

## 2.4 GHz Linearized Power Amplifier

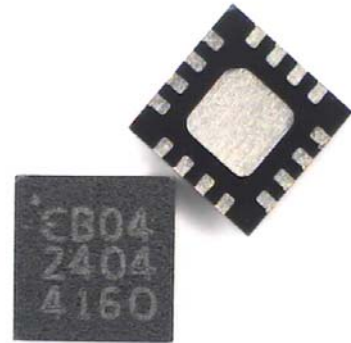
### Introduction

The PA2404 is a two-stage linearized power amplifier optimized for 802.11b/g wireless LAN (WLAN) applications in the 2.4 GHz band. While the device is designed to operate from a single 3.3V supply, it does allow for separate control of the first and second stages, allowing the user to choose the optimum balance between output power/efficiency and linearity for a particular application. The device features 23 dB of gain and delivers up to +27 dBm of output power.

The device is sold in a Pb-free QFN package to make automated assembly simple. Its small size makes the device an ideal solution for radios built in small form factors.

### Applications

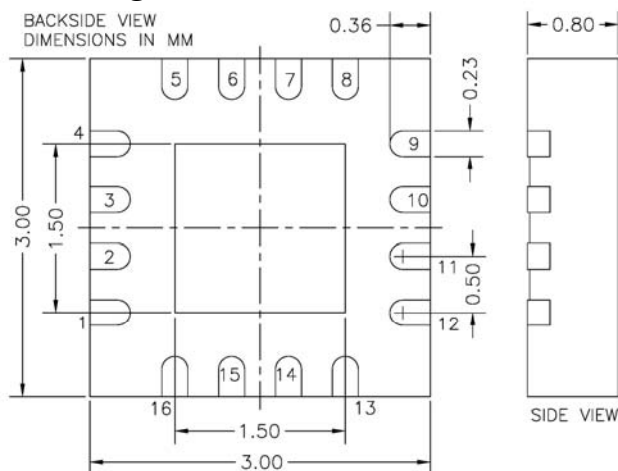
- IEEE 802.11b DSSS WLAN
- IEEE 802.11g OFDM WLAN
- HomeRF™
- 2.4 GHz Cordless Phones
- 2.4 GHz ISM Radios



### Features

- 2.4 to 2.5 GHz Operating Range
- 23 dB Gain
- 802.11b ACPR compliant up to +25 dBm
- 40% PAE at Pout=+25 dBm
- 3% EVM at Pout=+20 dBm with 54 Mbps OFDM signal
- 22% PAE at Pout=+20 dBm
- On-chip power detector
- +3.3V Single Supply
- Pb-free QFN Package

### Pin Configuration



1	N/C	9	Det Out
2	RF In	10	RF Out
3	N/C	11	RF Out
4	N/C	12	Vcc 2
5	N/C	13	N/C
6	Vctrl 1	14	Vcc 1
7	Vctrl 2	15	N/C
8	Det Ref	16	Vcc b

N/C = No internal connection to pad.

Jump Pin = Internal jumper, leave pin isolated.

## Specifications

### Absolute Maximum Ratings

Vcc1, Vcc2, Vctrl 1, Vctrl 2	-0.5V to +4.5V
RF Input Power	+10 dBm
Operating Temperature Range	-40°C to +85°C *Pout = +25 dBm
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +125°C
Total Power Dissipation, TA = +70°C	1.3 W
Soldering Conditions	250°C peak for 20 seconds

\* Assumes adequate air circulation around PWB.

### DC Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
<b>Supply Voltages</b>					
Vcc1		3.0	3.3	3.6	Volts
Vcc2		3.0	3.3	3.6	Volts
Vctrl 1	R1=300ohm(see app note)		3.0		Volts
Vctrl 2	R2=300ohm(see app note)		3.0		Volts
<b>Supply Currents</b>					
Icc1 + Icc2	Quiescent (no RF) Pout = +20 dBm Pout = +25 dBm		100 160 280		mA
Ictrl 1			2		mA
Ictrl 2			2		mA
Thermal Resistance Theta j-c	Pout=25dBm		67		°C/W
Case Temperature Tc	At Tj=150°C Pout=20dBm Pout=25dBm			114 90	°C °C

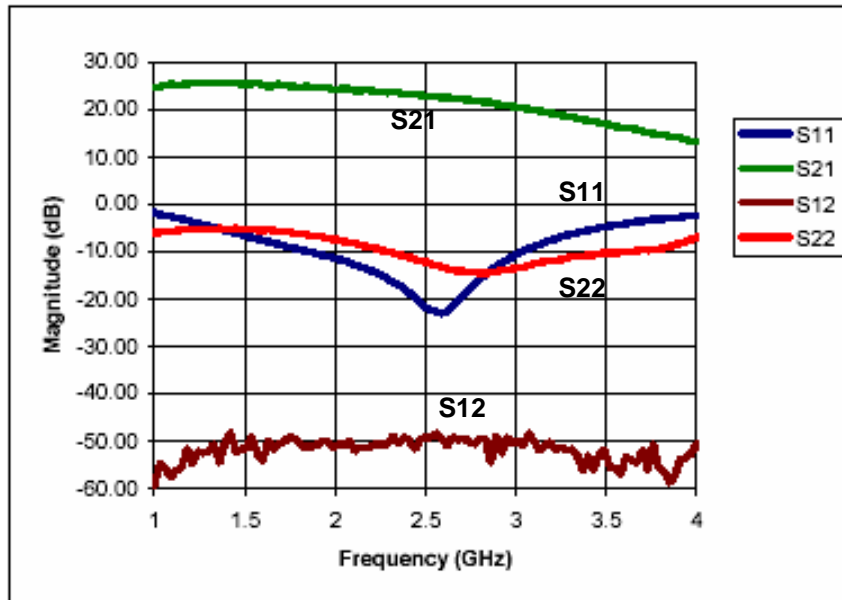
### AC Electrical Characteristics

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
RF Frequency Range (Note 1)		2.4		2.5	GHz
Power Gain	Vcc1 & Vcc2 = 3.3V, Pout = +23 dBm		23		dB
Gain Variation over supply voltage	Vcc1 & Vcc2 = 3.0V to 3.6V		±0.5		dB
Saturated Output Power	Pin = +3 dBm		27		dBm
Input Return Loss			-10		dB
Output Return Loss			-10		dB
Total Current at Pout=25dBm	11Mbps CCK		280		mA
1 <sup>st</sup> side lobe at Pout=25dBm	11Mbps CCK	-30			dBc
2 <sup>nd</sup> side lobe at Pout=25dBm	11Mbps CCK	-50			dBc
Total Current at Pout=20dBm	64QAM/54Mbps		160		mA
EVM at Pout=20dBm	64QAM/54Mbps		3.0		%

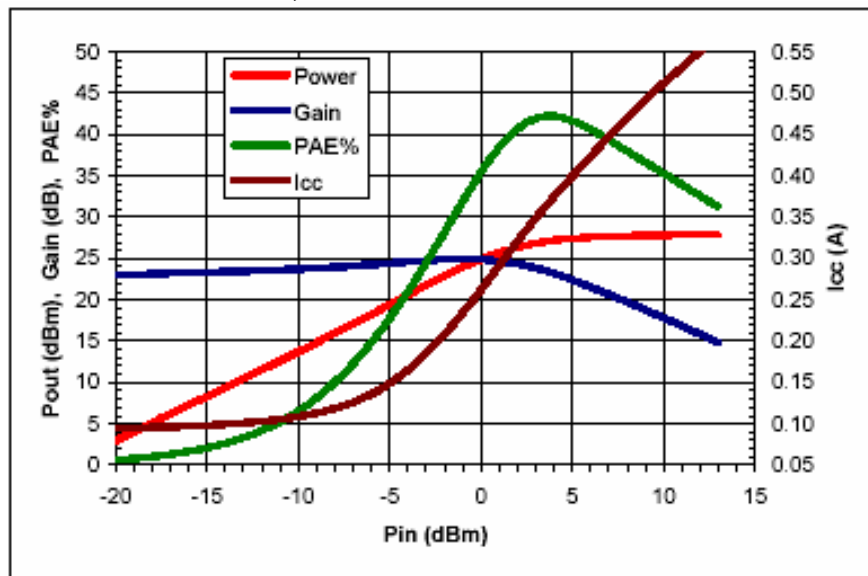
**Note:** Operation outside this range is possible, but not guaranteed

Test Data & Diagrams

Small Signal Gain (S21), Reversed Isolation (S12)  
 Input Return Loss (S11), Output Return Loss (S22)  
 (Vcc 1 & 2 = 3.3V, Vctrl 1 & 2 = 3.0V, Icc1+ Icc2= 90mA)

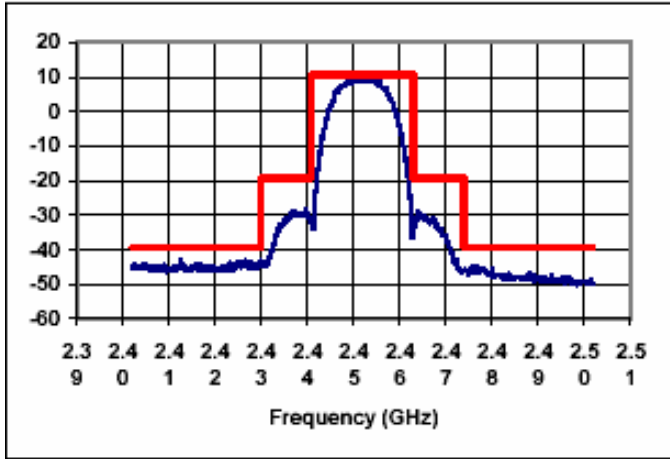


Power Sweep Curve  
 P1dB=27.5dBm, Maximum Efficiency=42.4%  
 (Vcc 1 & 2 = 3.3V, Vctrl 1 & 2 = 3.0V)

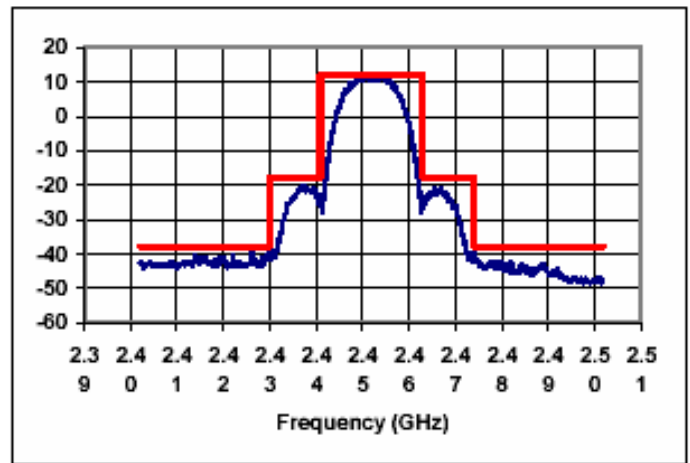


**Note:** EVM data are without system correction.

11b ACPR Spectrum (Freq=2.452GHz, Vcc=3.3V, Vctrl=3.0V)

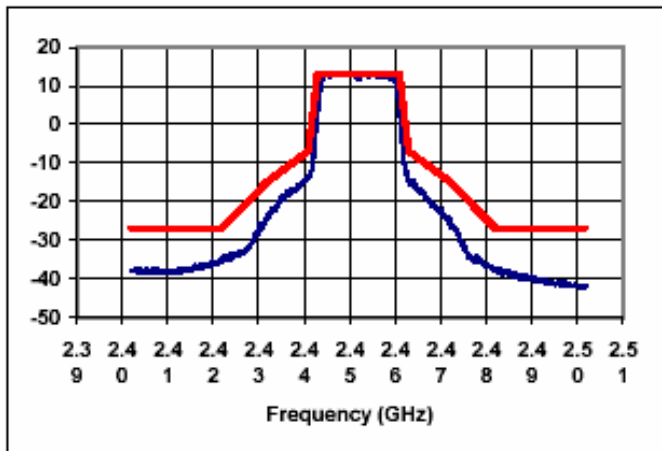


11b ACPR at Pout=23dBm

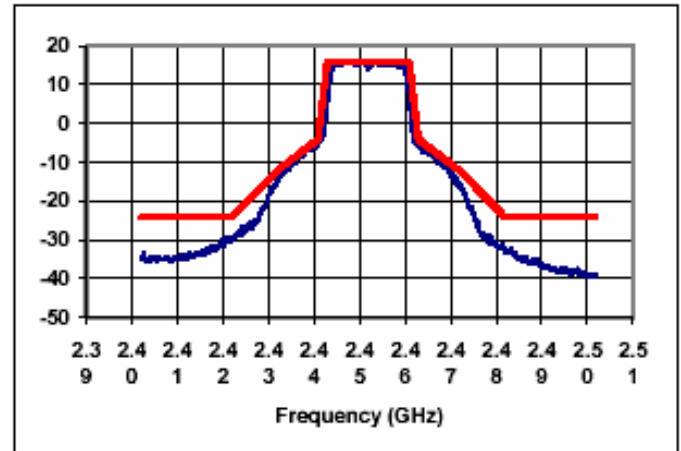


11b ACPR at Pout=25dBm

11g ACPR Spectrum (Freq=2.452GHz, Vcc=3.3V, Vctrl=3.0V)

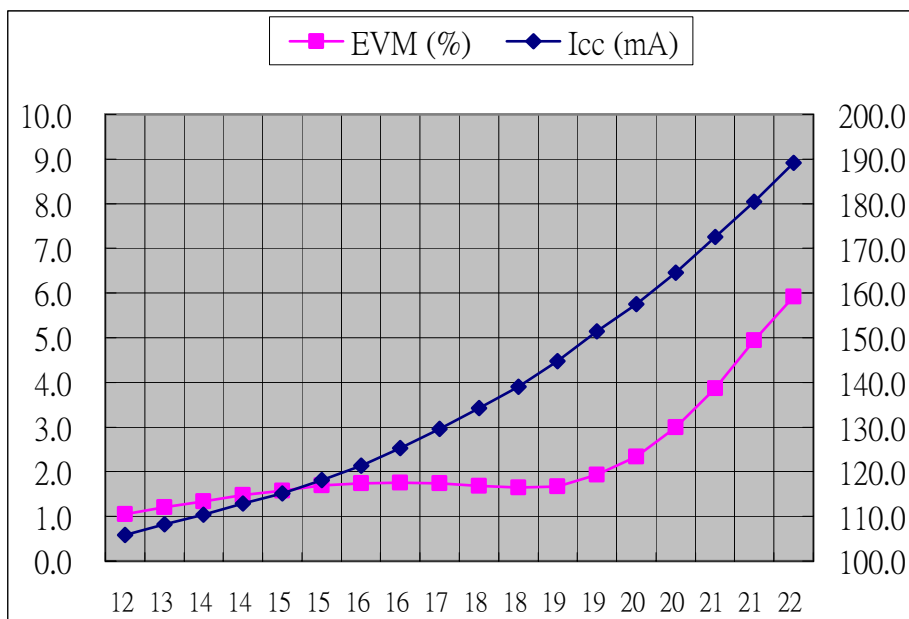


11g ACPR at Pout=21dBm



11g ACPR at Pout=23dBm

**EVM Data with 54Mbps 64QAM OFDM**  
 (Freq = 2.437GHz, Vcc =3.3V, Vctrl = 3.0V)



Note: All information provided is subjected to change without prior notice.

**Soldering Information**

	Convection or IR/Convection
Average ramp-up rate (217 °C to Peak)	3 °C/second max.
Preheat temperature 175(±25) °C	60-180 seconds
Temperature maintained above 217 °C	60-150 seconds
Time within 5 °C of actual peak temperature	20-40 seconds
Peak temperature range	250 +0/-5 °C
Ramp-down rate	6 °C/second max.
Time 25 °C to peak temperature	8 minutes max.

## Ordering and Packing Information

**PA2404-TR-1** Packing in tape & reel, 1k/reel

**PA2404-TR-3** Packing in tape & reel, 3k/reel

