+18dBm Linear Power Amplifier for 2.4GHz IEEE802.11b DSSS WLAN Applications: MAX2242

This application note presents how the MAX2242 power amplifier (PA) is "tuned" to support 802.11b WLAN needs for DSSS application. +18dBm of linear output power is obtained. Performance is presented for various supply voltages. The gain, side-lobes, output power and supply current are given. Operation is from 2412MHz to 2484MHz.

Additional Information: Wireless Product Line Page
Quick View Data Sheet for the MAX2242
Applications Technical Support

General Description

The MAX2242 is a low-cost, ultra-small (1.5mm x 2.0mm), highly versatile power amplifier (PA) for linear and non-linear applications in the 2.4GHz frequency band, with on-chip power detector. The device was originally characterized to deliver +22.5dBm linear output power (-33dBc side-lobe suppression under 11Mbps IEEE802.11b modulation) at a supply current of 310mA from a 3.3V supply (refer to the MAX2242 data sheet for further performance information). An adjustable bias control allows the PA to be tuned for linear output power levels up to +22.5dBm and non-linear applications at saturated output power levels up to +27dBm. This application note covers the tuning of the MAX2242 for +18dBm of linear output power, and the performance of the device over frequency and temperature variations. Refer to Tables 1, 2, and 3 for performance versus supply voltage, frequency, and output power.

Table 1. The MAX2242 Gain, Supply Current and Side-Lobe Suppression vs. Frequency and Supply Voltage for +18dBm Output Power (11Mbps 802.11b Modulation)

Frequency (MHz)	Gain (dB)	Supply Current (mA)	Side-Lobe Suppression* (Down)	Side-Lobe Suppression* (Up)
V_{cc} = +3.6V, P_{OUT} = +18dBm				
2412	28.5	142.2	-33.7	-35.0
2452	28.0	138.4	-33.2	-35.7
2484	27.9	135.8	-33.0	-34.8
V_{cc} = +3.3V, P_{OUT} = +18dBm				
2412	28.2	139.9	-33.3	-34.2
2452	27.7	136.2	-32.7	-34.8
2484	27.6	133.7	-32.8	-34.0
V_{cc} = +3.0V, P_{OUT} = +18dBm				
2412	27.9	137.7	-33.2	-34.0
2452	27.4	134.2	-32.3	-33.8
2484	27.2	131.9	-32.0	-32.8
V_{cc} = +2.7V, P_{OUT} = +18dBm				
2412	27.4	135.4	-32.3	-31.5
2452	26.8	132.5	-31.0	-31.5
2484	26.6	130.8	-30.5	-30.3

*Note: rbw = vbw = 100kHz

Table 2. The MAX2242 Performance vs. Output Power (V_{cc} = +3.3V, f = 2452MHz, 11Mbps 802.11b Modulation)

Output Power (dBm)	Gain (dB)	Supply Current (mA)	Side-Lobe Suppression* (dBc)	Side-Lobe Suppression* (dBc)
20.0	27.1	150.3	-30.3	-30.8
19.0	27.6	142.0	-32.0	-33.8
18.0	27.7	136.2	-32.7	-34.8
17.0	28.0	131.5	-33.8	-35.7
16.0	28.1	127.9	-33.7	-35.8

*Note: rbw = vbw = 100kHz

Table 3. The MAX2242 Bias Current vs. Supply Voltage (no RF power applied)

Supply Voltage (V)	Supply Current (mA)
2.7	113.6
3.0	116.4
3.3	119.3
3.6	122.1

Matching and Bias

The MAX2242 is a three-stage amplifier that requires output matching as well as some interstage matching for optimum gain and side-lobe suppression. Figure 1 demonstrates the layout of the MAX2242 EV kit. Replace the shunt output capacitor, C2, with a 3.0pF capacitor and locate the capacitor between notches 5 and 6.

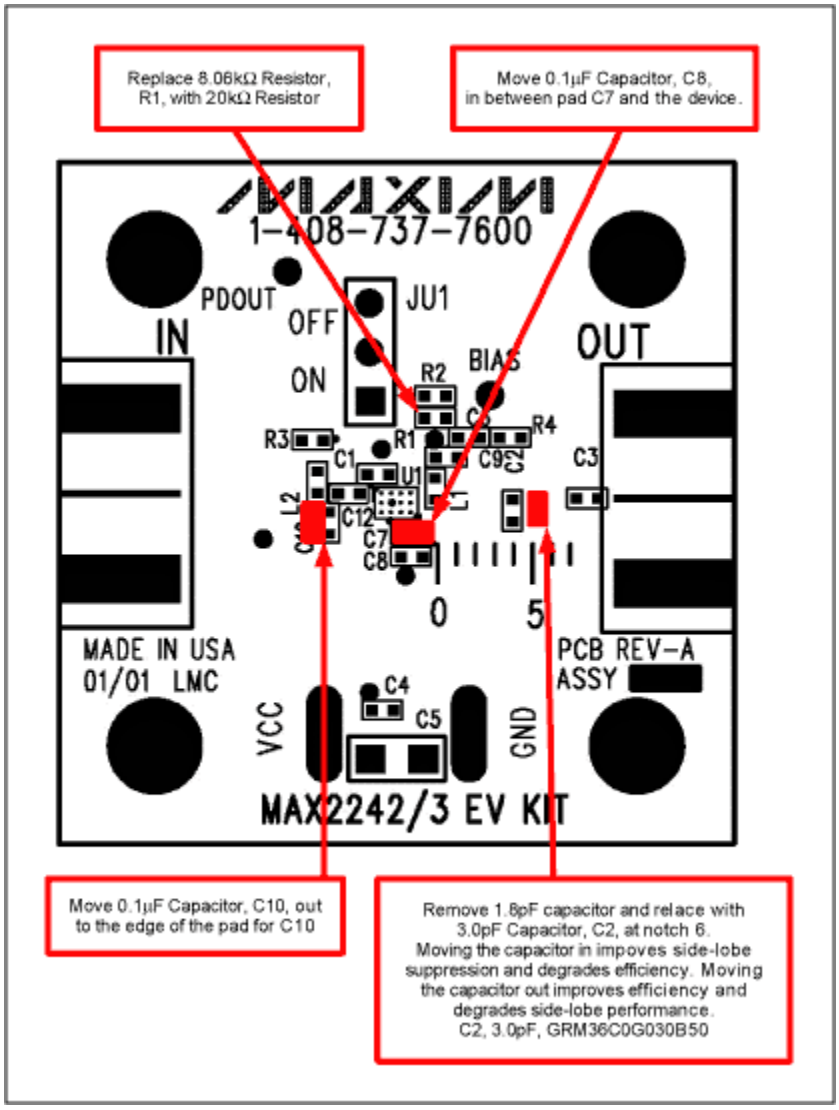

Figure 1. The MAX2242 EV kit +18dBm component placement guide

Figure 2 is the schematic of the MAX2242 EV kit optimized for +18dBm. Some slight adjustment of the location of the capacitor may be required to optimize performance. Moving the location of C2 away from the PA output tends to improve efficiency and degrade gain and side-lobe suppression, while moving the capacitor in towards the PA output, has the opposite effect. The MAX2242 EV kit provides a small amount of inductance in the form of a transmission line on the V_{CC1} and V_{CC2} lines. Adjusting the location of the bypass capacitors on the V_{CC} lines adjusts the amount of pull-up inductance seen by the amplifier and thus the match between stages. Move V_{CC1} bypass capacitor, C10, out to the edge of the bond pad for C10. Move V_{CC2} bypass capacitor, C8, from pad C8 to pad C7. Some experimentation with the location of these bypass capacitors will optimize performance for your application. Refer to Figure 1 for component placement.

In addition to adjusting the location of the bypass and matching capacitors, the value of the bias resistor, R1, needs to be changed to 20kΩ. This sets the DC bias of the PA to around 119mA from a 3.3V voltage supply. Refer to the MAX2242 EV kit data sheet for further assistance with the EV kit schematic, PC board trace dimensions and characteristics, and critical grounding information.

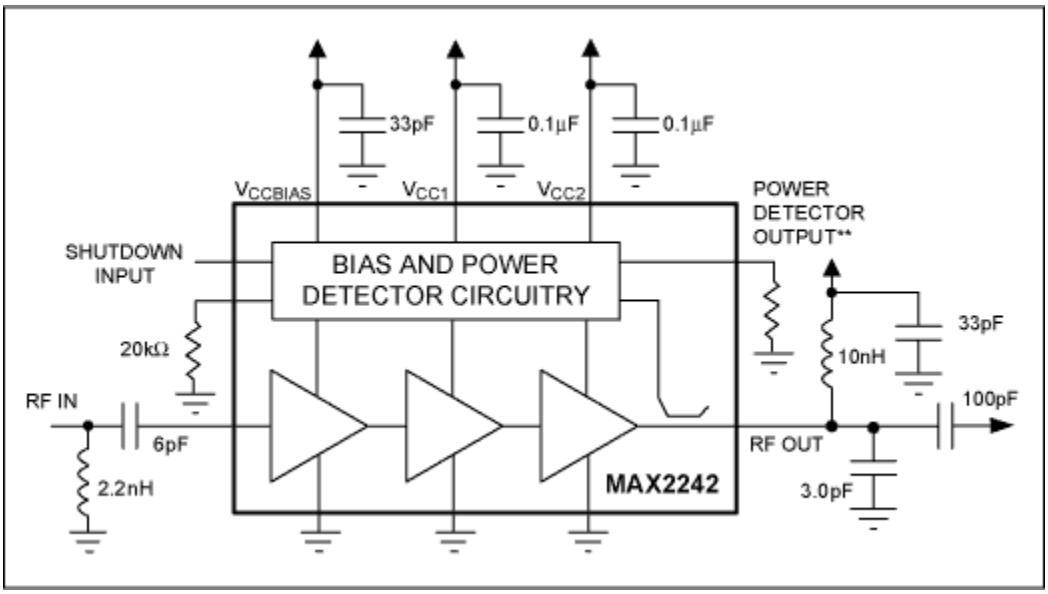

Figure 2. The MAX2242 +18dBm application circuit

MORE INFORMATION

MAX2242: QuickView -- Full (PDF) Data Sheet (200k) -- Free Sample