

# UP2206

## 2.4GHz Power Amplifier IC

**Data Sheet**

**DS-2206-01**

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## UP2206

### 2.4GHz Power Amplifier IC

## 1. Product Description

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The UP2206 is a high efficiency, linear power amplifier IC designed for 2.4GHz applications such as WLAN (802.11b/g), Bluetooth and other ISM-band applications. UP2206 is designed to provide excellent linearity and efficiency over a wide range of supply voltage and output power. The device is fabricated on an advanced GaAs/InGaP HBT process and packaged in a 3mmX3mm, 16pin, QFN with a bottom ground.

## 2. Features

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- ❑ **Single 3.3V Supply (High Power)**
  - 27 dBm P1dB output power
  - 29 dB linear gain
  - 2.2% EVM at 18 dBm output power for 802.11g, 54 Mbps, OFDM
  - 130 mA at 18 dBm output power
  - 50 ohms internally matched input
- ❑ **Single 3.3V Supply (Low Current)**
  - 24.5 dBm P1dB output power
  - 28 dB linear gain
  - 2.4% EVM at 15 dBm output power for 802.11g, 54 Mbps, OFDM
  - 80 mA at 15 dBm output power
  - 50 ohms internally matched input

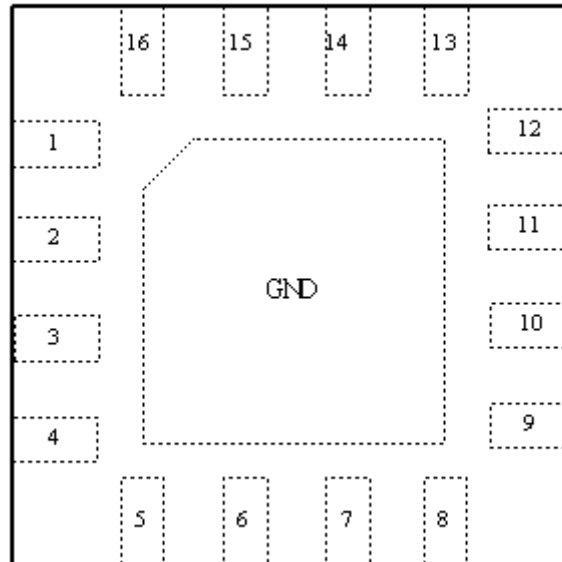
## 3. Typical Applications

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- ❑ IEEE 802.11b
- ❑ General Purpose 2.4GHz ISM band applications

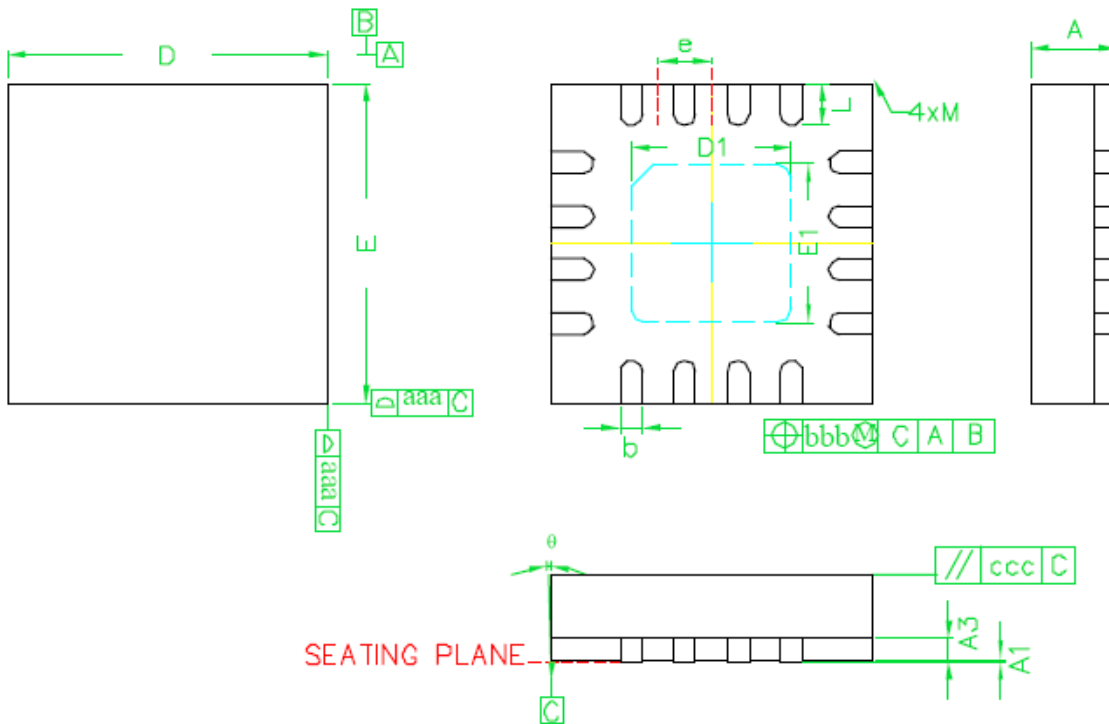
## 4. Pin Descriptions

Top View



Pin #	Name	Description
1	RFin	RF input
3	Vcc1	Power supply for PA 1 <sup>st</sup> stage
4	Rb2	Bias control resistor
6	Vpc2	Power control for PA 2 <sup>nd</sup> stage
7	Vb2	Power supply for PA bias 2 <sup>nd</sup> stage
2, 5, 8, 9, 10, 12, 13	NC	NC
11	Vcc2+RFout	Power supply for PA and RF out
14	Vdet	Output power detection
15	Vb1	power supply for PA bias 1 <sup>st</sup> stage
16	Vpc1	Power control for PA 1 <sup>st</sup> stage

## 5. Package Specification



Symbols	Dimensions In Millimeters		
	Min.	Nom.	Max.
A	0.80	0.9.	1.00
A1	0	0.015	0.030
A3	-----	0.20 REF.	-----
b	0.18	0.23	0.30
D	2.85	3.00BSC	3.15
D1	-----	1.48BSC	-----
E	2.85	3.00BSC	3.15
E1	-----	1.48BSC	-----
e	-----	0.50BSC	-----
L	0.30	0.40	0.50
$\theta$	-12	-----	0
aaa	-----	0.25	-----
bbb	-----	0.10	-----
ccc	-----	0.10	-----
M	-----	-----	0.05
Burr	0	0.030	0.060

## 6. Absolute Maximum Ratings

Parameter	Value	Unit
Supply voltage	3.6	V
Power control voltage	3.5	V
RF input power	-8	dBm
Operating case temperature	-30 to 80	°C
Storage temperature	-30 to 120	°C

## 7. Electrical Characteristics

### 7.1. Single 3.3 V Supply (High Power)

\* Vcc, Vpc1, Vpc2, Vb1, Vb2 are all connected to 3.3 V. Refer to Application Circuit Figure 9-1.

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Power Supply Voltage		3.0	3.3	3.6	V
Frequency Range		2.4	2.45	2.5	GHz
Quiescent Current		75	95	115	mA
Current Consumption	Pout =18 dBm; EVM≤2.2%	---	130	---	mA
Linear Gain		27	29	31	dB
Pout at 1dB Gain Compression		25	27	---	dBm
Input Return Loss		10	13	---	dB
Sensitivity of Power Detector		---	0.038	---	V/dBm
Power Control - Enable		3.0	3.3	---	V
Power Control - Disable		---	---	0.5	V
Power Down Current	V <sub>PC</sub> =0V	---	40	80	uA
Output Harmonics		---	-40	---	dBc

## 7.2. Single 3.3 V Supply (Low Current)

\*Vcc, Vpc1, Vpc2, Vb1, Vb2 are all connected to 3.3 V. Refer to Application Circuit Figure 9-2

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Power Supply Voltage		3.0	3.3	3.6	V
Frequency Range		2.4	2.45	2.5	GHz
Quiescent Current		55	60	65	mA
Current consumption	Pout=15dBm; EVM≤2.4%	---	80	---	mA
Linear Gain		27	28	29	dB
Pout at 1dB Gain Compression		24	24.5	---	dBm
Input Return Loss		10	12	---	dB
Sensitivity of Power Detector		---	0.047	---	V/dB
Power Control - Enable		3.0	3.3	---	V
Power Control - Disable		---	---	0.5	V
Power Control Current		---	---	3.5	mA
Power Down Current		---	---	4	uA

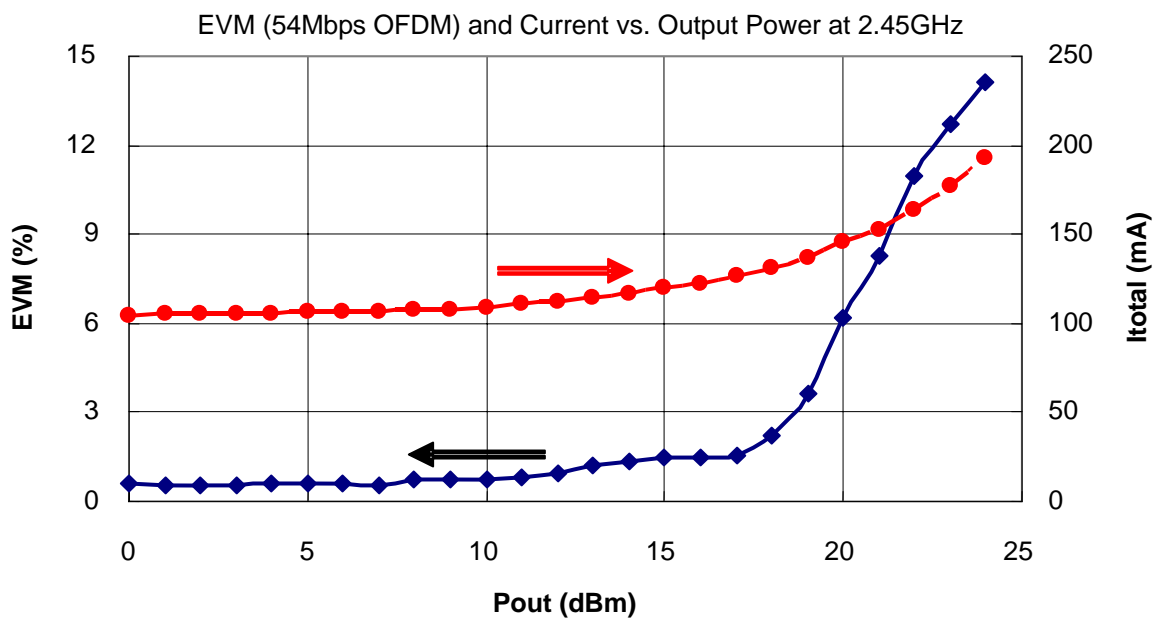
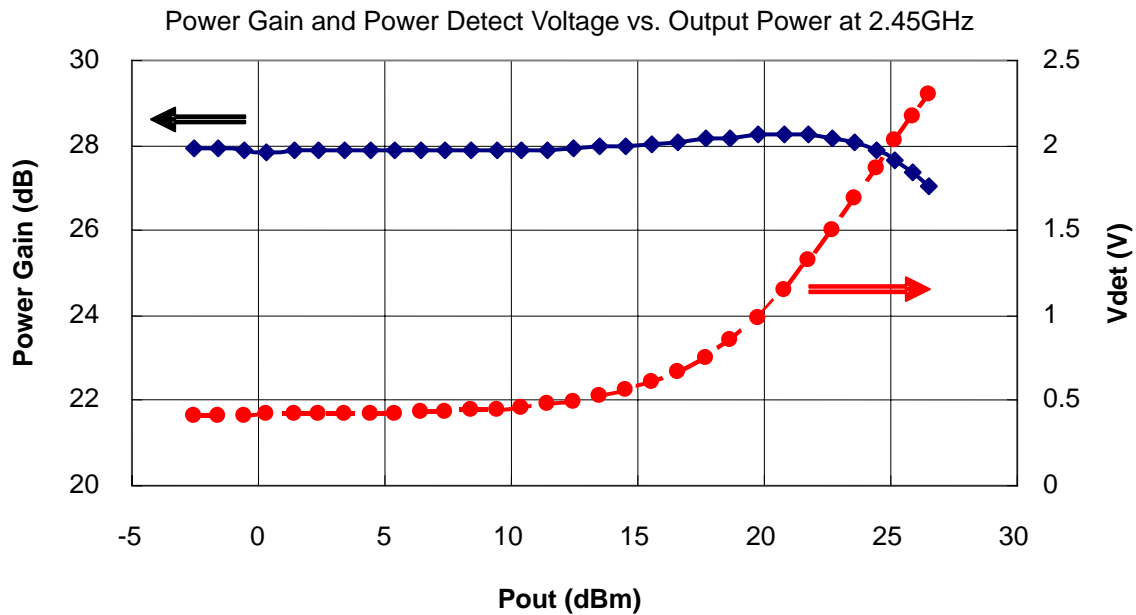


Caution: ESD sensitive.

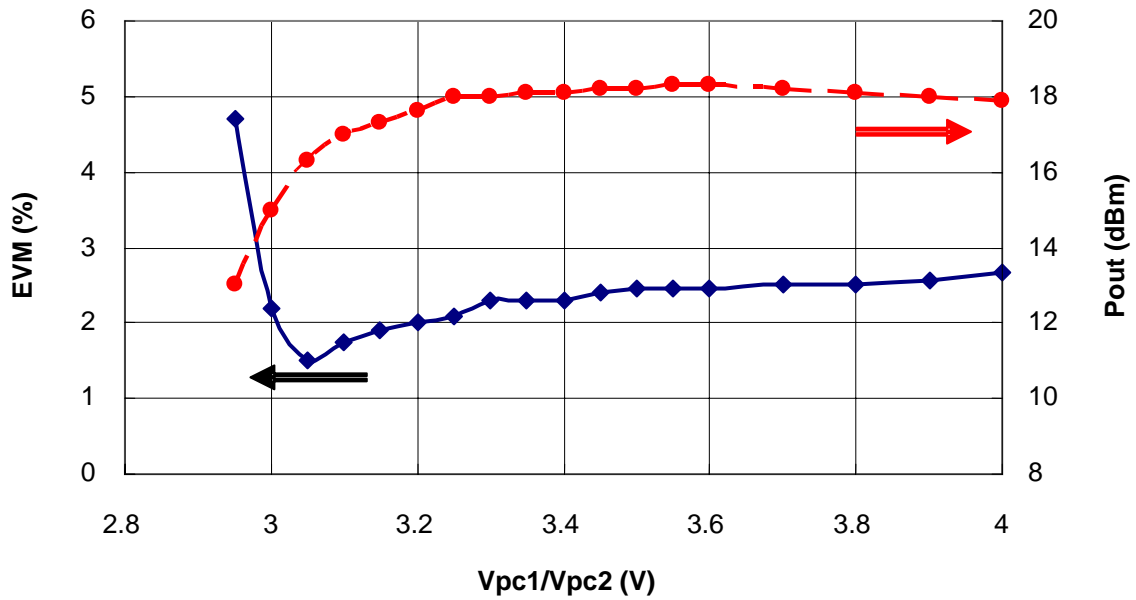
## 8. Performance Data

### 8.1. Single 3.3 V Supply (High Power)

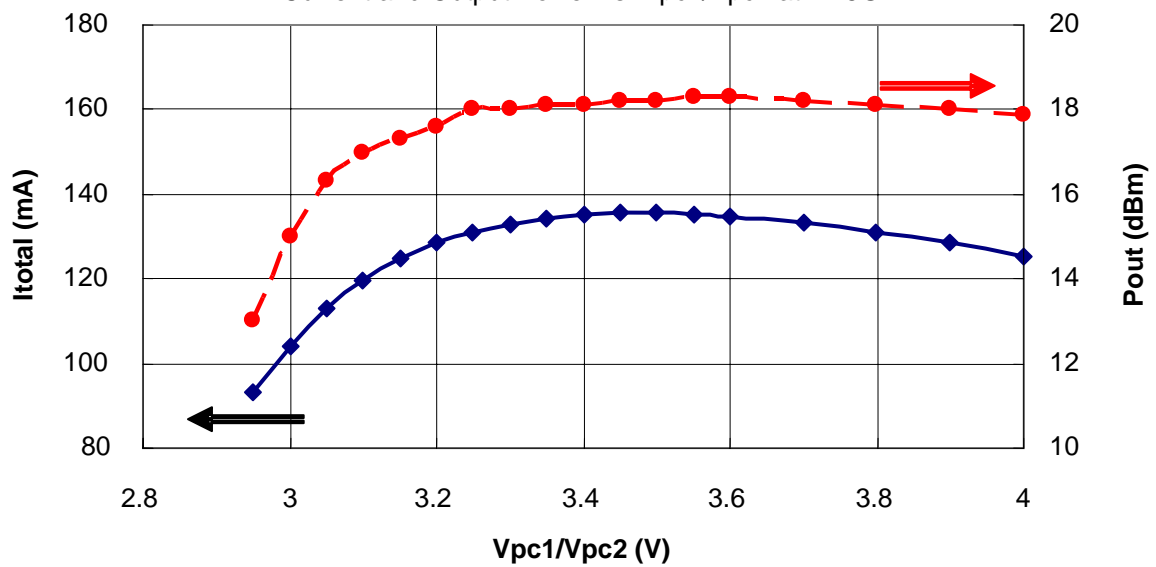
\*  $V_{cc}$ ,  $V_{pc1}$ ,  $V_{pc2}$ ,  $V_{b1}$ ,  $V_{b2}$  are all connected to 3.3 V,  $T=25^{\circ}\text{C}$ .



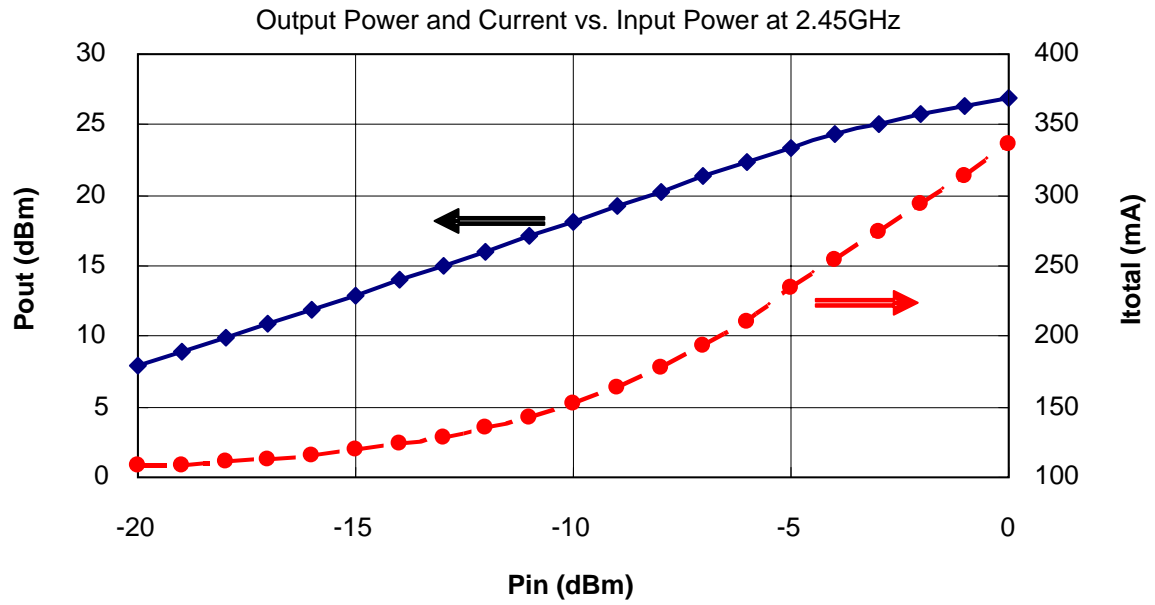
EVM (54Mbps OFDM) and Output Power vs. Vpc1/Vpc2 at 2.45GHz



Current and Output Power vs. Vpc1/Vpc2 at 2.45GHz

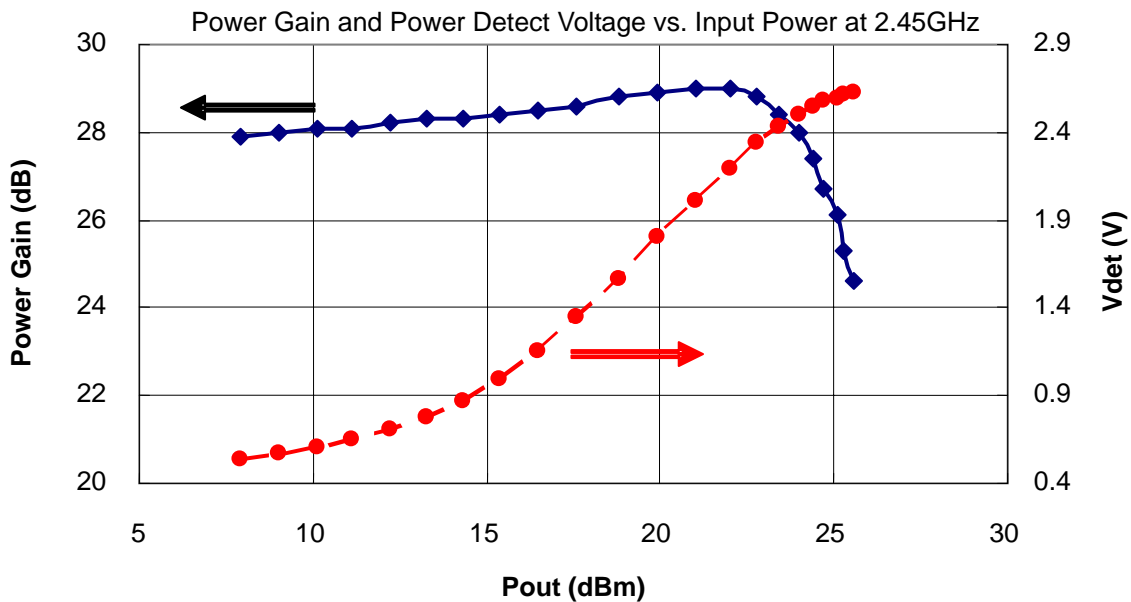
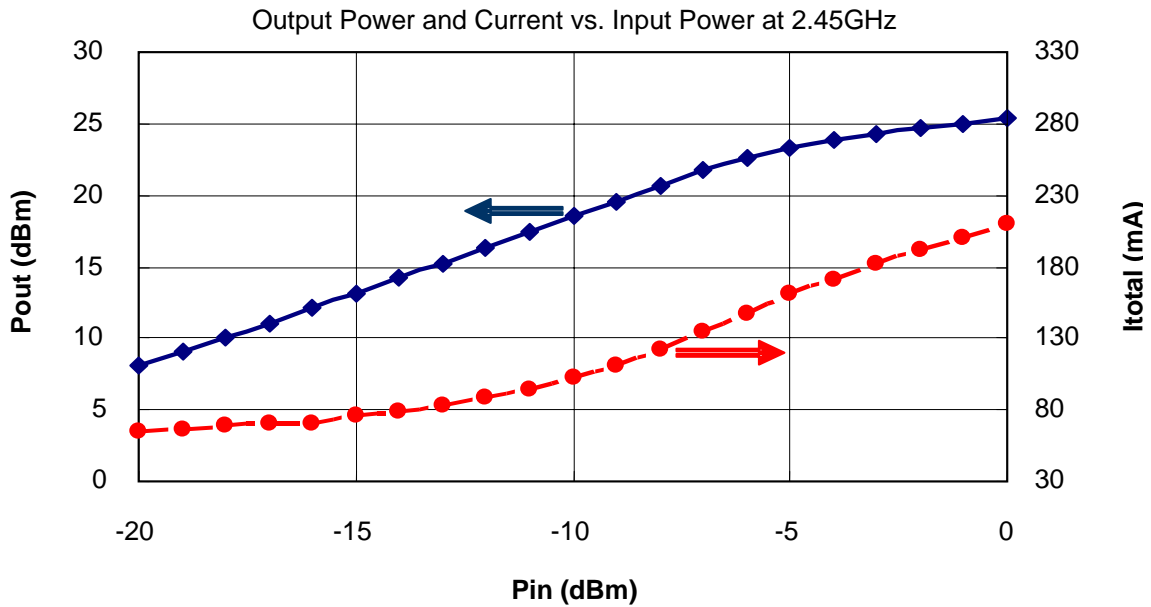




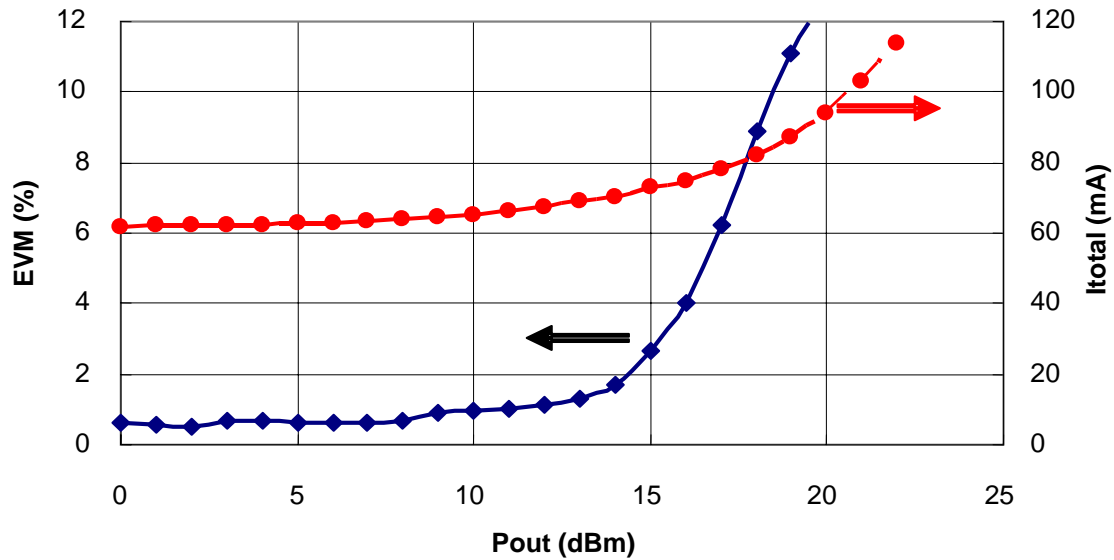


## 8.2. Single 3.3 V Supply (Low Current)

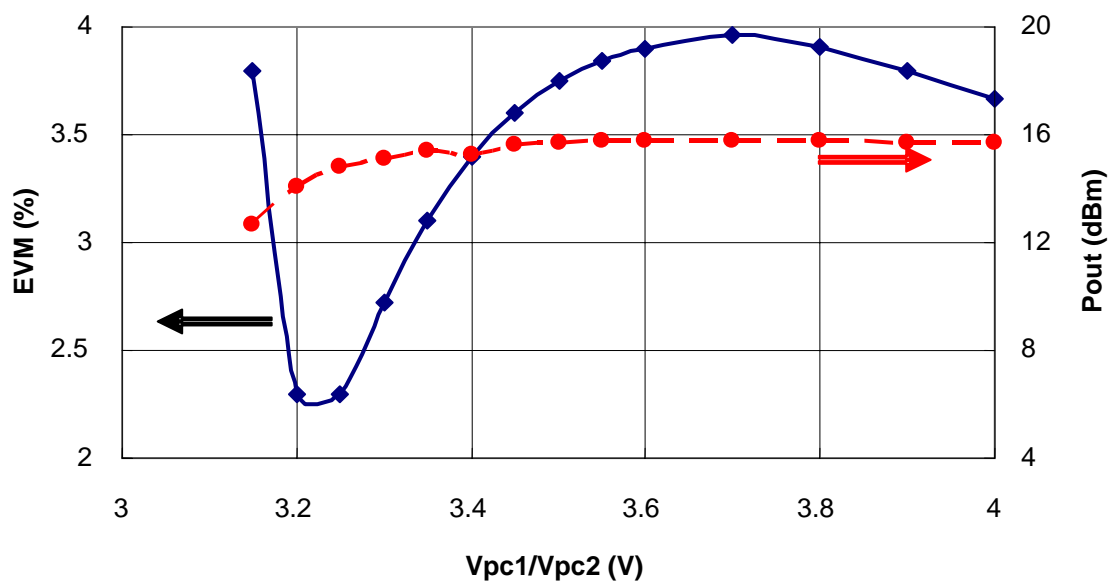
\* Vcc, Vpc1, Vpc2, Vb1, Vb2 are all connected to 3.3 V, T=25°C.



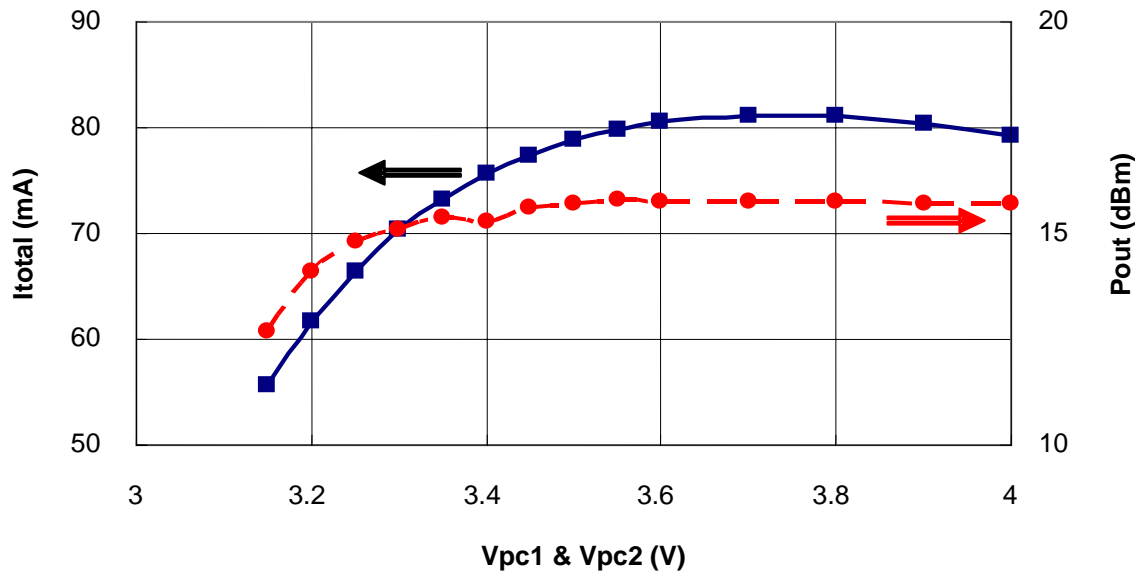
EVM (54Mbps OFDM) and Current vs. Output Power at 2.45GHz



EVM (54Mbps OFDM) and Output Power vs. Vpc1/Vpc2 at 2.45GHz



Current and Output Power vs. Vpc1/Vpc2 at 2.45GHz



## 9. Typical Application Circuit

### 9.1. Single 3.3 V Supply (High Power)

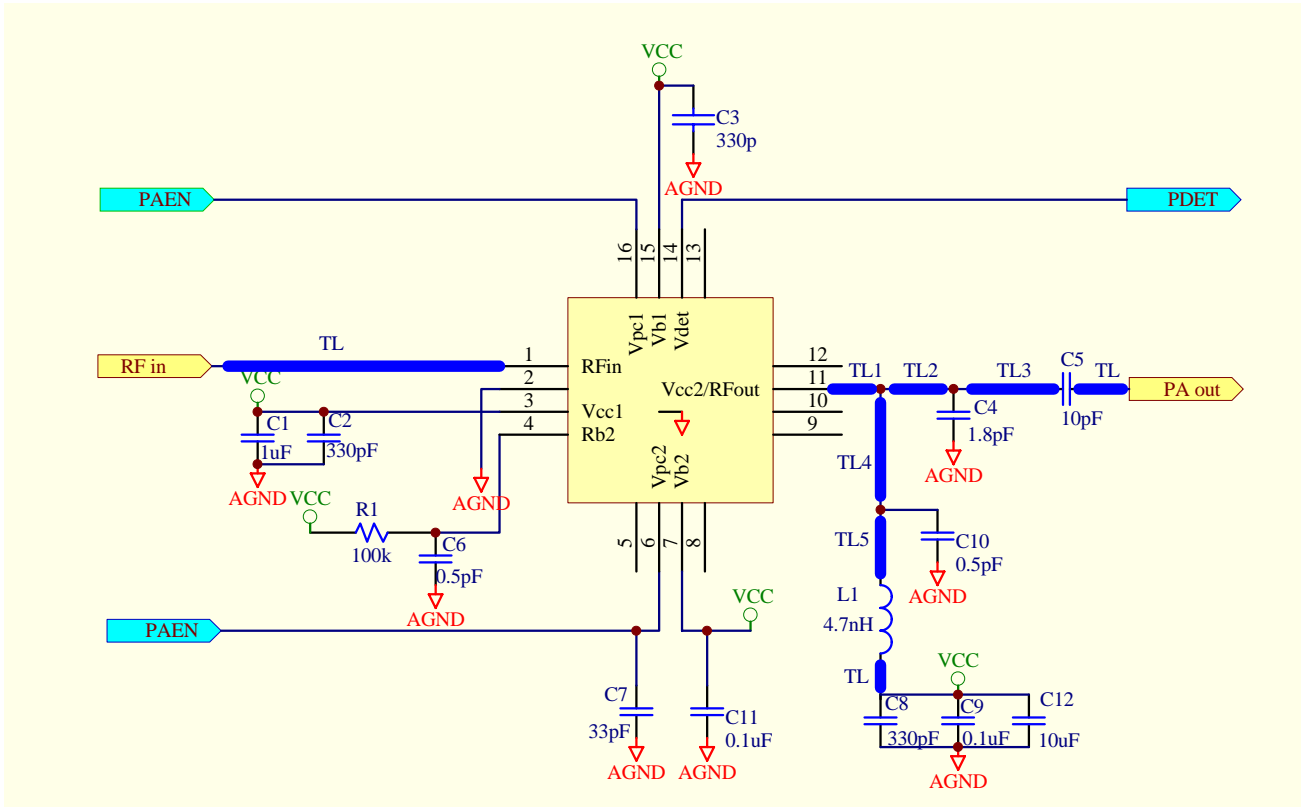


Figure 9-1. Application Circuit of High Power/ High Efficiency Power Amplifier

All TL are 50 ohm lines

	TL1	TL2	TL3	TL4	TL5
Length (mil)	<8	<22	24~80	<8	24~40

Note1: TL1, TL2, TL4 as short as possible (by the meaning of much closed to PA).

Note2: All length measured are from edge to edge.

9.2. Single 3.3 V supply (Low Current)

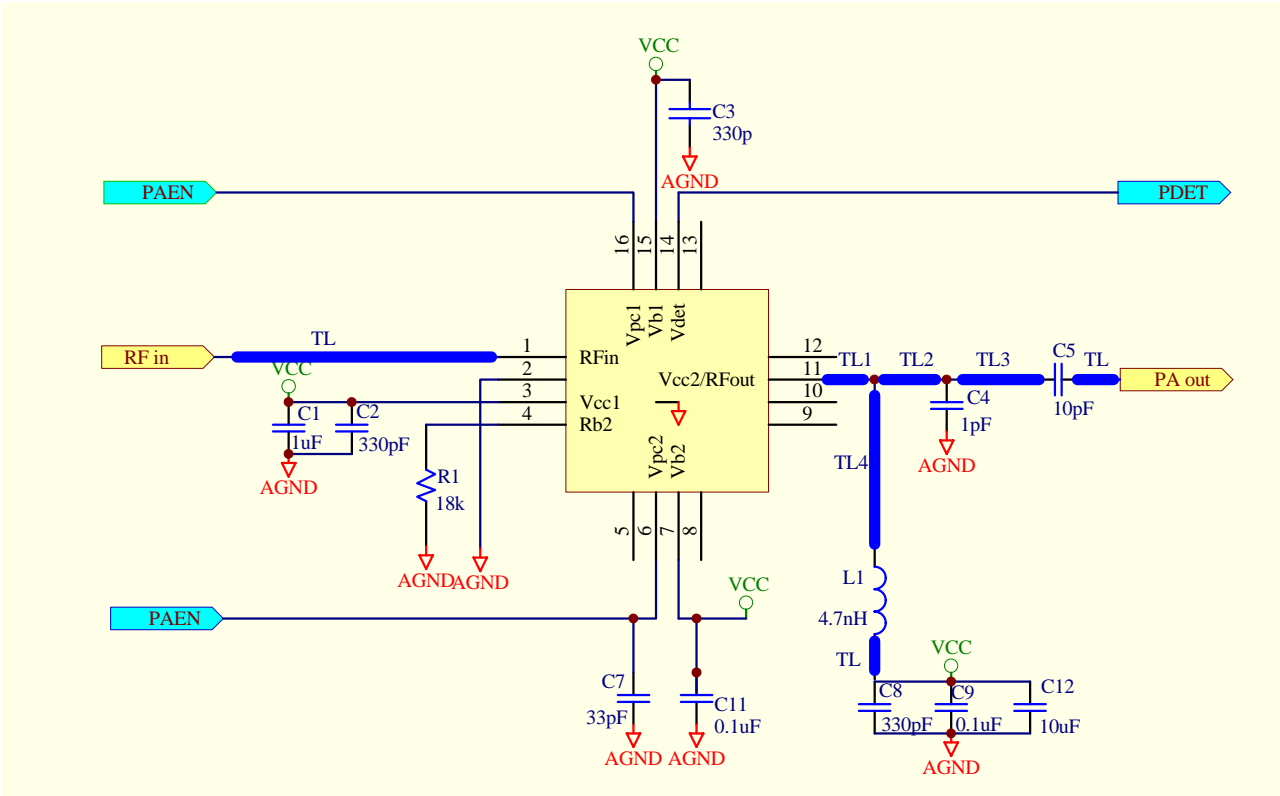


Figure 9-2. Application Circuit of Low Current / High Efficiency Power Amplifier

All TL are 50 ohm lines

	TL1	TL2	TL3	TL4
Length (mil)	<8	32	24~80	24~40

## Revision History

Revision	Date	Description of Change
0.0	2003/7/1	Original.
0.1	2003/7/3	1. Add dimension specification of QFN package 2. Modify the table of key electrical characteristics and typical application
0.2	2004/5/14	1. Change the PIN placement 2. Modify the table of chip performance
0.3	2004/8/31	Add detail performance data .
0.4	2005/1/13	Circuit modification.
0.5	2005/4/21	Update Vcc 5V data and 3.3 V low current data.
0.6	2006/ 6/ 23	Include WDCT application circuit.
0.7	2009/6/11	1. Update to new format 2. Remove Vcc 5V Data and WDCT application circuit.

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