ZigBee Light Switch Demo
CC2420DBK Demonstration Board Kit

Introduction

ZigBee is a rapidly growing open global standard intended for reliable, cost-effective, low-power, wirelessly networked monitoring and control products. It is targeted at home and building automation and controls, consumer electronics, PC peripherals, medical monitoring and toys. Long battery life, networking capabilities, reliability and low cost are key focus within ZigBee. The ZigBee alliance is a non-profit industry consortium consisting of leading semiconductor manufacturers, technology providers, OEMs and end-users. The Alliance provides interoperability testing and certification for ZigBee products through the test houses selected.

This demo provides the user with the capability to explore two ZigBee Home Control Lighting applications using the CC2420DBK, i.e. the Switch Remote Controller and the Switch Load Controller. The Switch Load Controller, i.e. the light, is the coordinator in the network and in this example it will only allow two routers to connect to it. The Switch Remote Controller, i.e. the light switch, is set up as a router, which enables the possibility to test true mesh networking with only 4 nodes. The required software to run this example is precompiled and available for download from the Chipcon website.
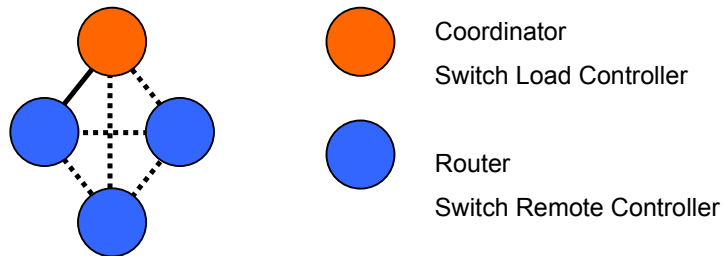

Coordinator
Switch Load Controller

Router
Switch Remote Controller

Figure 1 Point-to-point/mesh network

Getting started

To run the demo you will need to program one board as a Switch Load Controller and at least one board as Switch Remote Controller.

Device	File name	Number of CC2420DBs
Switch Load Controller	SLC03394-C.hex	1
Switch Remote Controller	SRC03391-R.hex	Min: 1 Max: 65536 or memory

The CC2420DB board are shipped with a bootloader, which makes it possible to download software to the board using a serial cable and AVR Studio from Atmel.

Step-by-Step procedure for downloading the Switch Load Controller application:

1. Connect the CC2420DB serial port to your PC COM port

2. Connect power to the CC2420DB

3. Start AVR Studio

4. Hold down the S2 push button on the CC2420DB

5. Push and release the S1 (reset button) while still holding the S2 push button

6. In AVR Studio select Tools→AVR Prog… from the menu

7. Release the S2 push button

8. Browse to find your application program SLC03394-C.hex file

9. Click on the Flash Program button to program the flash

10. Disconnect the serial port

11. Reset CC2420DB

12. Start your application program

To download the Switch Remote Controller to the other board(s) repeat the procedure above but use SRC03391-R.hex instead of SLC03394-C.hex. If you have more than one CC2420DBK set up the rest of the boards to be Switch Remote Controllers.

Run the example

When one CC2420DBK, which consists of two CC2420DBs, is used a point-to-point link will be established. If more than one CC2420DBK is available a small mesh network can be set up according to figure 1 above. If a CC2420DK is available one of the boards can be used to monitor the traffic using the Chipcon Packet Sniffer. The example application uses channel 0x0B (2405 MHz).

Packet sniffer

A CC2420DK can be used to monitor the traffic but is not needed to run the application. The CC2420 Packet sniffer can be downloaded form Chipcon's website. Please read the Packet Sniffer documentation included in the packet sniffer download package for further information.

Starting the coordinator

When power is applied to the coordinator it will send a beacon request on channel 0x0B. If there are no other networks on this channel it will start the network. When the network is started the orange LED on the CC2420DB is turned on.

Starting the router(s)

When the router is turned on it will send a beacon request searching for a coordinator/router to associate to. It will do this 5 times and then it will use an average of the link quality indication value to determine which device to associate to. It will choose the device highest up the tree structure with acceptable link quality. When it has associated to a device the orange LED will be turned on.

Binding a switch to a light

To be able to switch a light on and off a switch has to be bound to that light. There are two possible ways to do this bind. Since there is only one light in this example an auto bind feature has been implemented. To activate this feature, move the joystick to the left on the Switch Remote Controller. The green LED on the board indicates that the switch has been bound to the light.

The other way to bind the devices is called end device bind, which means setting the light in a mode that accepts binding requests from light switches. Moving the joystick to the right on the light will enable this mode. The device will now accept binding requests for 10 seconds. Moving the joystick to the right on the light switch during these 10 seconds will bind the switch to the light.

Switching the light on and off

After the devices have been bound together the light/green LED can be switched on and off by moving the joystick up on the switch.

CC2420 Demonstration Board

The following figure describes the CC2420DB and how to use it in this demonstration application.
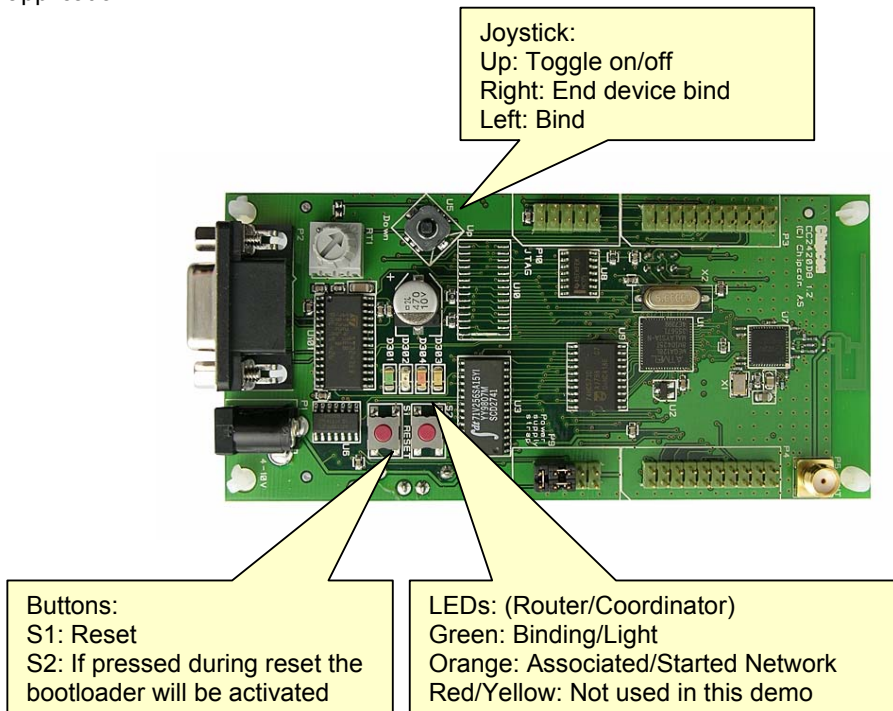

Joystick:
Up: Toggle on/off
Right: End device bind
Left: Bind

Buttons:
S1: Reset
S2: If pressed during reset the bootloader will be activated

LEDs: (Router/Coordinator)
Green: Binding/Light
Orange: Associated/Started Network
Red/Yellow: Not used in this demo

Figure 2 CC2420DB

References

CC2420DBK User Manual

CC2420 Packet Sniffer

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