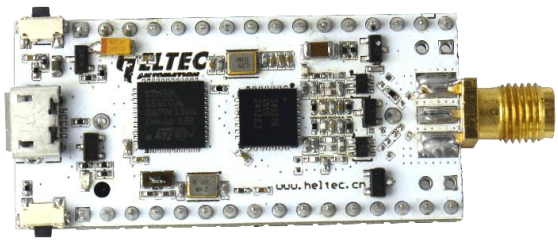
LoRa Node 151

LoRa Node Development Kit



Document version

Version	Time	Description
V1.0	2017-06-01	Documents creating
V2.0	2019-10-20	Document structure update
V2.2	2020-04-01	Document structure update

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Content

1. Description

1.1 Overview

Based on ultra low power design, we launched LoRa Node 151， adopting the STM32L151CCU6 MCU (support DFU mode) and SX127x LoRa chip, use 1/2 AA Lithium chlorine sulfite battery. Enter low power mode under the standard LoRaWAN protocol, the Deep Sleep Current ≤ 1.8uA.

LoRa Node 151 are available in two product variants:

Table 1.1 Product model list

No.	Model	Description
1	LoRa-Node-151-L	470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.
2	LoRa-Node-151-F	For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz.

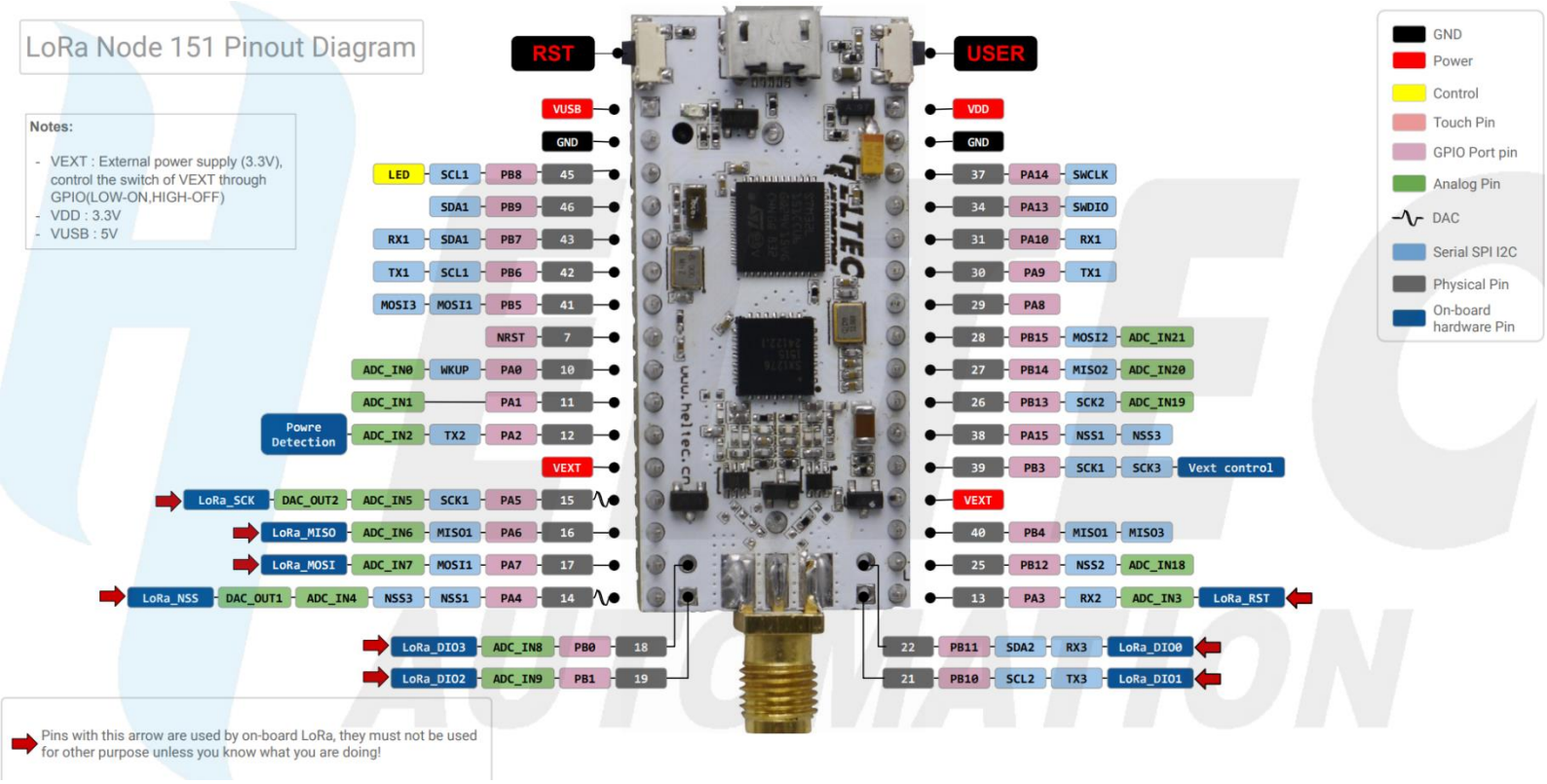
1.2 Product features

- CE Certificate;
- Microprocessor: STM32L151CCU6(ARM® Cortex®-M3 32-bit RISC core,support DFU mode) , with LoRa® node chip SX1276/SX1278;
- Onboard user resources available: 256 Kbytes of Flash memory with ECC; 32 Kbytes of RAM; 8 Kbytes of true EEPROM with ECC; 128-byte backup register;

- Micro USB interface with a complete voltage regulator, ESD protection, short circuit protection, and other protection measures;
- 1/2 AA battery shell, use 1/2 AA Lithium chlorine sulfite battery (this battery can't charge, but onboard USB / battery power automatic switching allows connect USB when the battery is assembled);
- Reserve SMA antenna interface for LoRa use;
- Download the firmware via DFU or ST-LINK;
- Provide complete LoRaWAN(ClassA/C) source code(support ABP and OTAA);
- With good RF circuit design and basic low-power design (sleep current: 1.8uA), it is convenient for IoT application vendors to quickly verify solutions and deploy applications.

2. Pin Definition

2.1 Pin assignment



2.2 Pin description

Header P1

Table 2-2-1 Pin description

No.	Name	Type	Function
1	VUSB	P	5V Input/Output.
2	GND	P	Ground.
3	PB8	P	PB8, SCL1, LED.
4	PB9	P	PB9, SDA1.
5	PB7	I/O	PB7, SDA1, RX1.
6	PB6	I/O	PB6, SCL1, TX1.
7	PB5	I	PB5, MOSI1, MOSI3.
8	NRST	I/O	RESET.

9	PA0	I/O	PA0, WKUP, ADC_IN0.
10	PA1	I/O	PA1, ADC_IN1.
11	PA2	I/O	PA2, TX2, ADC_IN2[1].
12	VEXT	I/O	Output 3.3V, power supply for external device.
13	PA5	I/O	PA5, SCK1, ADC_IN5, DAC_OUT2, LoRa_SCK.
14	PA6	I/O	PA6, MISO1, ADC_IN6, LoRa_MISO.
15	PA7	I/O	PA7, MOSI1, ADC_IN7, LoRa_MOSI.
16	PA4	I/O	PA4, NSS1, NSS3, ADC_IN4, DAC_OUT1, LoRa_NSS.

Header P2

Table 2-2-2 Pin description

No.	Name	Type	Function
1	VDD	P	3.3V Input/Output.
2	GND	P	Ground.
3	PA14	P	PA14, SWCLK.
4	PA13	I/O	PA13, SWDIO.
5	PA10	I/O	PA10, RX1.
6	PA9	I/O	PA9, TX1.
7	PA8	I/O	PA8.
8	PB15	I/O	PB15, MOSI2, ADC_IN21.
9	PB14	I/O	PB14, MISO2, ADC_IN20.
10	PB13	I/O	PB13, SCK2, ADC_IN19.
11	PA15	I/O	PA15, NSS1, NSS3.
12	PB3	I/O	PB3, SCK1, SCK3, VEXT_Control.
13	VEXT	I/O	Output 3.3V, power supply for external device.
14	PB4	I/O	PB4, MISO1, MISO3.
15	PB12	I/O	PB12, NSS2, ADC_IN18.
16	PA3	I/O	PA3, RX2, ADC_IN3, LoRa_RST.

Header P3

Table 2-2-3 Pin description

[1] ADC_IN2 is used to read the lithium battery voltage, the voltage of the lithium battery is: VBAT = 3.2*V(ADC_IN2).

No.	Name	Type	Function
1	PB0	I/O	PB0, ADC_IN8, LoRa_DIO3.
2	PB1	I/O	PB1, ADC_IN9, LoRa_DIO2.

Header P4

Table 2-2-4 Pin description

No.	Name	Type	Function
1	PB11	I/O	PB11, SDA2, RX3, LoRa_DIO0.
2	PB10	I/O	PB10, SCL2, TX3, LoRa_DIO1.

3. Specifications

3.1 General specifications

Table 3-1: General specifications

Parameters	Description
Master Chip	STM32L151CCU6(Ultra-low-power 32-bit MCU ARM®-based Cortex®-M3)
LoRa Chipset	SX1276/SX1278
Frequency	470~510 MHz, 863~923 MHz
Max TX Power	19dB ± 1dB
Receiving sensitivity	-135 dBm
Hardware Resource	USART x 3; SPI x 2; I2C x 2; I2S x 2; 12-bits ADC input x 25; 12-bits DAC output x 2; GPIO x 29
Memory	256KB internal FLASH; 32KB internal SRAM
Interface	Micro USB x 1; LoRa Antenna interface(SMA) x 1; 16 x 2.54 pin x 2 + 2 x 2.54 pin x 2
Battery	1/2AA Lithium
Operating temperature	-20 ~ 70 ℃
Dimensions	56.6 x 24 x 20 mm
Low Power	Deep Sleep 2.5uA

3.2 Power supply

Except when USB or 5V Pin is connected separately, lithium battery can be connected to charge it. In other cases, only a single power supply can be connected.

Table 3-2: Power supply

Power supply mode	Minimum	Typical	Maximum	Company
USB powered(≥500mA)	4.7	5	6	V
Lithium battery(≥250mA)	3.3	3.6	4.2	V
5V pin(≥500mA)	4.7	5	6	V
3V3 pin(≥150mA)	2.7	3.3	3.5	V

3.3 Power output

Table 3-3: Power output

Output Pin	Minimum	Typical	Maximum	Company
3.3V Pin			500	mA
5V Pin (USB Powered only)		Equal to the input current		
Vext Pin			350	mA

3.4 Power characteristics

Table 3-4: Power characteristics

Mode	Condition	Min.	Typical	Max.	Company
Power Consumption(mA)	LoRa 10dB output		50		mA
	LoRa 12dB output		60		mA
	LoRa 15dB output		110		mA
	LoRa 20dB output		130		mA

3.5 LoRa RF characteristics

3.5.1 Transmit power

Table3-5 Transmit power

Operating frequency band	Maximum power value/[dBm]
470~510	19 ± 1
867~870	19 ± 1
902~928	19 ± 1

3.5.2 Receiving sensitivity

The following table gives typically sensitivity level of the LoRa-Node-151-(L/H).

Table3-6: Receiving sensitivity

Signal Bandwidth/[KHz]	Spreading Factor	Sensitivity/[dBm]
125	SF12	-135
125	SF10	-130
125	SF7	-124

3.6 Operation Frequencies

LoRa Node 151(F) supports LoRaWAN frequency channels and models corresponding table.

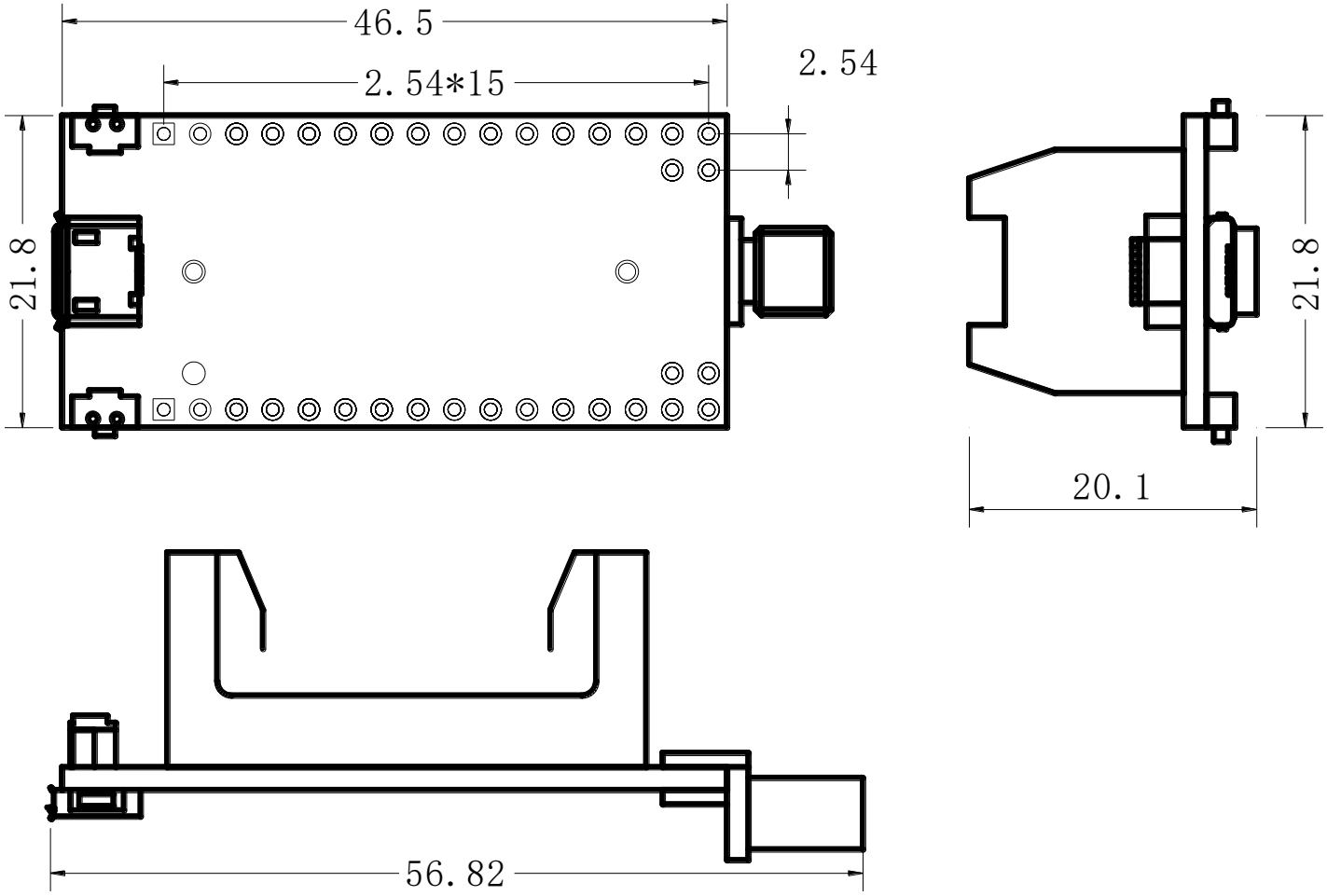
Table3-7: Operation Frequencies

Region	Frequency (MHz)	Model

EU433	433.175~434.665	LoRa-Node-151-L
CN470	470~510	LoRa-Node-151-L
IN868	865~867	LoRa-Node-151-F
EU868	863~870	LoRa-Node-151-F
US915	902~928	LoRa-Node-151-F
AU915	915~928	LoRa-Node-151-F
KR920	920~923	LoRa-Node-151-F
AS923	920~925	LoRa-Node-151-F

4. Hardware resource

4.1 Physical dimensions



5. Resource

5.1 Relevant Resource

- Schematic diagram
- Pin map
- Downloadable resource

5.2 Contact Information

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