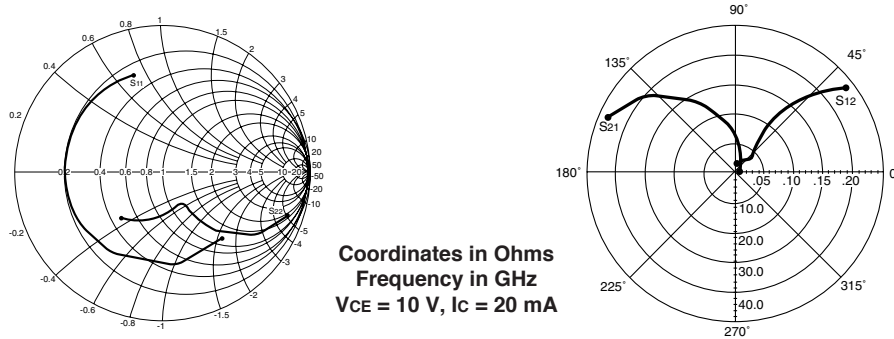
Note:

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 COMMON EMITTER SCATTERING PARAMETERS (T<sub>A</sub> = 25°C)

## NE85635

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 7 mA

| FREQUENCY | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |        | K    | MAG <sup>1</sup> |
|-----------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|------|------------------|
| (MHz)     | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG    |      | (dB)             |
| 100       | .796            | -46.7  | 17.619          | 152.2 | .024            | 65.5 | .907            | -19.8  | 0.11 | 28.6             |
| 500       | .709            | -139.8 | 8.012           | 100.9 | .052            | 32.0 | .492            | -44.0  | 0.41 | 21.9             |
| 1000      | .700            | -170.2 | 4.276           | 78.7  | .058            | 30.4 | .396            | -50.7  | 0.75 | 18.7             |
| 1500      | .692            | 174.0  | 2.903           | 64.1  | .064            | 35.2 | .382            | -59.8  | 1.03 | 15.5             |
| 2000      | .707            | 162.6  | 2.218           | 51.3  | .074            | 40.7 | .392            | -70.7  | 1.10 | 12.9             |
| 2500      | .711            | 152.2  | 1.800           | 39.6  | .086            | 44.7 | .411            | -81.9  | 1.12 | 11.1             |
| 3000      | .715            | 142.8  | 1.501           | 28.8  | .103            | 47.0 | .434            | -92.9  | 1.09 | 9.8              |
| 3500      | .715            | 133.8  | 1.291           | 18.8  | .122            | 47.4 | .462            | -103.5 | 1.03 | 9.2              |
| 4000      | .722            | 125.2  | 1.140           | 9.6   | .144            | 46.1 | .488            | -113.7 | 0.94 | 9.0              |

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 20 mA

|      |      |        |        |       |      |      |      |        |      |      |
|------|------|--------|--------|-------|------|------|------|--------|------|------|
| 100  | .631 | -81.7  | 33.116 | 138.8 | .018 | 57.6 | .765 | -33.5  | 0.19 | 32.6 |
| 500  | .667 | -162.2 | 10.351 | 93.1  | .033 | 42.9 | .306 | -54.1  | 0.70 | 24.9 |
| 1000 | .673 | 177.8  | 5.308  | 75.8  | .047 | 50.8 | .244 | -58.5  | 0.99 | 20.5 |
| 1500 | .668 | 165.9  | 3.579  | 63.3  | .063 | 54.7 | .241 | -67.1  | 1.12 | 15.5 |
| 2000 | .681 | 156.6  | 2.732  | 52.0  | .081 | 55.4 | .256 | -77.7  | 1.08 | 13.5 |
| 2500 | .684 | 147.5  | 2.217  | 41.3  | .100 | 54.3 | .277 | -88.2  | 1.06 | 11.9 |
| 3000 | .686 | 139.0  | 1.858  | 31.1  | .120 | 52.2 | .302 | -98.2  | 1.04 | 10.7 |
| 3500 | .687 | 130.8  | 1.605  | 21.6  | .141 | 49.2 | .331 | -107.7 | 1.00 | 10.6 |
| 4000 | .693 | 122.8  | 1.426  | 12.5  | .163 | 45.6 | .359 | -116.8 | 0.94 | 9.4  |

V<sub>CE</sub> = 10 V, I<sub>C</sub> = 30 mA

|      |      |        |        |       |      |      |      |        |      |      |
|------|------|--------|--------|-------|------|------|------|--------|------|------|
| 100  | .585 | -98.0  | 38.344 | 133.3 | .016 | 54.5 | .702 | -38.2  | 0.25 | 33.8 |
| 500  | .662 | -167.8 | 10.800 | 91.0  | .029 | 48.8 | .263 | -55.7  | 0.81 | 25.6 |
| 1000 | .669 | 175.0  | 5.500  | 74.9  | .046 | 56.8 | .213 | -59.8  | 1.04 | 19.6 |
| 1500 | .665 | 164.0  | 3.705  | 62.9  | .064 | 59.1 | .213 | -68.5  | 1.12 | 15.6 |
| 2000 | .677 | 155.1  | 2.828  | 51.8  | .083 | 58.5 | .230 | -79.1  | 1.08 | 13.6 |
| 2500 | .679 | 146.5  | 2.294  | 41.3  | .103 | 56.2 | .252 | -89.5  | 1.06 | 12.0 |
| 3000 | .682 | 138.1  | 1.922  | 31.3  | .124 | 53.4 | .277 | -99.4  | 1.02 | 10.9 |
| 3500 | .684 | 130.0  | 1.663  | 21.8  | .145 | 49.9 | .306 | -108.5 | 0.99 | 10.6 |
| 4000 | .688 | 122.2  | 1.478  | 12.8  | .166 | 45.9 | .334 | -117.4 | 0.94 | 9.5  |

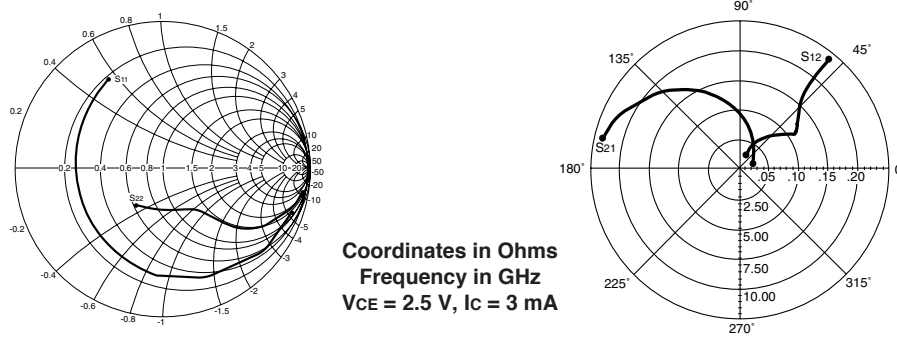
Note:

1. Gain Calculations:

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

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

## NE85639

VCE = 2.5 V, IC = 1 mA

| FREQUENCY<br>(MHz) | S11  |      | S21   |       | S12  |      | S22  |        | K    | MAG <sup>1</sup><br>(dB) |
|--------------------|------|------|-------|-------|------|------|------|--------|------|--------------------------|
|                    | MAG  | ANG  | MAG   | ANG   | MAG  | ANG  | MAG  | ANG    |      |                          |
| 100                | .968 | -27  | 3.616 | 164.2 | .049 | 74.5 | .985 | -8.1   | 0.03 | 18.7                     |
| 500                | .785 | -103 | 2.420 | 110.9 | .146 | 35.4 | .769 | -29.3  | 0.31 | 12.2                     |
| 1000               | .712 | -156 | 1.493 | 76.0  | .150 | 16.3 | .625 | -40.9  | 0.63 | 10.0                     |
| 1500               | .716 | 172  | 1.059 | 53.7  | .122 | 15.3 | .573 | -54.4  | 1.06 | 7.9                      |
| 2000               | .739 | 150  | 0.829 | 37.9  | .107 | 36.7 | .549 | -72.6  | 1.43 | 5.0                      |
| 2500               | .775 | 134  | 0.659 | 26.6  | .146 | 57.1 | .537 | -94.8  | 1.23 | 3.7                      |
| 3000               | .793 | 122  | 0.553 | 20.6  | .215 | 61.1 | .546 | -118.5 | 1.07 | 2.5                      |

VCE = 2.5 V, IC = 3 mA

|      |      |      |       |       |      |      |      |        |      |      |
|------|------|------|-------|-------|------|------|------|--------|------|------|
| 100  | .888 | -39  | 9.537 | 156.1 | .046 | 65.8 | .935 | -16.4  | 0.14 | 23.2 |
| 500  | .628 | -127 | 4.650 | 101.3 | .104 | 36.1 | .523 | -42.8  | 0.50 | 16.5 |
| 1000 | .594 | -173 | 2.549 | 74.3  | .117 | 34.3 | .368 | -49.8  | 0.90 | 13.4 |
| 1500 | .615 | 162  | 1.767 | 56.3  | .133 | 40.7 | .310 | -60.9  | 1.12 | 9.1  |
| 2000 | .649 | 145  | 1.361 | 41.8  | .159 | 48.4 | .283 | -79.4  | 1.17 | 6.8  |
| 2500 | .686 | 132  | 1.112 | 29.9  | .199 | 50.9 | .276 | -102.9 | 1.10 | 5.5  |
| 3000 | .716 | 121  | 0.930 | 20.7  | .245 | 50.4 | .304 | -127.4 | 1.04 | 4.6  |

VCE = 10 V, IC = 7 mA

|      |      |      |        |     |      |    |      |      |      |      |
|------|------|------|--------|-----|------|----|------|------|------|------|
| 100  | .759 | -43  | 16.992 | 148 | .004 | 54 | .896 | -18  | 0.73 | 36.3 |
| 500  | .478 | -138 | 6.930  | 98  | .051 | 51 | .496 | -29  | 0.83 | 21.3 |
| 1000 | .459 | 178  | 3.728  | 75  | .081 | 57 | .398 | -31  | 1.07 | 15.0 |
| 1500 | .490 | 155  | 2.557  | 61  | .119 | 61 | .353 | -39  | 1.07 | 11.7 |
| 2000 | .512 | 139  | 1.951  | 49  | .160 | 63 | .326 | -47  | 1.06 | 9.4  |
| 2500 | .563 | 127  | 1.597  | 38  | .203 | 62 | .293 | -63  | 0.99 | 9.0  |
| 3000 | .604 | 117  | 1.354  | 26  | .246 | 57 | .275 | -84  | 0.94 | 7.4  |
| 3500 | .651 | 108  | 1.164  | 18  | .290 | 52 | .279 | -109 | 0.90 | 6.0  |
| 4000 | .692 | 101  | 1.036  | 11  | .334 | 49 | .316 | -129 | 0.84 | 4.9  |

VCE = 10 V, IC = 20 mA

|      |     |      |       |     |     |    |     |      |      |      |
|------|-----|------|-------|-----|-----|----|-----|------|------|------|
| 100  | .57 | -66  | 28.21 | 134 | .00 | 46 | .75 | -28  | 1.72 | 34.7 |
| 500  | .39 | -161 | 8.30  | 91  | .04 | 64 | .36 | -28  | 1.12 | 20.9 |
| 1000 | .40 | 166  | 4.29  | 72  | .09 | 67 | .30 | -28  | 1.10 | 15.0 |
| 1400 | .44 | 150  | 3.10  | 62  | .12 | 66 | .27 | -36  | 1.07 | 12.4 |
| 2000 | .46 | 134  | 2.24  | 50  | .18 | 64 | .23 | -46  | 1.02 | 9.9  |
| 2500 | .52 | 124  | 1.83  | 40  | .22 | 60 | .19 | -64  | 0.99 | 9.1  |
| 3000 | .56 | 115  | 1.55  | 27  | .26 | 54 | .17 | -92  | 0.97 | 7.6  |
| 3500 | .61 | 108  | 1.34  | 20  | .30 | 48 | .18 | -123 | 0.94 | 6.4  |
| 4000 | .65 | 100  | 1.20  | 13  | .34 | 46 | .23 | -143 | 0.90 | 5.4  |

Note:

1. Gain Calculations:

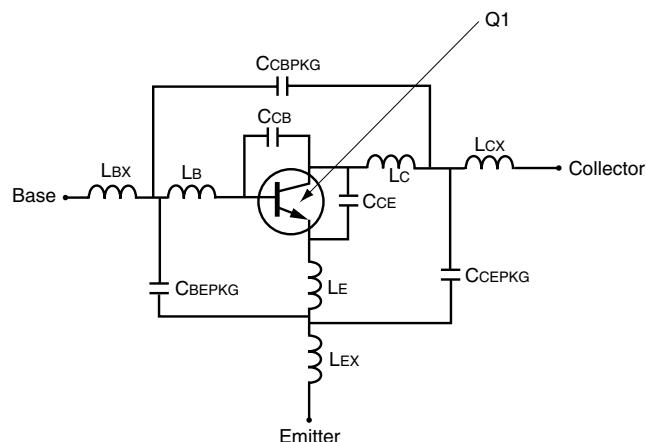
$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12}|^2}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

## NE85618 NONLINEAR MODEL

## SCHEMATIC

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

| Parameters | Q1      | Parameters | Q1     |
|------------|---------|------------|--------|
| IS         | 6e-16   | MJC        | 0.55   |
| BF         | 120     | XCJC       | 0.3    |
| NF         | 0.98    | CJS        | 0      |
| VAF        | 10      | VJS        | 0.75   |
| IKF        | 0.08    | MJS        | 0      |
| ISE        | 3.2e-15 | FC         | 0.5    |
| NE         | 1.93    | TF         | 10e-12 |
| BR         | 12      | XTF        | 6      |
| NR         | 0.991   | VTF        | 10     |
| VAR        | 3.9     | ITF        | 0.2    |
| IKR        | 0.17    | PTF        | 0      |
| ISC        | 0       | TR         | 1e-9   |
| NC         | 2       | EG         | 1.11   |
| RE         | 0.38    | XTB        | 0      |
| RB         | 4.16    | XTI        | 3      |
| RBM        | 3.6     | KF         | 0      |
| IRB        | 1.96e-4 | AF         | 1      |
| RC         | 2       |            |        |
| CJE        | 2.8e-12 |            |        |
| VJE        | 1.3     |            |        |
| MJE        | 0.5     |            |        |
| CJC        | 1.1e-12 |            |        |
| VJC        | 0.7     |            |        |

(1) Gummel-Poon Model

## UNITS

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

## ADDITIONAL PARAMETERS

| Parameters | NE85618   |
|------------|-----------|
| CCB        | 0.087e-12 |
| CCE        | 0.16e-12  |
| LB         | 1.29e-9   |
| LC         | 1.04e-9   |
| LE         | 0.62e-9   |
| CCBPKG     | 0.054e-12 |
| CCEPKG     | 0.044e-12 |
| CBEPKG     | 0.33e-12  |
| LBX        | 0.18e-9   |
| LCX        | 0.41e-9   |
| LEX        | 0.09e-9   |

## MODEL RANGE

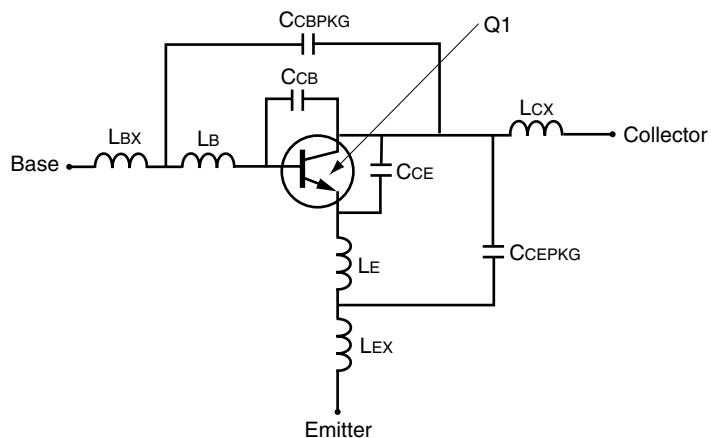
Frequency: 0.05 to 5.0 GHz  
 Bias:  $V_{CE} = 2.5$  V to 10 V,  $I_C = 3$  mA to 10 mA  
 Date: 6/7/96

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.

## NE85619 NONLINEAR MODEL

## SCHEMATIC

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

| Parameters | Q1      | Parameters | Q1     |
|------------|---------|------------|--------|
| IS         | 6e-16   | MJC        | 0.55   |
| BF         | 120     | XCJC       | 0.3    |
| NF         | 0.98    | CJS        | 0      |
| VAF        | 10      | VJS        | 0.75   |
| IKF        | 0.08    | MJS        | 0      |
| ISE        | 3.2e-15 | FC         | 0.5    |
| NE         | 1.93    | TF         | 10e-12 |
| BR         | 12      | XTF        | 6      |
| NR         | 0.991   | VTF        | 10     |
| VAR        | 3.9     | ITF        | 0.2    |
| IKR        | 0.17    | PTF        | 0      |
| ISC        | 0       | TR         | 1e-9   |
| NC         | 2       | EG         | 1.11   |
| RE         | 0.38    | XTB        | 0      |
| RB         | 4.16    | XTI        | 3      |
| RBM        | 3.6     | KF         | 0      |
| IRB        | 1.96e-4 | AF         | 1      |
| RC         | 2       |            |        |
| CJE        | 2.8e-12 |            |        |
| VJE        | 1.3     |            |        |
| MJE        | 0.5     |            |        |
| CJC        | 1.1e-12 |            |        |
| VJC        | 0.7     |            |        |

(1) Gummel-Poon Model

## UNITS

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

## ADDITIONAL PARAMETERS

| Parameters | NE85619   |
|------------|-----------|
| CCB        | 0.087e-12 |
| CCE        | 0.16e-12  |
| LB         | 1.84e-9   |
| LE         | 0.56e-9   |
| CCBPKG     | 0.08e-12  |
| CCEPKG     | 0.39e-12  |
| LBX        | 0.19e-9   |
| LCX        | 0.19e-9   |
| LEX        | 0.19e-9   |

## MODEL RANGE

Frequency: 0.05 to 3.0 GHz

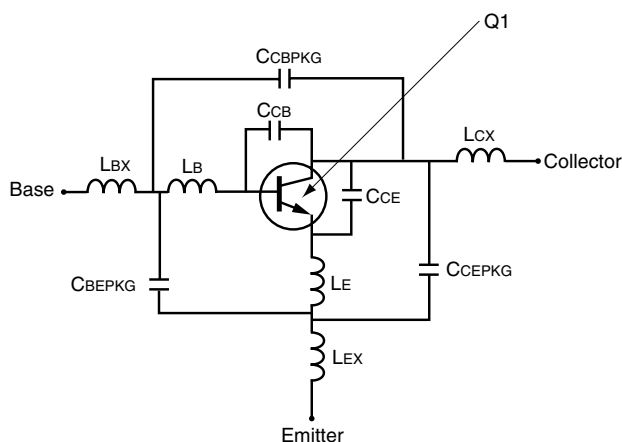
Bias:  $V_{CE} = 2.5 \text{ V to } 10 \text{ V}$ ,  $I_C = 0.3 \text{ mA to } 10 \text{ mA}$ 

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.

## NE85630 NONLINEAR MODEL

## SCHEMATIC

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

| Parameters | Q1      | Parameters | Q1     |
|------------|---------|------------|--------|
| IS         | 6e-16   | MJC        | 0.55   |
| BF         | 120     | XCJC       | 0.3    |
| NF         | 0.98    | CJS        | 0      |
| VAF        | 10      | VJS        | 0.75   |
| IKF        | 0.08    | MJS        | 0      |
| ISE        | 32e-16  | FC         | 0.5    |
| NE         | 1.93    | TF         | 10e-12 |
| BR         | 12      | XTF        | 6      |
| NR         | 0.991   | VTF        | 10     |
| VAR        | 3.9     | ITF        | 0.2    |
| IKR        | 0.17    | PTF        | 0      |
| ISC        | 0       | TR         | 1e-9   |
| NC         | 2       | EG         | 1.11   |
| RE         | 0.38    | XTB        | 0      |
| RB         | 4.16    | XTI        | 3      |
| RBM        | 3.6     | KF         | 0      |
| IRB        | 1.96e-4 | AF         | 1      |
| RC         | 2       |            |        |
| CJE        | 2.8e-12 |            |        |
| VJE        | 1.3     |            |        |
| MJE        | 0.5     |            |        |
| CJC        | 1.1e-12 |            |        |
| VJC        | 0.7     |            |        |

(1) Gummel-Poon Model

## UNITS

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

## ADDITIONAL PARAMETERS

| Parameters | NE85630  |
|------------|----------|
| CCB        | 0.09e-12 |
| CCE        | 0.16e-12 |
| LB         | 1.4e-9   |
| LE         | 0.93e-9  |
| CCBPKG     | 0.12e-12 |
| CCEPKG     | 0.16e-12 |
| CBEPKG     | 0.04e-12 |
| LBX        | 0.2e-9   |
| LCX        | 0.2e-9   |
| LEX        | 0.2e-9   |

## MODEL RANGE

Frequency: 0.05 to 3.0 GHz

Bias:  $V_{CE} = 2.5 \text{ V to } 10 \text{ V}$ ,  $I_C = 0.3 \text{ mA to } 10 \text{ mA}$ 

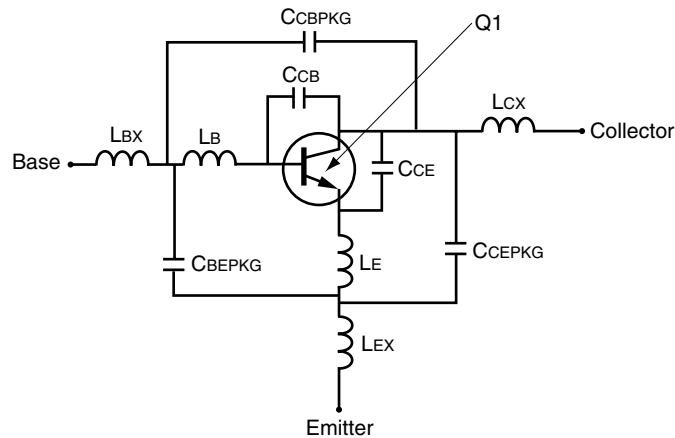
Date: 10/25/96

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.

## NE85633 NONLINEAR MODEL

## SCHEMATIC

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

| Parameters | Q1      | Parameters | Q1       |
|------------|---------|------------|----------|
| IS         | 6e-16   | MJC        | 0.55     |
| BF         | 120     | XCJC       | 0.3      |
| NF         | 0.98    | CJS        | 0        |
| VAF        | 10      | VJS        | 0.75     |
| IKF        | 0.08    | MJS        | 0        |
| ISE        | 32e-16  | FC         | 0.5      |
| NE         | 1.93    | TF         | 15e-12   |
| BR         | 12      | XTF        | 6        |
| NR         | 0.991   | VTF        | 10       |
| VAR        | 3.9     | ITF        | 0.2      |
| IKR        | 0.17    | PTF        | 0        |
| ISC        | 0       | TR         | 1e-9     |
| NC         | 2       | EG         | 1.11     |
| RE         | 0.38    | XTB        | 0        |
| RB         | 4.16    | XTI        | 3        |
| RBM        | 3.6     | KF         | 1.56e-18 |
| IRB        | 1.96e-4 | AF         | 1.49     |
| RC         | 2       |            |          |
| CJE        | 2.8e-12 |            |          |
| VJE        | 1.3     |            |          |
| MJE        | 0.5     |            |          |
| CJC        | 1.1e-12 |            |          |
| VJC        | 0.7     |            |          |

(1) Gummel-Poon Model

## UNITS

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

## ADDITIONAL PARAMETERS

| Parameters | NE85633  |
|------------|----------|
| CCB        | 0.09e-12 |
| CCE        | 0.16e-12 |
| LB         | 0.85e-9  |
| LE         | 1e-9     |
| CCBPKG     | 0.15e-12 |
| CCEPKG     | 0.15e-12 |
| CBEPKG     | 0.07e-12 |
| LBX        | 0.3e-9   |
| LCX        | 0.4e-9   |
| LEX        | 0.3e-9   |

## MODEL RANGE

Frequency: 0.1 to 8.0 GHz

Bias:  $V_{CE} = 1\text{ V to }10\text{ V}$ ,  $I_C = 1\text{ mA to }20\text{ mA}$ 

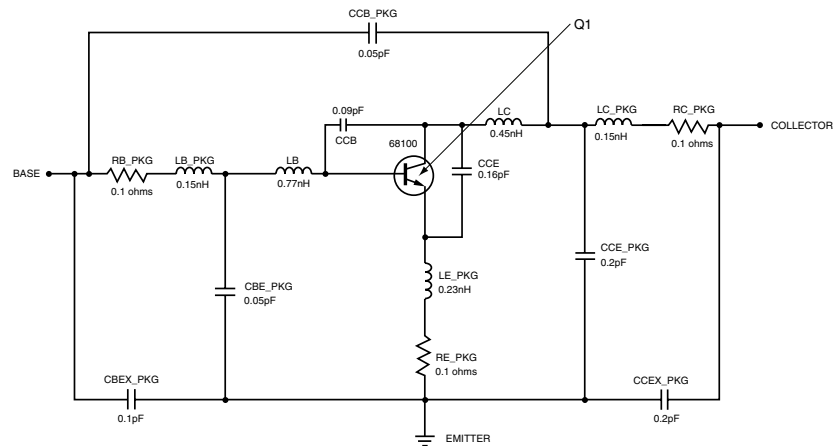
Date: 7/97

## 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.

## NE85635 NONLINEAR MODEL

## SCHEMATIC

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

| Parameters | Q1      | Parameters | Q1     |
|------------|---------|------------|--------|
| IS         | 6e-16   | MJC        | 0.55   |
| BF         | 120     | XCJC       | 0.3    |
| NF         | 0.98    | CJS        | 0      |
| VAF        | 10      | VJS        | 0.75   |
| IKF        | 0.08    | MJS        | 0      |
| ISE        | 32e-16  | FC         | 0.5    |
| NE         | 1.93    | TF         | 10e-12 |
| BR         | 12      | XTF        | 6      |
| NR         | 0.991   | VTF        | 10     |
| VAR        | 3.9     | ITF        | 0.2    |
| IKR        | 0.17    | PTF        | 0      |
| ISC        | 0       | TR         | 1e-9   |
| NC         | 2       | EG         | 1.11   |
| RE         | 0.38    | XTB        | 0      |
| RB         | 4.16    | XTI        | 3      |
| RBM        | 3.6     | KF         | 0      |
| IRB        | 1.96e-4 | AF         | 1      |
| RC         | 2       |            |        |
| CJE        | 2.8e-12 |            |        |
| VJE        | 1.3     |            |        |
| MJE        | 0.5     |            |        |
| CJC        | 1.1e-12 |            |        |
| VJC        | 0.7     |            |        |

(1) Gummel-Poon Model

## UNITS

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

## MODEL RANGE

Frequency: 0.05 to 5.0 GHz

Bias:  $V_{CE} = 10\text{ V}$ ,  $I_C = 7\text{ mA}$  to  $30\text{ mA}$ 

Date: 11/1/96

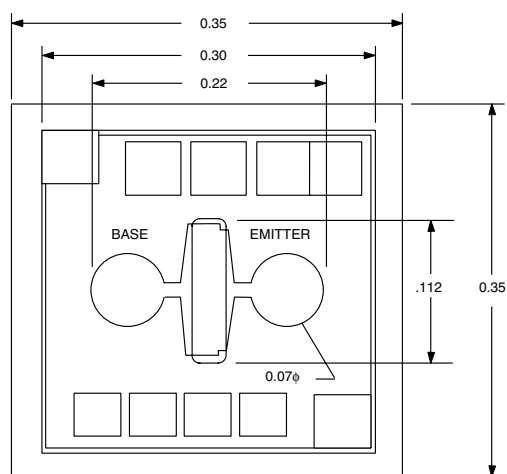
Note:

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

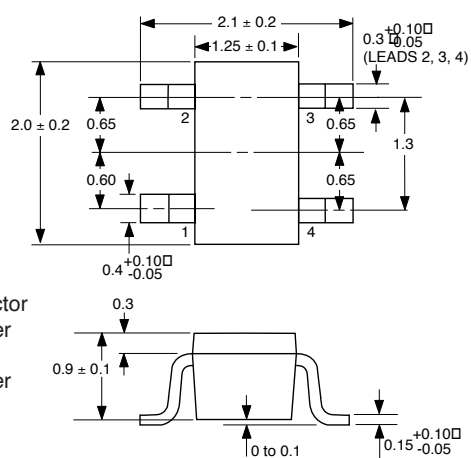
This nonlinear model utilized the latest data available. See our Design Parameter Library at [www.cel.com](http://www.cel.com) for this data.

## OUTLINE DIMENSIONS (Units in mm)

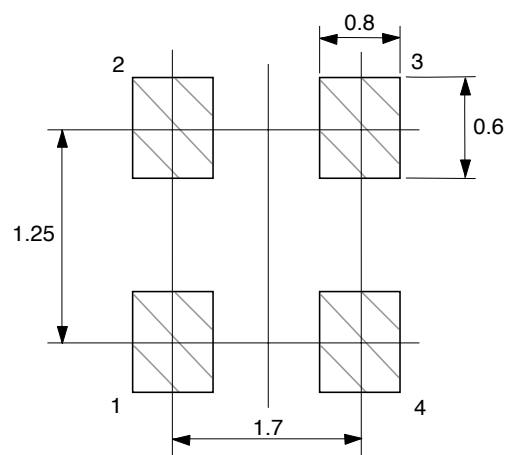
NE85600 (CHIP)



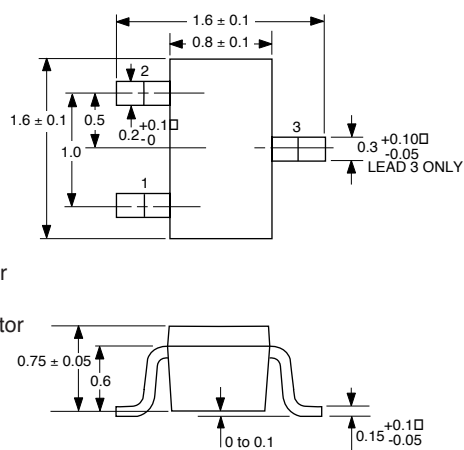
(Chip Thickness: 140 to 160 μm)

PACKAGE OUTLINE 18  
(SOT-343)

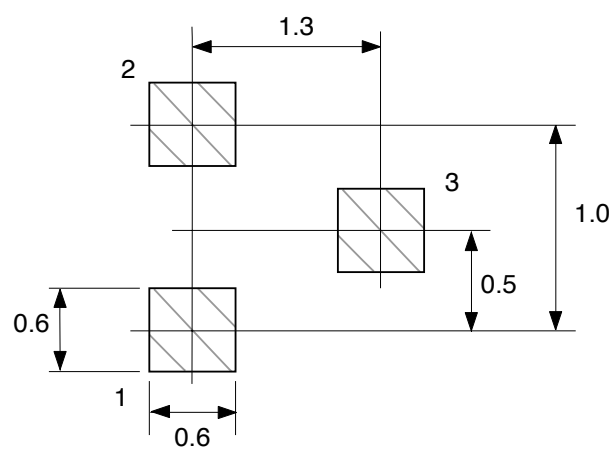
1. Collector
2. Emitter
3. Base
4. Emitter

PACKAGE OUTLINE 18  
RECOMMENDED P.C.B. LAYOUT

PACKAGE OUTLINE 19

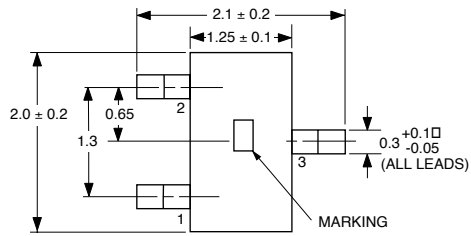


1. Emitter
2. Base
3. Collector

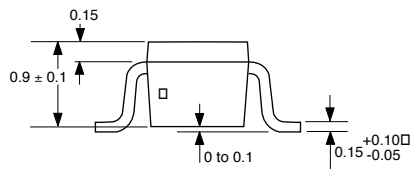
PACKAGE OUTLINE 19  
RECOMMENDED P.C.B. LAYOUT

**OUTLINE DIMENSIONS** (Units in mm)

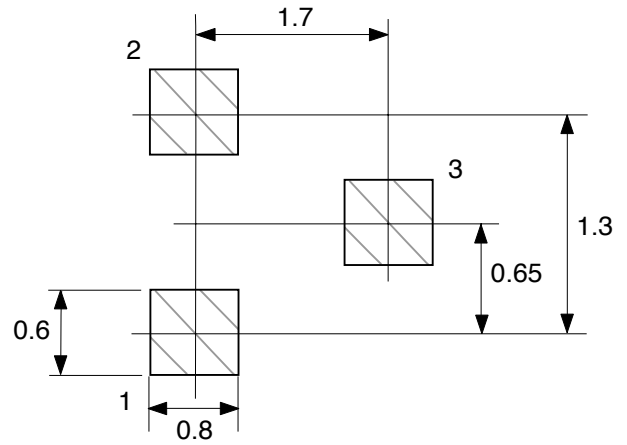
**PACKAGE OUTLINE 30  
(SOT-323)**



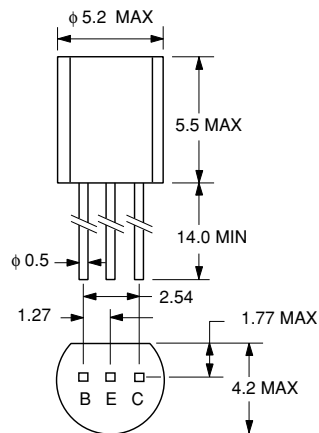
- 1. Emitter
- 2. Base
- 3. Collector



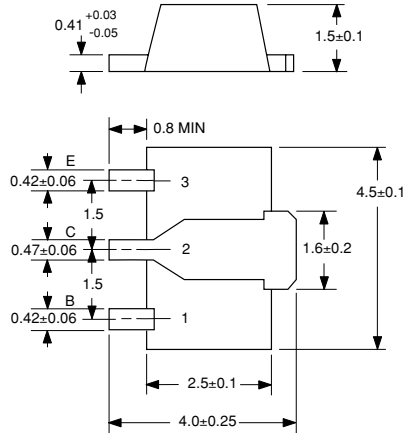
**PACKAGE OUTLINE 30  
RECOMMENDED P.C.B. LAYOUT**



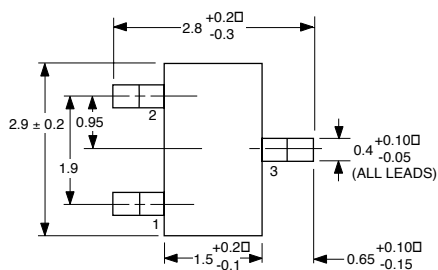
**PACKAGE OUTLINE 32  
(TO-92)**



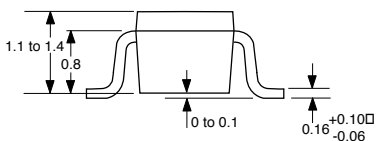
**PACKAGE OUTLINE 34  
(SOT-89)**



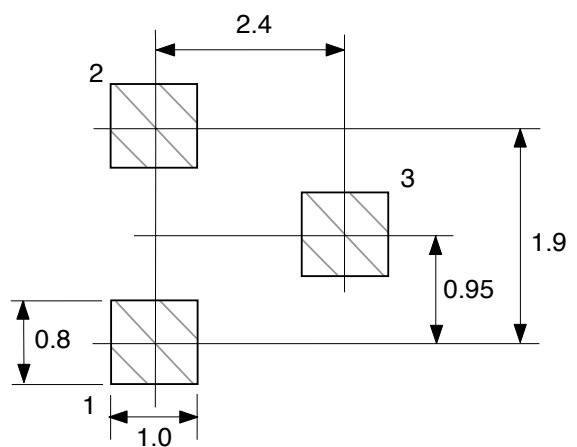
**PACKAGE OUTLINE 33  
(SOT-23)**



- 1. Emitter
- 2. Base
- 3. Collector

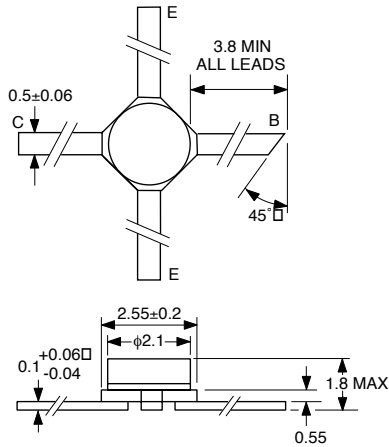


**PACKAGE OUTLINE 33  
RECOMMENDED P.C.B. LAYOUT**

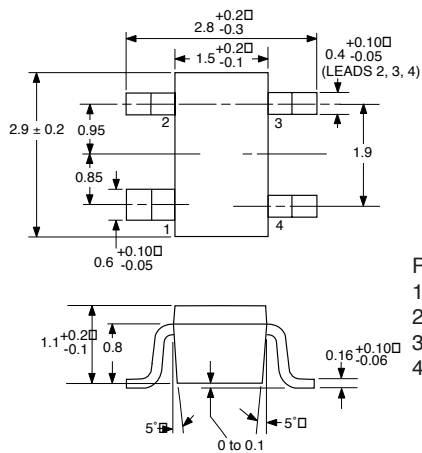


**OUTLINE DIMENSIONS** (Units in mm)

**PACKAGE OUTLINE 35**  
(MICRO-X)



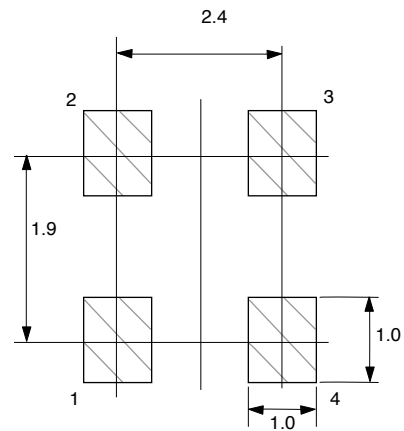
**PACKAGE OUTLINE 39**



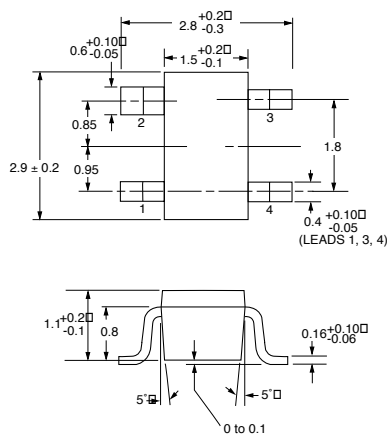
**PIN CONNECTIONS**

1. Collector
2. Emitter
3. Base
4. Emitter

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



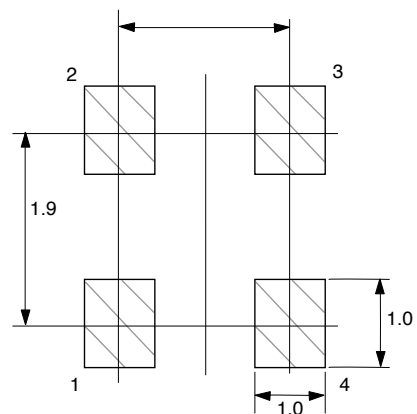
**PACKAGE OUTLINE 39R**



**PIN CONNECTIONS**

1. Emitter
2. Collector
3. Emitter
4. Base

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



**ORDERING INFORMATION (Solder Contains Lead)**

| PART NUMBER | QUANTITY | PACKAGING   |
|-------------|----------|-------------|
| NE85600     | 100      | Waffle Pack |
| NE85618-T1  | 3000     | Tape/Reel   |
| NE85619-T1  | 3000     | Tape/Reel   |
| NE85630-T1  | 3000     | Tape/Reel   |
| NE85632     | 1        | ESD Bag     |
| NE85633-T1B | 3000     | Tape/Reel   |
| NE85634-T1  | 1000     | Tape/Reel   |
| NE85635     | 1        | ESD Bag     |
| NE85639-T1  | 3000     | Tape/Reel   |
| NE85639R-T1 | 3000     | Tape/Reel   |

Note:

1. Embossed tape 12 mm wide.

**ORDERING INFORMATION (Pb-Free)**

| PART NUMBER   | QUANTITY | PACKAGING   |
|---------------|----------|-------------|
| NE85600       | 100      | Waffle Pack |
| NE85618-T1-A  | 3000     | Tape/Reel   |
| NE85619-T1-A  | 3000     | Tape/Reel   |
| NE85630-T1-A  | 3000     | Tape/Reel   |
| NE85632-A     | 1        | ESD Bag     |
| NE85633-T1B-A | 3000     | Tape/Reel   |
| NE85634-T1-A  | 1000     | Tape/Reel   |
| NE85635       | 1        | ESD Bag     |
| NE85639-T1-A  | 3000     | Tape/Reel   |
| NE85639R-T1   | 3000     | Tape/Reel   |

Note:

1. Embossed tape 12 mm wide.

## 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.

**CEL** California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.

4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 919-2500 • FAX (408) 988-0279 • [www.cel.com](http://www.cel.com)

DATA SUBJECT TO CHANGE WITHOUT NOTICE

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.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

## CEL:

[NE85632](#) [NE85639R-T1-A](#) [NE85632-A](#) [NE85632-AP-A](#)

## NEC:

[NE85619](#) [NE85639R](#) [NE8500295-4](#) [NE8500295-8](#) [NE8500295-6](#) [NE85633-A](#) [NE851M03](#) [NE85618](#) [NE85630](#)  
[NE85633](#)