



Driver or Pre-driver General Purpose Amplifier

The MMG30271B is a 1/2 W, Class AB, high gain amplifier designed as a driver or pre-driver for cellular base station Doherty amplifiers and general purpose small signal applications. Its versatile design enables operation from 900–4300 MHz, covering the 3G and 4G cellular bands.

Features

- P1dB: 26.9 dBm @ 2140 MHz
- Gain: 17.5 dB @ 2140 MHz
- Suitable for Doherty Amplifiers and BTS Transmitters
- 5 V Single Supply, 134 mA Quiescent Current
- SOT-89 Package
- 50 Ohm Operation with Minimal External Matching

MMG30271BT1

**900–4300 MHz, 17.5 dB @ 2140 MHz
 26.9 dBm
 BTS DRIVER AMPLIFIER**



SOT-89

Table 1. Load Pull Performance (1)

| Characteristic | Symbol | 900 MHz | 1900 MHz | 2140 MHz | 2600 MHz | 3500 MHz | 4200 MHz | Unit |
|------------------------------------|--------|----------|----------|----------|----------|----------|----------|------|
| Maximum Available Gain | MAG | 24.9 | 18.9 | 17.7 | 15.7 | 13.1 | 12.1 | dB |
| P _{out} @ 1dB Compression | P1dB | 29.0 (2) | 27.3 (2) | 27.2 | 27.3 | 27.4 | 27.1 | dBm |

Table 2. Maximum Ratings

| Rating | Symbol | Value | Unit |
|---------------------------|------------------|-------------|------|
| Supply Voltage | V _{CC} | 6 | V |
| Supply Current | I _{CC} | 240 | mA |
| RF Input Power | P _{in} | 23 | dBm |
| Storage Temperature Range | T _{stg} | –65 to +150 | °C |
| Junction Temperature | T _J | 175 | °C |

Table 3. Thermal Characteristics

| Characteristic | Symbol | Value (3) | Unit |
|---|------------------|-----------|------|
| Thermal Resistance, Junction to Case Case Temperature 65°C, 5 Vdc, 138 mA, no RF applied | R _{θJC} | 33 | °C/W |

1. V_{CC} = 5 Vdc, T_A = 25°C, CW.

2. Maximum allowable current not to exceed 240 mA.

3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.nxp.com/RF> and search for AN1955.

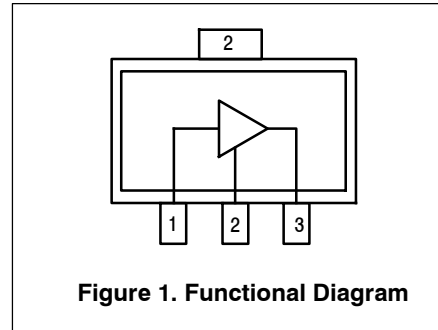


Table 4. Electrical Characteristics ($V_{CC} = 5$ Vdc, 2140 MHz, $T_A = 25^\circ\text{C}$, 50 ohm system, in Freescale Application Circuit)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|--------------------------------|----------|-------|-------|-------|------|
| Small-Signal Gain (S21) | G_p | 16.8 | 17.5 | — | dB |
| Power Output @ 1dB Compression | P1dB | — | 26.9 | — | dBm |
| Input Return Loss (S11) | IRL | — | -9.2 | — | dB |
| Output Return Loss (S22) | ORL | — | -11.4 | — | dB |
| Supply Current | I_{CC} | 107.5 | 134 | 142.5 | mA |
| Supply Voltage | V_{CC} | — | 5 | — | V |

Table 5. Functional Pin Description

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

**Table 6. ESD Protection Characteristics**

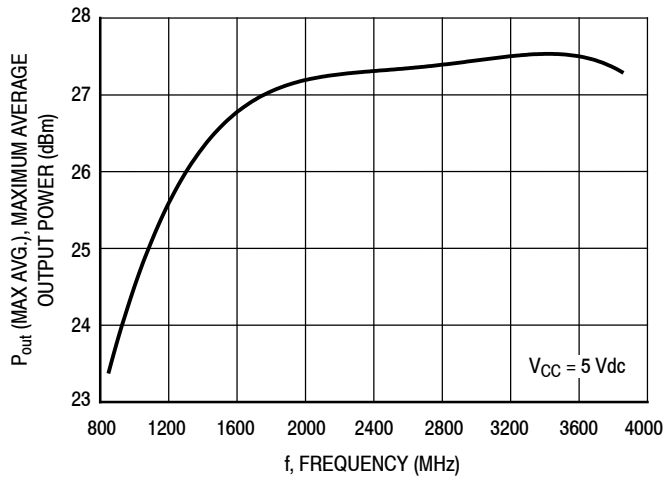
| Test Methodology | Class |
|--|-------|
| Human Body Model (per JESD 22-A114) | 2 |
| Machine Model (per EIA/JESD 22-A115) | A |
| Charge Device Model (per JESD 22-C101) | IV |

Table 7. Moisture Sensitivity Level

| Test Methodology | Rating | Package Peak Temperature | Unit |
|--------------------------------------|--------|--------------------------|------------------|
| Per JESD22-A113, IPC/JEDEC J-STD-020 | 1 | 260 | $^\circ\text{C}$ |

Table 8. Ordering Information

| Device | Tape and Reel Information | Package |
|-------------|--|---------|
| MMG30271BT1 | T1 Suffix = 1,000 Units, 12 mm Tape Width, 7-inch Reel | SOT-89 |



Note: Maximum allowable current not to exceed 240 mA.

Figure 2. Maximum Average Output Power versus Frequency

Table 9. ACPR versus Frequency (LTE 10 MHz, ACPR = -48 dBc)

| f (MHz) | ACPR = -48 dBc | | |
|---------|------------------------|-----------|----------------------|
| | P _{out} (dBm) | Gain (dB) | I _{CC} (mA) |
| 1900 | 16 | 19.2 | 147 |
| 2140 | 17.5 | 17.2 | 148 |
| 2600 | 17.5 | 16 | 144 |
| 3500 | 16.9 | 13.7 | 134 |
| 4250 | 17.6 | 11.5 | 138 |

50 OHM APPLICATION CIRCUIT: 2110–2170 MHz

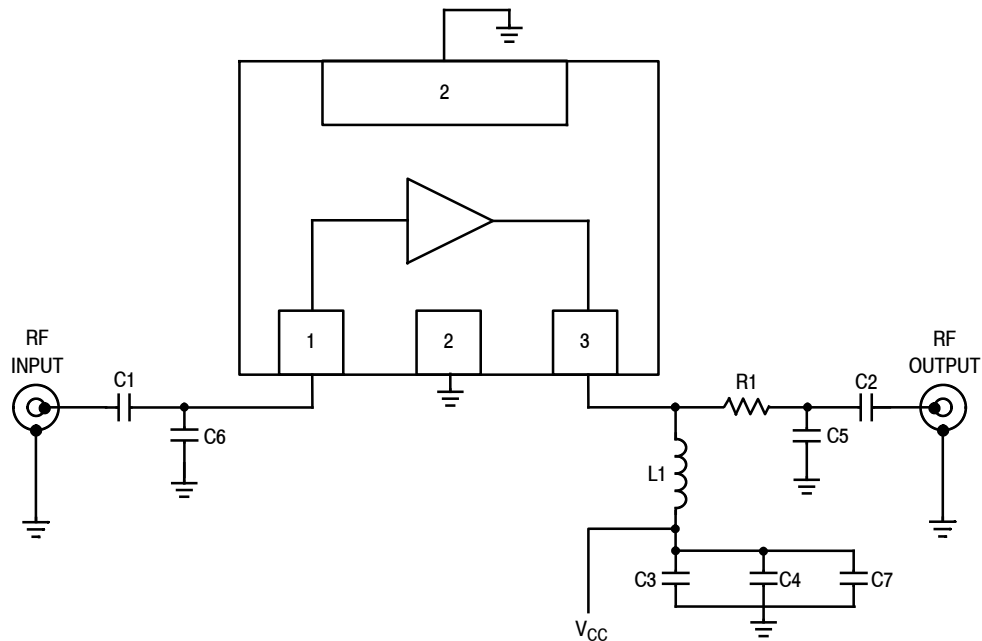
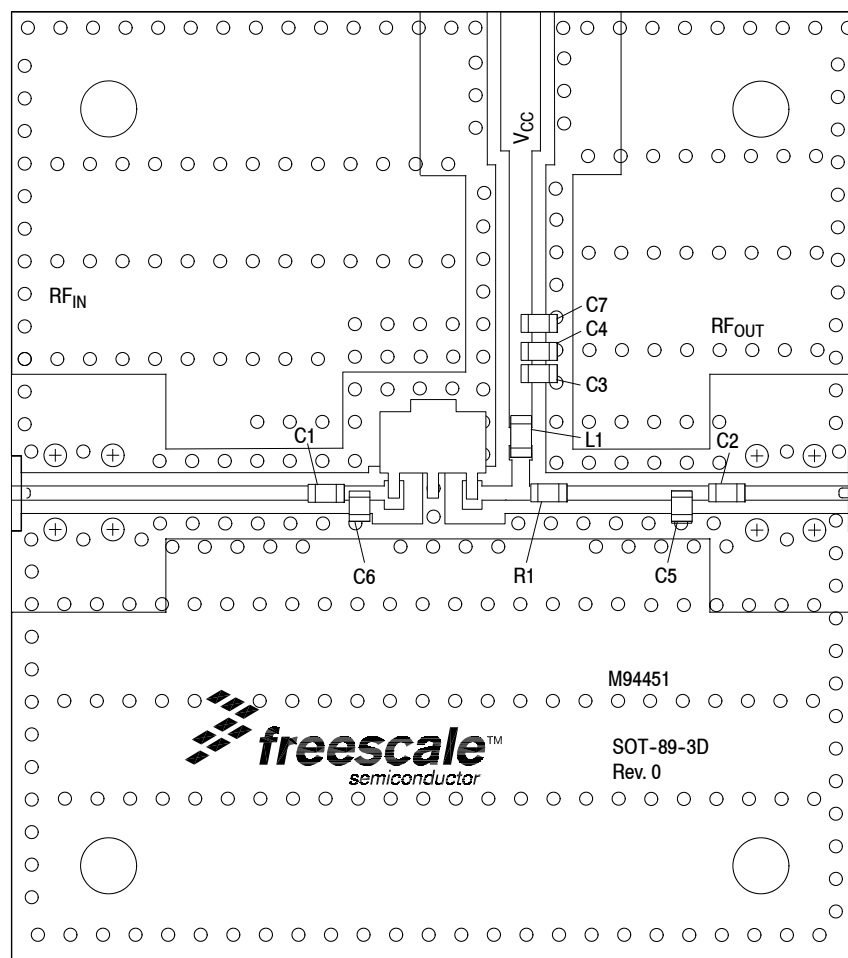


Figure 3. MMG30271BT1 Test Circuit Schematic

Table 10. MMG3027BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 1.5 pF Chip Capacitor | GJM1555C1H1R5BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μ F Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 1.3 pF Chip Capacitor | GJM1555C1H1R3BB01 | Murata |
| C6 | 1.8 pF Chip Capacitor | GJM1555C1H1R8BB01 | Murata |
| C7 | 1 μ F Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 3.9 nH Chip Inductor | LL1608-FSL3N9S | Toko |
| R1 | 0 Ω , 1 A Chip Resistor | RCO402JR-070RL | Yageo |
| PCB | Rogers R04350B, 0.010", $\epsilon_r = 3.66$ | M94451 | MTL |

50 OHM APPLICATION CIRCUIT: 2110–2170 MHz



PCB actual size: 1.3" × 1.46".

Figure 4. MMG30271BT1 Test Circuit Component Layout

Table 10. MMG30371BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 1.5 pF Chip Capacitor | GJM1555C1H1R5BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μF Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 1.3 pF Chip Capacitor | GJM1555C1H1R3BB01 | Murata |
| C6 | 1.8 pF Chip Capacitor | GJM1555C1H1R8BB01 | Murata |
| C7 | 1 μF Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 3.9 nH Chip Inductor | LL1608-FSL3N9S | Toko |
| R1 | 0 Ω, 1 A Chip Resistor | RCO402JR-070RL | Yageo |
| PCB | Rogers R04350B, 0.010", ε _r = 3.66 | M94451 | MTL |

(Test Circuit Component Designations and Values table repeated for reference.)

50 OHM TYPICAL CHARACTERISTICS: 2110–2170 MHz

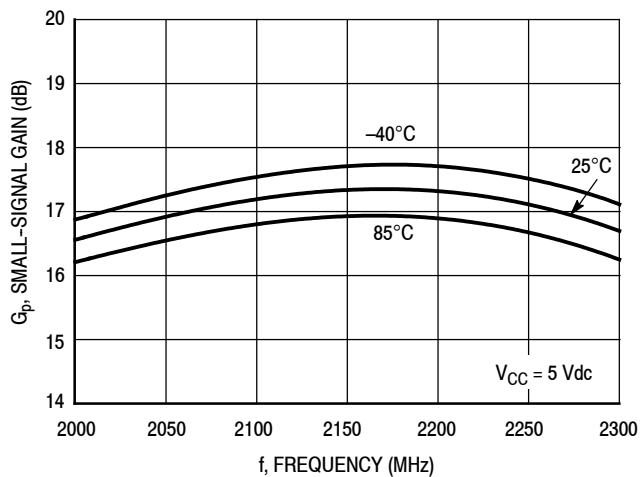


Figure 5. Small-Signal Gain (S21) versus Frequency and Temperature

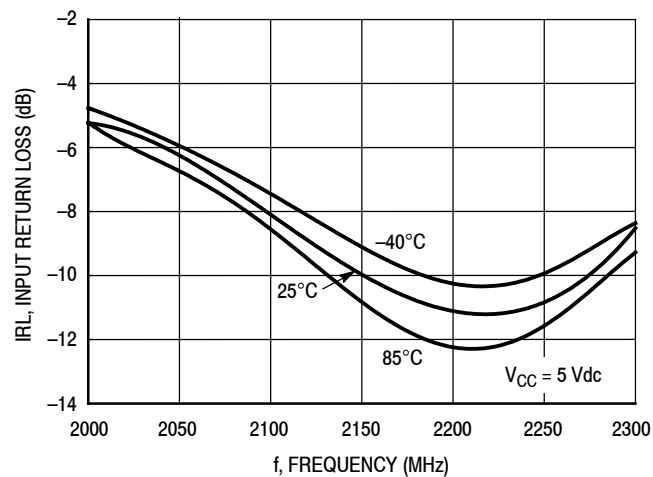


Figure 6. Input Return Loss (S11) versus Frequency and Temperature

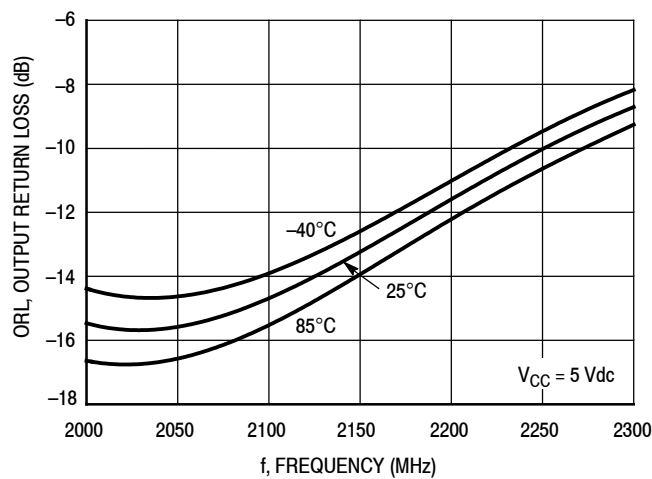


Figure 7. Output Return Loss (S22) versus Frequency and Temperature

50 OHM TYPICAL CHARACTERISTICS: 2110–2170 MHz

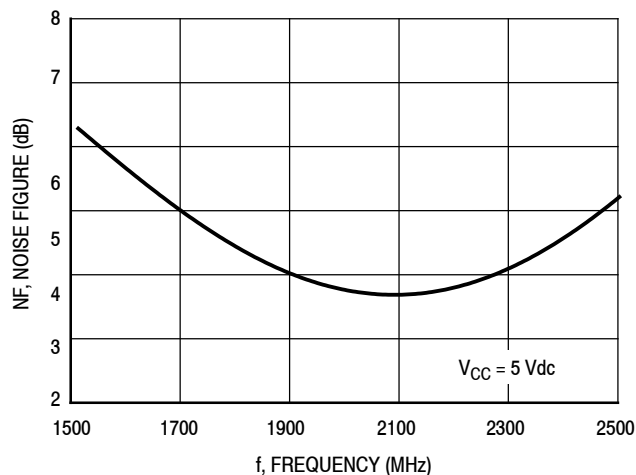


Figure 8. Noise Figure versus Frequency

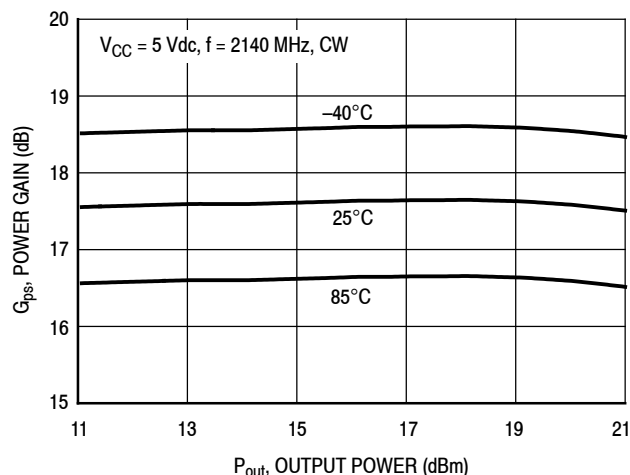


Figure 9. Power Gain versus Output Power and Temperature

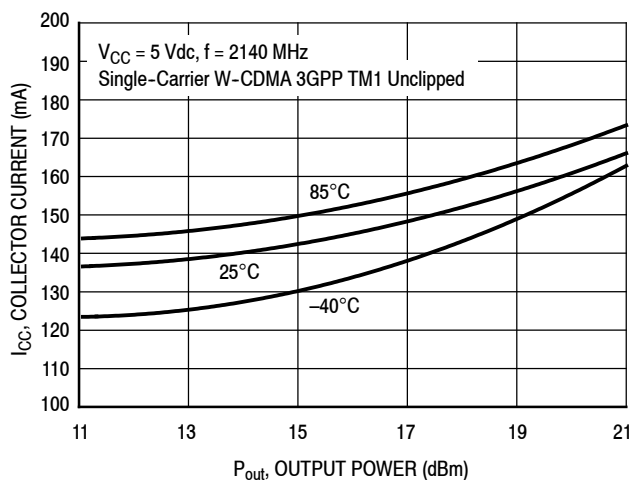


Figure 10. Collector Current versus Output Power and Temperature

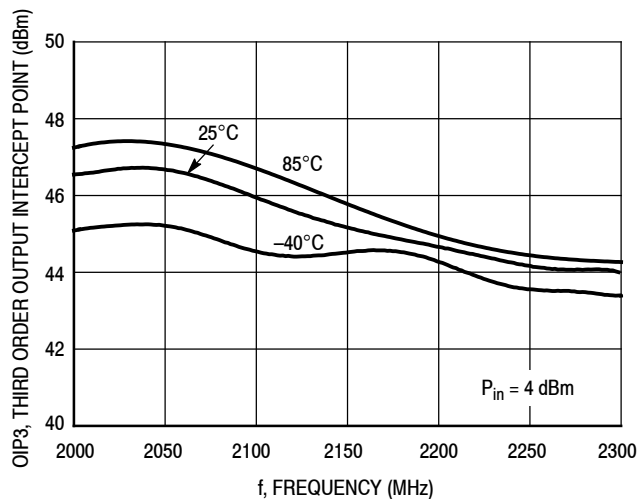


Figure 11. Third Order Output Intercept Point versus Frequency and Temperature

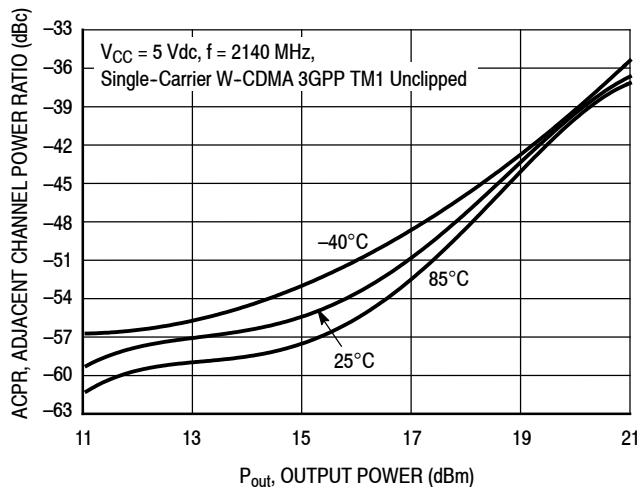


Figure 12. Single-Carrier W-CDMA Adjacent Channel Power Ratio versus Output Power and Temperature

50 OHM APPLICATION CIRCUIT: 1880–1920 MHz

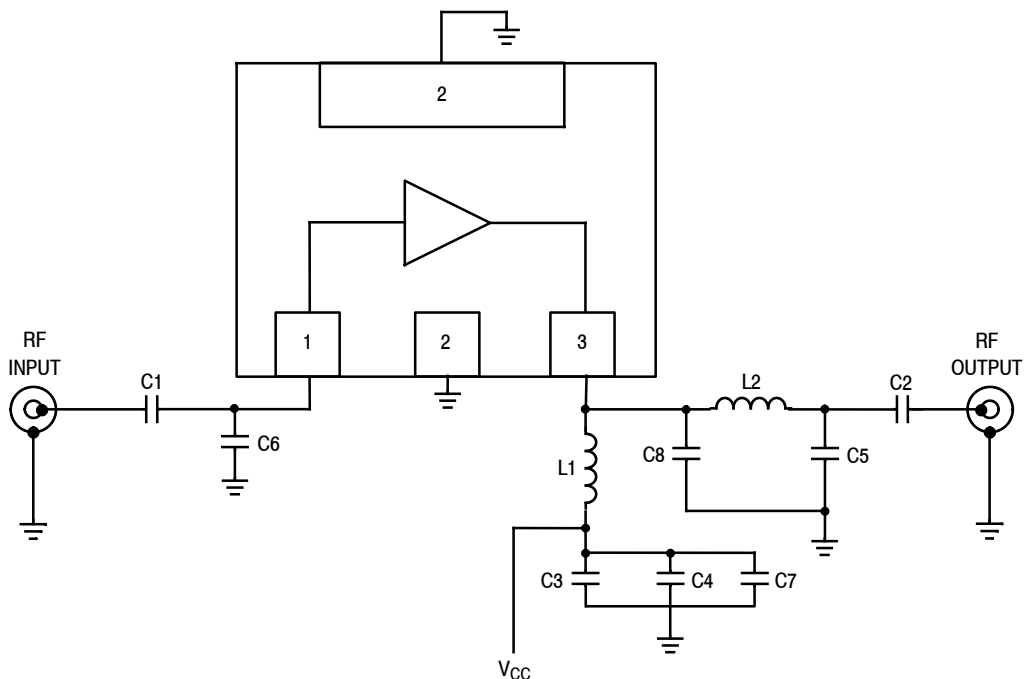
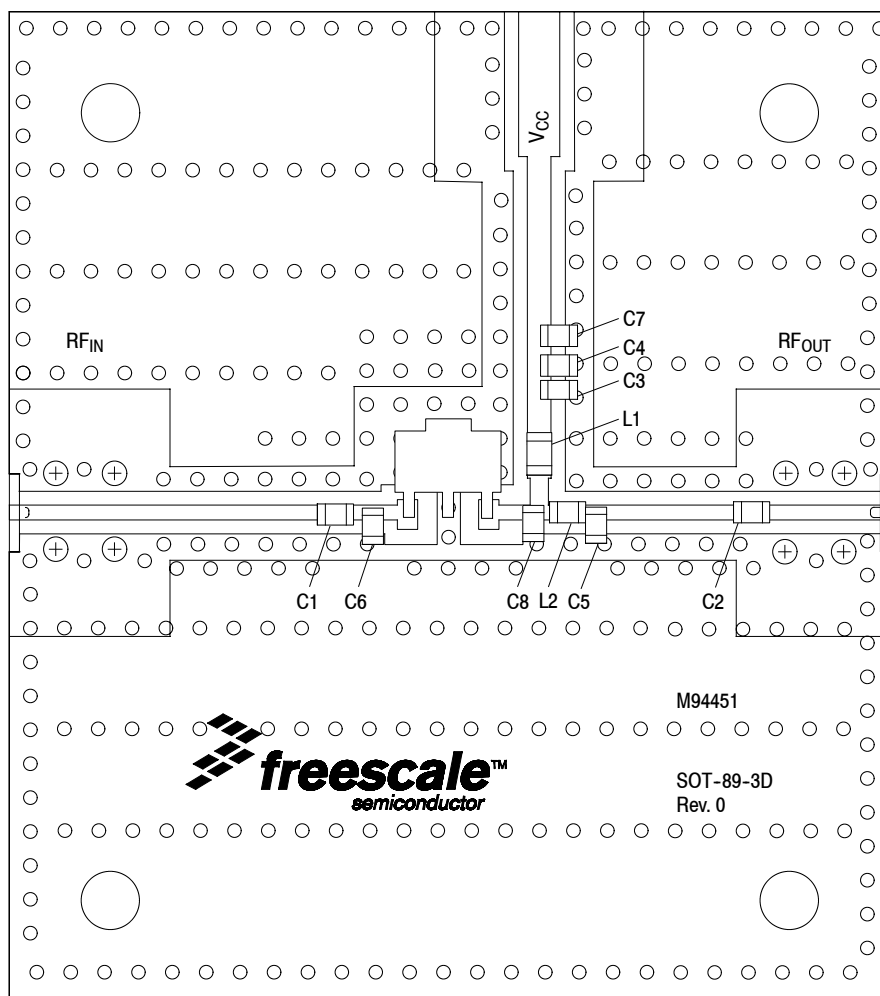


Figure 13. MMG30271BT1 Test Circuit Schematic

Table 11. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 1.2 pF Chip Capacitor | GJM1555C1H1R2BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μF Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 2.2 pF Chip Capacitor | GJM1555C1H2R2BB01 | Murata |
| C6 | 3.0 pF Chip Capacitor | GJM1555C1H3R0BB01 | Murata |
| C7 | 1 μF Chip Capacitor | GRM155R61A105KE15 | Murata |
| C8 | 2.4 pF Chip Capacitor | GJM1555C1H2R4BB01 | Murata |
| L1 | 10 nH Chip Inductor | LL1608-FH10NJ | Toko |
| L2 | 1.9 nH Chip Inductor | 0402CS-1N9XJLW | Coilcraft |
| PCB | Rogers R04350B, 0.010", ε _r = 3.66 | M94451 | MTL |

50 OHM APPLICATION CIRCUIT: 1880–1920 MHz



PCB actual size: 1.3" × 1.46".

Figure 14. MMG30271BT1 Test Circuit Component Layout

Table 11. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 1.2 pF Chip Capacitor | GJM1555C1H1R2BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μF Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 2.2 pF Chip Capacitor | GJM1555C1H2R2BB01 | Murata |
| C6 | 3.0 pF Chip Capacitor | GJM1555C1H3R0BB01 | Murata |
| C7 | 1 μF Chip Capacitor | GRM155R61A105KE15 | Murata |
| C8 | 2.4 pF Chip Capacitor | GJM1555C1H2R4BB01 | Murata |
| L1 | 10 nH Chip Inductor | LL1608-FH10NJ | Toko |
| L2 | 1.9 nH Chip Inductor | 0402CS-1N9XJLW | Coilcraft |
| PCB | Rogers R04350B, 0.010", ε _r = 3.66 | M94451 | MTL |

(Test Circuit Component Designations and Values table repeated for reference.)

50 OHM TYPICAL CHARACTERISTICS: 1880–1920 MHz

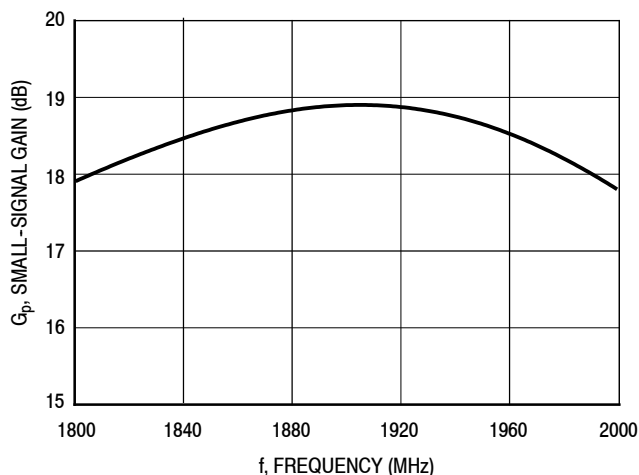


Figure 15. Small-Signal Gain (S21) versus Frequency

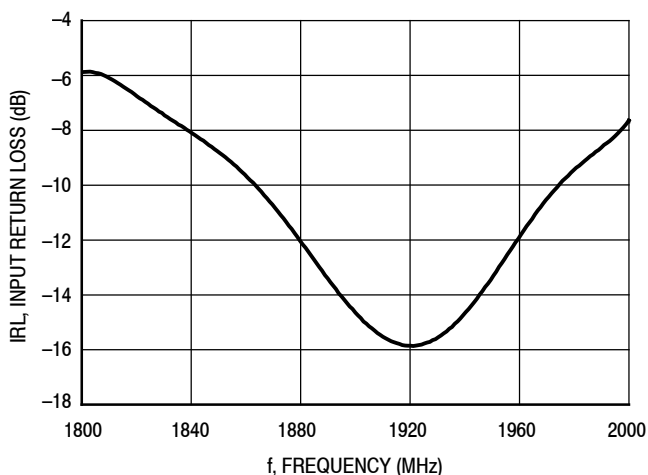


Figure 16. Input Return Loss (S11) versus Frequency

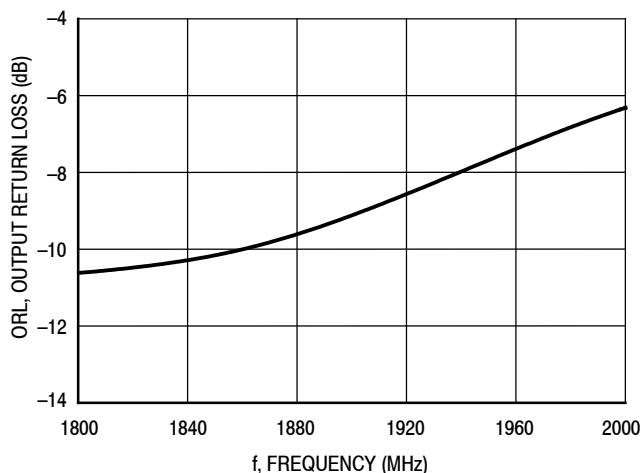
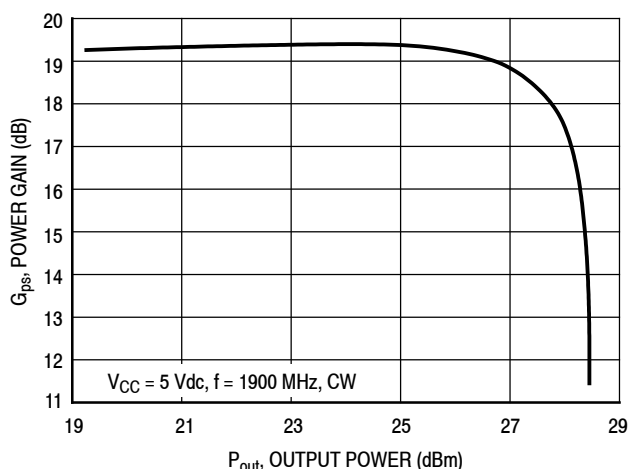


Figure 17. Output Return Loss (S22) versus Frequency



Note: Maximum allowable current not to exceed 240 mA.

Figure 18. Power Gain versus Output Power

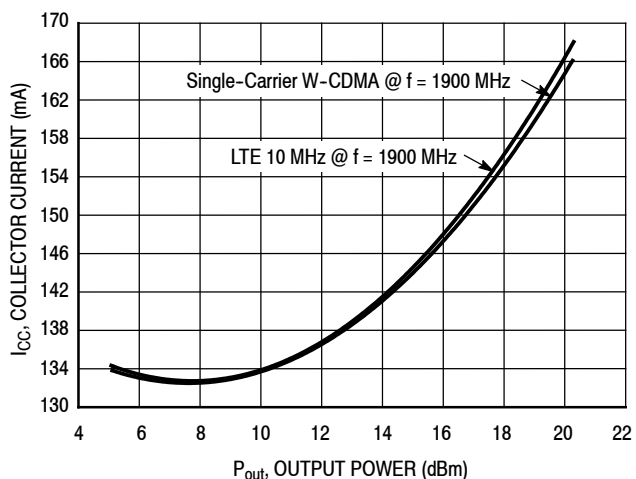


Figure 19. Collector Current versus Output Power

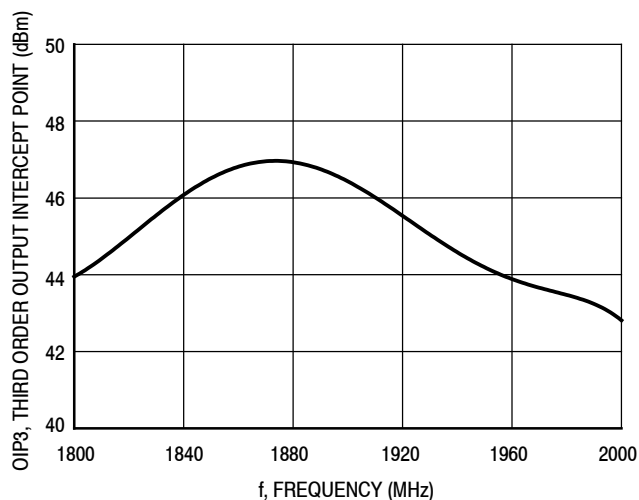


Figure 20. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS: 1880–1920 MHz

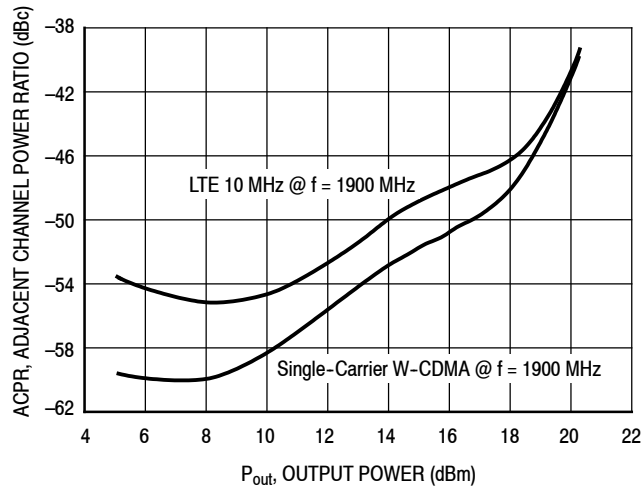


Figure 21. Adjacent Channel Power Ratio versus Output Power

50 OHM APPLICATION CIRCUIT: 2496–2690 MHz

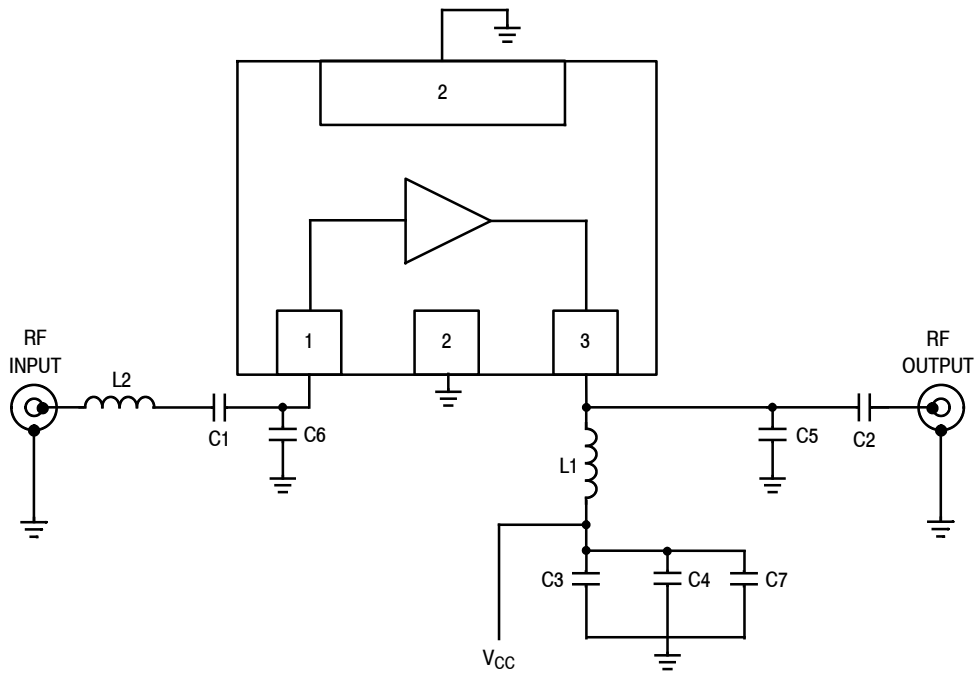
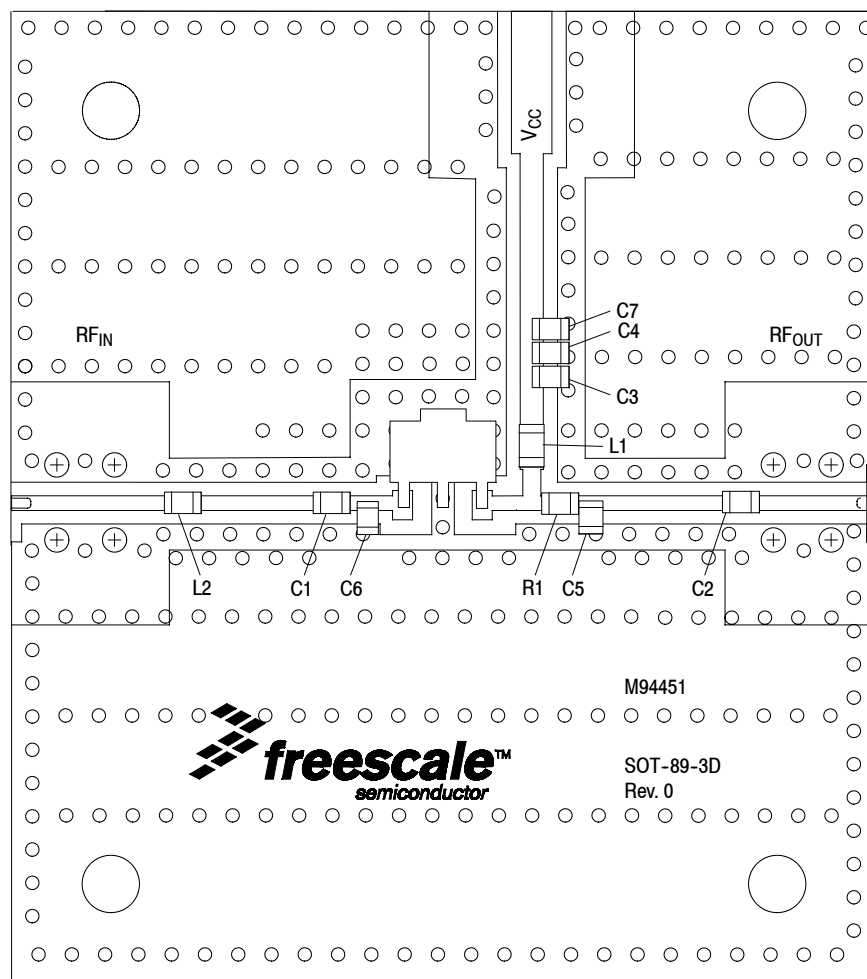


Figure 22. MMG30271BT1 Test Circuit Schematic

Table 12. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|--------|---|-------------------|--------------|
| C1, C2 | 100 pF Chip Capacitors | GRM1555C1H101JA01 | Murata |
| C3 | 220 pF Chip Capacitor | GRM1555C1H221JA01 | Murata |
| C4 | 2200 pF Chip Capacitor | GRM1555C1H222JA01 | Murata |
| C5 | 1.8 pF Chip Capacitor | GJM1555C1H1R8BB01 | Murata |
| C6 | 1.6 pF Chip Capacitor | GJM1555C1H1R6BB01 | Murata |
| C7 | 1 μ F Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 10 nH Chip Inductor | 0603HC-10NXJLC | Coilcraft |
| L2 | 3.3 nH Chip Inductor | 0402CS-3N3X | Coilcraft |
| PCB | Rogers R04350B, 0.010", $\epsilon_r = 3.66$ | M94451 | MTL |

50 OHM APPLICATION CIRCUIT: 2496–2690 MHz



PCB actual size: 1.3" × 1.46".

Figure 23. MMG30271BT1 Test Circuit Component Layout

Table 12. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|--------|---|-------------------|--------------|
| C1, C2 | 100 pF Chip Capacitors | GRM1555C1H101JA01 | Murata |
| C3 | 220 pF Chip Capacitor | GRM1555C1H221JA01 | Murata |
| C4 | 2200 pF Chip Capacitor | GRM1555C1H222JA01 | Murata |
| C5 | 1.8 pF Chip Capacitor | GJM1555C1H1R8BB01 | Murata |
| C6 | 1.6 pF Chip Capacitor | GJM1555C1H1R6BB01 | Murata |
| C7 | 1 μ F Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 10 nH Chip Inductor | 0603HC-10NXJLC | Coilcraft |
| L2 | 3.3 nH Chip Inductor | 0402CS-3N3X | Coilcraft |
| R1 | 0 Ω , 1 A Chip Resistor | RC0402JR-070RL | Yageo |
| PCB | Rogers R04350B, 0.010", $\epsilon_r = 3.66$ | M94451 | MTL |

(Test Circuit Component Designations and Values table repeated for reference.)

50 OHM TYPICAL CHARACTERISTICS: 2496–2690 MHz

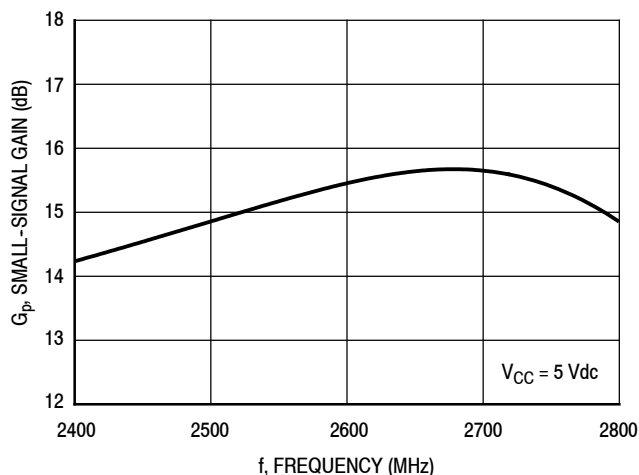


Figure 24. Small-Signal Gain (S21) versus Frequency

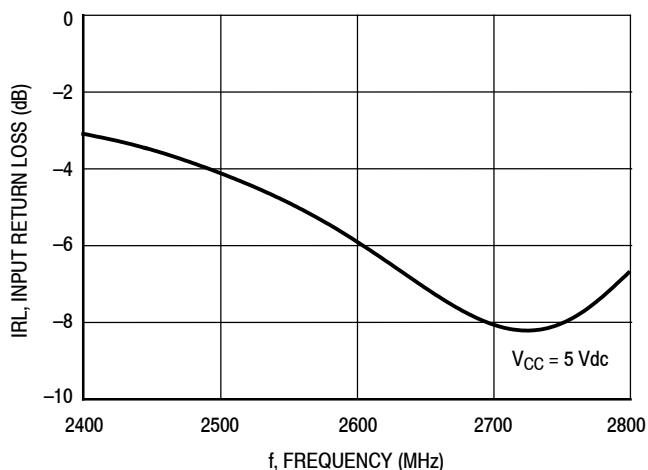


Figure 25. Input Return Loss (S11) versus Frequency

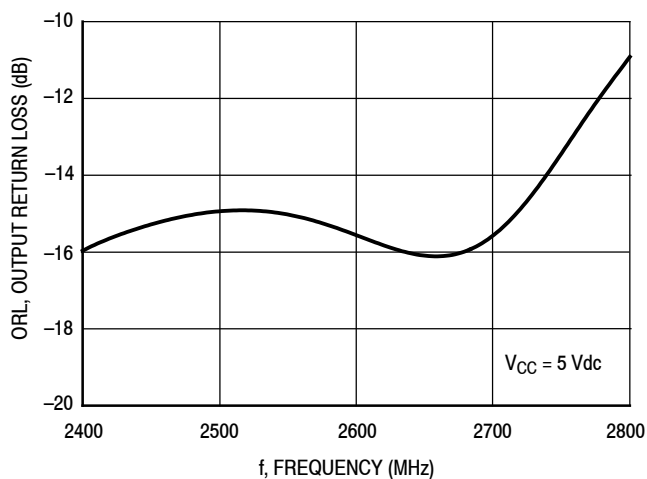


Figure 26. Output Return Loss (S22) versus Frequency

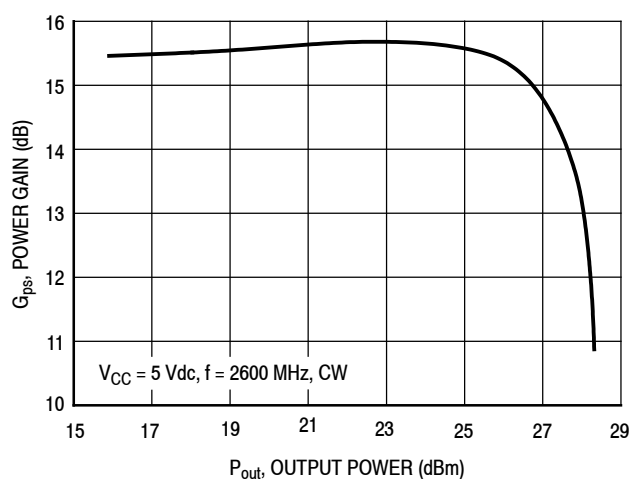


Figure 27. Power Gain versus Output Power

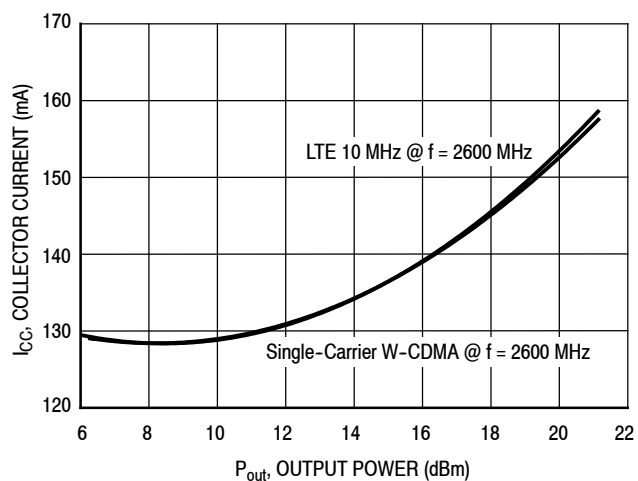


Figure 28. Collector Current versus Output Power

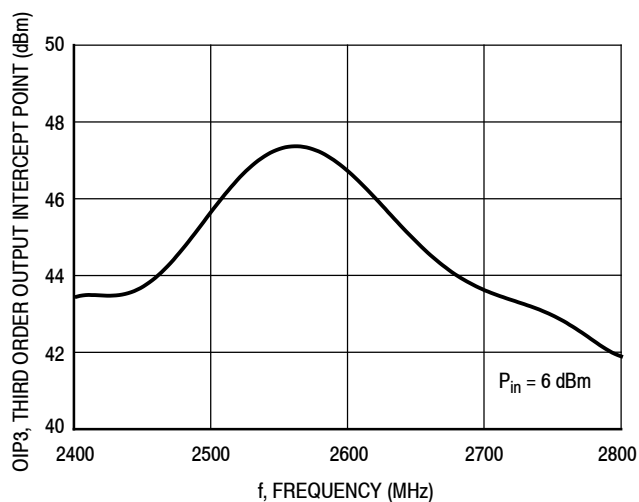


Figure 29. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS: 2496–2690 MHz

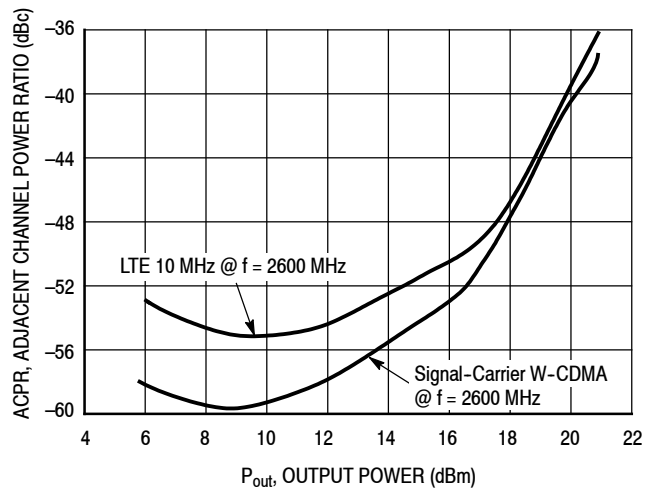


Figure 30. Adjacent Channel Power Ratio versus Output Power

50 OHM APPLICATION CIRCUIT: 3400–3600 MHz

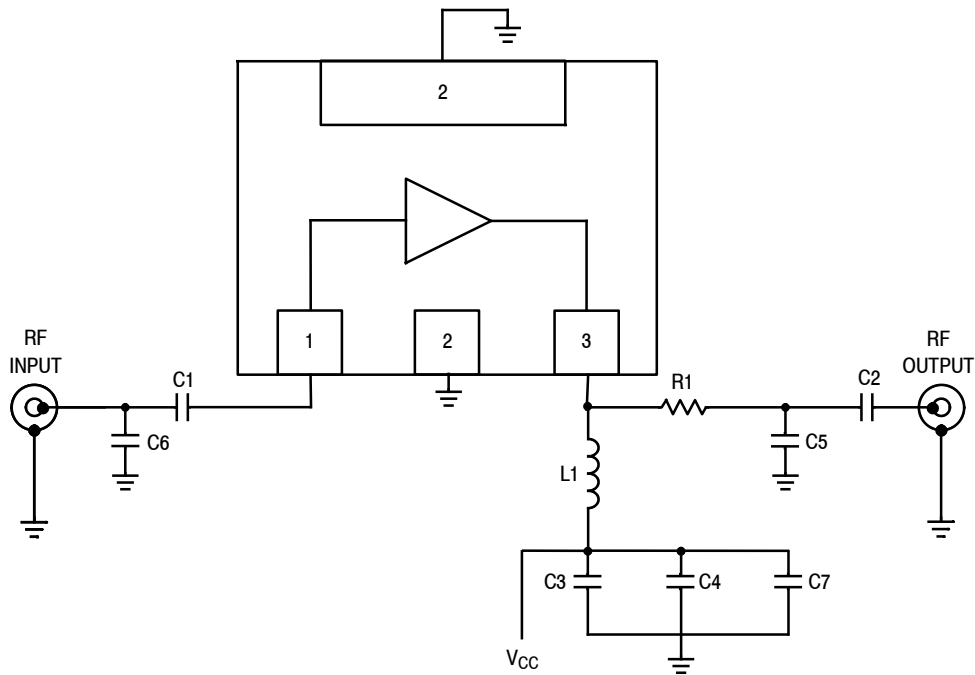
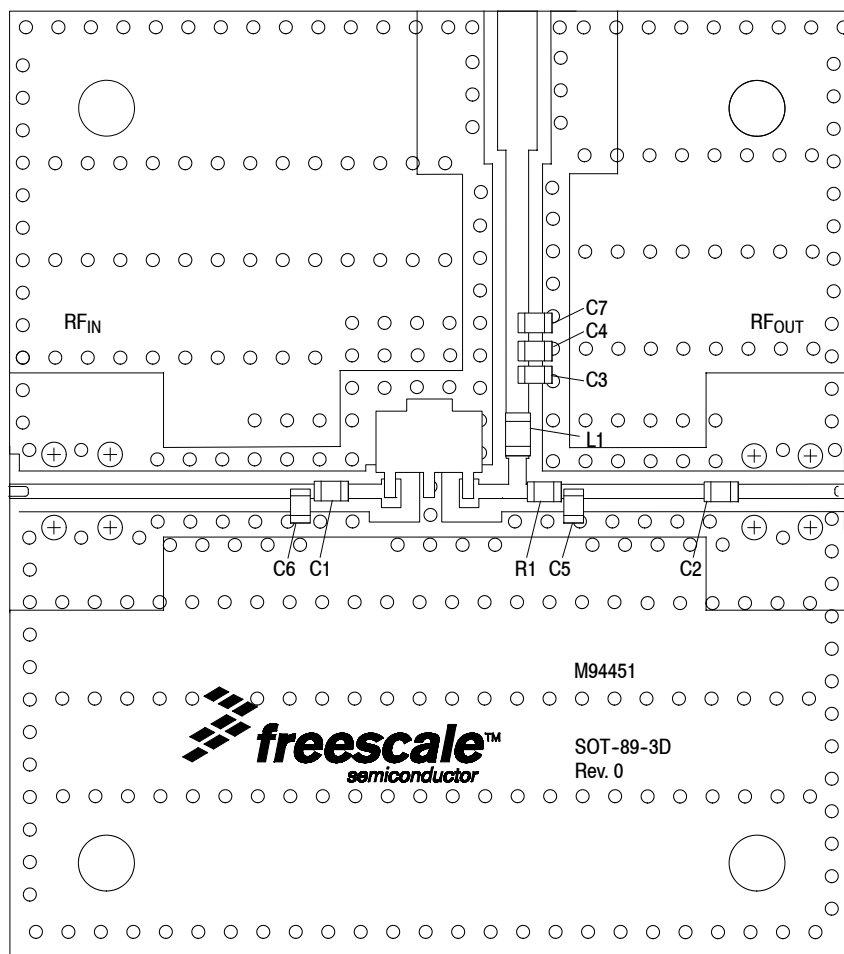


Figure 31. MMG30271BT1 Test Circuit Schematic

Table 13. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 0.8 pF Chip Capacitor | GJM1555C1H0R8BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μ F Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 1.1 pF Chip Capacitor | GJM1555C1H1R1BB01 | Murata |
| C6 | 1.1 pF Chip Capacitor | GJM1555C1H1R1BB01 | Murata |
| C7 | 1 μ F Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 10 nH Chip Inductor | LL1608-FH10NJ | Toko |
| R1 | 0 Ω , 1 A Chip Resistor | RC0402JR-070RL | Yageo |
| PCB | Rogers R04350B, 0.010", $\epsilon_r = 3.66$ | M94451 | MTL |

50 OHM APPLICATION CIRCUIT: 3400–3600 MHz



PCB actual size: 1.3" × 1.46".

Figure 32. MMG30271BT1 Test Circuit Component Layout

Table 13. MMG30271BT1 Test Circuit Component Designations and Values

| Part | Description | Part Number | Manufacturer |
|------|---|-------------------|--------------|
| C1 | 0.8 pF Chip Capacitor | GJM1555C1H0R8BB01 | Murata |
| C2 | 100 pF Chip Capacitor | GRM1555C1H101JA01 | Murata |
| C3 | 1000 pF Chip Capacitor | GCM155R71H102KA37 | Murata |
| C4 | 0.01 μ F Chip Capacitor | GRM188R72A103KA01 | Murata |
| C5 | 1.1 pF Chip Capacitor | GJM1555C1H1R1BB01 | Murata |
| C6 | 1.1 pF Chip Capacitor | GJM1555C1H1R1BB01 | Murata |
| C7 | 1 μ F Chip Capacitor | GRM155R61A105KE15 | Murata |
| L1 | 10 nH Chip Inductor | LL1608-FH10NJ | Toko |
| R1 | 0 Ω , 1 A Chip Resistor | RC0402JR-070RL | Yageo |
| PCB | Rogers R04350B, 0.010", $\epsilon_r = 3.66$ | M94451 | MTL |

(Test Circuit Component Designations and Values table repeated for reference.)

50 OHM TYPICAL CHARACTERISTICS: 3400–3600 MHz

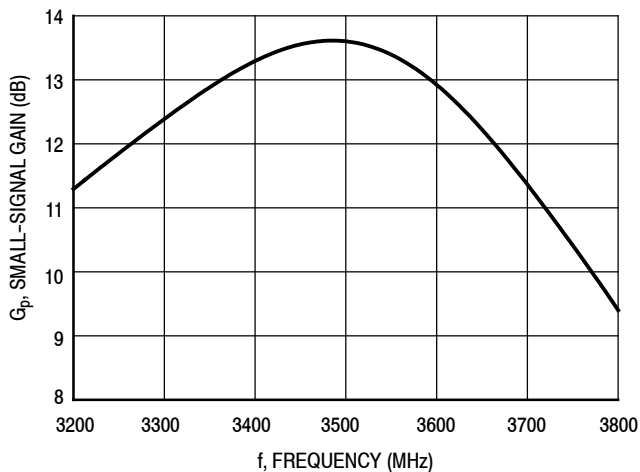


Figure 33. Small-Signal Gain (S21) versus Frequency

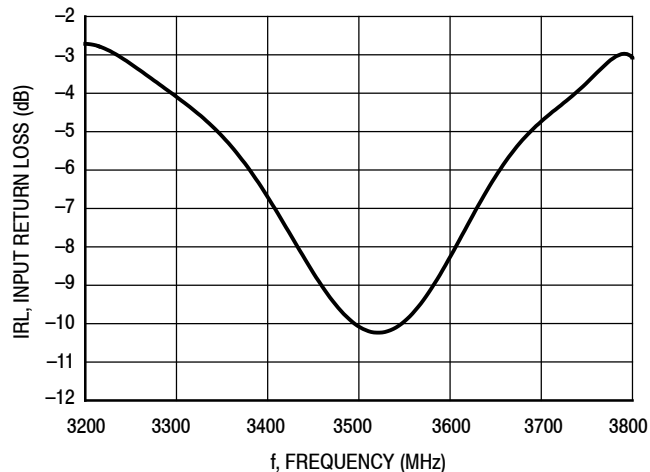


Figure 34. Input Return Loss (S11) versus Frequency

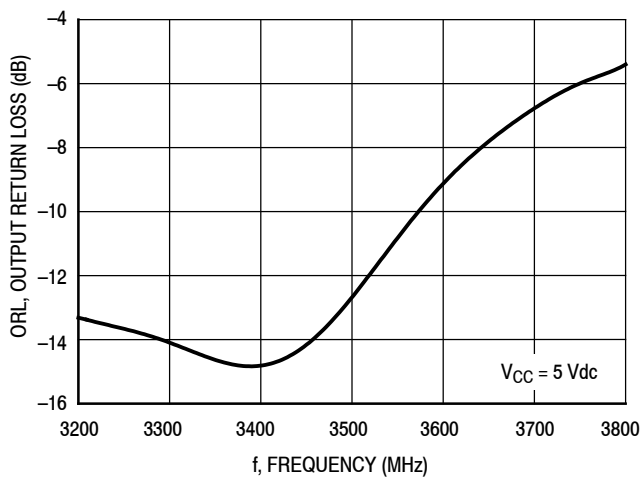


Figure 35. Output Return Loss (S22) versus Frequency

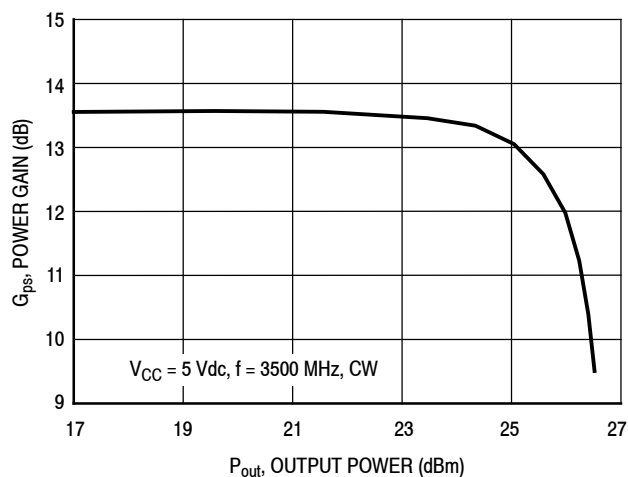


Figure 36. Power Gain versus Output Power

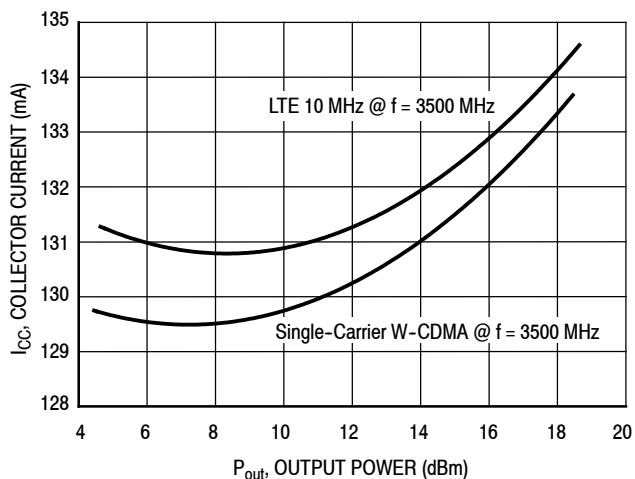


Figure 37. Collector Current versus Output Power

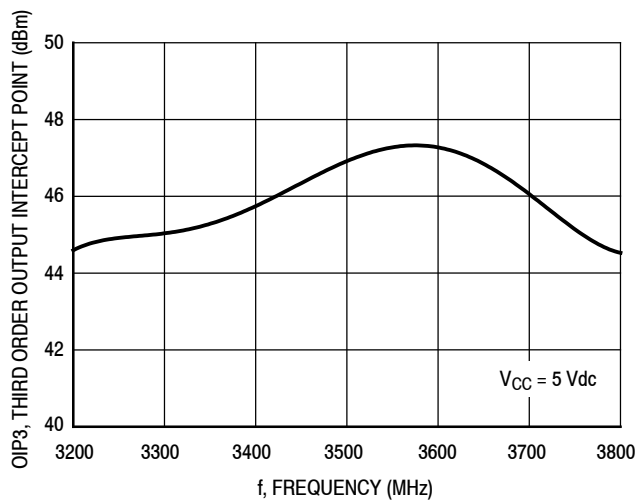


Figure 38. Third Order Output Intercept Point versus Frequency

50 OHM TYPICAL CHARACTERISTICS: 3400–3600 MHz

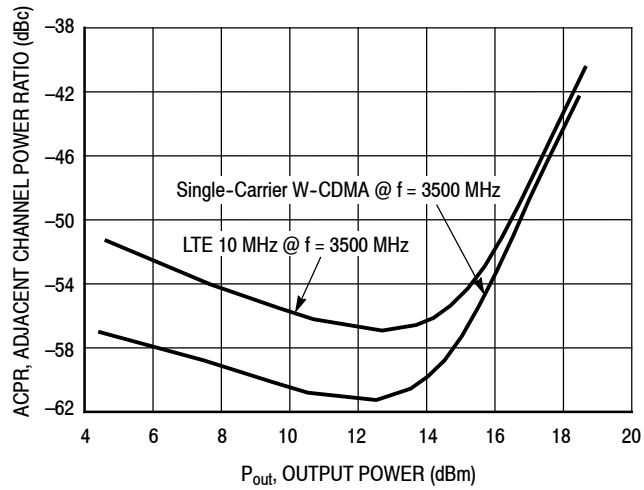


Figure 39. Adjacent Channel Power Ratio versus Output Power

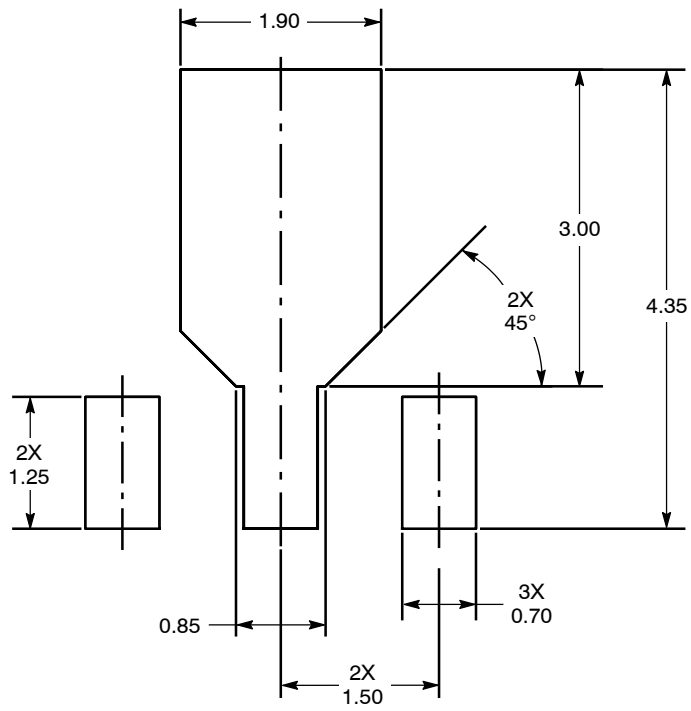


Figure 40. PCB Pad Layout for SOT-89A

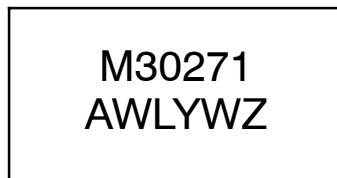
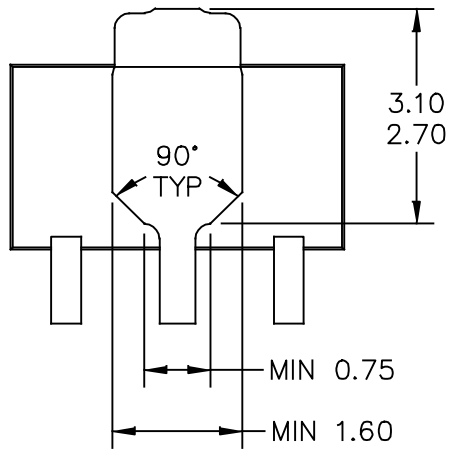


Figure 41. Product Marking



BOTTOM VIEW

| | | | |
|---|--------------------------|----------------------------|--|
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| TITLE: SOT-89A, 3 LEAD, 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: SOT-89A, 3 LEAD, 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

Software

- .s2p File

Development Tools

- Printed Circuit Boards

To Download Resources Specific to a Given Part Number:

2. Go to <http://www.nxp.com/RF>
3. Search by part number
4. Click part number link
5. Choose the desired resource from the drop down menu

FAILURE ANALYSIS

At this time, because of the physical characteristics of the part, failure analysis is limited to electrical signature analysis. In cases where Freescale is contractually obligated to perform failure analysis (FA) services, full FA may be performed by third party vendors with moderate success. For updates contact your local Freescale Sales Office.

REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date | Description |
|----------|-----------|---------------------------------|
| 0 | Mar. 2016 | • Initial Release of Data Sheet |

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