

APPLICATION NOTE 4276

WLAN Reference Design with the MAX2830

Abstract: This reference design is a complete RF front-end solution designed to meet the WLAN IEEE® 802.11b/g standard. Using the MAX2830 RF transceiver, the design is capable of accommodating full range of 802.11g OFDM data rates (6, 9, 12, 18, 24, 36, 48, and 54Mbps) and 802.11b QPSK data rates (1, 2, 5.5, and 11Mbps). This solution offers high performance, small size, and low BOM cost.

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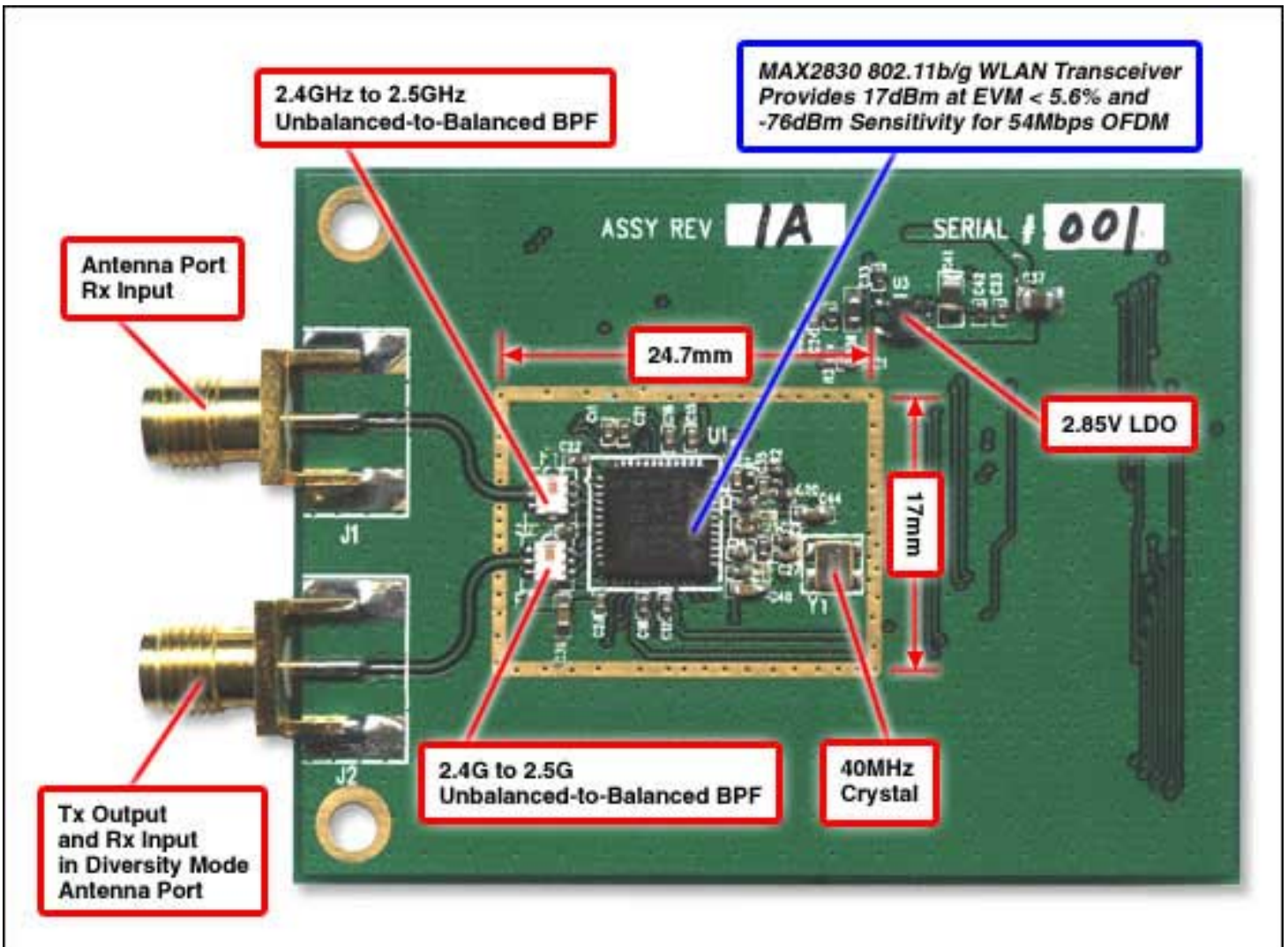


Figure 1. The WLAN reference design features the [MAX2830](#) RF transceiver.

Important Design Features

- High-Performance Rx NF < 6dB (typ); Tx Output 15dBm (typ)
- Small Size: 17mm x 24.7mm
- Platform Design for Multiple Form-Factors such as Card Bus and Compact Flash

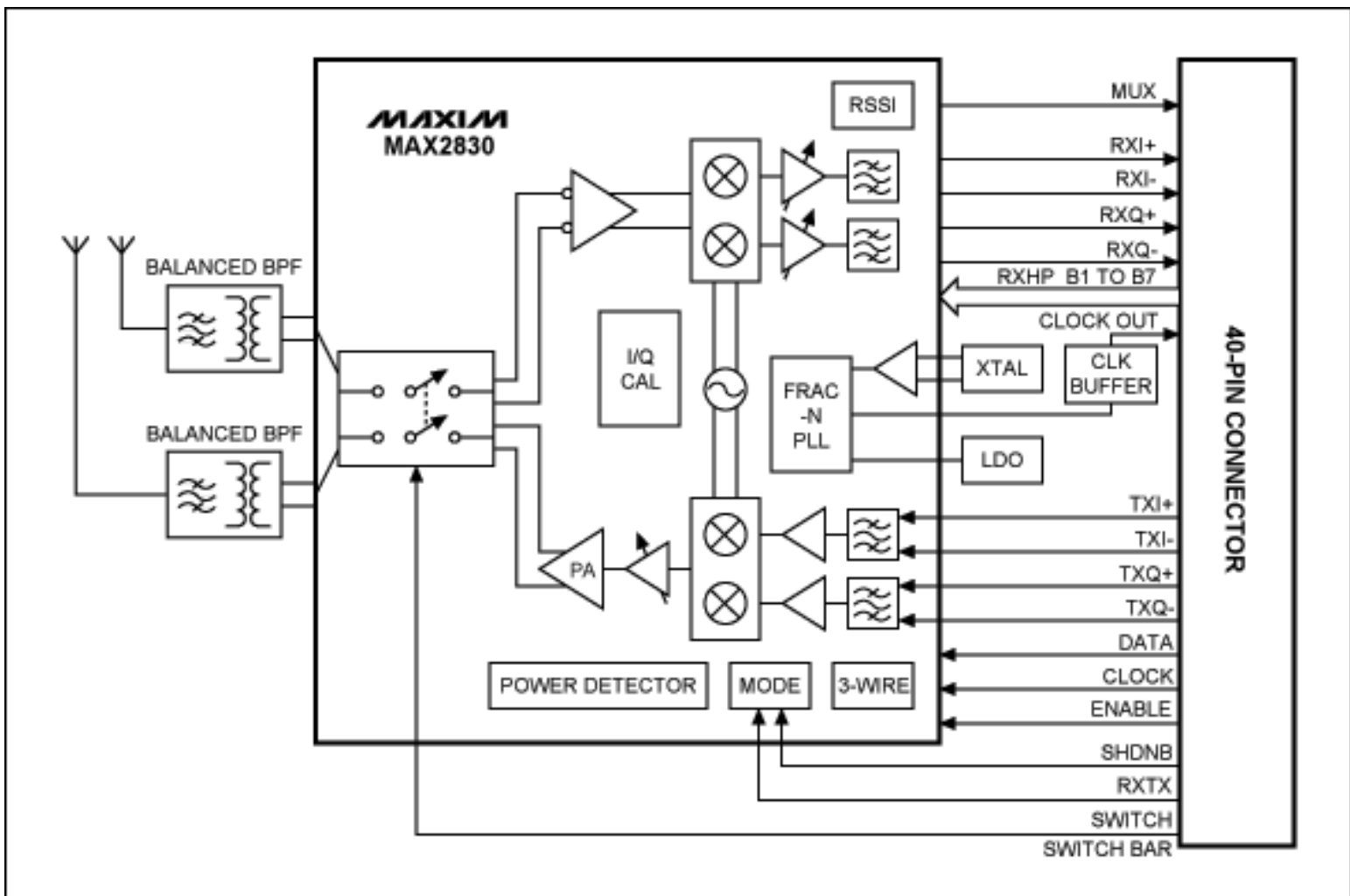


Figure 2. Block diagram of the WLAN reference design.

Power Consumption Summary

Operating conditions: $V_{CC} = 2.85V$; $V_{BAT} = 3.3V$; $f_{RF} = 2.437GHz$; RXTX and active-low SHDN set according to operating mode; active-low CS = high; SCLK = DIN = low; transmitter and receiver in maximum gain. There were no input signals at RF inputs. Baseband outputs are open. $100mV_{RMS}$ differential, 54Mbps IEEE 802.11g OFDM signals were applied to I and Q baseband inputs of transmitter in transmit mode.

Parameter	Test Conditions	Meas.	Unit
Supply Current	Shutdown		μA
	Standby; PLL + VCO + LO generator	28	mA
	Rx active	58	mA
	Tx active (most linear mode) at 3.3V for PA V_{CC} , $P_{OUT} = 15.7dBm$	295	mA

Receive Summary

Operating conditions: $V_{CC} = 2.85V$; $T_A = +25^\circ C$; $f_{RF} = 2.437GHz$; $f_{BB} = 4MHz$; Rx $V_{OUT} = 112mV_{RMS}$; $f_{REF} = 40MHz$; active-low SHDN = high; RXTX = low; active-low CS = high; SCLK = DIN = low.

Parameter	Test Condition	Meas.	Unit	
Frequency Range		2.4 to 2.5	GHz	
Total Voltage Gain		94	dB	
RF Gain Steps	Relative max gain (B7:B6 = 11)	B7:B6 = 10	-16	dB
		B7:B6 = 0X	-33	
BB Gain Range	Ratio of max to min gain	61	dB	
DSB NF	LNA input referred, based on 10kHz to 8.6MHz integrated noise at I/Q baseband output.	1. B7:B6 = 11, voltage gain = 90dB	6.0	dB
		2. B7:B6 = 11, voltage gain = 62dB	6.4	
		3. B7:B6 = 11, voltage gain = 48dB	7.0	
I/Q Phase Error near DC	Max gain	< ± 1	deg	
IQ Gain Imbalance	Max gain	< 0.1	dB	
Rx Sensitivity	EVM < 9%	Measured at J1	-73.6	dBm
		Measured at J2	-72.6	
EVM	$P_{IN} = -65dBm$	4.2	%	
	$P_{IN} = -40dBm$	2.2		
	$P_{IN} = -10dBm$	3.0		

Transmit Summary

Operating conditions: $V_{CC} = 2.85V$; $V_{BAT} = 3.3V$; $T_A = +25^{\circ}C$; $f_{RF} = 2.437GHz$; $f_{REF} = 40MHz$; active-low SHDN = high; RXTX = high; active-low CS = high; SCLK = DIN = low; $100mV_{RMS}$, 54Mbps 802.11g OFDM signal applied to I and Q baseband inputs of transmitter.

Parameter	Test Condition	Meas.	Unit
Frequency Range		2.4 to 2.5	GHz
Transmit Power	For EVM = 5.6%; meets the ACPR spec	15.7	dBm/16MHz
Transmit EVM	$P_{OUT} = +15.7dBm$	5.4%	
Adjacent Channel Power Ratio (for 54Mbps OFDM Signal)	At 11MHz offset over 100kHz RBW	See Figure 3	dBc
	At 20MHz offset over 100kHz RBW		
	At 30MHz offset over 100kHz RBW		

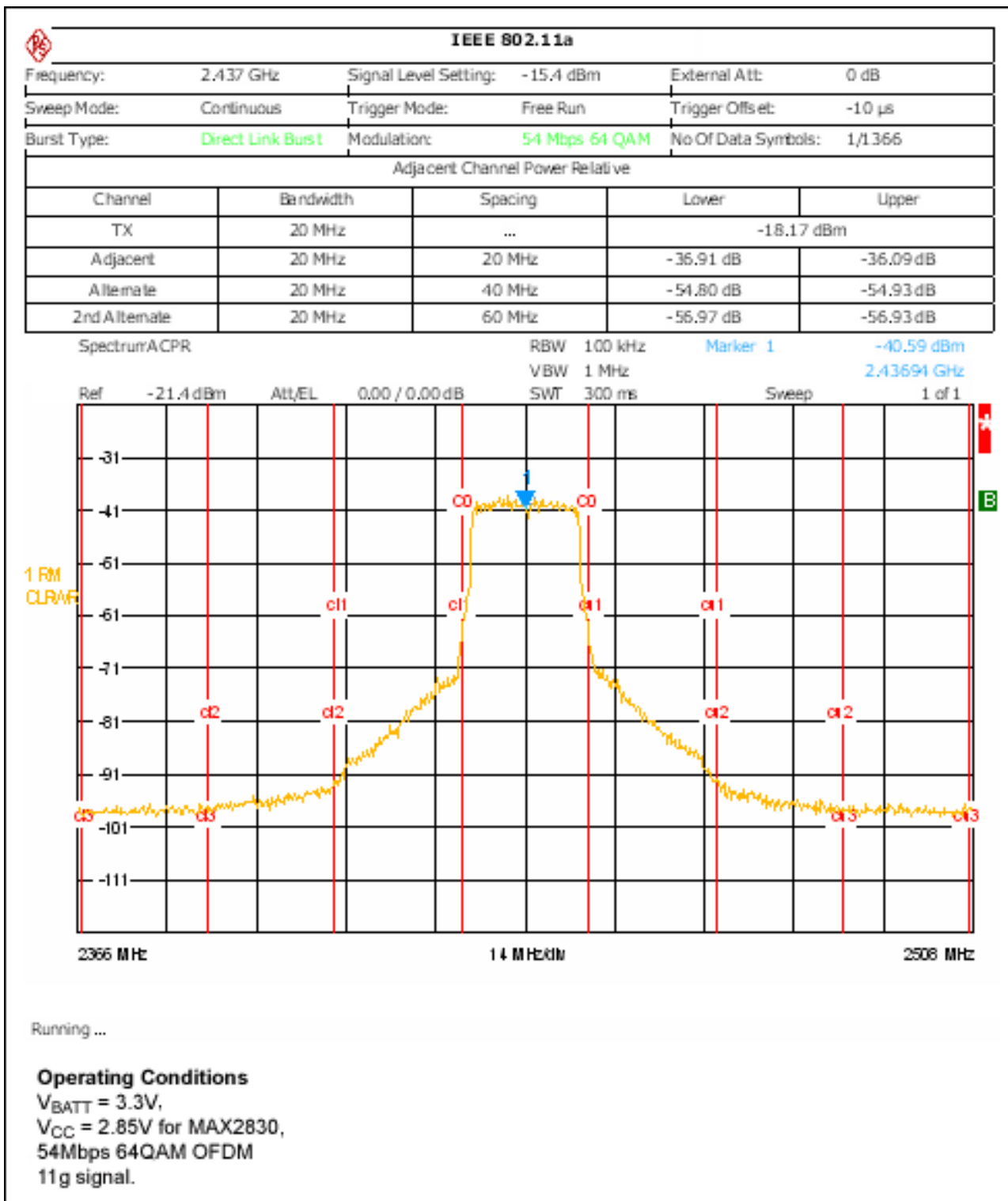


Figure 3. ACPR performance at Tx power = 15.7dBm, EVM < 5.6%.

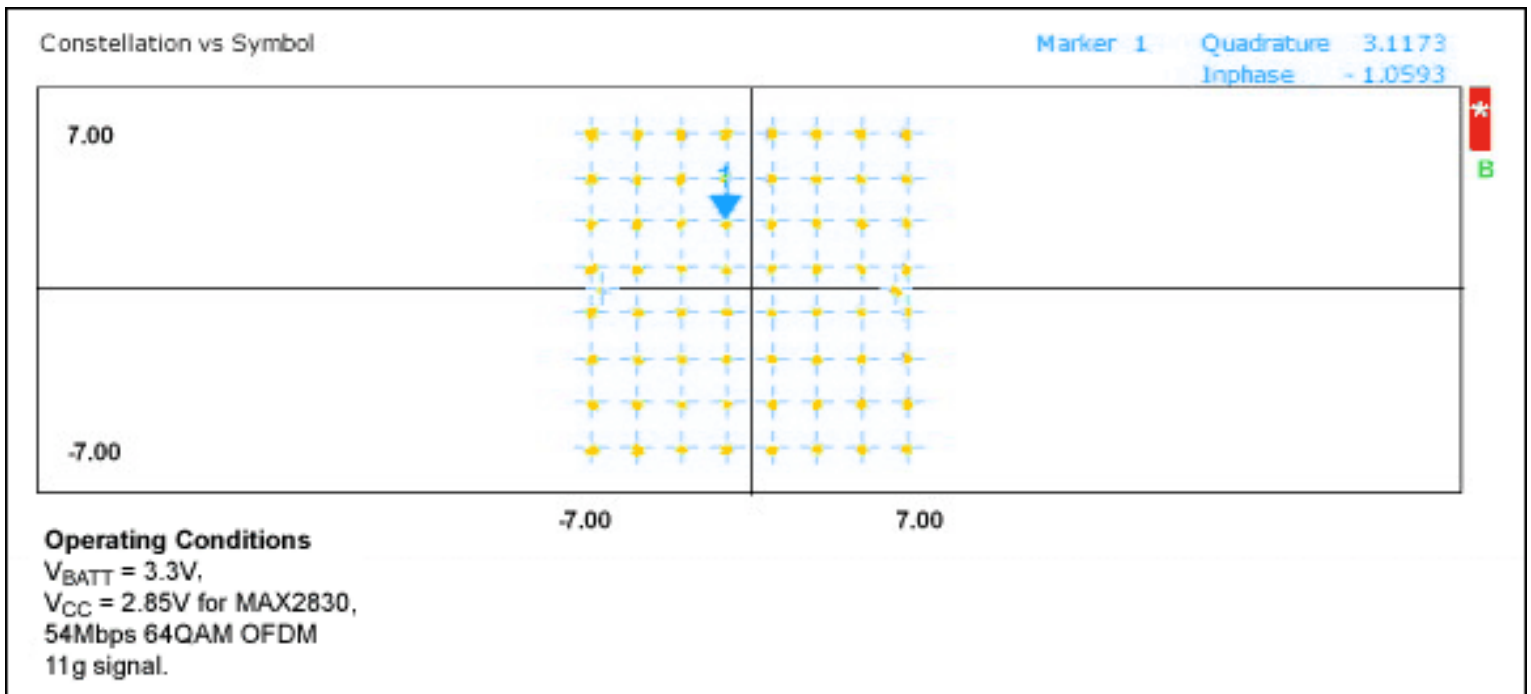


Figure 4. Rx I/Q constellation diagram at RF input = -40dBm, 54Mbps 64QAM, EVM = 2.2%.

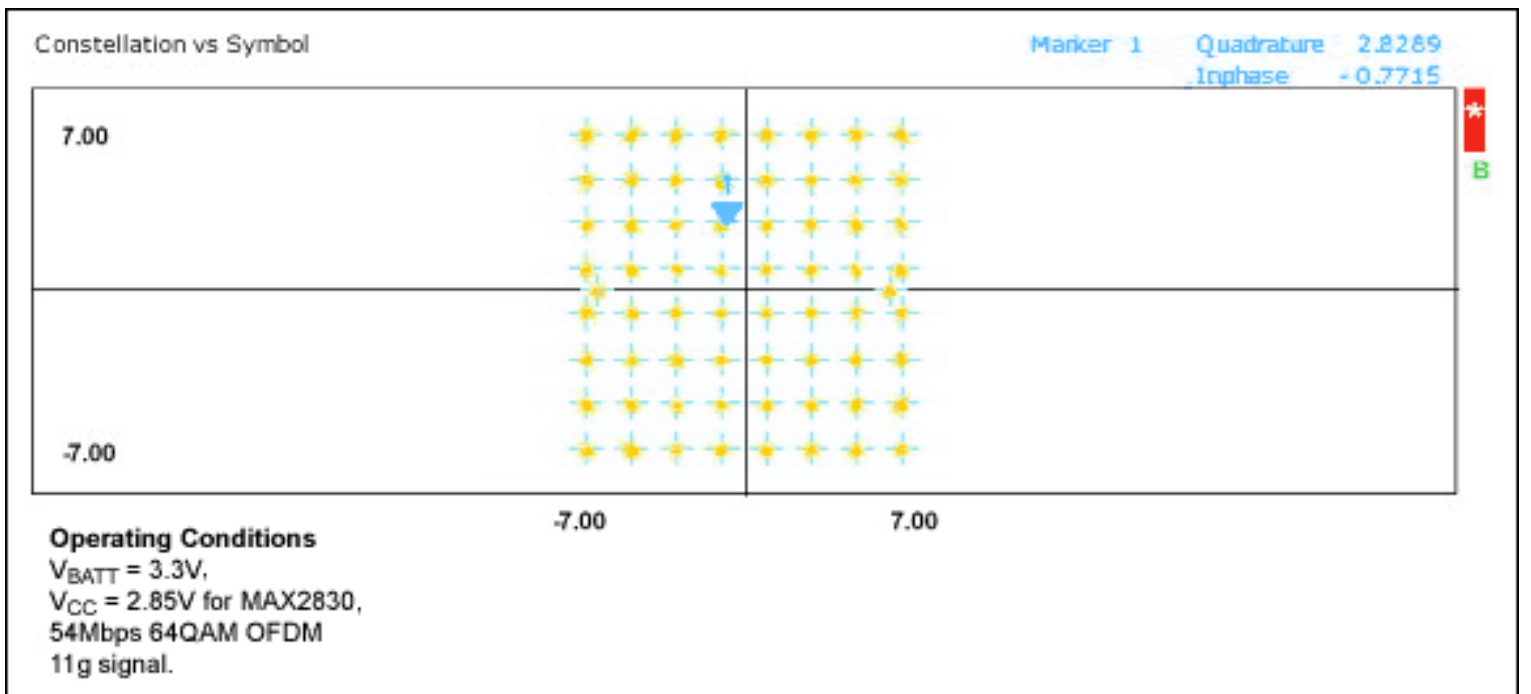


Figure 5. Rx I/Q constellation diagram at $P_{IN} = -65dBm$, 54Mbps 64QAM. The EVM is only 4.2%, which is better than the 9% requirement for sensitivity.

Detailed Description

This reference design is suitable for the full range of 802.11g OFDM data rates (6, 9, 12, 18, 24, 36, 48, and 54Mbps) and 802.11b QPSK data rates (1, 2, 5.5, and 11Mbps) at corresponding sensitivity levels. Using the MAX2830 chipset eliminates the need for external SAW filters, a RF switch, and a PA. Only a RF filter, RF balun, and a small number of passive components are required to form a complete 11b/g WLAN RF front-end solution that delivers high performance in a small PCB form-factor.

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Application note 4276: www.maxim-ic.com/an4276

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