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Spec No: 002-14933

Spec Title: AN214933 - SENSITIVITY PERFORMANCE FOR
                BLUETOOTH AND FM USING DIFFERENT
                FREQUENCY CRYSTALS

Replaced by: None

Sensitivity Performance for Bluetooth and FM Using Different Frequency Crystals

Associated Part Family: CYW4330

This Application Note provides an overview of CYW4330 sensitivity performance for Bluetooth and FM using different frequency crystals, with an emphasis on crystal harmonic desenses.

1   Introduction

This Application Note provides an overview of CYW4330 sensitivity performance for Bluetooth and FM using different frequency crystals, with an emphasis on crystal harmonic desenses.

1.1   Cypress Part Numbering Scheme

Cypress is converting the acquired IoT part numbers from Broadcom to the Cypress part numbering scheme. Due to this conversion, there is no change in form, fit, or function as a result of offering the device with Cypress part number marking. The table provides Cypress ordering part number that matches an existing IoT part number.

Table 1. Mapping Table for Part Number between Broadcom and Cypress

Broadcom Part Number	Cypress Part Number
BCM4330	CYW4330

1.2   Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined upon first use. For a more complete list of acronyms and other terms used in Cypress documents, go to: http://www.cypress.com/glossary.

2   IoT Resources

Cypress provides a wealth of data at http://www.cypress.com/internet-things-iot to help you to select the right IoT device for your design, and quickly and effectively integrate the device into your design. Cypress provides customer access to a wide range of information, including technical documentation, schematic diagrams, product bill of materials, PCB layout information, and software updates. Customers can acquire technical documentation and software from the Cypress Support Community website (http://community.cypress.com/).

3   Crystal Clock Vendor Parts

The experiments described in this Application Note use TXC 37.4/38.4/19.2/26 MHz 8Y-series crystals. Table 2 lists the vendor and Broadcom part numbers.

Table 2: Crystal Vendor Part Numbers

Crystal Frequency (MHz)	TXC Part Number	Broadcom Part Number
37.4	8Y37470001	541779-00
38.4	8Y38470002	542966-00
19.2	8Y19270002	–
26	8Y26070009	–

4 Desense Performance with Different Crystal Clocks

4.1 Bluetooth Sensitivity

The harmonics of crystal clocks will degrade Bluetooth receiver sensitivity at those harmonic channels.

Table 3 lists all harmonic channels for the crystal clocks.

Table 3: Bluetooth Crystal Harmonic Channels

Crystal Clocks	Harmonic Channels
37.4 MHz	2431 MHz (65th), 2468.4 MHz (66th)
38.4 MHz	2419.2 MHz (63rd), 2457.6 MHz (64th)
19.2 MHz	2419.2 MHz (126th), 2438.4 MHz (127th), 2457.6 MHz (128th), 2476.8 MHz (129th)
26 MHz	2418 MHz (93rd), 2444 MHz (94th), 2470 MHz (95th)

Figure 1. 1 Mbps Sensitivity
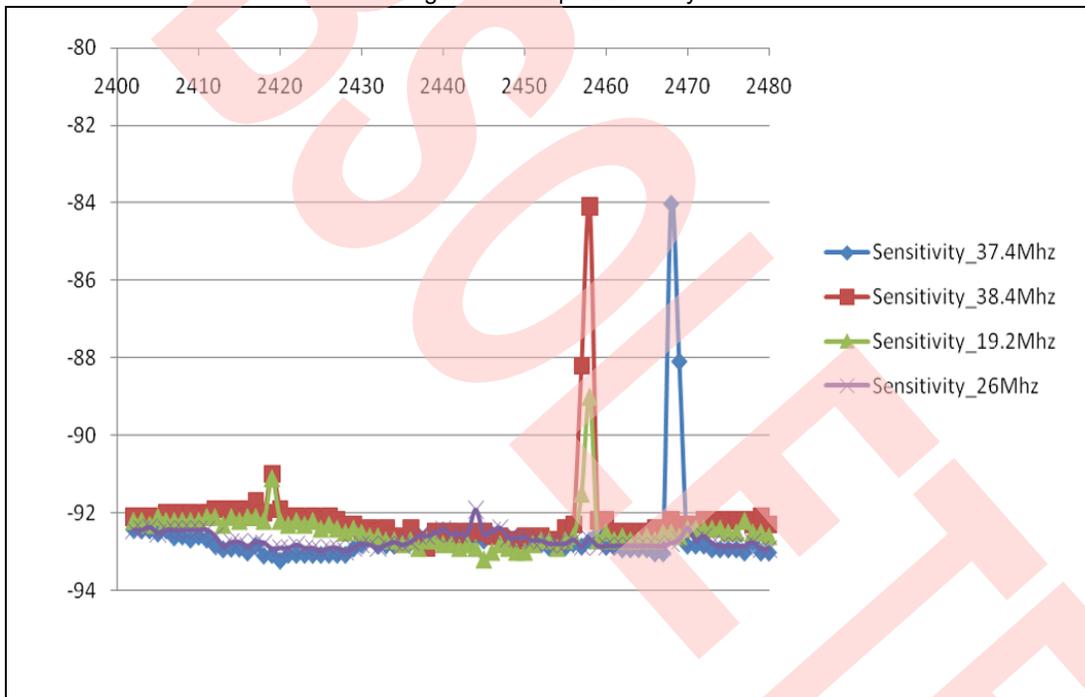
Figure 2. 2 Mbps Sensitivity
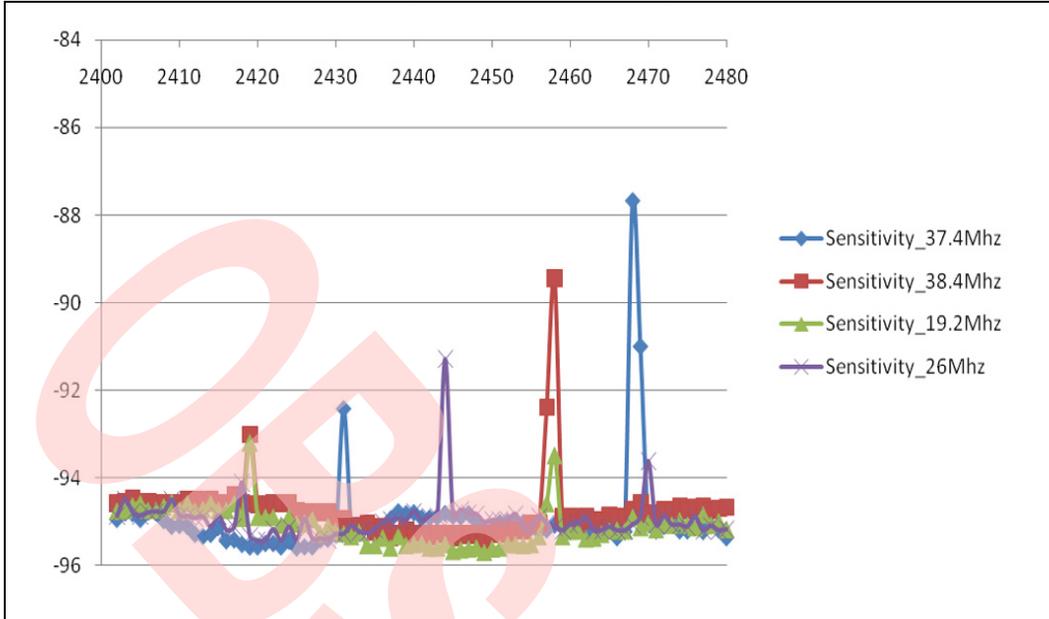
Figure 3. 3 Mbps Sensitivity
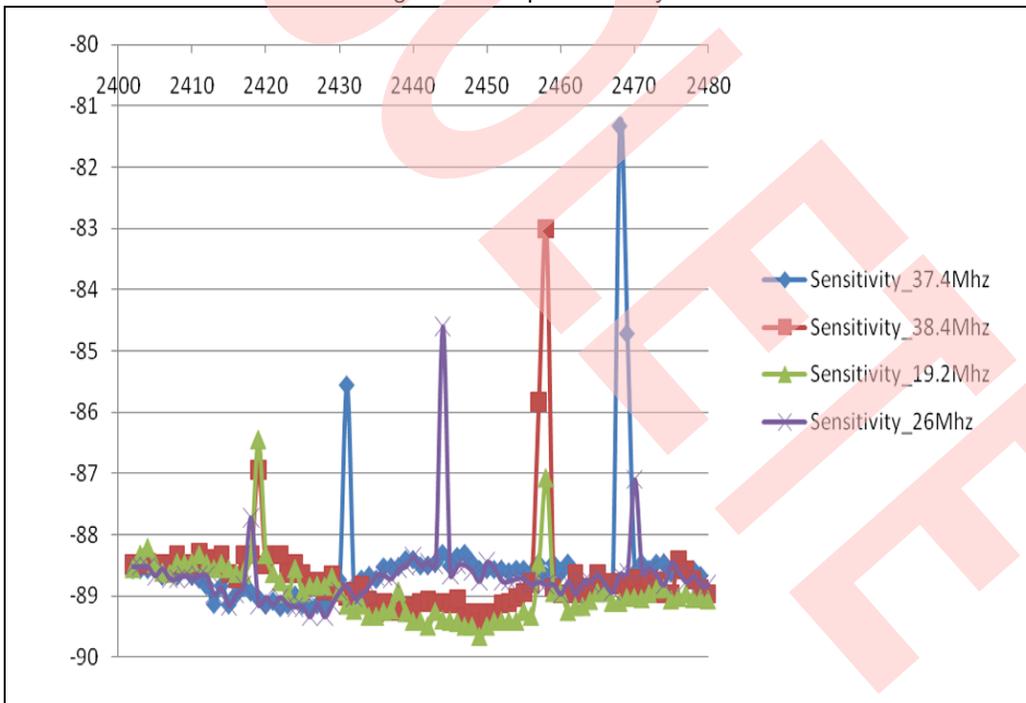
4.2   FM Sensitivity

The harmonics of crystal clocks will degrade FM receiver sensitivity at those harmonic channels.

Table 4 lists all harmonic channels for the crystal clocks.

Table 4: FM Crystal Harmonic Channels

Crystal Clocks	Harmonic Channels
37.4 MHz	74.8 MHz (2nd)
38.4 MHz	76.8 MHz (2nd)
19.2 MHz	76.8 MHz (4th), 96 MHz (5th), 115.2 MHz (6th)
26 MHz	78 MHz (3rd), 104 MHz (4th)

Figure 4. Sensitivity Sweep
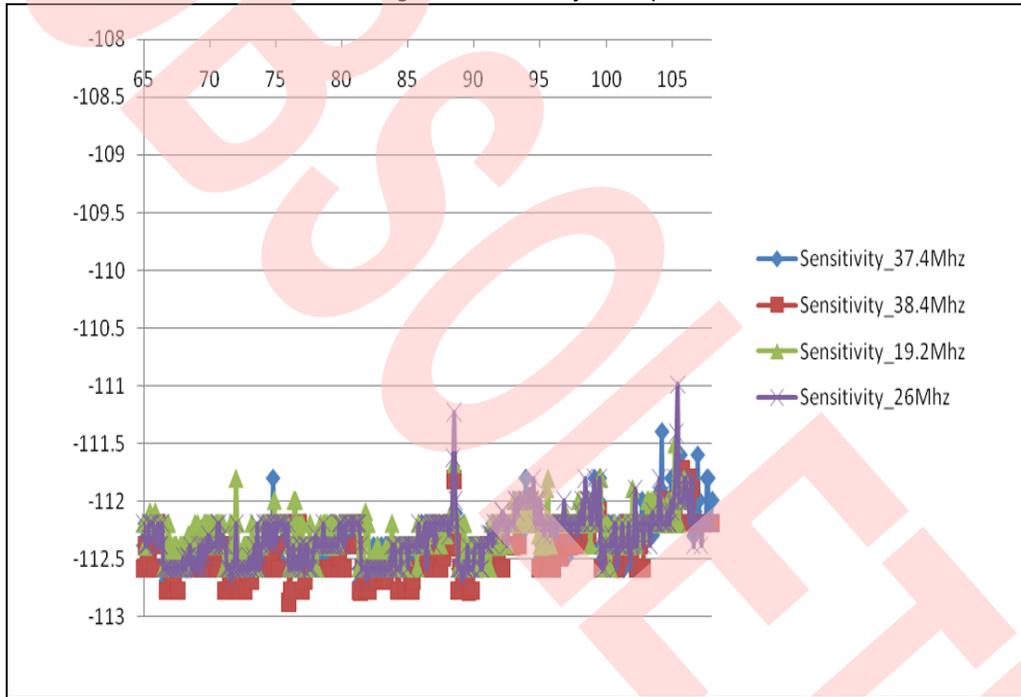
5   Design Recommendations

To reduce crystal clock harmonics desense:

■ It is highly recommended to use a 37.4 MHz crystal clock for the CYW4330, as it has less harmonic desense channels.

■ Ensure good isolation between crystal clock traces and RF traces. If possible, place OSC/TCXO at different sides of the board as the RF trace/connectors.

■ Ensure crystal clock traces are kept away from all power lines, FM traces, and all other noisy signals. The crystal itself must be well-grounded.

■ Use a 220Ω series resistor on the OSCOUT path. This resistor reduces crystal amplitude and improves sensitivity desense.

Document History Page

				Document Title: AN214933 - Sensitivity Performance for Bluetooth and FM Using Different Frequency Crystals
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Rev.	ECN No.	Orig. of Change	Submission Date	Description of Change
**	-	-	10/19/2010	4330-AN300-R Initial Release
*A	5457447	UTSV	09/30/2016	Added Cypress Part Numbering Scheme. Updated to Cypress template
*B	5839143	AESATMP8	07/31/2017	Updated logo and Copyright.
*C	6352268	SELE	10/16/2018	Obsoleted

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Cypress Semiconductor
198 Champion Court
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