

433 modem hardware specifications

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Introduction

This document gives an overview of the hardware specifications of the 433 modem, and provides links to the specifications of modem's components. The modem contains a programmable microcontroller. Instructions for modem's use and details about its operational principles are described in the user manual and in firmware specifications respectively.

Target audience: firmware developers and testers.

General

Licensing

PCI Express is a trademark of PCI-SIG.

Vocabulary

Term	Definition
GPIO	General Purpose Input/Output
ISM	Industrial, Scientific and Medical
MCU	Micro-Controller Unit
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
RF	Radio Frequency
RSSI	Received Signal Strength Indicator
SoC	System-on-Chip
SPI	Serial Programming Interface
USB	Universal Serial Bus

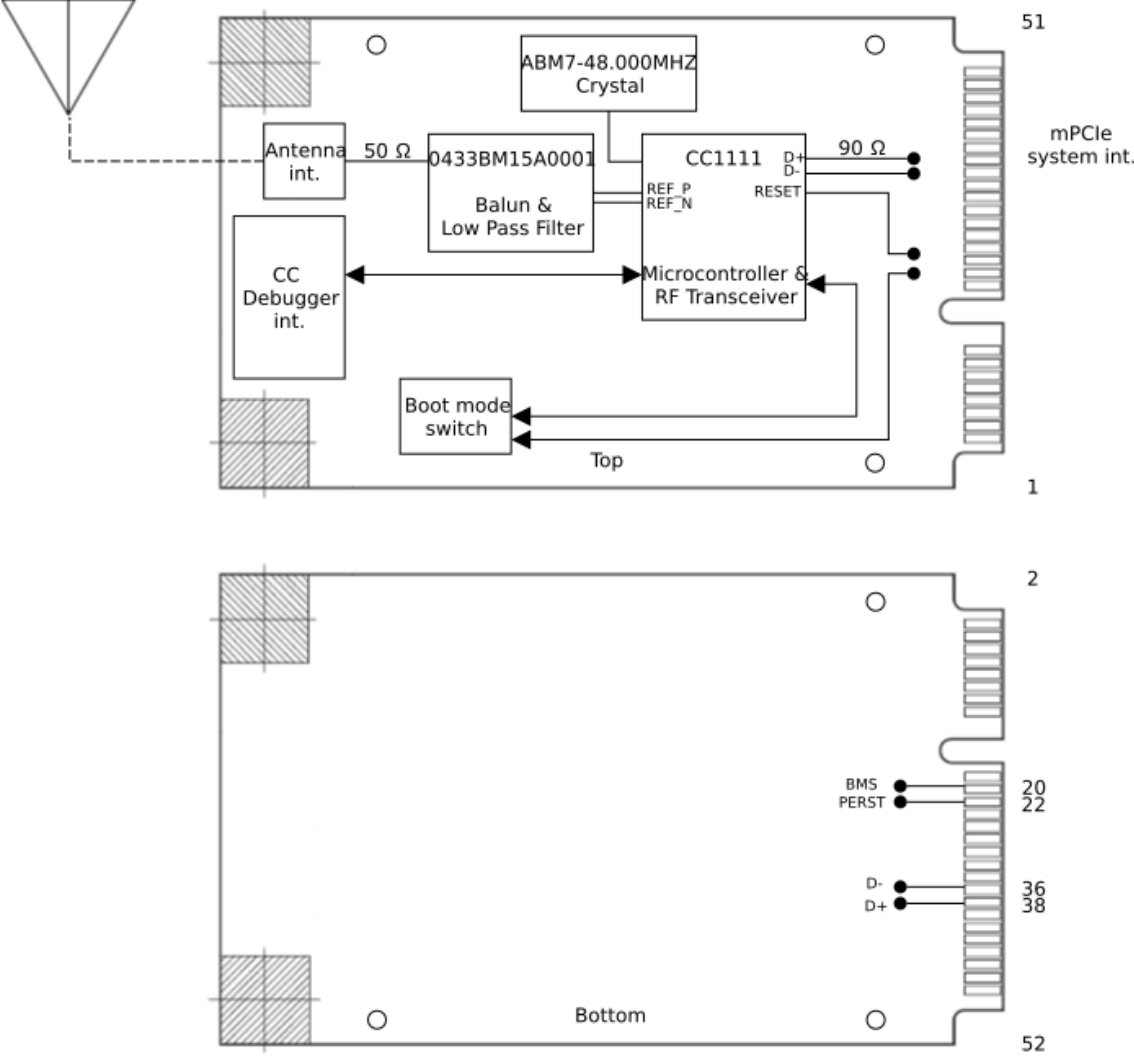
Product description

433 modem is an universal programmable radio transceiver for data communication. It can be used to receive data from various sensors and systems that operate on the 433 MHz ISM frequency band. The modem is equipped with a mini PCI Express system interface, therefore it can be installed to standard personal computers or network devices.

The modem has been equipped with an open-source bootloader to allow the user to develop customised firmware. The SoC transceiver and micro-controller provide a well documented and standardised method for modem firmware development. Boot mode selector makes it possible to update firmware via bootloader's upgrade mode.

Block diagram & layout drawing

The block diagram represents all the key components and interfaces with their locations in PCB. Modem form factor is in accordance with PCI Express Mini Card Electromechanical Specification's revision 1.0.



Key components

Component	Model	Description
Transceiver and micro-controller	CC1111F32RSP	Low-Power SoC with MCU , Memory, Sub-1 GHz RF Transceiver and USB Controller
RF filter and balun	0433BM15A0001	433 MHz Impedance Matched/Balun/LPF Integrated Component for Texas Instruments transceivers
Crystal	ABM7-48.000MHZ-D2Y-F-T	48 MHz, load capacitance 18 pF, frequency stability 30 ppm, frequency tolerance 20 ppm
U.FL male connector	U.FL-R-SMT01	Surface mounted U.FL receptacle
Slide switch	AYZ0103AGRLC	Surface mounted 3 position slide switch

Technical parameters

Parameter	Value
Transceiver	
Frequency band	433,050 - 434,790 MHz
RF output power	Programmable up to +10 dBm
Frequency error	11,01 kHz (When temperature is nominal)
Channel spacing	Programmable
RX filter bandwidth	Programmable
Receiver sensitivity	-101 dBm (at 1,2 kBaud)
Supported modulations	2-FSK/GFSK, MSK, OOK, ASK
Data rate	Programmable up to 500 kBaud
RSSI	Digital
Spurious Emissions	(Highest radiated emissions)
2167 MHz	-34,86 dBm
3034 MHz	-30,64 dBm

Parameter	Value
Balun/Filter	
Insertion loss	1,9 dB max
Return loss	9,5 dB min
Input power	1 W max
Unbalanced impedance	50 Ω
Micro-controller unit	
	Low power 8051 micro-controller core
	32 KB in-system programmable flash and 4 KB RAM
	Full-Speed USB Controller with 1 KB FIFO
Interfaces	
	mPCIe system interface for host communications
	Antenna (RF) interface for external antenna
	CC Debugger interface for firmware debugging and deploy
	Boot mode selector (BMS) switch
Electrical power	
Operating voltage	3,0 V to 3,6 V
Maximum current	40 mA
Dimensions	
Width	30,00 mm
Height	2,50 mm
Depth	50,95 mm
Weight	4,6 gram
Operating climate conditions	
Temperature	-10 to +60 degrees Celsius
Humidity	20 to 80 % RH
Storage climate conditions	
Temperature	-40 to +90 degrees Celsius
Humidity	20 to 80 % RH

Interfaces

mPCIe system interface

Description

Connector type	Mini PCI Express connector
Communications type	USB

Pinout

Pin	Signal/Description
2	3,3 V
4	GND
9	GND
15	GND
18	GND
21	GND
20	W_DISABLE# (Boot mode select)
22	PERST#
26	GND
27	GND
29	GND
34	GND
35	GND
36	D-
38	D+
40	GND
50	GND

Antenna (RF) interface

Description

Connector type	Hirose U.FL coaxial
Impedance	50 Ω

Pinout

Pin	Signal/Description
Inner Conductor	Signal
Outer Conductor	Ground

CC Debugger interface

Description

Connector type	Tag-Connect's TC2050-IDC
Communications type	SPI or GPIO, Debug

Pinout

Pin	Signal/Description
1	GND
2	3,3 V (Voltage sense)
3	Debug CLK
4	Debug DAT
5	P1_4 (SS)
6	P1_5 (SCLK)
7	RESET
8	P1_6 (MOSI)
9	3,3 V (Voltage supply)
10	P1_7 (MISO)

Boot mode selector switch

A switch with three positions to select boot mode (user code execution).

Switch position	Signal/Description
1	Transceiver P1_2 connected to GND
2	Open (User code is executed immediately)
3	Transceiver P1_2 connected to mPCIe connector pin 20

Used components specifications

1. [CC1111F32RSP specification](#)
2. [0433BM15A0001 specification](#)
3. [ABM7-48.000MHZ specification](#)
4. [U.FL-R-SMT\(01\) specification](#)
5. [TC2050-IDC drawing](#)
6. [AYZ0103AGRLC specification](#)