

RF Module Testing using SmartRF® Studio

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Keywords

- *Take Advantage of the Development Tools*
- *Simplify Module Verification*

1 Introduction

The SW and HW should first be tested separately when doing RF module debugging. This design note gives advice on how to connect an RF module based on Chipcon RF ICs from Texas Instruments to one of the SmartRF®

Evaluation Boards and use the SmartRF® Studio software [1] to configure the RF module and do simple verification and testing.

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2 Abbreviations

EB	Evaluation Board
DUT	Device (RF module) under Test
HW	Hardware
SW	Software

3 How to find the SmartRF® test platform to use for the DUT

The device manager in SmartRF® Studio [1] can be used to find the right SmartRF® platform for the device under test (DUT). As seen in Figure 1, there is one tab for each of the SmartRF® platforms, and all the devices for a given platform are listed under each tab.

As an example, CC2500 is part of the SmartRF® 04 platform.

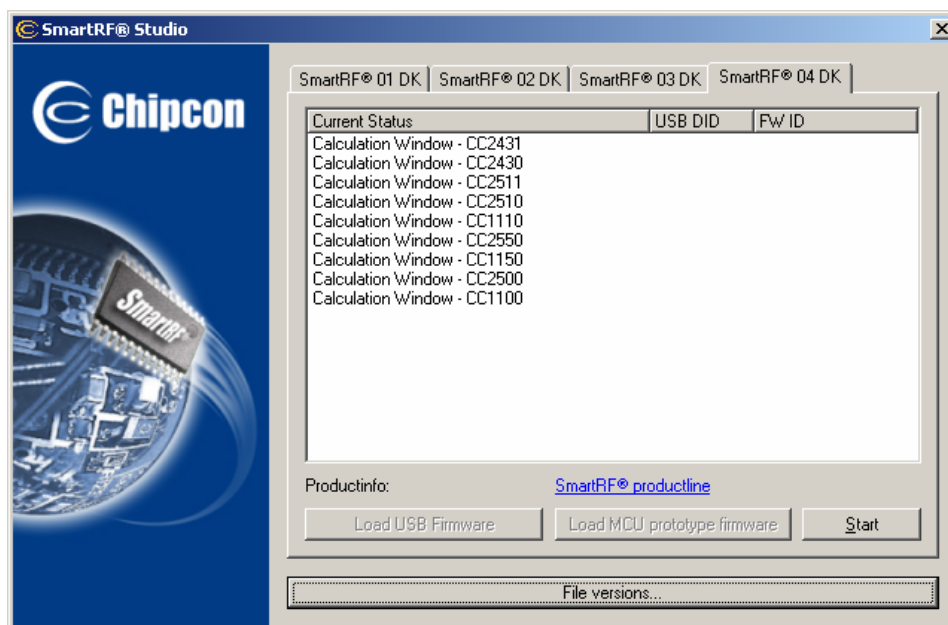


Figure 1. SmartRF® Studio Platform Overview

Table 1 lists the Evaluation Boards (EBs) for each SmartRF® platform. If the DUT is connected to the appropriate EB, the SmartRF® Studio software [1] can be used to control the operation of the DUT when verifying the HW design.

As an example, an RF module using CC2500 shall be connected to the SmartRF04EB.

SmartRF® platform	Evaluation Board	DUT connection	Additional info on EB
SmartRF®01	CC1020EB	P7	CC1020-CC1070DK User Manual [3]
SmartRF®02	CC1020EB	P7	CC1020-CC1070DK User Manual [3]
SmartRF®03	CC2400EB	P16,P17,P20	CC2400DK User Manual [4]
SmartRF®04	SmartRF04EB	P11	CC1150/1100/2500/2550DK User Manual [5]

Table 1. DUT Connections on Evaluation Boards

The approach described in this design note is only valid for transceiver and transmitter modules based on Chipcon RF ICs from Texas Instruments. For SoC modul testing it is recommended to use the debug connector P14 on the SmartRF04EB (see Figure 4). For additional information on how to use the different EBs for testing refer to the appropriate User Manual.

4 Connecting SmartRF01 or SmartRF02 DUT to EB

Application note AN006 [2] describes how to test and connect the CC400/CC900 or CC1000/CC1050 to their respective EB. However, the CC1020EB can be used to test all SmartRF01 and SmartRF02 devices. If the DUT is connected to the EB according to Table 2, the SmartRF® Studio software [1] can be used to control the operation of the DUT when verifying the HW design.

CC1020EB	DUT		
P7 connector	CC400/CC900	CC1000/CC1050	CC102X/CC1070
1	GND	GND	GND
2	GND	GND	GND
3	STROBE	PALE	PSEL
4	CLOCK	PCLK	PCLK
5		DCLK	DCLK
6	PDATA	PDATA	PDI
7	DIO	DIO	DIO
8	PDATA	PDATA	PDO
9	VCC	VCC	VCC
10	LOCK	CHP_OUT (LOCK)	LOCK
R29 on CC102EM	0 ohm	0 ohm	Do Not Mount

Table 2. Test Pin Overview for CC1020EB

Figure 2 shows where to find test connector P7 and resistor R29 on the CC1020EB.

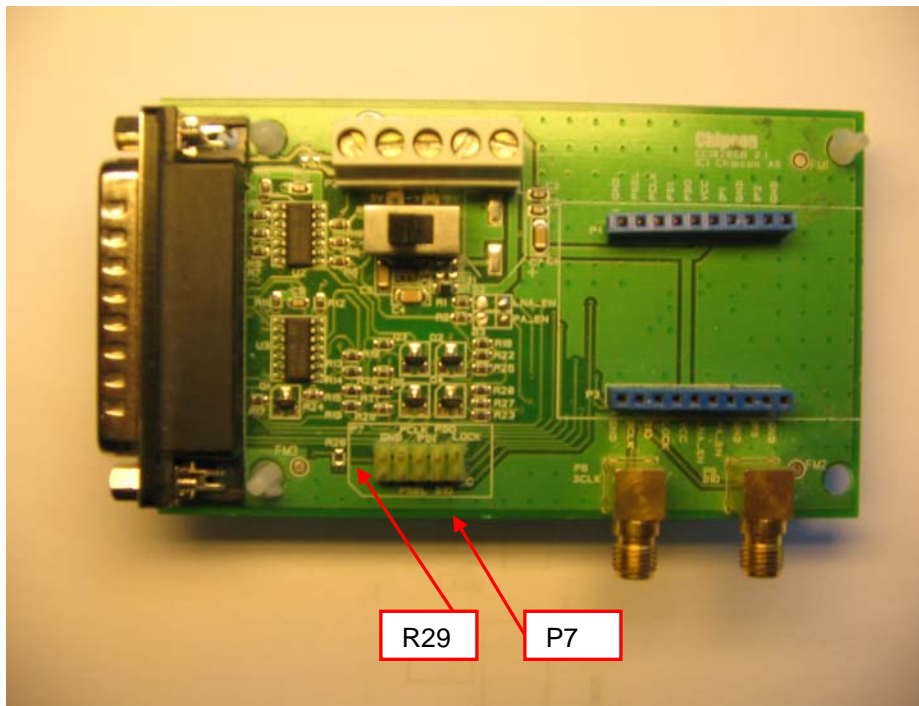


Figure 2. Picture of CC1020EB

5 Connecting SmartRF03 DUT to EB

The CC2400EB can be used to test all SmartRF03 devices. If the DUT is connected to the EB according to Table 3, the SmartRF® Studio software [1] can be used to control the operation of the DUT when verifying the HW design.

CC2400EB	DUT	
P16 connector	CC2400	CC2420
2	CSn	CSn
3	SCLK	SCLK
4	SI	SI
5	SO	SO
P20 connector		
3	DIO/PKT (Optional)	CCA (Optional)
4	DCLK/FIFO (Needed in Packet RX/TX mode)	SFD (Needed in Packet RX/TX mode)
U3		
9		FIFO (Needed in Packet RX/TX mode)
12		FIFOP (Optional)
P18 connector		
1	GND	GND
2	VCC_EM_CORE (1.8V)	VCC_EM_CORE (1.8V)
3	VCC_EM_IO (3.3V)	VCC_EM_IO (3.3V)

Table 3. Test Pin Overview of CC2400EB

Figure 3 shows where to find test connectors P16, P18, and P20 on the CC2400EB. Note that U3 is not mounted on the CC2400EB when shipped from TI. The U3 footprint is on the bottom side of the CC2400EB.

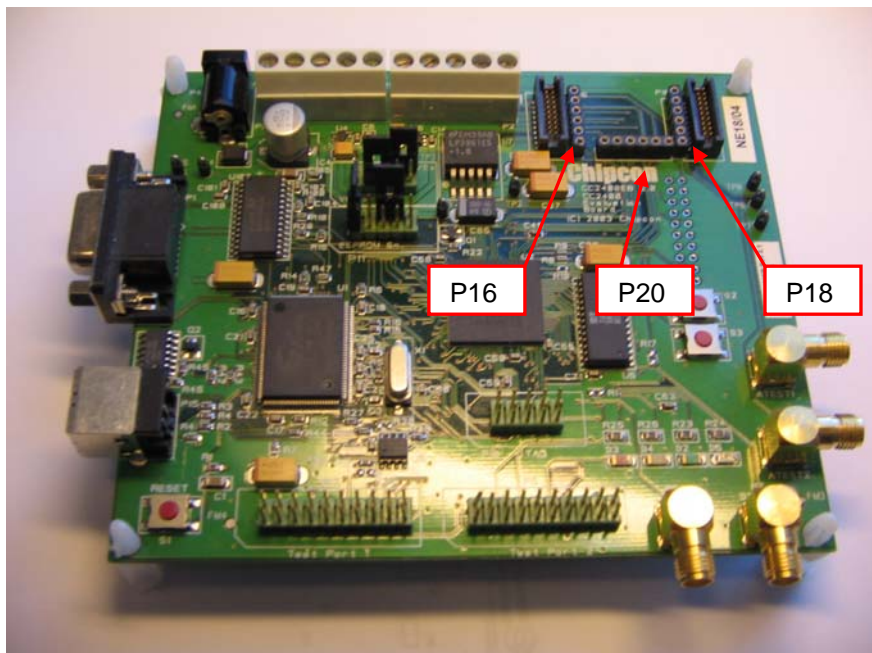


Figure 3. Picture of CC2400EB

6 Connecting SmartRF04 DUT to EB

The SmartRF04EB can be used to test all SmartRF04 devices. If the DUT is connected to the EB according to Table 4, the SmartRF® Studio software [1] can be used to control the operation of the DUT when verifying the HW design.

SmartRF04EB	DUT
P11 connector	CC1100/CC1100E/CC1101/CC1150/CC2500/CC2550
3	+3.3V
6	GDO0 (Needed in Packet RX/TX mode)
13	CSn
15	SCLK
17	SI
19	SO/GDO0
20	GND

Table 4. Test Pin Overview for SmartRF04EB

Figure 4 shows where to find test connectors P11 and P14 (for SoC) on the SmartRF04EB.

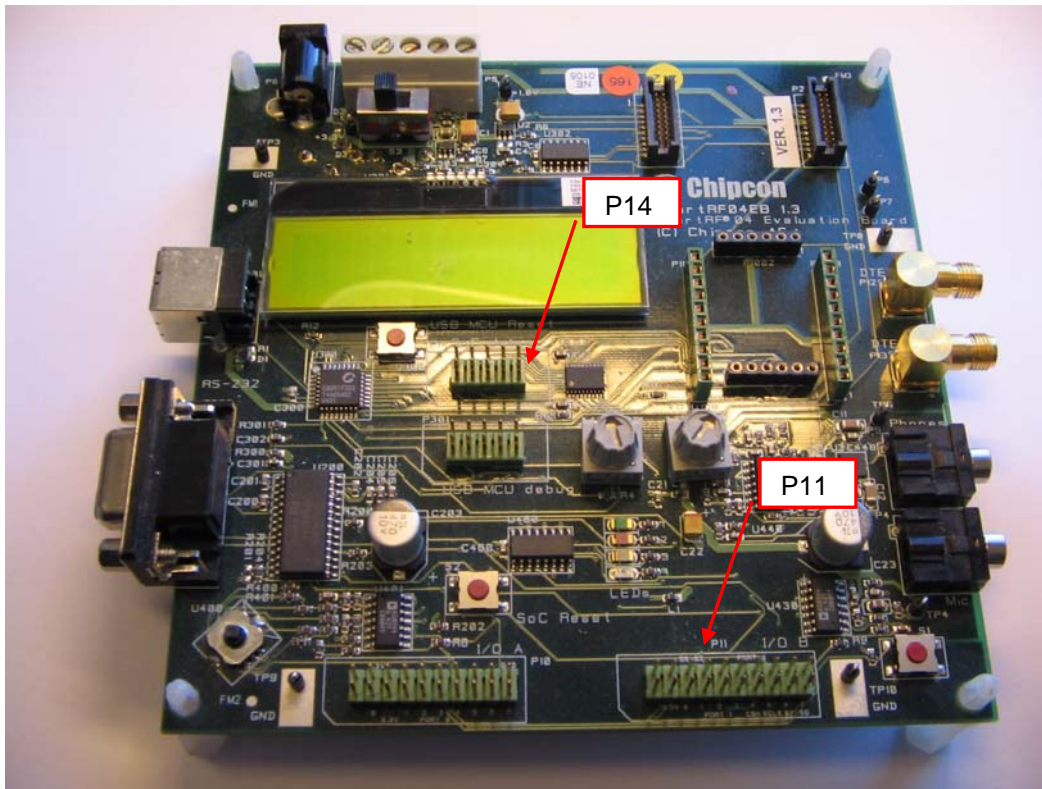


Figure 4. Picture of SmartRF04EB

7 References

- [1] SmartRF[®] Studio (swrc046.zip)
- [2] Testing of RF Modules based on Chipcon RFICs (swra085.pdf)
- [3] CC1020-CC1070DK User Manual (swru052.pdf)
- [4] CC2400DK User Manual (swru050.pdf)
- [5] CC1100/CC1150DK, CC1101DK, and CC2500/CC2550DK Development Kit User Manual (swru040.pdf)

8 General Information

8.1 Document History

Revision	Date	Description/Changes
SWRA149A	2009.03.12	Removed logo from header. Added CC1101 and CC1100E.
SWRA149	2007-08-28	Initial release

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