

Product Specification

3121N-ISC

PLC-IoT Module

Version: v1.4 (PS0211)

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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3121N-ISC Module Datasheet

Ordering Information	Part NO.	Description
	FG3121NISC-03	PLC Module, PS0211, 20.0*14.2*2.25mm, UART, GPIO, ADC, golden finger type

CONTENTS

1. General Description	1
1.1 Introduction	1
1.2 Features	1
1.3 General Specification	3
1.4 Recommended Operation Condition	3
2. Module PIN Definition	3
2.1 Module Picture	3
2.2 PIN Distribution	4
2.3 PIN Definition	4
3. Module Dimension Details	5
4. Hardware Design Guide	6
4.1 Voltage Input	6
4.2 Typical PLC network	6
5. Key Material List	6
6. Label Information	7
6.1 Module Label	7
6.2 Package label	7
7. RoHS compliance	7
8. Package	8
8.1 Reel	8
8.2 Carrier Tape Detail	8
8.3 Packaging Detail	9
8.4 Tray	10
9. Moisture sensitivity	10
10. List of certified information	10

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	2023/02/09	Refine module dimension details.	FC	LSP	QJP
V1.3	2023/11/16	Increase the length-width-height tolerance value Delete PLC Peripheral Design	LXP	LSP	QJP
V1.4	2024/08/19	Add Certificate No	LXP	LSP	QJP

1. General Description

1.1 Introduction

3121N-ISC 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-ISC supports UART, PWM, GPIO, I2C and ADC interfaces, delivers a set of hardware and software solution for varies 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

- I2C, UART, GPIO, PWM, ADC

Network Performance

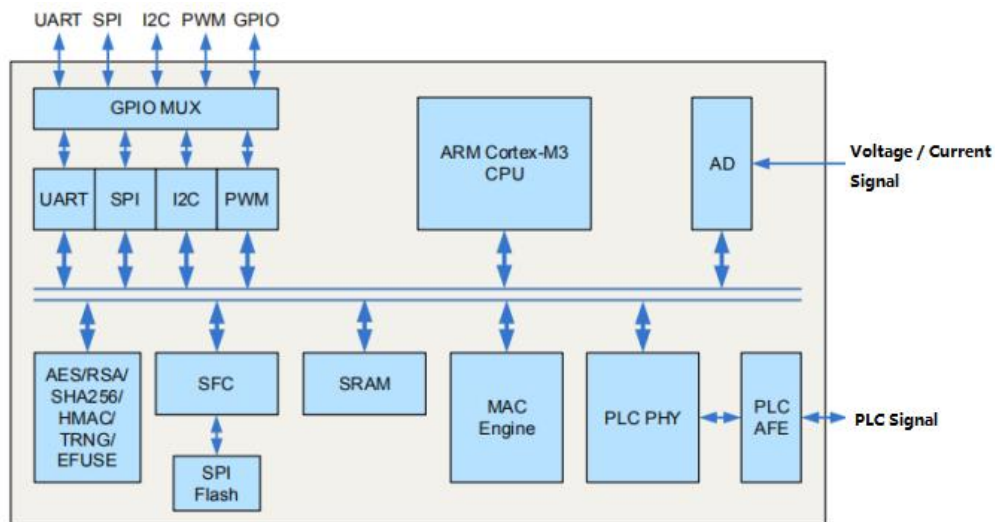
- Physical layer rate up to 0.507Mbps, application layer rate up to 80Kbps
- Receiving Sensitivity better than 0.2mVpp, about 95dB anti-attenuation performance

Power Consumption and Others

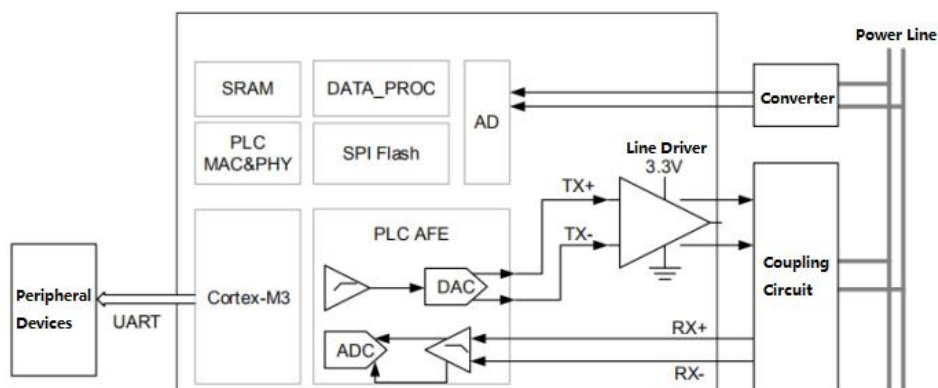
- Idle consumption $\leq 0.15\text{W}$ (Networked but no communication)
- Dynamic working consumption $\leq 0.7\text{W}$ (Continue communicating)
- Operation temperature: -40°C to $+85^{\circ}\text{C}$
- Storage temperature: -40°C to 125°C

Module Block Diagram

Functional block diagram:



Typical application diagram:



1.3 General Specification

Model Name	3121N-ISC
Main Chip	PS0211
Interfaces	I2C, UART, PWM, GPIO, ADC
Communication mode	Power Line Communication
Dimension	L x W x H: 20.00(±0.2)mm x 14.20(±0.2)mm x 2.25(±0.2)mm

1.4 Recommended Operation Condition

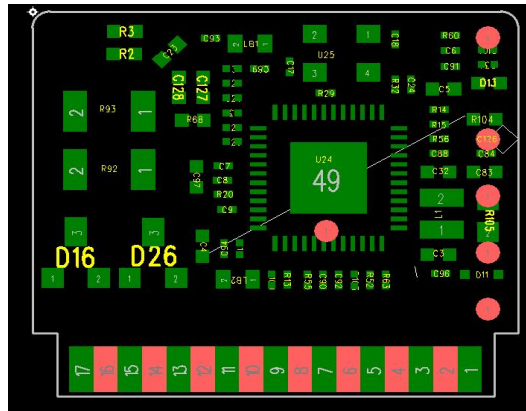
Input Voltage	3.3V±100mV
Operation Temperature	-40°C to +85°C
Storage Temperature	-40°C to +125°C

2. Module PIN Definition

2.1 Module Picture



2.2 PIN Distribution



2.3 PIN Definition

Pin definition and reuse description:

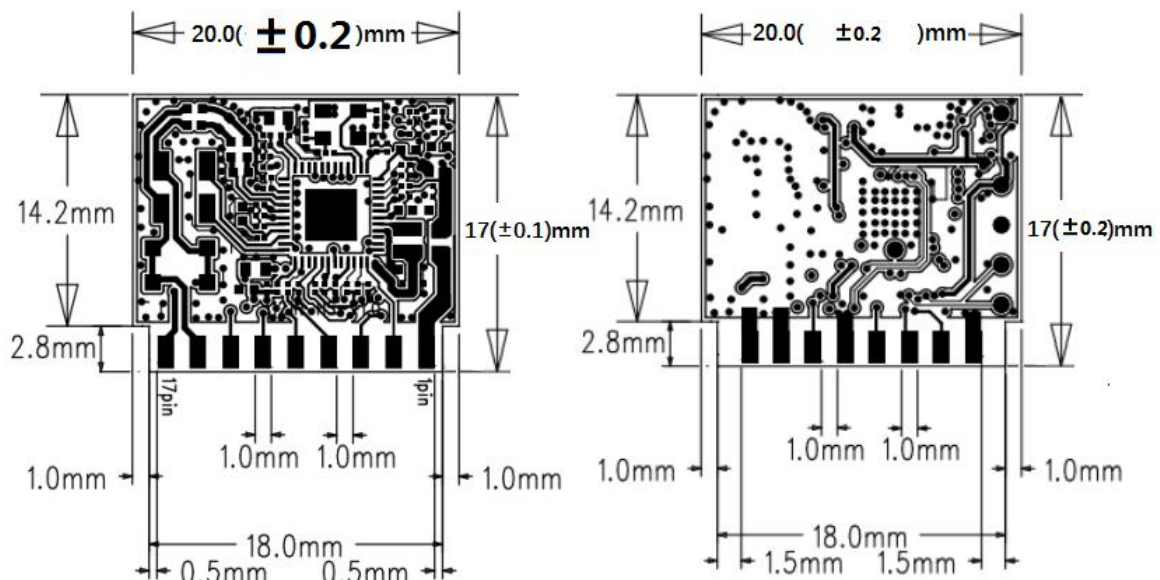
NO.	Name	Description
1	3.3Vin	Module 3.3V DC power supply
2	GND	System ground
3	GPIO0	MUX Function 0: GPIO_0. General-purpose input/output. MUX Function 1: LED4. General LED MUX Function 3: PWM_OUT, PWM0 data output. Duty cycle adjustment range 1~1/65535
4	UART0_RX	MUX Function 0: GPIO_9. General-purpose input/output with internal 10Kohm PL. MUX Function 1: UART0_RX, UART0 input, can be used to communicate with external MCU
5	GPIO3	MUX Function 0: GPIO_3. General-purpose input/output with internal 10Kohm PL, support software PWM. MUX Function 1: LED2. General LED
6	GPIO10	MUX Function 0: GPIO_10. General-purpose input/output. MUX Function 1: UART0_TX, UART0 output, can be used to communicate with external MCU
7	GPIO15	MUX Function 0: GPIO_15. General-purpose input/output with internal 10Kohm PU, support software PWM. MUX Function 3: LED4. General LED MUX Function 4: EFUSE_PW_E, enable signal of EFUSE power supply

8	GPIO4	MUX Function 0: GPIO_4. General-purpose input/output with internal 10Kohm PL, support software PWM. MUX Function 1: LED3. General LED.
9	GPIO16	MUX Function 0: GPIO_16. General-purpose input/output, support software PWM. MUX Function 3: LED5. General LED
10	GND	System ground
11	VIN4	ADC input, measurable voltage range 0.1~2.75V, resolution 12bit
12	VIN5	ADC input, measurable voltage range 0.1~2.75V, resolution 12bit
13	VIN6	ADC input, measurable voltage range 0.1~2.75V, resolution 12bit
14	GND	System ground
15	PLC-	PLC- signal input/output, need coupling circuits and protection circuits
16	GND	System ground
17	PLC+	PLC+ signal input/output, need coupling circuits and protection circuits

Remark 1: IO power domain 3.3V.

Remark 2: When powering up the module, high level pulse will occur on GPIOs without internal PL resistor. If any of those GPIOs is used to drive LED device, the pulse may cause a light flash. Please pay special attention in that case.

3. Module Dimension Details



The thickness of PCB is 1.2 ± 0.1 mm, and the slot width of gold finger should be greater than 1.3 mm.

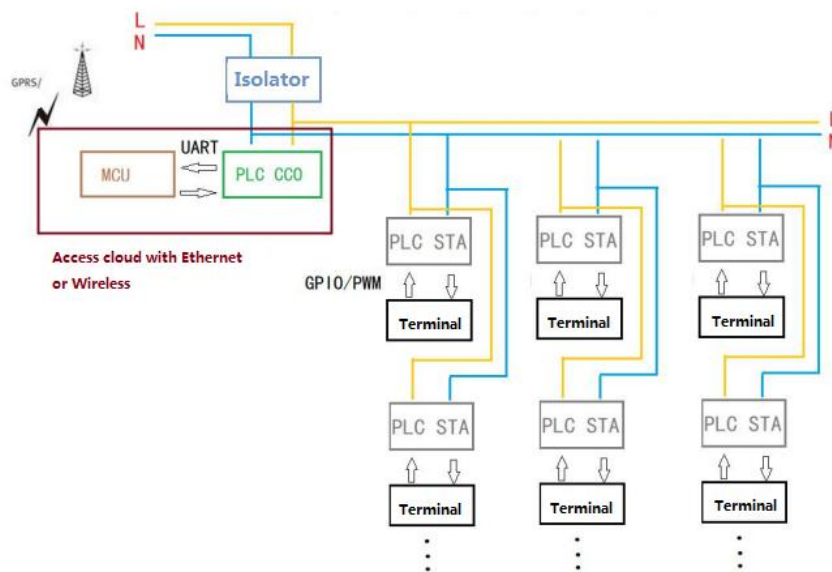
4. Hardware Design Guide

4.1 Voltage Input

Input Voltage	Min.	Typ.	Max.	Unit
3.3V _{in}	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_{pp}.
- 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.

4.2 Typical PLC network



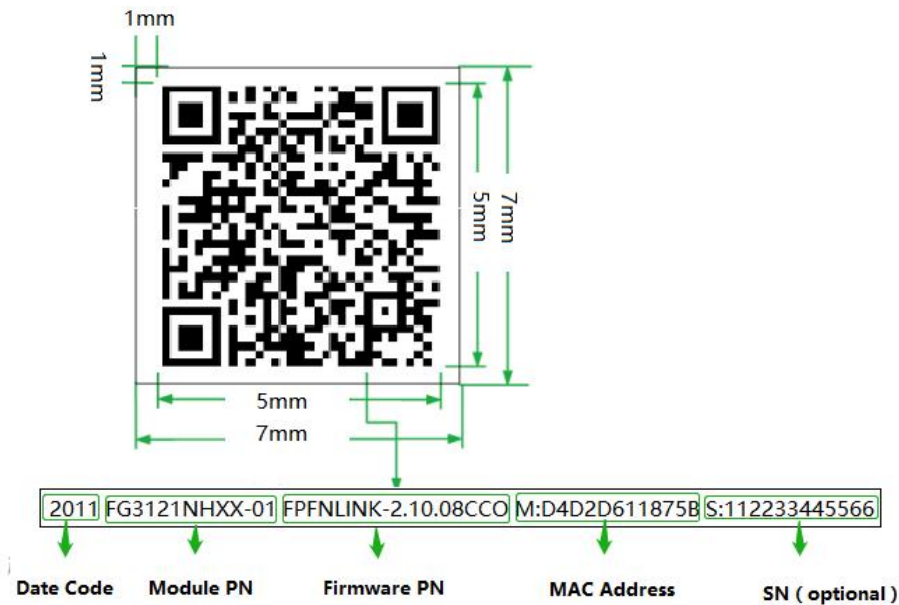
5. Key Material List

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

6. Label Information

6.1 Module Label

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



6.2 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 FN-LINK TECHNOLOGY LIMITED		PB	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		

7. RoHS compliance

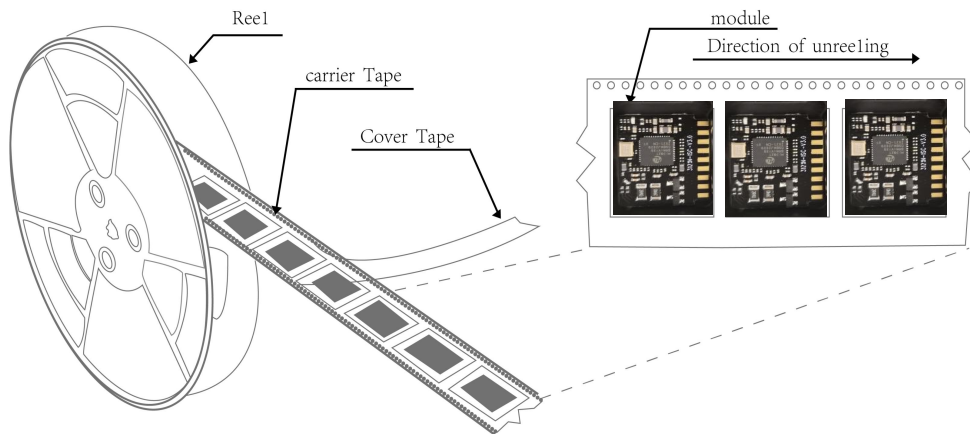
All hardware components are fully compliant with EU RoHS directive

8. Package

8.1 Reel

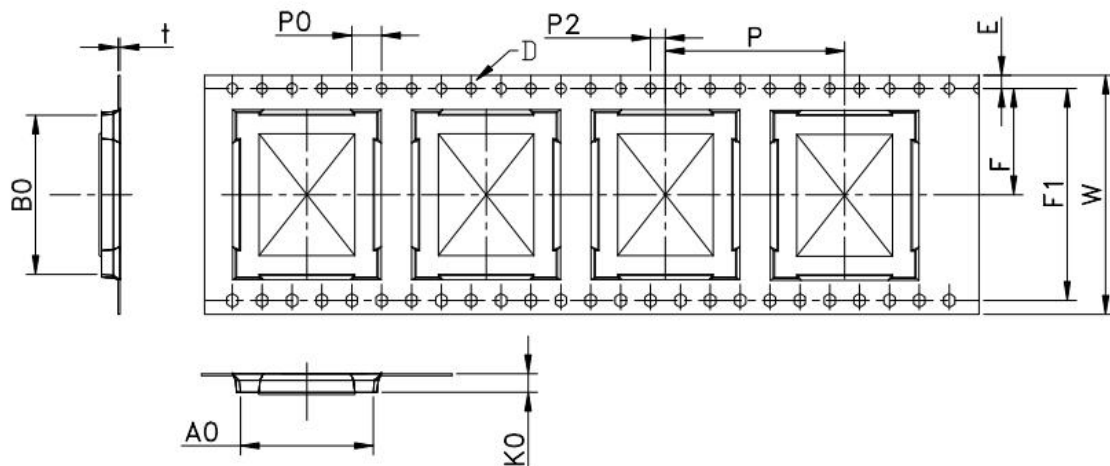
Use carrier tape with a roll of 800pcs.

(Note: The quantity information will be adjusted according to the actual order)



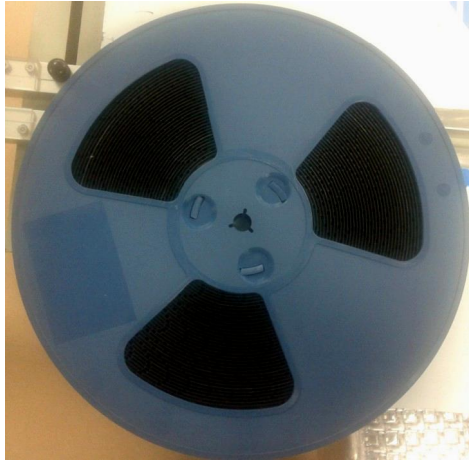
8.2 Carrier Tape Detail

ITEM	W	A0	B0	D	E	F	F1	K0	P0	P2	P	T
DIM	32	17.50	21.00	1.5	1.75	14.20	28.4	2.60	4.0	2.0	24.0	0.30
TOLE	+0.3 -0.3	±0.10	±0.10	+0.1 -0.0	±0.1	±0.15	±0.10	±0.10	±0.1	±0.15	±0.1	±0.05



8.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*32.6m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:460mm*385mm



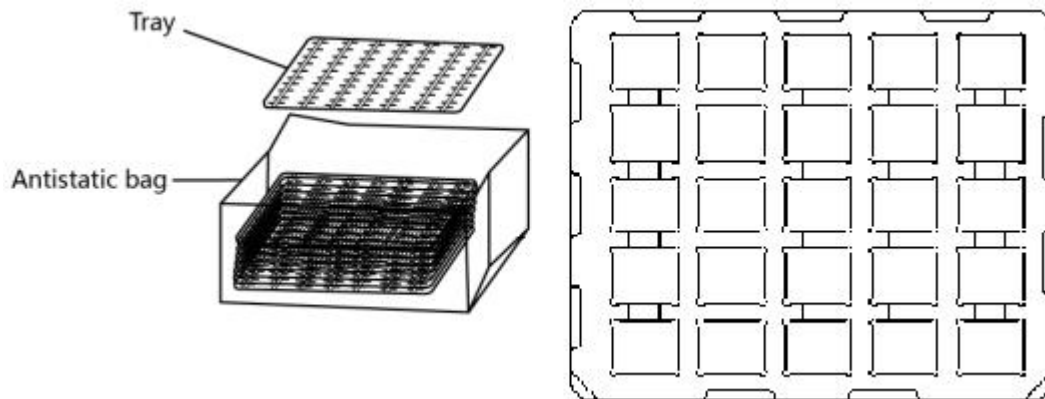
size : 350*350*35mm



The packing case size:350*210*370mm

8.4 Tray

Use pallet packaging for less than 300 pieces



9. Moisture sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care all the relevant requirements for using this kind of components.

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

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

10. List of certified information

Certification project	Certificate number
HiLink	2020000125