Asynchronous Serial Mode for CC1110Fx and CC2510Fx

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Keywords

- *Asynchronous Serial Mode*
- *CC1110Fx*
- *CC2510Fx*

1 Introduction

The purpose of this design note is to show how the CC1110Fx and CC2510Fx can be configured for asynchronous serial mode. This mode can be used in applications that need to transmit and/or receive data packets not fitting with the standard packet format supported by the CC1110Fx and CC2510Fx.

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2 Abbreviations

EB	Evaluation Board
FEC	Forward Error Correction
GPIO	General Purpose Input Output
ms	Millisecond
MSK	Minimum Shift Keying
RF	Radio Frequency
RX	Receive
TX	Transmit

3 Configuration

The PKTCTRL0 register needs to be programmed to 0x32 in both RX and TX mode. This means that both PKTCTRL0.PKT_FORMAT and PKTCTRL0.LENGHT_CONFIG is set to values described as "Reserved" in the data sheets ([1] and [2]). It is important to note that when asynchronous serial mode is enabled it is not possible to use data whitening, FEC, Manchester encoding, or MSK. The CC1110Fx and CC2510Fx modulator samples the level of the asynchronous input 8 times faster than the programmed data rate and hence the error in the bit period for the asynchronous stream must be less than one eighth of the programmed data rate.

3.1 TX Mode

In TX mode, P0_7 becomes serial data input and this pin must be configured to have peripheral function, meaning that P0SEL.SELP0_[7] should be set to 1. Since this pin is an input pin while in TX mode, it is not possible to write data directly to this pin. Instead, another port pin must be configured as a general purpose output pin and this pin must be connected to P0_7. For the pseudo code example in Figure 1, P1_5 is being used. Please note that if using SmartRF04EB to test this code, R107 must be removed, as P0_7 is connected to the potmeter.

3.2 RX Mode

In RX mode, P1_5, P1_6, or P1_7 can be configured as serial data output by setting IOCFG0, IOCFG1, or IOCFG2 to 0x0D respectively. Pseudo code showing how RX mode can be tested are shown in Figure 2.

4 Pseudo Code

```
// Pseudo code for testing asynchronous serial mode in TX. This code example assumes
// that P1_5 and P0_7 are connected. The code example shows how a simple 1010101...
// sequence can be transmitted in async. mode.

// 1) Init MCU (Operation of the RF transceiver requires that the high speed crystal
//    oscillator is used)

// 2) Configure Radio

// 3) Program P1.5 as an output (can be any other available GPIO)
P1DIR.DIR1_[5] = 1;

// 4) Make P0.7 becomes Serial Data Input in TX mode by configuring the pin to have
//    peripheral function
P0SEL.SELP0_[7] = 1;

// 5) Enter TX state by issuing an STX strobe command
RFST = 0x03;

// 6) Wait for radio to enter TX state
while (MARCSTATE != 0x13);

// 7) Loop forever while transmitting a 1010101... sequence with period 2x ms
while (1) {
    P1_5 = 0;
    delay(x); // x is the delay in ms
    P1_5 = 1;
    delay(x); // x is the delay in ms
}
```

Figure 1. Pseudo Code for TX

```
// Pseudo code for testing asynchronous serial mode in RX. In this code example P1_6 is
// configured as Serial Data Output and the received data can be monitored or read from
// this pin

// 1) Init MCU (Operation of the RF transceiver requires that the high speed crystal
//    oscillator is used)

// 2) Configure Radio

// 3) Program P1.6 as Serial Data Output
IOCFG1 = 0x0D;

// 4) Enter RX state by issuing an SRX strobe command
RFST = 0x02;

// 5) Wait for radio to enter RX state
while (MARCSTATE != 0x0D);

// 6) Loop forever. The received data can be monitored by connecting an oscilloscope to
//    P1_6 or it can be read in SW by reading P1.P1[6]
while (1) {
}
```

Figure 2. Pseudo Code for RX

5 References

[1] CC1110Fx/CC1111Fx Low-Power Sub-1 GHz RF System-on-Chip (SoC) with MCU, Memory, Transceiver, and USB Controller (cc1110f32.pdf)

[2] CC2510Fx/CC2511Fx Low-Power SoC (System-on-Chip) with MCU, Memory, 2.4 GHz RF Transceiver, and USB Controller (cc2510f32.pdf)

6 General Information

6.1 Document History

Revision	Date	Description/Changes
SWRA316	2010.01.26	Initial release.
SWRA316A	2012.03.21	Removed references to CC1111Fx and CC2511Fx as these devices do not have P0_7.

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