PSD Hardware Specifications

Revolar Instinct

REV 1.1a
28.03.2017

Revision History

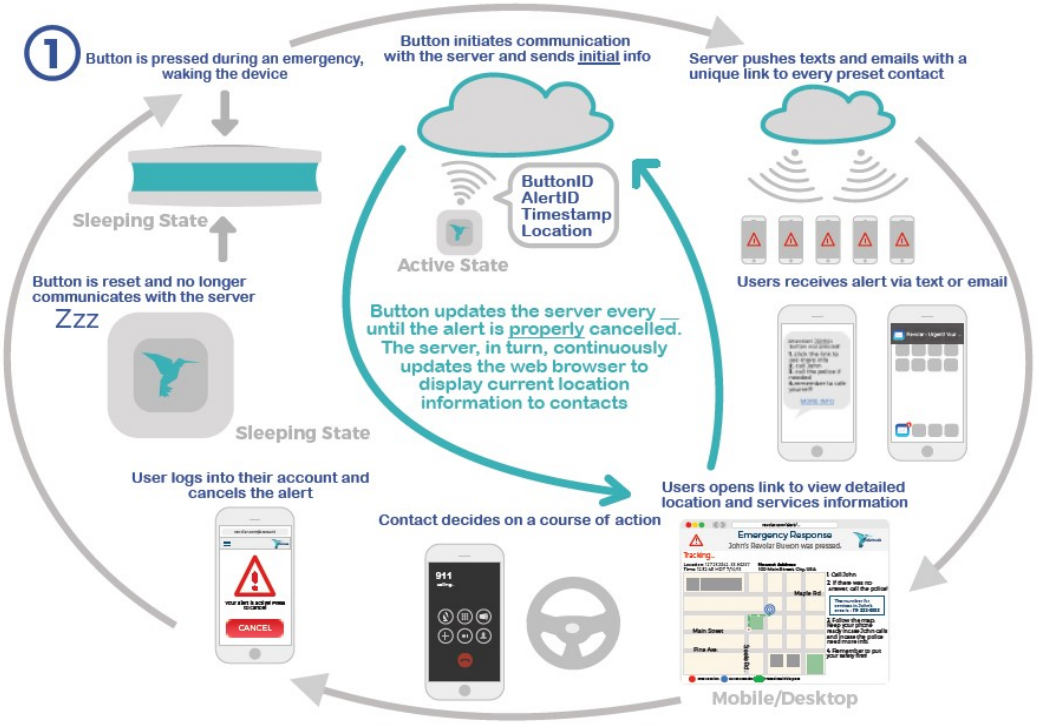
Version	Author	Date	Change list
0.1	JD	09. 2015	Initial draft
1.0 / 1.1	Tassanai B.	10.03.2017	Updated for Revolar Instinct
1.1a	Tassanai B.	28.03.2017	Communication Interface, number of Channel corrected: 40 channels

1. Overview

The Revolar Instinct product is a personal safety device (PSD). The product is a personal safety alert button that will predominantly be used by those working in the new and growing "sharing economy" and by young women. The sharing economy includes fields like Lyft & Uber drivers, Real Estate Agents, and others who constantly work with unknown individuals, in strange locations and in largely unregulated industries. The purpose of the PSD is to enable the user to discretely, and rapidly notify their support network that they may be in danger, and where they are located.

Other markets include young children, the elderly, and those who suffer from medical conditions that may need urgent help without the ability to use a smartphone in the event of the emergency.

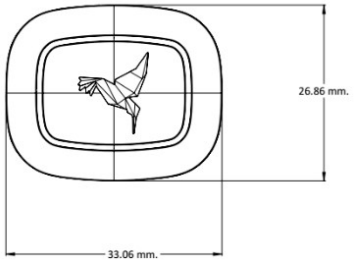
This document serves as a Source information for schematic capture, layout and DVT process.

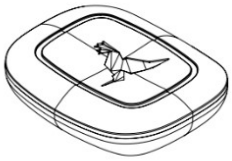


End User Gadget Image

(a) Top side (b) Back side

Product Dimensions: 26.86mm×33.06mm×8.73mm





The Revolar Instinct personal alert button uses Bluetooth Low Energy to communicate an emergency alert to the user's cell phone where a Revolar Instinct App relays the alert to the Revolar Instinct Cloud Services.

The button hardware design is built around the Silicon Labs EFR32 Bluetooth Low Energy SOC. The embedded ARM Cortex-M microcontroller runs both the Silabs BLE software stack and the Revolar Instinct button firmware. Peripheral devices include a single SPST push-button to initiate an alert and a haptic and beeper for indication of button status.

The button implements a single, proprietary Bluetooth LE service that in turn implements three characteristics or attributes.

- Revolar Instinct Status – a read/notify characteristic that reports the button's alert status
- Revolar Instinct Control – a write only attribute used to acknowledge receipt of alerts and control the button's internal state
- Revolar Instinct Query/Response – a read/notify/write attribute that is used to query and/or set various values within the button. Among other things, this attribute supports reading the Manufacturer Name string, the button Model string, the firmware version and the firmware date. It is also used to read and write a customized name for the button (ex. "Jane's button"). Other functions include Over-the-Air Download of firmware updates, initiating radio test modes for FCC qualification testing, and debug functions.
- Revolar Instinct Checkin – a read/notify/write attribute that reports and manages requests from the button for an end-to-end systems check-in and find my Revolar Instinct

2. Features:

- Delivers emergency alert messages to friends, loved-ones or a 24/7 call monitoring service
- Communicates to the Revolar Instinct cloud services using the smartphone (iOS or Android) as the user interface device and as the communications transport
- Powered by a Silicon LABS EFR32BG1 (Wireless Gecko 32-bit ARM Coretex-M4, Family: Blue, Generation:1) Bluetooth Low Energy SOC

- 2.4Ghz Bluetooth Smart (aka LEFR32GBow Energy) Compliant
- Very low power – operates on a user replaceable coin cell CR2032 battery
- Supports Over-the-Air Download of firmware updates

3. General Specifications

No	Items		Details
1	Communication Interface	Protocol	Bluetooth Smart V4.0 (Single mode Bluetooth low energy) Proprietary Protocols (EFR32BG1P OPNs)
		Operating Frequency	2.400 GHz ~ 2483.5 GHz
		Number of Channels	40 Channels
		Modulation	GFSK, 2-FSK/4-FSK, Shaped OQPSK/(G)MSK Configurable DSSS, FEC, BPSK/DBPSK TX, OOK/ASK
		Antennas	Stamp Inverted 'F'
		Coverage range	30m (Target)
		RF Output Power	0dBm
		RF Input Sensitivity	-94 dBm @ 1Mbit/s GFSK (2.4GHz)
2	User Interface	Motor	Vibration Motor Coin 3V Flex
		Audio Indicator	Piezo Buzzer 9×9mm 4KHz 1.9mm
		Switch	Type: Tactile Switch Lite Touch
3	Management	Programming/Upgrade	Over the Air
		Data logging need	Yes
		Device ID?	Yes
4	Power	Battery powered	Coin Cell Type CR2032
		Power Consumption	Radio on: ~10mA
		Power Consumption	Sleep Mode: ~25uA (EM2)
		Battery Lifespan	4 months (Target for typical use)
5	Physical Dimension		26.86mm×33.06mm×8.73mm
6	Mechanical Construction	Enclosure	Back: Zince, Top: PC
		O-ring	Silicone
7	Environmental Spec	Storage Temperature	-30 Deg C – 60 Deg C
		Operating Temperature	5 Deg C - 40 Deg C
		Humidity	0 – 100% RH
8	Compliance Adherence	Radiated Emission	Per FCC Part 15
		Conducted Emission	Per FCC Part 15

4. Operation Details – push button functions and haptic beeper indications

The Revolar Instinct haptic operation consists of one basic mode. Short vibration is vibrating for 250 mS. Then, stop vibrate. And the Revolar Instinct beeper operation consists of three basic modes. One chirp sound is on for 50 mS, two chirp sound is on for 50 mS then stop for 50 mS and chirp sound again for 50 mS, three chirp sound is chirp 3 times toggle between chirp and stop with 50 mS interval.

Desired Action How to Initiate	User Feedback via haptic/beeper
Trigger Yellow Alert Single press & release with a press duration < 4 sec	Vibrate 250ms
Trigger Red Alert	Vibrate 250ms

Double press & release with a total duration from start of first press to release of second press < 1sec	
Trigger Safe Check-In Press and hold for 1 seconds (and less than 6 seconds) until a single chirp sound occurs, then release. Watch for response sequence…	Checking on application
Trigger Pairing Press and hold for 6 seconds (and less than 20 seconds) until a 2-chirp sound occurs, then release. Response…	A sequence consisting of 2 chirp sound indicates that the 6 second hold period has been reached. It perform pairing mode for duration of 30 seconds. Upon successful pairing, application will show success pairing. If the 30 second pairing window expires without successful pairing, device will return to sleep mode.
Trigger Button Reset Press and hold for 20 seconds until 3 chirp sound occurs, then release.	A sequence consisting of 3 chirp sound that the 20 second holds period has been reached. A reset will occur. Responses sequences are button perform reset and power on self-test.

** After detection of a fatal error, the button firmware will wait for a push-button interrupt. Pressing and releasing the push-button will result in a firmware initiated reboot.

The Silicon Labs EFR32 Bluetooth SOC chip provides all of the processing power of the Revolar Instinct button. It executes both the Silabs Bluetooth software stack and the Revolar Instinct firmware. The integrated single-image firmware is programmed into the EFR32 during manufacturing via bed-of-nails test points on the bottom of the PC board using SWD protocol. Revolar Instinct shall provide Celestica manufacturing with the firmware in an industry standard .HEX file format as produced by the Simplicity Studio development system.

The Segger J-Link attaches to a computer system via USB and can be used with the J-Link Programmer application to program the EFR32. It is possible to program all button instances within a PCB panel simultaneously. Programming details and tools are found via the URLs below.

Segger Debugger: https://www.segger.com/production-programmers.html

Programmer Software: https://www.segger.com/downloads/

5. Packaging

6. Environmental Requirements

The Revolar Instinct button shall meet the following environmental requirements

- IP68 water resistance

7. EMC Requirements

The Revolar Instinct button shall meet all EMC requirements necessary to pass FCC specifications for EMC emissions – intentional. The Revolar Instinct firmware provides a mechanism to initiate four special radio-testing modes used to perform the necessary EMC testing. The initiation of these radio-testing modes is documented in a separate file “Button RF Testing Modes”.