TECHNICAL NOTE

TN269

Updating Your Application from the RCM4400W to the RCM5400W Wi-Fi RabbitCore Modules

Introduction

Digi offers several Rabbit-branded Wi-Fi modules, the RCM5600W MiniCore module, and the RCM4400W and RCM5400W/RCM5450W RabbitCore modules. Since the RCM5400W/RCM5450W and the RCM4400W RabbitCore modules have similar form factors, it is tempting to upgrade an application developed for the RCM4400W to the RCM5400W/RCM5450W to take advantage of the latter's advanced 802.11b/g capabilities and faster speeds. This technical note compares the two series of RabbitCore modules, and provides information on how to port an application developed for the RCM4400W to the RCM5400W/RCM5450W.

Comparing the RCM4400W and the RCM5400W/RCM5450W

Microprocessor and Clock Speed

The RCM4400W features a Rabbit 4000 running at 58.98 MHz, and both RCM5400W models have a Rabbit 5000 running at 73.73 MHz. The higher clock frequency allows data to be transmitted more quickly, but if you use the CPU frequency for calculations and/or timing, you may need to modify your code.

Wi-Fi Support

The RCM4400W features a radio that is based on a UBEC UW2453 802.11b transceiver with a baseband MAC that is controlled by a discrete FPGA. The RCM5400W models use the 802.11b/g baseband MAC functionality implemented directly within the Rabbit 5000 microprocessor, and the Rabbit 5000 controls the 802.11b/g integrated Airoha AL2236 transceiver.

Maximum Current

The RCM4400W draws 450 mA while transmitting/receiving vs. the 625 mA required by the RCM5400W models. The respective current draws are 80 mA vs. 175 mA when not transmitting/receiving. While the RCM5400W models appear to draw more current then the RCM4400W, the actual power or energy requirements are likely to be less, as described in the *Power Comparisons* section below.

Flash Memory

The 1MB serial flash memory on the RCM4400W is used to support the FPGA (the 802.11b baseband MAC controller), and 800KB is available for customer use with Dynamic C v. 10.54 or later. The RCM5400W and RCM5450W have 1MB and 2MB respectively that are available. The RCM5450W has 1MB of parallel flash memory for program storage, while the RCM4400W and the RCM5400W each have 512KB of parallel flash memory.

General-Purpose I/O

The RCM4400W has up to 35 general-purpose I/O available, and the RCM5400W models have up to 39 general-purpose I/O available.

Pinouts

The pinouts of the two series of RabbitCore modules are interchangeable since identical IDC headers and locations are used. Figure 1 compares the pinouts.
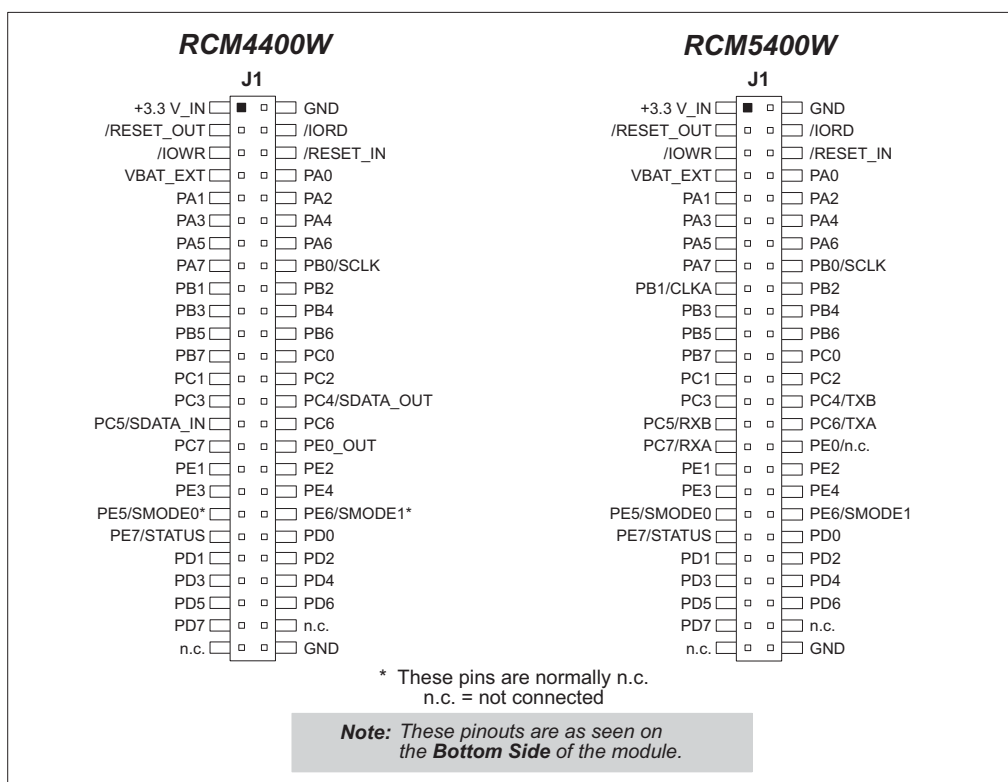

Figure 1. RCM4400W and RCM5400W Pinouts

The major difference in the pinout is on the pins labeled PC4 and PC5. PC4 and PC5 are shared with the serial flash data I/O on both the RCM4400W and the RCM5400W. These pins also share the FPGA data I/O on the RCM4400W, and PC5 also shares the serial data transmit power output on the RCM 5400W's A/D converter.

Dimensions

The dimensions of the two series of RabbitCore modules are almost identical — the RCM4400W is 1.84" $\times$ 2.85" $\times$ 0.50" (47 mm $\times$ 72 mm $\times$ 13 mm), and the RCM5400W is 1.84" $\times$ 2.85" $\times$ 0.55" (47 mm $\times$ 72 mm $\times$ 14 mm).

Dynamic C

The RCM4400W is supported by Dynamic C releases starting at version 10.21. Both the RCM5400W/ RCM5450W models are supported by Dynamic C releases starting at version 10.40.

Configuration methods changed between Dynamic C versions 10.21 and 10.40. The Wi-Fi configuration function call `wifi_ioctl()` was used by Dynamic C version 10.21 was replaced with `ifconfig()` and new macros in version 10.40. The static configuration macros in the Dynamic C `TCP_CONFIG.LIB` library also changed.

An application developed for the RCM4400W may be run on the RCM5400W/RCM5450W. If you developed the RCM4400W application using a version of Dynamic C earlier than v. 10.40, you may run that application on the RCM5400W models after you recompile it using Dynamic C v. 10.40 or later. In this case, Rabbit also recommends that you rework the application to use the `ifconfig()` function call and new macros to be forward-compatible with future releases of Dynamic C.

Power Comparisons

The current drawn by an electrical device reflects the *peak* electrical consumption, but what matters as much or more is the actually power or energy needed to operate the device. Let's compare the RCM4400W and the RCM5400/RCM5450W this way in a simplified calculation.

To start, let's look at the RCM4400W steadily transmitting 7 Mbits/s over the course of an hour. This data rate represents about 67% of the 802.11b maximum data rate. The RCM4400W consumes 450 mA while transmitting, and about 175 mA less while idling with the receiver on. 26 Gbits will get transmitted during the hour. Now, let's add up the power used.

$$450 \text{ mA} \times 1 \text{ h} \times 67\% \; = \; 300 \text{ mA•h}$$
$$275 \text{ mA} \times 1 \text{ h} \times 33\% \; = \; 92 \text{ mA•h}$$
———————————————————————
Total Power $\qquad = \quad \underline{392 \text{ mA•h}}$

Now let's see what happens when 26 Gbits are transmitted by the RCM5400/RCM5450W. The newer RabbitCore modules can transmit at 10.5 Mbits/s, which means the same 26 Gbits would be sent in 0.67 h. This data rate represents about 20% of the 802.11g maximum data rate. The RCM5400/RCM5450W consume 625 mA while transmitting, and about 150 mA less while idling with the receiver on; their current requirement falls to 175 mA when the receiver/transmitter is turned off. Now, let's add up the power used with the receiver/transmitter turned off after the data are sent.

$$625 \text{ mA} \times 0.67 \text{ h} \times 20\% \; = \; 83 \text{ mA•h}$$
$$475 \text{ mA} \times 0.67 \text{ h} \times 80\% \; = \; 253 \text{ mA•h}$$
$$175 \text{ mA} \times 0.33 \text{ h} \qquad\quad = \; 60 \text{ mA•h}$$
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Total Power $\qquad\quad = \; \underline{396 \text{ mA•h}}$

That's a power consumption not much different from the RCM4400W, and in return you get the enhanced transmission and 802.11b/g capabilities of the RCM5400W/RCM5450W.

The **SAMPLES\RCM5400W\TCPIP\POWERDOWN.C** sample program provides an example of how to turn the transmitter/receiver on the RCM5400/RCM5450W off/on.

Summary

Table 1 summarizes the features for the two series of RabbitCore modules.

Table 1. Feature Comparison

Parameter	RCM4400W	RCM5400W	RCM5450W
Microprocessor	Rabbit® 4000 at 58.98 MHz	Rabbit® 5000 at 73.73 MHz	
Wi-Fi	802.11b, 2.4 GHz	802.11b/g, 2.4 GHz	
SRAM	512KB program (fast SRAM) + 512KB data		1MB program (fast SRAM) + 512KB data
Flash Memory	512KB		1MB
Serial Flash Memory	1MB (reserved for Wi-FI FPGA, 800KB available with Dynamic C v. 10.54 or later)	512KB	1MB
General Purpose I/O	up to 35 parallel digital I/0 lines configurable with four layers of alternate functions	up to 39 parallel digital I/0 lines configurable with four layers of alternate functions	
Operating Temperature	-30°C to +75°C		
Power (pins unloaded)	3.3 V.DC ±5%		
	450 mA @ 3.3 V while transmitting/receiving 80 mA @ 3.3 V while not transmitting/receiving	625 mA @ 3.3 V while transmitting/receiving 175 mA @ 3.3 V while not transmitting/receiving	
Board Size	1.84" × 2.85" × 0.50" (47 mm × 72 mm × 13 mm)	1.84" × 2.85" × 0.55" (47 mm × 72 mm × 14 mm)	
Dynamic C	v. 10.21 or later (**wifi_ioctl()**)	v. 10.40 or later (**ifconfig()**)	

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