
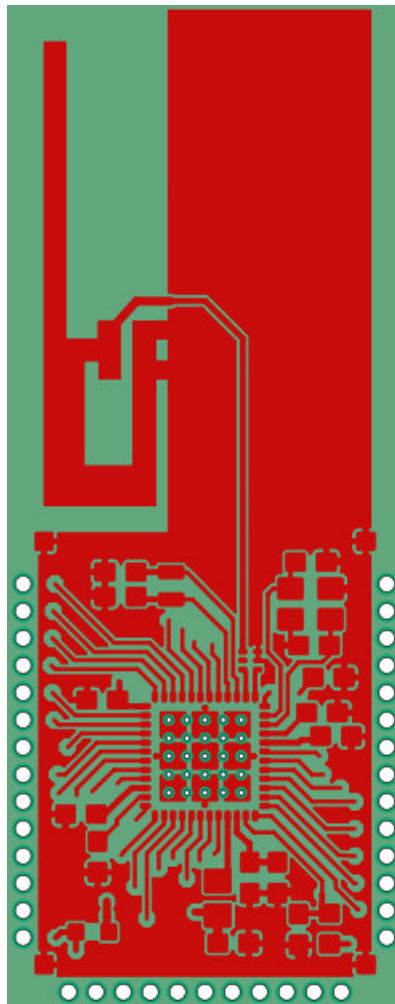


## muonio CC2538 Radio Module User Manual

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**CC2538  
RADIO MODULE  
User Manual**



The CC2538 is the ideal SoC for high-performance ZigBee applications. It combines a powerful ARM Cortex®-M3based MCU system with up to 32K on-chip RAM and up to 512 K on-chip flash with a robust IEEE 802.15.4 radio.

This enables it to handle complex network stacks with security, demanding applications, and over-the-air download. Thirty-two GPIOs and serial peripherals enable simple connections to the rest of the board. The powerful security accelerators enable quick and efficient authentication and encryption while leaving the CPU free to handle application tasks.

The low-power modes with retention enable quick startup from sleep and minimum energy spent to perform periodic tasks. For smooth development, the CC2538xFnn includes a powerful debugging system and a comprehensive driver library. To reduce the application flash footprint, CC2538xFnn ROM includes a utility function library and a serial boot loader.

FCC ID: 2AZ89C2538

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## Features & Applications

Built in CC2538 SoC

512KB, 256KB or 128KB of In-System Programmable Flash  
Size: 55 mm x 20 mm  
Powerful ARM® Cortex®-M3 With Code Prefetch  
Up to 32-MHz Clock Speed  
512KB, 256KB or 128KB of In-System Programmable Flash  
Supports On-Chip Over-the-Air Upgrade (OTA)  
Supports Dual ZigBee Application Profiles  
Up to 32KB of RAM (16KB With Retention in All  
Power Modes)  
cJTAG and JTAG Debugging  
RF 2.4-GHz IEEE 802.15.4 Compliant RF  
Transceiver  
Excellent Receiver Sensitivity of -97 dBm  
Robustness to Interference With ACR of 44 dB  
Programmable Output Power up to 7 dB  
Worldwide Acceptance

### **Applications**

Consumer electronics  
Mobile phone accessories  
Sports & Fitness equipment  
HID applications  
Home and Building Automation, Lighting  
Control, Alarm, and Security  
Electronic Shelf Labeling, Proximity  
Tags  
And many more...

### **Electrical Characteristics**

#### **ITEM TEST REQUIREMENT REMARKS**

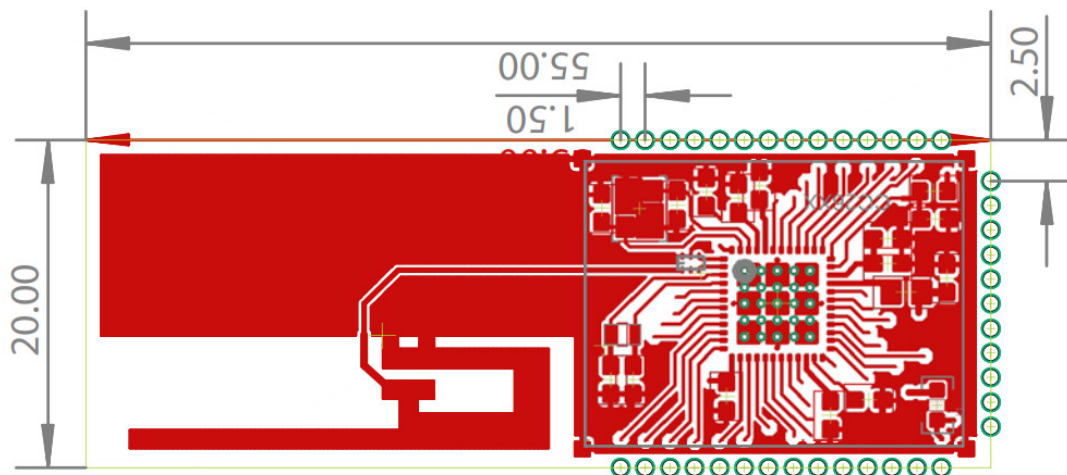
Active-Mode RX (CPU Idle): 20 mA  
Active-Mode TX at 0 dBm (CPU Idle): 24 mA  
Power Mode 1 (4-μs Wake-Up, 32-KB RAM  
Retention, Full Register Retention): 0.6 mA  
Power Mode 2 (Sleep Timer Running, 16-KB  
RAM Retention, Configuration Register  
Retention): 1.3 μA  
Power Mode 3 (External Interrupts, 16-KB RAM  
Retention, Configuration Register Retention): 0.4 μA  
Wide Supply-Voltage Range (2 V to 3.6 V)  
Module size 55 mm\*20 mm

#### **RECOMMENDED OPERATING CONDITIONS**

Operating ambient temperature range, TA -30 85 °C

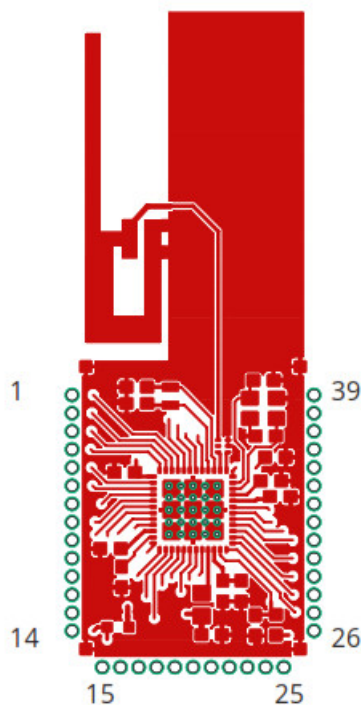
#### **CAUTION:**

ESD sensitive device. Precautions should be used when handling the device in order to prevent permanent damage.



## Pin assignment

NAME	Pin	PIN TYPE
VDD	14,15	
GND	10	
DVDD_USB	13	Power (USB pads)
JTAG_TCK	2	Digital I/O
JTAG_TMS	1	Digital I/O
PA0	24	Digital/analog I/O
PA1	25	Digital/analog I/O
PA2	26	Digital/analog I/O
PA3	27	Digital/analog I/O
PA4	29	Digital/analog I/O
PA5	30	Digital/analog I/O
PA6	31	Digital/analog I/O
PA7	32	Digital/analog I/O
PB0	13	Digital I/O
PB1	9	Digital I/O
PB2	8	Digital I/O
PB3	7	Digital I/O
PB4	6	Digital I/O
PB5	5	Digital I/O
PB6	4	Digital I/O
PB7	3	Digital I/O
PC0	23	Digital I/O
PC1	22	Digital I/O
PC2	21	Digital I/O
PC3	20	Digital I/O
PC4	19	Digital I/O
PC5	18	Digital I/O
PC6	17	Digital I/O
PC7	16	Digital I/O
PD0	33	Digital I/O
PD1	34	Digital I/O
PD2	35	Digital I/O
PD3	37	Digital I/O
PD4	38	Digital I/O
PD5	39	Digital I/O
RESET_N	36	Digital input
USB_P	11	USB I/O
USB_N	12	USB I/O



Pin counting starts top left.

## FCC regulatory compliance statement

### §15.19 Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### §15.21 Information to user

Warning: Changes or modifications not expressly approved by the party responsible for compliance could void the

user's authority to operate the equipment.

List of applicable FCC rules:

47 CFR Part 15, Subpart C 15.203

47 CFR Part 15, Subpart C 15.205

47 CFR Part 15, Subpart C 15.207

47 CFR Part 15, Subpart C 15.209

47 CFR Part 15, Subpart C 15.247

47 CFR Part 2 2.1091

Summarize the specific operational use conditions

This module can be used in IOT devices, the input voltage to the module is nominally 5V. Only the embedded integral antenna is allowed. Any other external antenna is prohibited.

Limited module procedures

This module is not a limited module.

Trace antenna designs

The antenna is not a trace antenna.

RF exposure considerations

This Module complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Antennas

If you desire to increase antenna gain and either change antenna type or use same antenna type certified, a Class II permissive change application is required to be filed by us, or you (host manufacturer) can take responsibility through the change in FCC ID

(new application) the procedure followed by a Class II permissive change application.

Label and compliance information

Please notice that if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains FCC ID: \_2AZ89C2538\_" any similar wording that expresses the same meaning may be used.

§ 15.19 Labelling requirements shall comply on the end-user device.

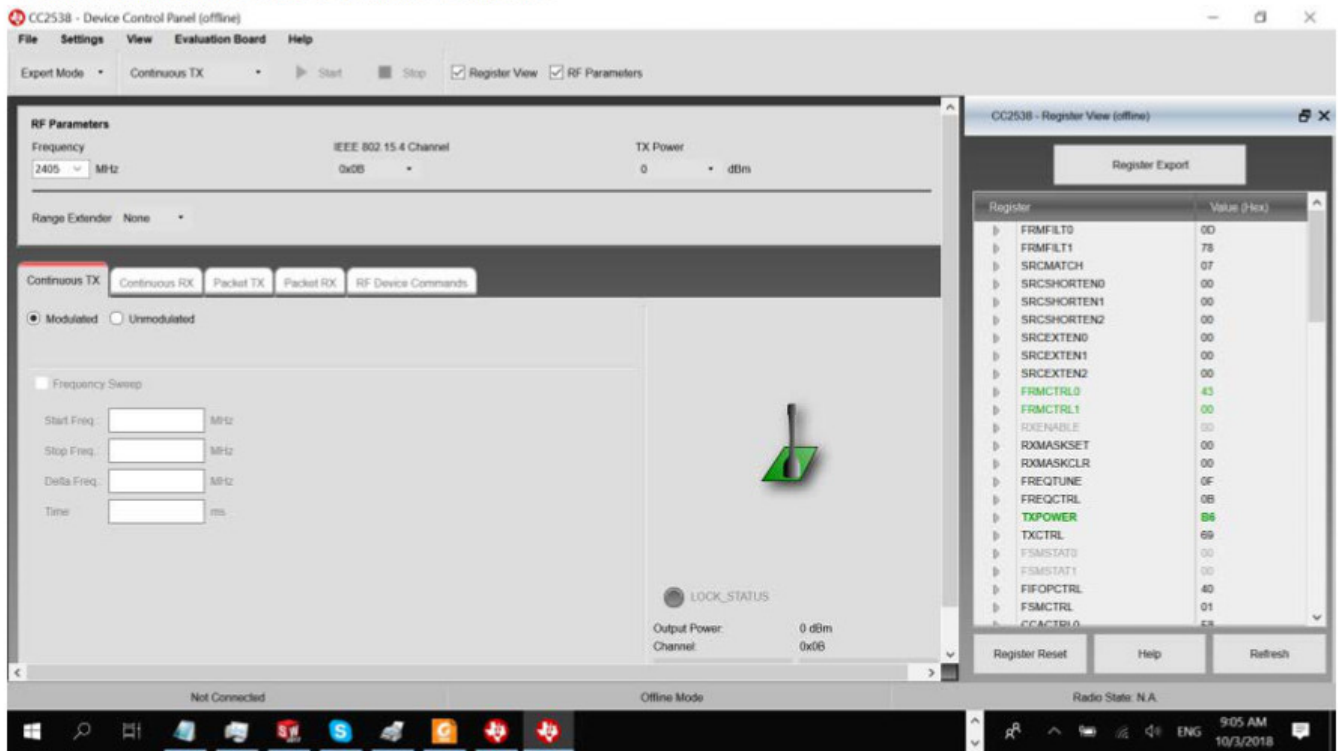
Labeling rules for a special device, please refer to §2.925, § 15.19 (a)(5), and relevant KDB publications. For E-label, please refer to §2.935.

Information on test modes and additional testing requirements

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install-module.

The module is limited to installation in mobile applications, a separate approval is required for all other operating configurations, including portable configurations with respect to §2.1093 and different antenna configurations.

## Test software: SmartRF Studio 7 2.10.0



### Additional testing, Part 15 Subpart B disclaimer

This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. Host manufacturer in any case shall ensure host product that is installed and operating with the module is in compliance with Part 15B requirements.

Please note that For a Class B or Class A digital device or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in §15.105 Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as follows:

### Sample Operation Description Sample

## Operation Description

### For Class B

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The 32MHZ Hz crystal oscillator drives the base of Q1.

The modulation is provided by IC FA128-32F20X-K3128. The output of has the matching network consisting of balun 2450BM14G0011 that limits the harmonic content and affects the proper coupling of the antenna to the output stage.

### Antenna, Ground and Power Source

The antenna consists of a 2.4GHz Meander line SWRU120C antenna.

Antenna gain: 1.1 to 3.3 dBi.

There is no external ground connection. The ground is only that of the printed circuit board.

Electric current is supplied by Input VCC;


Output: 3.3 Vd.c..

### Operation Descriptions

The transmitter is a Portable Wireless Music System operating at the 2400-2483.5MHz band. The transmitter is powered by 3.3 Vd.c and the transmitting frequency is crystal controlled. The operation is achieved by different combinations of form pulse modulating signals on the 2400MHz carrier frequency.

When the NTAG is positioned in the RF field, the high-speed RF communication interface allows the transmission of the data and enables Bluetooth pairing.

### Documents / Resources

	<p><a href="#">muonio CC2538 Radio Module</a> [pdf] User Manual</p> <p>C2538, 2AZ89C2538, CC2538 Radio Module, Radio Module</p>
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