

# Heterostructure Field Effect Transistor (GaAs HFET)

## Broadband High Linearity Amplifier

The MMH3111NT1 is a general purpose amplifier that is internally input and output prematched. It is designed for a broad range of Class A, small-signal, high linearity, general purpose applications. It is suitable for applications with frequencies from 250 to 4000 MHz such as cellular, PCS, WLL, PHS, CATV, VHF, UHF, UMTS and general small-signal RF.

### Features

- Frequency: 250 to 4000 MHz
- P1dB: 22.5 dBm @ 900 MHz
- Small-Signal Gain: 12 dB @ 900 MHz
- Third Order Output Intercept Point: 44 dBm @ 900 MHz
- Single 5 V Supply
- Internally Prematched to 50 Ohms
- Internally Biased
- Cost-effective SOT-89 Surface Mount Plastic Package
- In Tape and Reel. T1 Suffix = 1,000 Units, 12 mm Tape Width, 7-inch Reel.

**MMH3111NT1**

**250-4000 MHz, 12 dB  
22.5 dBm  
GaAs HFET GPA**



**SOT-89**

**Table 1. Typical Performance (1)**

| Characteristic                     | Symbol         | 900 MHz | 2140 MHz | 3500 MHz | Unit |
|------------------------------------|----------------|---------|----------|----------|------|
| Small-Signal Gain (S21)            | G <sub>p</sub> | 12      | 11.3     | 10       | dB   |
| Input Return Loss (S11)            | IRL            | -14     | -15      | -16      | dB   |
| Output Return Loss (S22)           | ORL            | -14     | -19      | -14      | dB   |
| Power Output @1dB Compression      | P1dB           | 22.5    | 22       | 22       | dBm  |
| Third Order Output Intercept Point | OIP3           | 44      | 44       | 42       | dBm  |

1. V<sub>DD</sub> = 5 Vdc, T<sub>A</sub> = 25°C, 50 ohm system, application circuit tuned for specified frequency.

**Table 2. Maximum Ratings**

| Rating                    | Symbol           | Value       | Unit |
|---------------------------|------------------|-------------|------|
| Supply Voltage            | V <sub>DD</sub>  | 6           | V    |
| Supply Current            | I <sub>DD</sub>  | 300         | mA   |
| RF Input Power            | P <sub>in</sub>  | 20          | dBm  |
| Storage Temperature Range | T <sub>stg</sub> | -65 to +150 | °C   |
| Junction Temperature      | T <sub>J</sub>   | 150         | °C   |

**Table 3. Thermal Characteristics**

| Characteristic                                                                              | Symbol           | Value (2) | Unit |
|---------------------------------------------------------------------------------------------|------------------|-----------|------|
| Thermal Resistance, Junction to Case<br>Case Temperature 95°C, 5 Vdc, 150 mA, no RF applied | R <sub>θJC</sub> | 37.5      | °C/W |

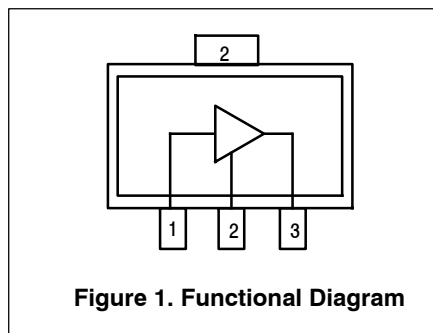
2. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.freescale.com/rf>. Select Documentation/Application Notes - AN1955.

**Table 4. Electrical Characteristics** ( $V_{DD} = 5 \text{ Vdc}$ , 900 MHz,  $T_A = 25^\circ\text{C}$ , 50 ohm system, in Freescale Application Circuit)

| Characteristic                     | Symbol   | Min | Typ  | Max | Unit |
|------------------------------------|----------|-----|------|-----|------|
| Small-Signal Gain (S21)            | $G_p$    | 11  | 12   | —   | dB   |
| Input Return Loss (S11)            | IRL      | —   | -14  | —   | dB   |
| Output Return Loss (S22)           | ORL      | —   | -14  | —   | dB   |
| Power Output @ 1dB Compression     | P1dB     | —   | 22.5 | —   | dBm  |
| Third Order Output Intercept Point | OIP3     | —   | 44   | —   | dBm  |
| Noise Figure                       | NF       | —   | 3.2  | —   | dB   |
| Supply Current                     | $I_{DD}$ | 120 | 150  | 190 | mA   |
| Supply Voltage                     | $V_{DD}$ | —   | 5    | —   | V    |

**Table 5. Functional Pin Description**

| Pin Number | Pin Function                 |
|------------|------------------------------|
| 1          | $RF_{in}$                    |
| 2          | Ground                       |
| 3          | $RF_{out}/DC \text{ Supply}$ |

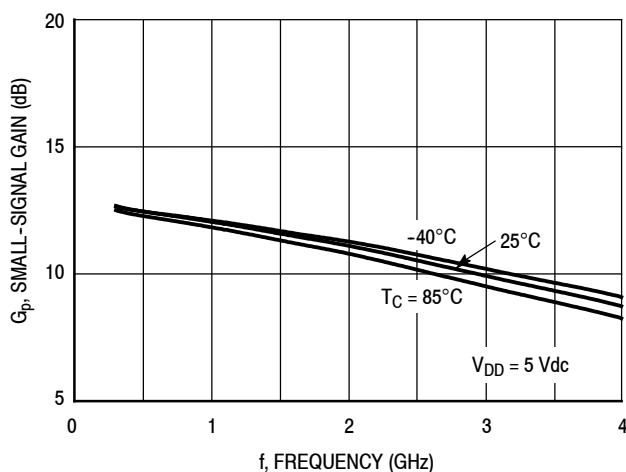

**Table 6. ESD Protection Characteristics**

| Test Methodology                       | Class |
|----------------------------------------|-------|
| Human Body Model (per JESD 22-A114)    | 1A    |
| Machine Model (per EIA/JESD 22-A115)   | A     |
| Charge Device Model (per JESD 22-C101) | IV    |

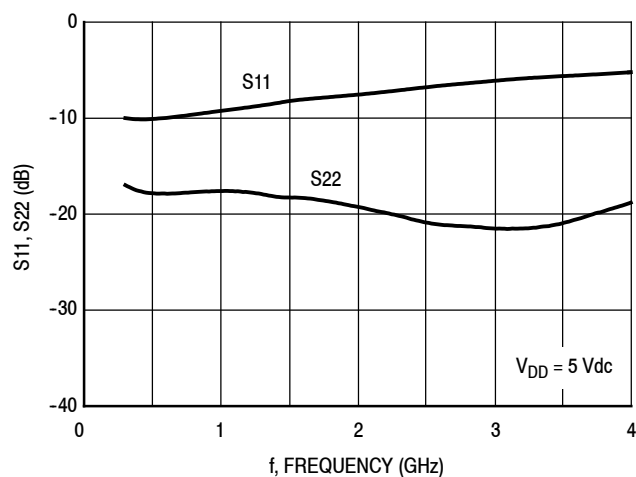
**Table 7. Moisture Sensitivity Level**

| Test Methodology                      | Rating | Package Peak Temperature | Unit             |
|---------------------------------------|--------|--------------------------|------------------|
| Per JESD 22-A113, IPC/JEDEC J-STD-020 | 1      | 260                      | $^\circ\text{C}$ |

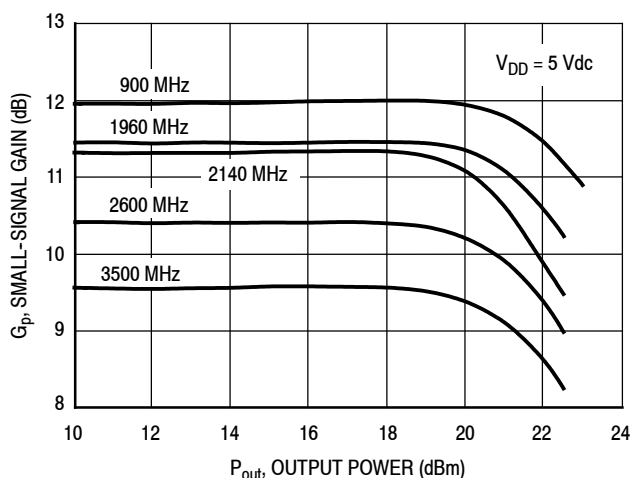
## 50 OHM TYPICAL CHARACTERISTICS



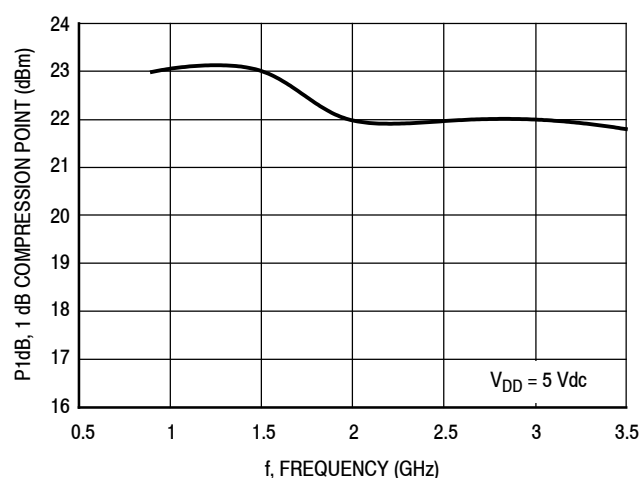
**Figure 2. Small-Signal Gain (S21) versus Frequency**



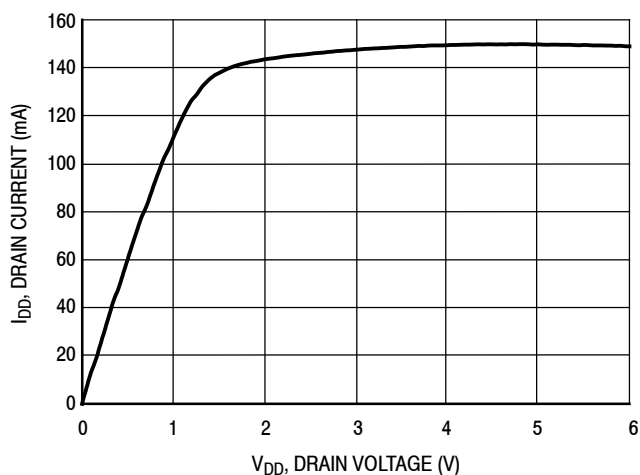
**Figure 3. Input/Output Loss versus Frequency**



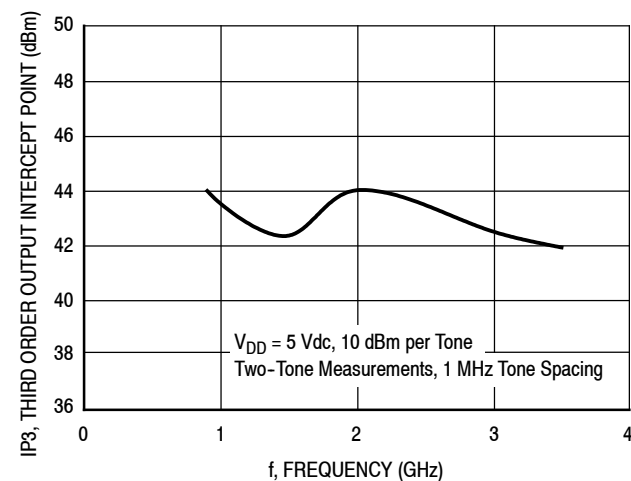
**Figure 4. Small-Signal Gain versus Output Power**



**Figure 5. P1dB versus Frequency**

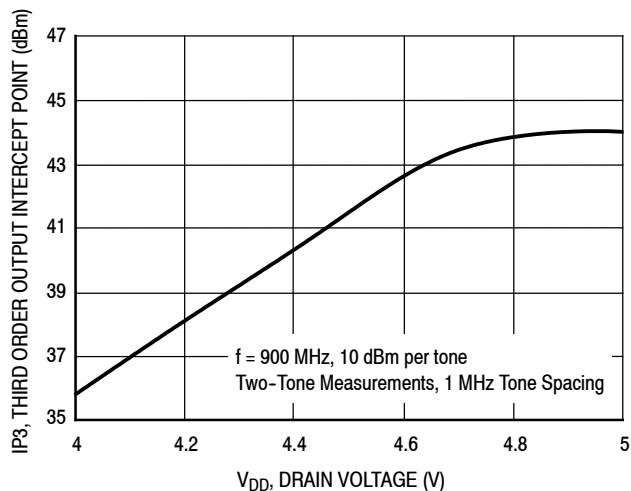


**Figure 6. Drain Current versus Drain Voltage**

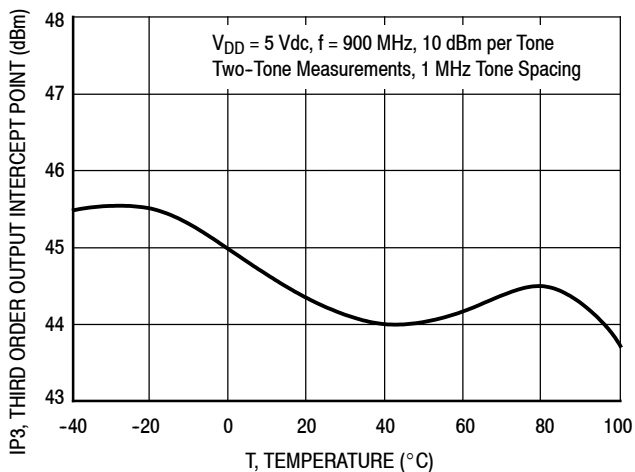


**Figure 7. Third Order Output Intercept Point versus Frequency**

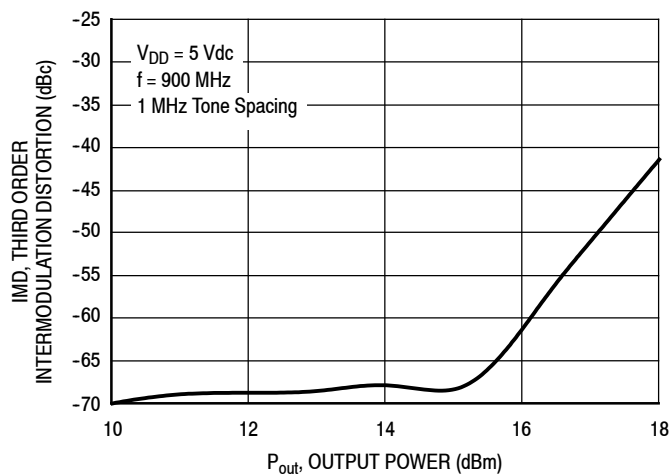
## 50 OHM TYPICAL CHARACTERISTICS



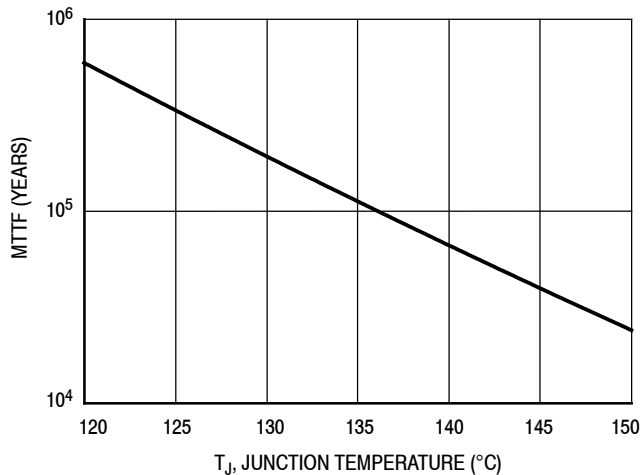
**Figure 8. Third Order Output Intercept Point versus Drain Voltage**



**Figure 9. Third Order Output Intercept Point versus Case Temperature**

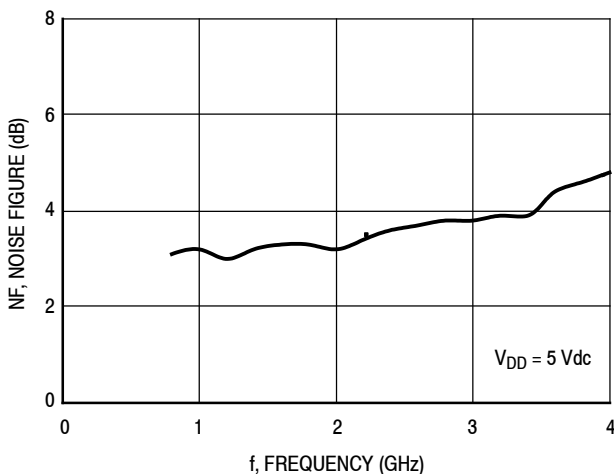


**Figure 10. Third Order Intermodulation versus Output Power**

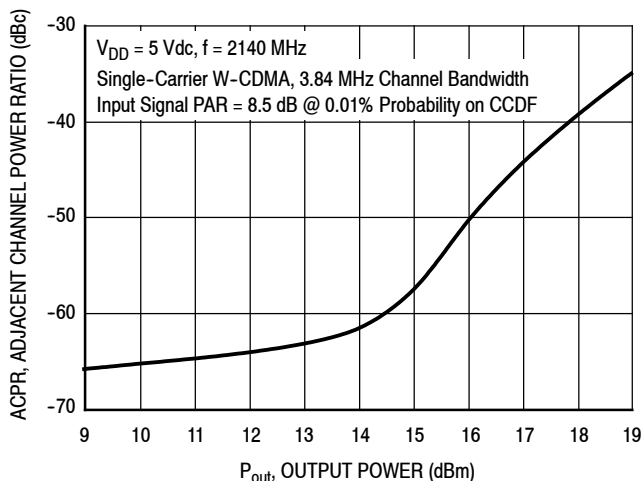


NOTE: The MTTF is calculated with  $V_{DD} = 5 \text{ Vdc}$ ,  $I_{DD} = 150 \text{ mA}$

**Figure 11. MTTF versus Junction Temperature**

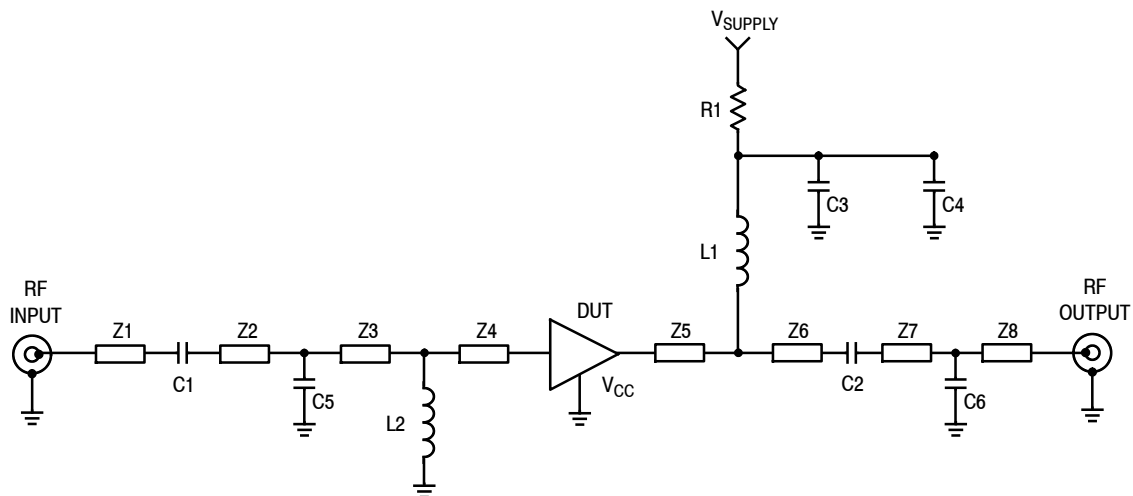


**Figure 12. Noise Figure versus Frequency**



**Figure 13. Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power**

## 50 OHM APPLICATION CIRCUIT: 800–1900 MHz



Z1 0.347" x 0.058" Microstrip  
 Z2 0.068" x 0.058" Microstrip  
 Z3 0.418" x 0.058" Microstrip  
 Z4 0.089" x 0.058" Microstrip  
 Z5 0.172" x 0.058" Microstrip

Z6 0.403" x 0.058" Microstrip  
 Z7 0.086" x 0.058" Microstrip  
 Z8 0.261" x 0.058" Microstrip  
 PCB Getek Grade ML200C, 0.031",  $\epsilon_r = 4.1$

Figure 14. 50 Ohm Test Circuit Schematic

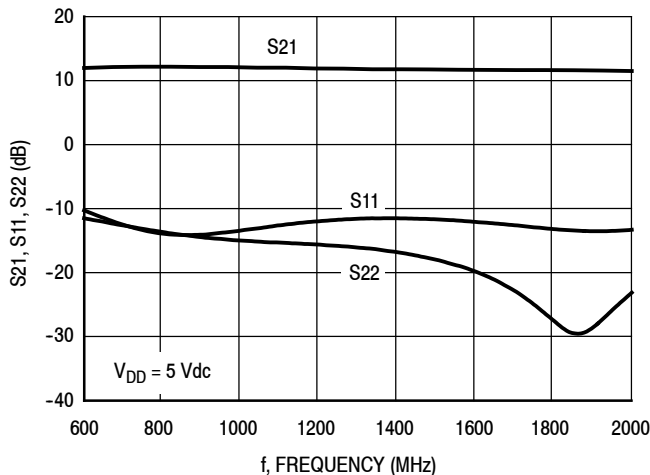


Figure 15. S21, S11 and S22 versus Frequency

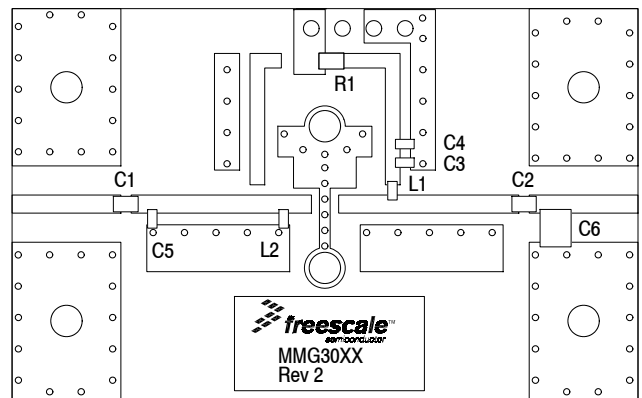


Figure 16. 50 Ohm Test Circuit Component Layout

Table 8. 50 Ohm Test Circuit Component Designations and Values

| Part   | Description                       | Part Number      | Manufacturer |
|--------|-----------------------------------|------------------|--------------|
| C1, C2 | 47 pF Chip Capacitors             | 06035J470BBS     | AVX          |
| C3     | 0.1 $\mu$ F Chip Capacitor        | C0603C104J5RAC   | Kemet        |
| C4     | 1 $\mu$ F Chip Capacitor          | C0603C105J5RAC   | Kemet        |
| C5     | 0.7 pF Chip Capacitor             | 06035J07BBS      | AVX          |
| C6     | 0.4 pF Chip Capacitor             | 12105J04BBS      | AVX          |
| L1     | 56 nH Chip Inductor               | HK160856NJ-T     | Taiyo Yuden  |
| L2     | 12 nH Chip Inductor               | HK160812NJ-T     | Taiyo Yuden  |
| R1     | 0 $\Omega$ , 1/10 W Chip Resistor | CRCW06030000FKEA | Vishay       |

## 50 OHM APPLICATION CIRCUIT: 1900-2200 MHz

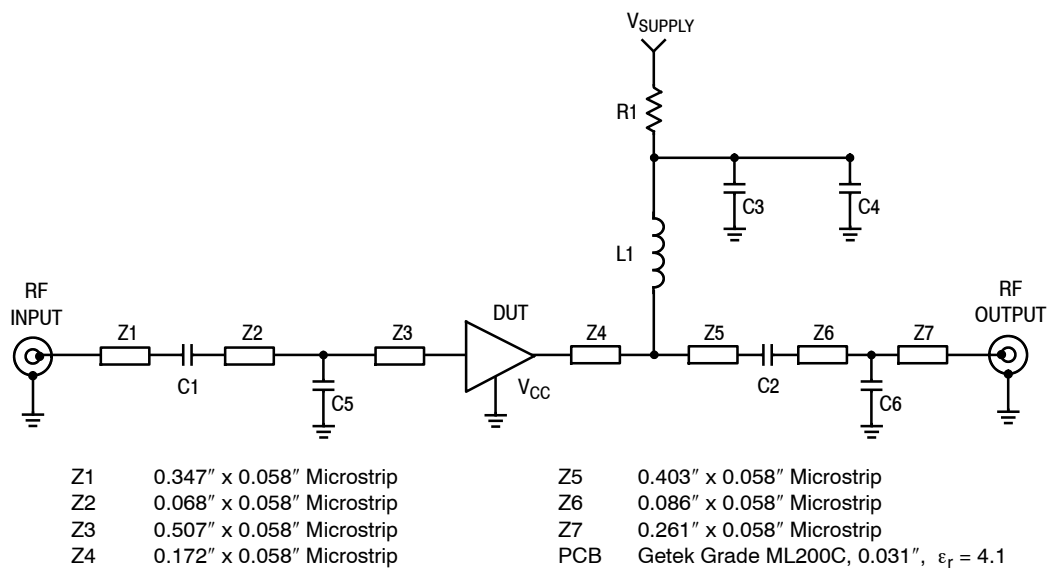


Figure 17. 50 Ohm Test Circuit Schematic

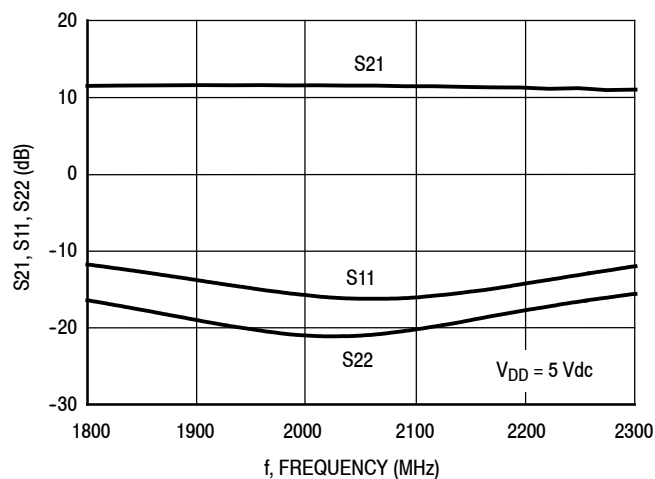


Figure 18. S21, S11 and S22 versus Frequency

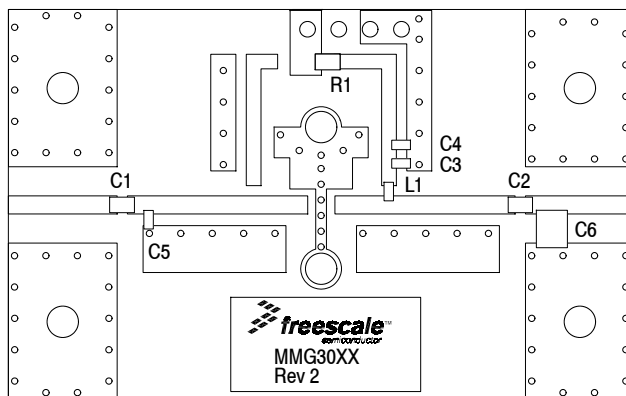


Figure 19. 50 Ohm Test Circuit Component Layout

Table 9. 50 Ohm Test Circuit Component Designations and Values

| Part   | Description                       | Part Number      | Manufacturer |
|--------|-----------------------------------|------------------|--------------|
| C1, C2 | 0.01 $\mu$ F Chip Capacitors      | 06035J470BBS     | AVX          |
| C3     | 0.1 $\mu$ F Chip Capacitor        | C0603C104J5RAC   | Kemet        |
| C4     | 1 $\mu$ F Chip Capacitor          | C0603C105J5RAC   | Kemet        |
| C5     | 0.7 pF Chip Capacitor             | 06035J0R7BBS     | AVX          |
| C6     | 0.4 pF Chip Capacitor             | 12105J0R4BBS     | AVX          |
| L1     | 56 nH Chip Inductor               | HK160856NJ-T     | Taiyo Yuden  |
| R1     | 0 $\Omega$ , 1/10 W Chip Resistor | CRCW06030000FKEA | Vishay       |

## 50 OHM APPLICATION CIRCUIT: 2500–3800 MHz

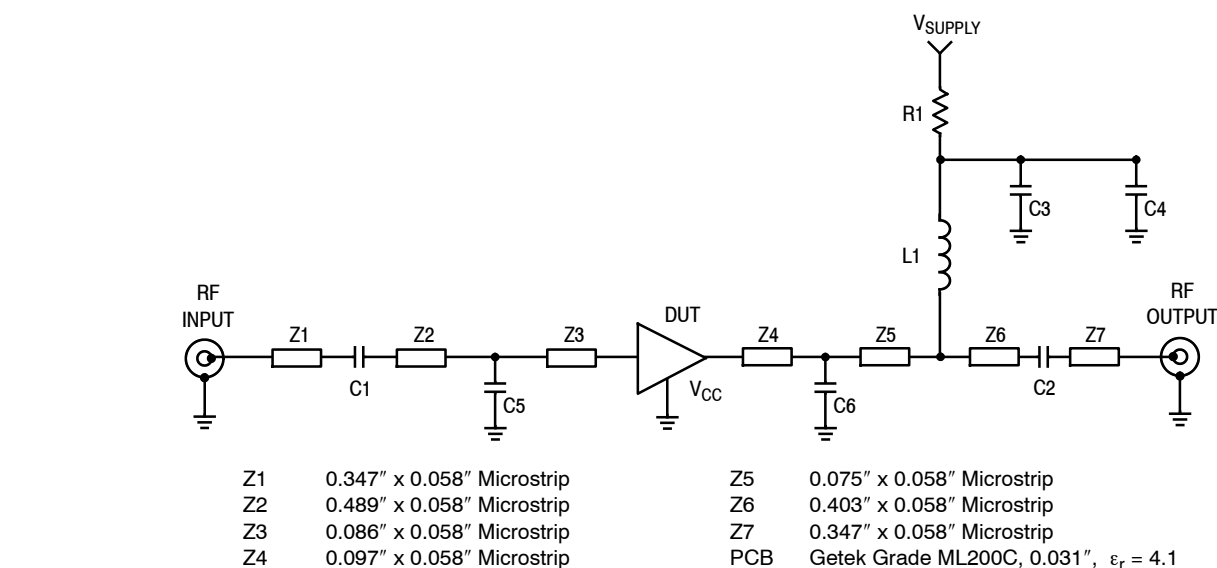


Figure 20. 50 Ohm Test Circuit Schematic

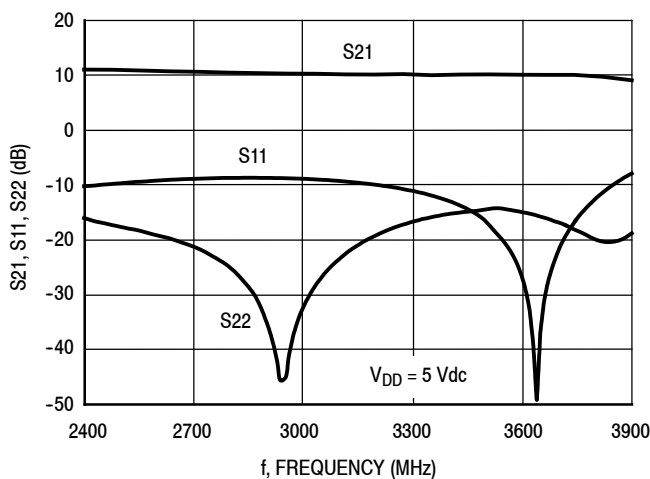


Figure 21. S21, S11 and S22 versus Frequency

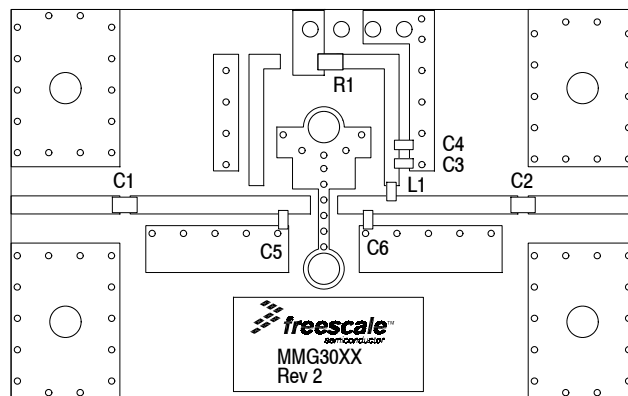


Figure 22. 50 Ohm Test Circuit Component Layout

Table 10. 50 Ohm Test Circuit Component Designations and Values

| Part   | Description                       | Part Number      | Manufacturer |
|--------|-----------------------------------|------------------|--------------|
| C1, C2 | 2 pF Chip Capacitors              | 06035J2R0BBS     | AVX          |
| C3     | 0.1 $\mu$ F Chip Capacitor        | C0603C104J5RAC   | Kemet        |
| C4     | 1 $\mu$ F Chip Capacitor          | C0603C105J5RAC   | Kemet        |
| C5     | 0.8 pF Chip Capacitor             | 06035J0R8BBS     | AVX          |
| C6     | 0.4 pF Chip Capacitor             | 06035J0R4BBS     | AVX          |
| L1     | 56 nH Chip Inductor               | HK160856NJ-T     | Taiyo Yuden  |
| R1     | 0 $\Omega$ , 1/10 W Chip Resistor | CRCW06030000FKEA | Vishay       |

## 50 OHM TYPICAL CHARACTERISTICS

**Table 11. Common Source S-Parameters** ( $V_{DD} = 5 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ , 50 Ohm System)

| f<br>MHz | S <sub>11</sub> |               | S <sub>21</sub> |               | S <sub>12</sub> |               | S <sub>22</sub> |               |
|----------|-----------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|
|          | S <sub>11</sub> | $\angle \phi$ | S <sub>21</sub> | $\angle \phi$ | S <sub>12</sub> | $\angle \phi$ | S <sub>22</sub> | $\angle \phi$ |
| 100      | 0.329           | -36.383       | 4.365           | 165.300       | 0.116           | 4.544         | 0.161           | -47.926       |
| 150      | 0.324           | -37.554       | 4.337           | 163.880       | 0.116           | 3.571         | 0.154           | -47.482       |
| 250      | 0.322           | -38.791       | 4.313           | 162.387       | 0.116           | 2.612         | 0.147           | -46.993       |
| 300      | 0.318           | -40.072       | 4.288           | 160.990       | 0.116           | 1.903         | 0.143           | -46.565       |
| 350      | 0.315           | -41.580       | 4.266           | 159.673       | 0.116           | 1.012         | 0.137           | -46.090       |
| 400      | 0.313           | -43.457       | 4.239           | 158.172       | 0.116           | 0.371         | 0.133           | -45.522       |
| 450      | 0.313           | -45.793       | 4.217           | 156.531       | 0.116           | -1.047        | 0.130           | -45.093       |
| 500      | 0.315           | -48.163       | 4.196           | 154.804       | 0.116           | -2.355        | 0.129           | -44.795       |
| 550      | 0.317           | -50.730       | 4.175           | 153.014       | 0.117           | -3.521        | 0.129           | -45.225       |
| 600      | 0.319           | -53.308       | 4.154           | 151.195       | 0.117           | -4.643        | 0.129           | -45.763       |
| 650      | 0.322           | -55.918       | 4.136           | 149.346       | 0.117           | -5.686        | 0.129           | -46.206       |
| 700      | 0.325           | -58.706       | 4.116           | 147.439       | 0.117           | -6.700        | 0.129           | -46.966       |
| 750      | 0.329           | -61.512       | 4.098           | 145.565       | 0.117           | -7.693        | 0.130           | -47.749       |
| 800      | 0.332           | -64.233       | 4.078           | 143.660       | 0.117           | -8.616        | 0.131           | -48.671       |
| 850      | 0.336           | -67.096       | 4.059           | 141.719       | 0.117           | -9.581        | 0.132           | -49.880       |
| 900      | 0.339           | -69.960       | 4.040           | 139.799       | 0.117           | -10.489       | 0.132           | -51.046       |
| 950      | 0.344           | -72.823       | 4.019           | 137.852       | 0.117           | -11.398       | 0.133           | -52.269       |
| 1000     | 0.347           | -75.724       | 4.001           | 135.896       | 0.117           | -12.312       | 0.133           | -53.492       |
| 1050     | 0.351           | -78.553       | 3.983           | 133.947       | 0.118           | -13.198       | 0.133           | -54.989       |
| 1100     | 0.355           | -81.424       | 3.964           | 131.996       | 0.118           | -14.093       | 0.132           | -56.508       |
| 1150     | 0.358           | -84.459       | 3.944           | 130.038       | 0.118           | -14.998       | 0.131           | -57.950       |
| 1200     | 0.362           | -87.372       | 3.924           | 128.069       | 0.118           | -15.903       | 0.131           | -59.716       |
| 1250     | 0.367           | -90.300       | 3.903           | 126.129       | 0.118           | -16.821       | 0.129           | -61.319       |
| 1300     | 0.371           | -93.201       | 3.883           | 124.163       | 0.118           | -17.713       | 0.128           | -63.068       |
| 1350     | 0.375           | -96.015       | 3.861           | 122.219       | 0.118           | -18.623       | 0.126           | -64.878       |
| 1400     | 0.380           | -98.765       | 3.837           | 120.287       | 0.118           | -19.497       | 0.124           | -66.432       |
| 1450     | 0.385           | -101.218      | 3.815           | 118.370       | 0.118           | -20.349       | 0.123           | -67.493       |
| 1500     | 0.391           | -103.291      | 3.793           | 116.530       | 0.118           | -21.202       | 0.123           | -68.218       |
| 1550     | 0.395           | -105.591      | 3.773           | 114.664       | 0.119           | -22.024       | 0.123           | -69.287       |
| 1600     | 0.398           | -108.116      | 3.752           | 112.769       | 0.119           | -22.896       | 0.122           | -70.746       |
| 1650     | 0.401           | -110.631      | 3.731           | 110.886       | 0.119           | -23.793       | 0.121           | -72.539       |
| 1700     | 0.404           | -113.324      | 3.710           | 108.972       | 0.119           | -24.719       | 0.120           | -74.765       |
| 1750     | 0.407           | -116.074      | 3.691           | 107.070       | 0.119           | -25.638       | 0.118           | -77.175       |
| 1800     | 0.410           | -118.856      | 3.672           | 105.143       | 0.119           | -26.594       | 0.117           | -79.613       |
| 1850     | 0.413           | -121.692      | 3.654           | 103.215       | 0.119           | -27.518       | 0.115           | -82.165       |
| 1900     | 0.416           | -124.469      | 3.633           | 101.291       | 0.119           | -28.483       | 0.113           | -84.722       |
| 1950     | 0.419           | -127.201      | 3.613           | 99.367        | 0.120           | -29.461       | 0.111           | -87.462       |
| 2000     | 0.422           | -130.044      | 3.592           | 97.431        | 0.120           | -30.414       | 0.110           | -90.359       |
| 2050     | 0.425           | -132.901      | 3.570           | 95.510        | 0.120           | -31.362       | 0.108           | -93.223       |
| 2100     | 0.428           | -135.666      | 3.547           | 93.588        | 0.120           | -32.353       | 0.106           | -96.005       |
| 2150     | 0.432           | -138.396      | 3.525           | 91.656        | 0.120           | -33.317       | 0.104           | -99.124       |
| 2160     | 0.433           | -138.893      | 3.519           | 91.287        | 0.120           | -33.518       | 0.104           | -99.644       |
| 2170     | 0.434           | -139.420      | 3.515           | 90.904        | 0.120           | -33.707       | 0.103           | -100.212      |
| 2180     | 0.434           | -139.934      | 3.509           | 90.532        | 0.120           | -33.908       | 0.103           | -100.854      |
| 2190     | 0.435           | -140.473      | 3.506           | 90.142        | 0.120           | -34.094       | 0.103           | -101.491      |

(continued)



## 50 OHM TYPICAL CHARACTERISTICS

**Table 11. Common Source S-Parameters** ( $V_{DD} = 5 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ , 50 Ohm System) (continued)

| f<br>MHz | S <sub>11</sub> |               | S <sub>21</sub> |               | S <sub>12</sub> |               | S <sub>22</sub> |               |
|----------|-----------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|
|          | S <sub>11</sub> | $\angle \phi$ | S <sub>21</sub> | $\angle \phi$ | S <sub>12</sub> | $\angle \phi$ | S <sub>22</sub> | $\angle \phi$ |
| 2200     | 0.436           | -141.015      | 3.502           | 89.764        | 0.120           | -34.293       | 0.102           | -102.102      |
| 2250     | 0.440           | -143.664      | 3.480           | 87.853        | 0.120           | -35.279       | 0.100           | -105.319      |
| 2300     | 0.444           | -146.130      | 3.456           | 85.964        | 0.120           | -36.278       | 0.099           | -108.673      |
| 2350     | 0.448           | -148.573      | 3.433           | 84.098        | 0.120           | -37.227       | 0.097           | -111.868      |
| 2400     | 0.452           | -150.891      | 3.408           | 82.262        | 0.120           | -38.193       | 0.094           | -115.093      |
| 2450     | 0.457           | -153.231      | 3.384           | 80.399        | 0.120           | -39.165       | 0.093           | -118.343      |
| 2500     | 0.461           | -155.588      | 3.360           | 78.562        | 0.120           | -40.131       | 0.091           | -121.666      |
| 2550     | 0.465           | -157.929      | 3.337           | 76.708        | 0.120           | -41.119       | 0.090           | -125.028      |
| 2600     | 0.469           | -160.182      | 3.312           | 74.886        | 0.120           | -42.109       | 0.089           | -128.277      |
| 2650     | 0.473           | -162.557      | 3.290           | 73.042        | 0.120           | -43.087       | 0.088           | -131.582      |
| 2700     | 0.476           | -164.863      | 3.268           | 71.221        | 0.120           | -44.100       | 0.088           | -134.657      |
| 2750     | 0.480           | -167.206      | 3.246           | 69.393        | 0.120           | -45.119       | 0.087           | -137.722      |
| 2800     | 0.483           | -169.520      | 3.223           | 67.572        | 0.120           | -46.143       | 0.087           | -140.631      |
| 2850     | 0.487           | -171.820      | 3.201           | 65.747        | 0.120           | -47.132       | 0.086           | -143.444      |
| 2900     | 0.490           | -173.992      | 3.180           | 63.945        | 0.120           | -48.134       | 0.086           | -146.347      |
| 2950     | 0.494           | -176.195      | 3.157           | 62.155        | 0.120           | -49.132       | 0.085           | -149.433      |
| 3000     | 0.498           | -178.278      | 3.136           | 60.357        | 0.120           | -50.131       | 0.085           | -152.745      |
| 3050     | 0.501           | 179.789       | 3.114           | 58.599        | 0.120           | -51.092       | 0.085           | -156.274      |
| 3100     | 0.505           | 177.950       | 3.092           | 56.836        | 0.120           | -52.074       | 0.084           | -160.030      |
| 3150     | 0.508           | 176.155       | 3.071           | 55.112        | 0.120           | -53.076       | 0.085           | -163.912      |
| 3200     | 0.511           | 174.401       | 3.051           | 53.377        | 0.120           | -54.062       | 0.085           | -167.662      |
| 3250     | 0.514           | 172.667       | 3.031           | 51.656        | 0.120           | -55.020       | 0.085           | -171.336      |
| 3300     | 0.517           | 170.842       | 3.010           | 49.907        | 0.120           | -55.996       | 0.086           | -175.010      |
| 3350     | 0.519           | 169.000       | 2.990           | 48.184        | 0.120           | -56.970       | 0.087           | -178.505      |
| 3400     | 0.522           | 167.181       | 2.970           | 46.458        | 0.120           | -57.975       | 0.087           | 177.850       |
| 3450     | 0.524           | 165.308       | 2.950           | 44.716        | 0.120           | -59.010       | 0.089           | 174.447       |
| 3500     | 0.527           | 163.438       | 2.930           | 43.003        | 0.120           | -60.024       | 0.090           | 170.925       |
| 3550     | 0.528           | 161.590       | 2.911           | 41.291        | 0.120           | -61.051       | 0.093           | 167.846       |
| 3600     | 0.531           | 159.691       | 2.892           | 39.560        | 0.120           | -62.060       | 0.095           | 164.966       |

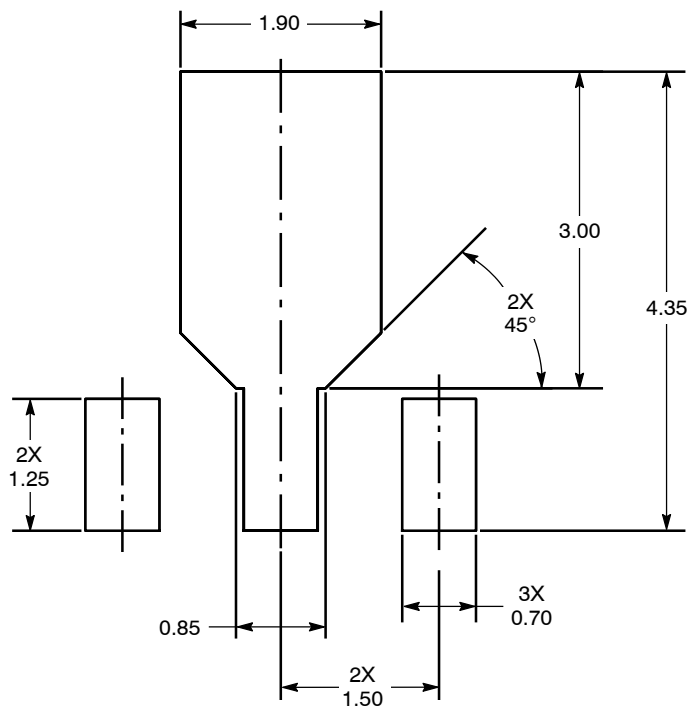
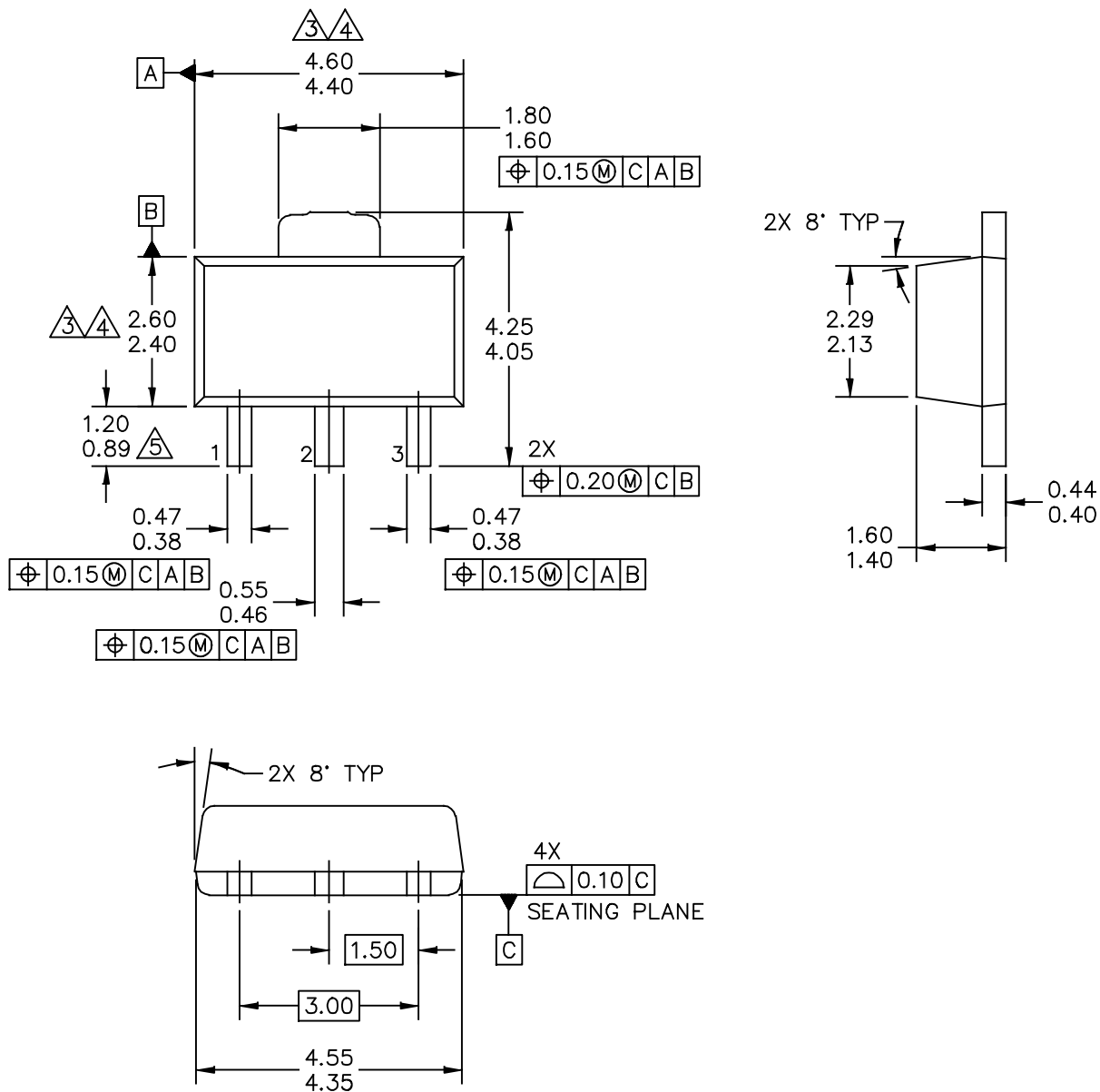


Figure 23. PCB Pad Layout for SOT-89A

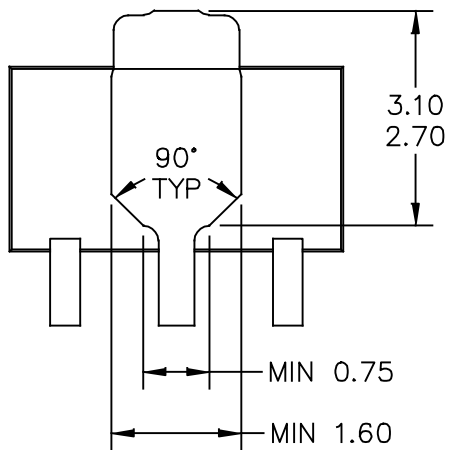


Figure 24. Product Marking

# PACKAGE DIMENSIONS



|                                                               |  |                    |                          |                            |             |
|---------------------------------------------------------------|--|--------------------|--------------------------|----------------------------|-------------|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED.       |  | MECHANICAL OUTLINE |                          | PRINT VERSION NOT TO SCALE |             |
| TITLE:<br><br>SOT-89A, 3 LEAD,<br>4.5 X 2.5 PKG, 1.5 MM PITCH |  |                    | DOCUMENT NO: 98ASA00241D |                            | REV: 0      |
|                                                               |  |                    | CASE NUMBER: 2142-01     |                            | 15 JUL 2010 |
|                                                               |  |                    | STANDARD: NON-JEDEC      |                            |             |



BOTTOM VIEW

|                                                           |                    |                            |             |
|-----------------------------------------------------------|--------------------|----------------------------|-------------|
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| TITLE:<br>SOT-89A, 3 LEAD,<br>4.5 X 2.5 PKG, 1.5 MM PITCH |                    | DOCUMENT NO: 98ASA00241D   | REV: 0      |
|                                                           |                    | CASE NUMBER: 2142-01       | 15 JUL 2010 |
|                                                           |                    | STANDARD: NON-JEDEC        |             |

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M – 1994.

2. ALL DIMENSIONS ARE IN MILLIMETERS.

3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.5 MM PER END. DIMENSION DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.5 MM PER SIDE.

4. DIMENSION ARE DETERMINED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY EXCLUSIVE OF MOLD FLASH, TIE BAR BURRS, GATE BURRS AND INTERLEAD FLASH, BUT INCLUDING ANY MISMATCH BETWEEN THE TOP AND BOTTOM OF THE PLASTIC BODY.

5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.

|                                                               |  |                    |                          |                            |             |
|---------------------------------------------------------------|--|--------------------|--------------------------|----------------------------|-------------|
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| TITLE:<br><br>SOT-89A, 3 LEAD,<br>4.5 X 2.5 PKG, 1.5 MM PITCH |  |                    | DOCUMENT NO: 98ASA00241D |                            | REV: 0      |
|                                                               |  |                    | CASE NUMBER: 2142-01     |                            | 15 JUL 2010 |
|                                                               |  |                    | STANDARD: NON-JEDEC      |                            |             |

## PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following resources to aid your design process.

### Application Notes

- AN1955: Thermal Measurement Methodology of RF Power Amplifiers
- AN3100: General Purpose Amplifier and MMIC Biasing

### Software

- .s2p File

### Development Tools

- Printed Circuit Boards

For Software and Tools, do a Part Number search at <http://www.freescale.com>, and select the “Part Number” link. Go to Software & Tools on the part’s Product Summary page to download the respective tool.

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | Nov. 2007  | <ul style="list-style-type: none"> <li>• Initial Release of Data Sheet</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1        | Apr. 2008  | <ul style="list-style-type: none"> <li>• Removed Footnote 2, Continuous voltage and current applied to device, from Table 2, Maximum Ratings, p. 1</li> <li>• Corrected Fig. 13, Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power y-axis (ACPR) unit of measure to dBc, p. 5</li> <li>• Updated Part Numbers in Tables 8, 9, 10, Component Designations and Values, to latest RoHS compliant part numbers, pp. 6, 7, 8</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 2        | Apr. 2010  | <ul style="list-style-type: none"> <li>• Changed Maximum Ratings table value for RF input power from 10 to 20 dBm as a result of improvements made in the measurement method and the capability of the device, p. 1</li> <li>• Added .s2p File availability to Product Software, p. 15</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 3        | Jan. 2011  | <ul style="list-style-type: none"> <li>• Corrected temperature at which Theta<sub>JC</sub> is measured from 25°C to 95°C and added “no RF applied” to Thermal Characteristics table to indicate that thermal characterization is performed under DC test with no RF signal applied, p. 1</li> <li>• Removed I<sub>DD</sub> bias callout from applicable graphs as bias is not a controlled value, pp. 4–8</li> <li>• Removed I<sub>DD</sub> bias callout from Table 11, Common Source S-Parameters heading as bias is not a controlled value, pp. 9–10</li> <li>• Added Printed Circuit Boards availability to Development Tools, p. 15</li> </ul>                                                                                                                                                                                                                                                                                                                              |
| 4        | Sept. 2012 | <ul style="list-style-type: none"> <li>• Replaced the PCB Pad Layout drawing, the package isometric and mechanical outline for Case 1514-02 (SOT-89) with Case 2142-01 (SOT-89) as a result of the device transfer from a Freescale wafer fab to an external GaAs wafer fab and new assembly site. The new assembly and test site’s SOT-89 package has slight dimensional differences, pp. 1, 11–14. Refer to PCN13337, <i>GaAs Fab Transfer</i>.</li> <li>• Table 6, ESD Protection Characteristics, removed the word “Minimum” after the ESD class rating. ESD ratings are characterized during new product development but are not 100% tested during production. ESD ratings provided in the data sheet are intended to be used as a guideline when handling ESD sensitive devices, p. 3</li> <li>• Added Fig. 24, Product Marking, p. 11</li> <li>• Added AN3100, General Purpose Amplifier and MMIC Biasing to Product Documentation, Application Notes, p. 15</li> </ul> |
| 4.1      | Oct. 2014  | <ul style="list-style-type: none"> <li>• Revised Fig. 24, Product Marking, p. 10</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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