

## Product Specification

# 3121N-H

## PLC-IoT Module

Version: v1.3 (PS0211)

Customer: \_\_\_\_\_

Customer P/N: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Office: 14th floor, Block B, phoenix zhigu, Xixiang Street, Baoan District, Shenzhen

Factory: NO.8, Litong RD., Liuyang Economic & Technical Development Zone, Changsha, CHINA

TEL: +86-755-2955-8186

Website: [www.fn-link.com](http://www.fn-link.com)

## 3121N-H Module Datasheet

| Ordering Information | Part NO.      | Description                                                                                   |
|----------------------|---------------|-----------------------------------------------------------------------------------------------|
|                      | FG3121NHXX-02 | PS0211, UART, PWM, GPIO, header assembly type, 28*18*11.54mm (including header height 6.54mm) |

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## Revision History

| Version | Date       | Contents                                                                         | Draft | Checked | Approved |
|---------|------------|----------------------------------------------------------------------------------|-------|---------|----------|
| V1.0    | 2022/08/23 | Initial release of PS0211 platform                                               | FC    | TZ      | QJP      |
| V1.1    | 2023/01/14 | Add description of PWM function; Correct typos.                                  | FC    | LSP     | QJP      |
| V1.2    | 2023/11/15 | Increase the length-width-height tolerance value<br>Delete PLC Peripheral Design | LXP   | LSP     | QJP      |

|      |            |                    |     |     |     |
|------|------------|--------------------|-----|-----|-----|
| V1.3 | 2024/08/19 | Add Certificate No | LXP | LSP | QJP |
|------|------------|--------------------|-----|-----|-----|

# 1. General Description

## 1.1 Introduction

3121N-H is a highly integrated, small size and low consumption Power Line Communication (PLC) module for IoT applications. It is integrated with multi-mode power line communication modem, a built-in line driver and an ARM Cortex-M3 MCU. The module is compliant with IEEE P1901.1 standard and supports OFDM/FSK modulation.

3121N-H supports UART, PWM, GPIO interfaces, delivers a set of hardware and software solution for various PLC-IoT applications such as smart lighting, smart home, central air-conditioning system.

## 1.2 Features

### CPU and storage

- High efficient Cortex-M3 processor, operating at up to 200MHz frequency
- Built-in SRAM 256KB

### PHY Characteristics

- Support IEEE 1901.1
- Support frequency band 0.5-3.7MHz and 2.5-5.7MHz, software configurable
- Support OFDM (Orthogonal Frequency Division Multiplex) technology, BPSK (Binary Phase Shift Keying) and QPSK (Quadrature Phase Shift Keying) modulation
- Support FEC (Forward Error Correction) and CRC (Cyclic Redundancy Check)

### MAC Characteristics

- Support TDMA (Time Division Multiple Access) and CSMA(Carrier Sense Multiple Access)/CA (Collision Avoidance), provides conflict-avoid ability
- Support data segmentation and reorganization, increase data transmission efficiency
- Support data retransmission
- Support QoS (Quality of Service)

### PLC Network Characteristics

- Support fast self-organization network. A typical 2 level network with 200 devices can be ready to communicate in less than 10 seconds
- Support Dynamic Routing and Multipath addressing

## Peripheral Interfaces

- UART, GPIO, PWM

## Network Performance

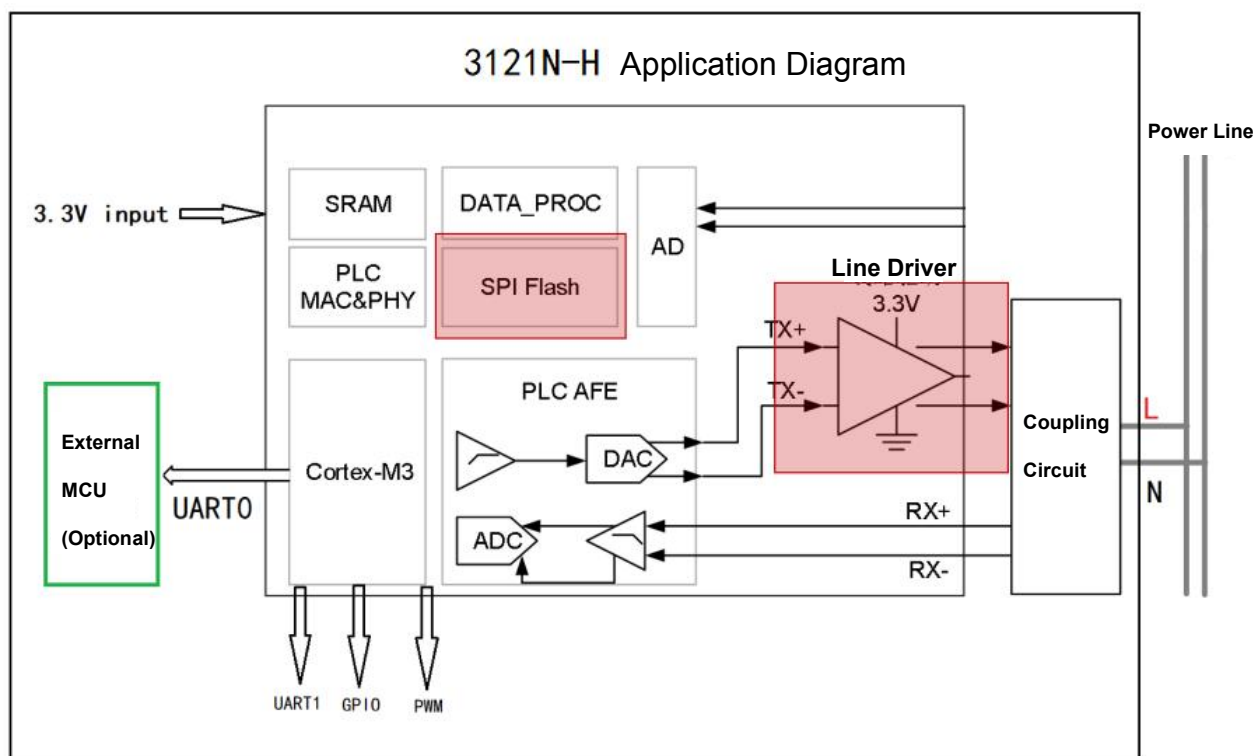
- Physical layer rate up to 0.507Mbps, application layer rate up to 80Kbps
- Receiving Sensitivity better than 0.2mVpp, about 95dB anti-attenuation performance

## Power Consumption and Others

- Idle consumption  $\leq 0.15W$  (networked but no communication)
- Dynamic working consumption  $\leq 0.7W$  (Continue communicating)
- Operation temperature:  $-40^{\circ}C$  to  $+85^{\circ}C$
- Storage temperature:  $-40^{\circ}C$  to  $125^{\circ}C$
- Physical dimension: 28.00\*18.00\*11.54mm (including header)

## Block Diagram

Typical application diagram:



## 1.3 General Specification

|                     |                                                                                   |
|---------------------|-----------------------------------------------------------------------------------|
| Model Name          | 3121N-H                                                                           |
| Main Chip           | PS0211                                                                            |
| Interfaces          | UART, PWM, GPIO                                                                   |
| Communication mode  | Power Line Communication                                                          |
| Installation method | PH2.54 Headers                                                                    |
| Dimension           | L x W x H: 28.00( ± 0.2)mmx18.00( ± 0.2)mmx11.54( ± 0.2)mm<br>(Including headers) |

## 1.4 Recommended Operation Condition

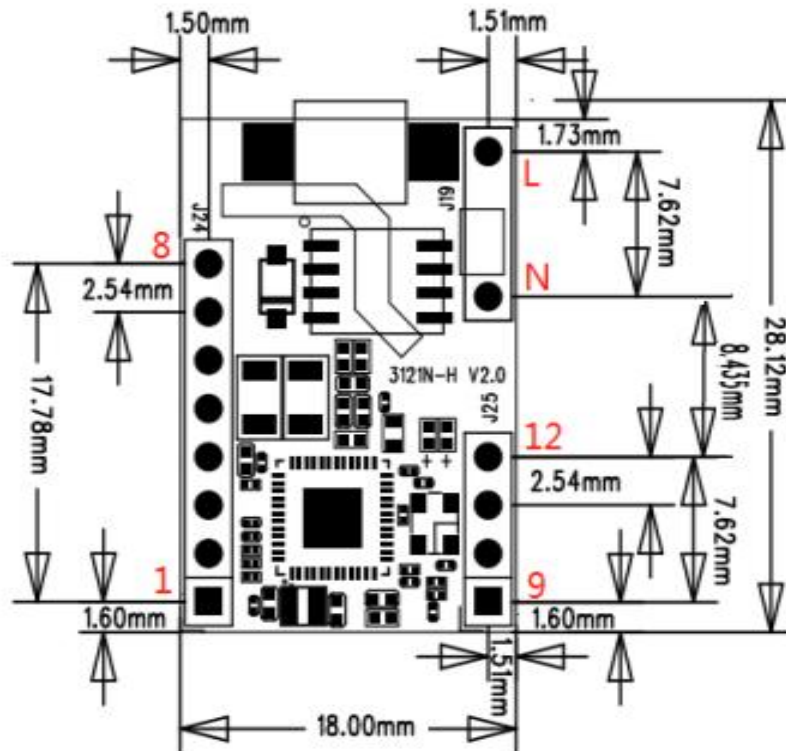
|                       |                 |
|-----------------------|-----------------|
| Input Voltage         | 3.3V±100mV      |
| Operation Temperature | -40°C to +85°C  |
| Storage Temperature   | -40°C to +125°C |

## 2. Module PIN Definition

### 2.1 Module picture



## 2.2 PIN distribution



LXW Tolerance value is pressed as  $\pm 0.2\text{mm}$

## 2.3 PIN Definition

Pin definition and reuse description:

| NO. | Name       | Description                                                                                                                                                          |
|-----|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 3.3Vin     | Module 3.3V DC power supply                                                                                                                                          |
| 2   | GND        | System ground                                                                                                                                                        |
| 3   | UART0_TX   | MUX Function 0: GPIO_10. General-purpose input/output.<br>MUX Function 1: UART0_TX, UART0 output.<br>Internally 10Kohm pull-up.                                      |
| 4   | UART0_RX   | MUX Function 0: GPIO_9. General-purpose input/output.<br>MUX Function 1: UART0_RX, UART0 input.<br>Internally 10Kohm pull-low.                                       |
| 5   | GPIO0/PWM0 | MUX Function 0: GPIO_0. General-purpose input/output.<br>MUX Function 1: LED4. General LED.<br>MUX Function 3: PWM_OUT, PWM data output. Duty cycle adjustment range |

|    |            |                                                                                                                                                                                                                                                                           |
|----|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |            | 1~1/65535.                                                                                                                                                                                                                                                                |
| 6  | GPIO5/PWM1 | MUX Function 1: GPIO_5. General-purpose input/output.<br>MUX Function 3: PWM_OUT_1, PWM1 data output. Duty cycle adjustment range 1~1/65535.<br>(A 800ms high level pulse will occur on this pin when powering up, please pay special attention for lighting application) |
| 7  | GPIO19     | GPIO_19. General-purpose input/output with internal 10K PU.                                                                                                                                                                                                               |
| 8  | RSTN       | Hardware reset. During system running, applying a low level pulse with a width of $\geq 5\text{ms}$ to this pin will reset the module.                                                                                                                                    |
| 9  | 3.3V       | Debug pin. 3.3V power supply. No header by default.                                                                                                                                                                                                                       |
| 10 | GND        | Debug pin. System ground. No header by default.                                                                                                                                                                                                                           |
| 11 | UART1_TXD  | Debug pin. UART1 output, for firmware download, factory test and LOG output. No header by default.                                                                                                                                                                        |
| 12 | UART1_RXD  | Debug pin. UART1 input, for firmware download, factory test. No header by default.                                                                                                                                                                                        |
| /  | L          | Connect to power line Live. PLC communication port.<br>Recommended surge protection level: $\pm 4\text{KV}$ .                                                                                                                                                             |
| /  | N          | Connect to power line Neutral. PLC communication port.<br>Recommended surge protection level: $\pm 4\text{KV}$ .                                                                                                                                                          |

Remark: IO power domain 3.3V。

## 3. Hardware Design Guide

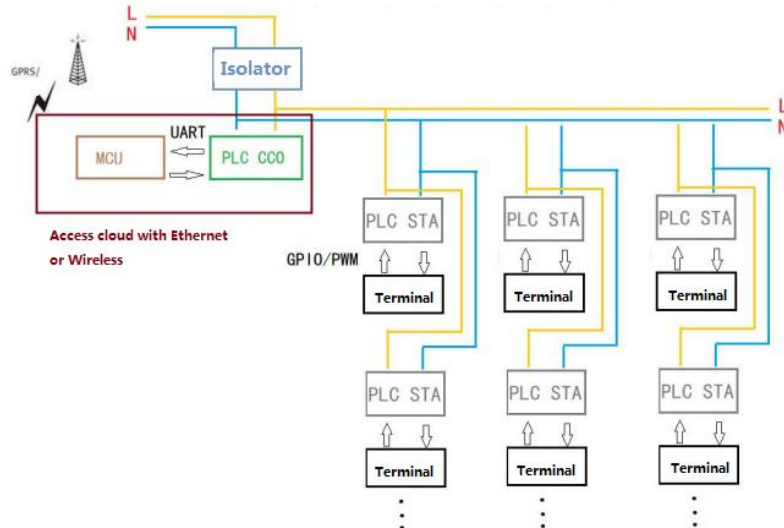
### 3.1 Voltage Input

| Input Voltage      | Min. | Typ. | Max. | Unit |
|--------------------|------|------|------|------|
| 3.3V <sub>in</sub> | 3.0  | 3.3  | 3.6  | V    |

- Put a 10uF and a 0.1uF capacitor close to module's 3.3V input pin. Keep power ripple less than 100mV<sub>pp</sub>.
- Supply individual 3.3V for PLC module, or use a 600R/1A ferrite bead to separate module's 3.3V and other device's 3.3V supply.

- Make sure the current supply is greater than 200mA for 3.3V input.

### 3.3 Typical PLC network



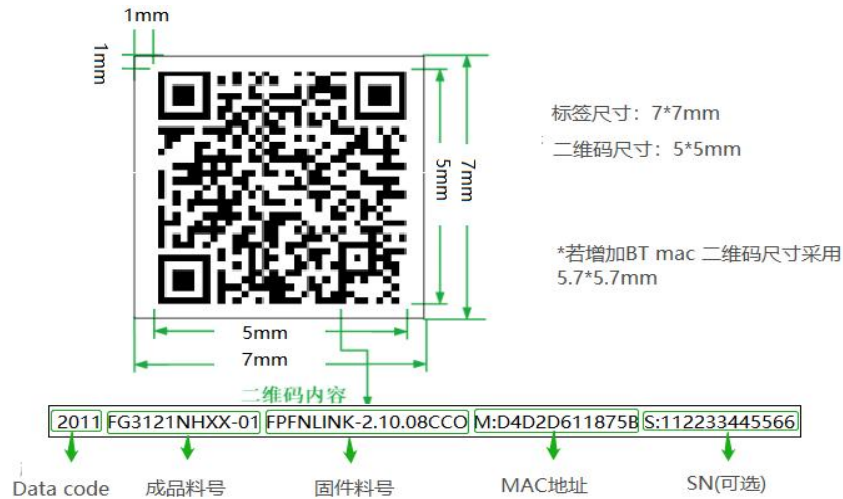
## 4. Key Material List

| Item | Part Name | Description               | Manufacturer                 |
|------|-----------|---------------------------|------------------------------|
| 1    | IC        | PS0211V100 QFN-48         |                              |
| 2    | Crystal   | 3225, 25MHz, 10ppm        | ECEC, TKD, Hosonic, JWT, TXC |
| 3    | PCB       | Black,4L,FR4,Halogen-free | XY-PCB, Sunlord, GDKX        |

## 5. Label Information

### 5.1 Module Label

Every module has a individual label with QR code on it. Details as below:



## 5.2 Package label

Module MFG information are listed on the label of inner package and carton. Details as below:

|                                           |             |            |
|-------------------------------------------|-------------|------------|
| 湖南欧智通科技有限公司<br>FN-LINK TECHNOLOGY LIMITED |             | PB<br>RoHS |
| CUST NAME:                                | 客户名称        |            |
| CUST P/O NO:                              | 客户订单号       |            |
| CUST P/N:                                 | 客户产品料号      |            |
| MODEL NO:                                 | 模组型号        |            |
| P/O NO:                                   | 出货订单号       |            |
| P/N:                                      | 模组成品料号      |            |
| DATE CODE:                                | 生产日期        |            |
| Q'TY:                                     | 包装数量        |            |
| REMARK:                                   | 备注: 模组固件信息等 |            |

## 6. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

## 7. Package

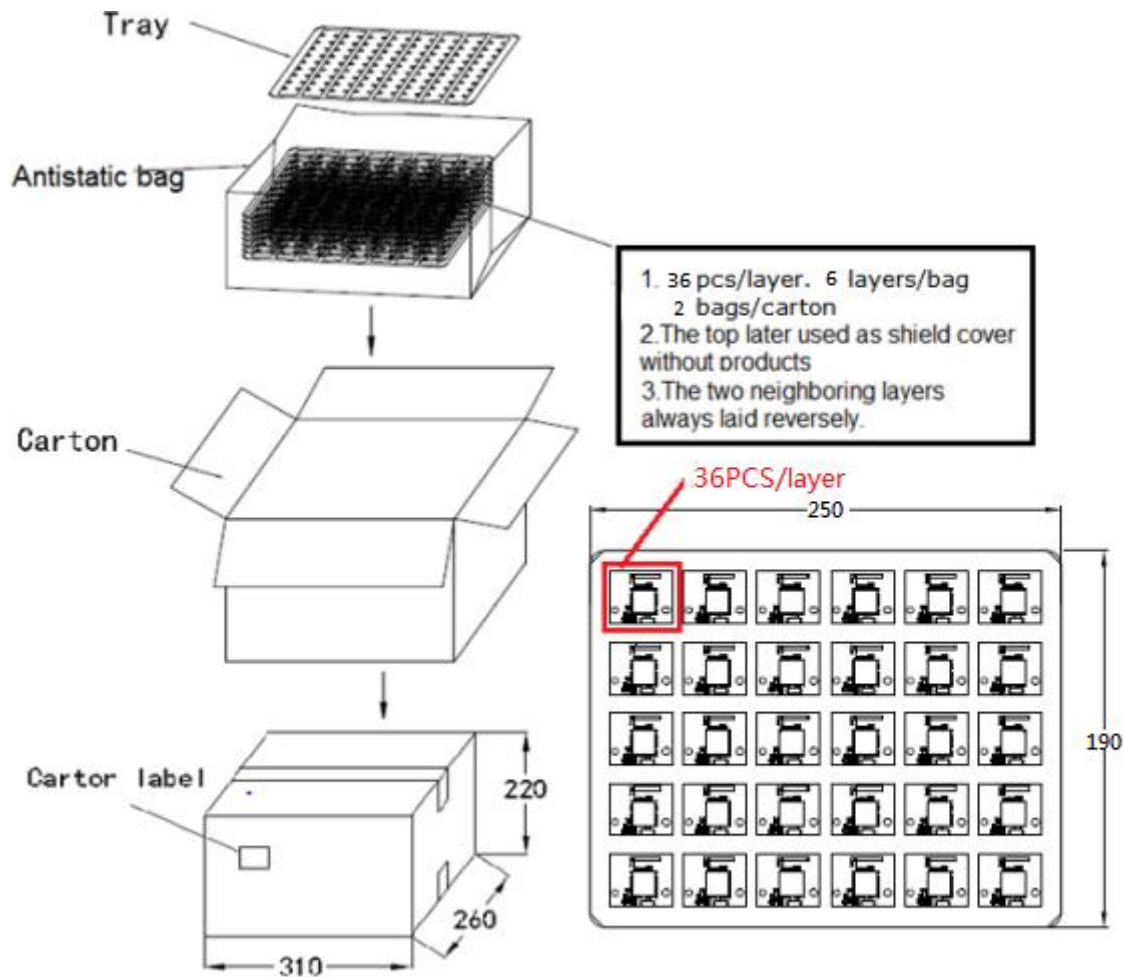
Pallet packaging is used by default, and the quantity may be adjusted according to the order.

Layer size: 250 X 190 X 5mm

Layer material: PVC

Carton size: 310 X 260 X 220mm

Carton material: A=A



## 8. Moisture Sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care

all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

- a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
- b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- d) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- e) Baking is required if conditions b) or c) are not respected
- f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

| Certification project | Certificate number |
|-----------------------|--------------------|
| HiLink                | 2020000126         |