Freescale Semiconductor
Technical Data

Document Number: MMZ09332B
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RoHS

Heterojunction Bipolar Transistor Technology (InGaP HBT)

High Efficiency/Linearity Amplifier

MMZ09332BT1

130–1000 MHz, 30 dB, 33 dBm
InGaP HBT LINEAR AMPLIFIER



QFN 3 × 3

The MMZ09332B is a 2-stage, high linearity InGaP HBT broadband amplifier designed for femtocell, picocell, smart grid, W-CDMA, TD-SCDMA and LTE wireless broadband applications. It provides exceptional linearity for LTE and W-CDMA air interfaces with an ACPR of –50 dBc at an output power of up to 23 dBm, covering frequencies from 130 to 1000 MHz. It operates from a supply voltage of 3 to 5 volts. The amplifier requires minimal external matching and offers state-of-the-art reliability, ruggedness, temperature stability and ESD performance.

- Typical PA Performance: V_{CC1} = V_{CC2} = V_{BIAS} = 5 Vdc, I_{CQ} = 140 mA

Frequency	P_{out} (dBm)	G_{ps} (dB)	ACPR (dBc)	I_{CC} (mA)	Test Signal
748 MHz	23	30.9	–49.6	315	W-CDMA
942 MHz	22	27.1	–50.4	240	W-CDMA

- Typical PA Performance: V_{CC1} = V_{CC2} = V_{BIAS} = 5 Vdc, I_{CQ} = 110 mA

Frequency	P_{out} (dBm)	G_{ps} (dB)	PAE (%)	Test Signal
450 MHz	32.3 30.3 @ 3.6 V	37.2 26.3 @ 3.6 V	45.5 @ 5 V 53.7 @ 3.6 V	CW
760 MHz	32.2	30.8	40.0 @ 5 V	CW

Features

- Frequency: 130–1000 MHz
- P1dB: 33 dBm, 450 to 1000 MHz
- OIP3: up to 48 dBm @ 900 MHz
- Excellent Linearity
- Active Bias Control (adjustable externally)
- Single 3 to 5 V Supply
- Single-ended Power Detector
- Cost-effective 12-pin 3 mm QFN Surface Mount Plastic Package

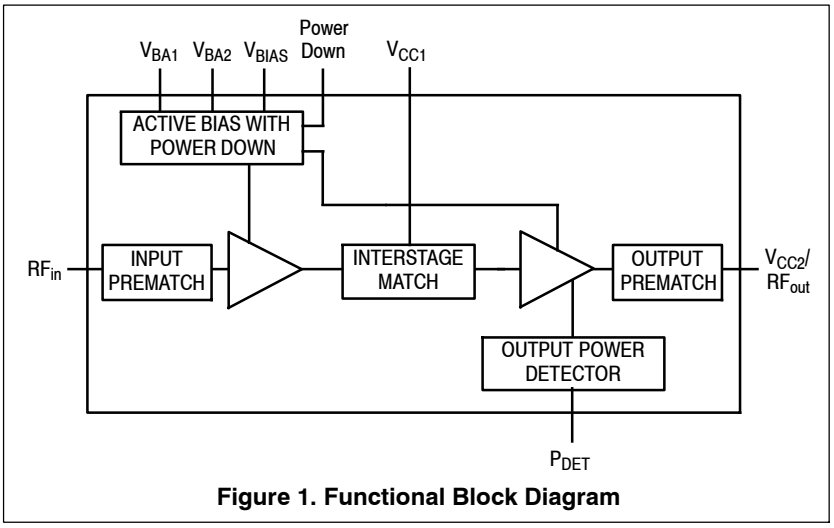


Figure 1. Functional Block Diagram

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Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	6	V
Total Supply Current	I_{CC}	1200	mA
RF Input Power	P_{in}	29	dBm
Storage Temperature Range	T_{stg}	–65 to +150	°C
Junction Temperature	T_J	175	°C

Table 2. Thermal Characteristics

Characteristic		Symbol	Value (1)	Unit
Thermal Resistance, Junction to Case Case Temperature 93°C, V_{CC1} = V_{CC2} = V_{BIAS} = 5 Vdc	 Stage 1 Stage 2	$R_{\theta JC}$	 51 26	°C/W

Table 3. Electrical Characteristics (V_{CC1} = V_{CC2} = V_{BIAS} = 5 Vdc, 760 MHz, T_A = 25°C, 50 ohm system, in Freescale PA Driver Application Circuit)

Characteristic		Symbol	Min	Typ	Max	Unit
Small–Signal Gain (S21)		G_p	28.7	30.5	—	dB
Input Return Loss (S11)		IRL	—	–12	—	dB
Output Return Loss (S22)		ORL	—	–12	—	dB
Power Output @ 1dB Compression		P1dB	—	32.8	—	dBm
Intercept Point, Two–Tone CW		OIP3	—	43	—	dBm
Power Down Voltage	Bias “On” Bias “Off”		0 1.4	— —	1.0 2.0	V
Power Down Current	Bias “On” Bias “Off”		0 0.018	— —	0 1.38	mA
Supply Current		I_{CQ}	88	108	128	mA
Supply Voltage		V_{CC}	—	5	—	V

Table 4. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22–A114)	1C
Machine Model (per EIA/JESD22–A115)	A
Charge Device Model (per JESD22–C101)	IV

Table 5. Moisture Sensitivity Level

Test Methodology	Rating	Package Peak Temperature	Unit
Per JESD22–A113, IPC/JEDEC J–STD–020	1	260	°C

Table 6. Ordering Information

Device	Tape and Reel Information	Package
MMZ09332BT1	T1 Suffix = 1,000 Units, 12 mm Tape Width, 7–inch Reel	QFN 3 × 3

1. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf and search for AN1955.

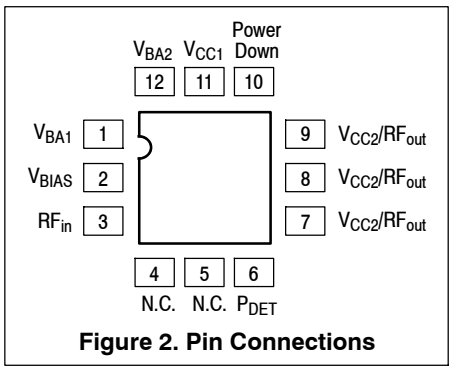


Figure 2. Pin Connections

50 OHM APPLICATION CIRCUIT: 925–960 MHz, 5 VOLT OPERATION

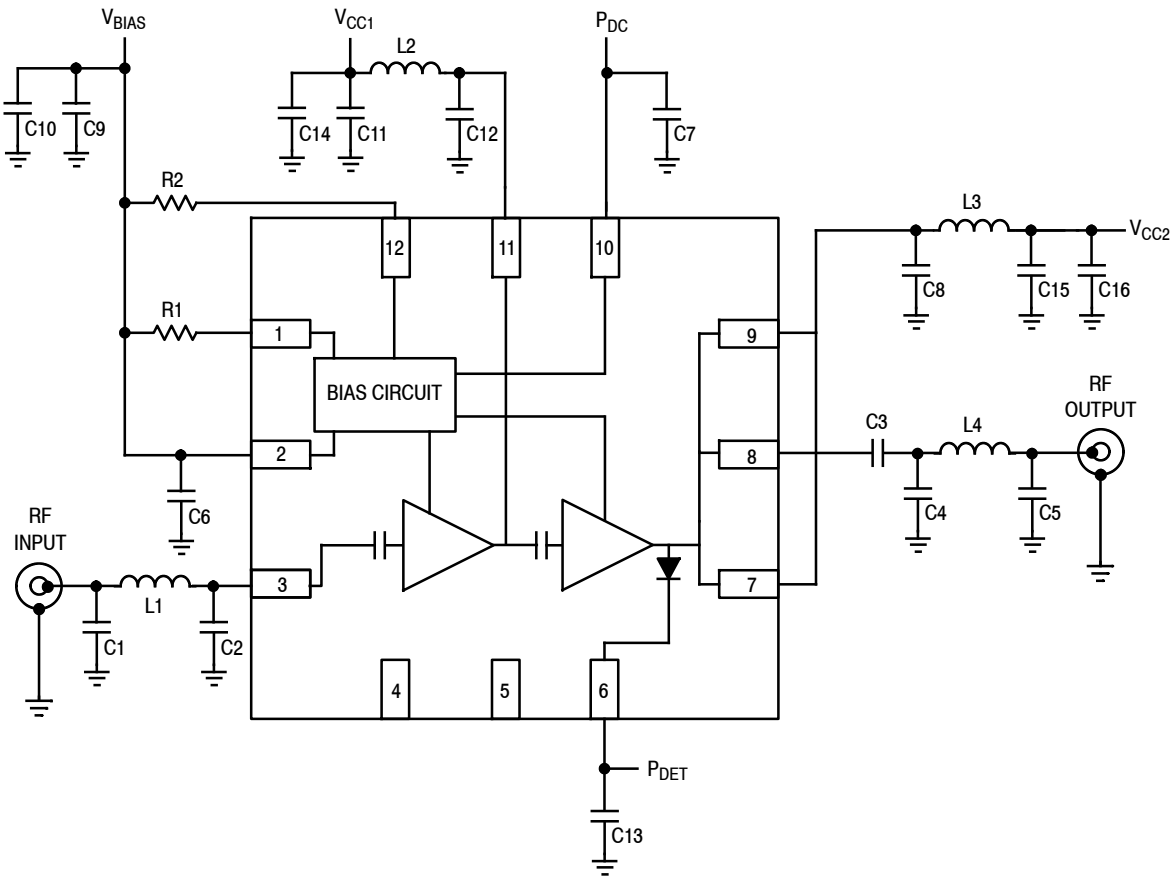
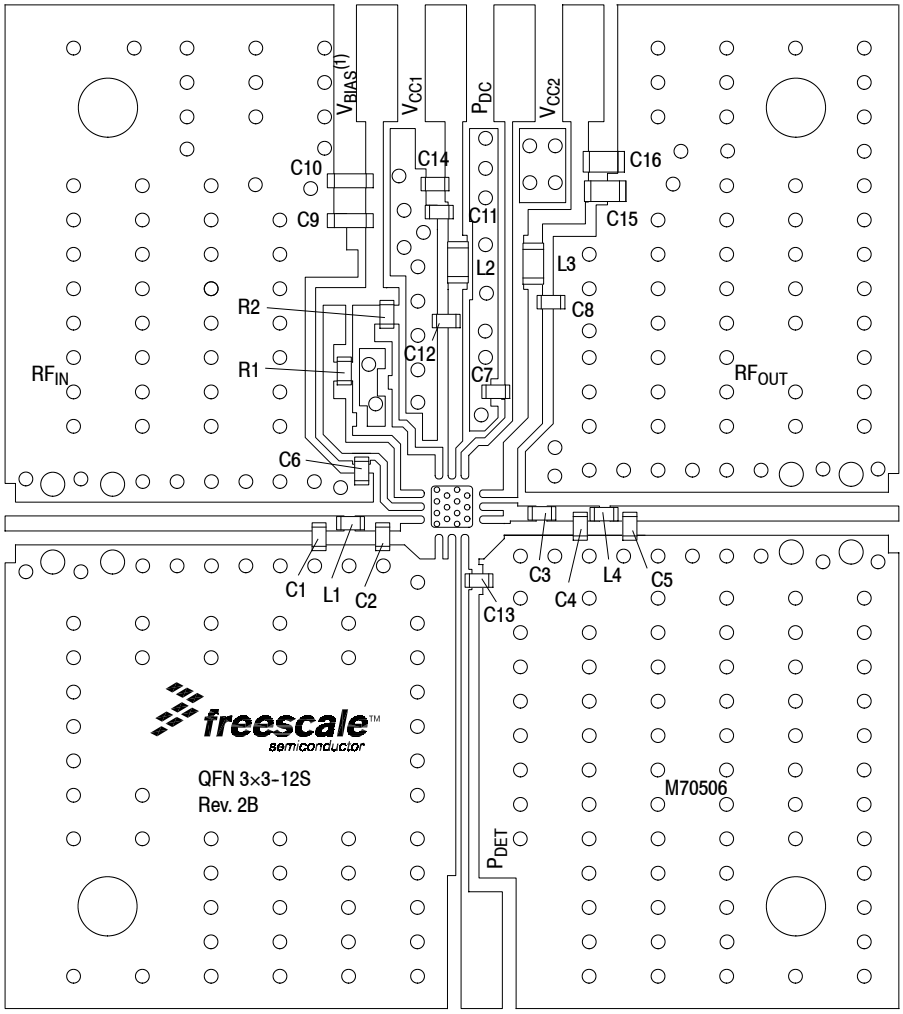


Figure 3. MMZ09332BT1 Test Circuit Schematic

Table 7. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	6.8 pF Chip Capacitor	GJM1555C1H6R8DB01ND	Murata
C2	2.4 pF Chip Capacitor	GJM1555C1H2R4DB01ND	Murata
C3	220 pF Chip Capacitor	GRM1555C1H221GA01ND	Murata
C4	4.7 pF Chip Capacitor	GJM1555C1H4R7DB01ND	Murata
C5	8.2 pF Chip Capacitor	GJM1555C1H8R2DB01ND	Murata
C6, C7, C13	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	2.2 pF Chip Capacitor	GJM1555C1H2R2DB01ND	Murata
C9, C11, C15	1000 pF Chip Capacitors	GRM1555C1H102JA01ND	Murata
C10, C14	1 μF Chip Capacitors	GRM188R61A105KE15ND	Murata
C12	3.9 pF Chip Capacitor	GJM1555C1H3R9DB01ND	Murata
C16	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	3.3 nH Chip Inductor	0402CS-3N3XJLU	Coilcraft
L2, L3	22 nH Chip Inductors	LL1608-FH22NK	Toko
L4	1.8 nH Chip Inductor	0402CS-1N8XJLW	Coilcraft
R1	1.1 KΩ, 1/16 W Chip Resistor	RC0402JR-071K1P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

50 OHM APPLICATION CIRCUIT: 925–960 MHz, 5 VOLT OPERATION



PCB actual size: 1.3″ × 1.46″.
(1) V_{BIAS} [Board] supplies V_{BA1}, V_{BA2} and V_{BIAS} [Device].

Figure 4. MMZ09332BT1 Test Circuit Component Layout

Table 7. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
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C2	2.4 pF Chip Capacitor	GJM1555C1H2R4DB01ND	Murata
C3	220 pF Chip Capacitor	GRM1555C1H221GA01ND	Murata
C4	4.7 pF Chip Capacitor	GJM1555C1H4R7DB01ND	Murata
C5	8.2 pF Chip Capacitor	GJM1555C1H8R2DB01ND	Murata
C6, C7, C13	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	2.2 pF Chip Capacitor	GJM1555C1H2R2DB01ND	Murata
C9, C11, C15	1000 pF Chip Capacitors	GRM1555C1H102JA01ND	Murata
C10, C14	1 μF Chip Capacitors	GRM188R61A105KE15ND	Murata
C12	3.9 pF Chip Capacitor	GJM1555C1H3R9DB01ND	Murata
C16	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	3.3 nH Chip Inductor	0402CS-3N3XJLU	Coilcraft
L2, L3	22 nH Chip Inductors	LL1608-FH22NK	Toko
L4	1.8 nH Chip Inductor	0402CS-1N8XJLW	Coilcraft
R1	1.1 KΩ, 1/16 W Chip Resistor	RC0402JR-071K1P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

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

50 OHM APPLICATION CIRCUIT: 925–960 MHz, 5 VOLT OPERATION

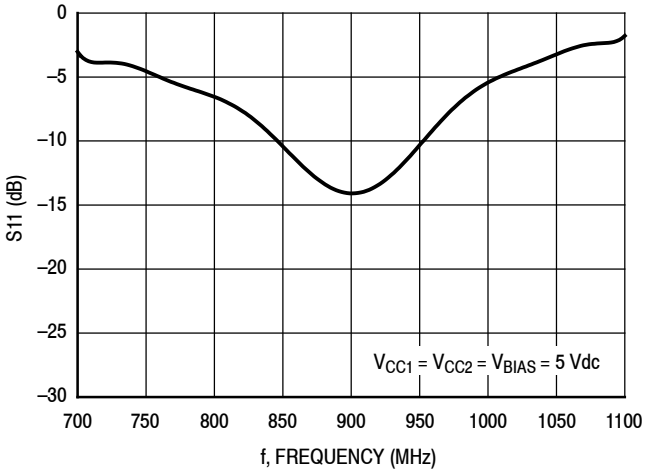


Figure 5. S11 versus Frequency

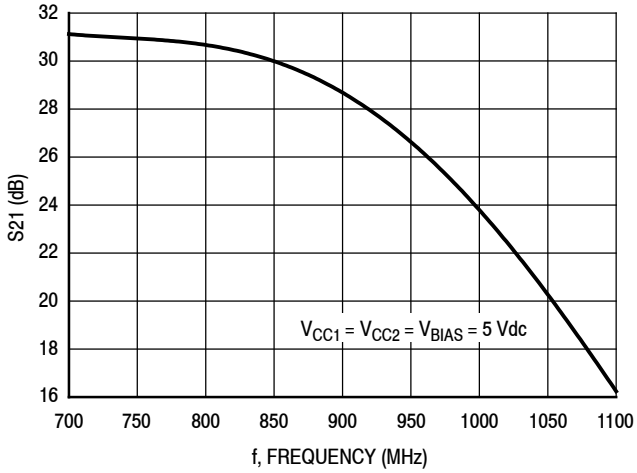


Figure 6. S21 versus Frequency

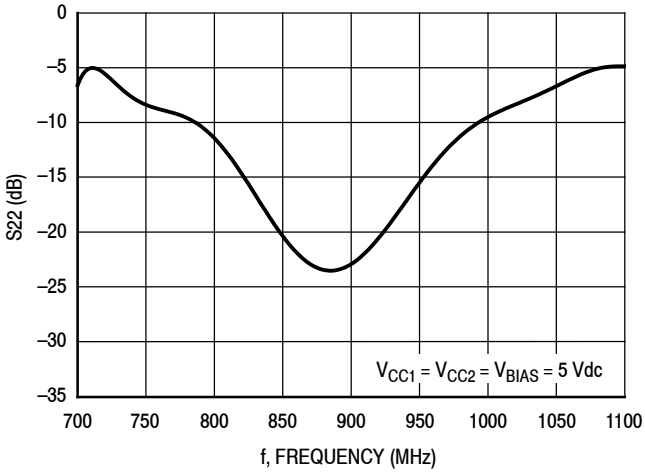


Figure 7. S22 versus Frequency

50 OHM APPLICATION CIRCUIT: 925–960 MHz, 5 VOLT OPERATION

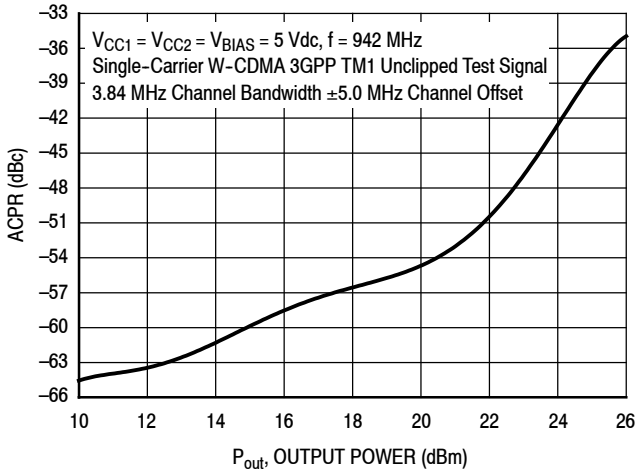


Figure 8. ACPR versus Output Power

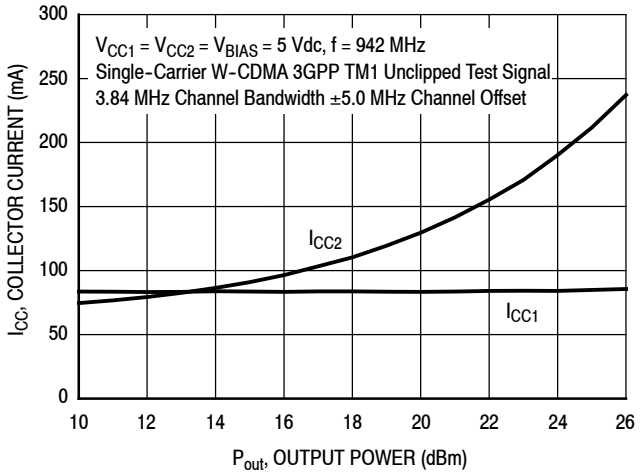


Figure 9. Stage Collector Current versus Output Power

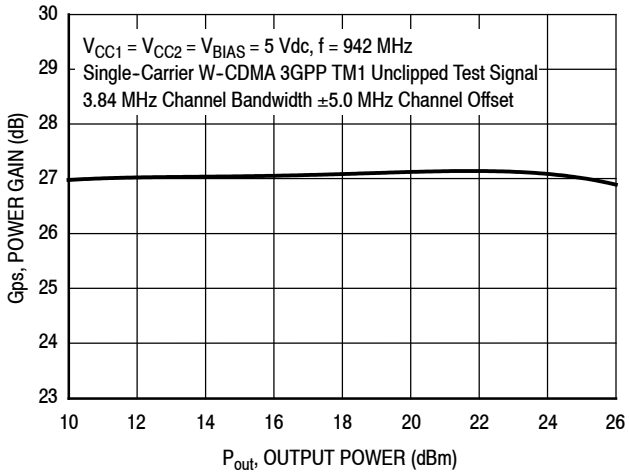


Figure 10. Power Gain versus Output Power

50 OHM APPLICATION CIRCUIT: 728–768 MHz, 5 VOLT OPERATION

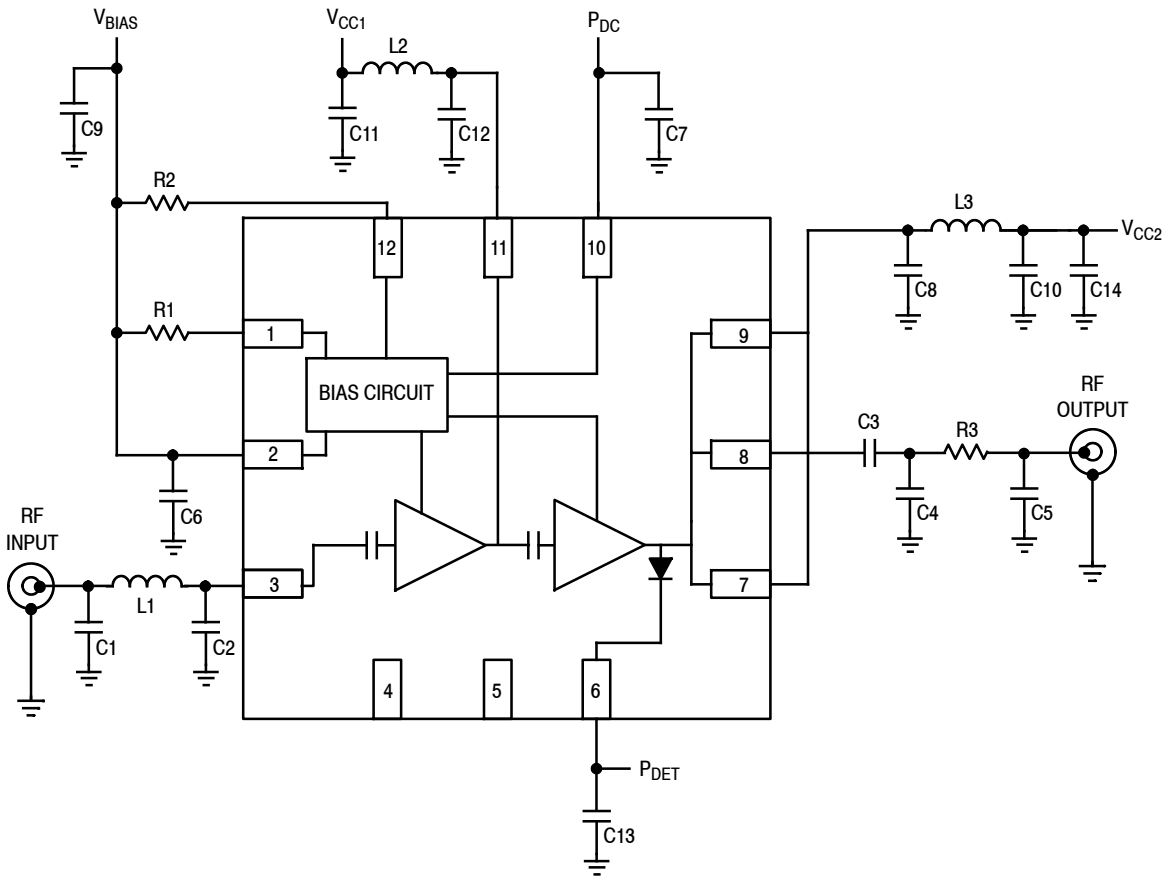
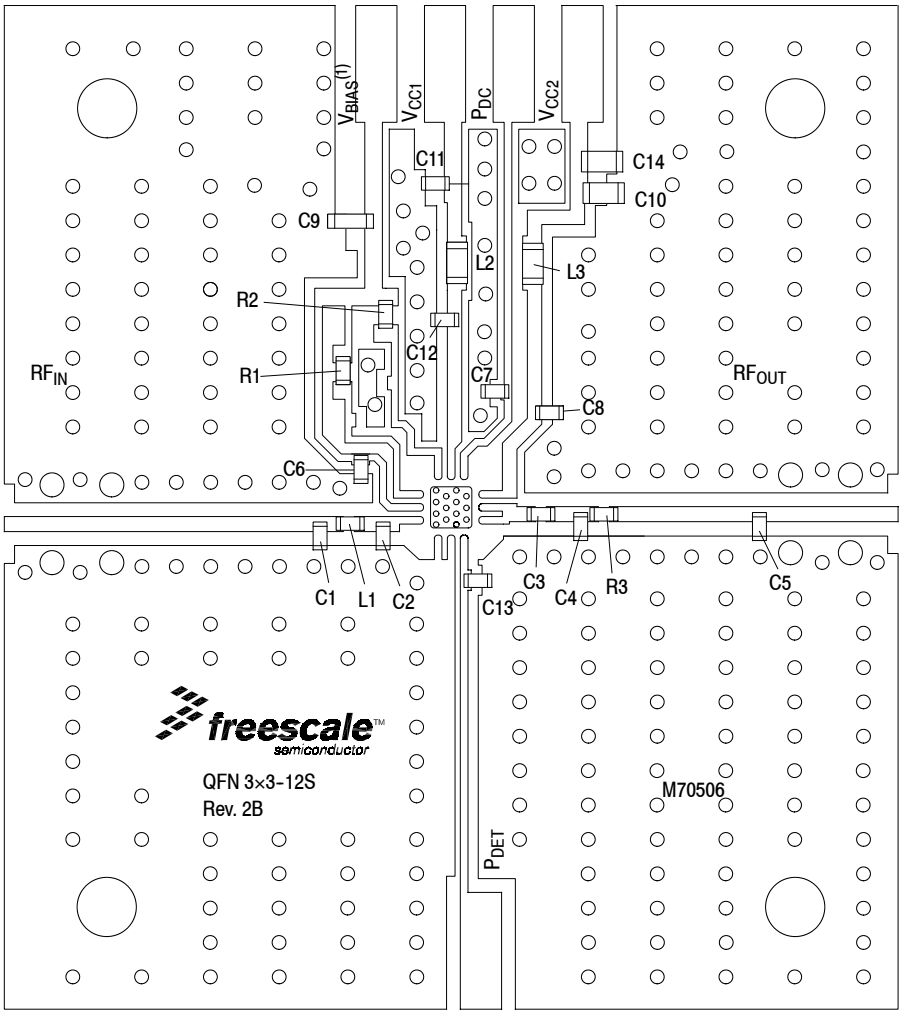


Figure 11. MMZ09332BT1 Test Circuit Schematic

Table 8. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C12	7.5 pF Chip Capacitors	04023J7R5BBS	AVX
C2	2.4 pF Chip Capacitor	04023J2R4BBS	AVX
C3	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C4	4.7 pF Chip Capacitor	04023J4R7BBS	AVX
C5	12 pF Chip Capacitor	04025A120JAT2A	AVX
C6, C7, C13	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	6.8 pF Chip Capacitor	06033J6R8BBS	Murata
C9, C11	1 μF Chip Capacitors	GRM155R61A105KE15ND	Murata
C10	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
C14	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	5.6 nH Chip Inductor	LL1005-FHL5N6S	Toko
L2	22 nH Chip Inductor	LL1608-FH22N0K	Toko
L3	18 nH Chip Inductor	0603HC-18NXJLW	Coilcraft
R1	1.1 KΩ Chip Resistor	RC0402JR-071K1P	Yageo
R2	2.0 KΩ Chip Resistor	RC0402JR-072KP	Yageo
R3	0 Ω Chip Resistor	RC0402JR-070RP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

50 OHM APPLICATION CIRCUIT: 728–768 MHz, 5 VOLT OPERATION



PCB actual size: 1.3″ × 1.46″.
(1) V_{BIAS} [Board] supplies V_{BA1}, V_{BA2} and V_{BIAS} [Device].

Figure 12. MMZ09332BT1 Test Circuit Component Layout

Table 8. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C12	7.5 pF Chip Capacitors	04023J7R5BBS	AVX
C2	2.4 pF Chip Capacitor	04023J2R4BBS	AVX
C3	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C4	4.7 pF Chip Capacitor	04023J4R7BBS	AVX
C5	12 pF Chip Capacitor	04025A120JAT2A	AVX
C6, C7, C13	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	6.8 pF Chip Capacitor	06033J6R8BBS	Murata
C9, C11	1 μF Chip Capacitors	GRM155R61A105KE15ND	Murata
C10	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
C14	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	5.6 nH Chip Inductor	LL1005-FHL5N6S	Toko
L2	22 nH Chip Inductor	LL1608-FH22N0K	Toko
L3	18 nH Chip Inductor	0603HC-18NXJLW	Coilcraft
R1	1.1 KΩ Chip Resistor	RC0402JR-071K1P	Yageo
R2	2.0 KΩ Chip Resistor	RC0402JR-072KP	Yageo
R3	0 Ω Chip Resistor	RC0402JR-070RP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

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

50 OHM APPLICATION CIRCUIT: 728–768 MHz, 5 VOLT OPERATION

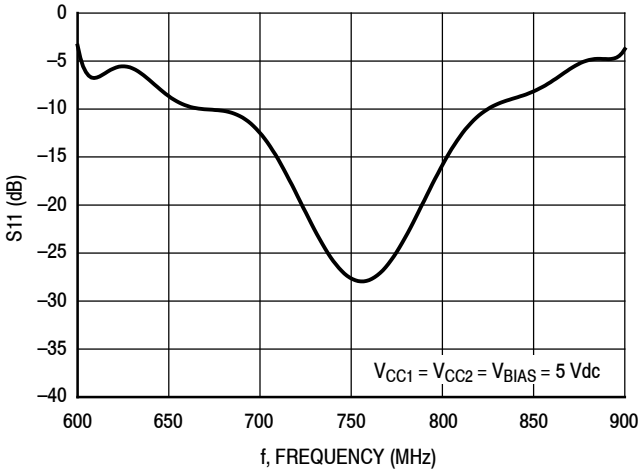


Figure 13. S11 versus Frequency

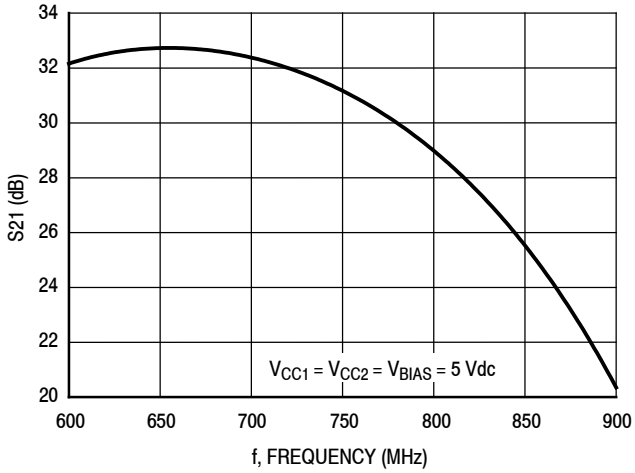


Figure 14. S21 versus Frequency

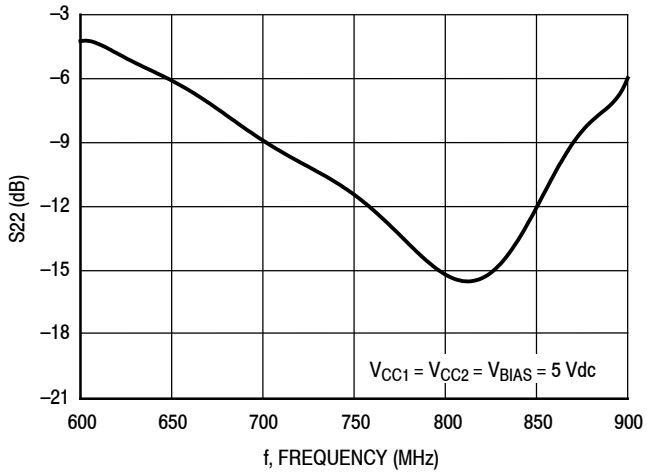


Figure 15. S22 versus Frequency

50 OHM APPLICATION CIRCUIT: 728–768 MHz, 5 VOLT OPERATION

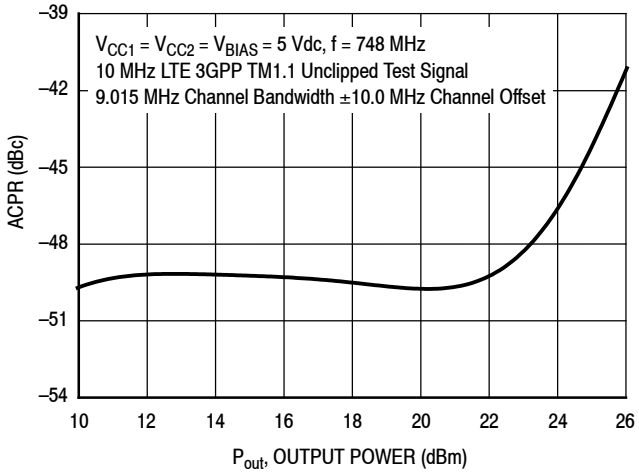


Figure 16. ACPR versus Output Power

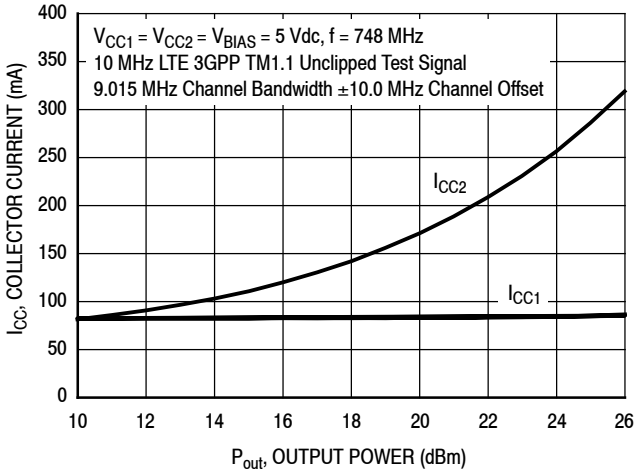


Figure 17. Stage Collector Current versus Output Power

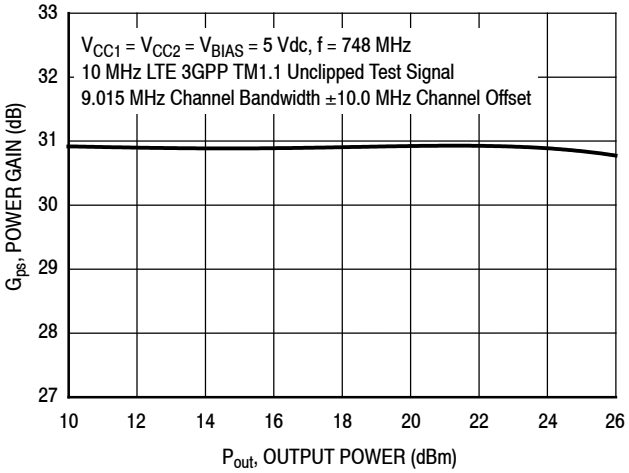


Figure 18. Power Gain versus Output Power

50 OHM APPLICATION CIRCUIT: 760–870 MHz, 5 VOLT OPERATION

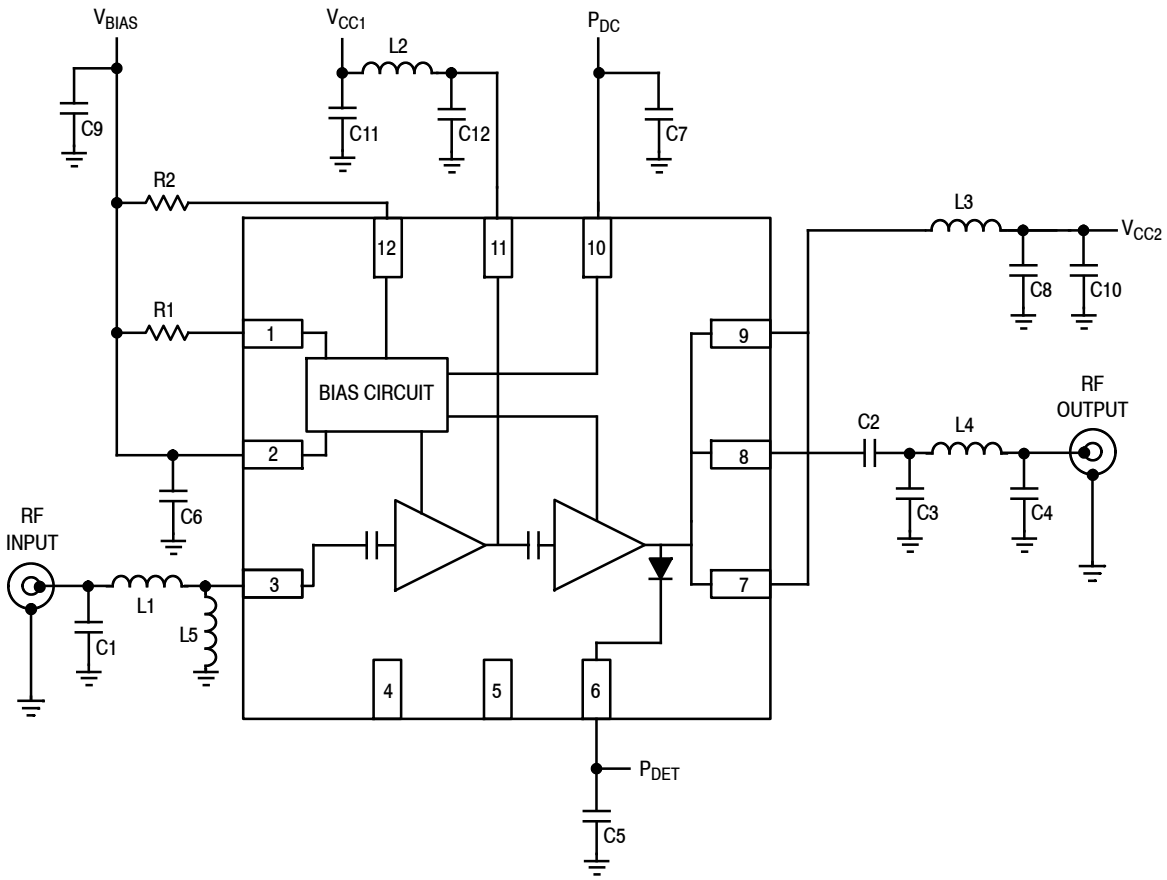
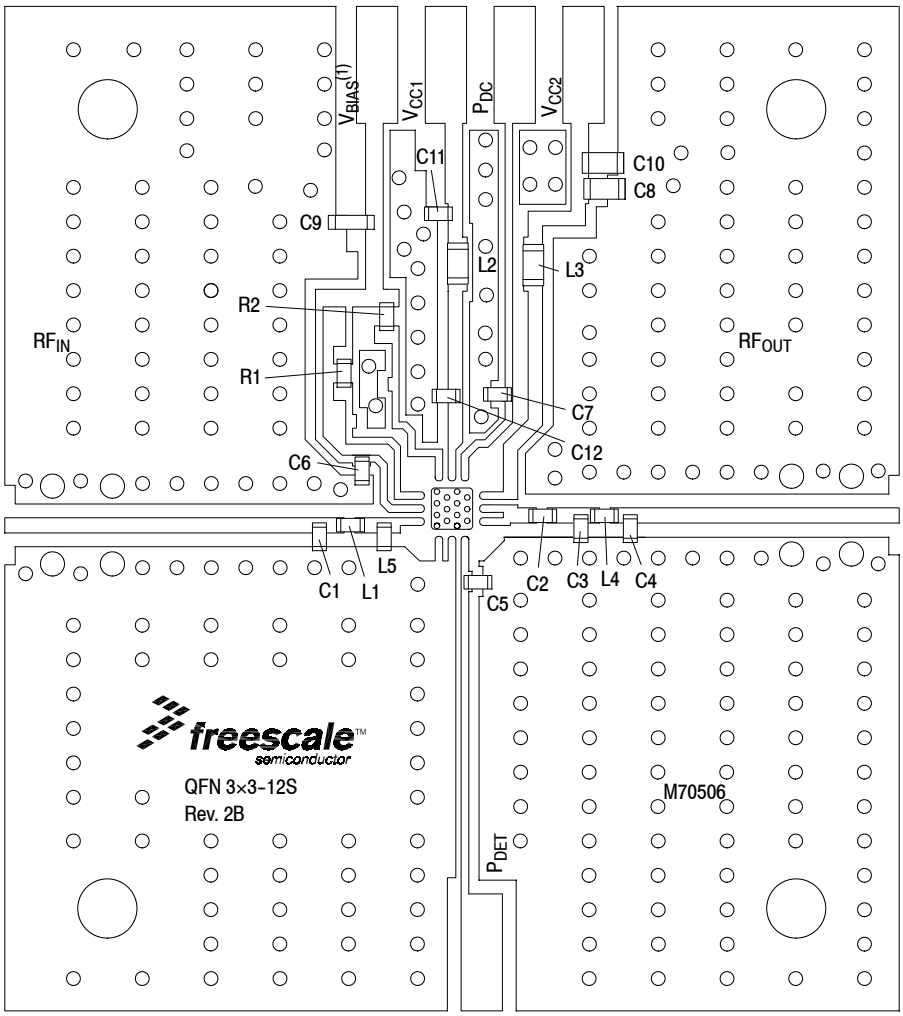


Figure 19. MMZ09332BT1 Test Circuit Schematic

Table 9. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	5.6 pF Chip Capacitor	GJM1555C1H5R6JB01ND	Murata
C2	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C3	4.7 pF Chip Capacitor	GJM1555C1H4R7DB01ND	Murata
C4	10 pF Chip Capacitor	GJM1555C1H100JB01ND	Murata
C5, C6, C7	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
C9, C11	1 μF Chip Capacitors	GRM188R61A105KA61ND	Murata
C10	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
C12	3.3 pF Chip Capacitor	GJM1555C1H3R3CB01ND	Murata
L1	4.7 nH Chip Inductor	LL1005-FHL4N7S	Toko
L2	12 nH Chip Inductor	LL1608-FH12N0K	Toko
L3	22 nH Chip Inductor	0603HC-22NXJLW	Coilcraft
L4	2.2 nH Chip Inductor	LL1608-FH2N2K	Toko
L5	5.6 nH Chip Inductor	LL1005-FHL5N6S	Toko
R1	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

50 OHM APPLICATION CIRCUIT: 760–870 MHz, 5 VOLT OPERATION



PCB actual size: 1.3″ × 1.46″.
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Figure 20. MMZ09332BT1 Test Circuit Component Layout

Table 9. MMZ09332BT1 Test Circuit Component Designations and Values

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C2	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C3	4.7 pF Chip Capacitor	GJM1555C1H4R7DB01ND	Murata
C4	10 pF Chip Capacitor	GJM1555C1H100JB01ND	Murata
C5, C6, C7	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
C9, C11	1 μF Chip Capacitors	GRM188R61A105KA61ND	Murata
C10	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
C12	3.3 pF Chip Capacitor	GJM1555C1H3R3CB01ND	Murata
L1	4.7 nH Chip Inductor	LL1005-FHL4N7S	Toko
L2	12 nH Chip Inductor	LL1608-FH12N0K	Toko
L3	22 nH Chip Inductor	0603HC-22NXJLW	Coilcraft
L4	2.2 nH Chip Inductor	LL1608-FH2N2K	Toko
L5	5.6 nH Chip Inductor	LL1005-FHL5N6S	Toko
R1	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

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

50 OHM APPLICATION CIRCUIT: 760–870 MHz, 5 VOLT OPERATION

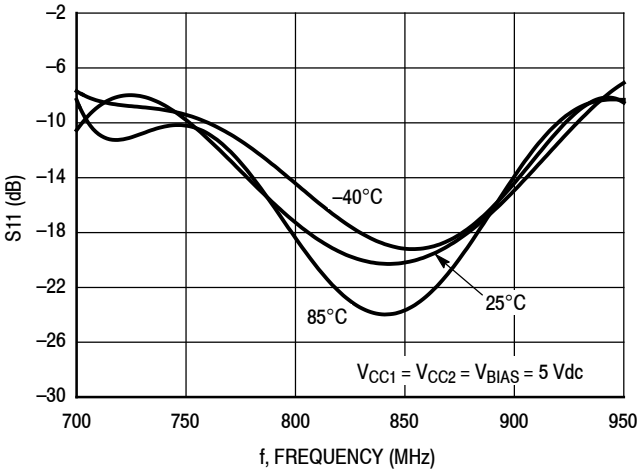


Figure 21. S11 versus Frequency versus Temperature

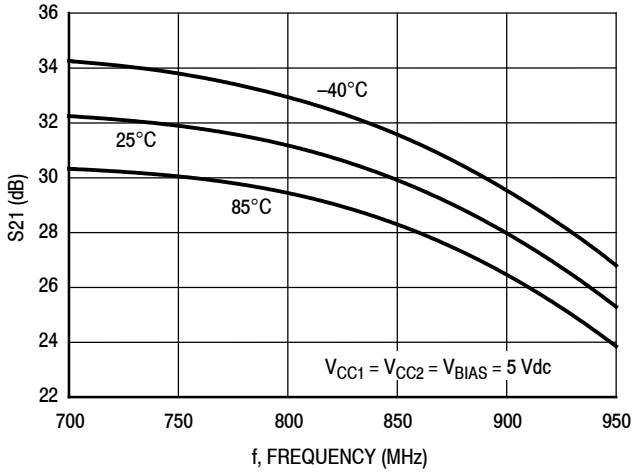


Figure 22. S21 versus Frequency versus Temperature

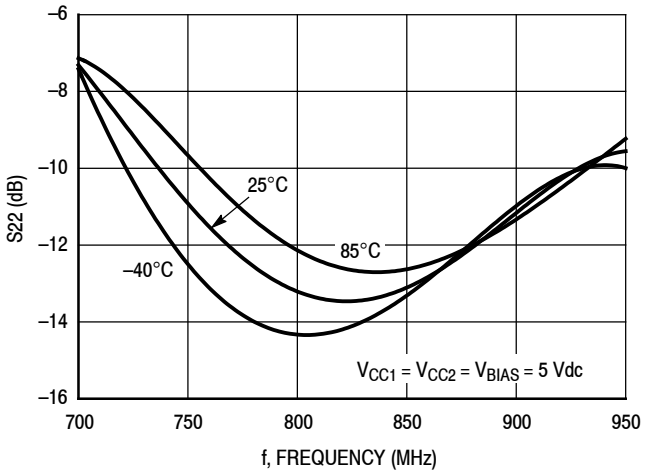


Figure 23. S22 versus Frequency versus Temperature

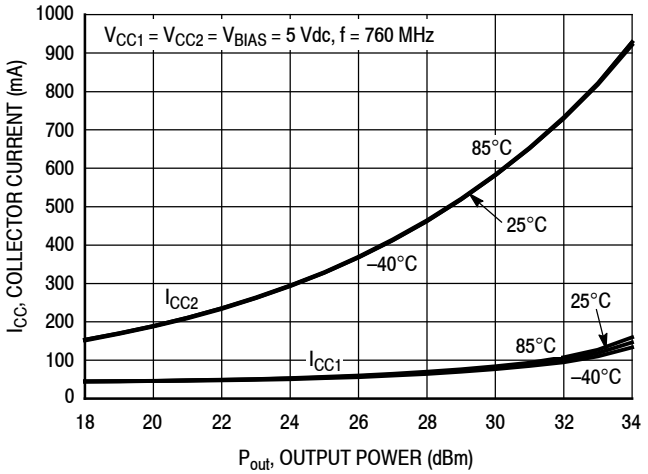


Figure 24. Stage Collector Current versus Output Power versus Temperature

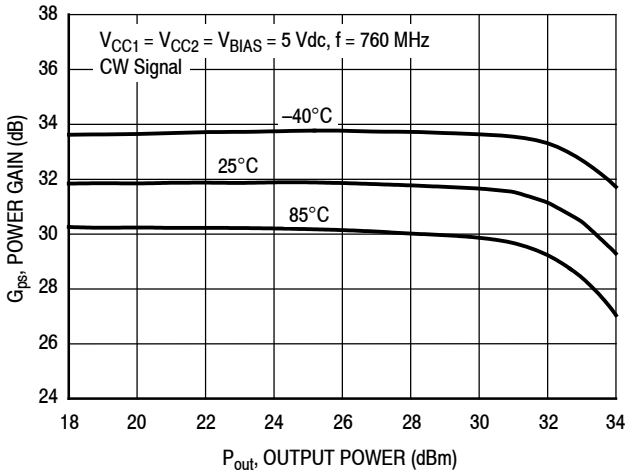


Figure 25. Power Gain versus Output Power versus Temperature

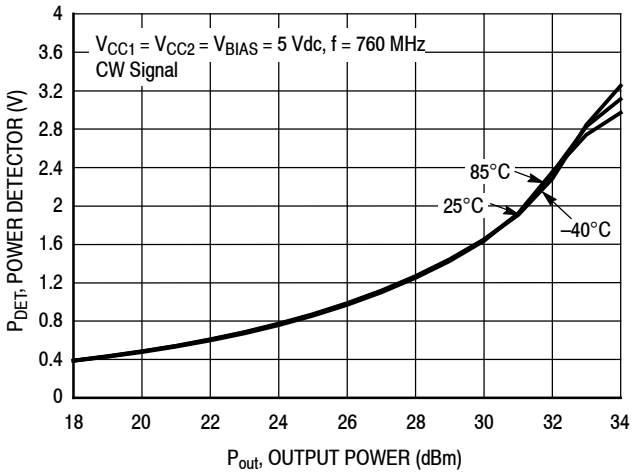


Figure 26. Power Detector versus Output Power versus Temperature

50 OHM APPLICATION CIRCUIT: 400–500 MHz, 5 VOLT OPERATION

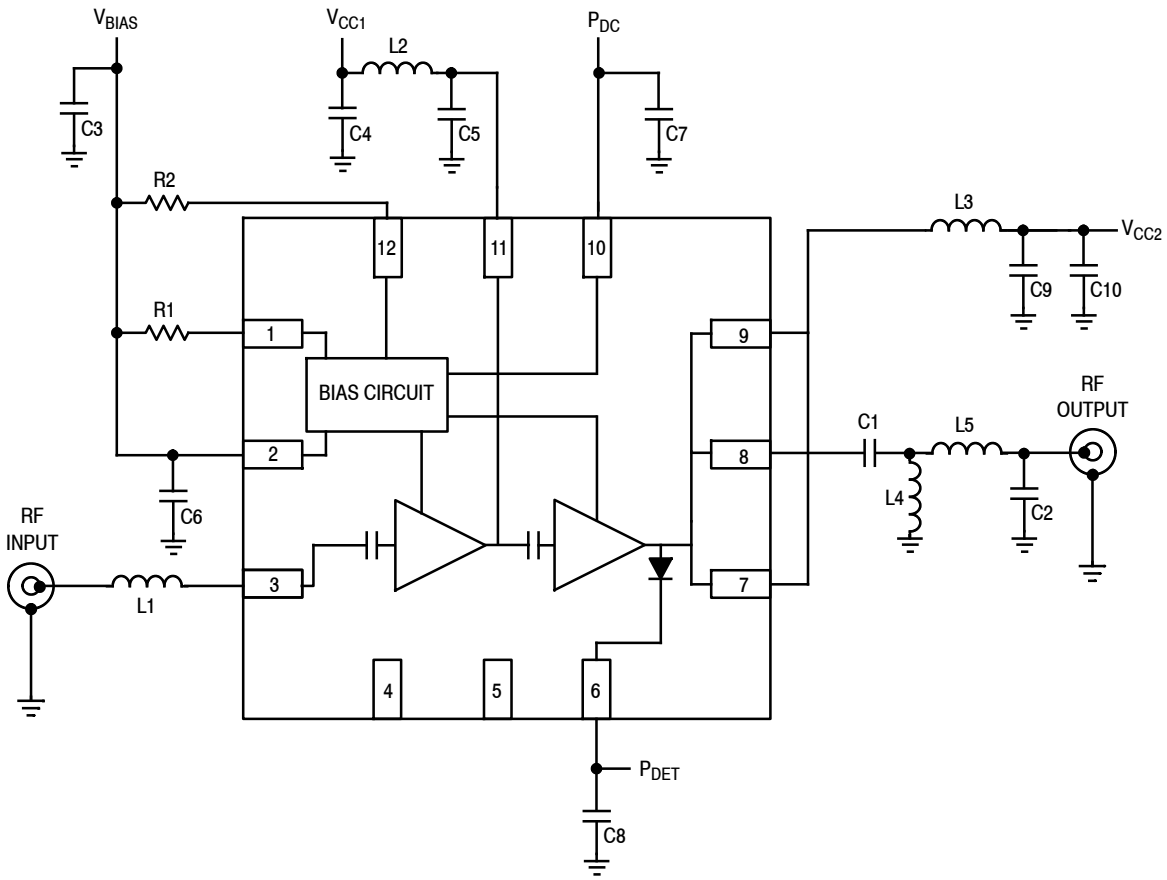
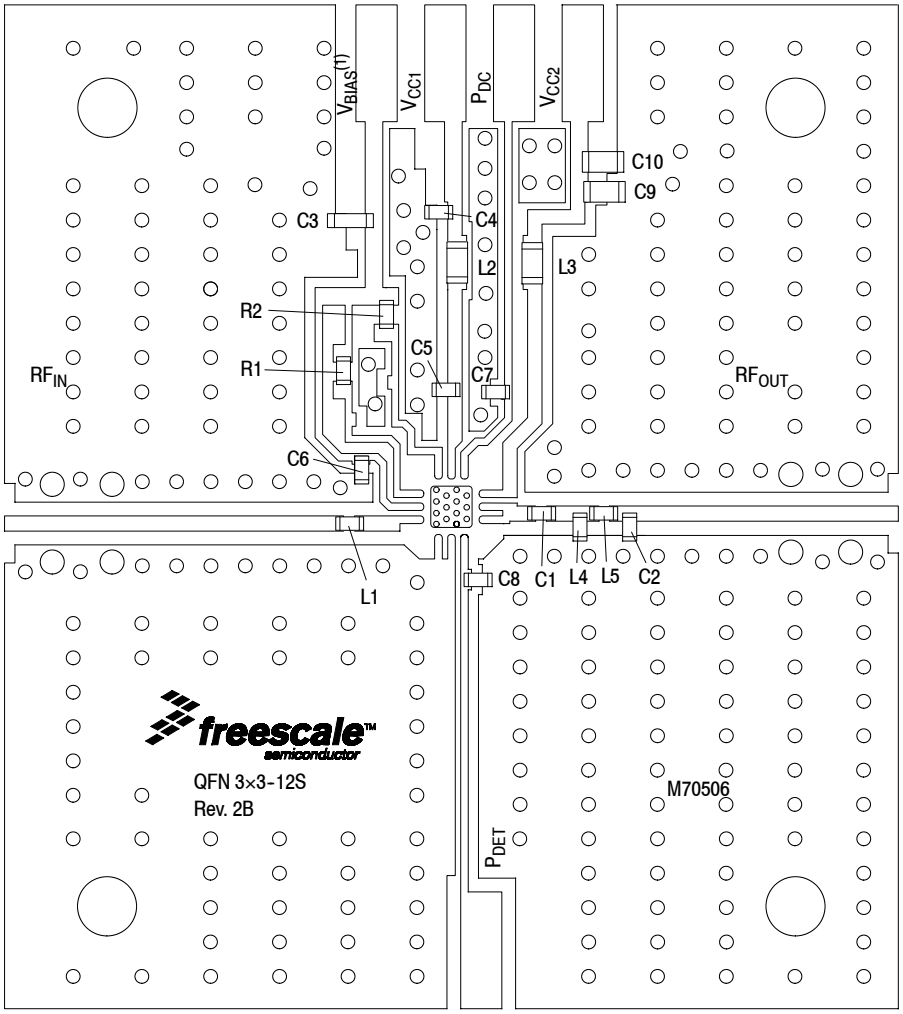


Figure 27. MMZ09332BT1 Test Circuit Schematic

Table 10. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C2	18 pF Chip Capacitor	06033J180GBT2A	AVX
C3, C4	1 uF Chip Capacitors	GRM188R61A105KE15ND	Murata
C5	2.4 pF Chip Capacitor	04023J2R4BBS	AVX
C6, C7, C8	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C9	1000 pF Chip Capacitor	GRM1555C1H102JA01ND	Murata
C10	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	3.9 nH Chip Inductor	LL1608-FH3N9K	Toko
L2	5.6 nH Chip Inductor	LL1608-FH5N6K	Toko
L3	12 nH Chip Inductor	LL1608-FH12NK	Toko
L4	22 nH Chip Inductor	LL1608-FH22NK	Toko
L5	5.6 nH Chip Inductor	LL1608-FH5N6K	Toko
R1	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

50 OHM APPLICATION CIRCUIT: 400–500 MHz, 5 VOLT OPERATION



PCB actual size: 1.3″ × 1.46″.
(1) V_{BIAS} [Board] supplies V_{BA1}, V_{BA2} and V_{BIAS} [Device].

Figure 28. MMZ09332BT1 Test Circuit Component Layout

Table 10. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C2	18 pF Chip Capacitor	06033J180GBT2A	AVX
C3, C4	1 uF Chip Capacitors	GRM188R61A105KE15ND	Murata
C5	2.4 pF Chip Capacitor	04023J2R4BBS	AVX
C6, C7, C8	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C9	1000 pF Chip Capacitor	GRM1555C1H102JA01ND	Murata
C10	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
L1	3.9 nH Chip Inductor	LL1608-FH3N9K	Toko
L2	5.6 nH Chip Inductor	LL1608-FH5N6K	Toko
L3	12 nH Chip Inductor	LL1608-FH12NK	Toko
L4	22 nH Chip Inductor	LL1608-FH22NK	Toko
L5	5.6 nH Chip Inductor	LL1608-FH5N6K	Toko
R1	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
R2	2.0 KΩ, 1/16 W Chip Resistor	RC0402JR-072KP	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

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

50 OHM APPLICATION CIRCUIT: 400–500 MHz, 5 VOLT OPERATION

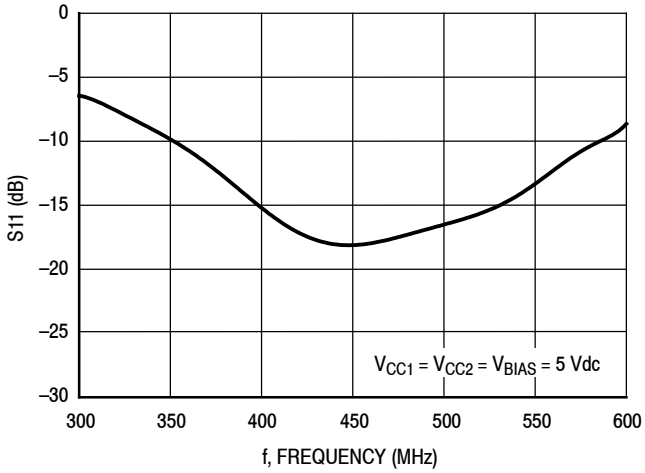


Figure 29. S11 versus Frequency

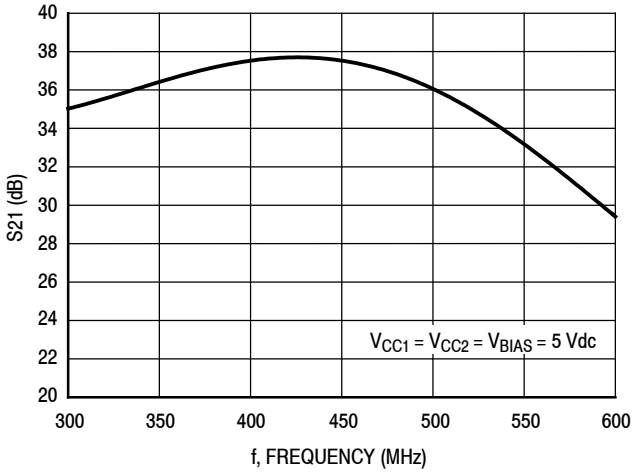


Figure 30. S21 versus Frequency

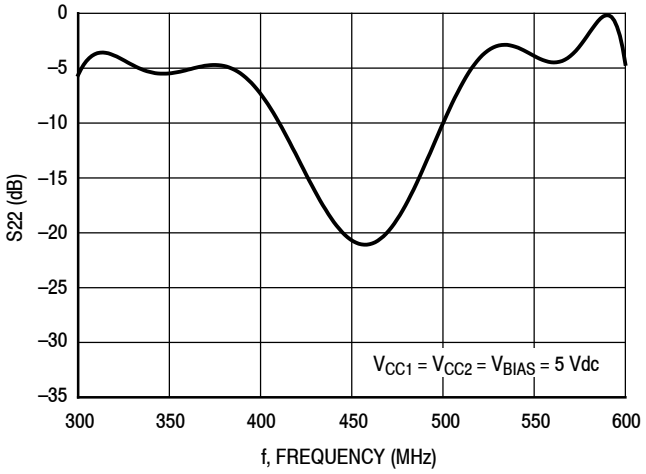


Figure 31. S22 versus Frequency

50 OHM APPLICATION CIRCUIT: 400–500 MHz, 5 VOLT OPERATION

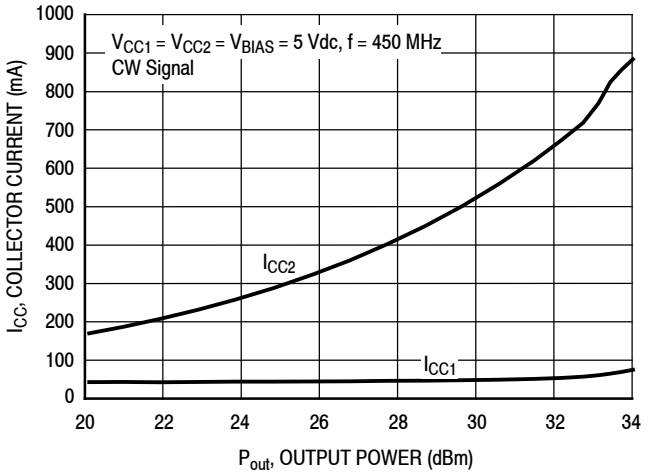


Figure 32. Stage Collector Current versus Output Power

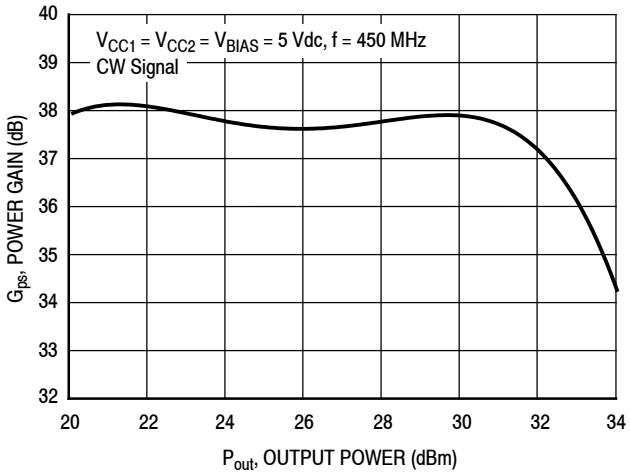


Figure 33. Power Gain versus Output Power

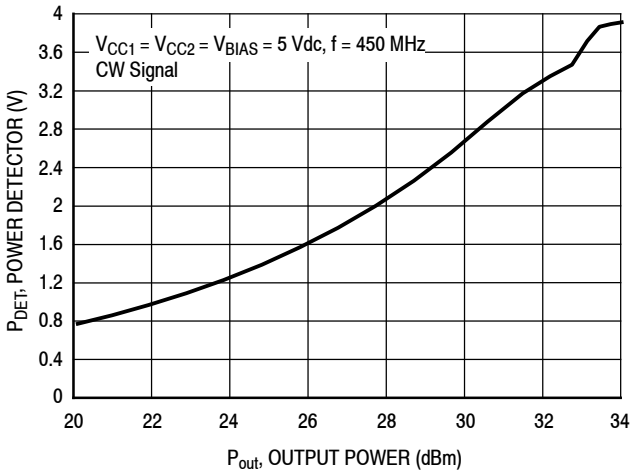


Figure 34. Power Detector versus Output Power

50 OHM APPLICATION CIRCUIT: 136–174 MHz, 5 VOLT OPERATION

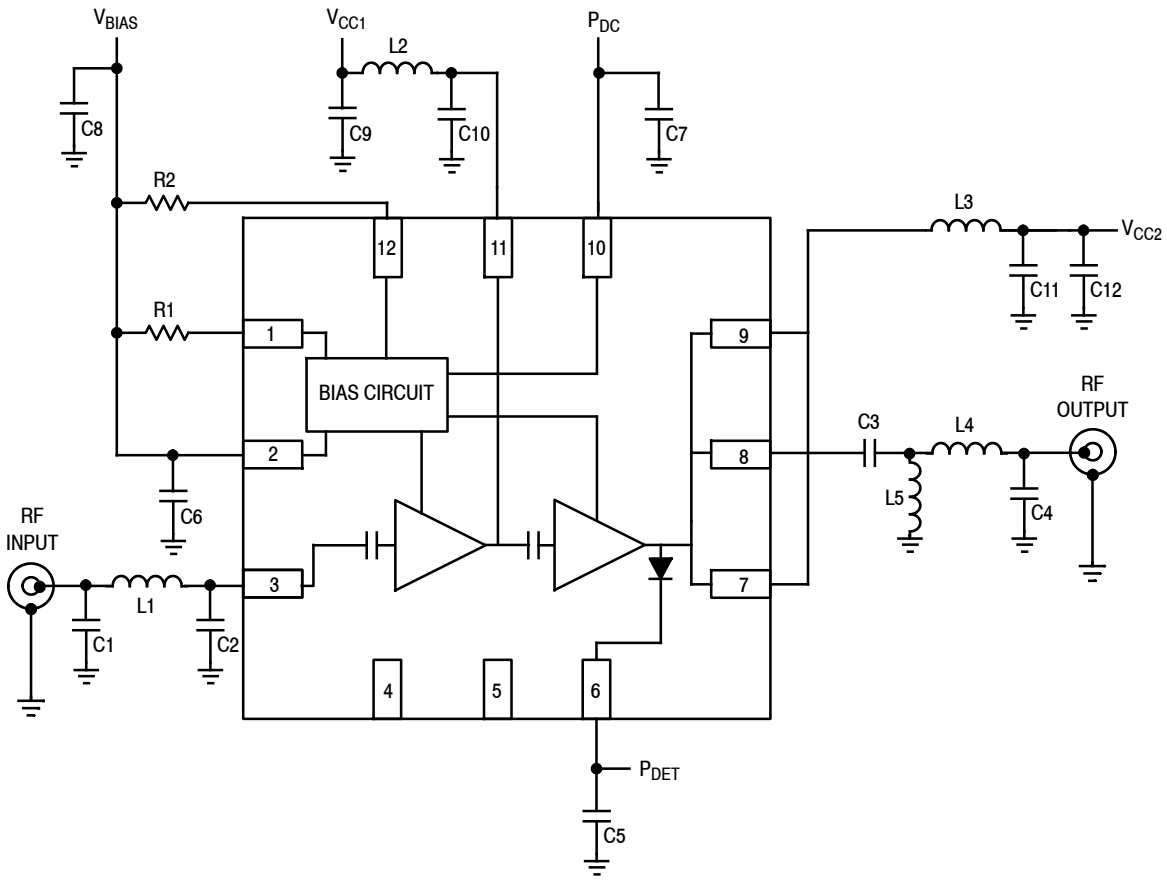
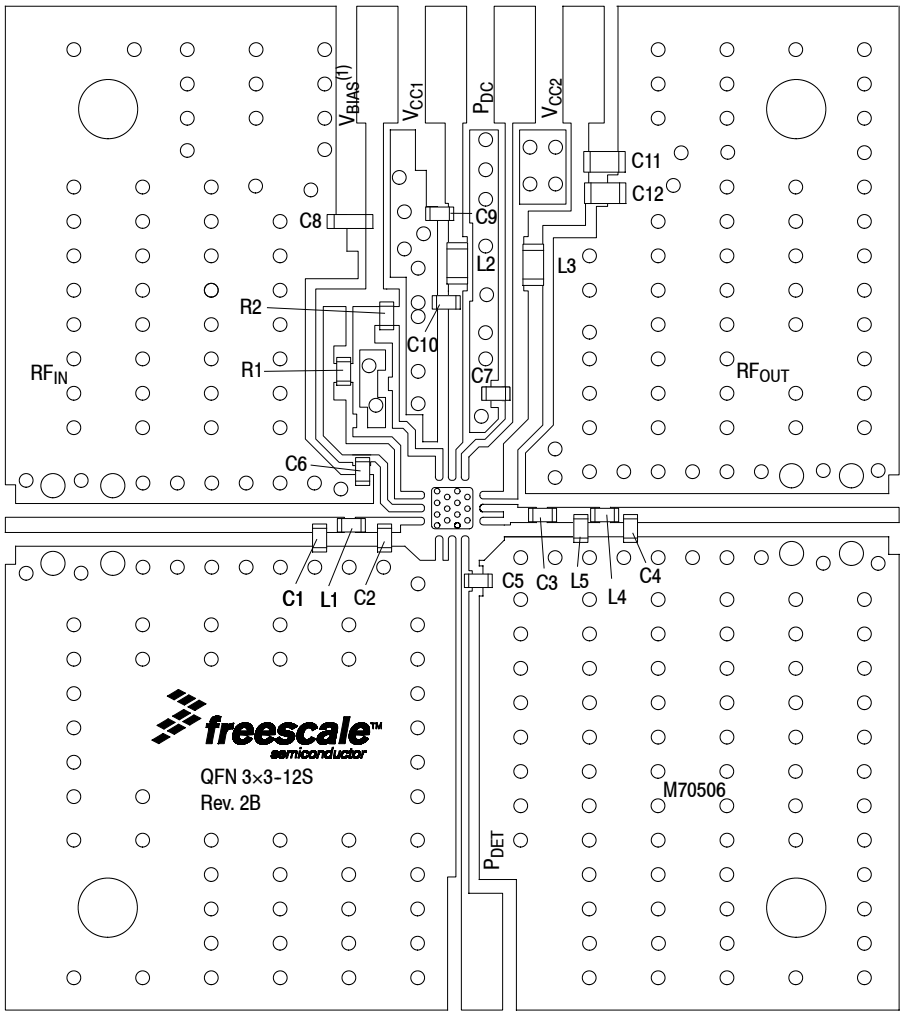


Figure 35. MMZ09332BT1 Test Circuit Schematic

Table 11. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	15 pF Chip Capacitor	GJM1555C1H150JB01ND	Murata
C2	27 pF Chip Capacitor	GJM1555C1H270JB01ND	Murata
C3	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C4	33 pF Chip Capacitor	GJM1555C1H330JB01ND	Murata
C5, C6, C7	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8, C9	1 μF Chip Capacitors	GRM188R61A105KA61ND	Murata
C10	3.3 pF Chip Capacitor	GJM1555C1H3R3CB01ND	Murata
C11	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
C12	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
L1	22 nH Chip Inductor	LL1005-FH22NK	Toko
L2, L3	33 nH Chip Inductors	LL1608-FH33NK	Toko
L4	33 nH Chip Inductor	LL1608-FSL33NJ	Toko
L5	33 nH Chip Inductor	LL1005-FH33NK	Toko
R1	2.2 KΩ, 1/16 W Chip Resistor	RC0402JR-072K2P	Yageo
R2	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

50 OHM APPLICATION CIRCUIT: 136–174 MHz, 5 VOLT OPERATION



PCB actual size: 1.3″ × 1.46″.

(1) V_{BIAS} [Board] supplies V_{BA1}, V_{BA2} and V_{BIAS} [Device].

Figure 36. MMZ09332BT1 Test Circuit Component Layout

Table 11. MMZ09332BT1 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	15 pF Chip Capacitor	GJM1555C1H150JB01ND	Murata
C2	27 pF Chip Capacitor	GJM1555C1H270JB01ND	Murata
C3	220 pF Chip Capacitor	GRM1555C1H221JA01ND	Murata
C4	33 pF Chip Capacitor	GJM1555C1H330JB01ND	Murata
C5, C6, C7	100 pF Chip Capacitors	GRM1555C1H101JA01ND	Murata
C8, C9	1 μF Chip Capacitors	GRM188R61A105KA61ND	Murata
C10	3.3 pF Chip Capacitor	GJM1555C1H3R3CB01ND	Murata
C11	4.7 μF Chip Capacitor	GRM188R60J475KE19ND	Murata
C12	1000 pF Chip Capacitor	GRM155R71H102KA01ND	Murata
L1	22 nH Chip Inductor	LL1005-FH22NK	Toko
L2, L3	33 nH Chip Inductors	LL1608-FH33NK	Toko
L4	33 nH Chip Inductor	LL1608-FSL33NJ	Toko
L5	33 nH Chip Inductor	LL1005-FH33NK	Toko
R1	2.2 KΩ, 1/16 W Chip Resistor	RC0402JR-072K2P	Yageo
R2	1.8 KΩ, 1/16 W Chip Resistor	RC0402JR-071K8P	Yageo
PCB	Rogers RO4350B, 0.010″, ε_r = 3.66	M70506	MTL

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

50 OHM APPLICATION CIRCUIT: 136–174 MHz, 5 VOLT OPERATION

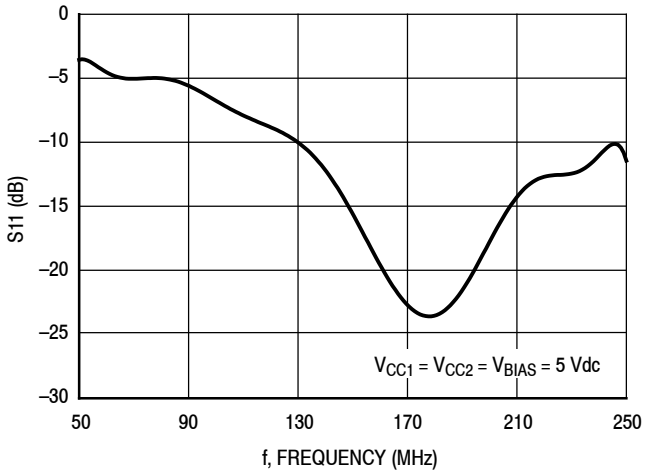


Figure 37. S11 versus Frequency

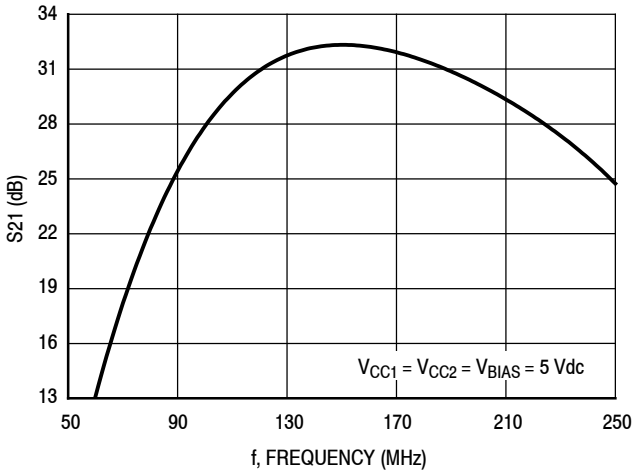


Figure 38. S21 versus Frequency

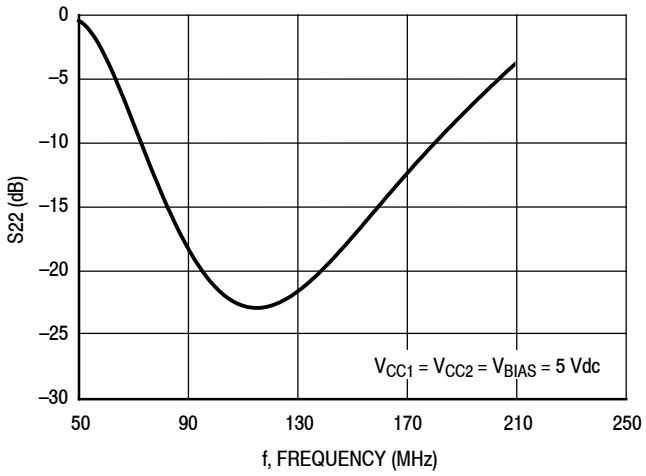


Figure 39. S22 versus Frequency

50 OHM APPLICATION CIRCUIT: 136–174 MHz, 5 VOLT OPERATION

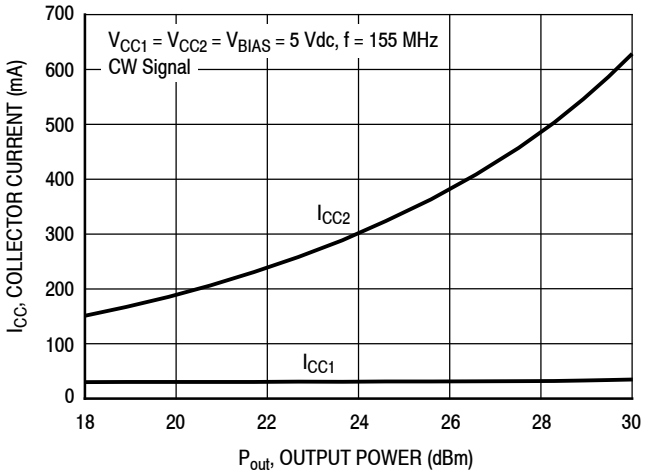


Figure 40. Stage Collector Current versus Output Power

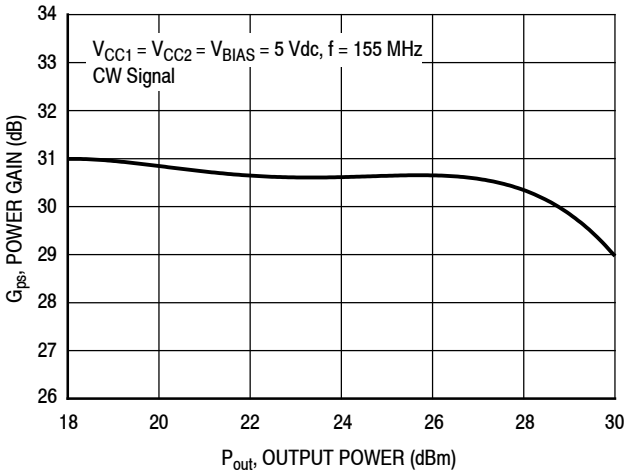


Figure 41. Power Gain versus Output Power

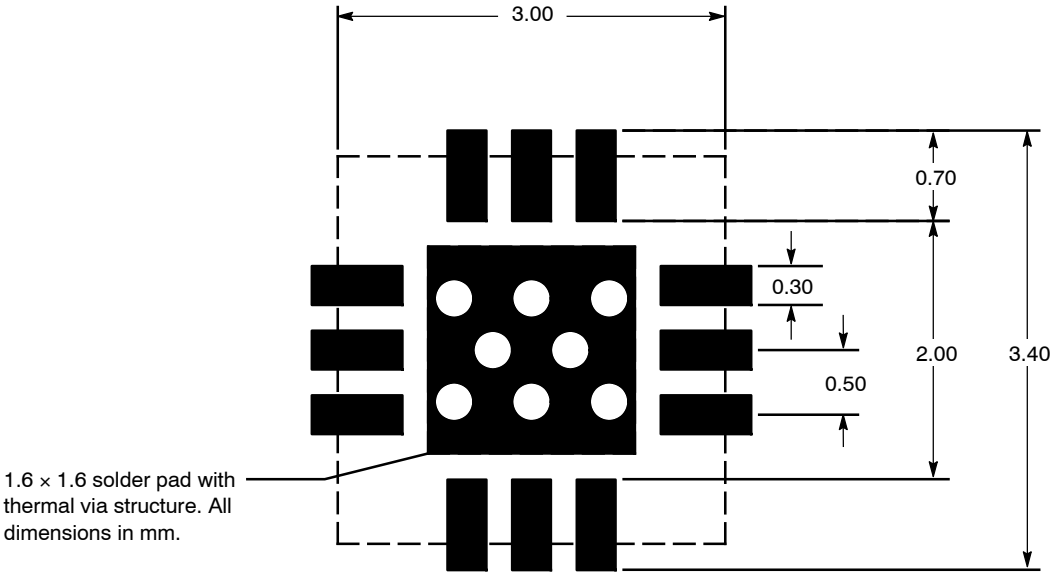
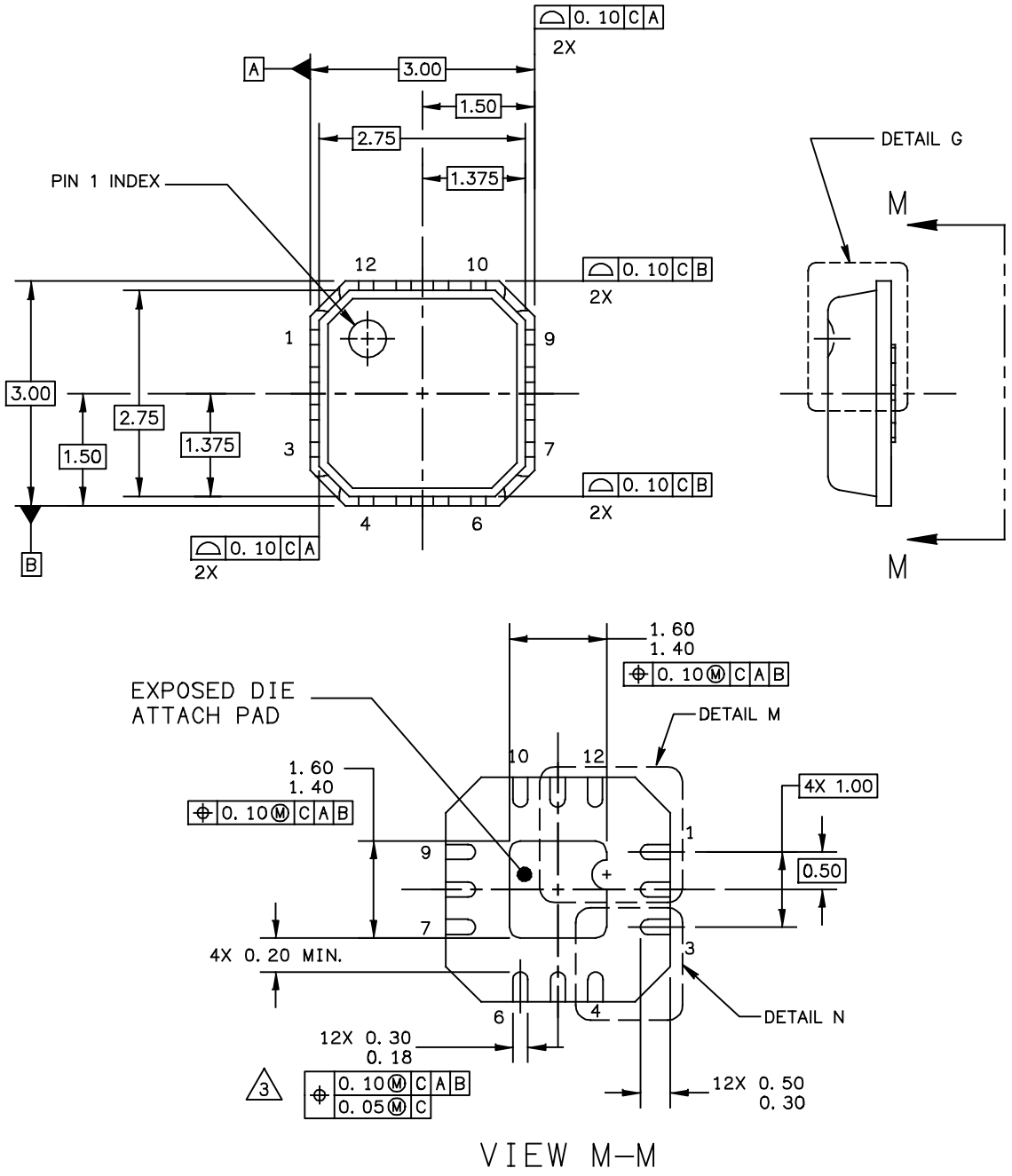


Figure 42. PCB Pad Layout for QFN 3 × 3

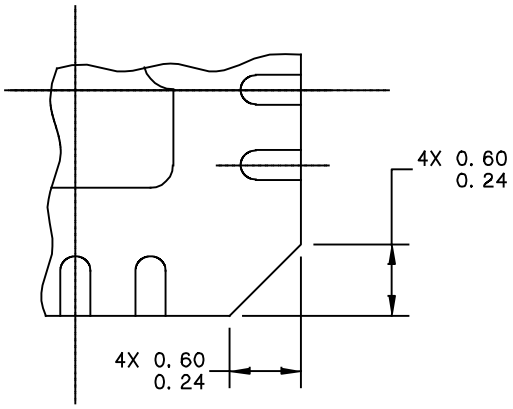


Figure 43. Product Marking

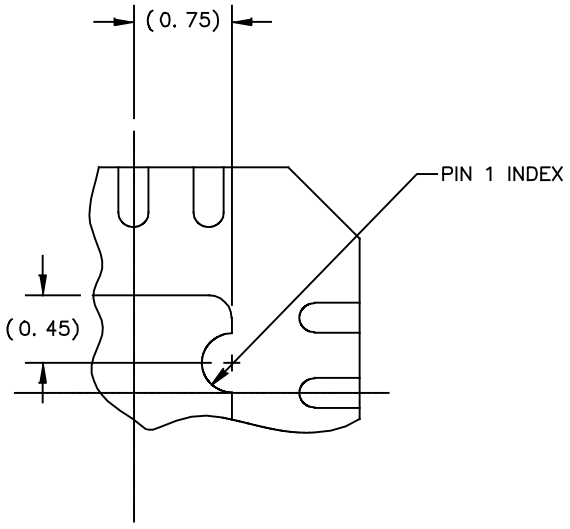
PACKAGE DIMENSIONS



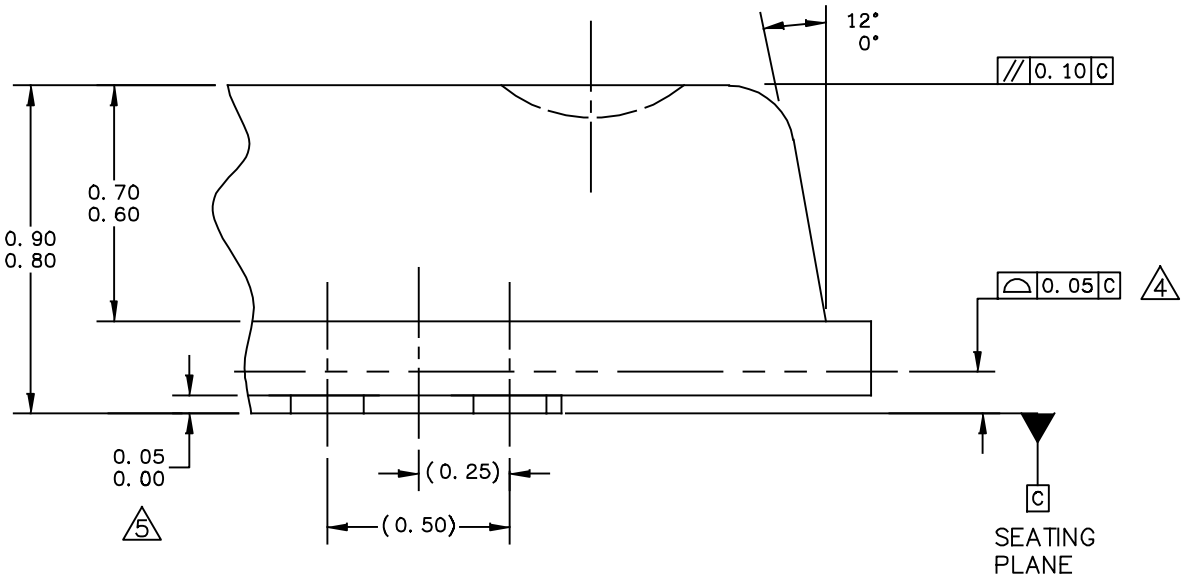
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	CASE NUMBER: 2131–01	14 MAY 2010
	STANDARD: NON–JEDEC	



DETAIL N
CORNER CONFIGURATION



DETAIL M
PIN 1 BACKSIDE INDEX



DETAIL G
VIEW ROTATED 90° CW

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NOTE:

1. ALL DIMENSIONS ARE IN MILLIMETERS.

2. DIMENSIONING & TOLERANCING PER ASME Y14.5 – 2009.

3. THIS DIMENSION APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL TIP.

4. BILATERAL COPLANARITY ZONE APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

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	CASE NUMBER: 2131–01	14 MAY 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:

1. Go to http://www.freescale.com/rf
2. Search by part number
3. Click part number link
4. Choose the desired resource from the drop down menu

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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	Aug. 2015	• Initial Release of Data Sheet

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