

# Zolertia Firefly Revision A Internet of Things hardware development platform, for 2.4-GHz and 863-950MHz IEEE 802.15.4, 6LoWPAN and ZigBee® Applications

## 1. Device overview

### 1.1. Features

- Platform
  - Two on-board IEEE 802.15.4-compliant transceivers: 2.4GHz and 863-950MHz
  - Dual band with Sub-GHz PCB antenna and 2.4GHz ceramic chip antenna
  - Optionally U.FI connectors can be mounted for external antenna support
  - 3.3VDC support for 2xAA/AAA and Coin Cell batteries
  - Programmable over USB
  - On-board RGB LED, user and MCU reset button, with an optional third button for master reset
  - USB 2.0 Full-Speed device (12Mbps)
- Microcontroller
  - CC2538 ARM® Cortex®-M3 with Code Prefetch
  - Up to 32-MHz Clock Speed
  - 512KB Programmable Flash
  - 32KB RAM (16KB with retention in all Power Modes)
  - JTAG Debugging
  - Low-Power
    - Active Mode: 20mA
    - Power Mode 1 (4µs wake-up): 0.6mA
    - Power Mode 2 (sleep timer running and 16KB RAM retention): 1.3µA
    - Power Mode 3 (external interrupt and 16KB RAM retention): 0.4 µA
- Radio
  - ISM 2.4GHz IEEE 802.15.4 Compliant transceiver
  - Receiver sensitivity -97dBm
  - Robustness to interference with ACR 44dB
  - Programmable output power up to 7dBm
  - 250Kbps data rate with DSSS modulation
  - Reception (CPU Idle): 20mA peak
  - Transmission (CPU Idle, @ 0dBm): 24mA peak
- ISM 863-950MHz IEEE 802.15.4 Compliant transceiver
  - Receiver sensitivity -123dBm @1.2kbps, -109dBm @ 50kbps
  - Blocking 86dB at 10MHz
  - Adjacent channel selectivity: up to 60dB at 12.5KHz offset
  - Programmable output power up to 16dBm
  - Modulation formats: 2-FSK, 2-GFSK, 4-FSK, 4-GFSK, MSK, OOK
  - Data rate up to 1.25Mbps
  - Power down: 0.12 µA, 0.5 µA with Wake-On radio (eWOR)
  - Reception: 19mA, 0.5mA in RX Sniff Mode
  - Transmission (@10-14dBm): 35-46mA
- Security Hardware Acceleration
  - AES-128/256, SHA2 Hardware Encryption Engine
  - ECC-128/256 RSA Hardware Acceleration Engine for secure key exchange
- Layout
  - 58.79 x 68.78 mm
  - Compatible with 2xAA Battery holder

## 1.2. Description

The Zolertia Firefly Revision A is a wireless hardware development platform, designed to build real IoT (Internet of Things) applications and products, aimed to high skilled developers, Makers (Do-It-Yourself enthusiasts) and beginners, providing an industry-ready and resilient hardware solution with a fast time to market. The Firefly conciliates an ultra-low power consumption with a high performance design, meeting specifications of processing resources, security and resilient operation. The Firefly exposes most of the CC2538/CC1200 pins to allow a flexible and affordable prototyping, compatible with breadboards and battery holders to ease developing and testing

## 1.3. Applications

- Internet of Things research and development

- Wireless Sensor Network
- Smart Grid and Home Area Network
- Home and Building Automation
- Intelligent Lighting System
- Smart Metering

## 1.4. Development Tools

- Code Composer Studio™
- IAR Embedded Workbench® for ARM
- SmartRF™ Studio
- SmartRF™ Flash Programmer
- BSL programming over USB (cc2538-bsl)
- Sensniff 6LoWPAN packet sniffer

## 1.5. Operating Systems & Software

- Contiki OS
- RIOT OS
- OpenWSN
- OpenThread
- Texas Instruments ZigBee Z-Stack
- Texas Instruments CC2538 Foundation Firmware
- Texas Instruments IEEE 802.15.4 MAC software Stack (TIMAC)

## 2. Revision history

Version	Author	Date	Description
1.0.0	Antonio Liñán Colina	22/09/2016	Initial Release

## 3. Compliances

- Europe: ETSI EN 300 220, ETSI EN 300 328, ETSI EN 300 440, EN 54-25
- US: FCC CFR47 Part 15, FCC CFR47 Part 90

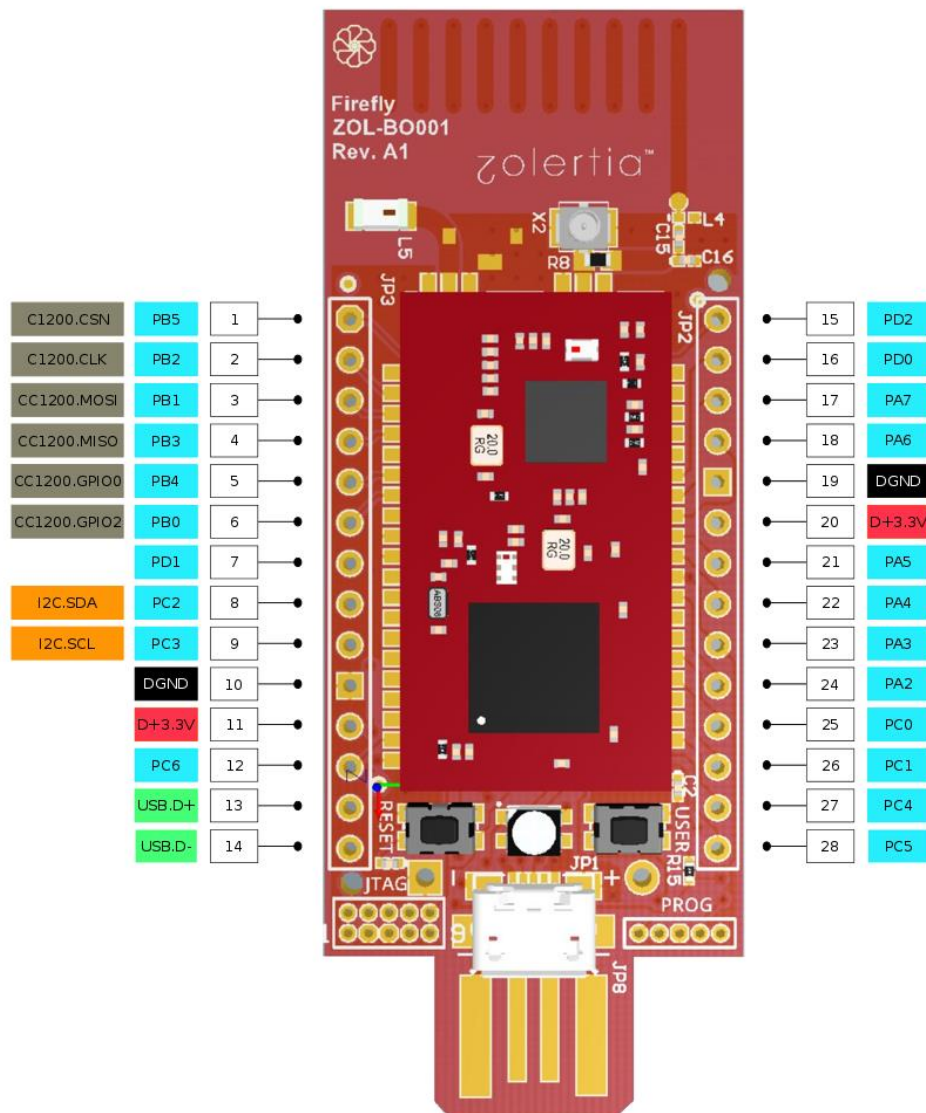
Certification for CE/FCC 2016 Q4

## 4. Ordering information and documentation

- Online Purchases: <http://zolertia.io/store>
- Sales department: [sales@zolertia.com](mailto:sales@zolertia.com)
- Website: <http://zolertia.io/product/hardware/firefly>
- Technical resources: <https://github.com/Zolertia/Resources/wiki/Firefly>
- Schematics and design resources: <https://github.com/Zolertia/Resources>

## 5. Device Information

### 5.1. Block description and pin-out



## 5.2. Pin description

Pin	Default name	Pin Type	MC	Description
1	CC1200.CSN	Digital I/O	PB5	CC1200 SPI Chip Select
2	CC1200.CLK	Digital I/O	PB2	CC1200 SPI clock output
3	CC1200.MOSI	Digital I/O	PB1	CC1200 SPI MOSI
4	CC1200.MISO	Digital I/O	PB3	CC1200 SPI MISO
5	CC1200.GPIO0	Digital I/O	PB4	CC1200 GPIO0 pin
6	CC1200.GPIO2	Digital I/O	PB0	CC1200 GPIO2 pin
7	GPD1	Digital I/O	PD1	GPIO
8	GPC2	Digital I/O	PC2	GPIO 20 mA output capability, no pull-up or pull-down.
9	GPC3	Digital I/O	PC3	GPIO 20 mA output capability, no pull-up or pull-down
10	DGND	Ground	N/A	Digital Ground
11	+VDD	Power output	N/A	3.3VDC max output pin
12	GPC6	Digital I/O	PC6	GPIO 20 mA output capability, no pull-up or pull-down
13	USB-HID.D+	USB2.0	D+	USB 2.0 Data + with pull-up
14	USB-HID.D-	USB2.0	D-	USB 2.0 Data - with pull-up
15	GPD2	Digital I/O	PD2	GPIO
16	GPD0	Digital I/O	PD0	GPIO
17	ADC5/AIN7/GPA7	Digital I/O	PA7	ADC5 analogue input channel, or AIN7 as external reference for the ADC, or GPIO
18	ADC4/AIN6/GPA6	Digital I/O	PA6	ADC4 analogue input channel, or AIN6 as external reference for the ADC, or GPIO
19	DGND	Ground	N/A	Digital Ground
20	+VDD	Power output	N/A	3.3VDC max output pin
21	ADC1/AIN5/GPA5	Digital I/O	PA5	ADC1 analogue input channel or GPIO
22	ADC2/AIN4/GPA4	Digital I/O	PA4	ADC2 analogue input channel or GPIO
23	USER/ADC6/AIN3/GPA3	Digital Input	PA3	Programmable User Button (default), to use otherwise disable the BSL bootloader or change backdoor enable pin
24	ADC3/AIN2/GPA2	Digital I/O	PA2	ADC3 analogue input channel or GPIO
25	GPC0	Digital I/O	PC0	GPIO 20 mA output capability, no pull-up or pull-down.
26	GPC1	Digital I/O	PC1	GPIO 20 mA output capability, no pull-up or pull-down.
27	GPC4	Digital I/O	PC4	GPIO 20 mA output capability, no pull-up or pull-down
28	GPC5	Digital I/O	PC5	GPIO 20 mA output capability, no pull-up or pull-down

## 5.3. Parametric and ratings

The Firefly can be powered over the Micro USB port or over 3.3VDC, via the VIN power input either directly or using a battery holder for 2xAA/AAA batteries, Coin Cell, etc. All Power Inputs are protected and pose no harm to simultaneously connect any combination at once.

Table 1. Absolute Maximum Ratings

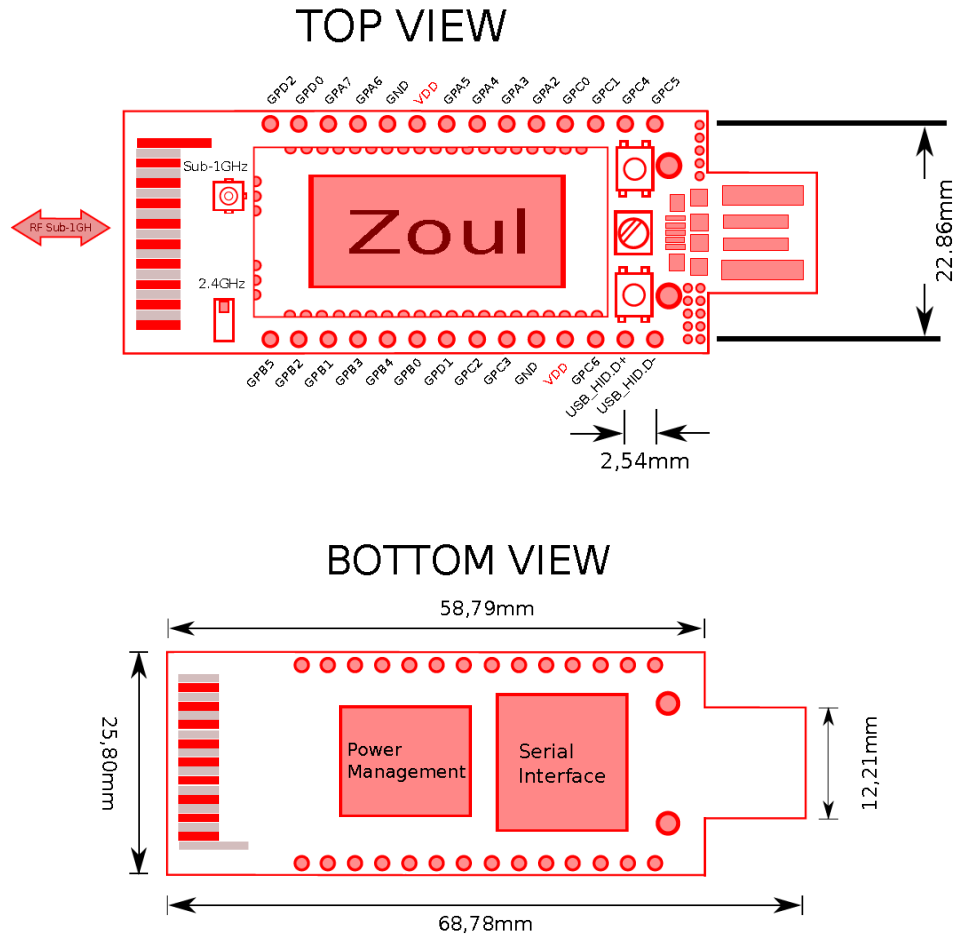
Parameter	Min	Max	Unit
Supply voltage	2.3 (VBAT) 5 (USB)	3.9 (VBAT) 5.1 (USB)	V
Voltage on any digital pin	-0.3	3.3V (ADC3/PA2 5.1V)	V
Input RF Level	-	10 both RF interfaces	dBm
Storage temperature range	-40	125	°C

Table 2. Recommended Operating Conditions

Parameter	Min	Max	Unit
Operating ambient temperature range	-40	85	°C
Operating supply voltage	2.3	3.3 (VIN) 5.0(USB)	V

## 5.4. Mechanical information

The RE-Mote is a two-sided electronic board, check height of the components and connectors to avoid mechanical interferences. Metallic planes may impact on the radio performance, keep the antenna areas free.



## 6. Disclaimer

Zolertia® reserve the right to make corrections, enhancements, improvements and other changes to its products and services, and to discontinue any product or service. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to Zolertia's terms and conditions of sale supplied at the time of order acknowledgment. Zolertia warrants performance of its products to the specifications applicable at the time of sale, in accordance with the warranty in Zolertia's terms and conditions of sale of products.

Zolertia assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using Zolertia products.

Zolertia does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which Zolertia's products or services are used.

Zolertia does not takes any responsibility for the misuse of its products, use in non-compliance with a country regulation, use for illegal purposes, or its use in applications endangering humans lives or property.