

# Zolertia RE-Mote Revision B 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
  - Radio switch to select a radio interface to a RP-SMA connector for external antennas
  - Optionally dual radio operation supported
  - Real-Time Clock and Calendar
  - Power management block, reduce current draw down to 150nA with real-time clock wake-up
  - On-board battery charger
  - 3.5-16VDC input voltage and solar panel support
  - Micro-SD slot
  - External battery level measurement over I2C
  - 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
  - 40.29 x 73.75 mm
  - Indoor enclosure available

## 1.2. Description

The Zolertia RE-Mote Revision B 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 RE-Mote conciliates an ultra-low power consumption with a high performance design, meeting specifications of processing resources, security and resilient operation. The RE-Mote platform was designed jointly with universities and industrial partners from different countries in the context of RERUM European Project.

## 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

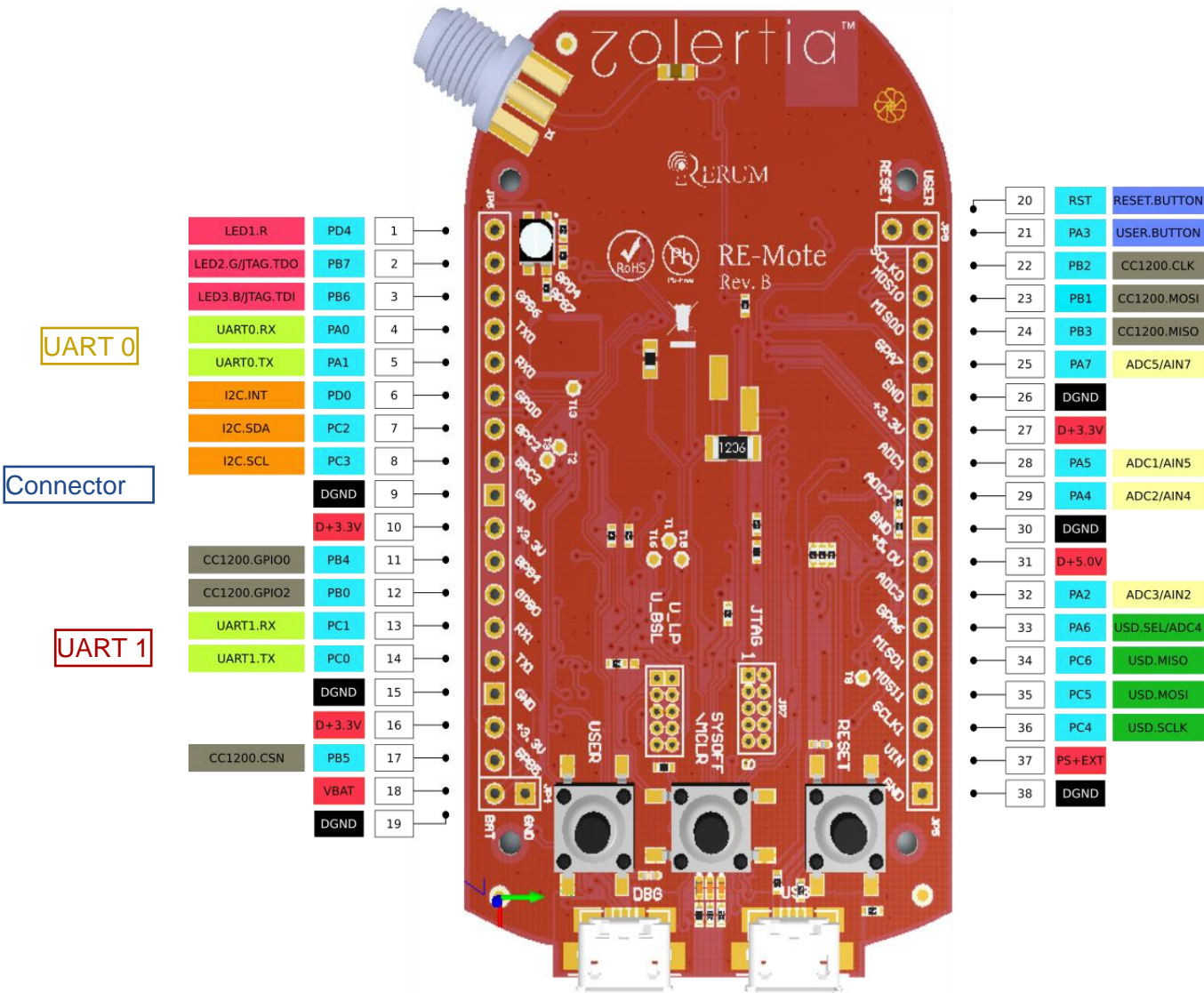
- Europe: ETSI EN 300 220, ETSI EN 300 328, ETSI EN 300 440, EN 54-25
- US: FCC CFR47 Part 15, FCC CFR47 Part 90

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/re-mote>
- Technical resources: <https://github.com/Zolertia/Resources/wiki/RE-Mote>
- Schematics and design resources: <https://github.com/Zolertia/Resources>

5. Device Information  
5.1. Block description and pin-out



Connected to CP2104 USB-to-s

---- UART 0 ----PA0 : GP

## 5.2. Pin description

Pin	Default name	Pin Type	MC	Description
1	LED1.R	Digital I/O	PD4	Red LED, can be disabled removing 00hm resistor
2	LED2.G/JTAG.TDO	Digital I/O	PB7	Green LED, can be disabled removing 00hm resistor, shared with JTAG TDO
3	LED3.B/JTAG.TDI	Digital I/O	PB6	Blue LED, can be disabled removing 00hm resistor, shared with JTAG TDI
4	UART0.RX	Digital I/O	PA0	Connected to the CP2104 USB-to-serial converter
5	UART0.TX	Digital I/O	PA1	Connected to the CP2104 USB-to-serial converter
6	GPD0/I2C.Interrupt	Digital I/O	PD0	Generic pin, may be used as auxiliary pin for I2C/SPI
7	I2C.SDA	Digital I/O	PC2	GPIO 20 mA output capability, pull-up. Shared with the RTCC and on-board low-power PIC
8	I2C.SCL	Digital I/O	PC3	GPIO 20 mA output capability, pull-up. Shared with the RTCC and on-board low-power PIC
9	DGND	Ground	N/A	Digital Ground
10	D+3.3	Power output	N/A	3.3VDC output pin
11	CC1200.GPIO0	Digital I/O	PB4	CC1200 GPIO0 pin. If RF switch disables sub-GHz is available for other purposes
12	CC1200.GPIO2	Digital I/O	PB0	CC1200 GPIO2 pin. If RF switch disables sub-GHz is available for other purposes
13	UART1.RX	Digital I/O	PC1	GPIO 20 mA output capability, no pull-up or pull-down.
14	UART1.TX	Digital I/O	PC0	GPIO 20 mA output capability, no pull-up or pull-down.
15	DGND	Ground	N/A	Digital Ground
16	D+3.3	Power output	N/A	3.3VDC output pin
17	CC1200.CSN	Digital I/O	PB5	CC1200 SPI Chip Select. If RF switch disables sub-GHz is available as GPIO
18	VBAT	Power Input	N/A	Pin to connect a battery (max 4.2V)
19	DGND	Ground	N/A	Digital Ground
20	RESET	Digital Input	RST	CC2538 reset, connected to the Reset Button
21	USER/ADC6/AIN3	Digital Input	PA3	Programmable User Button (default), to use otherwise disable the BSL bootloader or change backdoor enable pin
22	CC1200.CLK	Digital I/O	PB2	CC1200 SPI clock output. If RF switch disables sub-GHz is available as GPIO
23	CC1200.MOSI	Digital I/O	PB1	CC1200 SPI MOSI. If RF switch disables sub-GHz is available as GPIO
24	CC1200.MISO	Digital I/O	PB3	CC1200 SPI MISO. If RF switch disables sub-GHz is available as GPIO
25	USD.CS ADC5/AIN7	Digital I/O	PA7	Micro-SD SPI Chip Select (default). ADC5 analogue input channel enabled if removing R26 00hm resistor, or AIN7 as external reference for the ADC, or GPIO
26	DGND	Ground	N/A	Digital Ground
27	D+3.3	Power output	N/A	3.3VDC output pin
28	ADC1/AIN5	Digital I/O	PA5	ADC1 analogue input channel, configurable as GPIO
29	ADC2/AIN4	Digital I/O	PA4	ADC2 analogue input channel, configurable as GPIO
30	DGND	Ground	N/A	Digital Ground
31	D+5.0	Power output	N/A	5VDC output pin, if connected to the USB, if powered over external battery its maximum value is 4.2VDC
32	ADC3/AIN2	Digital I/O	PA2	ADC3 analogue input channel with 5/3 voltage divider to connect 5VDC-based analogue sensors
33	USD.SEL ADC4	Digital I/O	PA6	Micro-SD SEL (default). ADC4 analogue input channel enabled if removing R33 00hm resistor, or AIN6 as external reference for the ADC, or GPIO
34	USD.MISO	Digital I/O	PC6	Micro-SD SPI MISO (default). GPIO 20 mA output capability, no pull-up or pull-down
35	USD.MOSI	Digital I/O	PC5	Micro-SD SPI MOSI (default). GPIO 20 mA output capability, no pull-up or pull-down
36	USD.SCLK	Digital I/O	PC4	Micro-SD SPI SCLK (default). GPIO 20 mA output capability, no pull-up or pull-down
37	PS+EXT/VIN	Power Input	N/A	4.6-16VDC power input, 100/500mA (default)
38	DGND	Ground	N/A	Digital Ground

### 5.3. Connector descriptions

The images below detail the default connectors (2.54mm pitch) and ports of the Zolertia RE-Mote (both revisions A and B) with the indoor white enclosure. The RE-Mote exposes 2x ADC connectors, one for 3V sensors and the other with a voltage divider to allow connecting 5V sensors. The Digital connector allows to connect digital devices using I2C, SPI or UART as default. As the ARM Cortex-M3 allows to configure pins with different controllers, these assignments are not hardcoded thus the exposed pins can be used for other purposes. Note: the pins of the Port A are the only ADC-capable.



### 5.4. Parametric and ratings

The RE-Mote can be powered over the Micro USB ports (any or both at the same time), via the PS+EXT/VIN external power input (external power supply, solar panel, etc.), or over a rechargeable battery connected to VBAT (max 4.2VDC). 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	2.9 (VBAT) 4.6 (PS+EXT) 5 (USB)	4.2 (VBAT) 16 (PS+EXT) 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

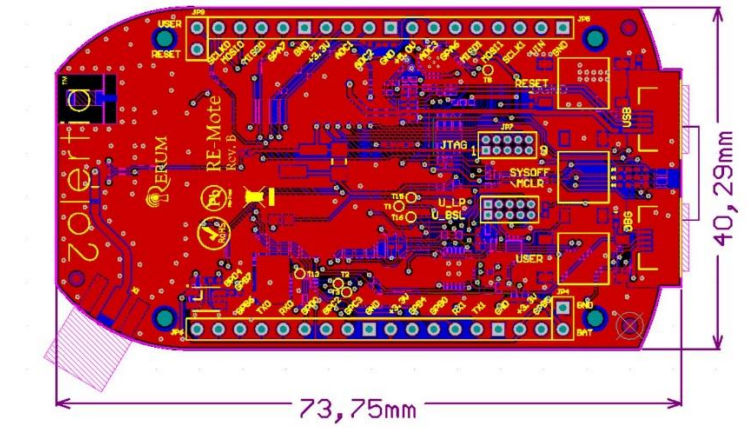
Table 2. Recommended Operating Conditions

Parameter	Min	Max	Unit
Operating ambient temperature range	-40	85	°C
Operating supply voltage	3	16 (PS+EXT) 5.1 (USB)	V



## 5.5. 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

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