MAAP-008516

Linear Power Amplifier
2.4 - 2.5 GHz, 802.11b/g

Rev. V3

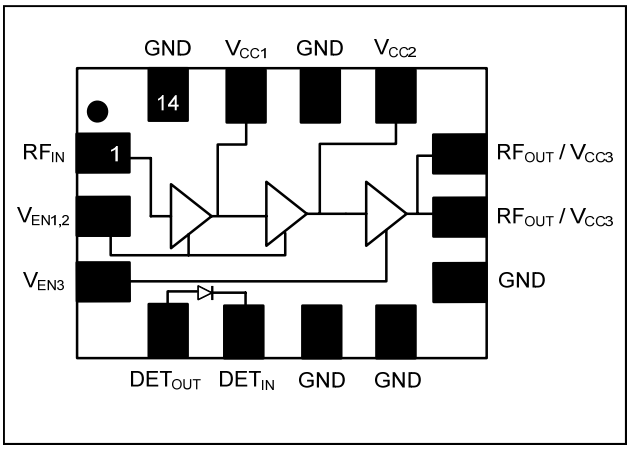
Features

- Ideal for 802.11b/g
- +23 dBm P1dB typical at 3.3 V
- 30 dB Gain typical
- 802.11g compliant to +16.5 dBm P_{OUT}, 3% EVM
- Micro-Amp Shutdown
- Integrated Detector
- SiGe Process: Lowest Cost Solution
- Lead-Free 2.5 X 2 mm 14-Lead PQFN Package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description

The MAAP-008516 is a three stage power amplifier, designed for WLAN applications. This power amplifier is available in a lead free 2.5 X 2 mm 14-Lead PQFN plastic package. The MAAP-008516 also features an integrated power detector, and consumes only 80 mA at -13.5 dBm input power under 802.11g modulation conditions.

Functional Schematic



Pin Configuration

Pin No.	Pin Name	Description
1	RF_{IN}	RF Input
2	$V_{EN1,2}$	Power Enable
3	V_{EN3}	Power Enable
4	DET_{OUT}	Detector Output
5	DET_{IN}	Detector Input
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	RF_{OUT} / V_{CC3}	RF Output, 3rd Stage Supply
10	RF_{OUT} / V_{CC3}	RF Output, 3rd Stage Supply
11	V_{CC2}	2nd Stage Supply
12	GND	Ground
13	V_{CC1}	1st Stage Supply
14	GND	Ground
Pad	Paddle[3]	RF & DC Ground

3. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Ordering Information[1,2]

Part Number	Package
MAAP-008516-TR3000	3000 piece reel
MAAP-008516-001SMB	Sample Test Board

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

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Electrical Specifications: F = 2.45 GHz, V_{CC} = 3.3 V, V_{EN} = 2.6 V, T_A = 25°C, Z_0 = 50 Ω

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Gain	—	dB	27.5	30	—
Input Return Loss	—	dB	—	15	—
Forward Isolation	—	dB	—	50	—
P1dB	—	dBm	—	23	—
Current	Idle P_{IN} = -13.5 dBm, Modulated[4] P_{IN} = -13.5 dBm, C.W.	mA mA mA	— — 60	55 80 95	95 120 110
Off Current	V_{EN} = 0 V	µA	—	3	20
Control Current	V_{EN} Current	mA	—	4.5	7
Harmonics	2fo @ -13.5 dBm Input Power 3fo @ -13.5 dBm Input Power	dBc dBc	— —	-33 -55	-23 -45
Duty Cycle	—	%	—	100	—
Linear Output Power	DSS source; compliance with 802.11b EVM=3.0%, OFDM, QAM-64, 54 Mbps, 802.11g	dBm dBm	— —	21.5 16.5	— —
Detector Output	P_{IN} = -13.5 dBm, C.W.	V	—	0.65	—

4. OFDM, QAM-64, 54 Mbps

Absolute Maximum Ratings [5,6,7]

Parameter	Absolute Maximum
Input Power	-5 dBm
Operating Supply Voltage	+4.0 Volts
Operating Control Voltage	+3.0 Volts
Operating Temperature	-20°C to +85°C
Junction Temperature [8]	+150°C
Storage Temperature	-40°C to +150°C

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM Technology does not recommend sustained operation near these survivability limits.
7. These operating conditions will ensure MTTF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + Θjc * ((V * I) - (P_{OUT} - P_{IN}))
   Typical thermal resistance (Θjc) = 25° C/W.
   a) For T_C = 25°C,
   T_J = 31 °C @ 3.3 V, 80 mA, P_{OUT} = 16.5 dBm, P_{IN} = -13.5 dBm
   b) For T_C = 85°C,
   T_J = 91 °C @ 3.3 V, 90 mA, P_{OUT} = 15 dBm, P_{IN} = -13.5 dBm

Operating the MAAP-008516

The MAAP-008516 is static sensitive. Please handle with care. To operate the device, follow these steps.

1. Apply V_{CC} (3.3 V).
2. Apply V_{EN} (2.6 V).
3. Set input power.
4. Turn off in reverse order with V_{CC} last.

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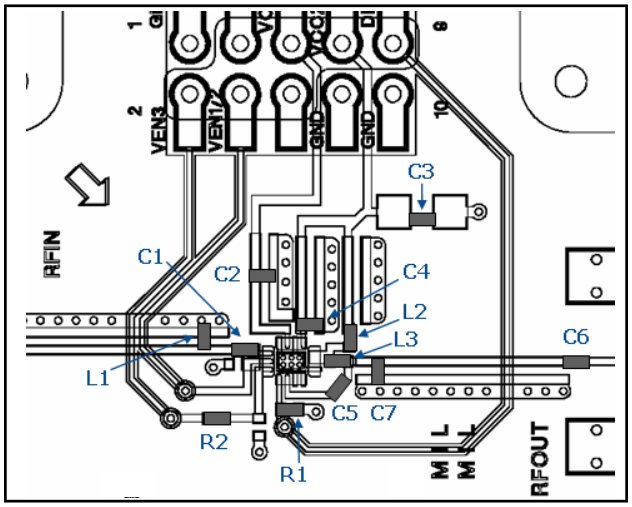
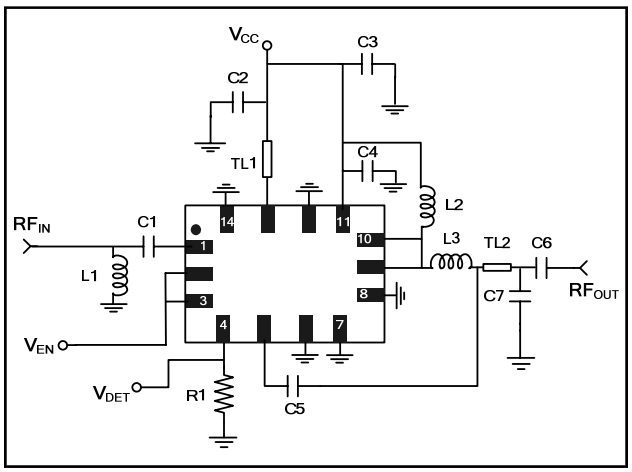
Recommended PCB Configuration



Evaluation Board Schematic



External Parts List

Component	Value	Footprint	Manufacturer
C1	2.7 pF	0402	Murata
C2	10 pF	0402	Murata
C3	1.0 µF	0402	Murata
C4	0.1 µF	0402	Murata
C5	.70 pF	0402	ATC High Q
C6	1000 pF	0402	Murata
C7	1.0 pF	0402	ATC High Q
L1	2.0 nH	0402	Coilcraft
L2	10.0 nH	0402	Coilcraft
L3	1.0 nH	0402	Coilcraft
R1	220K Ω	0402	Panasonic
R2	0 Ω	0402	Panasonic
TL1	50 Ω, 20.6° @ 2.45 GHz		
TL2	50 Ω, 7.4° @ 2.45 GHz		

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Proper ESD control techniques should be used when handling these Class 1B devices.

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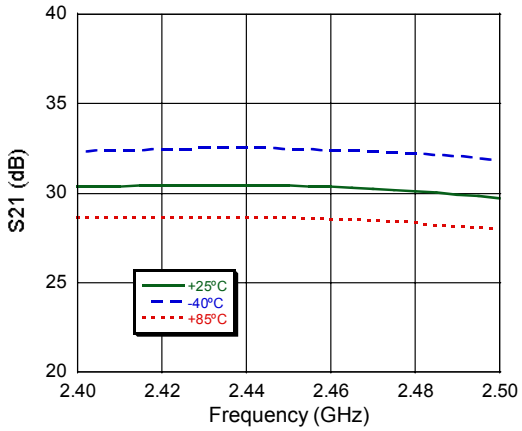
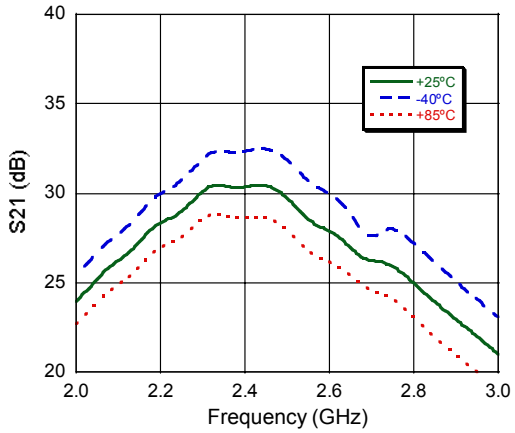
Typical Performance Curves: V_{CC} = 3.3 V, V_{EN} = 2.6 V, over Temperature

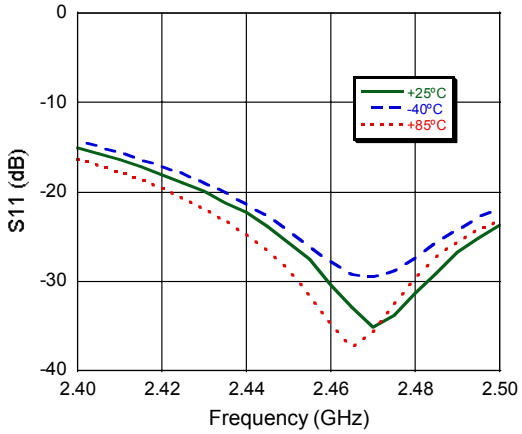
S21 vs. Frequency (2.4 GHz - 2.5 GHz) -Gain



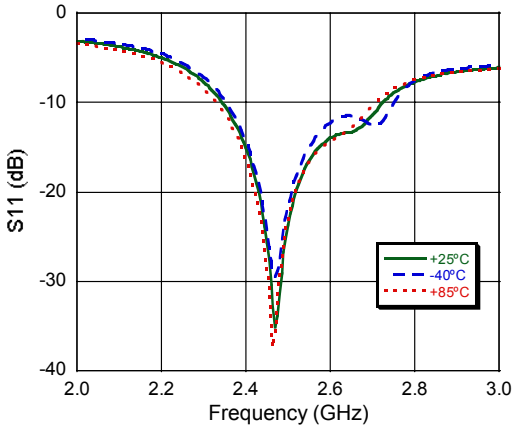
S21 vs. Frequency –Gain



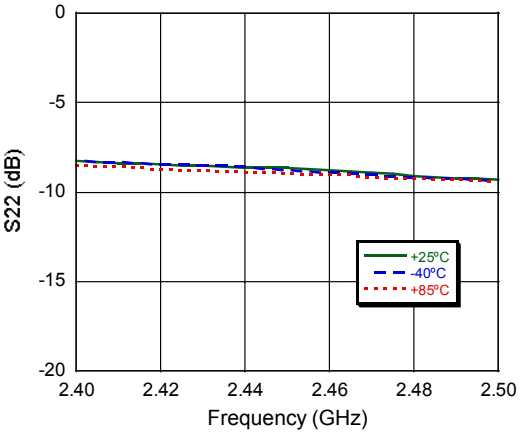
S11 vs. Frequency (2.4 GHz - 2.5 GHz)



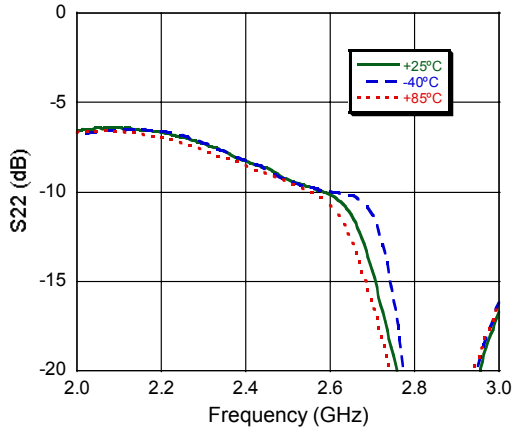
S11 vs. Frequency



S22 vs. Frequency (2.4 GHz - 2.5 GHz)



S22 vs. Frequency



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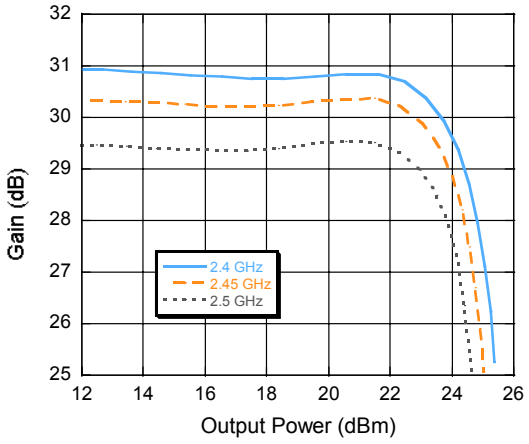
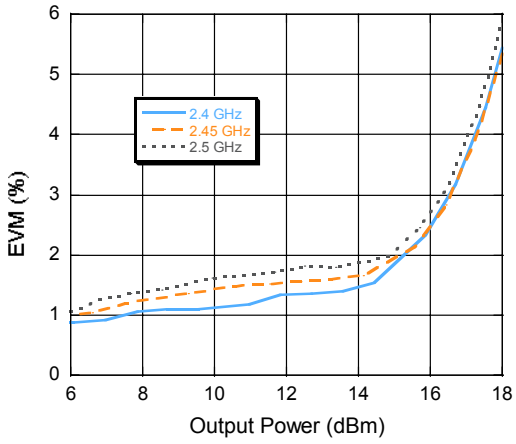
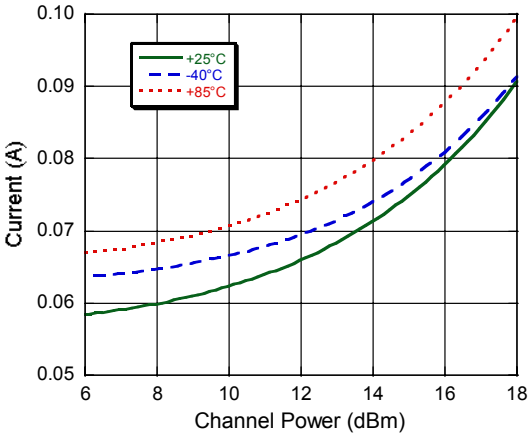
P1dB @ 2.4 - 2.5 GHz



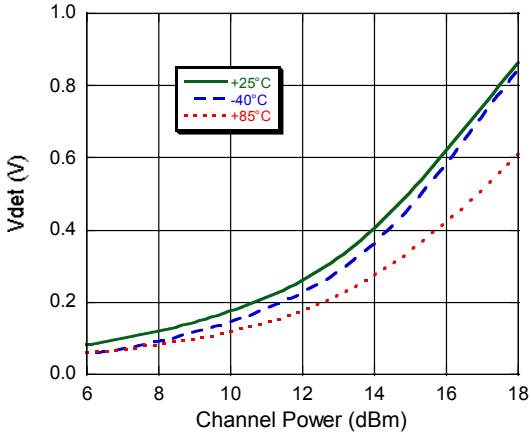
EVM vs. P_{OUT} @ 2.4 - 2.5 GHz, OFDM, QAM-64, 54 Mbps



Modulated Current vs. P_{OUT} over Temperature @ 2.45 GHz



V_{DET} vs. P_{OUT} over Temperature @ 2.45 GHz



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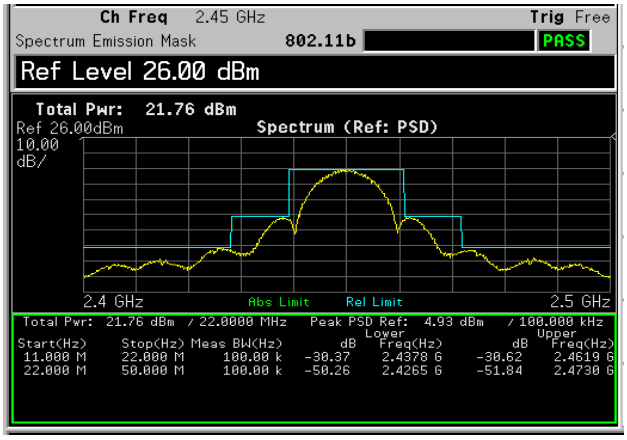
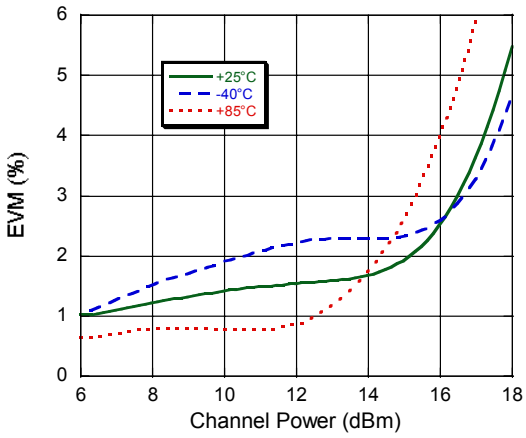
802.11b Spectrum Emission Mask @ 2.45 GHz

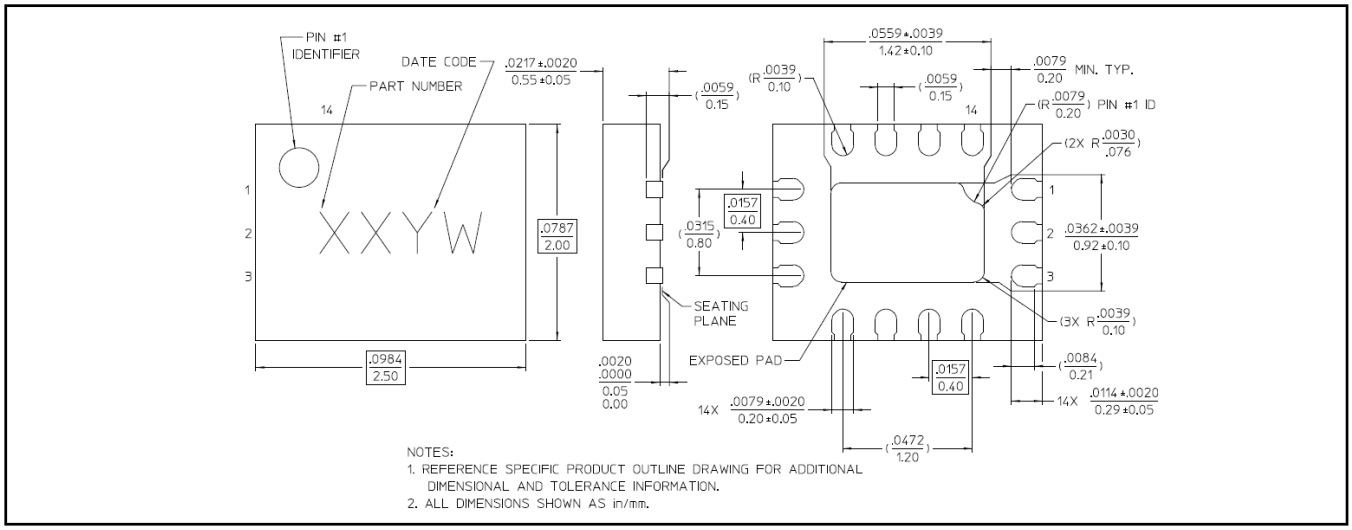


EVM vs. P_{OUT} over Temperature @ 2.45 GHz, OFDM, QAM-64, 54 Mbps[9]



9. Includes system level EVM of 0.7%

Lead-Free 2.5 x 2 mm 14-Lead PQFN†



† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

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