Si4010 Simplified Key Fob Demo Kit User's Guide

1. Purpose

Thank you for your interest in Silicon Laboratories Si4010 simplified key fob demo. The Silicon Laboratories Si4010 simplified key fob demo kit contains everything you need to familiarize yourself with and evaluate the Si4010 RF SoC. The kit has two versions: one for the 434 MHz band and one for the 868 MHz band. The key features of the development platform are as follows:

- The key fob demo board has five push buttons and one LED output.
- The receiver demo board has four LEDs to display received key fob commands.
- The provided software pack contains all the documentation and files needed to develop a user application. The kit supports the use of the Silicon Laboratories Integrated Development Environment (IDE) for software debugging and the use of the Keil C compiler, assembler, and linker toolchain.
- Contains demo applications using API functions and the key fob demo application.

2. Kit Content

Table 1. Kits Content

Qty	Part Number	Description
	4010-DASKF_434	**Si4010 Simplified Key Fob Demo Kit 434 MHz**
1	4010-DAPB_434	Si4010 Universal Key Fob 434 MHz
1	4313-DAPB_LB	Si4313 LED receiver board low band with pcb antenna
1	MSC-PLPB_1	Key Fob Plastic Case (translucent grey)
2	CRD2032	CR2032 3 V coin battery
1	MSC-DKSW1	Wireless Development Suite disc
	4010-DASKF_868	**Si4010 Simplified Key Fob Demo Kit 868 MHz**
1	4010-DAPB_868	Si4010 Universal Key Fob 868MHz
1	4313-DAPB_HB	Si4313 LED receiver board high band with pcb antenna
1	MSC-PLPB_2	Key Fob Plastic Case (translucent red)
2	CRD2032	CR2032 3 V coin battery
1	MSC-DKSW1	Wireless Development Suite disc

Figure 1. 4010 RKE Universal Key Fob and Plastic Case (P/N 4010-DAPB_434 and MSC-PLPB_1)

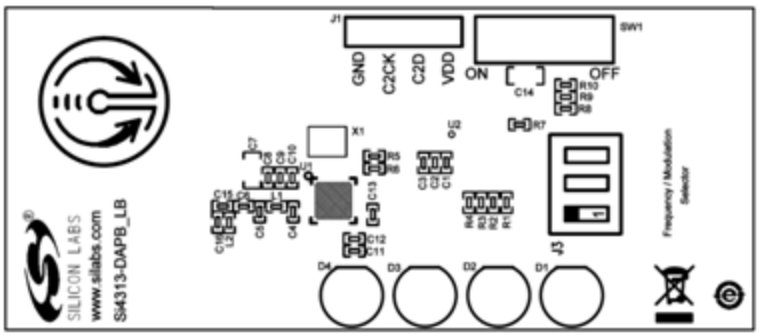

Figure 2. Si4313 LED Receiver Board Low Band with PCB Antenna (P/N 4313-DAPB_LB)

3. Key Fob Demo

The 4010-DAPB key fob transmitter and the 4313-DAPB receiver are the transmit and receive devices used in the key fob demo. This transmit/receive pair can be used to evaluate the capabilities of the Si4010 transmitter and the Si4313 receiver.

The first step is to insert the CR2032 battery into the 4010-DAPB demo board and then place the board with the battery into the plastic key fob case. Next, insert a battery in the 4313-DAPB receiver board and turn it on using the switch on the board. The key fob first transmits an RF packet nine times (each time a button is pressed), and it also blinks the LED. The packet structure is as follows:

Button1 .. AA AA AA AA 2D D4 D7 28 D7

Button2 .. AA AA AA AA 2D D4 F5 0A F5

Button3 .. AA AA AA AA 2D D4 5F A0 5F

Button4 .. AA AA AA AA 2D D4 7D 82 7D

Button5 .. AA AA AA AA 2D D4 FF 00 FF

(Then, the key fob also transmits two other packets appropriate for Silicon Labs Si4311 and Si4312 receiver demo boards.)

The first four bytes are preamble, the next two is the sync word and the last three are the button info. Therefore if any key pressed on the key fob, a combination of LEDs will light up on the Receiver Board according to the button info part of the packet. The structure of the packets is detailed below:

Preamble Byte	Synchron Byte	Function Control Byte	One's complement of Function Control Byte	Function Control Byte
AAh	2DD4h	See below	See below	See below

The structure of the Function Control Byte is shown below. For each LED output there are two bits assigned to define their mode of operation:

OUT3 F1	OUT3 F0	OUT2 F1	OUT2 F0	OUT1 F1	OUT1 F0	OUT0 F1	OUT0 F0

OUT3 / F1 sent out first, OUT0–OUT3 represent the four LED outputs, F0–F1 represents the function bits.

Output functions controlled by the function bits are the followings:

F1	F0	Function
0	0	No change
0	1	Sets output logical low (LED is OFF)
1	0	Sets output logical high (LED is ON)
1	1	Sets output high in mono-stable mode, cycle time is 100 ms

Mono-stable mode will be restarted as long as the proper Function Control Byte is received.

The code used in the transmitter of this key fob demo application can be found in the documentation kit in the \Si4010 projects\rke_demo folder.

It is advised to first study the simple example program “keyfob_demo”, which generates the same packets needed for the Si4313 LED demo receiver board. For details about programming the Si4010, see the following documentation:

- Si4010 Data Sheet
- Si4010 Development Kit User's Guide
- AN370: Si4010 Software Programming Guide

4. Software Installation

The provided software pack contains all the documentation and files needed to develop a user application. It also contains example applications using API functions and the key fob demo application.

The directory structure of the software examples is as follows:

```
+--Si4010_projects
|   +--aes_demo
|   |   +--bin                .. Keil uVision and SiLabs IDE files
|   |   +--out                .. output directory for Keil toolchain
|   |   +--src                .. aes_demo source code
|   +--common
|   |   +--lib                .. Si4010 additional API functions library
|   |   +--src                .. Si4010 required files
|   +--fcast_demo             .. frequency casting (tuning) demo
|   |   +--bin
|   |   +--out
|   |   +--src
|   +--fstep_demo             .. frequency two step tuning demo
|   |   +--bin
|   |   +--out
|   |   +--src
|   +--tone_demo              .. continuous wave (tone) demo
|   |   +--bin
|   |   +--out
|   |   +--src
|   +--keyfob_demo            .. simple keyfob demo
|   |   +--bin
|   |   +--out
|   |   +--src
|   +--rke_demo               .. advanced keyfob demo with AES
|   |   +--bin
|   |   +--out
|   |   +--src
```

Copy the directory structure in a directory of your choice. It is recommended to keep the structure of the Si4010_projects folder to allow the compiler to find the Si4010 common files. Each project has a *.wsp project file in the bin folder that contains all the settings of the IDE for the project, including the relative path of the common files.

5. Siicon Labs IDE Run

Download the SiLabs IDE (Integrated Dvelopment Environment) from http://www.silabs.com/products/mcu/Pages/SiliconLaboratoriesIDE.aspx and install it on your computer. To run the Silicon Labs IDE, open the *.wsp project file.

6. Keil Toolchain Integration

The project files in examples assume that the Keil toolchain is installed to: C:\Keil directory. The location of the Keil toolchain can be easily changed in the Silabs IDE in the Project—Tool Chain Integration menu. An evaluation version of the Keil toolchain can be downloaded from the Keil web site, http://www.keil.com/. This free version has 2 kB code limitation and starts the code at 0x0800 address. The Keil free evaluation version can be unlocked to become a 4k version with no code placement limitation by following the directions given in application note “AN104: Integrating Keil 8051 Tools into the Silicon Labs IDE”, which covers Keil toolchain integration and license management. Unlock code can be found on the WDS CDROM in the root folder in the Keil_license_number.txt file. Contact your Silicon Laboratories sales representative or distributor for application assistance.

For complete development platform containing debug adapter and development boards, see Silicon Laboratories key fob development kit (P/N 4010-DKKF_434 or 4010-DKKF_868).

NOTES:

Simplicity Studio

One-click access to MCU tools, documentation, software, source code libraries & more. Available for Windows, Mac and Linux!

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