

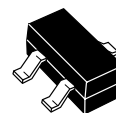
## The RF Line **NPN Silicon** **Low Noise, High-Frequency** **Transistors**

Designed for use in high gain, low noise small-signal amplifiers. This series features excellent broadband linearity and is offered in a variety of packages.

- Fully Implanted Base and Emitter Structure
- 18 Finger, 1.25 Micron Geometry with Gold Top Metal
- Gold Sintered Back Metal
- Available in tape and reel packaging options:  
T1 suffix = 3,000 units per reel

### **MMBR951** **MRF957** **SERIES**

$I_C = 100 \text{ mA}$   
**LOW NOISE**  
**HIGH-FREQUENCY**  
**TRANSISTORS**



CASE 318-08, STYLE 6  
SOT-23  
LOW PROFILE  
MMBR951LT1



CASE 419-02, STYLE 3  
MRF957T1



# Freescale Semiconductor, Inc.

## MAXIMUM RATINGS

| Rating                                                                                                  | Symbol          | MMBR951LT1    | MRF957T1      | Unit                          |
|---------------------------------------------------------------------------------------------------------|-----------------|---------------|---------------|-------------------------------|
| Collector–Emitter Voltage                                                                               | $V_{CEO}$       | 10            | 10            | Vdc                           |
| Collector–Base Voltage                                                                                  | $V_{CBO}$       | 20            | 20            | Vdc                           |
| Emitter–Base Voltage                                                                                    | $V_{EBO}$       | 1.5           | 15            | Vdc                           |
| Power Dissipation (1) $T_C = 75^\circ\text{C}$<br>Derate linearly above $T_{case} = 75^\circ\text{C}$ @ | $P_{D(max)}$    | 0.322<br>4.29 | 0.227<br>3.03 | Watts<br>mW/ $^\circ\text{C}$ |
| Collector Current — Continuous (2)                                                                      | $I_C$           | 100           | 100           | mA                            |
| Maximum Junction Temperature                                                                            | $T_{Jmax}$      | 150           | 150           | $^\circ\text{C}$              |
| Storage Temperature                                                                                     | $T_{stg}$       | –55 to +150   | –55 to +150   | $^\circ\text{C}$              |
| Thermal Resistance, Junction to Case                                                                    | $R_{\theta JC}$ | 233           | 330           | $^\circ\text{C/W}$            |

## DEVICE MARKING

MMBR951LT1 = 7Z      MRF957T1 = B

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS (3)

|                                                                              |               |    |    |     |                 |
|------------------------------------------------------------------------------|---------------|----|----|-----|-----------------|
| Collector–Emitter Breakdown Voltage<br>( $I_C = 0.1\text{ mA}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 10 | 13 | —   | Vdc             |
| Collector–Base Breakdown Voltage<br>( $I_C = 0.1\text{ mA}$ , $I_E = 0$ )    | $V_{(BR)CBO}$ | 20 | 25 | —   | Vdc             |
| Emitter Cutoff Current<br>( $V_{EB} = 1.0\text{ V}$ , $I_C = 0$ )            | $I_{EBO}$     | —  | —  | 0.1 | $\mu\text{Adc}$ |
| Collector Cutoff Current<br>( $V_{CB} = 10\text{ V}$ , $I_E = 0$ )           | $I_{CBO}$     | —  | —  | 0.1 | $\mu\text{Adc}$ |

### ON CHARACTERISTICS (3)

|                                                                        |          |    |   |     |   |
|------------------------------------------------------------------------|----------|----|---|-----|---|
| DC Current Gain<br>( $V_{CE} = 6.0\text{ V}$ , $I_C = 5.0\text{ mA}$ ) | $h_{FE}$ | 50 | — | 200 | — |
|------------------------------------------------------------------------|----------|----|---|-----|---|

### DYNAMIC CHARACTERISTICS

|                                                                                                               |          |   |            |     |     |
|---------------------------------------------------------------------------------------------------------------|----------|---|------------|-----|-----|
| Collector–Base Capacitance<br>( $V_{CB} = 10\text{ V}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                   | $C_{cb}$ | — | 0.45       | 1.0 | pF  |
| Current Gain — Bandwidth Product<br>( $V_{CE} = 6.0\text{ V}$ , $I_C = 30\text{ mA}$ , $f = 1.0\text{ GHz}$ ) | $f_T$    | — | 8.0<br>9.0 | —   | GHz |

#### NOTES:

- To calculate the junction temperature use  $T_J = (P_D \times R_{\theta JA}) + T_{CASE}$ . Case temperature measured on collector lead immediately adjacent to body of package.
- $I_C$  — Continuous (MTBF  $\approx 10$  years).
- Pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$  pulsed.

# Freescale Semiconductor, Inc.

## PERFORMANCE CHARACTERISTICS

| Conditions                                                                                                                                                                                                                                        | Symbol                         | MMBR951LT1  |                  |             | MRF957T1    |                   |             | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------|------------------|-------------|-------------|-------------------|-------------|------|
|                                                                                                                                                                                                                                                   |                                | Min         | Typ              | Max         | Min         | Typ               | Max         |      |
| Insertion Gain<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 30 mA, f = 1.0 GHz)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 30 mA, f = 2.0 GHz)<br>(V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 30 mA, f = 1.5 GHz)                              | S <sub>21</sub>   <sup>2</sup> | —           | 12.5<br>7.0<br>— | —<br>—<br>— | —<br>—<br>— | 13.3<br>—<br>10.1 | —<br>—<br>— | dB   |
| Maximum Unilateral Gain (1)<br>(V <sub>CE</sub> = 8.0 V, I <sub>C</sub> = 30 mA, f = 1.0 GHz)<br>(V <sub>CE</sub> = 8.0 V, I <sub>C</sub> = 30 mA, f = 2.0 GHz)<br>(V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 30 mA, f = 1.5 GHz)                 | G <sub>U max</sub>             | —<br>—<br>— | 14<br>8.0<br>—   | —<br>—<br>— | —<br>—<br>— | 14<br>—<br>10.8   | —<br>—<br>— | dB   |
| Noise Figure — Minimum (Figure 9)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 1.0 GHz)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 2.0 GHz)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 1.5 GHz)        | N <sub>F MIN</sub>             | —<br>—<br>— | 1.3<br>2.1<br>—  | —<br>—<br>— | —<br>—<br>— | 1.5<br>—<br>2.0   | —<br>—<br>— | dB   |
| Associated Gain at Minimum NF (Figure 9)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 1.0 GHz)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 2.0 GHz)<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 1.5 GHz) | G <sub>NF</sub>                | —<br>—<br>— | 13<br>7.5<br>—   | —<br>—<br>— | —<br>—<br>— | 11.8<br>—<br>9.0  | —<br>—<br>— | dB   |
| Noise Figure — 50 ohm Source<br>(V <sub>CE</sub> = 6.0 V, I <sub>C</sub> = 5.0 mA, f = 1.0 GHz)                                                                                                                                                   | N <sub>F50 Ω</sub>             | —           | 1.9              | 2.8         | —           | 1.9               | 2.8         | dB   |

NOTE:

$$1. \text{ Maximum Unilateral Gain is } G_{U \max} = \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)}$$

# Freescale Semiconductor, Inc.

## TYPICAL CHARACTERISTICS

### MMBR951LT1

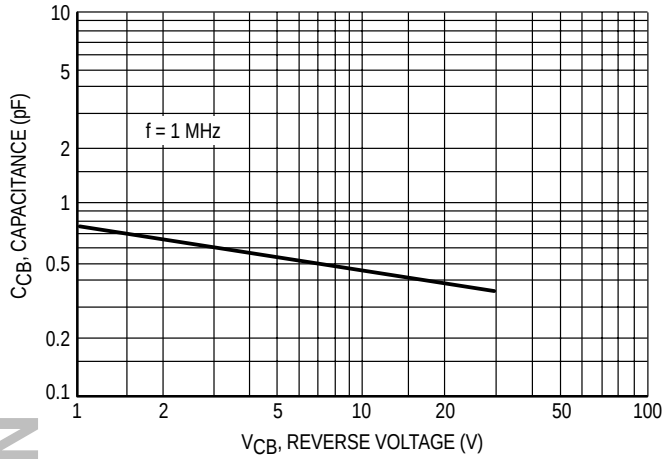


Figure 1. Collector-Base Capacitance versus Voltage

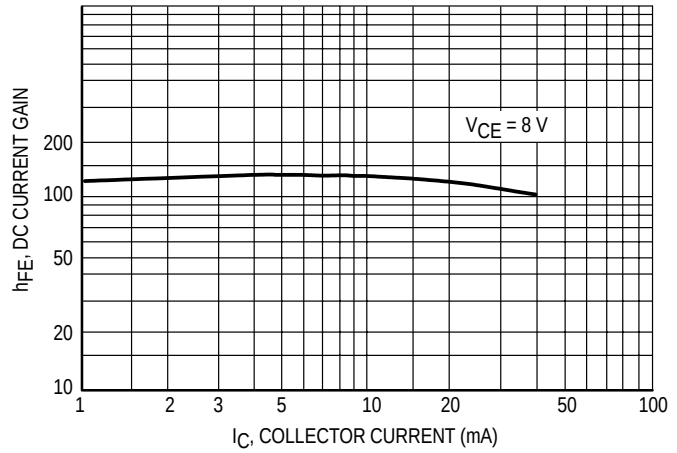


Figure 2. DC Current Gain versus Collector Current

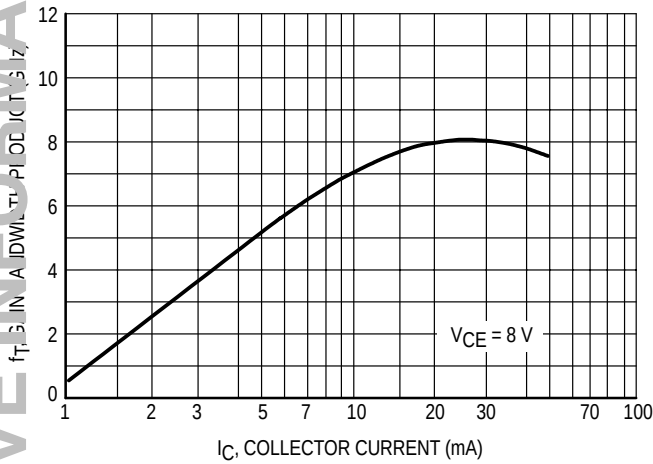


Figure 3. Gain Bandwidth Product versus Collector Current

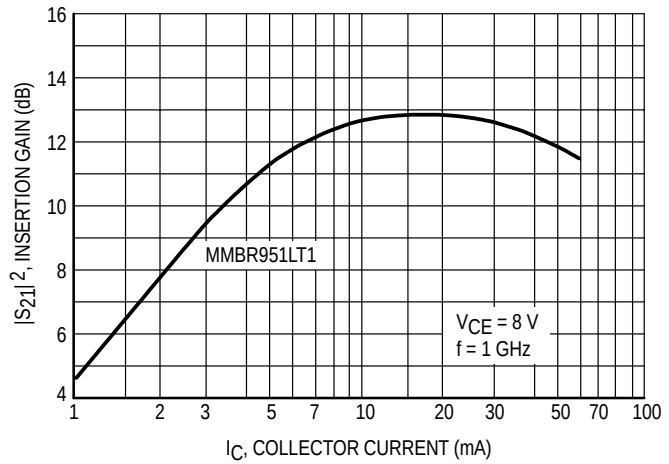


Figure 4. Insertion Gain versus Collector Current

# Freescale Semiconductor, Inc.

## TYPICAL FORWARD INSERTION GAIN AND MAXIMUM UNILATERAL GAIN versus FREQUENCY

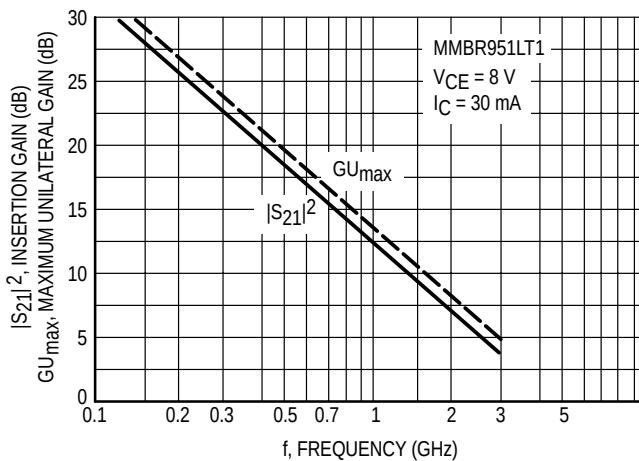


Figure 6. MMBR951LT1

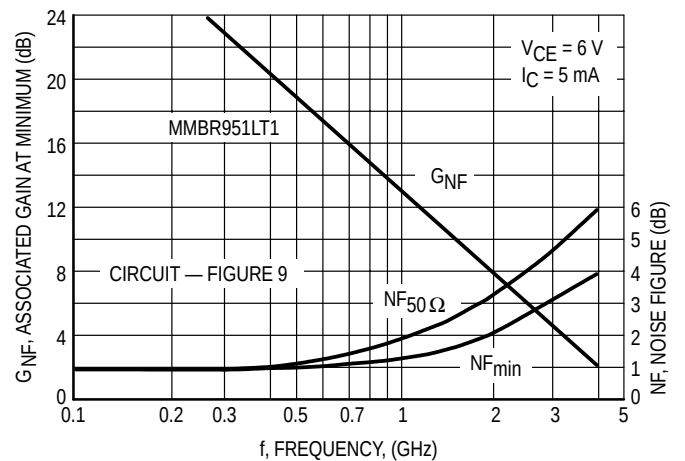


Figure 5. Typical Noise Figure and Associated Gain versus Frequency

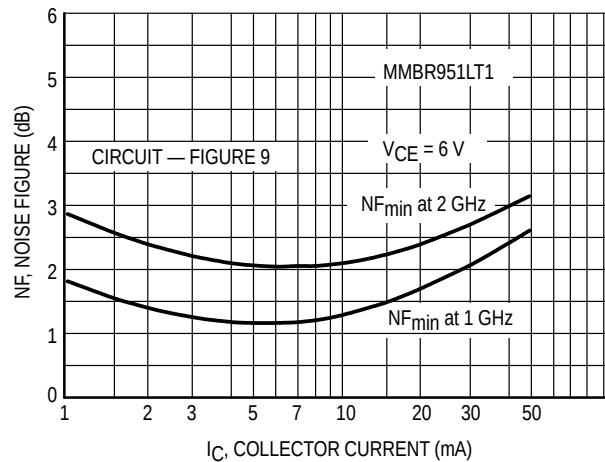


Figure 7. Typical Noise Figure versus Collector Current

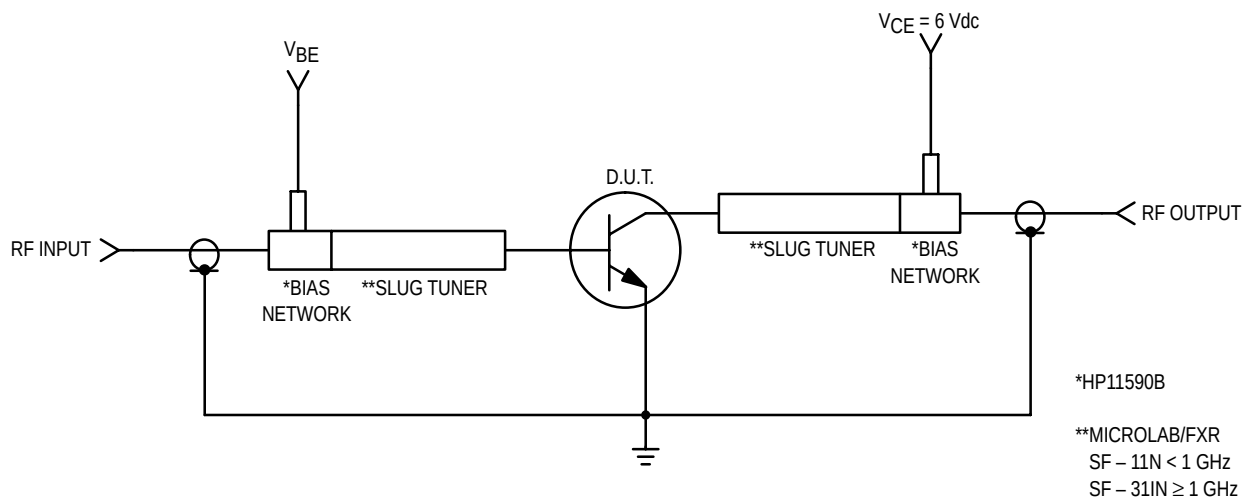
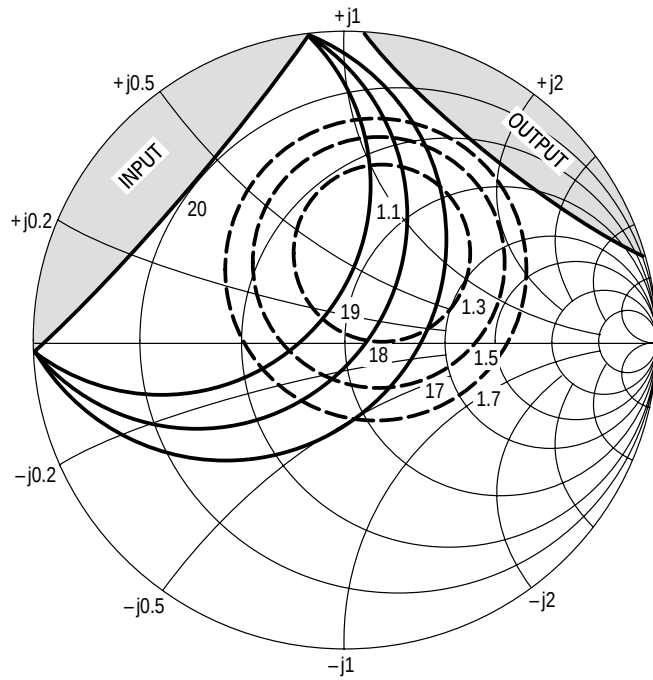


Figure 8. Functional Circuit Schematic (All Devices)

# Freescale Semiconductor, Inc.

| V <sub>CE</sub><br>(Volts) | I <sub>C</sub><br>(mA) | f<br>(MHz) | 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    |
| 6.0                        | 5.0                    | 100        | 0.82            | −36.6 | 14.0            | 153  | 0.04            | 44.7 | 0.88            | −18.2 |
|                            |                        | 500        | 0.50            | −119  | 6.6             | 104  | 0.07            | 48.2 | 0.52            | −40   |
|                            |                        | 1000       | 0.39            | −162  | 3.5             | 81   | 0.11            | 55   | 0.43            | −43   |
|                            |                        | 2000       | 0.32            | 150   | 1.9             | 57   | 0.21            | 66   | 0.42            | −50   |
|                            |                        | 3000       | 0.36            | 110   | 1.4             | 40   | 0.31            | 66   | 0.40            | −67   |
|                            | 10                     | 100        | 0.66            | −54   | 22.6            | 142  | 0.03            | 60   | 0.78            | −29   |
|                            |                        | 500        | 0.38            | −138  | 7.8             | 96   | 0.07            | 55   | 0.40            | −42   |
|                            |                        | 1000       | 0.32            | −176  | 4.0             | 78   | 0.13            | 71   | 0.34            | −47   |
|                            |                        | 2000       | 0.26            | 142   | 2.2             | 57   | 0.22            | 70   | 0.36            | −46   |
|                            |                        | 3000       | 0.31            | 105   | 1.6             | 41   | 0.32            | 64   | 0.33            | −62   |
|                            | 20                     | 100        | 0.49            | −76   | 30              | 131  | 0.01            | 85   | 0.67            | −37   |
|                            |                        | 500        | 0.32            | −153  | 8.3             | 92   | 0.08            | 76   | 0.34            | −39   |
|                            |                        | 1000       | 0.29            | 175   | 4.3             | 77   | 0.11            | 67   | 0.29            | −44   |
|                            |                        | 2000       | 0.24            | 137   | 2.3             | 57   | 0.24            | 71   | 0.32            | −48   |
|                            |                        | 3000       | 0.28            | 102   | 1.6             | 42   | 0.34            | 63   | 0.29            | −60   |
|                            | 30                     | 100        | 0.40            | −94   | 33              | 125  | 0.03            | 87   | 0.58            | −42   |
|                            |                        | 500        | 0.30            | −162  | 8.4             | 90   | 0.07            | 84   | 0.31            | −35   |
|                            |                        | 1000       | 0.29            | 170   | 4.3             | 76   | 0.12            | 80   | 0.27            | −39   |
|                            |                        | 2000       | 0.24            | 134   | 2.3             | 56   | 0.23            | 71   | 0.33            | −48   |
|                            |                        | 3000       | 0.30            | 101   | 1.6             | 41   | 0.35            | 66   | 0.30            | −60   |
|                            | 60                     | 100        | 0.38            | −126  | 31              | 116  | 0.03            | 74   | 0.49            | −37   |
|                            |                        | 500        | 0.37            | −176  | 7.3             | 77.6 | 0.05            | 84   | 0.34            | −26   |
|                            |                        | 1000       | 0.36            | 163   | 3.7             | 73.4 | 0.12            | 84   | 0.34            | −37   |
|                            |                        | 2000       | 0.33            | 130   | 2.0             | 52   | 0.22            | 78   | 0.37            | −48   |
|                            |                        | 3000       | 0.38            | 98    | 1.4             | 37   | 0.34            | 69   | 0.34            | −62   |
| 8.0                        | 5.0                    | 100        | 0.83            | −35   | 13.9            | 154  | 0.04            | 92   | 0.90            | −19   |
|                            |                        | 500        | 0.51            | −117  | 6.7             | 104  | 0.08            | 51   | 0.55            | −38   |
|                            |                        | 1000       | 0.38            | −160  | 3.6             | 82   | 0.10            | 72   | 0.44            | −42   |
|                            |                        | 2000       | 0.31            | 151   | 1.9             | 58   | 0.20            | 73   | 0.46            | −47   |
|                            |                        | 3000       | 0.35            | 110   | 1.4             | 41   | 0.32            | 71   | 0.43            | −63   |
|                            | 10                     | 100        | 0.67            | −52   | 23              | 143  | 0.02            | 96   | 0.81            | −28   |
|                            |                        | 500        | 0.37            | −135  | 7.9             | 97   | 0.07            | 64   | 0.43            | −38   |
|                            |                        | 1000       | 0.30            | −173  | 4.1             | 80   | 0.11            | 78   | 0.37            | −41   |
|                            |                        | 2000       | 0.25            | 143   | 2.2             | 57   | 0.21            | 74   | 0.38            | −47   |
|                            |                        | 3000       | 0.30            | 105   | 1.6             | 42   | 0.31            | 67   | 0.34            | −60   |
|                            | 20                     | 100        | 0.51            | −72   | 30              | 131  | 0.02            | 68   | 0.68            | −35   |
|                            |                        | 500        | 0.31            | −150  | 8.5             | 92   | 0.07            | 75   | 0.36            | −36   |
|                            |                        | 1000       | 0.28            | 177   | 4.3             | 77   | 0.13            | 76   | 0.32            | −39   |
|                            |                        | 2000       | 0.23            | 138   | 2.3             | 57   | 0.22            | 72   | 0.35            | −45   |
|                            |                        | 3000       | 0.27            | 103   | 1.6             | 42   | 0.31            | 64   | 0.31            | −58   |
|                            | 30                     | 100        | 0.42            | −87   | 33              | 125  | 0.02            | 71   | 0.61            | −38   |
|                            |                        | 500        | 0.31            | −159  | 8.6             | 90   | 0.07            | 71   | 0.33            | −33   |
|                            |                        | 1000       | 0.27            | 172   | 4.4             | 76   | 0.11            | 74   | 0.32            | −39   |
|                            |                        | 2000       | 0.23            | 135   | 2.3             | 57   | 0.22            | 73   | 0.34            | −42   |
|                            |                        | 3000       | 0.28            | 102   | 1.6             | 41   | 0.31            | 65   | 0.33            | −55   |
|                            | 60                     | 100        | 0.39            | −119  | 32              | 117  | 0.02            | 31   | 0.52            | −31   |
|                            |                        | 500        | 0.36            | −174  | 7.4             | 87   | 0.06            | 84   | 0.37            | −25   |
|                            |                        | 1000       | 0.35            | 164   | 3.8             | 74   | 0.11            | 78   | 0.35            | −33   |
|                            |                        | 2000       | 0.32            | 131   | 2.0             | 53   | 0.22            | 81   | 0.42            | −41   |
|                            |                        | 3000       | 0.37            | 100   | 1.4             | 38   | 0.33            | 70   | 0.40            | −62   |

Table 1. MMBR951LT1 Common Emitter S-Parameters



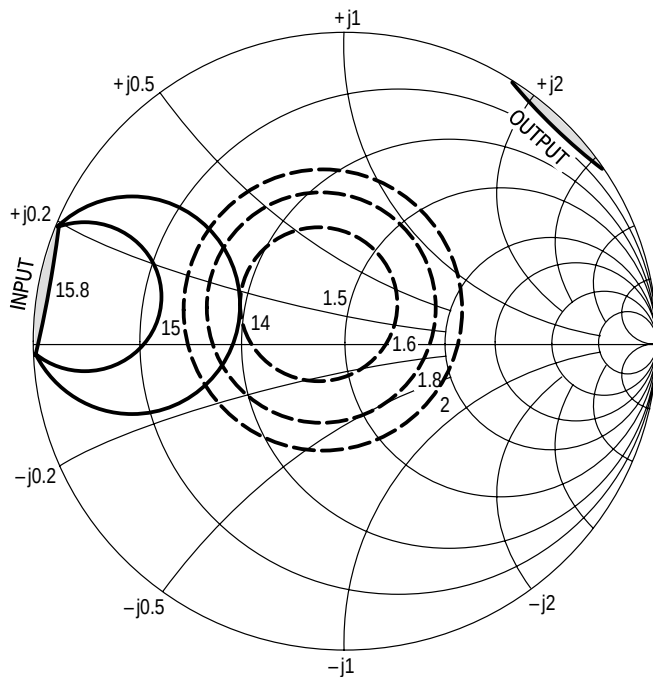
$V_{CE} = 6.0 \text{ V}$

$I_C = 5.0 \text{ mA}$

— AREA OF INSTABILITY

| f (GHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT   | Rn | K    |
|---------|-------------|------------------------|----|------|
| 0.5     | 1.13        | $0.35 \angle 68^\circ$ | 9  | 0.68 |

Figure 9. MMBR951LT1 Constant Gain and Noise Figure Contours  
(f = 0.5 GHz)



$V_{CE} = 6.0 \text{ V}$

$I_C = 5.0 \text{ mA}$

— AREA OF INSTABILITY

| f (GHz) | NF OPT (dB) | $\Gamma_{MS}$ NF OPT    | Rn | K    |
|---------|-------------|-------------------------|----|------|
| 1.0     | 1.45        | $0.16 \angle 124^\circ$ | 8  | 0.97 |

Figure 10. MMBR951LT1 Constant Gain and Noise Figure Contours  
(f = 1.0 GHz)

## Freescale Semiconductor, Inc.

| $V_{CE}$<br>(Vdc) | $I_C$<br>(mA) | $f$<br>(MHz) | $NF_{min}$<br>(dB) | $\Gamma_o$<br>(MAG, ANG)             | $r_N$<br>(ohms) |
|-------------------|---------------|--------------|--------------------|--------------------------------------|-----------------|
| 6.0               | 5.0           | 1000<br>1500 | 1.7<br>2.0         | $0.27 \angle 97$<br>$0.21 \angle 54$ | 0.2<br>0.28     |

Table 2. MRF957T1 Typical Noise Parameters

### TYPICAL CHARACTERISTICS MRF957T1

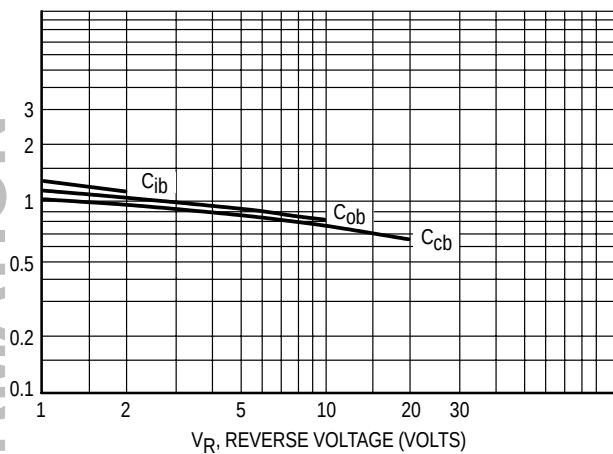


Figure 11. Capacitance versus Voltage

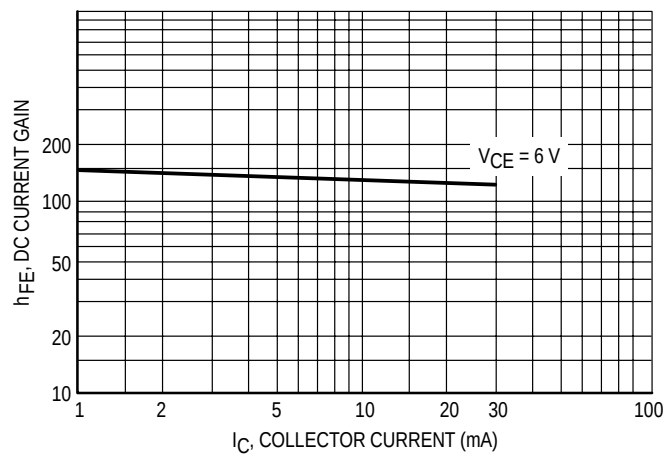


Figure 12. DC Current Gain versus Collector Current



# Freescale Semiconductor, Inc.

## TYPICAL CHARACTERISTICS

### MRF957T1

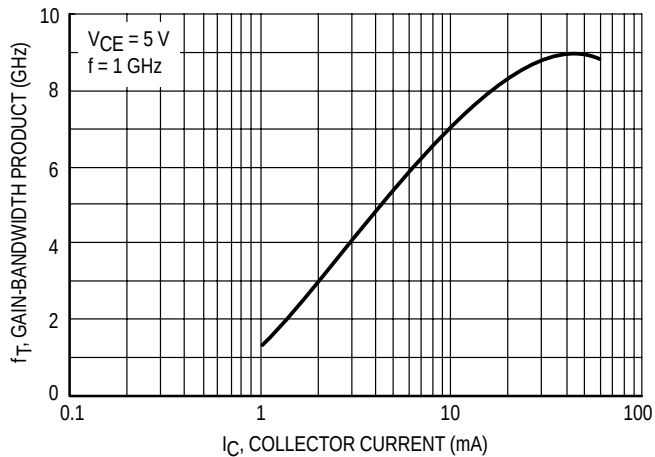


Figure 13. Gain-Bandwidth Product versus Collector Current

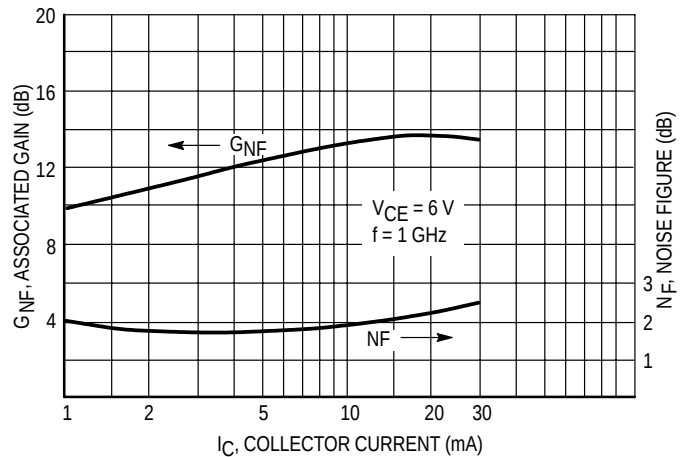


Figure 14. Associated Gain versus Collector Current

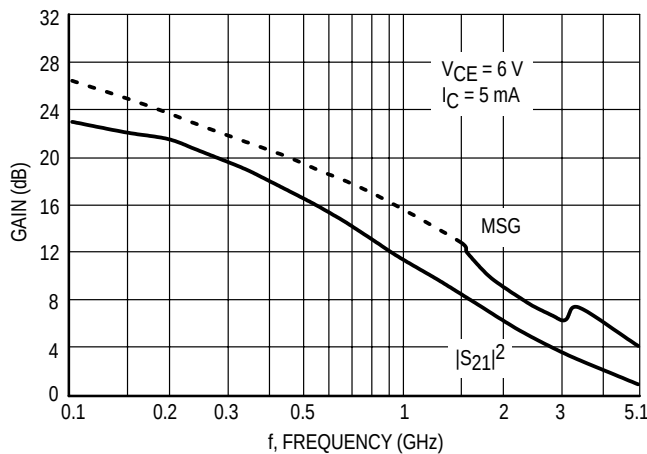


Figure 15. Insertion Gain and Maximum Stable Power Gain versus Frequency

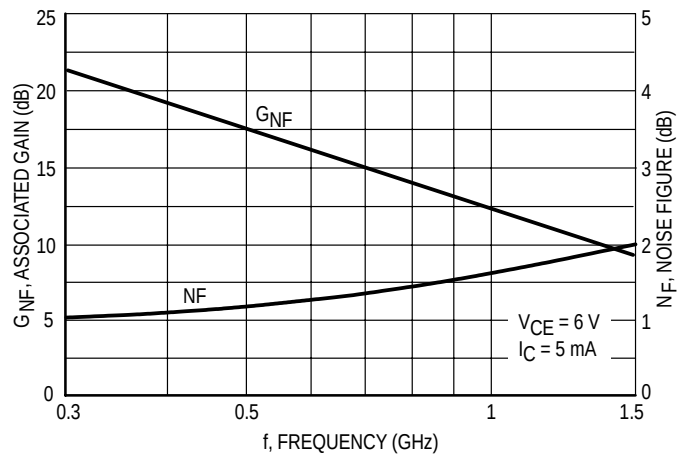


Figure 16. Noise Figure and Associated Gain versus Frequency

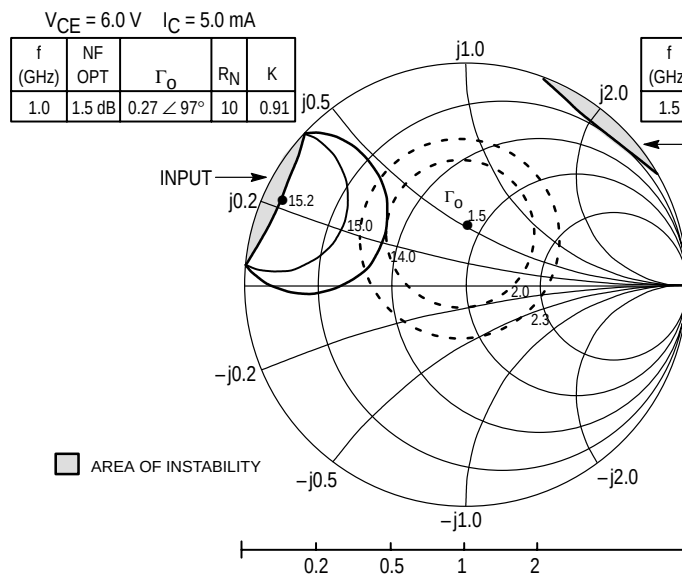


Figure 17. Constant Gain and Noise Figure Contours  $f = 1.0$  GHz

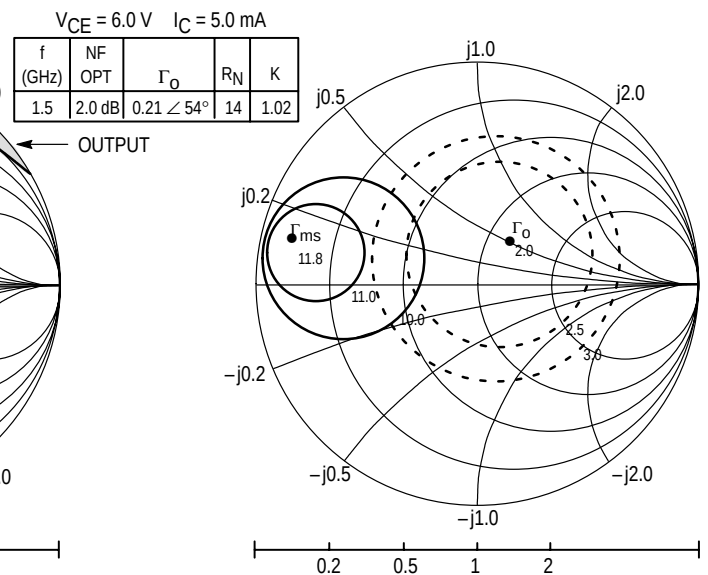


Figure 18. Constant Gain and Noise Figure Contours  $f = 1.5$  GHz

# Freescale Semiconductor, Inc.

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(MHz) | 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     |
| 2.0                      | 1.0                    | 100        | 0.959           | −19.22  | 3.518           | 166.25 | 0.044           | 78.43 | 0.986           | −8.12  |
|                          |                        | 200        | 0.922           | −38.32  | 3.482           | 153.75 | 0.079           | 69.06 | 0.948           | −15.98 |
|                          |                        | 500        | 0.825           | −81.94  | 2.614           | 122.98 | 0.146           | 44.99 | 0.803           | −30.02 |
|                          |                        | 1000       | 0.690           | −125.83 | 1.737           | 93.40  | 0.167           | 30.15 | 0.662           | −41.41 |
|                          |                        | 2000       | 0.600           | −174.02 | 1.079           | 63.65  | 0.131           | 44.93 | 0.576           | −51.42 |
|                          |                        | 3000       | 0.640           | 147.15  | 0.791           | 50.62  | 0.196           | 80.39 | 0.517           | −64.42 |
|                          | 2.0                    | 100        | 0.922           | −24.97  | 6.598           | 162.54 | 0.042           | 75.55 | 0.967           | −12.35 |
|                          |                        | 200        | 0.862           | −48.55  | 6.177           | 147.47 | 0.075           | 64.60 | 0.893           | −23.28 |
|                          |                        | 500        | 0.713           | −96.45  | 4.140           | 116.09 | 0.123           | 43.92 | 0.671           | −38.55 |
|                          |                        | 1000       | 0.586           | −137.24 | 2.483           | 90.37  | 0.140           | 38.71 | 0.524           | −46.93 |
|                          |                        | 2000       | 0.506           | 179.54  | 1.462           | 64.47  | 0.158           | 57.00 | 0.456           | −51.97 |
|                          |                        | 3000       | 0.546           | 144.80  | 1.079           | 49.98  | 0.232           | 74.13 | 0.416           | −61.22 |
|                          | 5.0                    | 100        | 0.815           | −39.45  | 14.163          | 153.09 | 0.038           | 70.19 | 0.895           | −22.63 |
|                          |                        | 200        | 0.708           | −71.89  | 11.635          | 133.50 | 0.061           | 58.57 | 0.739           | −38.46 |
|                          |                        | 500        | 0.541           | −121.43 | 6.284           | 104.78 | 0.090           | 49.12 | 0.454           | −52.31 |
|                          |                        | 1000       | 0.461           | −155.05 | 3.428           | 85.44  | 0.123           | 54.90 | 0.337           | −56.38 |
|                          |                        | 2000       | 0.406           | 169.75  | 1.921           | 65.04  | 0.198           | 65.80 | 0.304           | −54.16 |
|                          |                        | 3000       | 0.438           | 139.42  | 1.424           | 51.41  | 0.282           | 69.61 | 0.276           | −57.77 |
|                          | 10                     | 100        | 0.667           | −57.75  | 22.121          | 142.36 | 0.032           | 64.38 | 0.788           | −34.26 |
|                          |                        | 200        | 0.559           | −95.89  | 15.709          | 121.54 | 0.048           | 57.27 | 0.574           | −52.06 |
|                          |                        | 500        | 0.447           | −140.52 | 7.417           | 98.06  | 0.075           | 58.00 | 0.317           | −63.32 |
|                          |                        | 1000       | 0.405           | −166.70 | 3.921           | 82.59  | 0.123           | 66.07 | 0.235           | −65.49 |
|                          |                        | 2000       | 0.360           | 162.90  | 2.155           | 65.25  | 0.222           | 69.45 | 0.220           | −57.93 |
|                          |                        | 3000       | 0.390           | 134.95  | 1.597           | 52.60  | 0.311           | 68.14 | 0.196           | −57.79 |
|                          | 30                     | 100        | 0.435           | −99.80  | 31.662          | 125.82 | 0.023           | 62.49 | 0.570           | −51.69 |
|                          |                        | 200        | 0.421           | −135.04 | 18.696          | 108.07 | 0.034           | 64.74 | 0.360           | −68.74 |
|                          |                        | 500        | 0.398           | −162.97 | 8.025           | 91.81  | 0.069           | 71.43 | 0.192           | −75.85 |
|                          |                        | 1000       | 0.382           | −179.33 | 4.163           | 79.67  | 0.127           | 74.17 | 0.151           | −77.73 |
|                          |                        | 2000       | 0.347           | 155.68  | 2.269           | 64.55  | 0.240           | 72.04 | 0.155           | −63.30 |
|                          |                        | 3000       | 0.379           | 130.21  | 1.686           | 52.60  | 0.336           | 67.80 | 0.132           | −60.40 |
|                          | 60                     | 100        | 0.442           | −131.87 | 26.755          | 118.52 | 0.021           | 62.60 | 0.422           | −56.23 |
|                          |                        | 200        | 0.483           | −155.78 | 15.086          | 103.17 | 0.032           | 66.87 | 0.261           | −70.51 |
|                          |                        | 500        | 0.484           | −173.89 | 6.390           | 88.79  | 0.067           | 74.30 | 0.154           | −73.64 |
|                          |                        | 1000       | 0.472           | 172.69  | 3.317           | 76.81  | 0.127           | 76.73 | 0.140           | −74.96 |
|                          |                        | 2000       | 0.452           | 149.80  | 1.834           | 60.68  | 0.243           | 72.97 | 0.155           | −66.57 |
|                          |                        | 3000       | 0.496           | 126.23  | 1.393           | 48.59  | 0.345           | 68.81 | 0.131           | −71.10 |

(continued)

Table 3. MRF957T1 Typical Common Emitter S-Parameters

# Freescale Semiconductor, Inc.

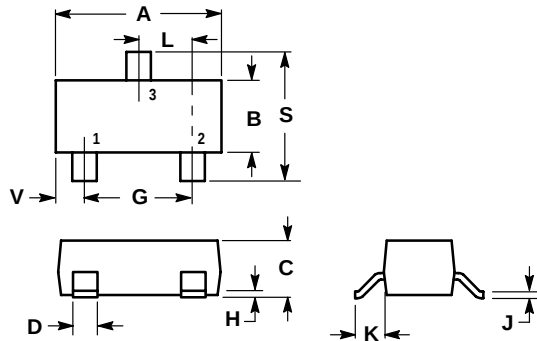
## MRF957T1

| V <sub>CE</sub><br>(Vdc) | I <sub>C</sub><br>(mA) | f<br>(MHz) | 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     |
| 5.0                      | 1.0                    | 100        | 0.965           | −17.73  | 3.508           | 167.36 | 0.035           | 78.18 | 0.990           | −6.80  |
|                          |                        | 200        | 0.931           | −35.39  | 3.495           | 155.78 | 0.065           | 71.66 | 0.958           | −13.35 |
|                          |                        | 500        | 0.835           | −77.08  | 2.680           | 126.50 | 0.122           | 48.12 | 0.839           | −25.23 |
|                          |                        | 1000       | 0.694           | −120.78 | 1.820           | 97.22  | 0.143           | 33.67 | 0.713           | −35.51 |
|                          |                        | 2000       | 0.583           | −170.80 | 1.133           | 67.35  | 0.115           | 50.88 | 0.629           | −44.48 |
|                          |                        | 3000       | 0.615           | 148.45  | 0.813           | 53.19  | 0.182           | 85.71 | 0.565           | −55.47 |
|                          | 2.0                    | 100        | 0.932           | −22.38  | 6.532           | 164.05 | 0.034           | 77.81 | 0.975           | −9.92  |
|                          |                        | 200        | 0.875           | −44.00  | 6.217           | 150.00 | 0.061           | 67.15 | 0.914           | −18.98 |
|                          |                        | 500        | 0.726           | −89.77  | 4.314           | 119.58 | 0.106           | 47.42 | 0.724           | −31.79 |
|                          |                        | 1000       | 0.582           | −131.10 | 2.638           | 93.76  | 0.122           | 41.23 | 0.586           | −39.20 |
|                          |                        | 2000       | 0.483           | −176.30 | 1.544           | 67.35  | 0.140           | 60.85 | 0.521           | −43.55 |
|                          |                        | 3000       | 0.515           | 146.92  | 1.117           | 52.27  | 0.208           | 78.88 | 0.479           | −51.26 |
|                          | 5.0                    | 100        | 0.836           | −34.35  | 14.112          | 155.49 | 0.031           | 71.72 | 0.920           | −18.06 |
|                          |                        | 200        | 0.731           | −63.59  | 11.971          | 137.05 | 0.052           | 61.40 | 0.785           | −31.06 |
|                          |                        | 500        | 0.539           | −112.00 | 6.737           | 107.93 | 0.080           | 51.32 | 0.522           | −41.63 |
|                          |                        | 1000       | 0.438           | −147.18 | 3.710           | 88.06  | 0.110           | 57.59 | 0.408           | −43.94 |
|                          |                        | 2000       | 0.364           | 175.10  | 2.050           | 67.58  | 0.175           | 68.31 | 0.383           | −42.49 |
|                          |                        | 3000       | 0.392           | 142.26  | 1.501           | 53.59  | 0.251           | 73.36 | 0.357           | −45.46 |
|                          | 10                     | 100        | 0.704           | −49.02  | 22.526          | 145.79 | 0.027           | 67.46 | 0.831           | −27.03 |
|                          |                        | 200        | 0.577           | −83.93  | 16.647          | 125.23 | 0.042           | 59.78 | 0.634           | −41.45 |
|                          |                        | 500        | 0.421           | −129.59 | 8.120           | 100.71 | 0.069           | 60.52 | 0.385           | −47.31 |
|                          |                        | 1000       | 0.361           | −158.62 | 4.290           | 84.82  | 0.109           | 67.54 | 0.305           | −46.57 |
|                          |                        | 2000       | 0.307           | 168.57  | 2.330           | 67.52  | 0.196           | 71.46 | 0.305           | −42.00 |
|                          |                        | 3000       | 0.332           | 137.50  | 1.706           | 54.85  | 0.277           | 71.05 | 0.288           | −42.21 |
|                          | 20                     | 100        | 0.559           | −66.34  | 30.018          | 136.00 | 0.023           | 64.88 | 0.720           | −35.45 |
|                          |                        | 200        | 0.453           | −103.91 | 19.598          | 116.12 | 0.036           | 61.80 | 0.501           | −48.64 |
|                          |                        | 500        | 0.358           | −143.87 | 8.835           | 96.19  | 0.064           | 68.23 | 0.298           | −49.15 |
|                          |                        | 1000       | 0.324           | −167.05 | 4.595           | 83.08  | 0.112           | 72.95 | 0.247           | −47.12 |
|                          |                        | 2000       | 0.278           | 163.88  | 2.462           | 67.27  | 0.208           | 72.96 | 0.263           | −41.09 |
|                          |                        | 3000       | 0.306           | 133.94  | 1.809           | 55.45  | 0.291           | 70.31 | 0.249           | −39.38 |
|                          | 30                     | 100        | 0.492           | −73.65  | 32.055          | 131.68 | 0.022           | 64.17 | 0.669           | −37.70 |
|                          |                        | 200        | 0.412           | −110.53 | 20.121          | 113.25 | 0.033           | 64.60 | 0.459           | −49.28 |
|                          |                        | 500        | 0.345           | −147.89 | 8.900           | 94.88  | 0.062           | 69.52 | 0.278           | −48.58 |
|                          |                        | 1000       | 0.319           | −169.39 | 4.646           | 82.13  | 0.113           | 74.20 | 0.234           | −46.64 |
|                          |                        | 2000       | 0.277           | 162.38  | 2.492           | 67.55  | 0.210           | 73.10 | 0.255           | −40.63 |
|                          |                        | 3000       | 0.305           | 133.57  | 1.821           | 55.24  | 0.295           | 70.42 | 0.239           | −38.73 |

Table 3. MRF957T1 Typical Common Emitter S-Parameters (continued)

# Freescale Semiconductor, Inc.

## PACKAGE DIMENSIONS

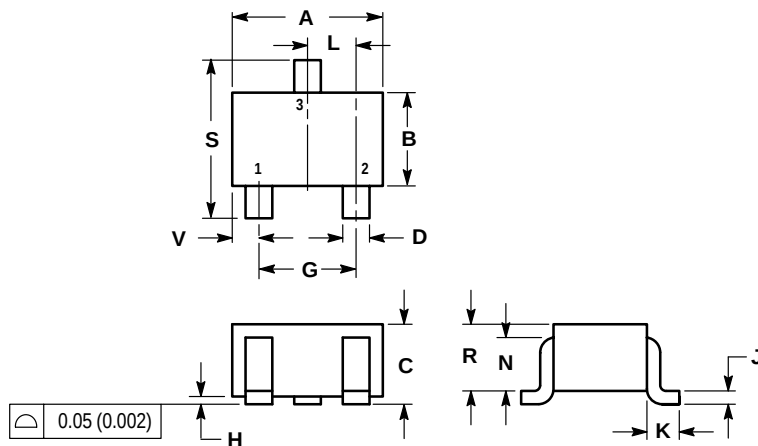


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | INCHES |        | MILLIMETERS |       |
|-----|--------|--------|-------------|-------|
|     | MIN    | MAX    | MIN         | MAX   |
| A   | 0.1102 | 0.1197 | 2.80        | 3.04  |
| B   | 0.0472 | 0.0551 | 1.20        | 1.40  |
| C   | 0.0350 | 0.0440 | 0.89        | 1.11  |
| D   | 0.0150 | 0.0200 | 0.37        | 0.50  |
| G   | 0.0701 | 0.0807 | 1.78        | 2.04  |
| H   | 0.0005 | 0.0040 | 0.013       | 0.100 |
| J   | 0.0034 | 0.0070 | 0.085       | 0.177 |
| K   | 0.0140 | 0.0285 | 0.35        | 0.69  |
| L   | 0.0350 | 0.0401 | 0.89        | 1.02  |
| S   | 0.0830 | 0.1039 | 2.10        | 2.64  |
| V   | 0.0177 | 0.0236 | 0.45        | 0.60  |

- STYLE 6:
- PIN 1. BASE
  - EMITTER
  - COLLECTOR

**CASE 318-08**  
**ISSUE AF**  
**MMBR951LT1, MMBR951ALT1**



- 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
  - EMITTER
  - COLLECTOR

**CASE 419-02**  
**ISSUE J**  
**MRF957T1**

Motorola reserves the right to make changes without further notice to any products herein. Motorola makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Motorola assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters which may be provided in Motorola data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. Motorola does not convey any license under its patent rights nor the rights of others. Motorola products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Motorola product could create a situation where personal injury or death may occur. Should Buyer purchase or use Motorola products for any such unintended or unauthorized application, Buyer shall indemnify and hold Motorola and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Motorola was negligent regarding the design or manufacture of the part. Motorola and  are registered trademarks of Motorola, Inc. Motorola, Inc. is an Equal Opportunity/Affirmative Action Employer.

Mfax is a trademark of Motorola, Inc.

#### How to reach us:

**USA/EUROPE/Locations Not Listed:** Motorola Literature Distribution;  
P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

**JAPAN:** Motorola Japan Ltd.; SPD, Strategic Planning Office, 141,  
4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan. 81-3-5487-8488

**Customer Focus Center: 1-800-521-6274**

**Mfax™:** RMFAX0@email.sps.mot.com – TOUCHTONE 1-602-244-6609  
Motorola Fax Back System – US & Canada ONLY 1-800-774-1848  
– <http://sps.motorola.com/mfax/>

**ASIA/PACIFIC:** Motorola Semiconductors H.K. Ltd.; 8B Tai Ping Industrial Park,  
51 Ting Kok Road, Tai Po, N.T., Hong Kong. 852-26629298

**HOME PAGE:** <http://motorola.com/sps/>



**MOTOROLA**



**For More Information On This Product,  
Go to: [www.freescale.com](http://www.freescale.com)**

MMBR951/D