Sub-GHz Remote Control Dimmer Quick Start Guide

Reference Design for
Kinetis KW01 MCU
KW01RCDRDQSG

Get to Know the Sub-GHz Remote Control Dimmer
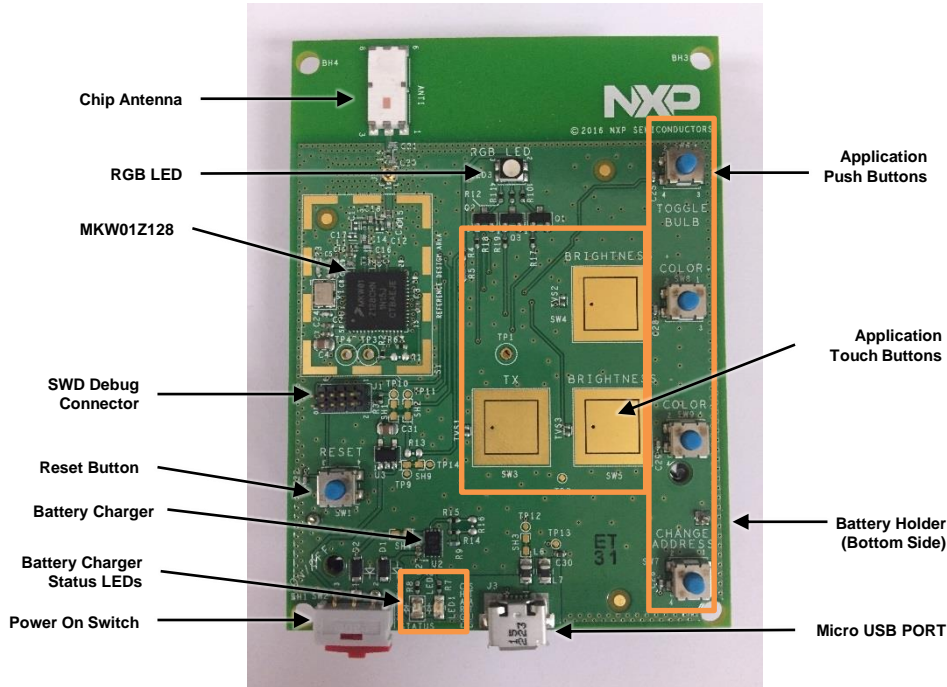

Figure 1: KW01-RCD-RD board (IEEE 802.15.4 end device)

Sub-GHz RC Dimmer Reference Design

The KW01-RCD-RD (**Figure 1**) is a custom hardware configured as a low power IEEE 802.15.4 end device, which establishes connection with a USB-KW019032 board configured as the IEEE 802.15.4 coordinator device. Multiple USB-KW019032 IEEE 802.15.4 routers can establish connection with the coordinator device to create a custom IEEE 802.15.4 star network.

Introduction to the Sub-GHz RC Dimmer

The Sub-GHz RC Dimmer reference design demonstrates the functionality of the MKW01Z128 MCU working in a custom IEEE 802.15.4 star network.

This reference design is focused on a home automation application where the user is able to control various devices connected in a network using the KW01-RCD-RD board as a remote control. Controlled devices are RGB bulbs simulated in a graphical user interface (GUI) which establishes connection to its corresponding USB-KW019032 (coordinator or router) through the Freescale Serial Communication Interface (FSCI) that is a custom protocol to interface with the IEEE 802.15.4 SW stack. Sub-GHz technology has some advantages over other Wireless technologies such as less data traffic in its respective ISM band. The Sub-GHz RC Dimmer and remaining devices (coordinator and routers) are configured to work on the 915MHz ISM band, in the Americas region.

This Quick Start Guide will help you to:

• Make use of the pre-loaded demo application.

Sub-GHz RC Dimmer features:

• Based on NXP's MKW01Z128 highly integrated, cost-effective, system-in-package (SIP), sub-1GHz wireless node solution transceiver and low-power ARM Cortex M0+ CPU microcontroller.
• NXP's IEEE 802.15.4 MAC/PHY stack application development.
• NXP's MC34671 Li-Ion battery charger.

Tools Required

• KW01-RCD-RD end device
• USB-KW019032 coordinator
• 1 to 4 USB-KW019032 routers
• RGB Bulb – SubGHz RC Dimmer GUI

Setup instructions

1   Download RGB Bulb GUI

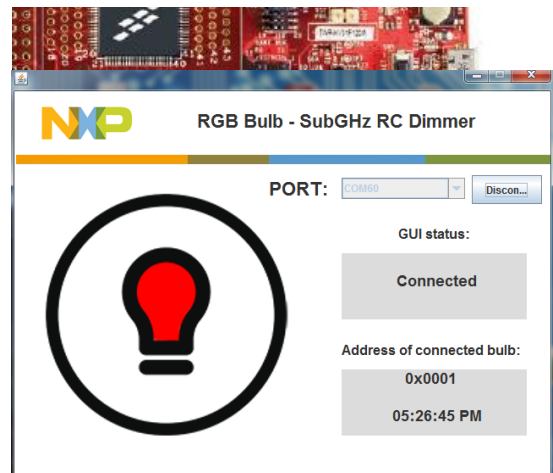Download RGB Bulb GUI under «Software & Tools» at **nxp.com/kw01rcd**

2   Setup the IEEE 802.15.4 network

- Plug-in the coordinator USB-KW019032 to a PC. Blue LED (D12) will blink indicating the coordinator is creating the network and it will stop once created.
- Plug-in the desired number of USB-KW019032 routers (1 to 4) to the PC. Blue LED (D12) will blink indicating that is searching for coordinator and it will stop once associated.
- Make sure that the battery is properly placed on the KW01-RCD-RD board. It also supports external power supply via micro-USB port.

- Turn on the KW01-RCD-RD end device using SW2; RGB LED (LED3) will start flashing indicating that is searching for coordinator, and it will stop once associated.
- Once the devices are associated, open an RGB Bulb GUI for each USB-KW019032 (coordinator and routers) connected in the network. Select the appropriated serial port and click on «connect» button in each GUI.

RGB Bulb - SubGHz RC Dimmer

PORT: COM60   Discon...

GUI status:

Connected

Address of connected bulb:

0x0001

05:26:45 PM

Low Power

3 Low Power

The KW01-RCD-RD development platform is programmed to go into low power mode (LLS) after one minute of inactivity. Red color in RGB LED (LED3) will blink indicating the board is entering in low power mode.

Other option to configure the KW01-RCD-RD board into low power mode is with a SW6 long press; Red color will blink indicating the board is entering in low power mode.

MKW01Z128 in this specific scenario is programmed to wake up from GPIO source. Press any application push button (SW6, SW7, SW8 or SW9) to exit from low power mode; Green color in RGB LED (LED3) will blink indicating that the MCU is now in run mode.

Using the Application

The application works in two modes of operation. Mode 1 allows the user to control the RGB Bulb configuring static colors and Mode 2 starts a color sequence in RGB Bulb.

4 Mode 1

Mode 1 is the default mode configured in KW01-RCD-RD board at first connection.

Press SW3 touch button to toggle between mode 1 and mode 2.
When mode 1 is selected RGB LED (LED3) in KW01-RCD-RD board will blink magenta as shown in **figure 2**, and when mode 2 is selected it will blink yellow as shown in **figure 3**.

Figure 2: Mode 1 selected	**Figure 3: Mode 2 selected**

Table 1 shows a summary of the application buttons functionality in mode 1 (next page) .

Using the Application (cont.)

Application button	Silkscreen	Button type	Functionality in mode 1
SW3	TX	Touch button	Toggle mode
SW4	BRIGHTNESS +	Touch button	Inc. brightness
SW5	BRIGHTNESS -	Touch button	Dec. brightness
SW6 (short press)	TOGGLE BULB	Push button	Toggle bulb
SW6 (long press)	TOGGLE BULB	Push button	Configure MCU into low power mode
SW7 (short press)	CHANGE ADDRESS	Push button	Change address
SW7 (long press)	CHANGE ADDRESS	Push button	No effect
SW8 (short press)	COLOR +	Push button	Inc. color from predefined list
SW8 (long press)	COLOR +	Push button	Configure default HSL values
SW9 (short press)	COLOR -	Push button	Dec. color from predefined list
SW9 (long press)	COLOR -	Push button	No effect

Table 1: Application buttons functionality in mode 1.

5 Mode 2

When mode 2 is selected by pressing SW3 yellow color will blink in RGB LED (LED 3) then a color sequence will start in RGB Bulb GUI. Default time interval between colors is 1 second.

Press SW8/SW9 to increment/decrement time interval by 250 milliseconds.

Some of the application buttons keep same functionality in both modes of operation, but there are other application buttons that change its functionality depending on the operational mode configured.

Table 2 shows a summary of the application buttons functionality in mode 2 (next page) .

Using the Application (cont.)

Application button	Silkscreen	Button type	Functionality in mode 1
SW3	TX	Touch button	Toggle mode
SW4	BRIGHTNESS +	Touch button	No effect
SW5	BRIGHTNESS -	Touch button	No effect
SW6 (short press)	TOGGLE BULB	Push button	Toggle bulb
SW6 (long press)	TOGGLE BULB	Push button	Configure MCU into low power mode
SW7 (short press)	CHANGE ADDRESS	Push button	Change address
SW7 (long press)	CHANGE ADDRESS	Push button	No effect
SW8 (short press)	COLOR +	Push button	Inc. time interval between colors
SW8 (long press)	COLOR +	Push button	Configure max. time limit
SW9 (short press)	COLOR -	Push button	Dec. time interval between colors
SW9 (long press)	COLOR -	Push button	Configure min. time limit

Table 2: Application buttons functionality in mode 2.

Using the Application (cont.)

6 Change address

Application push button SW7 will change the destination address of the messages sent by the KW01-RCD-RD. In other words, the user can select what RGB bulb in network will be controlled. Coordinator short address is always 1. When the first router associates with coordinator, this is assigned to the short address 2, the next router 3, and successively with the other routers connected. RGB LED (LED 3) in KW01-RCD-RD will blink blue the number of times of the RGB bulb device short address, for example if it toggles 3 times it means that now the router 2 is being controlled.

A broadcast address to control all RGB bulbs at same time is set as the destination address in KW01-RCD-RD by pressing SW7 as the last option after controlling the last device in the network. RGB LED in KW01-RCD-RD will perform a blue long blink indicating a broadcast address is the new destination address.

Table 3 shows the short address of the RGB bulb devices in the network.

Device name	Short address
Coordinator	1
Router 1	2
Router 2	3
Router 3	4
Router 4	5

Table 3: Device's short address

Charging the battery

7 Charging the battery

To recharge the battery it needs to be placed at the battery holder and USB connected to a computer or wall plug-in (not included).

The green LED (LED2) will turn on indicating power presence in USB micro port, and red LED (LED1) will turn on when charge is complete as shown in **figure 4**.
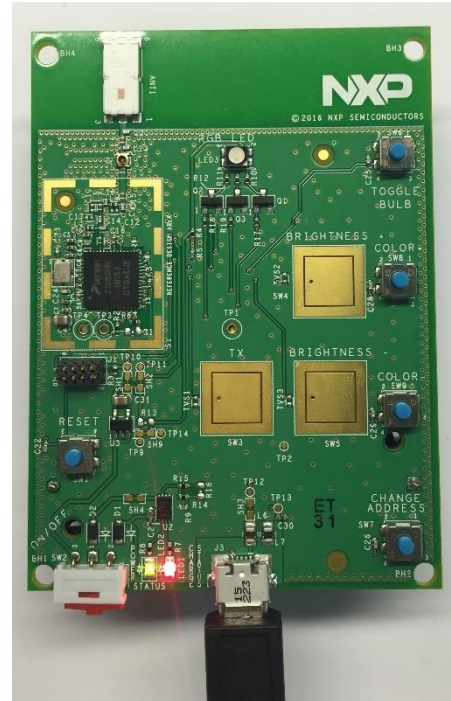

Figure 4: Battery is fully charged

Get Started

Download installation software and documentation under
"Sub-GHz RC Dimmer" at nxp.com/kw01rcd

Support

Visit **nxp.com/support** for a list of phone
numbers within your region.

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