Preliminary

March 2005

FAIRCHILD SEMICONDUCTOR®

RMPA5252
4.9–5.9 GHz InGaP HBT WLAN Linear Power Amplifier

Features

- Full 4.9 to 5.9GHz operation
- 34dB small signal gain
- 3% EVM at 18dBm modulated power out
- 3.3V single positive supply operation
- Integrated power detector with 20dB dynamic range
- Lead-free RoHS compliant 3 x 3 x 0.9 mm leadless package
- Internally matched to 50 Ohms and DC blocked RF input/ output
- Optimized for use in 802.11a applications

General Description

The RMPA5252 power amplifier is designed for high performance WLAN applications in the 4.9–5.9 GHz frequency band. The low profile 16 pin 3 x 3 x 0.9 mm package with internal matching on both input and output to 50 Ohms minimizes next level PCB space and allows for simplified integration. An on-chip detector provides power sensing capability. The PA's low power consumption and excellent linearity are achieved using our InGaP Heterojunction Bipolar Transistor (HBT) technology.

Device

Electrical Characteristics[1] 802.11a OFDM Modulation

(with 176 µs burst time, 100 µs idle time) 54 Mbps Data Rate, 16.7 MHz Bandwidth

Parameter	Min	Typ	Max	Units
Frequency	4.9		5.9	GHz
Collector Supply Voltage	3.0	3.3	3.6	V
Mirror Supply Voltage		2.4		V
Mirror Supply Current		28		mA
Gain		34		dB
Total Current @ 18dBm P_{OUT}		275		mA
EVM @ 18dBm P_{OUT}[2]		3.0		%
Detector Output @ 18dBm P_{OUT}		500		mV
Detector Threshold[3]		5		dBm

Notes:

1. VCC = 3.3V, VM12, VM34 = 2.4V, T_A = 25°C, PA is constantly biased, 50¾ system.
2. Percentage includes system noise floor of EVM = 0.8%.
3. P_{OUT} measured at P_{IN} corresponding to power detection threshold.

Electrical Characteristics[1] Single Tone

Parameter	Min	Typ	Max	Units
Frequency	4.9		5.9	GHz
Supply Voltage (VCC)	3.0	3.3	3.6	V
Mirror Supply Voltage (VM)	2.1	2.4	2.6	V
Gain		34		dB
Total Quiescent Current		180		mA
Bias Current at pin VM (total)[2]		28		mA
P1dB Compression		26		dBm
Current @ P1dB Compression		500		mA
Shutdown Current (VM12, VM34 = 0V)		<1.0		µA
Input Return Loss		10		dB
Output Return Loss		12		dB
Detector Output at P1dB Compression		1.1		V
Detector Pout Threshold[4]		5		V
Turn-On Time[3]		<1.0		µS

Notes:

1. VCC = 3.3V, VM12, VM34 = 2.4V, T_A = 25°C, PA is constantly biased, 50¾ system.
2. Power Control bias current is included in the total quiescent current.
3. Measured from Device On signal turn on, to the point where RF P_{OUT} stabilizes to 0.5dB.
4. P_{OUT} measured at P_{IN} corresponding to power detection threshold.

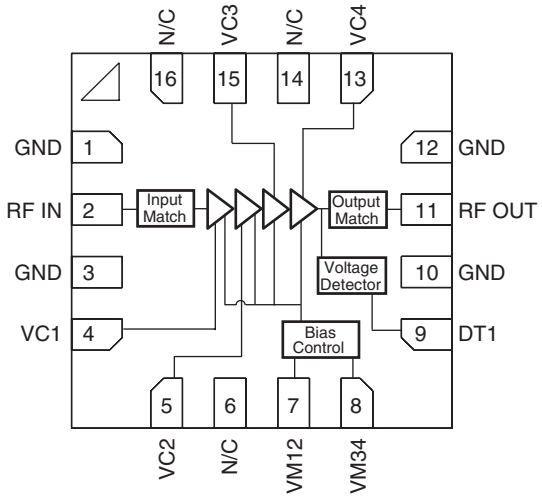
Absolute Ratings[1]

Symbol	Parameter	Ratings	Units
VCC	Positive Supply Voltage	5	V
ICC	Supply Current	1000	mA
PC	Positive Bias Voltage	4	V
P_{IN}	RF Input Power	+5	dBm
T_{CASE}	Case Operating Temperature	-40 to +85	°C
T_{STG}	Storage Temperature	-55 to +150	°C

Note:

1. No permanent damage with one parameter set at extreme limit. Other parameters set to typical values.

Functional Block Diagram

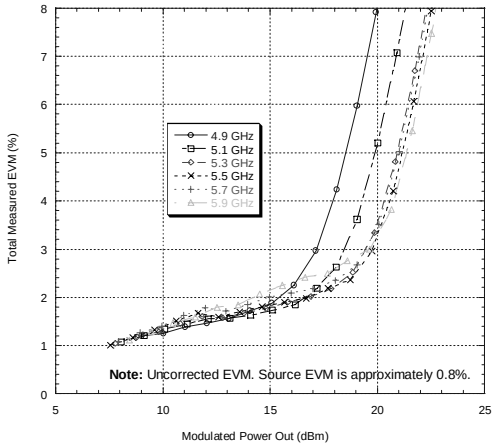


Performance Data

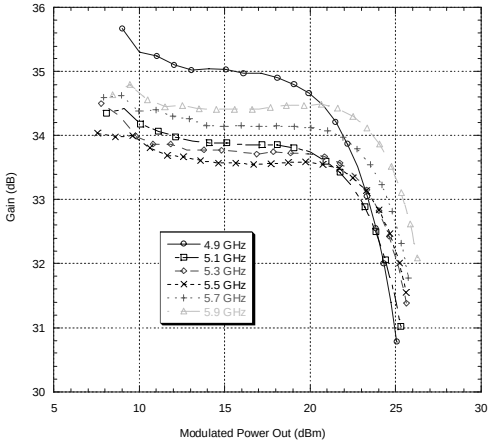
802.11a OFDM Modulation

(176 µs burst time, 100 µs idle time) 54 Mbps Data Rate, 16.7 MHz Bandwidth

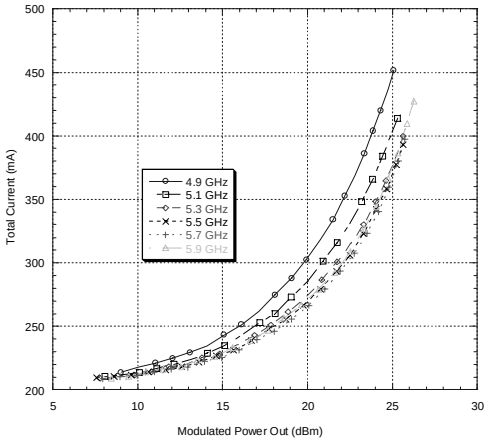
Total Measured EVM Vs. Modulated Power Out
VCC=3.3V VM12, VM34=2.4V T=25C



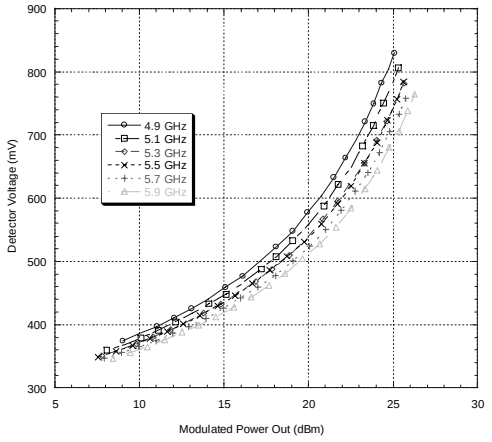
Gain Vs. Modulated Power Out
VCC=3.3V VM12, VM34=2.4V T=25C



Total Current Vs. Modulated Power Out
VCC=3.3V VM12, VM34=2.4V T=25C

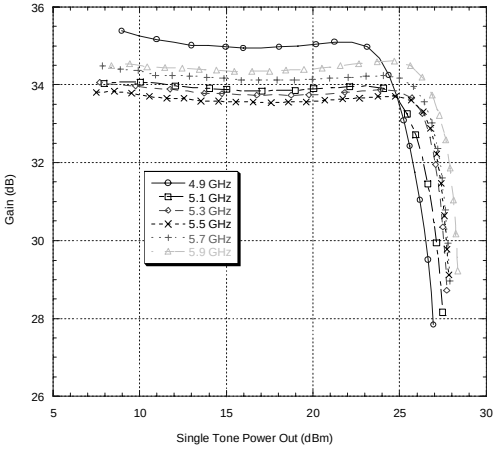


Detector Voltage Vs. Modulated Power Out
VCC=3.3V VM12, VM34=2.4V T=25C

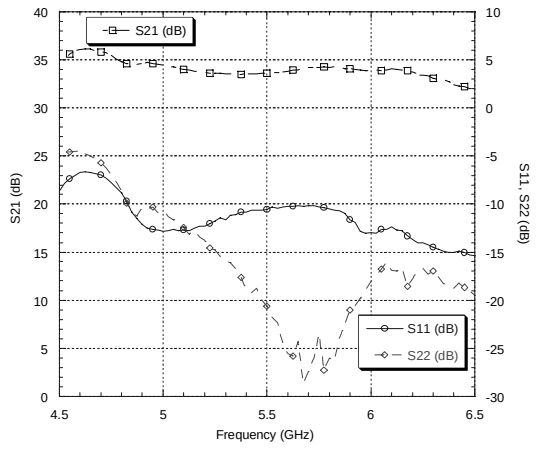


Single Tone

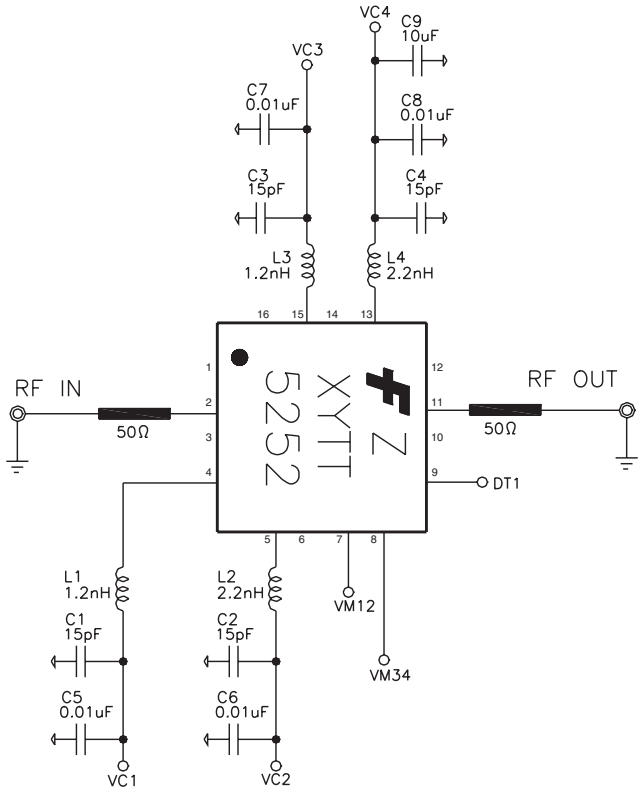
Gain Vs. Single Tone Power Out
VCC=3.3V VM12, VM34=2.4V T=25C



RMPA5252 S-Parameters Vs. Frequency
VCC=3.3V VM12,VM34=2.4V T=25C

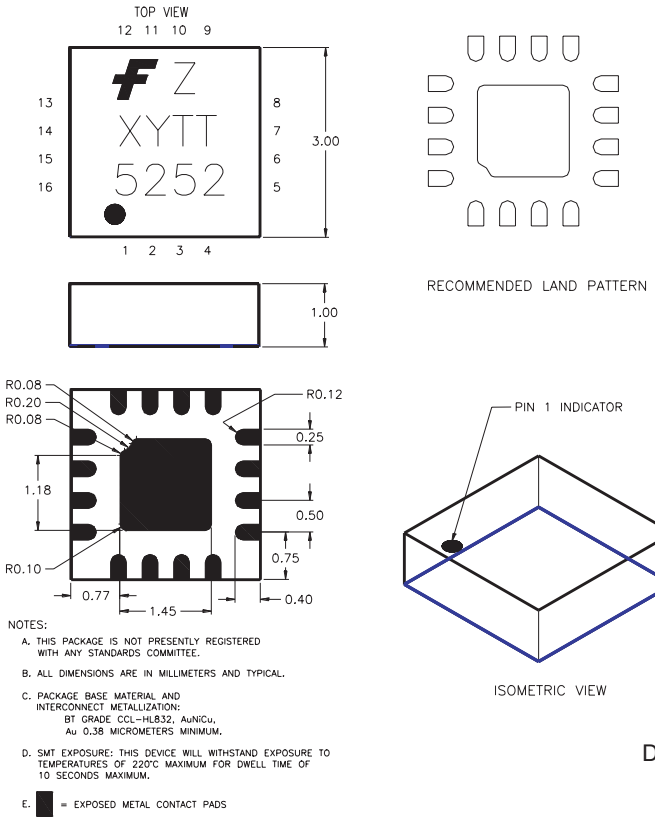


Schematic



Pin	Description
1	GND
2	RF IN
3	GND
4	VC1
5	VC2
6	N/C
7	VM12
8	VM34
9	DT1
10	GND
11	RF OUT
12	GND
13	VC4
14	N/C
15	VC3
16	N/C
17	CENTER GND

Package Outline



NOTES:

A. THIS PACKAGE IS NOT PRESENTLY REGISTERED WITH ANY STANDARDS COMMITTEE.

B. ALL DIMENSIONS ARE IN MILLIMETERS AND TYPICAL.

C. PACKAGE BASE MATERIAL AND INTERCONNECT METALLIZATION:
BT GRADE CCL-HL832, AuNiCu,
Au 0.38 MICROMETERS MINIMUM.

D. SMT EXPOSURE: THIS DEVICE WILL WITHSTAND EXPOSURE TO TEMPERATURES OF 220°C MAXIMUM FOR DWELL TIME OF 10 SECONDS MAXIMUM.

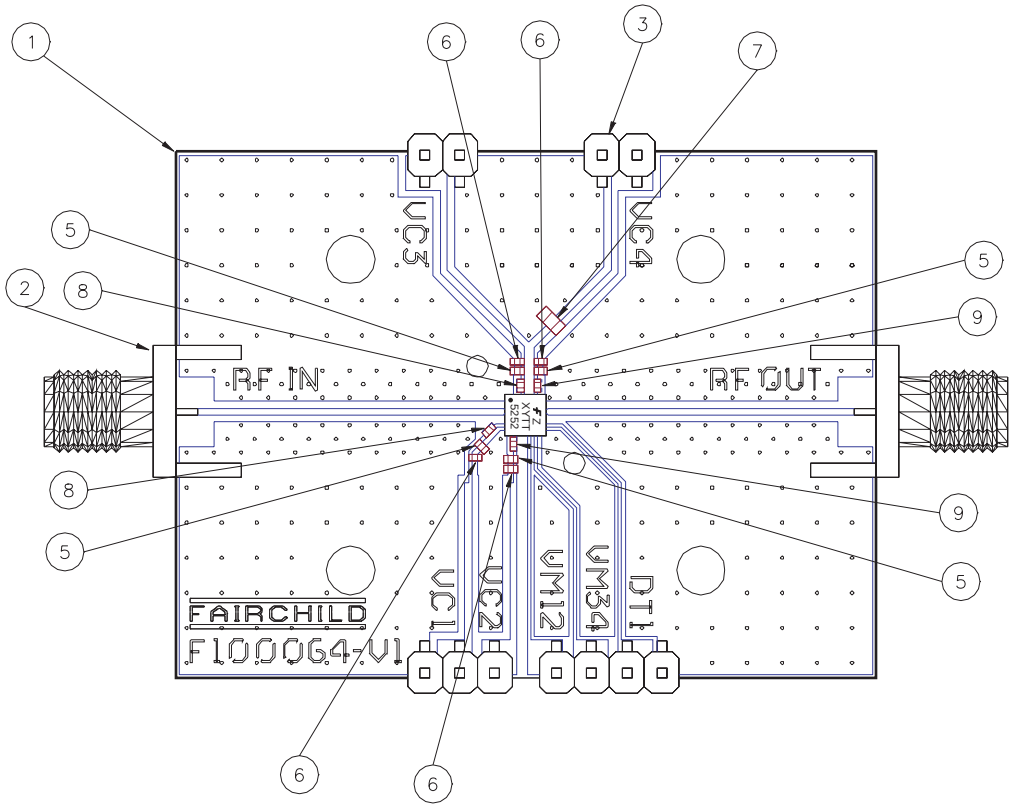
E. ■ = EXPOSED METAL CONTACT PADS

Dimensions in mm

Evaluation Board Bill of Materials

Qty	Item No.	Part Number	Description	Vendor
1	1	F100064	PC Board	Fairchild
2	2	#142-0701-841	SMA Connector	Johnson
10	3	#S1322-XX-ND	RT Angle Sgl M Header	Digikey
Ref	4		Assembly, RMPA5252	Fairchild
4	5 (C1, C2, C3, C4)	250R07C150JV4	15pF Capacitor	Johanson
4	6 (C5, C6, C7, C8)	GRM36X7R103K25	10,000pF Capacitor	Murata
1	7 (C9)	GRM21BR60J106KE01L	10µF Capacitor	Murata
2	8 (L1, L3)	LL1005-FHL1N2S	1.2nH Inductor	Toko
2	9 (L2, L4)	LL1005-FHL2N2S	2.2nH Inductor	Toko
A/R	10	SN63	Solder Paste	Indium Corp.
A/R	11	SN96	Solder Paste	Indium Corp.

Evaluation Board Layout



Actual Board Size = 2.0" X 1.5"

Evaluation Board Turn-On Sequence[1]

Recommended turn-on sequence:

1) Connect common ground terminal to the Ground (GND) pin on the board.

2) Connect voltmeter to DT1 pin (Detector Voltage).

3) Connect VC1, VC2, VC3, VC4 (Collector voltages) together using jumper cables. Apply a single positive supply voltage (3.3V) to pin VC4.

4) Connect VM12 and VM34 (Power Control voltage) together using a jumper cable. Apply a single positive supply voltage (2.4V) to pin VM12.

5) At this point, you should expect to observe the following positive currents flowing into the pins::

Pin	Current
VCC (total)	180 mA
VM12 and VM34	28 mA

6) Apply input RF power to SMA connector pin RFIN. Current for pin VCC will vary depending on the input drive level.

7) Vary positive voltage VM12, VM34 from +2.4 V to +0 V to shut down the amplifier or alter the power level. Shut down current flow into the pins:

Pin	Current
VCC (total)	<1 nA

Recommended turn-off sequence:

Use reverse order described in the turn-on sequence above.

Note:

1. Turn on sequence is not critical and it is not necessary to sequence power supplies in actual system level design

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CROSSVOLT™	GlobalOptoisolator™	MicroFET™	PowerTrench	SuperSOT™-6
DOME™	GTO™	MicroPak™	QFET	SuperSOT™-8
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EnSigna™	*i-Lo*™	MSXPro™	Quiet Series™	TINYOPTO™
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FACT Quiet Series™		OCXPro™	RapidConnect™	UHC™
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