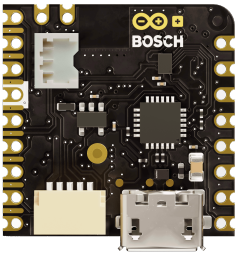
User Manual
SKU: ABX00050



Description

The Arduino Nicla Sense ME is our smallest form factor yet, with a range of industrial-grade sensors packed into a tiny footprint. Measure process parameters such as temperature, humidity, and movement. Dive into edge computing with powerful data fusion capabilities. Make your own industrial-grade wireless sensing network with the onboard BHI260AP, BMP390, BMM150, and BME688 sensors from Bosch®.

Target Areas

Wireless sensor networks, data fusion, artificial intelligence, and gas detection

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1 Features

1.1 Bluetooth® Module

Feature	Description
Model	ANNA-B112 Bluetooth® Module
Microcontroller	nRF52832 System-on-chip
CPU Core	64 MHz Arm® Cortex®-M4F
Internal SRAM Memory	64 KB
Internal Flash Memory	512 KB
External Flash Memory	2 MB
Interfaces	2x SPI, 2x I2C (one accessible via pin header each)
ADC	12-bit/200 ksps
Bluetooth® Frequency	2400–2483.5 MHz
Antenna	Internal
Oscillator	Internal 32 MHz
Operating Voltage	1.8 VDC

1.2 Smart Sensor with Integrated IMU

Feature	Description
Model	Bosch® BHI260AP
CPU Core	Fuser 2, 32 Bit Synopsys DesignWare ARC™ EM4™ CPU
IMU	6-axis: 16-bit 3-axis accelerometer & gyroscope
Advanced Features	Self-learning AI, swim analytics, pedestrian dead reckoning, orientation
External Memory	2MB Flash connected via QSPI

1.3 High-Performance Pressure Sensor

Feature	Description
Model	Bosch® BMP390
Operating Range	300-1250 hPa
Absolute Accuracy	± 0.5 hPa
Relative Accuracy	± 0.03 hPa (equivalent to ±25 cm)
RMS Noise	0.02 Pa
FIFO Buffer	Integrated 512 byte
Maximum Sampling Rate	200 Hz

1.4 3-Axis Magnetometer

Feature	Description
Model	Bosch® BMM150
Magnetic Range	X, Y axis: ±1300 µT, Z axis: ±2500 µT
Resolution	0.3 µT
Non-linearity	<1% FS

1.5 Environmental Sensor

Feature	Description
Model	Bosch® BME688
Operating Range	Pressure: 300-1100 hPa, Humidity: 0-100%, Temperature: -40 - +85°C
eNose Sensor	Sensor-to-sensor deviation (IAQ): ± 15% ± 15 IAQ
Sensor Outputs	IAQ, bVOC- and CO2-equivalents (ppm), gas scan result (%), intensity level

1.6 Onboard Microcontroller

Feature	Description
Model	ATSAMD11D14A-MUT
Functions	Serial to USB bridge, debugger interface

2 The Board

2.1 Application Examples

The Arduino® Nicla Sense ME is your gateway to develop wireless networking solutions with rapid development and high robustness. Get real-time insight into the operational characteristics of your processes. Take advantage of the high-quality sensors and networking capabilities to evaluate novel WSN architectures. Ultra-low power consumption and integrated battery management allow for deployment in various capabilities. WebBLE allows for easy OTA updates of the firmware as well as remote monitoring.

- **Warehouse & Inventory Management**: The environmental sensor of the Arduino® Nicla Sense ME can detect the ripening state of fruits, vegetables and meat allowing for intelligent management of perishable assets alongside the Arduino Cloud.
- **Distributed Industrial Sensing**: Identify operating conditions within your machine, factory or greenhouse remotely and even in hard-to-access or hazardous areas. Detect natural gas, toxic gases or other hazardous fumes using the AI capabilities on the **Arduino® Nicla Sense ME**. Improve safety levels with remote analysis. Mesh capabilities allow for simple deployment of WSN with minimal infrastructure requirements.
- **Wireless Sensor Network Reference Design**: The Nicla form factor has been specifically developed at Arduino® as a standard for wireless sensor networks which can be adapted by partners to develop custom-designed industrial solutions. Get a head start by developing custom end-user solutions including Cloud-connected battery-powered IoT devices and autonomous robotics. Researchers and educators can use this platform to work on an industrially-recognized standard for wireless sensor research and development that can shorten the time from concept to market.

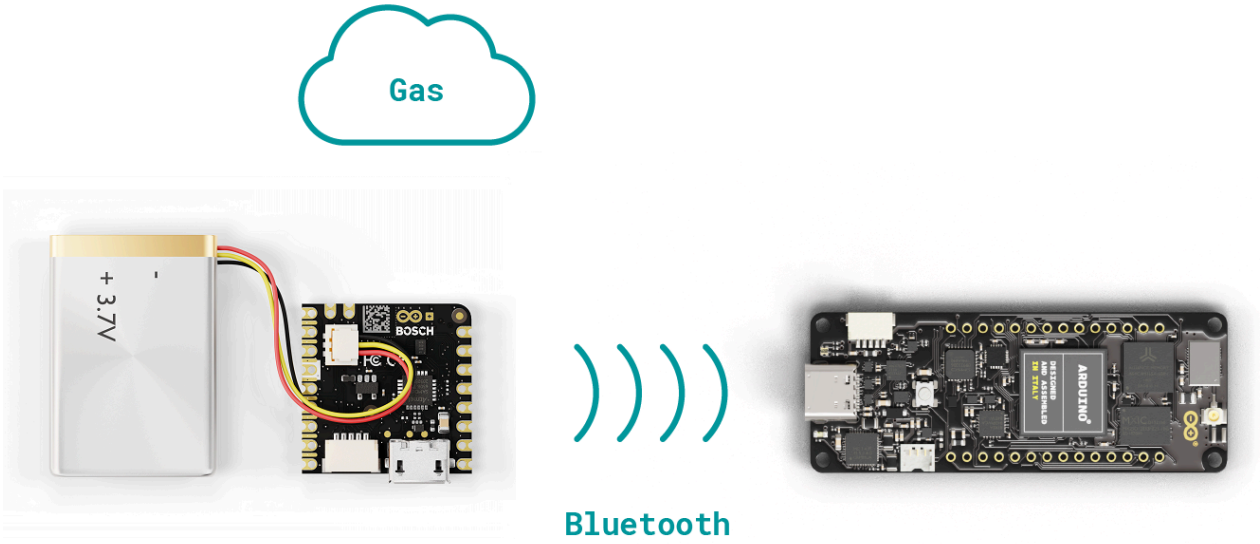
2.2 Accessories (Not Included)

- Single-cell Li-ion/Li-Po battery

2.3 Related Products

- ESLOV connector
- Arduino® Portenta H7 (SKU: ABX00042)

2.4 Assembly Overview



Example of a typical solution for remote environmental sensing including an Arduino® Nicla Sense ME, Portenta H7 and battery. Notice the orientation of the battery's cable in the board's connector.

Note: The NTC pin on the battery connector is optional. This feature allows safer use and thermal shutoff.

3 Ratings

3.1 Recommended Operating Conditions

Symbol	Description	Min	Typ	Max	Unit
V_{IN}	Input voltage from VIN pad	3.5	5.0	5.5	V
V_{USB}	Input voltage from USB connector	4.8	5.0	5.5	V
V_{DDIO_EXT}	Level Translator Voltage	1.8	3.3	3.3	V
V_{IH}	Input high-level voltage	$0.7V_{DDIO\_EXT}$ [1]		V_{DDIO_EXT}	V
V_{IL}	Input low-level voltage	0		$0.3V_{DDIO\_EXT}$ [2]	V
T_{OP}	Operating Temperature	-40	25	85	°C

Note: V_{DDIO_EXT} is software programmable. While the ADC inputs can accept up to 3.3V, the maximum value is at the ANNA B112 operating voltage.

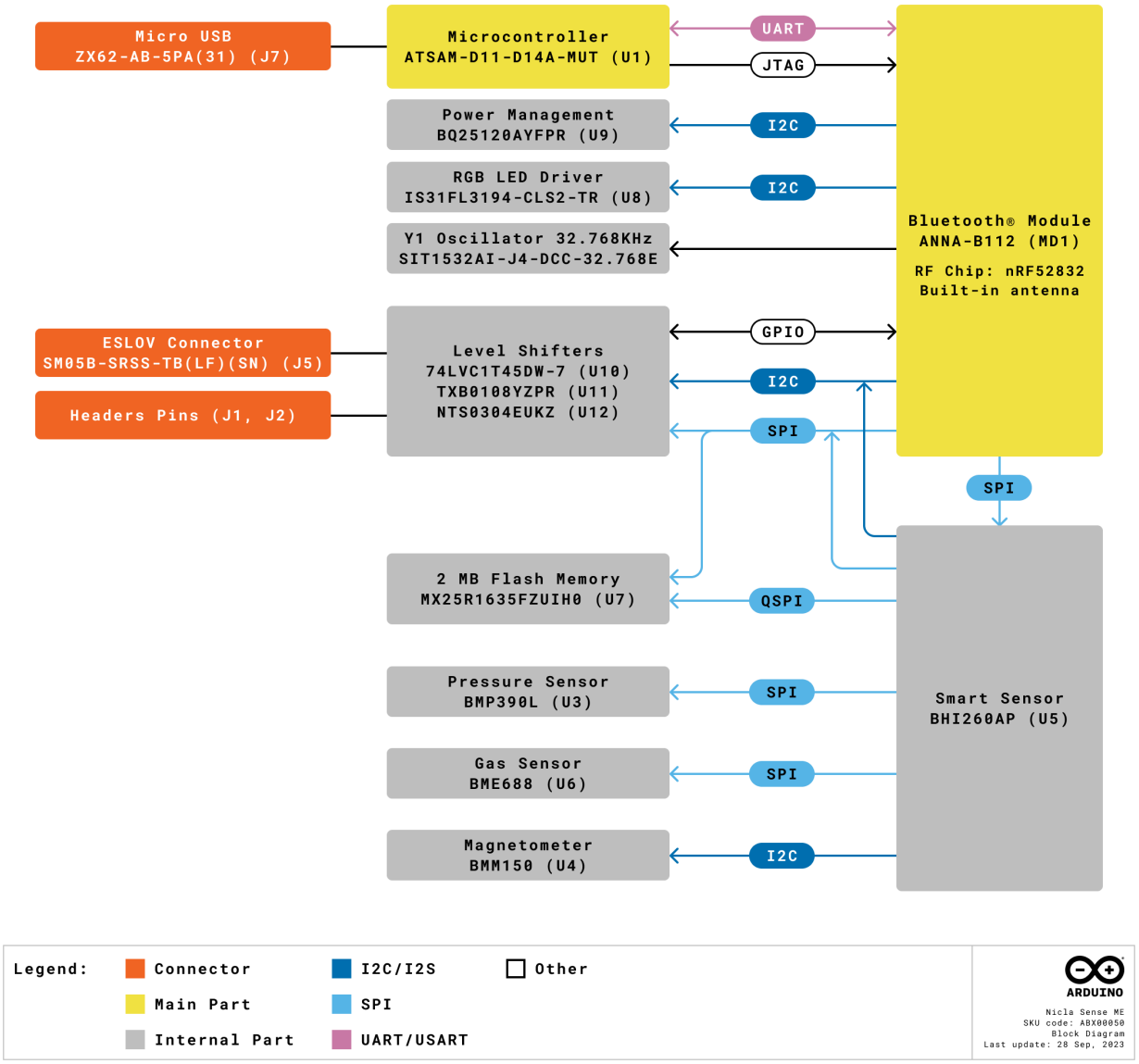
1 : All I/O pins operate at V_{DDIO_EXT} apart from the following:

- ADC1 and ADC2 - 1V8
- JTAG_SAMD11 - 3V3
- JTAG_ANNA - 1V8
- JTAG_BHI - 1V8

2 : If the internal V_{DDIO_EXT} is disabled, it is possible to supply it externally.

4 Functional Overview

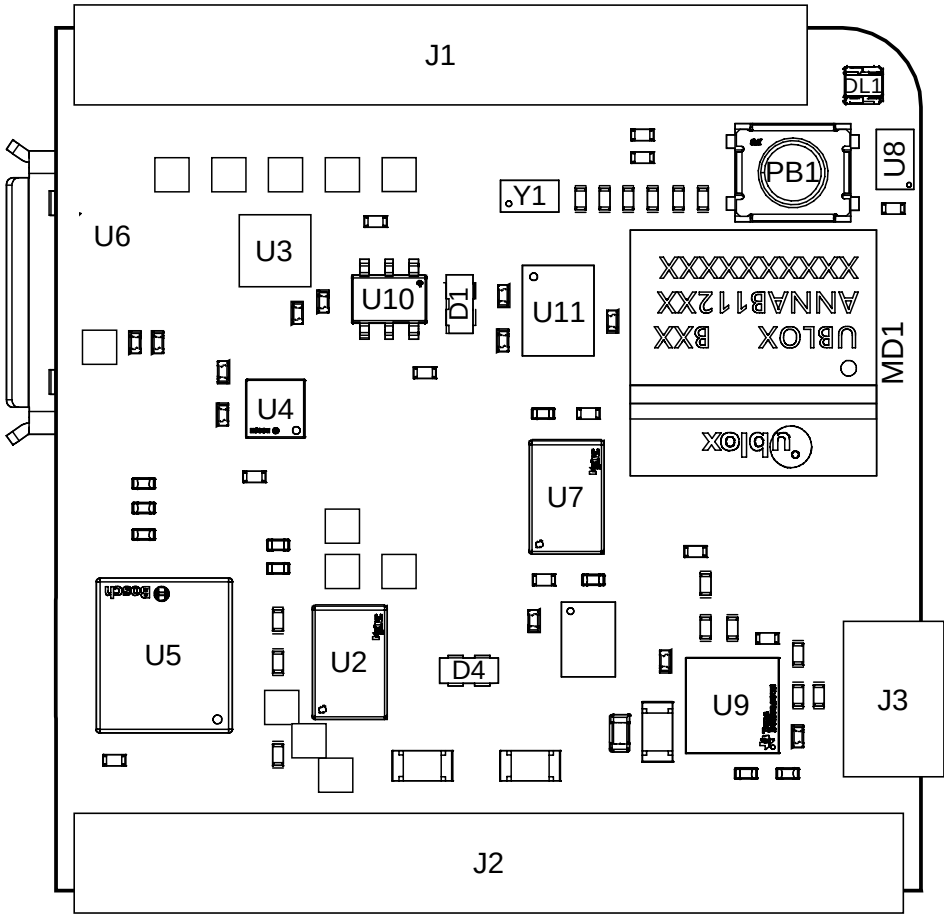
4.1 Block Diagram



Nicla Sense ME Block Diagram

4.2 Board Topology

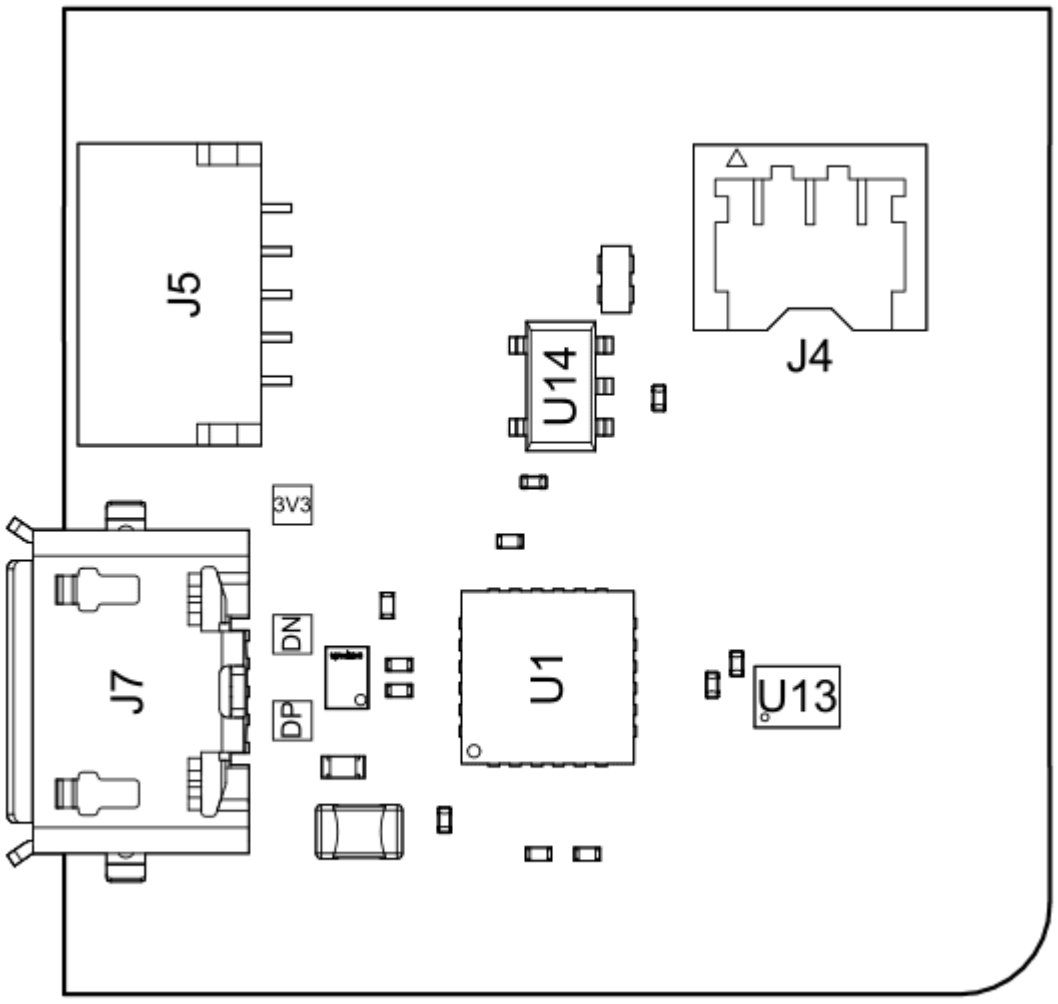
Top View



Nicla Sense ME Top View

Ref.	Description	Ref.	Description
MD1	ANNA B112 Bluetooth® Module	U2, U7	MX25R1635FZUIH0 2 MB FLASH IC
U3	BMP390 Pressure Sensor IC	U4	BMM150 3-axis Magnetic Sensor IC
U5	BHI260AP 6 axis IMU and AI core IC	U6	BME688 Environmental Sensor IC
U8	IS31FL3194-CLS2-TR 3-channel LED IC	U9	BQ25120AYFPR Battery Charger IC
U10	SN74LVC1T45 1Channel voltage level translator IC	U11	TXB0108YZPR Bidirectional IC
U12	NTS0304EUKZ 4-bit translating transceiver	J1	ADC, SPI and LPIO Pin headers
J2	I2C, JTAG, Power and LPIO pin headers	J3	Battery pin headers
Y1	SIT1532AI-J4-DCC MEMS 32.7680 kHz Oscillator	DL1	SMLP34RGB2W3 RGB SMD LED
PB1	Reset button		

Back View



Nicla Sense ME Back View

Ref.	Description	Ref.	Description
U1	ATSAMD11D14A-MUT USB Bridge	U13	NTS0304EUKZ 4-bit translating transceiver IC
U14	AP2112K-3.3TRG1 0.6 A 3.3 V LDO IC	J4	3-pin 1.2mm ACH Battery Connector (BM03B-ACHSS-GAN-TF)
J5	SM05B-SRSS-TB(LF)(SN) 5-pin Eslov connector	J7	microUSB connector

4.3 Microcontroller

The Arduino® Nicla Sense ME is powered by a nRF52832 SoC within the ANNA-B112 module (MD1). The nRF52832 SoC is built around an Arm® Cortex®-M4 microcontroller with a floating point unit running at 64 MHz. Sketches are stored inside the nRF52832 internal 512 KB FLASH which is shared with the bootloader. 64 KB SRAM is available to the user. The ANNA-B112 acts as an SPI host for the data logging 2MB flash (U7) and the BHI260 6-axis IMU (U5). It is also the secondary for the BHI260 (U5) I2C and SPI connection. While the module itself runs at 1.8V, a level shifter can adjust the logic level between 1.8V and 3.3V depending on the LDO set in BQ25120 (U9). An external oscillator (Y1) provides a 32 KHz signal.

4.4 Bosch® BHI260 Smart Sensor System with Built-in 6-Axis IMU

The Bosch® BHI260 is an ultra-low power programmable sensor, combining a Fuser2 core processor, 6-axis IMU (gyroscope and accelerometer) together with a sensor fusion software framework. The BHI260 is a smart sensor core (hosting a programmable recognition system), that handles communication with other sensors on the **Arduino Nicla Sense ME** via I2C and SPI connections. There is also a dedicated 2MB Flash (U2) used to store execute-in-place (XiP) code as well as data storage, such as Bosch® sensor fusion algorithm (BSX) calibration data. The BHI 260 is capable of loading custom algorithms that can be trained on a PC. The generated smart algorithm then operates on this chip.

4.5 Bosch® BME688 Environmental Sensor

The **Arduino Nicla Sense ME** is able to perform environmental monitoring via the Bosch® BME688 sensor (U6). This provides capabilities for pressure, humidity, temperature as well as Volatile Organic Compound (VOC) detection. The Bosch® BME688 performs gas detection via an eNose metal oxide semiconductor array with a typical gas scan cycle of 10.8 seconds.

4.6 Bosch® BMP390 Pressure Sensor

Industrial grade accuracy and stability in pressure measurements are provided by the BMP390 (U3) designed for prolonged use, with a relative accuracy of ±0.03 hPa and an RMS of 0.02 Pa in high-resolution mode. The Bosch® BMP390 is suitable for rapid measurements with a sampling rate of 200 Hz, or for low-power use with a sampling rate of 1 Hz, consuming less than 3.2 µA. U3 is controlled via an SPI interface to the BHI260 (U2), on the same bus as the BME688 (U6).

4.7 Bosch® BMM150 3-Axis Magnetometer

The Bosch® BMM150 (U4) provides accurate 3-axis measurements of the magnetic field with compass-level accuracy. Combined with the BHI260 IMU (U2), Bosch® sensor fusion can be used to obtain high-accuracy spatial orientation and motion vectors for the detection of heading in autonomous robots as well as predictive maintenance. There is a dedicated I2C connection to the BHI260 (U2), acting as the host.

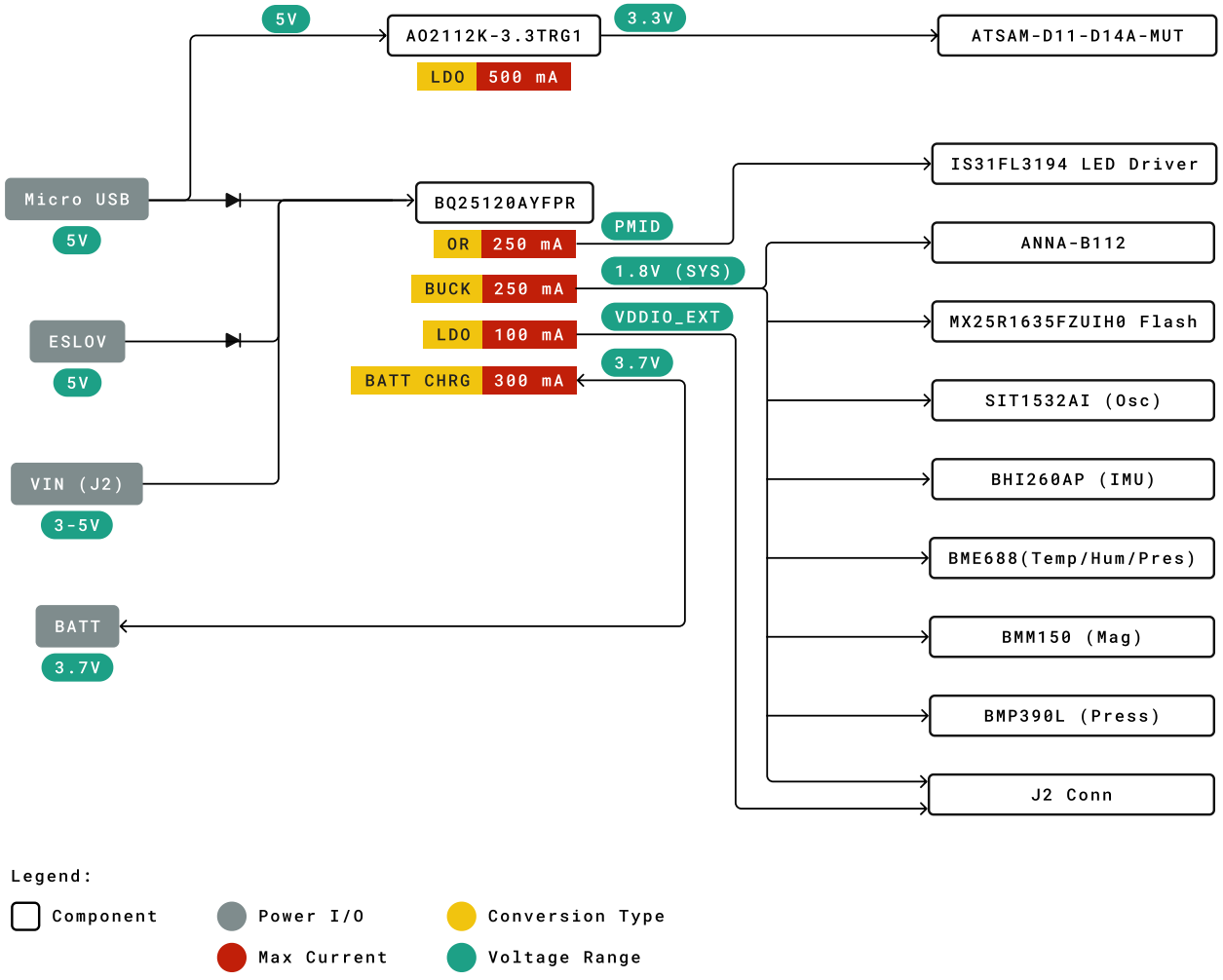
4.8 RGB LED

An I2C LED driver (U8) drives the RGB LED (DL1) and is capable of a maximum output of 40 mA. It is driven by the ANN-B112 (U5) microcontroller.

4.9 USB Bridge

The SAMD11 microcontroller (U1) is dedicated to act as both the USB bridge as well as the JTAG controller for the ANNA-B112. A logic level translator (U13) acts as an in-between to translate 3.3V logic to 1.8V for the ANNA-B112. The 3.3V voltage is generated from the USB voltage by an LDO (U14).

4.10 Power Tree



Nicla Sense ME Back View

The **Arduino Nicla Sense ME** can be powered via micro USB (J7), ESLOV (J5) or VIN. This is converted into the relevant voltages via the BQ2512BAYFPR IC (U9). A Schottky diode provides reverse polarity protection to the USB and ESLOV voltages. When voltage is supplied via the micro USB, a linear 3.3V regulator also provides power to the SAMD11 microcontroller used for programming the board as well as for JTAG and SWD. The LED driver (U8) and RGB LEDs (DL1) are driven by a boost voltage of 5V. All other components operate off the 1.8V rail regulated by a buck converter. PMID acts as an OR switch between VIN and BATT and operates the LED driver. All I/O broken out to the pins are fed through a bidirectional voltage translator running at V_{DDIO_EXT}.

Additionally, the BQ25120AYFPR (U9) also provides support for a single cell 3.7V LiPo/Li-ion battery pack connected to J4, allowing the use of the board as a wireless sensor network. The battery charging current is set to 40mA with a termination current of 4mA (10%).

5 Board Operation

5.1 Getting Started - IDE

If you want to program your Arduino® Nicla Sense ME while offline you need to install the Arduino® Desktop IDE **[1]** To connect the Arduino® Nicla Sense ME to your computer, you'll need a micro USB cable. This also provides power to the board, as indicated by the LED. The Arduino core is operated on the ANNA-B112 while the Bosch® Smart Sensor framework operates on the BHI260.

5.2 Getting Started - Arduino Cloud Editor

All Arduino® boards, including this one, work out-of-the-box on the Arduino® Cloud Editor **[2]**, by just installing a simple plugin.

The Arduino® Cloud Editor is hosted online, therefore it will always be up-to-date with the latest features and support for all boards. Follow **[3]** to start coding on the browser and upload your sketches onto your board.

5.3 Getting Started - Arduino Cloud

All Arduino® IoT enabled products are supported on Arduino® Cloud which allows you to log, graph and analyze sensor data, trigger events, and automate your home or business.

5.4 Getting Started - WebBLE

The Arduino Nicla Sense ME provides the capability for OTA updates to the NINA-B112 and BHI260 firmware using WebBLE.

5.5 Getting Started - ESLOV

This board can act as a secondary to an ESLOV controller and have the firmware updated through this method.

5.6 Sample Sketches

Sample sketches for the Arduino® Nicla Sense ME can be found either in the "Examples" menu in the Arduino® IDE or in the "Documentation" section of the Arduino® Pro website **[4]**

5.7 Online Resources

Now that you have gone through the basics of what you can do with the board you can explore the endless possibilities it provides by checking exciting projects on ProjectHub **[5]**, the Arduino® Library Reference **[6]** and the online store **[7]** where you will be able to complement your board with sensors, actuators and more.

5.8 Board Recovery

All Arduino® boards have a built-in bootloader that allows flashing the board via USB. In case a sketch locks up the processor and the board is not reachable anymore via USB, it is possible to enter bootloader mode by double-tapping the reset button right after the power-up.

6 Connector Pinouts

Note: All the pins on J1 and J2 (excluding fins) are referenced to the V_{DDIO_EXT} voltage which can be generated internally or supplied externally.

6.1 J1 Nicla Header A

Pin	Function	Type	Description
1	LPIO0_EXT	Digital	Low Power IO Pin 0
2	NC	N/A	N/A
3	CS	Digital	SPI Cable Select
4	COPI	Digital	SPI Controller Out / Peripheral In
5	CIPO	Digital	SPI Controller In / Peripheral Out
6	SCLK	Digital	SPI Clock
7	ADC2	Analog	Analog Input 2
8	ADC1	Analog	Analog Input 1

6.2 J2 Nicla Header B

Pin	Function	Type	Description
1	SDA	Digital	I2C Data Line
2	SCL	Digital	I2C Clock
3	LPIO1_EXT	Digital	Low Power IO Pin 1
4	LPIO2_EXT	Digital	Low Power IO Pin 2
5	LPIO3_EXT	Digital	Low Power IO Pin 3
6	GND	Power	Ground
7	VDDIO_EXT	Digital	Logic Level Reference
8	N/C	N/A	N/A
9	VIN	Digital	Input Voltage

Note: For further information on how Low Power I/Os work, check Nicla Family Form Factor documentation.

6.3 J2 Fins

Pin	Function	Type	Description
P1	BHI_SWDIO	Digital	BHI260 JTAG Serial Wire Debug Data
P2	BHI_SWDCLK	Digital	BHI260 JTAG Serial Wire Debug Clock
P3	ANNA_SWDIO	Digital	ANNA JTAG Serial Wire Debug Data
P4	ANNA_SWDCLK	Digital	ANNA JTAG Serial Wire Debug Clock
P5	RESET	Digital	Reset Pin
P6	SAMD11_SWDIO	Digital	SAMD11 JTAG Serial Wire Debug Data
P7	+1V8	Power	+1.8V Voltage Rail
P8	SAMD11_SWDCLK	Digital	SAMD11 JTAG Serial Wire Debug Clock

Note: These test points can easily be accessed by inserting the board in a double row 1.27 mm/50 mil pitch male header. **Note 2:** All JTAG logic levels operate at 1.8V apart from the SAMD11 pins (P6 and P8) which are 3.3V. All these JTAG pins are 1.8V only and don't scale with VDDIO.

6.4 J3 Battery Pads

Pin	Function	Type	Description
1	VBAT	Power	Battery input
2	NTC	Analog	NTC Thermistor

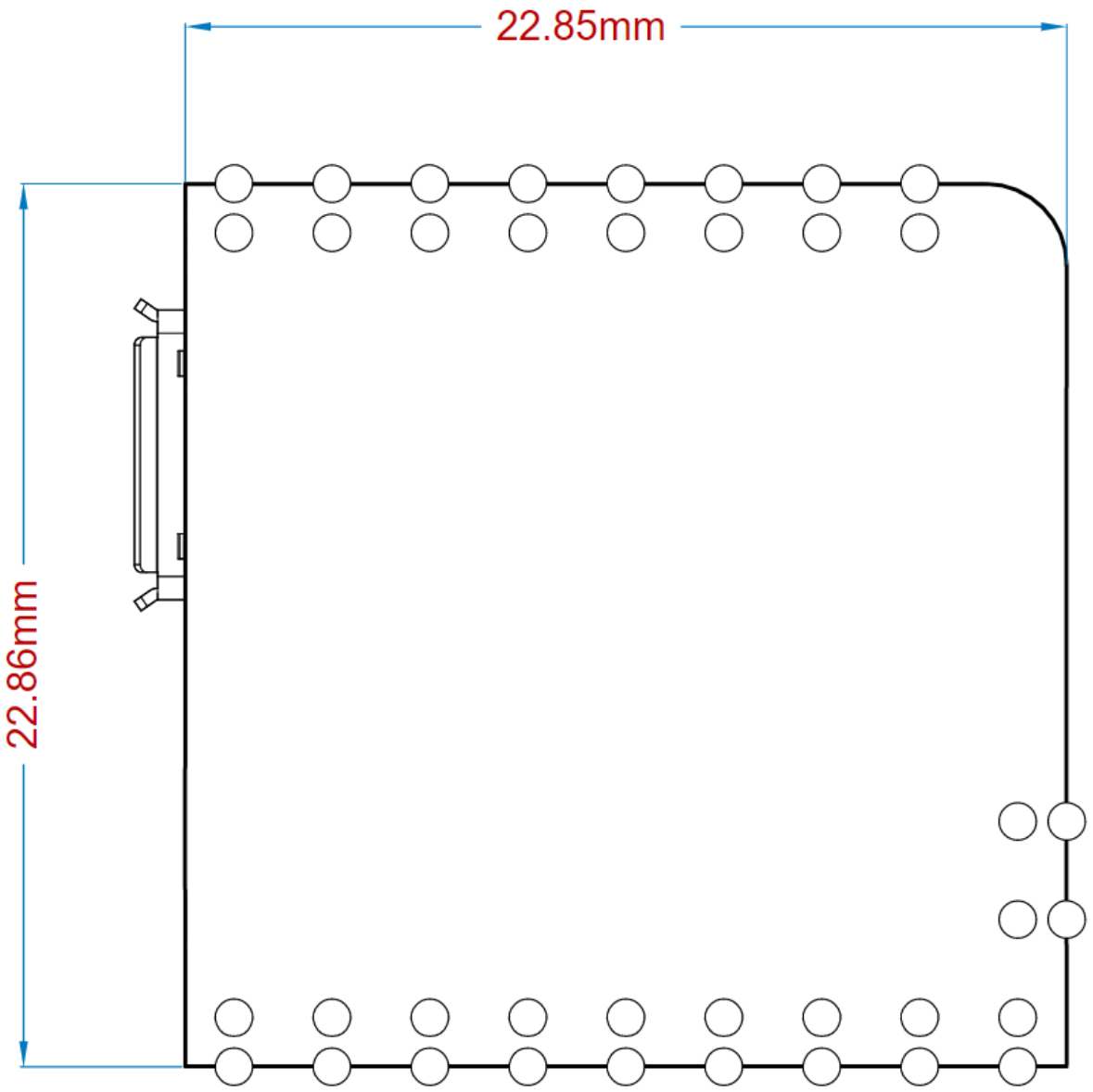
6.5 J4 Battery Connector

Pin	Function	Type	Description
1	VBAT	Power	Battery input
2	NTC	Analog	NTC Thermistor
3	GND	Power	Ground

6.6 J5 ESLOV

Pin	Function	Type	Description
1	5V	Power	5V Power Rail
2	INT	Digital	Digital IO
3	SCL	Digital	I2C Clock Line
4	SDA	Digital	I2C Data Line
5	GND	Power	Ground

7 Mechanical Information



7.1 Power Consumption

Description	Min	Typ	Max	Unit
Power consumption in standby		460		uA
Power consumption with blink sketch		960		uA
Power consumption advertising with sensor polling at 1Hz		2.5		mA
Power consumption advertising with sensor polling once per hour		1.15		mA

Note: The measurements have been performed by activating the temperature sensor, accelerometer and gyroscope, which have been configured with a 1Hz sample rate and 1ms latency.

8 Certifications

8.1 Certifications Summary

Certification	Status
CE (EU)	EN IEC 62311:2020 EN 62368-1:2014+A11+2017 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 300 328 V2.2.2: 2019-07
RoHS (EU)	IEC 62321-3-1-2013 IEC 62321-5-2013 IEC 62321-7-1-2015 IEC 62321-7-2-2017 IEC 62321-6-2015 IEC 62321-8-2017
REACH (EU)	Yes
WEEE (EU)	Yes
UKCA (UK)	EN IEC 62311:2020 EN 62368-1-2014+A11+2017 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 300 328 V2.2.2: 2019-07
FCC (US)	Yes
IC (CA)	RSS-247 Issue 2

Certification	Status
MIC	Yes
SRRC	Yes
CCC	Yes
GB4943	Yes

8.2 Declaration of Conformity CE DoC (EU)

We declare under our sole responsibility that the products above are in conformity with the essential requirements of the following EU Directives and therefore qualify for free movement within markets comprising the European Union (EU) and European Economic Area (EEA).

8.3 Declaration of Conformity to EU RoHS & REACH 211 01/19/2021

Arduino boards are in compliance with RoHS 2 Directive 2011/65/EU of the European Parliament and RoHS 3 Directive 2015/863/EU of the Council of 4 June 2015 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Substance	Maximum limit (ppm)
Lead (Pb)	1000
Cadmium (Cd)	100
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl ethers (PBDE)	1000
Bis(2-Ethylhexyl) phthalate (DEHP)	1000
Benzyl butyl phthalate (BBP)	1000
Dibutyl phthalate (DBP)	1000
Diisobutyl phthalate (DIBP)	1000

Exemptions: No exemptions are claimed.

Arduino Boards are fully compliant with the related requirements of European Union Regulation (EC) 1907 /2006 concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH). We declare none of the SVHCs (https://echa.europa.eu/web/guest/candidate-list-table), the Candidate List of Substances of Very High Concern for authorization currently released by ECHA, is present in all products (and also package) in quantities totaling in a concentration equal or above 0.1%. To the best of our knowledge, we also declare that our products do not contain any of the substances listed on the "Authorization List" (Annex XIV of the REACH regulations) and Substances of Very High Concern (SVHC) in any significant amounts as specified by the Annex XVII of Candidate list published by ECHA (European Chemical Agency) 1907 /2006/EC.

8.4 Conflict Minerals Declaration

As a global supplier of electronic and electrical components, Arduino is aware of our obligations with regards to laws and regulations regarding Conflict Minerals, specifically the Dodd-Frank Wall Street Reform and Consumer Protection Act, Section 1502. Arduino does not directly source or process conflict minerals such as Tin, Tantalum, Tungsten, or Gold. Conflict minerals are contained in our products in the form of solder, or as a component in metal alloys. As part of our reasonable due diligence Arduino has contacted component suppliers within our supply chain to verify their continued compliance with the regulations. Based on the information received thus far we declare that our products contain Conflict Minerals sourced from conflict-free areas.

9 FCC Caution

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

(2) this device must accept any interference received, including interference that may cause undesired operation.

FCC RF Radiation Exposure Statement:

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

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil nedoit pas produire de brouillage

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC SAR Warning:

English This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

French: Lors de l' installation et de l' exploitation de ce dispositif, la distance entre le radiateur et le corps est d 'au moins 20 cm.

Important: The operating temperature of the EUT can't exceed 85°C and shouldn't be lower than -40°C.

Hereby, Arduino S.r.l. declares that this product is in compliance with essential requirements and other relevant provisions of Directive 201453/EU. This product is allowed to be used in all EU member states.

Frequency bands	Typical Output Power
2.402-2480 MHz, 40 channels	+6dBm

10 NCC Low Power Warning

警語:

取得審驗證明之低功率射頻器材，非經核准，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前述合法通信，指依電信管理法規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

11 SRRC

This equipment contains a radio transmitter module with model approval code: CMIIT ID: 25J996Q00001.

12 Company Information

Company name	Arduino SRL
Company Address	Via Andrea Appiani, 25 - 20900 MONZA (Italy)

13 Reference Documentation

Ref	Link
Arduino® IDE (Desktop)	https://www.arduino.cc/en/Main/Software
Arduino® IDE (Cloud)	https://create.arduino.cc/editor
Arduino® Cloud IDE Getting Started	https://create.arduino.cc/projecthub/Arduino_Genuino/getting-started-with-arduino-web-editor-4b3e4a
Arduino® Pro Website	https://www.arduino.cc/pro
Project Hub	https://create.arduino.cc/projecthub?by=part&part_id=11332&sort=trending
Library Reference	https://github.com/bcmi-labs/Arduino_EdgeControl/tree/4dad0d95e93327841046c1ef80bd8b882614eac8
Online Store	https://store.arduino.cc/

14 Revision History

Date	Revision	Changes
05/02/2025	8	Description updates
03/09/2024	7	Cloud Editor updated from Web Editor
09/01/2024	6	High-Performance Pressure Sensor information updated
03/07/2023	5	Certification Summary Table Updated
22/12/2022	4	Add NTC Image & addition pins info
13/12/2022	3	Change Solution Overview Image
20/07/2021	2	Technical Revisions
27/05/2021	1	Initial Version

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BEFORE INSTALLING THE PRODUCTS, ENSURE THAT ITS FIRMWARE IS UPGRADED TO THE LATEST VERSION, AVAILABLE FOR DOWNLOAD FROM OUR WEBSITE. DURING THE LIFESPAN OF PRODUCTS, IT IS IMPORTANT TO CHECK ABOUT THE APPLICABILITY OF FIRMWARE UPDATES.

USERS SHOULD, WHERE APPLICABLE, CHANGE PASSWORDS FREQUENTLY AND ENSURE A HIGH-QUALITY PASSWORD (PASSWORDS SHOULD BE LONG AND COMPLEX ENOUGH, NEVER SHARED, AND ALWAYS UNIQUE). FURTHERMORE, IT IS THE USERS' RESPONSIBILITY TO KEEP ITS ANTI-VIRUS SYSTEM UP TO DATE.

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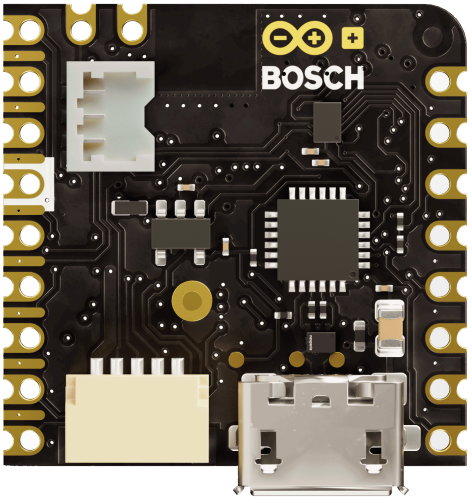
中文（ZH）



Nicla Sense ME

描述

Arduino Nicla Sense ME 是我们迄今为止体积最小的产品，将一系列工业级传感器集成于极小巧的机身内。可测量温度、湿度、运动等工艺参数。借助强大的数据融合能力，深入探索边缘计算。通过内置的 Bosch® BHI260AP、BMP390、BMM150 和 BME688 传感器，构建专属的工业级无线传感网络。

目标领域

无线传感器网络、数据融合、人工智能与气体检测

目录

16 特点

16.1 Bluetooth® 蓝牙模块

特点	描述
型号	ANNA-B112 Bluetooth® 蓝牙模块
微控制器	nRF52832 系统级芯片
CPU 内核	64 MHz Arm® Cortex®-M4F
内部SRAM	64 KB
内部闪存	512 KB
外部闪存	2 MB
接口	2 路 SPI，2 路 I2C（每种接口各通过一个引脚排针可访问）
ADC	12-bit/200 ksps
Bluetooth® 蓝牙模块频率	2400–2483.5 MHz
天线规格	内部
振荡器	内部 32 MHz
工作电压	1.8 VDC

16.2 集成 IMU 的智能传感器

特点	描述
型号	Bosch® BHI260AP
CPU 内核	Fuser 2, 32 Bit Synopsys DesignWare ARCTM EM4TM 处理器
IMU	6 轴：16 位3轴加速度计和陀螺仪
高级特点	自学习人工智能、游泳分析、行人航迹推算、方向感测
外部内存	通过 QSPI 连接的 2MB 闪存

16.3 高性能压力传感器

特点	描述
型号	Bosch® BMP390
允许范围	300-1250 hPa
绝对精度	± 0.5 hPa
相对精度	± 0.03 hPa（相当于 ±25 厘米）
RMS 降噪	0.02 Pa
FIFO 缓冲区	集成 512 字节
最大采样率	200 Hz

16.4 3轴磁力计

特点	描述
型号	Bosch® BMM150
磁场范围	X, Y axis: ±1300 µT, Z axis: ±2500 µT
分辨率	0.3 µT
非线性误差	<1% FS

16.5 环境传感器

特点	描述
型号	Bosch® BME688
允许范围	压力：300-1100 hPa，湿度：0-100%，温度：-40 至 - +85°C
eNose 传感器	传感器间偏差（IAQ）：±15% ±15 IAQ
传感器输出	IAQ、bVOC 和 CO2 等效浓度（ppm）、气体扫描结果（%）、强度等级

16.6 微控制器

特点	描述
型号	ATSAMD11D14A-MUT
功能	串口转USB桥接器，调试接口

17 电路板简介

17.1 应用示例

Arduino® Nicla Sense ME 是您开发无线网络解决方案的理想选择，具备快速开发和高可靠性。实时监控您的生产流程的运行特性。利用高质量传感器和网络功能，评估新型无线传感器网络（WSN）架构。超低功耗和集成电池管理功能，支持在各种应用场景中部署。WebBLE 支持固件的远程固件升级（OTA）以及远程监控。

- **仓库和库存管理**： Arduino® Nicla Sense ME 的环境传感器可检测水果、蔬菜和肉类的成熟状态，与 Arduino Cloud 一起实现易腐资产的智能管理。
- **分布式工业传感**： 即使在难以到达或具有危险性的区域，也可远程识别机器、工厂或温室内的运行状态。借助 **Arduino® Nicla Sense ME** 的 AI 能力，检测天然气、有毒气体或其他危险气体。通过远程分析提升安全等级。Mesh 网络功能使无线传感网络（WSN）的部署更加简便，几乎不需基础设施支持。
- **无线传感网络参考设计:** Nicla 封装规格是 Arduino® 专为无线传感网络开发的一种标准，可由合作伙伴适配用于定制化工业解决方案。通过开发包括连接云端的电池供电 IoT 设备和自主机器人在内的定制终端用户解决方案，让您的项目领先一步。研究人员和教育工作者也可利用该平台，在一个获得工业认可的无线传感器研究开发标准上开展工作，从而缩短从概念到市场的时间。

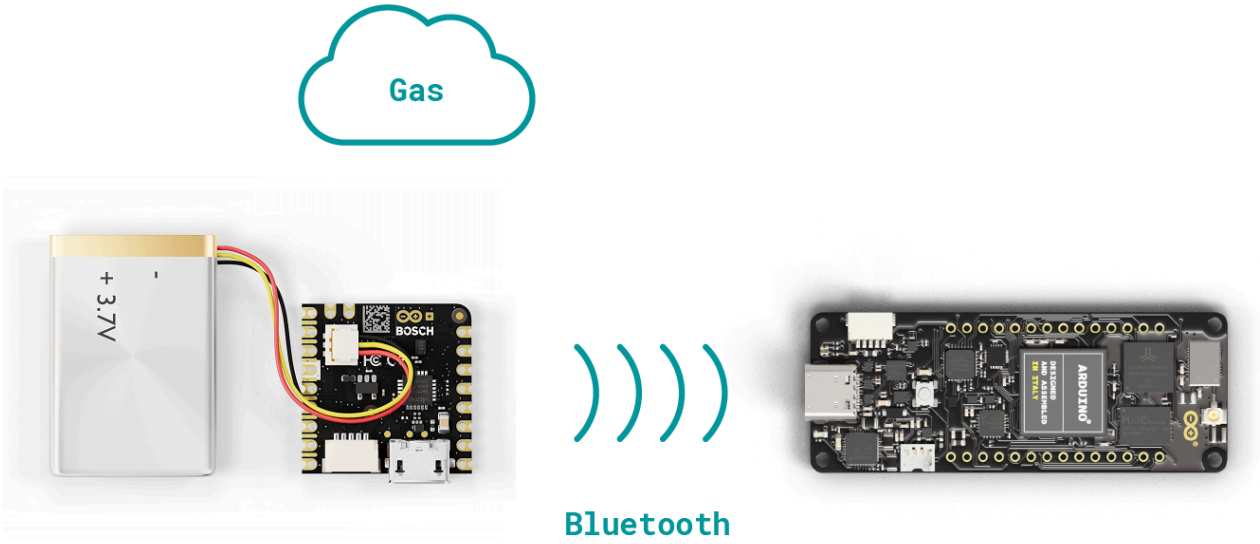
17.2 配件（不包含在内）

- 单节锂离子/锂聚合物电池

17.3 相关产品

- ESLOV 连接器
- Arduino® Portenta H7 (SKU: ABX00042)

17.4 功能概述



远程环境监测的典型解决方案示例，包括Arduino® Nicla Sense ME、Portenta H7和电池。请注意电池电缆在电路板连接器中的方向。

注意: 电池连接器上的 NTC 引脚为可选项。此特点有助于更安全地使用，并支持过热保护功能。

18 额定值

18.1 建议运行条件

符号	描述	最小值	典型值	最大值	单位
V_{IN}	来自 VIN 焊盘的输入电压	3.5	5.0	5.5	V
V_{USB}	来自 USB 连接器的输入电压	4.8	5.0	5.5	V
V_{DDIO_EXT}	电平转换电压	1.8	3.3	3.3	V
V_{IH}	输入高电平电压	$0.7V_{DDIO\_EXT}$[1]		V_{DDIO_EXT}	V
V_{IL}	输入低电平电压	0		$0.3V_{DDIO\_EXT}$[2]	V
T_{OP}	工作温度	-40	25	85	°C

注意：V_{DDIO_EXT} 可通过软件编程。虽然 ADC 输入可接受高达 3.3V 的电压，但最大值取决于 ANNA B112 的工作电压。

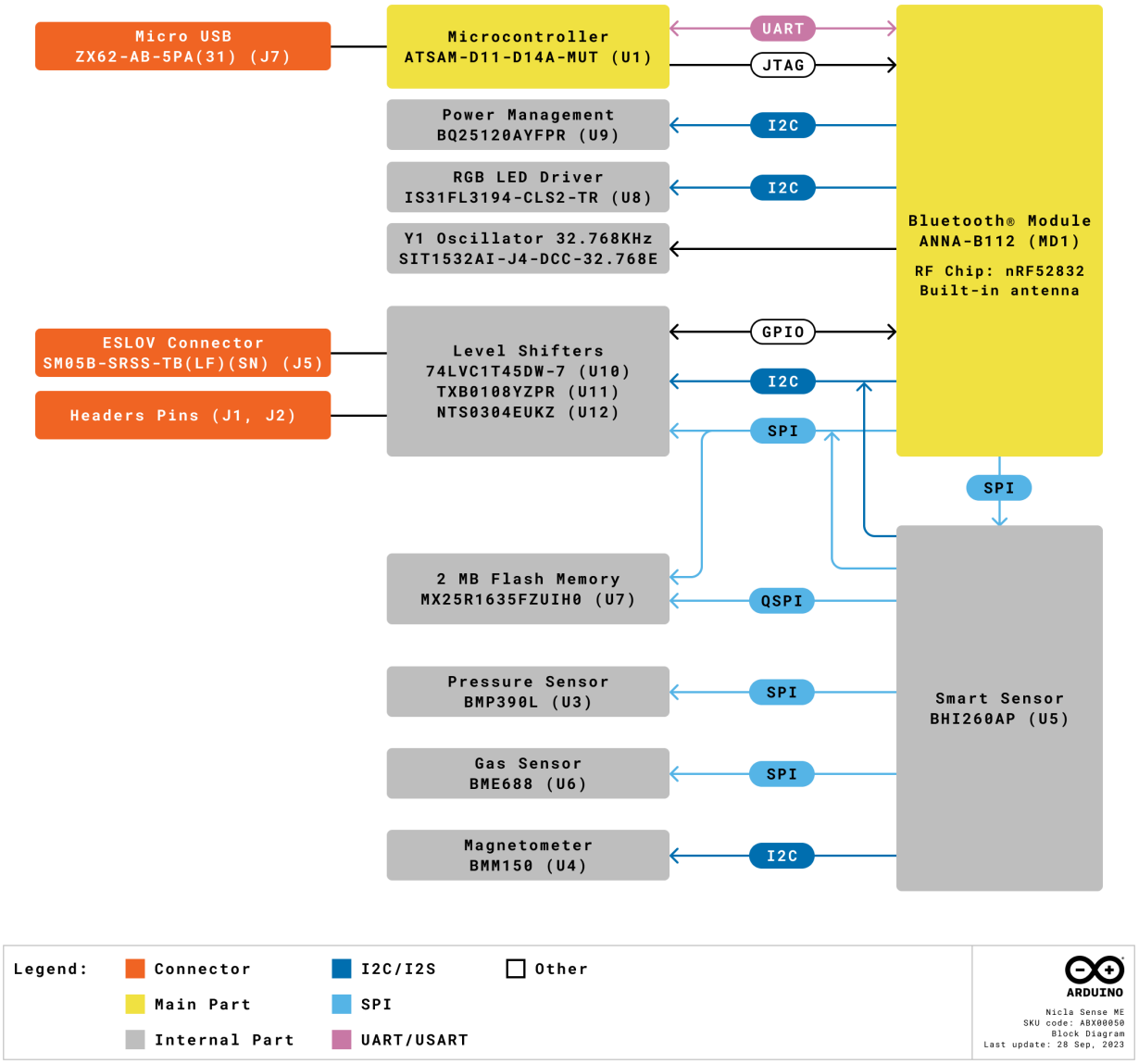
[1]：除以下引脚外，所有 I/O 引脚均工作在 V_{DDIO_EXT} 电压下：

- ADC1 和 ADC2 - 1V8
- JTAG_SAMD11 - 3V3
- JTAG_ANNA - 1V8
- JTAG_BHI - 1V8

[2]：如果内部 V_{DDIO_EXT} 被禁用，则可以通过外部供电。

19 功能概述

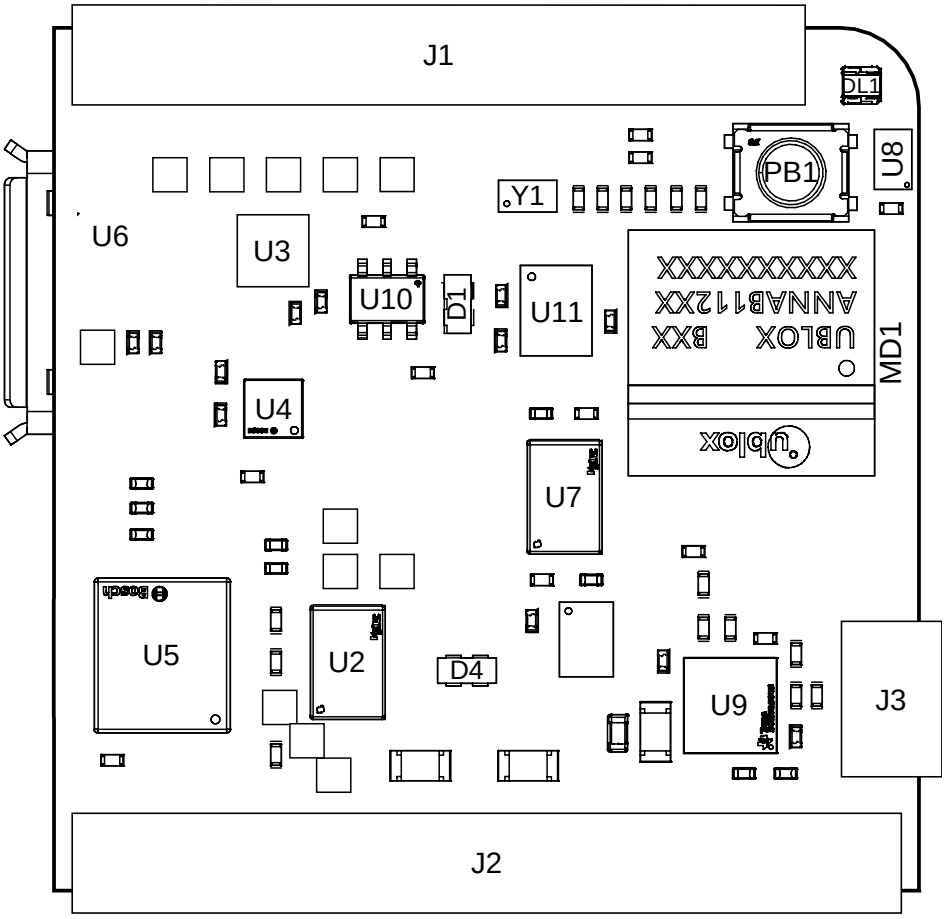
19.1 方框图



Nicla Sense ME Block Diagram

19.2 电路板拓扑结构

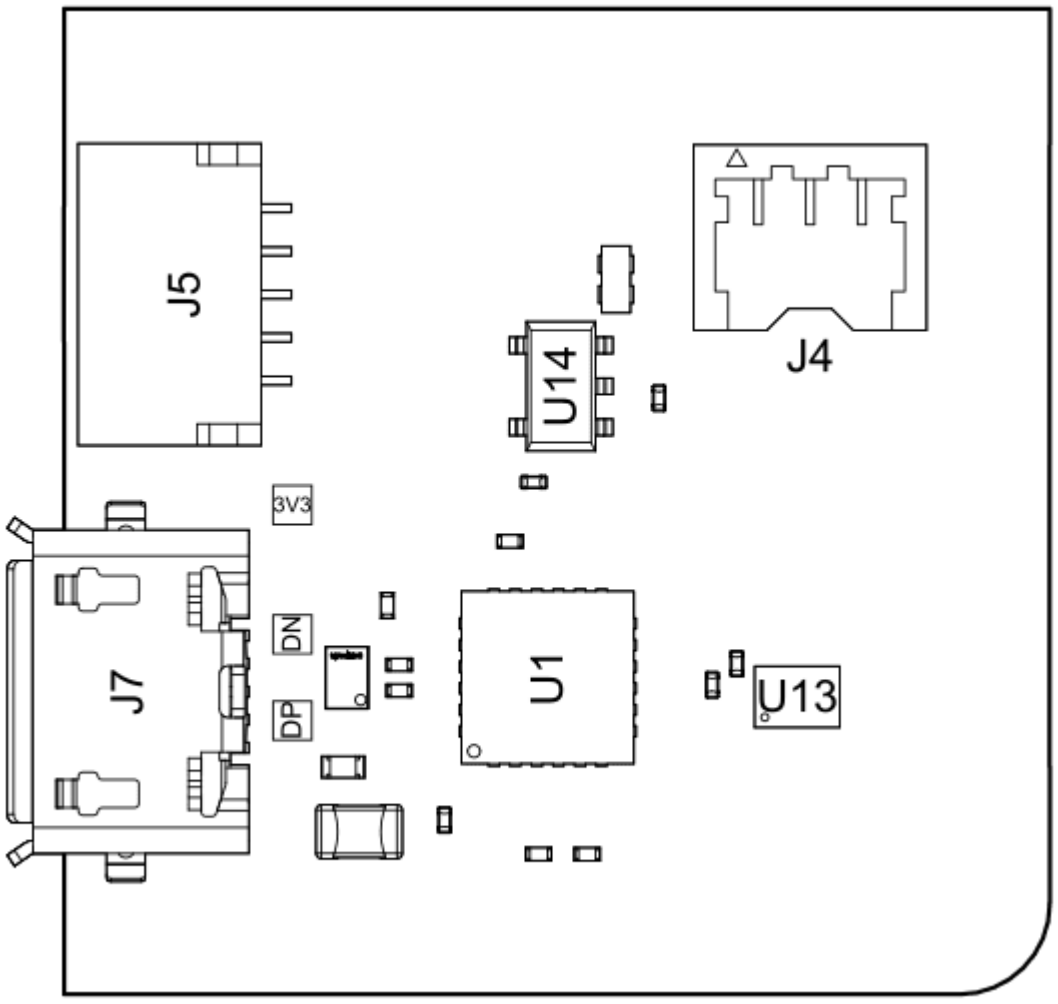
俯视图



Nicla Sense ME Top View

编号	描述	编号	描述
MD1	ANNA B112 Bluetooth® 蓝牙模块	U2, U7	MX25R1635FZUIH0 2MB 闪存芯片
U3	BMP390 压力传感器芯片	U4	BMM150 3轴磁传感器芯片
U5	BHI260AP 六轴 IMU 与 AI 核心芯片	U6	BME688 环境传感器芯片
U8	IS31FL3194-CLS2-TR 三通道 LED 驱动芯片	U9	BQ25120AYFPR 电池充电管理芯片
U10	SN74LVC1T45 1通道电压电平转换器集成电路	U11	TXB0108YZPR 双向集成电路
U12	NTS0304EUKZ 4位转换收发器	J1	ADC、SPI和LPIO引脚接头
J2	I2C, JTAG, 电源, LPIO引脚接头	J3	电池引脚接头
Y1	SIT1532AI-J4-DCC MEMS 32.7680 kHz 振荡器	DL1	SMLP34RGB2W3 RGB SMD LED
PB1	复位按钮		

电路板背面视图



Nicla Sense ME Back View

编号	描述	编号	描述
U1	ATSAMD11D14A-MUT USB桥接器	U13	NTS0304EUKZ 4位转换收发器 IC
U14	AP2112K-3.3TRG1 0.6 A 3.3 V LDO IC	J4	3针 1.2mm ACH 电池连接器 （BM03B-ACHSS-GAN-TF）
J5	SM05B-SRSS-TB（LF）（SN) 5针 Eslov 连接器	J7	microUSB 连接器

19.3 微控制器

Arduino® Nicla Sense ME 由 ANNA-B112 模块（MD1）内的 nRF52832 SoC 提供动力。nRF52832 SoC 基于 Arm® Cortex®-M4 微控制器构建，配备浮点运算单元，运行频率为 64 MHz。草图程序存储在 nRF52832 的内部 512 KB 闪存中（与引导程序共享）。用户可使用 64 KB 的 SRAM。ANNA-B112 模块作为数据记录用的 2MB 闪存（U7）和 BHI260 六轴 IMU（U5）的 SPI 主机。同时，它也是 BHI260（U5）I2C 和 SPI 连接的从设备。虽然该模块本身运行在 1.8V 电压下，但可通过电平转换器根据 BQ25120（U9）中设置的 LDO，在 1.8V 和 3.3V 之间调整逻辑电平。一个外部振荡器（Y1）提供 32 KHz 信号。

19.4 Bosch® BHI260 内置六轴 IMU 的智能传感器系统

Bosch® BHI260 是一款超低功耗可编程传感器，集成了 Fuser2 核心处理器、六轴 IMU（陀螺仪和加速度计）以及传感器融合软件框架。BHI260 是一个智能传感器核心（可运行可编程识别系统），负责通过 I2C 和 SPI 接口与 **Arduino Nicla Sense ME** 上的其他传感器进行通信。芯片还配备一个专用的 2MB 闪存（U2），用于存储可直接执行的代码（XiP）以及数据，如 Bosch® 传感器融合算法（BSX）的校准数据。BHI260 支持加载在 PC 上训练好的自定义算法，生成的智能算法可直接在芯片上运行。

19.5 Bosch® BME688 环境传感器

Arduino Nicla Sense ME 能够通过 Bosch® BME688 传感器（U6）进行环境监测。该传感器具备检测气压、湿度、温度以及挥发性有机化合物（VOC）的功能。Bosch® BME688 通过 eNose 金属氧化物半导体阵列进行气体检测，典型气体扫描周期为 10.8 秒。

19.6 Bosch® BMP390 压力传感器

在气压测量方面，BMP390（U3）提供工业级的精度与稳定性，适用于长期使用，在高分辨率模式下具有 ±0.03 hPa 的相对精度和 0.02 Pa 的 RMS 噪声。Bosch® BMP390 既适用于 200 Hz 采样率的快速测量，也可在 1 Hz 低功耗模式下运行，电流消耗低于 3.2 µA。U3 通过 SPI 接口由 BHI260（U2）控制，与 BME688（U6）共用同一总线。

19.7 Bosch® BMM150 3轴磁力计

Bosch® BMM150（U4）可实现对磁场的高精度3轴测量，具备指南针级别的准确性。与 BHI260 IMU（U2）结合后，可通过 Bosch® 传感器融合算法获得高精度的空间姿态和运动矢量，用于自主机器人中的航向检测以及预测性维护。该传感器通过专用 I2C 接口与 BHI260（U2）相连，BHI260 作为主机。

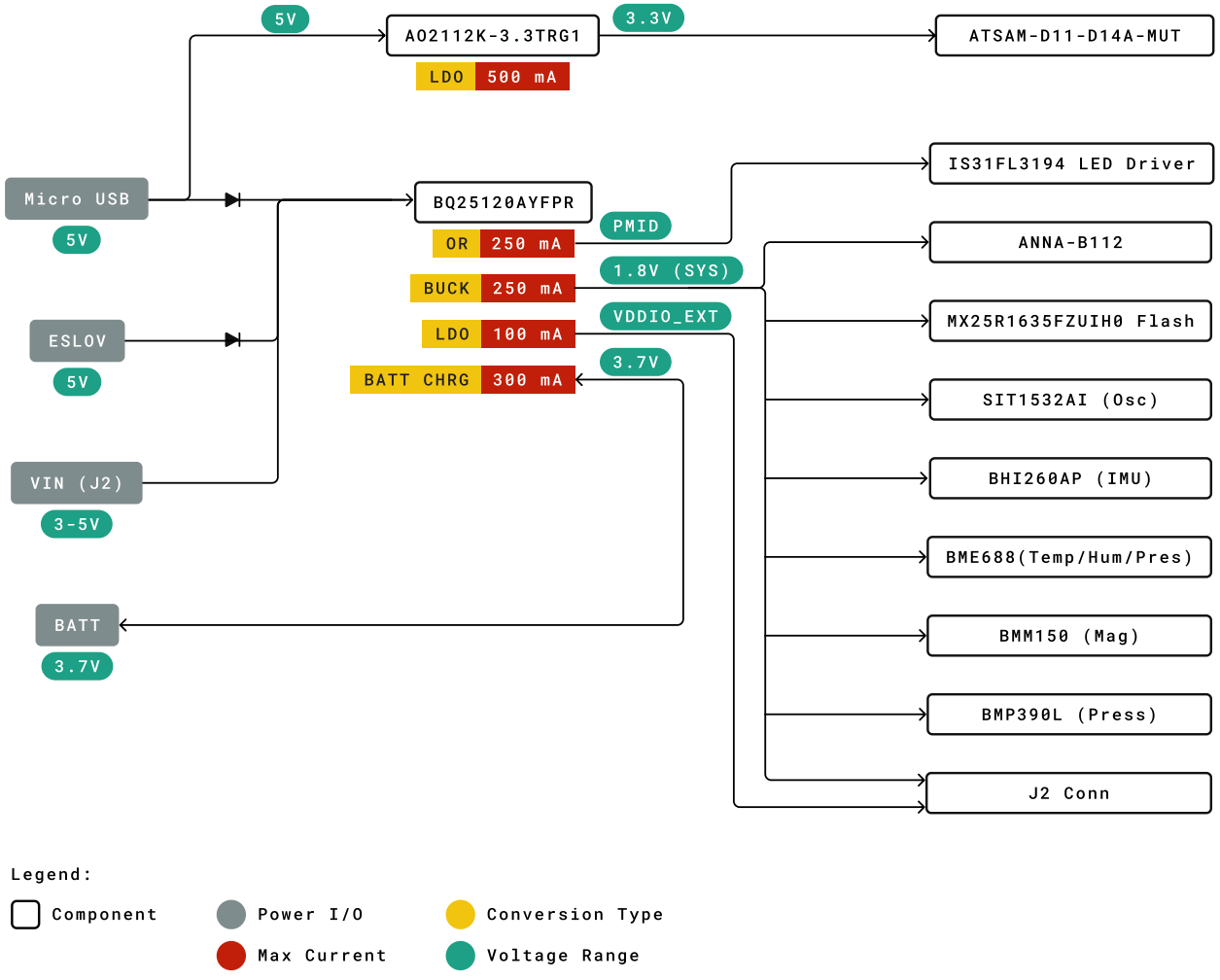
19.8 RGB LED

一个 I2C 接口的 LED 驱动芯片（U8）驱动 RGB LED（DL1），其最大输出电流为 40 mA，由微控制器 ANN-B112（U5）控制。

19.9 USB 转接桥

SAMD11 微控制器（U1）专用于作为 USB 转接桥和 ANNA-B112 的 JTAG 控制器。逻辑电平转换器（U13）用于将 3.3V 逻辑电平转换为 ANNA-B112 所需的 1.8V 电平。3.3V 电压由 LDO 稳压器（U14）通过 USB 电压生成。

19.10 电源树



Nicla Sense ME Back View

Arduino Nicla Sense ME 可通过 Micro USB（J7）、ESLOV（J5）或 VIN 接口供电。这些输入电压通过 BQ2512BAYFPR 芯片（U9）转换为各个所需电压。一个肖特基二极管为 USB 和 ESLOV 电压提供反向极性保护。当通过 Micro USB 供电时，一个线性 3.3V 稳压器为用于编程、JTAG 和 SWD 的 SAMD11 微控制器供电。LED 驱动芯片（U8）及 RGB LED（DL1）则由 5V 升压电压驱动。其余所有组件均由降压稳压器提供的 1.8V 电压轨供电。PMID 引脚作为 VIN 和 BATT 之间的“或门”开关，用于驱动 LED 驱动器。所有引出至引脚的 I/O 信号均通过工作在 V_{DDIO_EXT} 电压下的双向电平转换器处理。

此外，BQ25120AYFPR（U9）还支持通过 J4 接口连接单节 3.7V 锂聚合物（LiPo）/锂离子（Li-ion）电池组，使该板卡能够作为无线传感网络使用。电池充电电流设定为 40mA，终止电流为 4mA（10%）。

20 电路板操作

20.1 入门指南 - IDE

如果您希望在离线状态下为 Arduino® Nicla Sense ME 编程，您需要安装 Arduino® 桌面版 IDE **[1]**。要将 Arduino® Nicla Sense ME 连接至计算机，您需要一根 Micro USB 数据线。该数据线也为开发板供电，供电状态通过 LED 指示灯显示。Arduino 核心运行在 ANNA-B112 上，而 Bosch® 智能传感器框架则运行在 BHI260 上。

20.2 入门指南 - Arduino Cloud Editor

包括本电路板在内的所有 Arduino® 电路板，都可以在 Arduino® Cloud Editor **[2]**上开箱即用，只需安装一个简单的插件即可。

Arduino® Cloud Editor 是在线托管的，因此它将始终提供最新功能并支持所有电路板。接下来**[3]**开始在浏览器上编码并将程序上传到您的电路板上。

20.3 入门指南 - Arduino Cloud

Arduino® Cloud 支持所有 Arduino® 支持 IoT 功能的产品，让您可以记录、绘制和分析传感器数据，触发事件，实现家庭或企业自动化。

20.4 入门指南 - WebBLE

Arduino Nicla Sense ME 支持使用 WebBLE 对 NINA-B112 和 BHI260 固件进行 OTA 更新。

20.5 入门指南 - ESLOV

该开发板可以作为 ESLOV 控制器的从设备，并可通过该方式更新固件。

20.6 示例程序

Arduino® Nicla Sense ME 的示例程序可以在 Arduino IDE 的“示例”菜单或 Arduino® Pro 网站 **[4]** 的“文档”部分找到。

20.7 在线资源

现在，您已经了解该电路板的基本功能，就可以通过查看 Project Hub **[5]**、Arduino® Library Reference **[6]** 和在线商店 **[7]** 上的精彩项目来探索它所提供的无限可能性；在这些项目中，您可以为电路板配备传感器、执行器等。

20.8 电路板恢复

所有 Arduino® 电路板都配置有内置的引导加载程序，可以通过 USB 对电路板进行刷新。如果某一程序锁定了处理器，且无法通过 USB 再次访问电路板，则可以在上电后立即双击复位按钮进入引导加载程序模式。

21 连接器引脚布局

注意: J1 和 J2 上的所有引脚（不包括散热片）均参考 V_{DDIO_EXT} 电压，该电压可以由内部生成或由外部供电。

21.1 J1 Nicla 头A

引脚	功能	类型	描述
1	LPIO0_EXT	数字	低功耗 IO 引脚 0
2	NC	N/A	N/A
3	CS	数字	SPI 电缆选择
4	COPI	数字	SPI 控制器输出外设输入
5	CIPO	数字	SPI 控制器输入外设输出
6	SCLK	数字	SPI 时钟
7	ADC2	模拟	模拟输入 2
8	ADC1	模拟	模拟输入 1

21.2 J2 Nicla 头B

引脚	功能	类型	描述
1	SDA	数字	I2C 数据线
2	SCL	数字	I2C 时钟
3	LPIO1_EXT	数字	低功耗 IO 引脚 1
4	LPIO2_EXT	数字	低功耗 IO 引脚 2
5	LPIO3_EXT	数字	低功耗 IO 引脚 3
6	GND	电源	接地
7	VDDIO_EXT	数字	逻辑电平参考值
8	N/C	N/A	N/A
9	VIN	数字	输入电压

注意: 有关低功耗 I/O 工作原理的更多信息，请查阅 Nicla 系列封装规格文档。

21.3 J2 Fins

引脚	功能	类型	描述
P1	BHI_SWDIO	数字	BHI260 JTAG 串行线调试数据
P2	BHI_SWDCLK	数字	BHI260 JTAG 串行线调试时钟
P3	ANNA_SWDIO	数字	ANNA JTAG 串行线调试数据
P4	ANNA_SWDCLK	数字	ANNA JTAG 串行线调试时钟
P5	RESET	数字	复位引脚
P6	SAMD11_SWDIO	数字	SAMD11 JTAG 串行线调试数据
P7	+1V8	电源	+1.8V 电压轨
P8	SAMD11_SWDCLK	数字	SAMD11 JTAG 串行线调试时钟

注意: 这些测试点可以通过将板子插入双排 1.27 mm / 50 mil 间距的排针轻松访问。 **注意 2:** 除 SAMD11 引脚（P6 和 P8）为 3.3V 外，所有 JTAG 逻辑电平均为 1.8V。这些 JTAG 引脚仅支持 1.8V，不会随 VDDIO 电压变化而调整。

21.4 J3 电池焊盘

引脚	功能	类型	描述
1	VBAT	电源	电池输入
2	NTC	模拟	NTC 热敏电阻

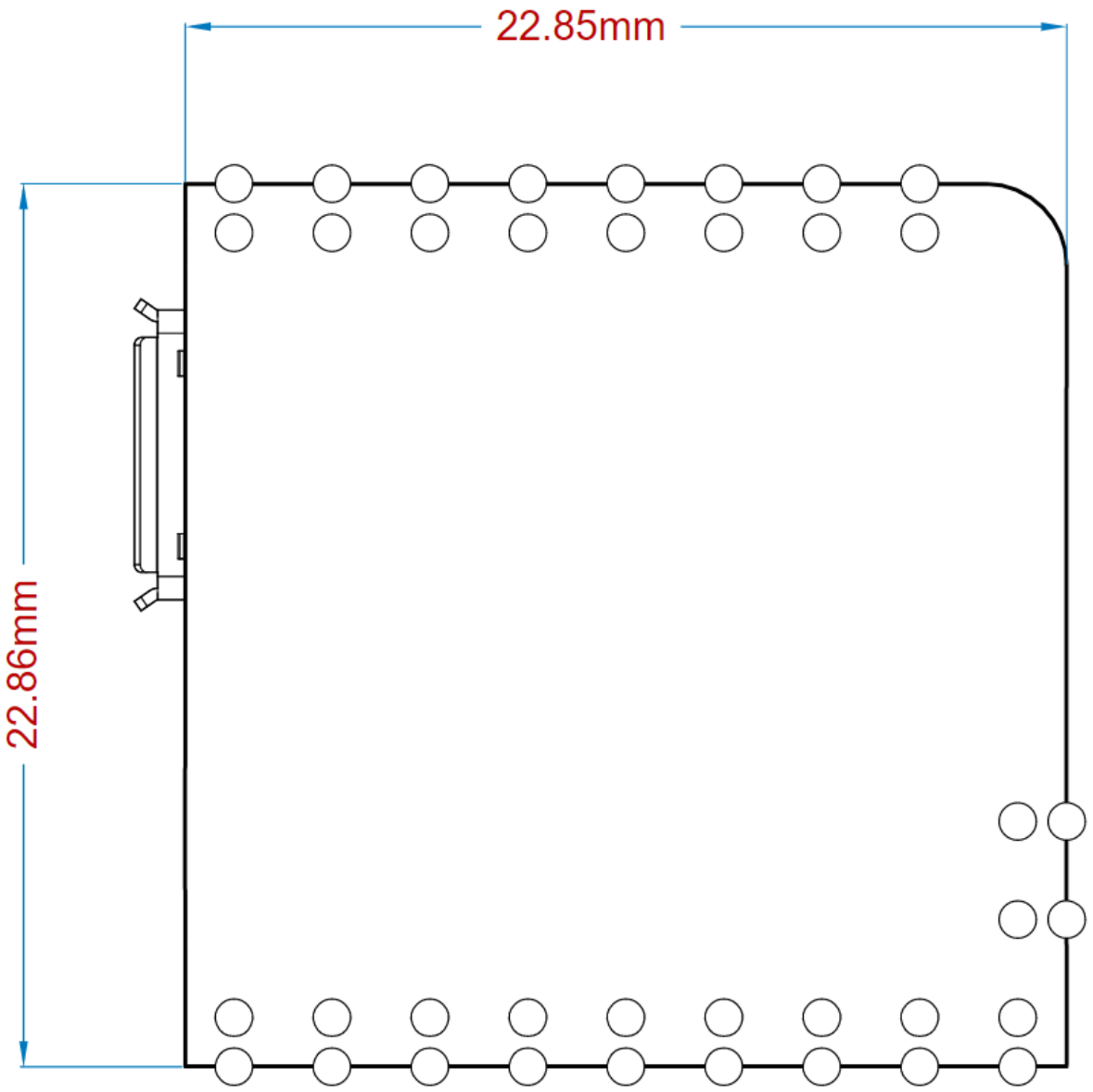
21.5 J4 电池连接器

引脚	功能	类型	描述
1	VBAT	电源	电池输入
2	NTC	模拟	NTC 热敏电阻
3	GND	电源	接地

21.6 J5 ESLOV

引脚	功能	类型	描述
1	5V	电源	5V 电源轨
2	INT	数字	数字 IO
3	SCL	数字	I2C 时钟线
4	SDA	数字	I2C 数据线
5	GND	电源	接地

22 机械层信息



22.1 功耗

描述	最小值	典型值	最大值	单位
待机功耗		460		uA
运行 Blink 程序时的电源功耗		960		uA
以 1Hz 频率轮询传感器时的广播功耗		2.5		mA
每小时轮询一次传感器时的广播功耗		1.15		mA

注意: 测量是在启用温度传感器、加速度计和陀螺仪的前提下进行的，这些传感器配置为 1Hz 采样率和 1ms 延迟。

23 认证

23.1 认证摘要

认证	状态
CE (EU)	EN IEC 62311:2020 EN 62368-1:2014+A11+2017 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 300 328 V2.2.2: 2019-07
RoHS (EU)	IEC 62321-3-1-2013 IEC 62321-5-2013 IEC 62321-7-1-2015 IEC 62321-7-2-2017 IEC 62321-6-2015 IEC 62321-8-2017
REACH (EU)	是
WEEE (EU)	是
UKCA (UK)	EN IEC 62311:2020 EN 62368-1-2014+A11+2017 ETSI EN 301 489-1 V2.2.3 (2019-11) ETSI EN 301 489-17 V3.2.4 (2020-09) ETSI EN 300 328 V2.2.2: 2019-07
FCC (US)	是
IC (CA)	RSS-247 Issue 2

认证	状态
RCM	是
MIC	是
SRRC	是
CCC	是
GB4943	是

23.2 符合性声明 CE DoC（欧盟）

我们在此郑重声明，上述产品符合以下欧盟指令的基本要求，因此有资格在包括欧盟（EU）和欧洲经济区（EEA）在内的市场内自由流通。

23.3 声明符合欧盟 RoHS 和 REACH 211 01/19/2021

Arduino 电路板符合欧洲议会关于限制在电子电气设备中使用某些有害物质的 RoHS 2 指令 2011/65/EU 和欧盟理事会于 2015 年 6 月 4 日颁布的关于限制在电子电气设备中使用某些有害物质的 RoHS 3 指令 2015/863/EU。

物质	最大限值 (ppm)
铅 (Pb)	1000
镉 (Cd)	100
汞 (Hg)	1000
六价铬（Cr6+）	1000
多溴联苯（PBB）	1000
多溴联苯醚（PBDE）	1000
邻苯二甲酸二(2-乙基己)酯 (DEHP)	1000
邻苯二甲酸丁苄酯 (BBP)	1000
邻苯二甲酸二丁酯（DBP）	1000
邻苯二甲酸二异丁酯（DIBP）	1000

豁免：未申请任何豁免。

Arduino 电路板完全符合欧盟法规 (EC) 1907/2006 中关于化学品注册、评估、许可和限制 (REACH) 的相关要求。我们声明，所有产品（包括包装）中的 SVHC (https://echa.europa.eu/web/guest/candidate-list-table), （欧洲化学品管理局目前发布的《高度关注物质候选授权清单》）含量总浓度均未超过 0.1%。据我们所知，我们还声明，我们的产品不含 ECHA（欧洲化学品管理局）1907/2006/EC 公布的候选清单附件 XVII 中规定的“授权清单”（REACH 法规附件 XIV）和高度关注物质 (SVHC) 所列的任何物质。

23.4 冲突矿产声明

作为电子和电气元件的全球供应商，Arduino 意识到我们有义务遵守有关冲突矿产的法律法规，特别是《多德-弗兰克华尔街改革与消费者保护法案》第 1502 条。Arduino 不直接采购或加工锡、钽、钨或金等冲突矿物。冲突矿物以焊料的形式或作为金属合金的组成部分存在于我们的产品中。作为我们合理尽职调查的一部分，Arduino 已联系供应链中的元件供应商，以核实他们是否始终遵守法规的相关规定。根据迄今收到的信息，我们声明我们的产品中含有来自非冲突地区的冲突矿物。

24 FCC 警告

任何未经合规性负责方明确批准的更改或修改都可能导致用户无权操作设备。

本设备符合 FCC 规则第 15 部分的规定。操作须满足以下两个条件：

(1) 此设备不会造成有害干扰。

(2) 此设备必须接受接收到的任何干扰，包括可能导致不良操作的干扰。

FCC 射频辐射暴露声明：

1. 此发射器不得与任何其他天线或发射器放置在同一位置或同时运行。
2. 此设备符合为非受控环境规定的射频辐射暴露限值。
3. 本设备在安装和使用时，应确保天线与人体之间的最小距离为 20 厘米。

English: User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both. This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause interference

(2) this device must accept any interference, including interference that may cause undesired operation of the device.

French: Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes:

(1) l’appareil nedoit pas produire de brouillage

(2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

IC SAR警告：

English This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body.

French: Lors de l’ installation et de l’ exploitation de ce dispositif, la distance entre le radiateur et le corps est d ’au moins 20 cm.

重要提示： EUT 的工作温度不能超过 85°C，也不能低于 -40°C。

Arduino S.r.l. 特此声明，本产品符合 201453/EU 指令的基本要求和其他相关规定。本产品允许在所有欧盟成员国使用。

频段信息	输出功率典型值
2.402-2480 MHz, 40 通道	+6dBm

25 NCC 低功率警告

警語:

取得審驗證明之低功率射頻器材,非經核准,公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

低功率射頻器材之使用不得影響飛航安全及干擾合法通信;經發現有干擾現象時,應立即停用,並改善至無干擾時方得繼續使用。

前述合法通信,指依電信管理法規定作業之無線電通信。

低功率射頻器材須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

26 SRRC

本设备包含一个射频发射模块，型号核准代码为：CMIIT ID: 25J996Q00001

27 公司信息

公司名称	Arduino SRL
公司地址	Via Andrea Appiani, 25 - 20900 MONZA（意大利）

28 参考资料

参考资料	链接
Arduino® IDE (Desktop)	https://www.arduino.cc/en/Main/Software
Arduino® IDE (Cloud)	https://create.arduino.cc/editor
Arduino Cloud IDE - 入门指南	https://create.arduino.cc/projecthub/Arduino_Genuino/getting-started-with-arduino-web-editor-4b3e4a
Arduino® Pro Website	https://www.arduino.cc/pro
Arduino Project Hub	https://create.arduino.cc/projecthub?by=part&part_id=11332&sort=trending
库参考	https://github.com/bcmi-labs/Arduino_EdgeControl/tree/4dad0d95e93327841046c1ef80bd8b882614eac8
在线商店	https://store.arduino.cc/

29 修订记录

日期	版次	变更
05/02/2025	8	描述
03/09/2024	7	Cloud 编辑已从网页编辑器更新
09/01/2024	6	高性能压力传感器信息已更新
03/07/2023	5	认证汇总表已更新
22/12/2022	4	添加了 NTC 图像及额外引脚信息
13/12/2022	3	更换解决方案概览图像
20/07/2021	2	版次
27/05/2021	1	首次发布

30 产品警告和免责声明

这些产品仅供合格专业人员销售和安装。Arduino 无法确保购买其产品的任何个人或实体，包括任何“授权经销商”或“授权转售商”，是否具备正确安装相关产品所需的培训或经验。

正确安装和维护的系统只能降低某些事件（如功能丧失）发生的风险；该系统并非保险或保证，无法确保此类事件不会发生，无法确保会提供充分的警告或保护，也无法防止死亡、人身伤害和/或财产损失的发生。

在安装产品之前，请确保其固件已升级至最新版本，可从我们的网站下载。在产品的整个生命周期内，务必定期检查固件更新的适用性。

用户在适用情况下应频繁更改密码，并确保使用高强度密码（密码应足够长且复杂、不得共享，并且必须唯一）。此外，用户有责任确保其防病毒系统为最新版本。

尽管 Arduino 在合理范围内努力减少第三方入侵、破坏或绕过其安全产品、相关软件或云服务器的可能性，但 Arduino 制造、销售和/或许可的任何安全产品、软件或云服务器仍可能被入侵、破坏和/或绕过。

Arduino 制造、销售或许可的某些产品或软件会连接互联网以发送和/或接收数据（即“物联网”或“IoT”产品）。若在 Arduino 停止支持某 IoT 产品后仍继续使用（例如通知 Arduino 不再提供固件更新或漏洞修复），可能导致性能下降、故障和/或遭受入侵、破坏和/或绕过的风险增加。

除非适用法律要求，Arduino 并不总是对产品与其外围设备（包括但不限于传感器或探测器）之间的通信进行加密。因此，这些通信可能会被拦截，并可能被用来绕过您的系统。

Arduino 产品和软件的正常运行依赖于多个第三方产品和服务，包括但不限于：互联网、蜂窝网络和固定电话连接；移动设备和操作系统兼容性；以及正确的安装和维护。Arduino 不对第三方行为或疏忽造成的任何损害承担责任。

电池供电的传感器、探测器、遥控器、设备及其他面板配件的电池寿命有限。尽管这些产品可能设计为在电量即将耗尽时提供某些警告，但提供该类警告的能力有限，并且并非在所有情况下都能提供。根据产品文档定期测试系统是唯一能确认所有传感器、探测器、遥控器、设备及其他面板配件是否正常运行的方法。

某些传感器、设备和其他面板配件可以被编程为“监管设备”，以便在一定时间内未接收到来自设备的信号时面板会发出指示。但有些设备无法被编程为监管设备。即使可以设置为监管设备的产品，也可能在安装时未被正确编程，可能导致故障未被报告，从而可能造成死亡、严重伤害和/或财产损失。

所购买的产品含有小部件，可能对儿童或宠物构成窒息危险。请将所有小部件远离儿童和宠物。

买方应将上述产品风险、警告和免责声明信息传达给其客户和最终用户。

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