

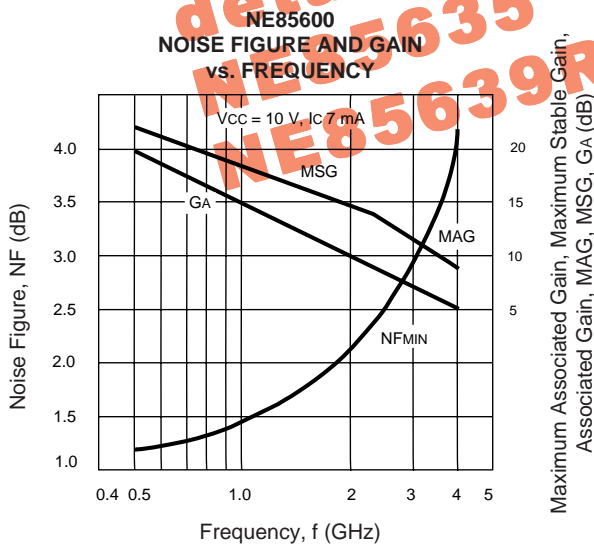
NEC's NPN SILICON HIGH FREQUENCY TRANSISTOR

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.



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

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ELECTRICAL CHARACTERISTICS (T_A = 25°C)

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

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

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

Notes:

1. Electronic Industrial Association of Japan.
2. Pulse width ≤ 350 μs, duty cycle ≤ 2% pulsed.
3. C_{re} measurement employs a three terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
4. With 2.5 cm² x 0.7 mm ceramic substrate (infinite heatsink).

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

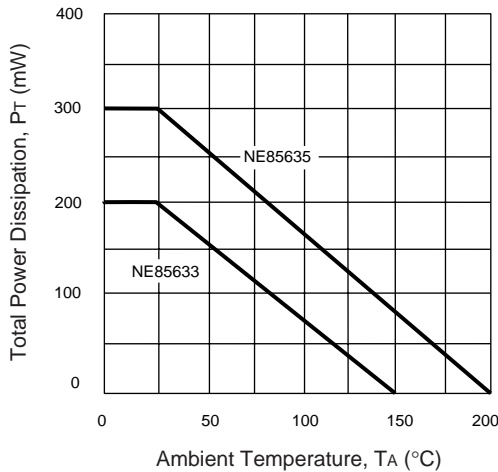
| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|------------------|------------------------------|-------|------------------|
| V _{CB0} | Collector to Base Voltage | V | 20 |
| V _{CEO} | Collector to Emitter Voltage | V | 12 |
| V _{EB0} | Emitter to Base Voltage | V | 3.0 |
| I _C | Collector Current | mA | 100 |
| T _J | Junction Temperature | °C | 150 ² |
| T _{STG} | Storage Temperature | °C | -65 to +150 |

Notes:

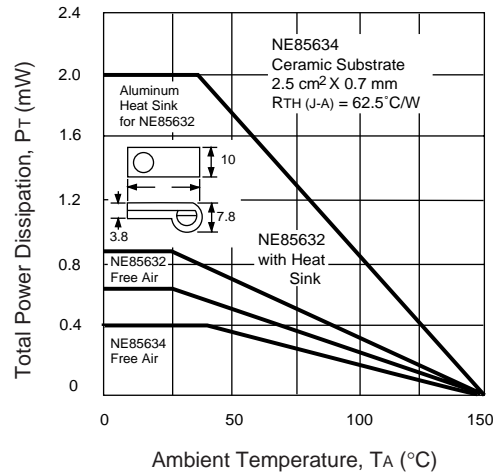
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Maximum T_J for the NE85600 and NE85635 is 200°C.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

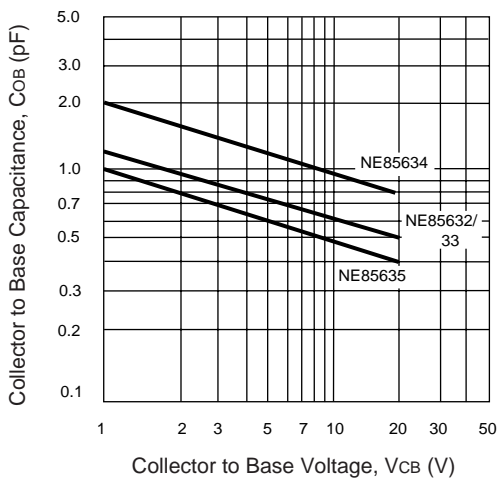
**NE85633 AND NE85635
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE**



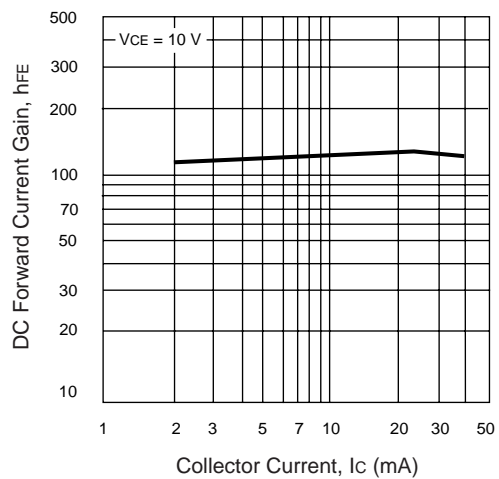
**NE85632 AND NE85634
TOTAL POWER DISSIPATION
vs. AMBIENT TEMPERATURE**



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

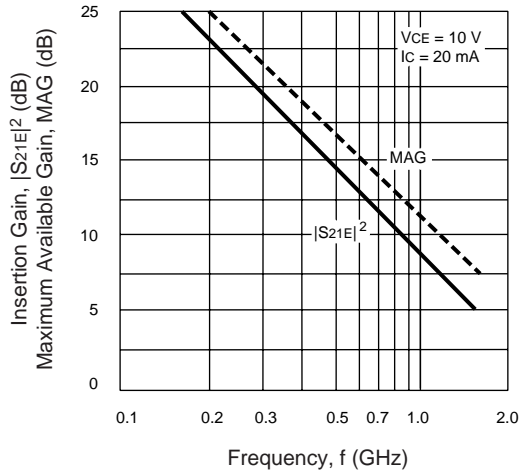


**FORWARD CURRENT GAIN
vs. COLLECTOR CURRENT**

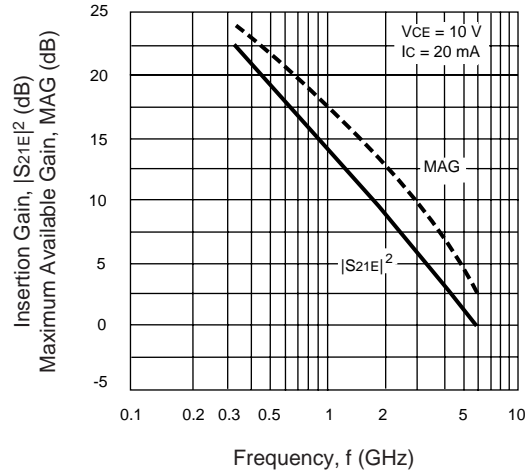


TYPICAL PERFORMANCE CURVES (T_A = 25 °C)

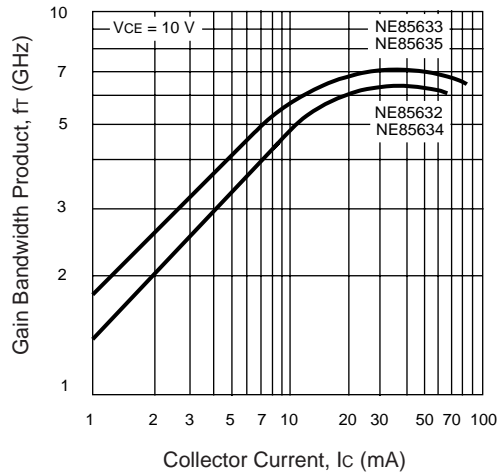
NE85634
FORWARD INSERTION GAIN
AND MAXIMUM AVAILABLE GAIN
vs. FREQUENCY



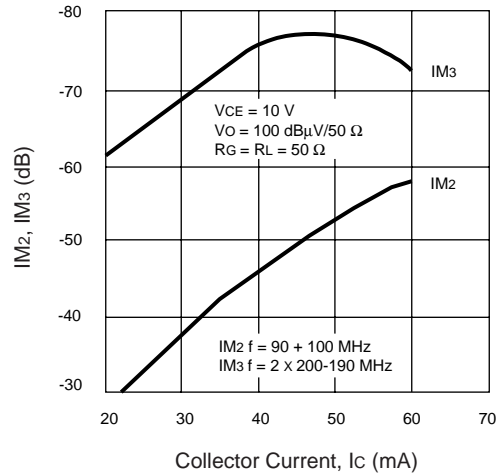
NE85635
FORWARD INSERTION GAIN
AND MAXIMUM AVAILABLE GAIN
vs. FREQUENCY



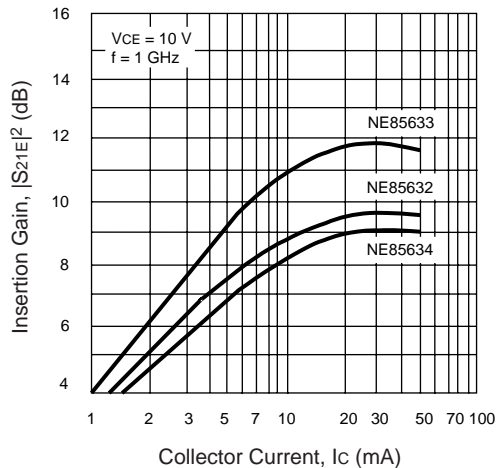
**GAIN BANDWIDTH PRODUCT
vs. COLLECTOR CURRENT**



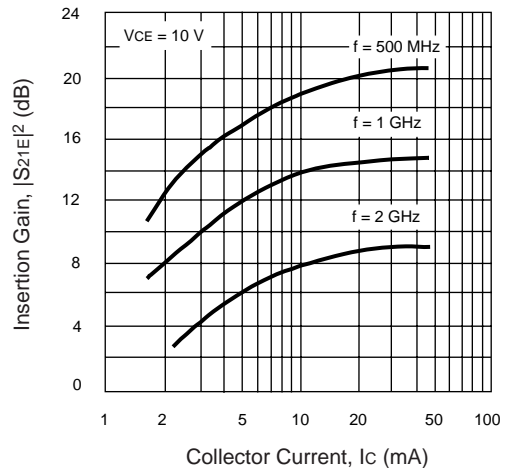
**NE85632 AND NE85634
INTERMODULATION DISTORTION
vs. COLLECTOR CURRENT**



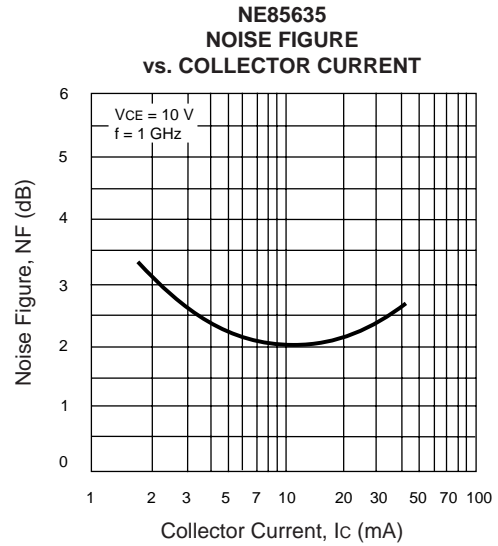
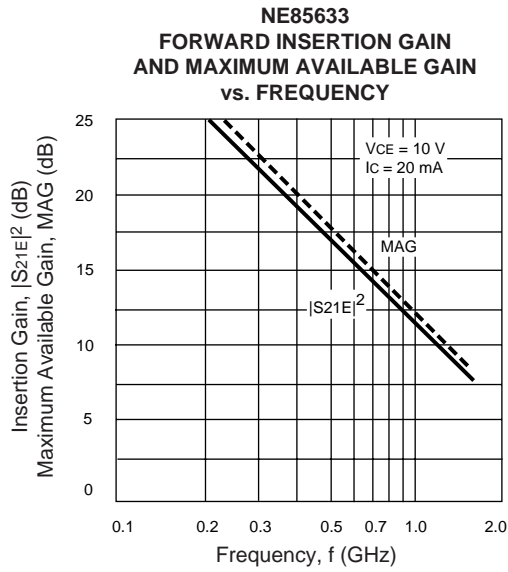
**INSERTION GAIN vs.
COLLECTOR CURRENT**



**NE85635
INSERTION GAIN vs.
COLLECTOR CURRENT**



TYPICAL PERFORMANCE CURVES (TA = 25°C)



NE85600
TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | 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 |

NE85619
TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|---------------------------------|---------------------------|------------|------------------|------|-------|
| | | | MAG | ANG | |
| VCE = 2.5 V, IC = 0.3 mA | | | | | |
| 500 | 1.73 | 6.03 | 0.74 | 73 | 1.23 |
| 800 | 2.20 | 4.42 | 0.74 | 113 | 0.62 |
| VCE = 2.5 V, IC = 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 |
| VCE = 2.5 V, IC = 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 |
| VCE = 3 V, IC = 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 |
| VCE = 10 V, IC = 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 |

NE85630
TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | 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 |

NE85632

TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|--|---------------------------|------------|------------------|-----|-------|
| | | | MAG | ANG | |
| V_{CE} = 4.5 V, I_c = 10 mA | | | | | |
| 500 | 1.1 | | 0.20 | 50 | 0.10 |
| 1000 | 1.6 | 30.72 | 0.34 | 159 | 0.10 |

NE85633

TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|---|---------------------------|------------|------------------|------|-------|
| | | | MAG | ANG | |
| V_{CE} = 2.5 V, I_c = 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_{CE} = 2.5 V, I_c = 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_{CE} = 2.5 V, I_c = 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_{CE} = 10 V, I_c = 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_{CE} = 10 V, I_c = 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_{CE} = 10 V, I_c = 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 (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|--|---------------------------|------------|------------------|-----|-------|
| | | | MAG | ANG | |
| V_{CE} = 4.5 V, I_c = 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 (TA = 25°C)

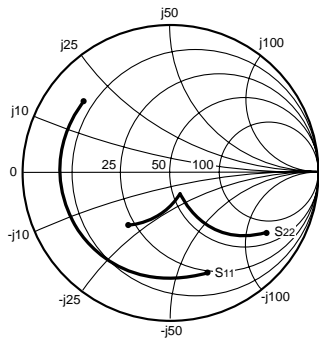
| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|--|---------------------------|------------|------------------|------|-------|
| | | | MAG | ANG | |
| V_{CE} = 10 V, I_c = 7 mA | | | | | |
| 500 | 1.02 | 20.24 | 0.15 | 117 | 0.12 |
| 700 | 1.29 | 18.11 | 0.27 | 138 | 0.09 |
| 1000 | 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

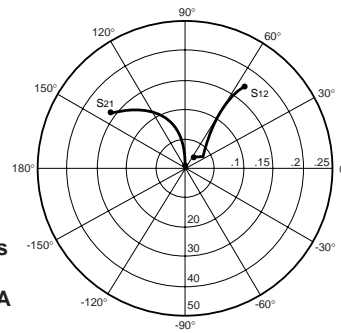
TYPICAL NOISE PARAMETERS (TA = 25°C)

| FREQ. (MHz) | NF _{OPT} (dB) | GA (dB) | Γ _{OPT} | | Rn/50 |
|---|---------------------------|------------|------------------|------|-------|
| | | | MAG | ANG | |
| V_{CE} = 2.5 V, I_c = 0.3 mA | | | | | |
| 500 | 1.60 | 8.65 | 0.69 | 79 | 1.25 |
| 800 | 2.00 | 6.26 | 0.75 | 121 | 0.45 |
| V_{CE} = 2.5 V, I_c = 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_{CE} = 2.5 V, I_c = 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_{CE} = 10 V, I_c = 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_{CE} = 10 V, I_c = 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 (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 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

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 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:

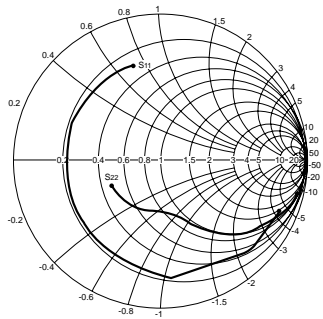
1. Gain Calculations:

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

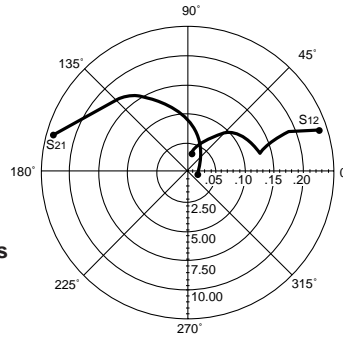
MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



Coordinates in Ohms
Frequency in GHz
VCE = 1 V, IC = 3 mA



NE85618

VCE = 1 V, IC = 1 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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 |

VCE = 1 V, IC = 3 mA

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 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 |

VCE = 2.5 V, IC = 1 mA

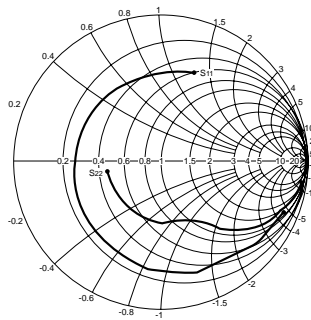
| | | | | | | | | | | |
|------|-------|--------|-------|-------|-------|------|-------|--------|------|------|
| 50 | 0.971 | -10.1 | 2.890 | 175.8 | 0.021 | 80.9 | 0.998 | -3.6 | 0.03 | 21.4 |
| 100 | 0.962 | -22.4 | 2.779 | 163.2 | 0.039 | 75.9 | 0.988 | -8.2 | 0.07 | 18.5 |
| 200 | 0.930 | -46.4 | 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:

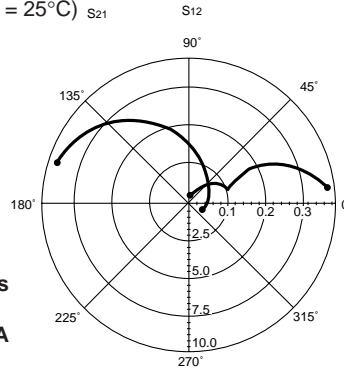
1. Gain Calculations:

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

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



Coordinates in Ohms
Frequency in GHz
VCE = 2.5 V, IC = 3 mA



NE85619

VCE = 2.5 V, IC = 1 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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 |

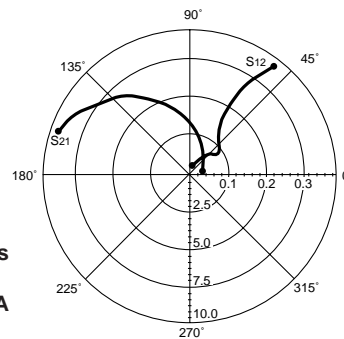
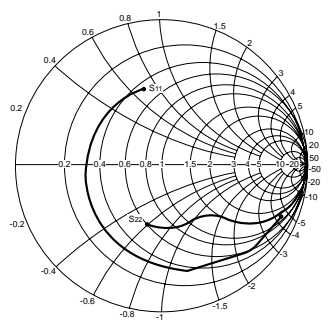
VCE = 2.5 V, IC = 3 mA

| | | | | | | | | | | |
|------|-------|--------|-------|-------|-------|------|-------|--------|------|------|
| 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

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|-------|-------|--------|------|------|
| 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°C)



Coordinates in Ohms
Frequency in GHz
V_{CE} = 2.5 V, I_c = 3 mA

NE85630

V_{CE} = 2.5 V, I_c = 1 mA

| FREQUENCY (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG ¹ (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 |

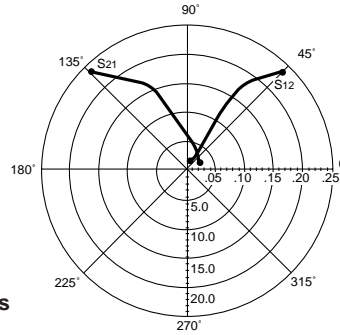
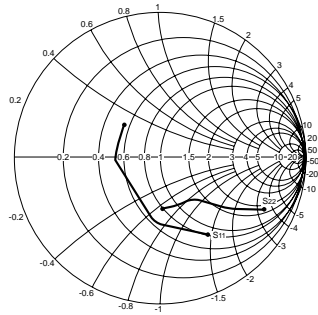
V_{CE} = 2.5 V, I_c = 3 mA

| | | | | | | | | | | |
|------|-------|--------|-------|-------|-------|------|-------|--------|------|------|
| 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 V, I_c = 7 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°C)



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

NE85632

VCE = 10 V, IC = 7 mA

| FREQUENCY (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | | K | MAG ¹ (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 |

VCE = 10 V, IC = 10 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 |

VCE = 10 V, IC = 20 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:

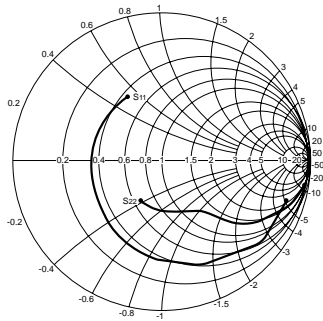
$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

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

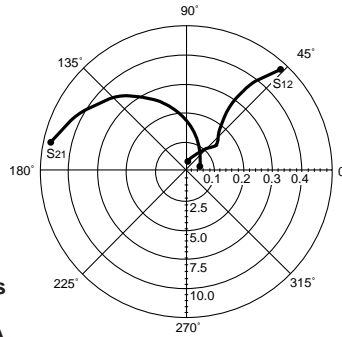
MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



Coordinates in Ohms
Frequency in GHz
VCE = 2.5 V, IC = 3 mA



NE85633

VCE = 2.5 V, IC = 1 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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 |

VCE = 2.5 V, IC = 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 |

VCE = 3.5 V, IC = 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:

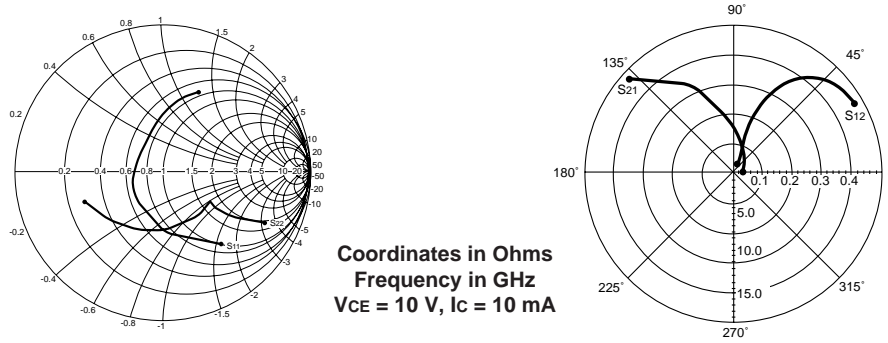
$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



NE85634

VCE = 10 V, IC = 7 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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 |

VCE = 10 V, IC = 10 mA

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 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 |

VCE = 10 V, IC = 20 mA

| | | | | | | | | | | |
|------|-------|--------|--------|-------|-------|------|-------|--------|------|------|
| 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:

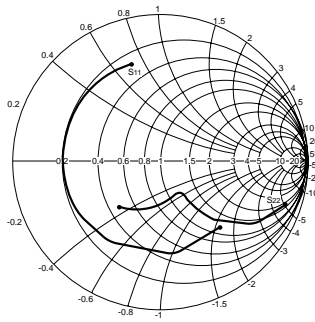
1. Gain Calculations:

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

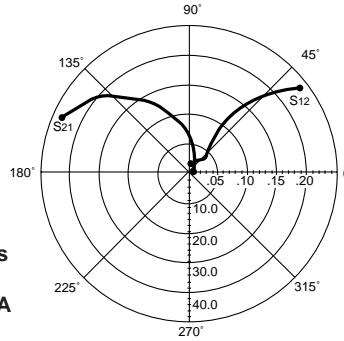
MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



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



NE85635

VCE = 10 V, IC = 7 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (dB) |
|--------------------|------|--------|--------|-------|------|------|------|--------|------|--------------------------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG | | |
| 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 |

VCE = 10 V, IC = 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 |

VCE = 10 V, IC = 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:

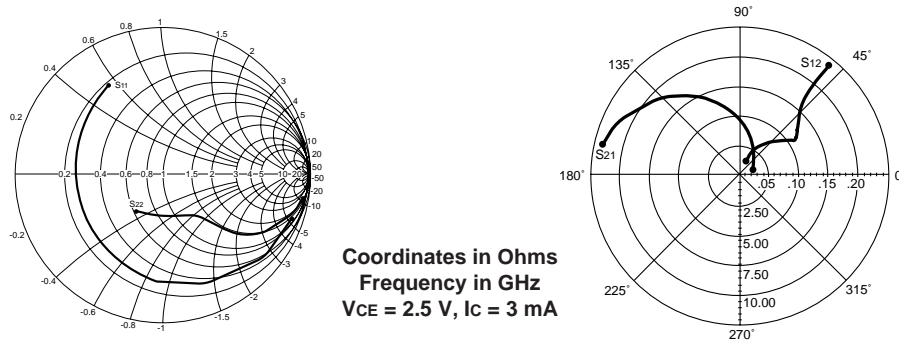
$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

TYPICAL COMMON EMITTER SCATTERING PARAMETERS (TA = 25°C)



NE85639

VCE = 2.5 V, IC = 1 mA

| FREQUENCY (MHz) | S11 | | S21 | | S12 | | S22 | | K | MAG ¹ (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:

$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

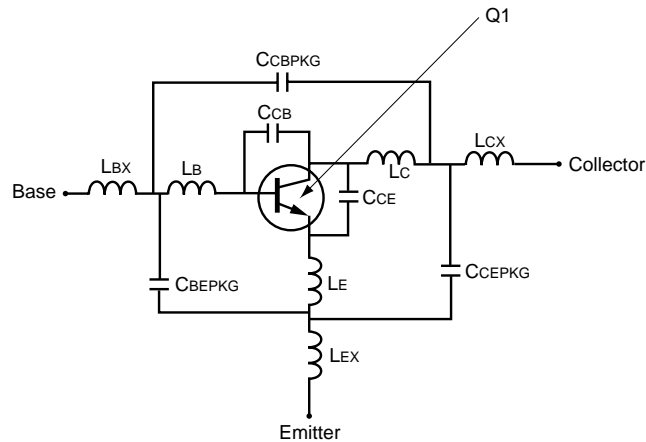
When $K \leq 1$, MAG is undefined and MSG values are used. $MSG = \frac{|S_{21}|}{|S_{12}|}$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12} S_{21}|}$, $\Delta = S_{11} S_{22} - S_{21} S_{12}$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

NE85618 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS(1)

| 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

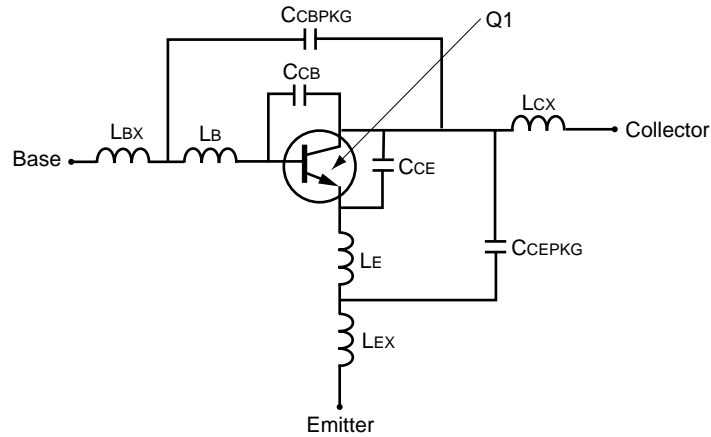
Frequency: 0.05 to 5.0 GHz
 Bias: VCE = 2.5 V to 10 V, IC = 3 mA to 10 mA
 Date: 6/7/96

Note:

This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

NE85619 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

| 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

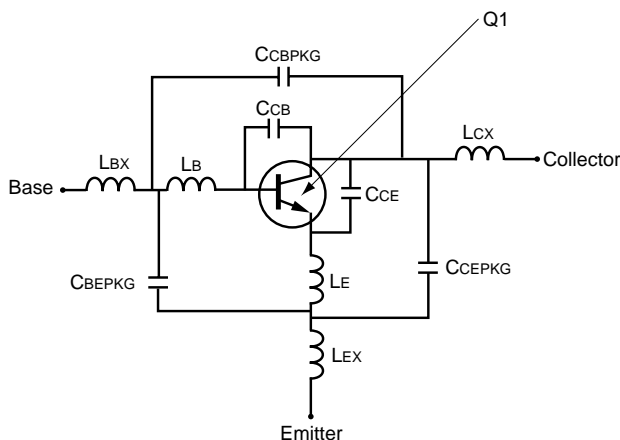
Frequency: 0.05 to 3.0 GHz
 Bias: $V_{CE} = 2.5 \text{ V to } 10 \text{ V}$, $I_c = 0.3 \text{ mA to } 10 \text{ mA}$

Note:

This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

NE85630 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS ⁽¹⁾

| 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

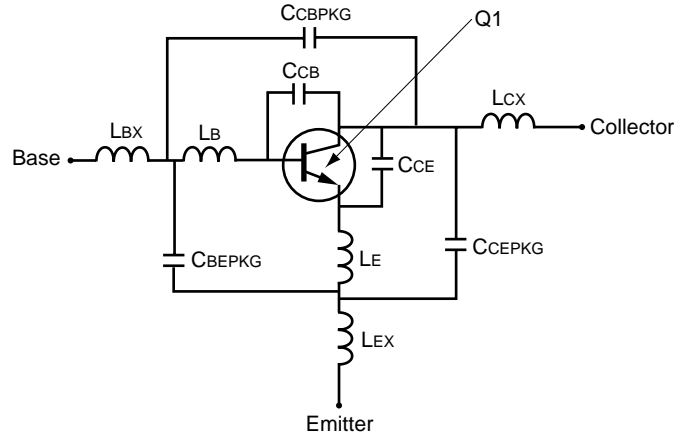
Frequency: 0.05 to 3.0 GHz
 Bias: V_{CE} = 2.5 V to 10 V, I_C = 0.3 mA to 10 mA
 Date: 10/25/96

Note:

This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

NE85633 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS ⁽¹⁾

| 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 |
|------------|----------|
| CBB | 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

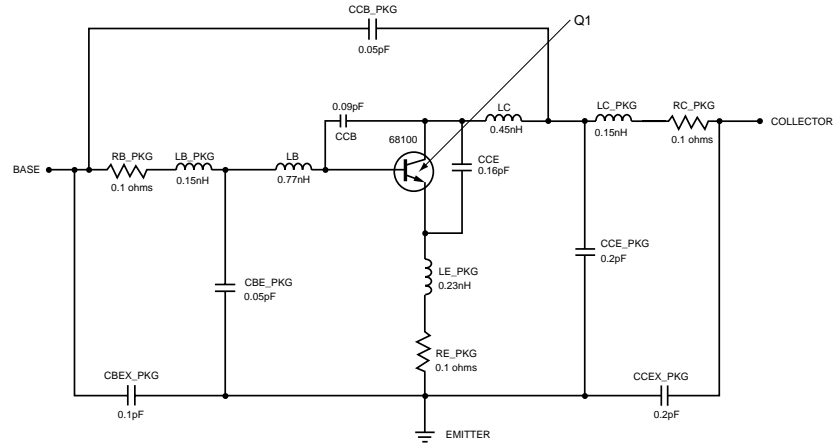
Frequency: 0.1 to 8.0 GHz
 Bias: VCE = 1 V to 10 V, IC = 1 mA to 20 mA
 Date: 7/97

Note:

This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

NE85635 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

| 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 | | |

UNITS

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

MODEL RANGE

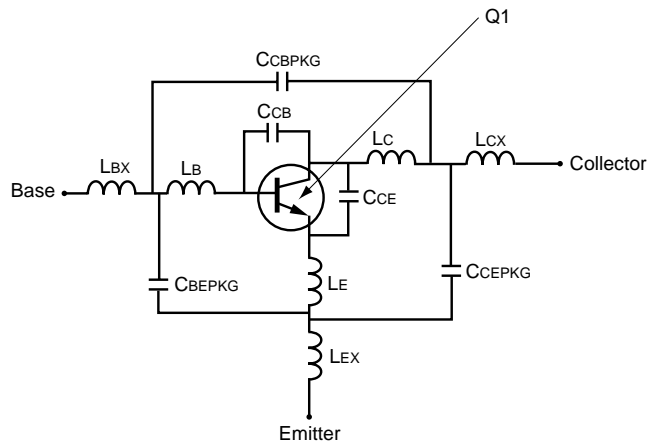
Frequency: 0.05 to 5.0 GHz
 Bias: V_{CE} = 10 V, I_C = 7 mA to 30 mA
 Date: 11/1/96

(1) Gummel-Poon Model

Note:
 This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

NE85639 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

| 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 | NE85639 |
|------------|-----------|
| CCB | 0.087e-12 |
| CCE | 0.16e-12 |
| LB | 1.1e-9 |
| LC | 0.81e-9 |
| LE | 0.58e-9 |
| CCBPKG | 0.02e-12 |
| CCEPKG | 0.08e-12 |
| CBEPKG | 0.01e-12 |
| LBX | 0.39e-9 |
| LCX | 0.39e-9 |
| LEX | 0.2e-9 |

MODEL RANGE

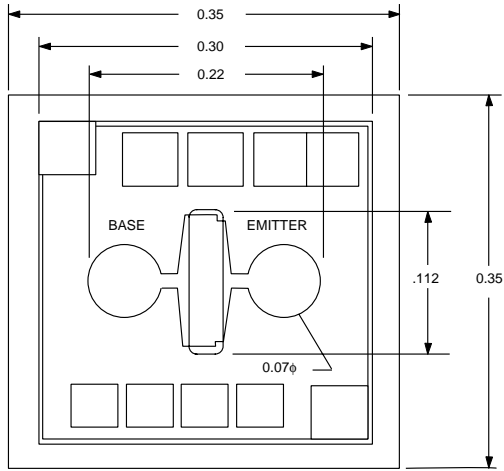
Frequency: 0.1 to 3.0 GHz
 Bias: VCE = 2.5 V to 10 V, IC = 0.3 mA to 7 mA
 Date: 6/12/96

Note:

This nonlinear model utilized the latest data available. See our Design Parameter Library at www.cel.com for this data.

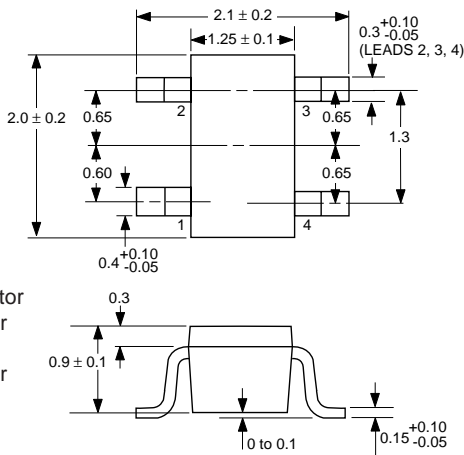
OUTLINE DIMENSIONS (Units in mm)

NE85600 (CHIP)



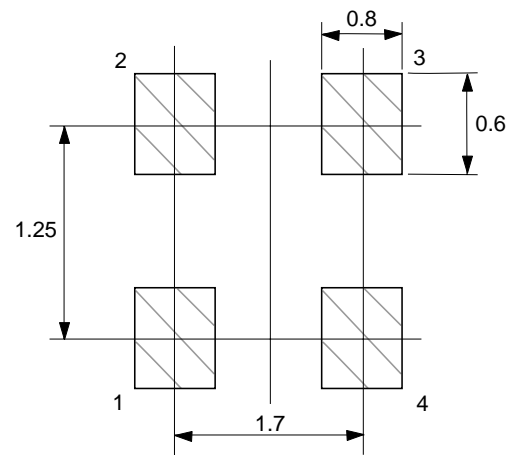
(Chip Thickness: 140 to 160 μ m)

**PACKAGE OUTLINE 18
(SOT-343)**

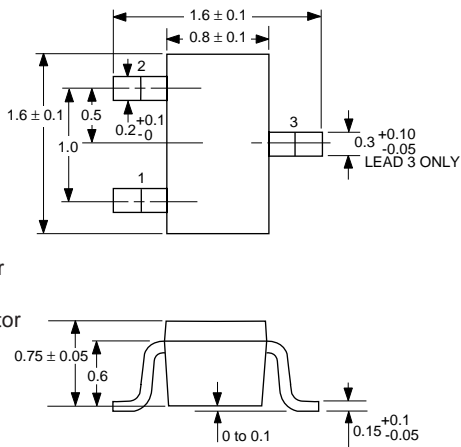


- 1. Collector
- 2. Emitter
- 3. Base
- 4. Emitter

**PACKAGE OUTLINE 18
RECOMMENDED P.C.B. LAYOUT**

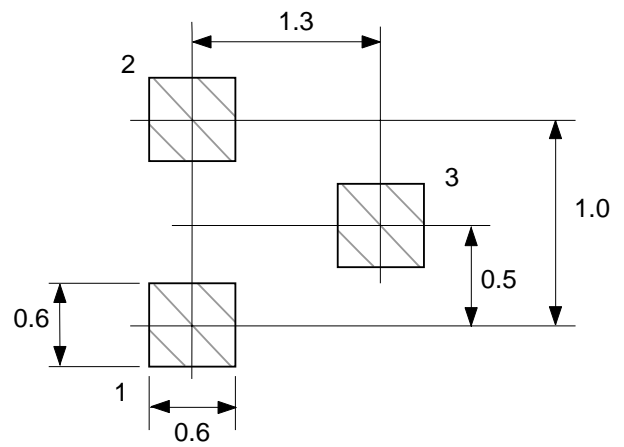


PACKAGE OUTLINE 19



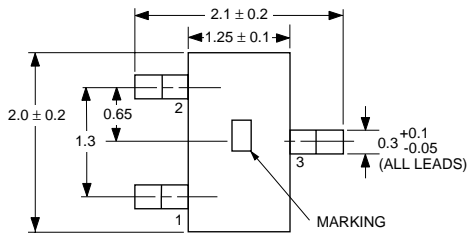
- 1. Emitter
- 2. Base
- 3. Collector

**PACKAGE OUTLINE 19
RECOMMENDED P.C.B. LAYOUT**

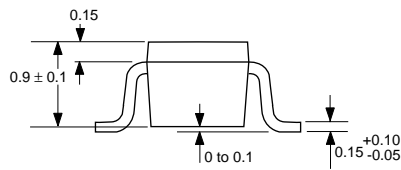


OUTLINE DIMENSIONS (Units in mm)

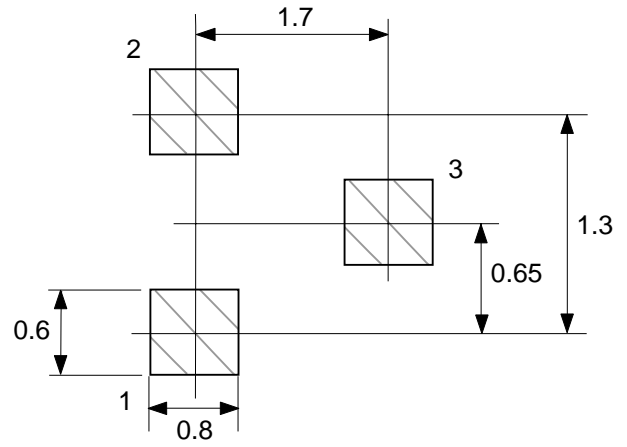
PACKAGE OUTLINE 30
(SOT-323)



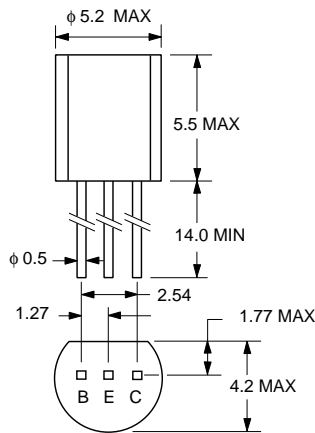
- 1. Emitter
- 2. Base
- 3. Collector



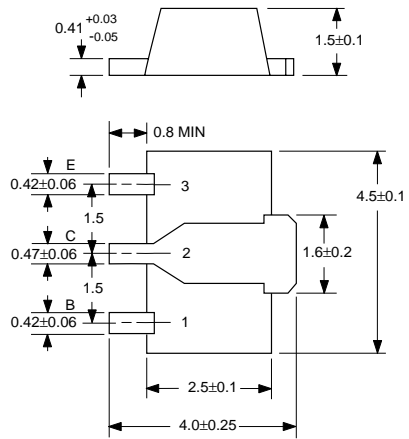
PACKAGE OUTLINE 30
RECOMMENDED P.C.B. LAYOUT



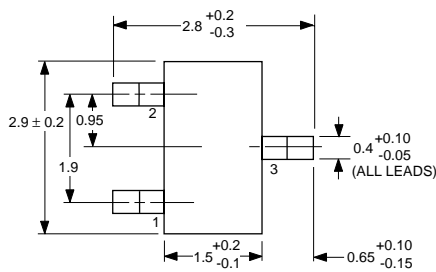
PACKAGE OUTLINE 32
(TO-92)



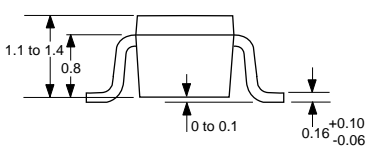
PACKAGE OUTLINE 34
(SOT-89)



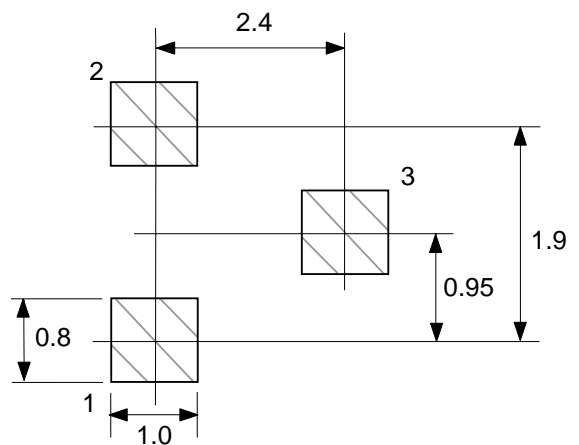
PACKAGE OUTLINE 33
(SOT-23)



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

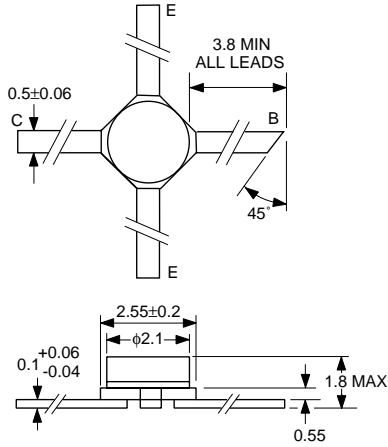


PACKAGE OUTLINE 33
RECOMMENDED P.C.B. LAYOUT

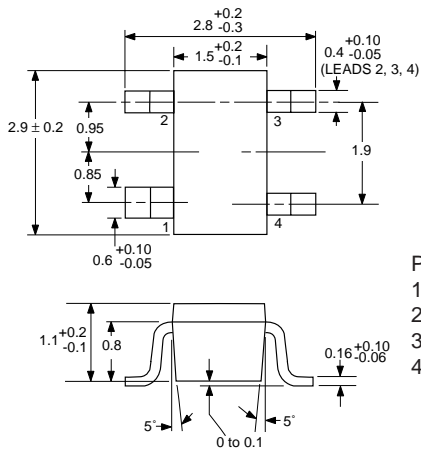


OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE 35
(MICRO-X)



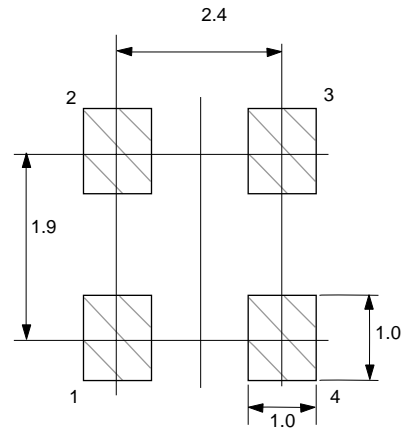
PACKAGE OUTLINE 39



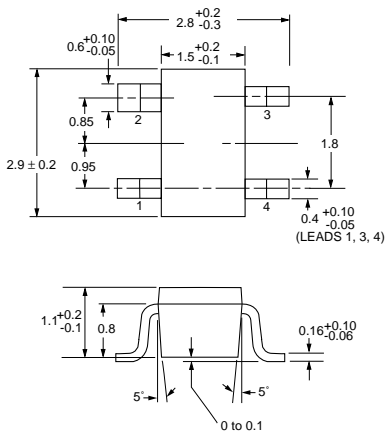
PIN CONNECTIONS

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

PACKAGE OUTLINE 39
RECOMMENDED P.C.B. LAYOUT



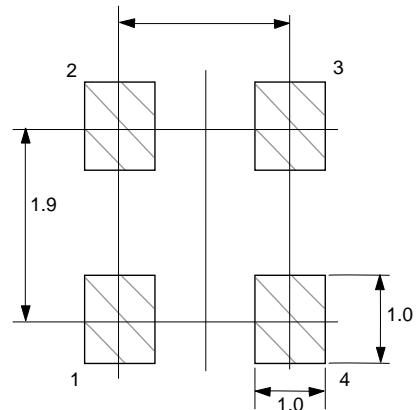
PACKAGE OUTLINE 39R



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-A | 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-A | 1 | ESD Bag |
| NE85639-T1-A | 3000 | Tape/Reel |
| NE85639R-T1-A | 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.

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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 per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained 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.