

## The RF Small Signal Line NPN Silicon Low Voltage, Low Current, Low Noise, High-Frequency Transistors

Designed for use in low voltage, low current applications at frequencies to 2.0 GHz. Specifically aimed at portable communication devices such as pagers and hand-held phones.

- High Gain ( $G_{Umax}$  15 dB Typ @ 1.0 GHz) @ 1.0 mA
- Small, Surface-Mount Package (SC-70)
- High Current Gain-Bandwidth Product at Low Current, Low Voltage ( $f_T$  = 8.0 GHz Typ @ 3.0 V, 5.0 mA)
- Available in Tape and Reel by Adding T1 Suffix to Part Number.  
T1 Suffix = 3,000 Units per 8 mm, 7 inch Reel.

**MRF927T1** **$I_C$  = 10 mA  
LOW NOISE  
HIGH FREQUENCY  
TRANSISTOR****CASE 419-02, STYLE 3  
(SC-70/SOT-323)**

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol    | Value        | Unit                       |
|----------------------------------------------------------------------------------------|-----------|--------------|----------------------------|
| Collector-Emitter Voltage                                                              | $V_{CEO}$ | 10           | Vdc                        |
| Collector-Base Voltage                                                                 | $V_{CB0}$ | 20           | Vdc                        |
| Emitter-Base Voltage                                                                   | $V_{EBO}$ | 2.5          | Vdc                        |
| Collector Current — Continuous                                                         | $I_C$     | 10           | mA dc                      |
| Total Device Dissipation @ $T_C = 50^\circ\text{C}$<br>Derate above $50^\circ\text{C}$ | $P_D$     | 100<br>1.0   | mW<br>mW/ $^\circ\text{C}$ |
| Storage Temperature Range                                                              | $T_{stg}$ | - 55 to +150 | $^\circ\text{C}$           |
| Operating Temperature Range                                                            | $T_J$     | 150          | $^\circ\text{C}$           |

### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Value | Unit               |
|--------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1000  | $^\circ\text{C/W}$ |

### DEVICE MARKING

MRF927T1 = F

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

| Characteristic                                                                                                                       | Symbol        | Min | Typ  | Max | Unit          |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|------|-----|---------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                           |               |     |      |     |               |
| Collector–Emitter Breakdown Voltage<br>( $I_C = 0.1\text{ mA}$ , $I_B = 0\text{ mA}$ )                                               | $V_{(BR)CEO}$ | 10  | —    | —   | Vdc           |
| Collector–Base Breakdown Voltage<br>( $I_C = 0.1\text{ mA}$ , $I_E = 0$ )                                                            | $V_{(BR)CBO}$ | 20  | —    | —   | Vdc           |
| Emitter–Base Breakdown Voltage<br>( $I_E = 0.1\text{ mA}$ , $I_C = 0$ )                                                              | $V_{(BR)EBO}$ | 1.5 | —    | —   | Vdc           |
| Emitter Cutoff Current<br>( $V_{EB} = 1.0\text{ Vdc}$ , $I_C = 0$ )                                                                  | $I_{EBO}$     | —   | —    | 0.1 | $\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>                                                                                                            |               |     |      |     |               |
| DC Current Gain<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 0.5\text{ mA}$ )                                                             | $h_{FE}$      | 50  | —    | 200 | —             |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                       |               |     |      |     |               |
| Collector–Base Capacitance<br>( $V_{CB} = 1.0\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                       | $C_{cb}$      | —   | 0.33 | —   | pF            |
| Current–Gain Bandwidth Product<br>( $V_{CE} = 3.0\text{ Vdc}$ , $I_E = 5.0\text{ mA}$ , $f = 1.0\text{ GHz}$ )                       | $f_t$         | —   | 8.0  | —   | GHz           |
| <b>PERFORMANCE CHARACTERISTICS</b>                                                                                                   |               |     |      |     |               |
| Noise Figure — Minimum<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 1.0\text{ mA}$ , $f = 1000\text{ MHz}$ )<br>Figure 3                  | $N_{Fmin}$    | —   | 1.7  | —   | dB            |
| Associated Gain at Minimum Noise Figure<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 1.0\text{ mA}$ , $f = 1000\text{ MHz}$ )<br>Figure 3 | $G_{NF}$      | —   | 9.8  | —   | dB            |
| Maximum Unilateral Gain<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 1.0\text{ mA}$ , $f = 1000\text{ MHz}$ )                             | $G_{Umax}$    | —   | 15   | —   | dB            |
| Insertion Gain<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 1.0\text{ mA}$ , $f = 1000\text{ MHz}$ )                                      | $ S_{21} ^2$  | —   | 8.0  | —   | dB            |
| Noise Resistance<br>( $V_{CE} = 1.0\text{ Vdc}$ , $I_C = 1.0\text{ mA}$ , $f = 1000\text{ MHz}$ )                                    | $R_N$         | —   | 62   | —   | Ohms          |

## TYPICAL CHARACTERISTICS

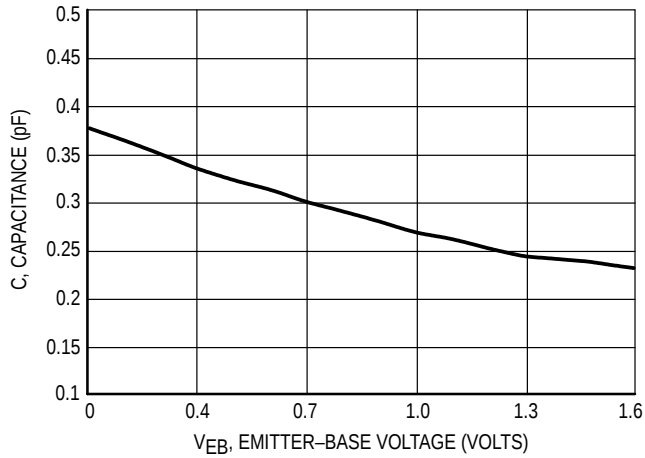


Figure 1.  $C_{ib}$  Input Capacitance versus Voltage

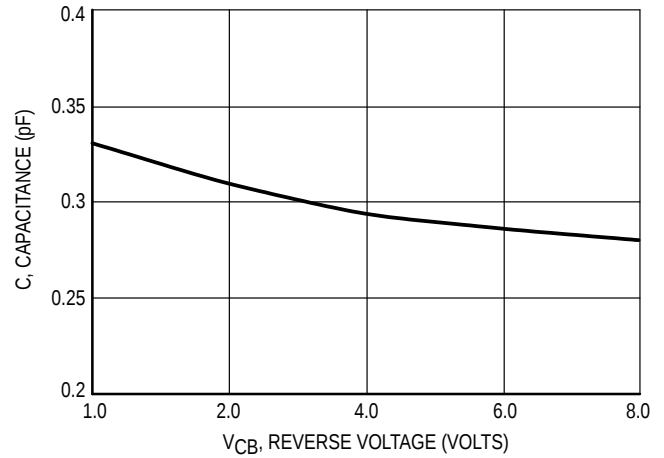


Figure 2.  $C_{cb}$ , Collector-Base Capacitance versus Voltage

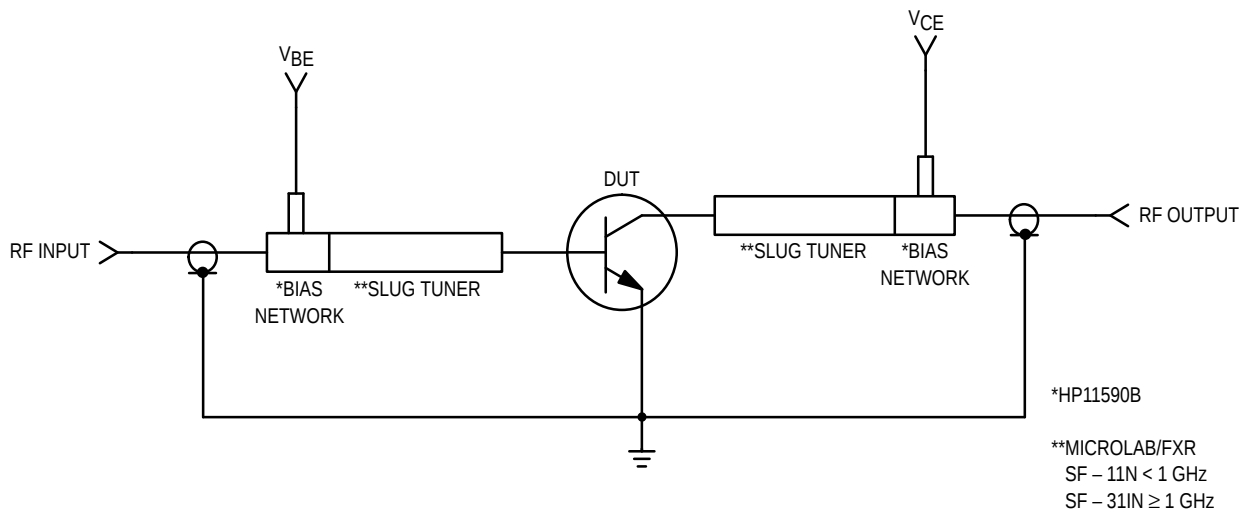


Figure 3. Functional Circuit Schematic

## TYPICAL CHARACTERISTICS

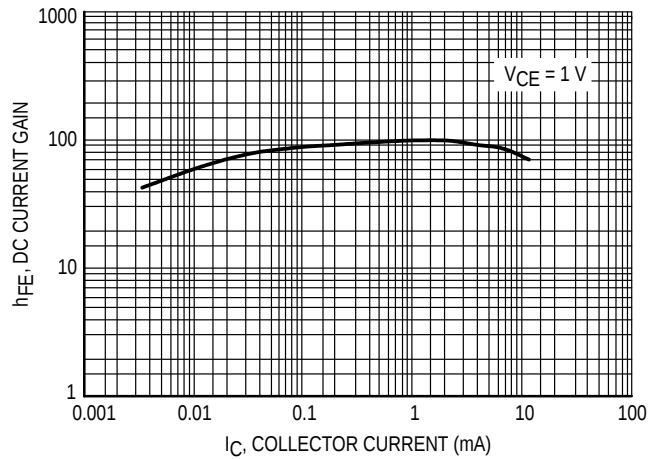


Figure 4. DC Current Gain versus Collector Current

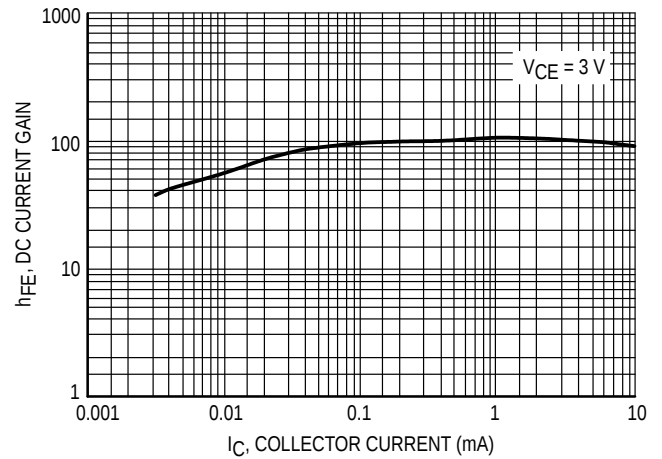


Figure 5. DC Current Gain versus Collector Current

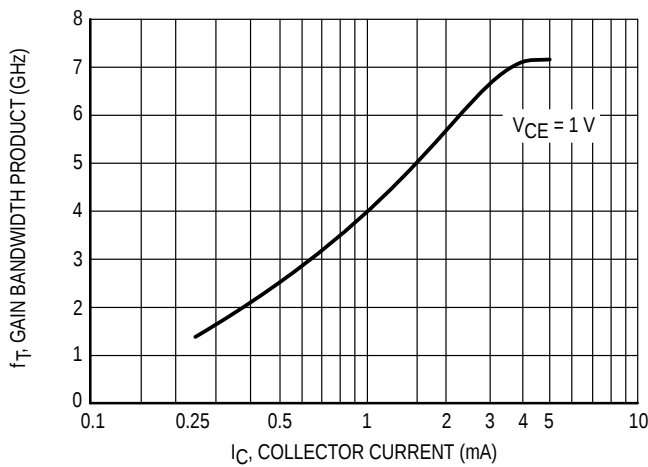


Figure 6. Gain Bandwidth Product versus Collector Current

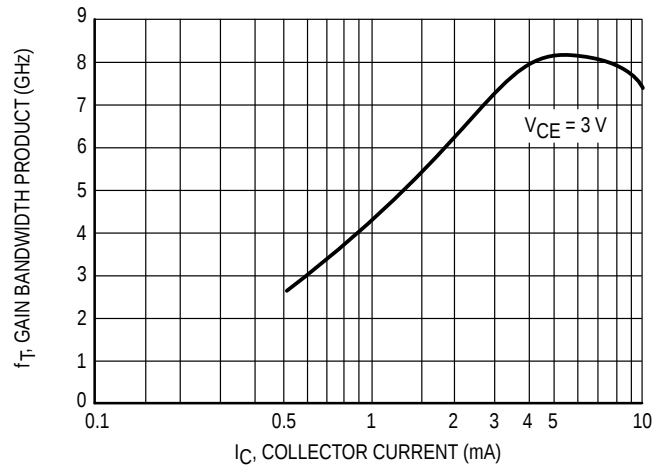


Figure 7. Gain Bandwidth Product versus Collector Current

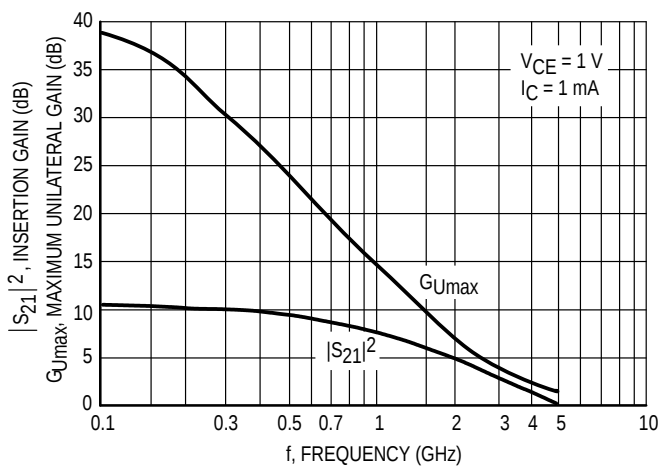


Figure 8. Forward Insertion Gain and Maximum Unilateral Gain versus Frequency

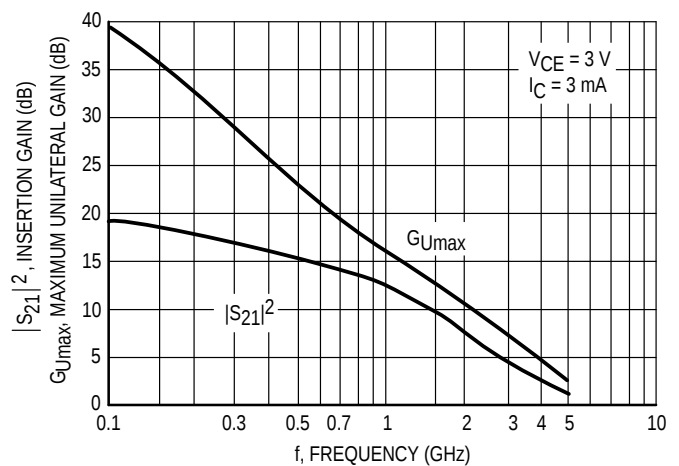
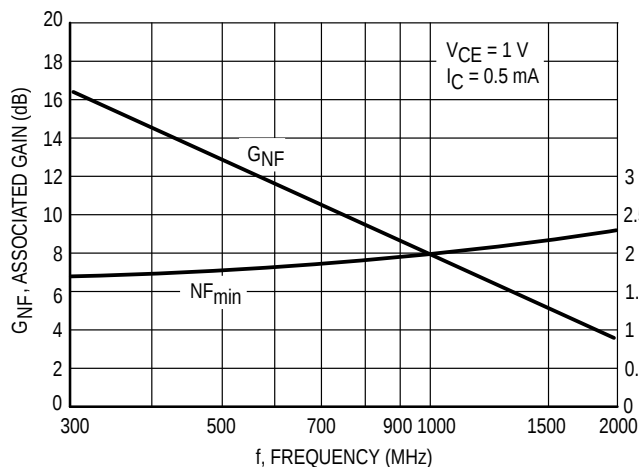
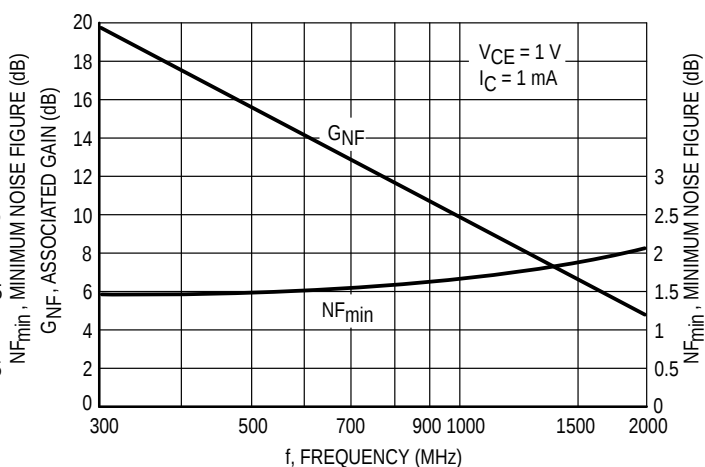


Figure 9. Forward Insertion Gain and Maximum Unilateral Gain versus Frequency

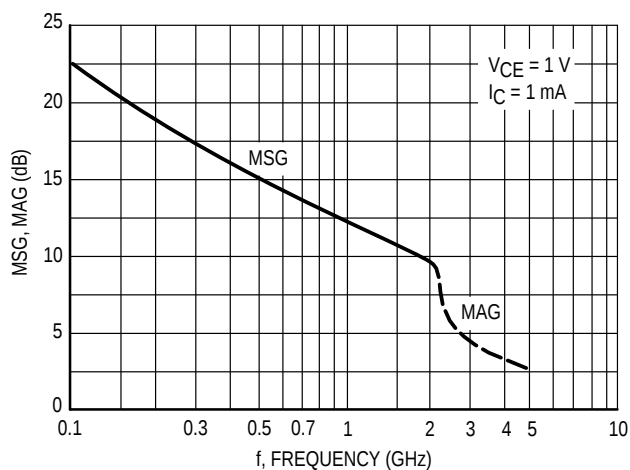
## TYPICAL CHARACTERISTICS



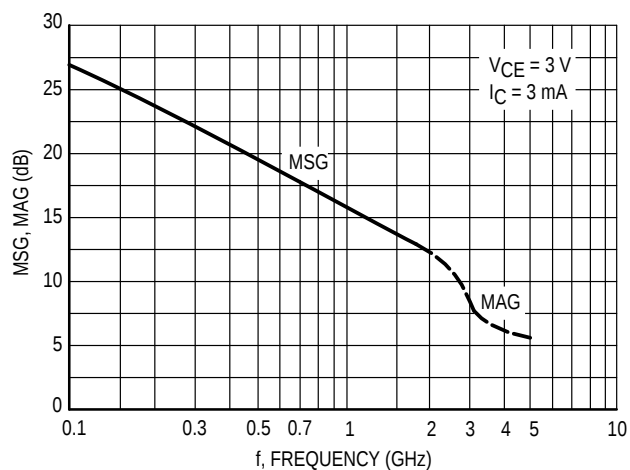
**Figure 10. Minimum Noise Figure and Associated Gain versus Frequency**



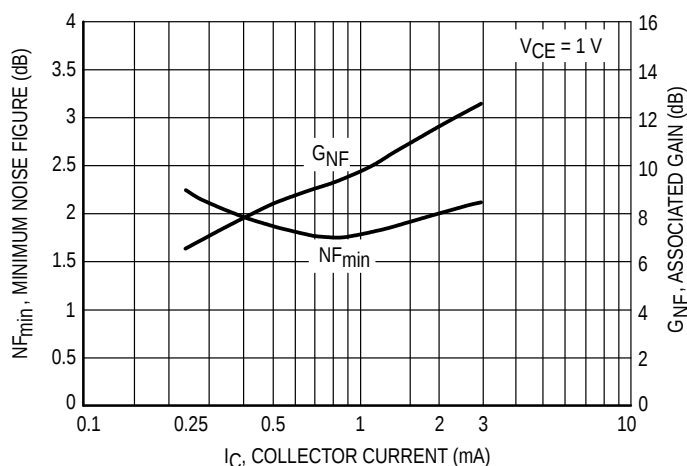
**Figure 11. Minimum Noise Figure and Associated Gain versus Frequency**



**Figure 12. MSG, Maximum Stable Gain; MAG, Maximum Available Gain versus Frequency**



**Figure 13. MSG, Maximum Stable Gain; MAG, Maximum Available Gain versus Frequency**



**Figure 14. Noise Figure and Gain @ Minimum Noise Figure versus Collector Current**

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(GHz) | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |      |
|--------------------------|------------------------|------------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|                          |                        |            | S <sub>11</sub> | ∠ φ  | S <sub>21</sub> | ∠ φ | S <sub>12</sub> | ∠ φ | S <sub>22</sub> | ∠ φ  |
| 1.0                      | 0.25                   | 0.10       | 0.992           | −4   | 0.911           | 174 | 0.020           | 86  | 0.997           | −3   |
|                          |                        | 0.20       | 0.990           | −9   | 0.903           | 169 | 0.039           | 83  | 0.993           | −6   |
|                          |                        | 0.30       | 0.983           | −13  | 0.909           | 163 | 0.059           | 80  | 0.992           | −8   |
|                          |                        | 0.40       | 0.978           | −17  | 0.904           | 157 | 0.077           | 77  | 0.988           | −11  |
|                          |                        | 0.50       | 0.973           | −21  | 0.834           | 149 | 0.095           | 72  | 0.975           | −13  |
|                          |                        | 0.60       | 0.943           | −25  | 0.892           | 144 | 0.111           | 69  | 0.966           | −16  |
|                          |                        | 0.70       | 0.929           | −29  | 0.873           | 139 | 0.127           | 66  | 0.958           | −19  |
|                          |                        | 0.80       | 0.889           | −33  | 0.901           | 135 | 0.142           | 63  | 0.949           | −22  |
|                          |                        | 0.90       | 0.895           | −37  | 0.888           | 129 | 0.158           | 60  | 0.939           | −24  |
|                          |                        | 1.00       | 0.876           | −41  | 0.890           | 124 | 0.171           | 57  | 0.929           | −26  |
|                          |                        | 1.50       | 0.772           | −60  | 0.871           | 100 | 0.227           | 44  | 0.873           | −38  |
|                          |                        | 2.00       | 0.670           | −78  | 0.835           | 80  | 0.261           | 34  | 0.823           | −48  |
|                          |                        | 2.50       | 0.564           | −96  | 0.812           | 62  | 0.276           | 25  | 0.776           | −58  |
|                          |                        | 3.00       | 0.477           | −114 | 0.785           | 48  | 0.276           | 18  | 0.741           | −68  |
|                          |                        | 3.50       | 0.412           | −132 | 0.741           | 36  | 0.270           | 15  | 0.722           | −77  |
|                          |                        | 4.00       | 0.364           | −151 | 0.701           | 25  | 0.261           | 14  | 0.711           | −87  |
|                          |                        | 4.50       | 0.308           | −172 | 0.702           | 17  | 0.261           | 18  | 0.682           | −97  |
|                          |                        | 5.00       | 0.297           | 166  | 0.639           | 11  | 0.270           | 22  | 0.686           | −107 |
|                          | 0.5                    | 0.10       | 0.983           | −5   | 1.788           | 174 | 0.020           | 86  | 0.994           | −3   |
|                          |                        | 0.20       | 0.977           | −10  | 1.763           | 168 | 0.040           | 82  | 0.992           | −7   |
|                          |                        | 0.30       | 0.965           | −16  | 1.764           | 162 | 0.059           | 79  | 0.984           | −10  |
|                          |                        | 0.40       | 0.953           | −21  | 1.735           | 156 | 0.077           | 76  | 0.976           | −13  |
|                          |                        | 0.50       | 0.947           | −26  | 1.637           | 147 | 0.094           | 70  | 0.954           | −16  |
|                          |                        | 0.60       | 0.901           | −30  | 1.673           | 142 | 0.109           | 67  | 0.941           | −19  |
|                          |                        | 0.70       | 0.878           | −34  | 1.619           | 137 | 0.124           | 64  | 0.927           | −21  |
|                          |                        | 0.80       | 0.827           | −38  | 1.601           | 132 | 0.136           | 62  | 0.912           | −24  |
|                          |                        | 0.90       | 0.825           | −43  | 1.594           | 127 | 0.151           | 58  | 0.893           | −27  |
|                          |                        | 1.00       | 0.796           | −48  | 1.571           | 122 | 0.162           | 56  | 0.877           | −29  |
|                          |                        | 1.50       | 0.659           | −67  | 1.420           | 99  | 0.207           | 45  | 0.797           | −40  |
|                          |                        | 2.00       | 0.535           | −85  | 1.275           | 80  | 0.232           | 37  | 0.733           | −49  |
|                          |                        | 2.50       | 0.417           | −102 | 1.177           | 63  | 0.247           | 32  | 0.678           | −58  |
|                          |                        | 3.00       | 0.332           | −122 | 1.097           | 50  | 0.256           | 29  | 0.639           | −67  |
|                          |                        | 3.50       | 0.271           | −143 | 1.014           | 38  | 0.265           | 28  | 0.617           | −75  |
|                          |                        | 4.00       | 0.238           | −164 | 0.949           | 28  | 0.279           | 29  | 0.604           | −84  |
|                          |                        | 4.50       | 0.212           | 170  | 0.928           | 19  | 0.305           | 31  | 0.573           | −94  |
|                          |                        | 5.00       | 0.218           | 147  | 0.856           | 12  | 0.333           | 31  | 0.574           | −105 |
|                          | 1.0                    | 0.10       | 0.965           | −7   | 3.383           | 172 | 0.020           | 85  | 0.990           | −4   |
|                          |                        | 0.20       | 0.952           | −14  | 3.315           | 165 | 0.040           | 81  | 0.982           | −9   |
|                          |                        | 0.30       | 0.928           | −20  | 3.277           | 157 | 0.057           | 77  | 0.965           | −13  |
|                          |                        | 0.40       | 0.905           | −26  | 3.172           | 151 | 0.074           | 73  | 0.947           | −16  |
|                          |                        | 0.50       | 0.88            | −33  | 3.027           | 141 | 0.090           | 67  | 0.910           | −19  |
|                          |                        | 0.60       | 0.819           | −37  | 2.936           | 136 | 0.102           | 64  | 0.887           | −23  |
|                          |                        | 0.70       | 0.783           | −42  | 2.804           | 130 | 0.115           | 61  | 0.861           | −26  |
|                          |                        | 0.80       | 0.725           | −47  | 2.666           | 125 | 0.125           | 59  | 0.839           | −28  |
|                          |                        | 0.90       | 0.702           | −52  | 2.623           | 119 | 0.136           | 56  | 0.810           | −31  |
|                          |                        | 1.00       | 0.664           | −57  | 2.525           | 114 | 0.145           | 54  | 0.787           | −33  |
|                          |                        | 1.50       | 0.504           | −75  | 2.085           | 93  | 0.181           | 47  | 0.690           | −42  |
|                          |                        | 2.00       | 0.382           | −92  | 1.759           | 75  | 0.207           | 42  | 0.626           | −50  |
|                          |                        | 2.50       | 0.278           | −108 | 1.548           | 61  | 0.229           | 40  | 0.577           | −58  |
|                          |                        | 3.00       | 0.21            | −129 | 1.397           | 48  | 0.252           | 38  | 0.543           | −66  |
|                          |                        | 3.50       | 0.168           | −154 | 1.271           | 38  | 0.276           | 36  | 0.523           | −73  |
|                          |                        | 4.00       | 0.15            | −177 | 1.177           | 28  | 0.303           | 35  | 0.513           | −82  |
|                          |                        | 4.50       | 0.148           | 155  | 1.123           | 19  | 0.336           | 34  | 0.490           | −91  |
|                          |                        | 5.00       | 0.165           | 132  | 1.049           | 12  | 0.369           | 32  | 0.487           | −101 |

Table 1. Common Emitter S-Parameters

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(GHz) | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |     |
|--------------------------|------------------------|------------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|-----|
|                          |                        |            | S <sub>11</sub> | ∠ φ  | S <sub>21</sub> | ∠ φ | S <sub>12</sub> | ∠ φ | S <sub>22</sub> | ∠ φ |
| 1.0                      | 2.0                    | 0.10       | 0.928           | −10  | 6.181           | 169 | 0.020           | 83  | 0.980           | −6  |
|                          |                        | 0.20       | 0.901           | −19  | 5.967           | 160 | 0.037           | 78  | 0.959           | −12 |
|                          |                        | 0.30       | 0.856           | −28  | 5.744           | 150 | 0.054           | 73  | 0.923           | −17 |
|                          |                        | 0.40       | 0.811           | −36  | 5.410           | 142 | 0.068           | 69  | 0.886           | −22 |
|                          |                        | 0.50       | 0.753           | −43  | 5.051           | 132 | 0.080           | 63  | 0.828           | −25 |
|                          |                        | 0.60       | 0.681           | −48  | 4.679           | 126 | 0.091           | 61  | 0.790           | −28 |
|                          |                        | 0.70       | 0.632           | −54  | 4.367           | 119 | 0.100           | 59  | 0.753           | −31 |
|                          |                        | 0.80       | 0.574           | −59  | 4.021           | 114 | 0.108           | 57  | 0.726           | −33 |
|                          |                        | 0.90       | 0.538           | −64  | 3.831           | 109 | 0.116           | 55  | 0.692           | −35 |
|                          |                        | 1.00       | 0.497           | −68  | 3.595           | 104 | 0.123           | 54  | 0.667           | −37 |
|                          |                        | 1.50       | 0.349           | −86  | 2.732           | 85  | 0.156           | 50  | 0.576           | −44 |
|                          |                        | 2.00       | 0.255           | −102 | 2.200           | 70  | 0.186           | 47  | 0.527           | −50 |
|                          |                        | 2.50       | 0.182           | −120 | 1.871           | 57  | 0.216           | 45  | 0.491           | −58 |
|                          |                        | 3.00       | 0.137           | −143 | 1.647           | 46  | 0.246           | 42  | 0.469           | −66 |
|                          |                        | 3.50       | 0.115           | −167 | 1.478           | 36  | 0.276           | 39  | 0.460           | −73 |
|                          |                        | 4.00       | 0.109           | 167  | 1.356           | 27  | 0.306           | 36  | 0.453           | −81 |
|                          |                        | 4.50       | 0.115           | 138  | 1.268           | 19  | 0.337           | 33  | 0.443           | −89 |
|                          |                        | 5.00       | 0.136           | 119  | 1.190           | 11  | 0.368           | 30  | 0.441           | −98 |

Table 1. Common Emitter S-Parameters (continued)

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(GHz) | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |     |
|--------------------------|------------------------|------------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|-----|
|                          |                        |            | S <sub>11</sub> | ∠ φ  | S <sub>21</sub> | ∠ φ | S <sub>12</sub> | ∠ φ | S <sub>22</sub> | ∠ φ |
| 3.0                      | 0.5                    | 0.10       | 0.985           | −5   | 1.796           | 174 | 0.018           | 86  | 0.995           | −3  |
|                          |                        | 0.20       | 0.980           | −10  | 1.776           | 169 | 0.034           | 83  | 0.993           | −6  |
|                          |                        | 0.30       | 0.969           | −15  | 1.778           | 163 | 0.051           | 79  | 0.986           | −9  |
|                          |                        | 0.40       | 0.959           | −19  | 1.753           | 157 | 0.066           | 76  | 0.980           | −12 |
|                          |                        | 0.50       | 0.952           | −24  | 1.651           | 149 | 0.081           | 71  | 0.961           | −14 |
|                          |                        | 0.60       | 0.910           | −28  | 1.693           | 144 | 0.095           | 68  | 0.949           | −17 |
|                          |                        | 0.70       | 0.888           | −32  | 1.639           | 139 | 0.108           | 65  | 0.937           | −20 |
|                          |                        | 0.80       | 0.841           | −36  | 1.628           | 134 | 0.119           | 63  | 0.924           | −23 |
|                          |                        | 0.90       | 0.839           | −41  | 1.618           | 129 | 0.131           | 60  | 0.908           | −25 |
|                          |                        | 1.00       | 0.812           | −45  | 1.596           | 124 | 0.142           | 57  | 0.894           | −27 |
|                          |                        | 1.50       | 0.681           | −64  | 1.445           | 102 | 0.184           | 47  | 0.824           | −38 |
|                          |                        | 2.00       | 0.565           | −80  | 1.294           | 83  | 0.210           | 39  | 0.768           | −47 |
|                          |                        | 2.50       | 0.455           | −96  | 1.190           | 66  | 0.226           | 33  | 0.720           | −56 |
|                          |                        | 3.00       | 0.369           | −112 | 1.106           | 53  | 0.237           | 30  | 0.687           | −64 |
|                          |                        | 3.50       | 0.308           | −128 | 1.019           | 41  | 0.246           | 28  | 0.670           | −72 |
|                          |                        | 4.00       | 0.264           | −146 | 0.950           | 30  | 0.256           | 28  | 0.661           | −81 |
|                          |                        | 4.50       | 0.212           | −166 | 0.933           | 21  | 0.274           | 29  | 0.638           | −89 |
|                          |                        | 5.00       | 0.201           | 171  | 0.858           | 13  | 0.294           | 30  | 0.642           | −99 |
|                          | 1.0                    | 0.10       | 0.969           | −6   | 3.341           | 173 | 0.017           | 85  | 0.992           | −4  |
|                          |                        | 0.20       | 0.958           | −13  | 3.284           | 166 | 0.034           | 81  | 0.985           | −8  |
|                          |                        | 0.30       | 0.938           | −19  | 3.255           | 159 | 0.050           | 78  | 0.972           | −11 |
|                          |                        | 0.40       | 0.917           | −24  | 3.163           | 152 | 0.064           | 74  | 0.957           | −15 |
|                          |                        | 0.50       | 0.896           | −30  | 3.019           | 143 | 0.078           | 68  | 0.925           | −18 |
|                          |                        | 0.60       | 0.838           | −35  | 2.951           | 138 | 0.089           | 66  | 0.905           | −21 |
|                          |                        | 0.70       | 0.805           | −40  | 2.823           | 132 | 0.101           | 63  | 0.883           | −23 |
|                          |                        | 0.80       | 0.750           | −44  | 2.700           | 127 | 0.110           | 61  | 0.864           | −26 |
|                          |                        | 0.90       | 0.732           | −49  | 2.661           | 122 | 0.121           | 58  | 0.838           | −28 |
|                          |                        | 1.00       | 0.696           | −53  | 2.570           | 117 | 0.129           | 56  | 0.818           | −31 |
|                          |                        | 1.50       | 0.541           | −71  | 2.139           | 95  | 0.163           | 48  | 0.731           | −40 |
|                          |                        | 2.00       | 0.424           | −86  | 1.807           | 78  | 0.188           | 43  | 0.674           | −47 |
|                          |                        | 2.50       | 0.325           | −100 | 1.588           | 63  | 0.210           | 40  | 0.629           | −55 |
|                          |                        | 3.00       | 0.252           | −116 | 1.430           | 51  | 0.230           | 37  | 0.600           | −63 |
|                          |                        | 3.50       | 0.204           | −132 | 1.294           | 40  | 0.250           | 36  | 0.589           | −70 |
|                          |                        | 4.00       | 0.170           | −150 | 1.195           | 30  | 0.272           | 34  | 0.581           | −78 |
|                          |                        | 4.50       | 0.136           | −173 | 1.141           | 21  | 0.297           | 33  | 0.565           | −86 |
|                          |                        | 5.00       | 0.134           | 162  | 1.063           | 13  | 0.323           | 32  | 0.566           | −95 |

Table 2. Common Emitter S-Parameters

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(GHz) | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |     |
|--------------------------|------------------------|------------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|-----|
|                          |                        |            | S <sub>11</sub> | ∠ φ  | S <sub>21</sub> | ∠ φ | S <sub>12</sub> | ∠ φ | S <sub>22</sub> | ∠ φ |
| 3.0                      | 3.0                    | 0.10       | 0.902           | −11  | 8.541           | 168 | 0.017           | 83  | 0.976           | −7  |
|                          |                        | 0.20       | 0.863           | −21  | 8.133           | 156 | 0.031           | 77  | 0.946           | −13 |
|                          |                        | 0.30       | 0.805           | −31  | 7.647           | 146 | 0.045           | 73  | 0.901           | −18 |
|                          |                        | 0.40       | 0.746           | −39  | 7.050           | 137 | 0.056           | 69  | 0.856           | −22 |
|                          |                        | 0.50       | 0.673           | −45  | 6.436           | 127 | 0.066           | 65  | 0.794           | −24 |
|                          |                        | 0.60       | 0.604           | −50  | 5.853           | 121 | 0.074           | 63  | 0.757           | −27 |
|                          |                        | 0.70       | 0.552           | −55  | 5.378           | 115 | 0.082           | 61  | 0.721           | −29 |
|                          |                        | 0.80       | 0.499           | −59  | 4.897           | 110 | 0.089           | 60  | 0.697           | −30 |
|                          |                        | 0.90       | 0.461           | −63  | 4.586           | 105 | 0.096           | 59  | 0.667           | −32 |
|                          |                        | 1.00       | 0.424           | −66  | 4.260           | 100 | 0.103           | 59  | 0.647           | −33 |
|                          |                        | 1.50       | 0.295           | −80  | 3.141           | 83  | 0.136           | 56  | 0.578           | −38 |
|                          |                        | 2.00       | 0.215           | −91  | 2.494           | 70  | 0.169           | 54  | 0.542           | −44 |
|                          |                        | 2.50       | 0.152           | −105 | 2.101           | 58  | 0.201           | 51  | 0.514           | −51 |
|                          |                        | 3.00       | 0.108           | −124 | 1.837           | 47  | 0.232           | 47  | 0.497           | −59 |
|                          |                        | 3.50       | 0.083           | −146 | 1.641           | 38  | 0.263           | 44  | 0.490           | −66 |
|                          |                        | 4.00       | 0.071           | −173 | 1.501           | 30  | 0.294           | 41  | 0.485           | −73 |
|                          |                        | 4.50       | 0.069           | 148  | 1.395           | 21  | 0.325           | 38  | 0.480           | −81 |
|                          |                        | 5.00       | 0.090           | 121  | 1.310           | 14  | 0.357           | 35  | 0.478           | −90 |
|                          | 5.0                    | 0.10       | 0.839           | −15  | 12.345          | 164 | 0.016           | 81  | 0.961           | −9  |
|                          |                        | 0.20       | 0.774           | −28  | 11.339          | 149 | 0.030           | 75  | 0.906           | −16 |
|                          |                        | 0.30       | 0.690           | −38  | 10.154          | 137 | 0.041           | 71  | 0.840           | −21 |
|                          |                        | 0.40       | 0.614           | −47  | 8.971           | 127 | 0.050           | 68  | 0.780           | −24 |
|                          |                        | 0.50       | 0.528           | −52  | 7.877           | 119 | 0.058           | 65  | 0.715           | −26 |
|                          |                        | 0.60       | 0.464           | −57  | 6.974           | 112 | 0.066           | 64  | 0.677           | −27 |
|                          |                        | 0.70       | 0.414           | −61  | 6.267           | 107 | 0.073           | 63  | 0.646           | −28 |
|                          |                        | 0.80       | 0.370           | −65  | 5.628           | 102 | 0.080           | 63  | 0.625           | −29 |
|                          |                        | 0.90       | 0.338           | −68  | 5.165           | 98  | 0.087           | 63  | 0.602           | −30 |
|                          |                        | 1.00       | 0.307           | −71  | 4.742           | 94  | 0.094           | 62  | 0.587           | −31 |
|                          |                        | 1.50       | 0.207           | −83  | 3.389           | 79  | 0.130           | 61  | 0.536           | −36 |
|                          |                        | 2.00       | 0.148           | −96  | 2.658           | 66  | 0.165           | 58  | 0.512           | −41 |
|                          |                        | 2.50       | 0.100           | −113 | 2.221           | 56  | 0.200           | 54  | 0.490           | −49 |
|                          |                        | 3.00       | 0.072           | −138 | 1.930           | 46  | 0.233           | 51  | 0.475           | −56 |
|                          |                        | 3.50       | 0.059           | −168 | 1.720           | 37  | 0.266           | 47  | 0.470           | −64 |
|                          |                        | 4.00       | 0.062           | 152  | 1.569           | 29  | 0.299           | 43  | 0.466           | −72 |
|                          |                        | 4.50       | 0.080           | 118  | 1.451           | 21  | 0.331           | 40  | 0.462           | −80 |
|                          |                        | 5.00       | 0.107           | 103  | 1.362           | 14  | 0.365           | 36  | 0.460           | −88 |

Table 2. Common Emitter S-Parameters (continued)

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(MHz) | NF <sub>min</sub><br>(dB) | Γ <sub>o</sub><br>(MAG, ANG) | R <sub>N</sub><br>(ohms) |
|--------------------------|------------------------|------------|---------------------------|------------------------------|--------------------------|
| 1.0                      | 0.5                    | 300        | 1.65                      | 0.81 ∠ 8                     | 89                       |
|                          |                        | 500        | 1.70                      | 0.80 ∠ 13                    | 86                       |
|                          |                        | 900        | 1.85                      | 0.77 ∠ 23                    | 78                       |
|                          |                        | 1000       | 1.90                      | 0.77 ∠ 25                    | 76                       |
|                          |                        | 1500       | 2.05                      | 0.74 ∠ 40                    | 64                       |
|                          |                        | 2000       | 2.20                      | 0.70 ∠ 56                    | 50                       |
|                          | 1.0                    | 300        | 1.45                      | 0.76 ∠ 7                     | 71                       |
|                          |                        | 500        | 1.47                      | 0.76 ∠ 12                    | 69                       |
|                          |                        | 900        | 1.65                      | 0.75 ∠ 21                    | 63                       |
|                          |                        | 1000       | 1.70                      | 0.74 ∠ 24                    | 62                       |
|                          |                        | 1500       | 1.90                      | 0.71 ∠ 38                    | 53                       |
|                          |                        | 2000       | 2.05                      | 0.67 ∠ 55                    | 44                       |

Table 3. Common-Emitter Noise Parameters

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(MHz) | NF <sub>min</sub><br>(dB) | Γ <sub>o</sub><br>(MAG, ANG) | R <sub>N</sub><br>(ohms) |
|--------------------------|------------------------|------------|---------------------------|------------------------------|--------------------------|
| 3.0                      | 1.0                    | 300        | 1.60                      | 0.72 ∠7                      | 61                       |
|                          |                        | 500        | 1.62                      | 0.72 ∠12                     | 60                       |
|                          |                        | 900        | 1.64                      | 0.70 ∠21                     | 57                       |
|                          |                        | 1000       | 1.64                      | 0.70 ∠24                     | 56                       |
|                          |                        | 1500       | 1.70                      | 0.67 ∠39                     | 49                       |
|                          |                        | 2000       | 1.80                      | 0.63 ∠55                     | 41                       |
|                          | 3.0                    | 300        | 1.80                      | 0.63 ∠7                      | 48                       |
|                          |                        | 500        | 1.82                      | 0.62 ∠11                     | 47                       |
|                          |                        | 900        | 1.84                      | 0.60 ∠19                     | 45                       |
|                          |                        | 1000       | 1.85                      | 0.59 ∠22                     | 44                       |
|                          |                        | 1500       | 1.94                      | 0.56 ∠37                     | 40                       |
|                          |                        | 2000       | 2.12                      | 0.51 ∠56                     | 34                       |

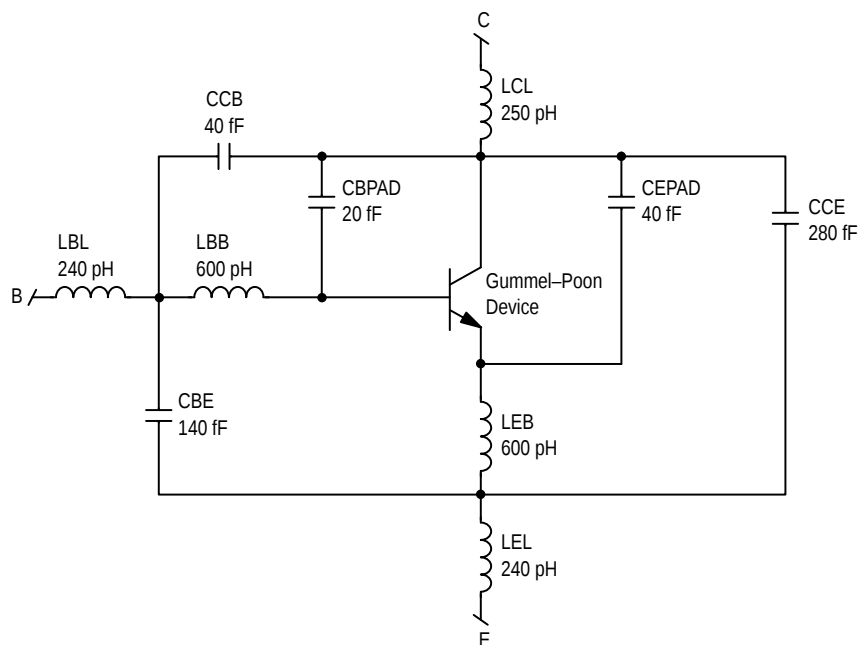
**Table 3. Common-Emitter Noise Parameters (continued)**

| Name | Value     | Name | Value     | Name | Value    |
|------|-----------|------|-----------|------|----------|
| IS   | 187.1E-18 | IRB  | 80.0E-6   | TF   | 13.0E-12 |
| BF   | 133       | RBM  | 31        | XTF  | 500      |
| NF   | 0.9958    | RE   | 3.3       | VTF  | 1.1      |
| VAF  | 40        | RC   | 6         | ITF  | 0.35     |
| IKF  | 0.07      | XTB  | 0(1)      | PTF  | 50       |
| ISE  | 5.393E-12 | EG   | 1.11(1)   | TR   | 2.38E-9  |
| NE   | 4.933     | XTI  | 3(1)      | FC   | 0.9      |
| BR   | 17        | CJE  | 280.0E-15 | CJS  | 0(1)     |
| NR   | 0.9929    | VJE  | 0.884     | VJS  | 1(1)     |
| VAR  | 2.6       | MJE  | 0.318     | MJS  | 0(1)     |
| IKR  | 0.018     | CJC  | 290.0E-15 | AF   | 1(1)     |
| ISC  | 28.92E-18 | VJC  | 0.424     | KF   | 0(1)     |
| NC   | 1.049     | MJC  | 0.108     |      |          |
| RB   | 31        | XCJC | 0.2       |      |          |

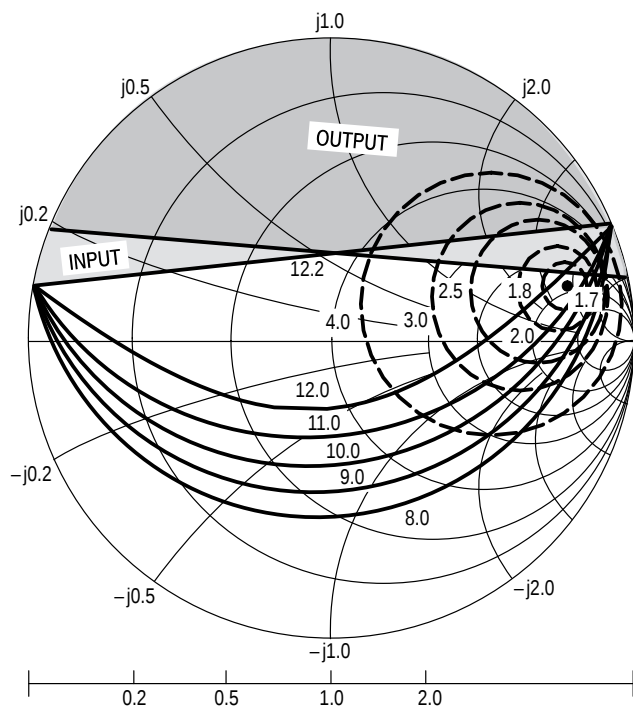
Note

1. These parameters have not been extracted. Default values are shown.

**Table 4. Spice Parameters (MRF927 Die Gummel-Poon Parameters)**



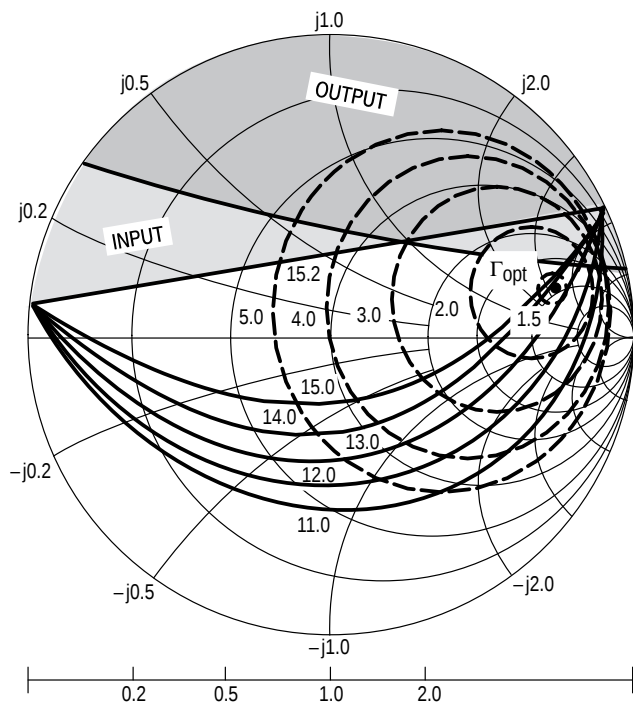
**Figure 15. MRF927 SC-70 Package Equivalent Circuit**



$V_{CE} = 1.0 \text{ V}$   
 $I_C = 0.5 \text{ mA}$   
 — Potentially Unstable

| f (MHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT   | Rn | K    |
|---------|-------------|------------------------|----|------|
| 500     | 1.7         | $0.80 \angle 13^\circ$ | 86 | 0.25 |

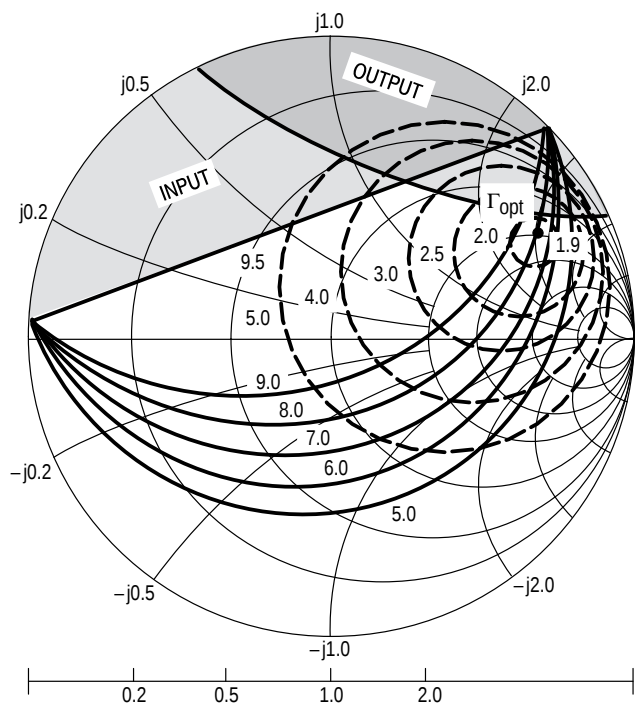
Figure 16. Constant Gain and Noise Figure Contours



$V_{CE} = 1.0 \text{ V}$   
 $I_C = 1.0 \text{ mA}$   
 — Potentially Unstable

| f (MHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT   | Rn | K    |
|---------|-------------|------------------------|----|------|
| 500     | 1.47        | $0.76 \angle 12^\circ$ | 69 | 0.29 |

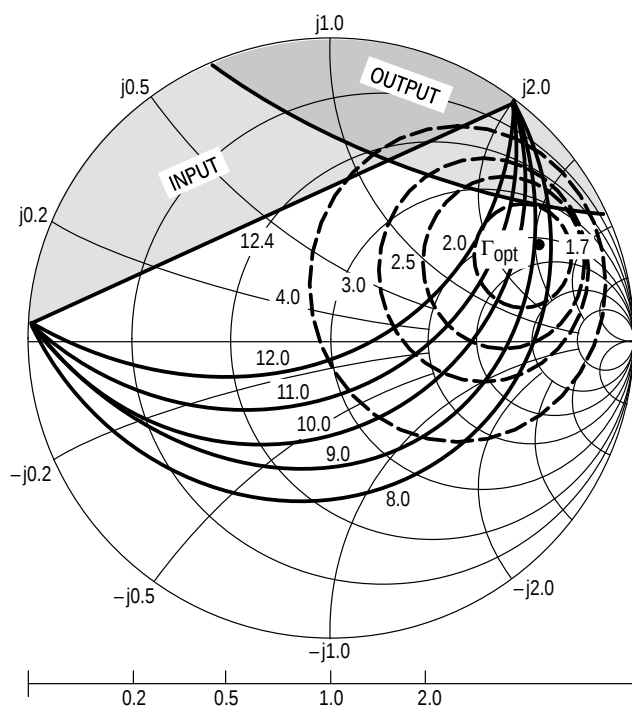
Figure 17. Constant Gain and Noise Figure Contours



$V_{CE} = 1.0 \text{ V}$   
 $I_C = 0.5 \text{ mA}$   
 — Potentially Unstable

| f (MHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT   | Rn | K    |
|---------|-------------|------------------------|----|------|
| 1000    | 1.9         | $0.77 \angle 25^\circ$ | 76 | 0.43 |

Figure 18. Constant Gain and Noise Figure Contours

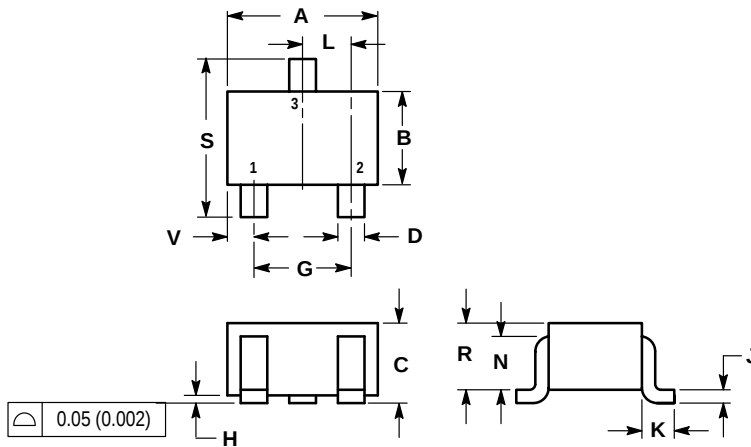


$V_{CE} = 1.0 \text{ V}$   
 $I_C = 1.0 \text{ mA}$   
 — Potentially Unstable

| f (MHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT   | Rn | K    |
|---------|-------------|------------------------|----|------|
| 1000    | 1.7         | $0.74 \angle 24^\circ$ | 62 | 0.51 |

Figure 19. Constant Gain and Noise Figure Contours

## PACKAGE DIMENSIONS



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |      |
|-----|-----------|-------|-------------|------|
|     | MIN       | MAX   | MIN         | MAX  |
| A   | 0.071     | 0.087 | 1.80        | 2.20 |
| B   | 0.045     | 0.053 | 1.15        | 1.35 |
| C   | 0.035     | 0.049 | 0.90        | 1.25 |
| D   | 0.012     | 0.016 | 0.30        | 0.40 |
| G   | 0.047     | 0.055 | 1.20        | 1.40 |
| H   | 0.000     | 0.004 | 0.00        | 0.10 |
| J   | 0.004     | 0.010 | 0.10        | 0.25 |
| K   | 0.017 REF |       | 0.425 REF   |      |
| L   | 0.026 BSC |       | 0.650 BSC   |      |
| N   | 0.028 REF |       | 0.700 REF   |      |
| R   | 0.031     | 0.039 | 0.80        | 1.00 |
| S   | 0.079     | 0.087 | 2.00        | 2.20 |
| V   | 0.012     | 0.016 | 0.30        | 0.40 |

STYLE 3:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

### CASE 419-02 ISSUE G

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MRF927T1/D

