

IEEE 802.11 1x1 b/g/n Wireless LAN Stamp Module

Datasheet

Version 1.4

Date	Revision Content	Revised By	Version
2020/12/12	Initial Release	RF	V1.0
2020/12/31	Modify System_PDn power domain	RF	V1.1
2021/01/22	Updated 1. Package LGA change to Stamp 2. CON[0] and CON[1] 100k change to 51k 3. Dimension 4. Power up Timing Sequence	EE	V1.2
2021/05/23	Release 1. 2.4G WLAN Specification	RF	V1.3
2021/05/27	Update 2. 2.4G WLAN Specification	RF	V1.4

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1. Introduction

Product Overview and Functional Description

The LS004ONWNS is a highly integrated, single-band (2.4 GHz) IEEE 802.11n 1x1 Module, specifically designed to support High Throughput (HT) data rates for Wi-Fi products.

The device integrates Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency Division Multiplexing (OFDM) baseband modulation, Medium Access Controller (MAC), CPU, memory, host interface, and direct-conversion Wi-Fi radio.

For security, the 802.11i security standard is supported through several protocols. And for video, voice, and multimedia applications, 802.11e Quality of Service (QoS) is supported.

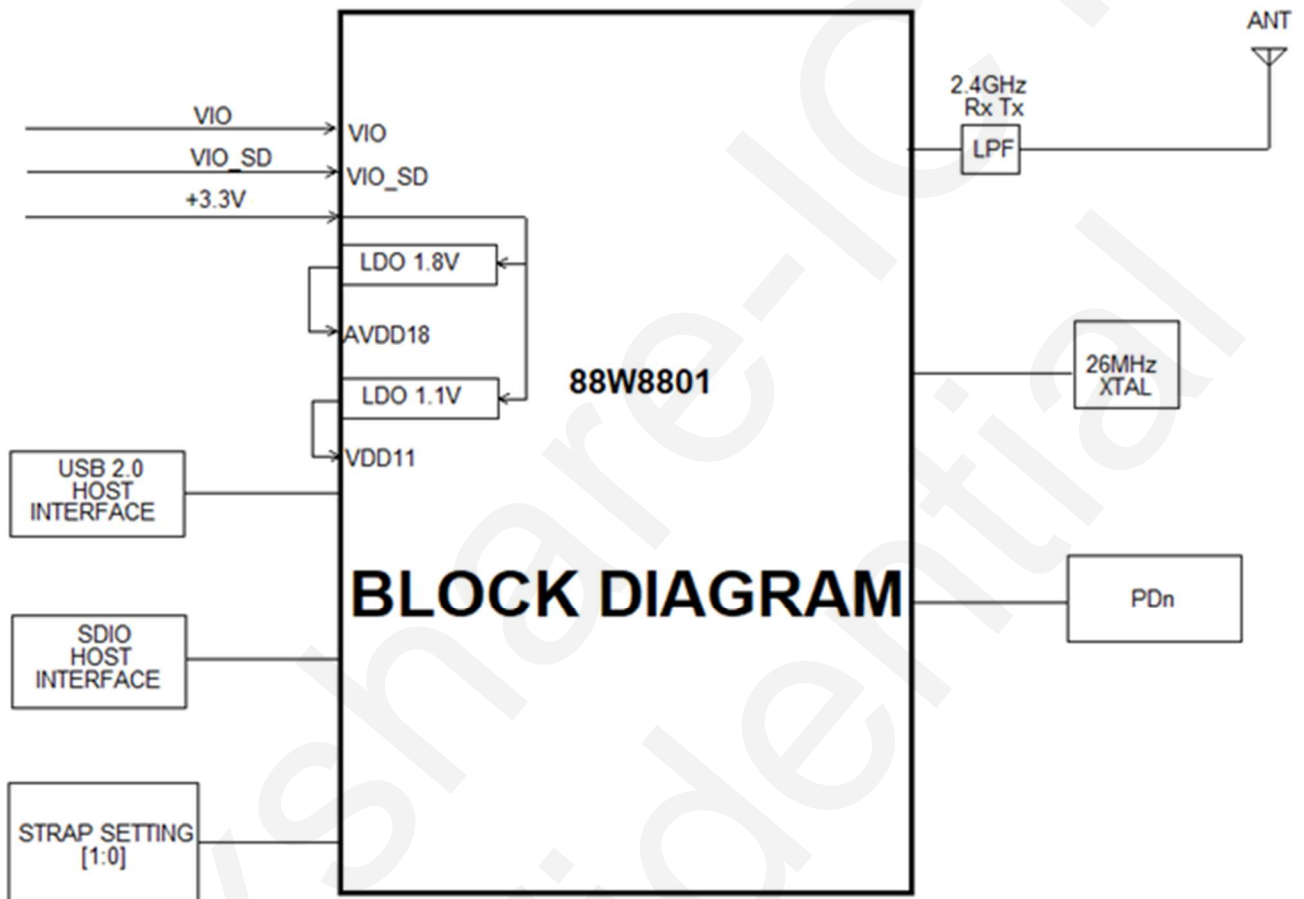
Host interfaces include USB 2.0 and SDIO 2.0 to connect the Wi-Fi radio to the host processor.

2. Features

- Support 802.11 b/g/n
- Single-band: 2.4 GHz
- 1x1 SISO and HT20 operation
- Up to MCS7 data rates (72.2 Mbps)
- 802.11e Quality of Service (QoS)
- Thick MAC architecture
- Simultaneous operation
 - Mobile AP and STA
 - Wi-Fi direct and STA
- Supports WPA2/WPA2 mixed mode and WPA3 security standards

3. Block Diagram

A simplified block diagram of the LS004ONWNS is depicted in the figure below.



4. Specifications Table

4.1 General Specification

Model Name	LS004ONWNS
Product Description	Support Wi-Fi 2.4G Single-band
Dimension	L x W x H(Max): 15*15*2.55(Max)mm
Main Chip	88W8801(NXP)
Standard	802.11 b/g/n
Encryption	WAPI WEP 64-bit and 128-bit encryption WPA/WPA2 (Wi-Fi Protected Access) AES-CCMP hardware implementation as part of 802.11i security standard WMM
Wi-Fi Interface	SDIO2.0/USB2.0
Package	Stamp

4.2 2.4G WLAN Specification

Features	Description
Operating Frequency	2.412GHz~2.472 GHz
Standards	IEEE 802.11b/g/n, Wi-Fi compliant
Modulation	802.11b: DQPSK, BPSK, CCK 802.11g/n: OFDM
Data Rates	802.11b: 1,2,5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: Maximum data rates up to 72.2Mbps (20MHz channel)
Output Power	802.11b@11Mbps : 19dBm +/- 2dBm @ EVM \leq 35%
	802.11g@54Mbps : 22dBm +/- 2dBm @ EVM \leq -27dB
	802.11n@ HT20 MCS 7 : 21dBm +/- 2dBm @ EVM \leq -28dB
Receiver Sensitivity	802.11b@11Mbps : -86dBm
	802.11g@54Mbps : -70dBm
	802.11n@ HT20 MCS 7 : -68dBm
Number of Channels	USA, North America, Canada and Taiwan: (Ch. 1-11) China, Australia, Most European Countries, Japan: (Ch. 1-13)



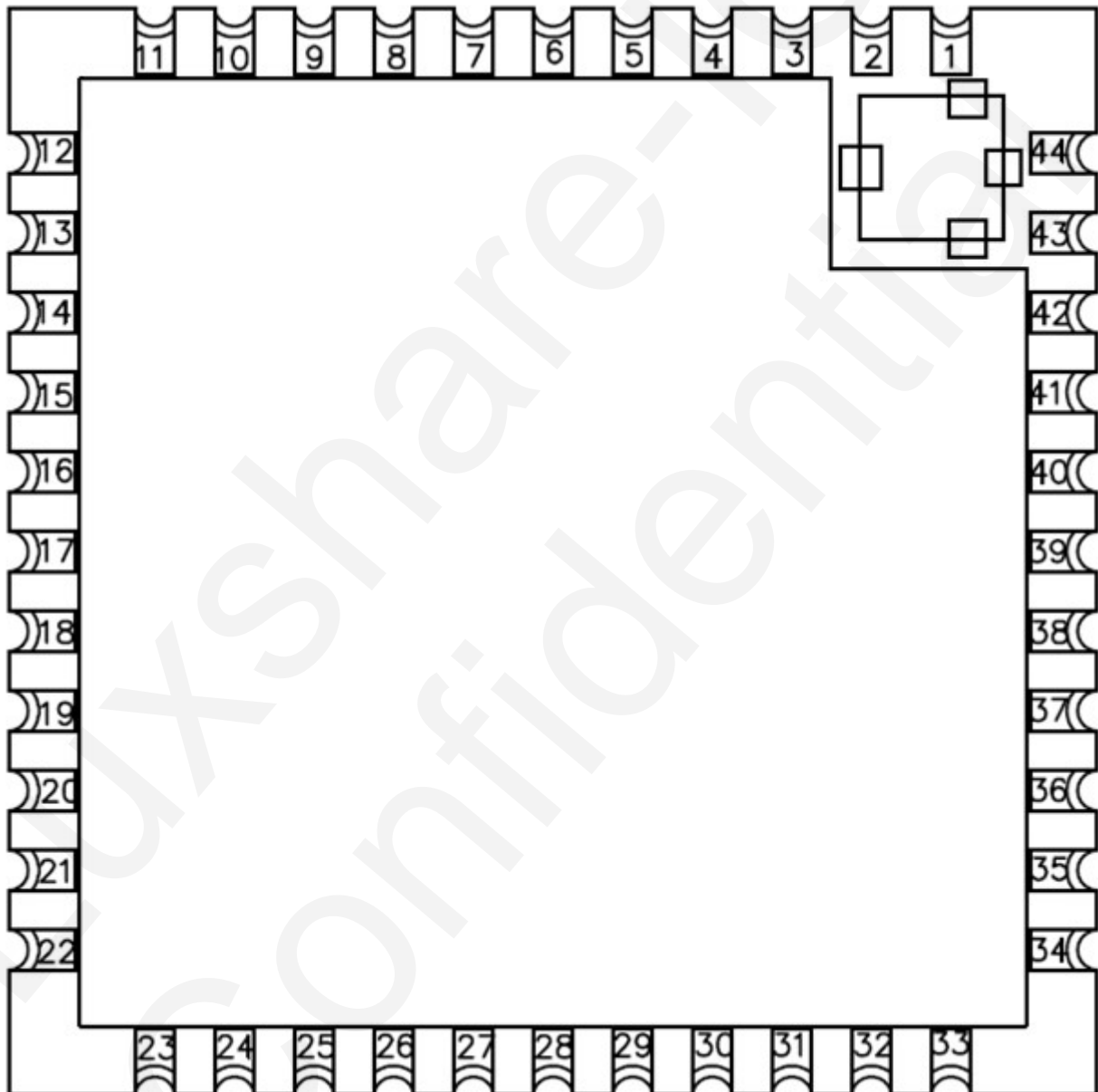
4.3 Operating Conditions

Operation Conditions	
Voltage	VDD33: 3.3V VIO: 3.3V/1.8V VIO_SD: 3.3V/1.8V
Operating Temperature	0°C to 70°C
Storage Temperature	-40°C to 90°C
Humidity	less than 95% (Non-Condensing)
ESD Protection	
Human Body Model	+2KV
Charged Device Model	+500V

5. Pin Assignments

5.1 Pin Map

LS004ONWNS Top View Pin Map



5.2 Pin Definition

Pin No	Definition	Description	Voltage	Type
1	GND	Ground connections	---	---
2	GND	Ground connections	---	---
3	NC	No connect to anything	---	Floating
4	CON[0]	Firmware Boot Options [00]: UART[Debug] [01]: Reserved [10]: SDIO	1.8V	I
5	CON[1]	[11]: USB To set a configuration bit to 0, attach a 51k resistor from the pin to ground. No external circuitry is required to set a configuration bit to 1	1.8V	I
6	NC	No connect to anything	---	Floating
7	NC	No connect to anything	---	Floating
8	GND	Ground connections	---	---
9	GND	Ground connections	---	---
10	GND	Ground connections	---	---
11	GND	Ground connections	---	---
12	GND	Ground connections	---	---
13	GND	Ground connections	---	---
14	VDD33	3.3V Power Supply	3.3V	P
15	VDD33	3.3V Power Supply	3.3V	P
16	NC	No connect to anything	---	Floating
17	NC	No connect to anything	---	Floating
18	NC	No connect to anything	---	Floating

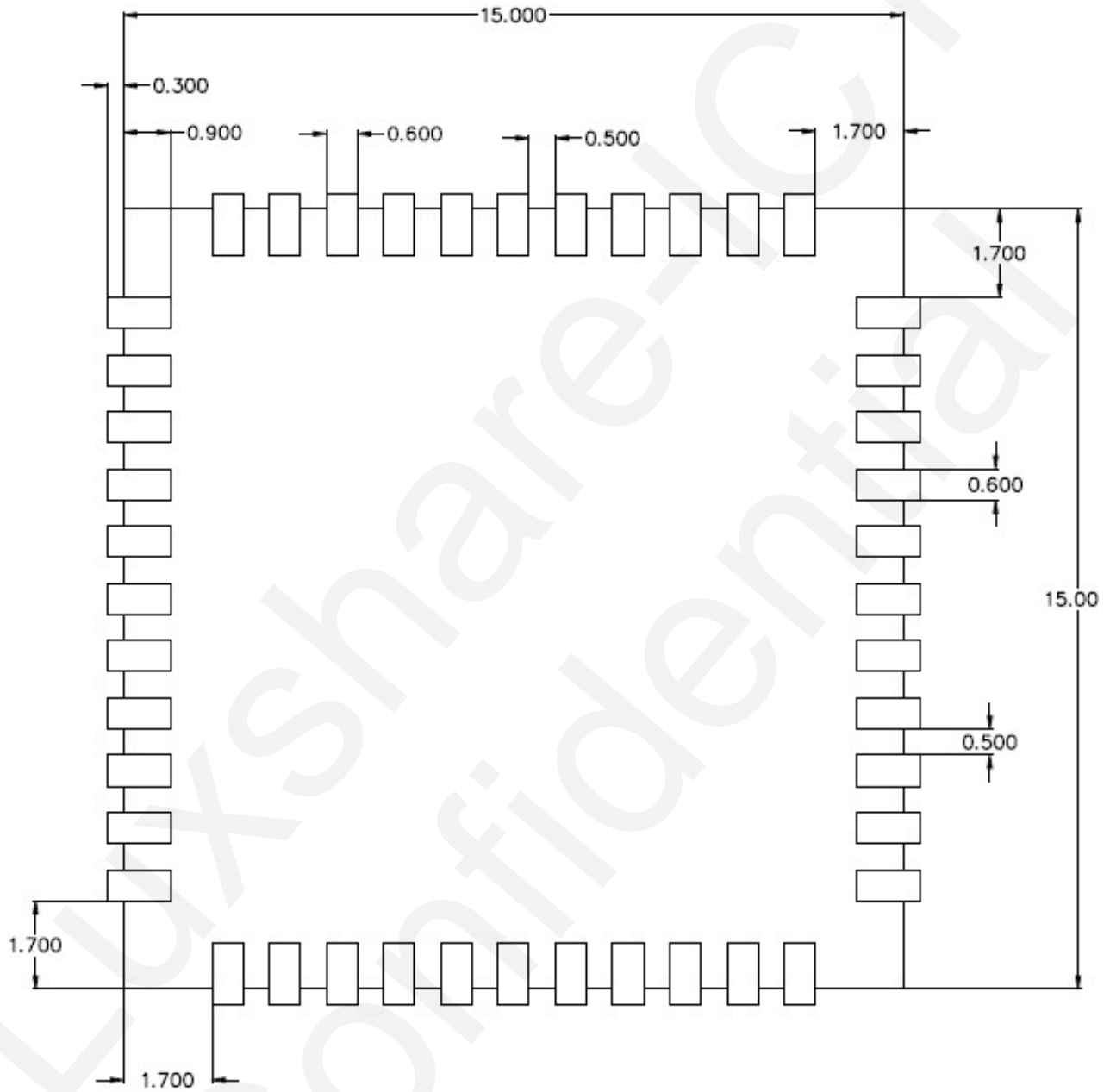
19	NC	No connect to anything	---	Floating
20	GPIO3	GPIO Mode: GPIO[3]	VIO	I/O
21	System_PDn	Full Power-down input Low: Full power-down mode High: Normal mode Internal pull-up on this pin	VDD33	I
22	WL_HOST_WAKE	WL device wake-up HOST GPIO Mode: GPIO[1] UART_SOUT (output), debug only	VIO	O I/O O
23	NC	No connect to anything	---	Floating
24	NC	No connect to anything	---	Floating
25	GPIO0	GPIO Mode: GPIO[0] UART_SIN (input), debug only	VIO	I/O I
26	GPIO2	GPIO Mode: GPIO[2]	VIO	I/O
27	SD_CMD/ USB_VBUS_ON	SDIO Command USB_VBUS_ON	VIO_SD	I/O I
28	SD_CLK	SDIO Clock input	VIO_SD	I
29	SD_D0	SDIO Data line 0	VIO_SD	I/O
30	SD_D1	SDIO Data line 1	VIO_SD	I/O
31	SD_D2	SDIO Data line 2	VIO_SD	I/O
32	SD_D3	SDIO Data line 3	VIO_SD	I/O
33	GND	Ground connections	---	---
34	VIO_SD	1.8V/3.3V Digital I/O SDIO Power Supply	1.8/3.3V	P
35	USB_DP	USB 2.0 Serial Differential Data Positive	VDD33	I/O
36	USB_DN	USB 2.0 Serial Differential Data Negative	VDD33	I/O
37	GND	Ground connections	---	---
38	VIO	1.8V/3.3V Digital I/O Power Supply	1.8/3.3V	P
39	NC	No connect to anything	---	Floating

40	NC	No connect to anything	---	Floating
41	NC	No connect to anything	---	Floating
42	NC	No connect to anything	---	Floating
43	NC	No connect to anything	---	Floating
44	WL_WAKE	HOST wake-up WL device	1.8V	I

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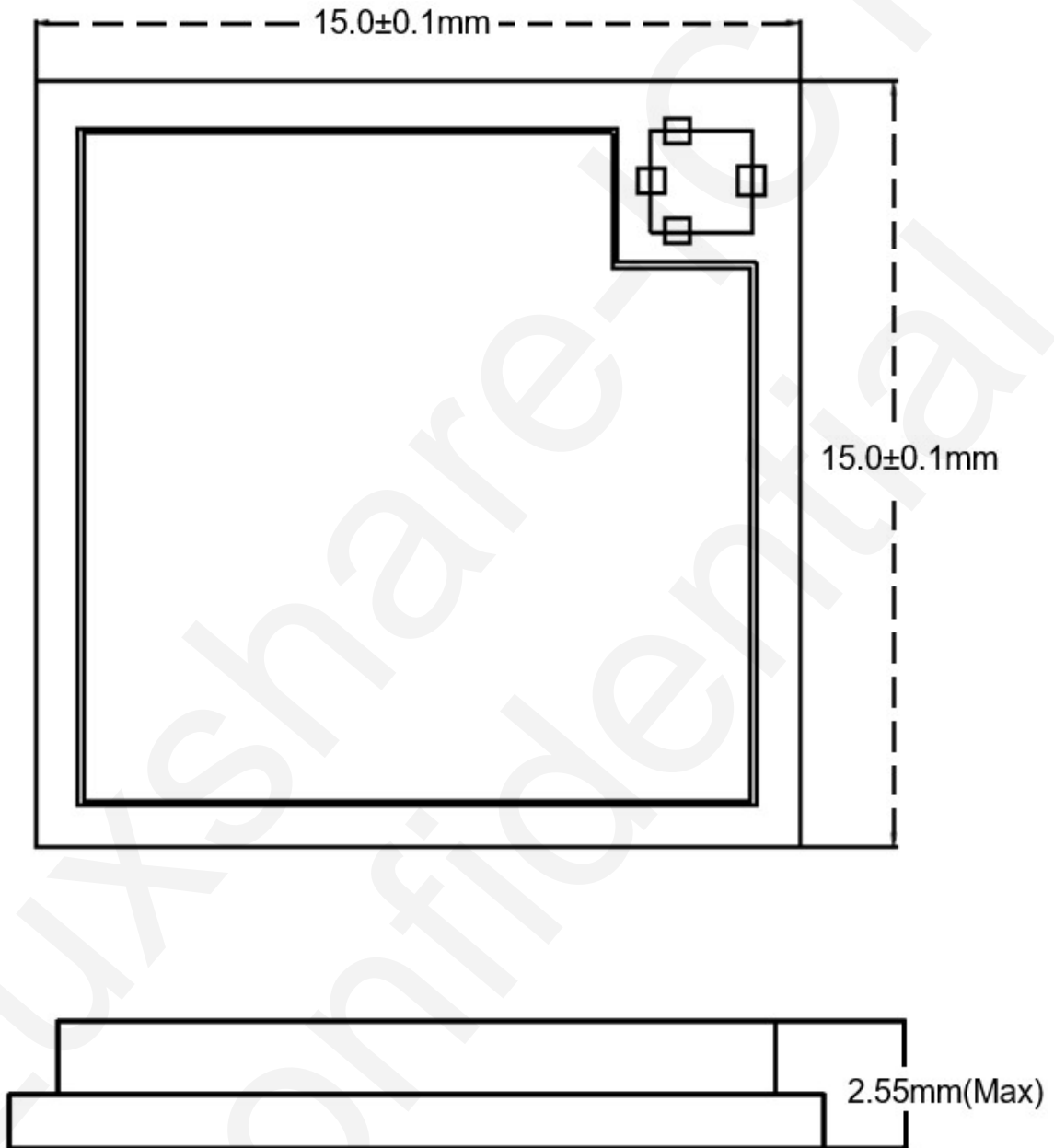
5.3 Layout Recommendation

Unit: mm



5.4 Physical Dimensions

Unit: mm



6. Electrical Characteristics

6.1 Absolute Maximum Ratings

Symbol	Parameter	Min	Typ	Max	Units
VDD33	Power supply voltage with respect to VSS	--	3.3	4.0	V
VIO	Power supply voltage with respect to VSS	--	3.3	4.0	V
		--	1.8	2.2	V
VIO_SD	Power supply voltage with respect to VSS	--	3.3	4.0	V
		--	1.8	2.2	V

6.2 Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Units
VDD33	3.3V power supply	2.97	3.3	3.63	V
VIO	1.8V/3.3V digital I/O power supply	2.97	3.3	3.63	V
		1.62	1.8	1.98	V
VIO_SD	1.8V/3.3V digital SDIO I/O power supply	2.97	3.3	3.63	V
		1.62	1.8	1.98	V

6.3 DC characteristics

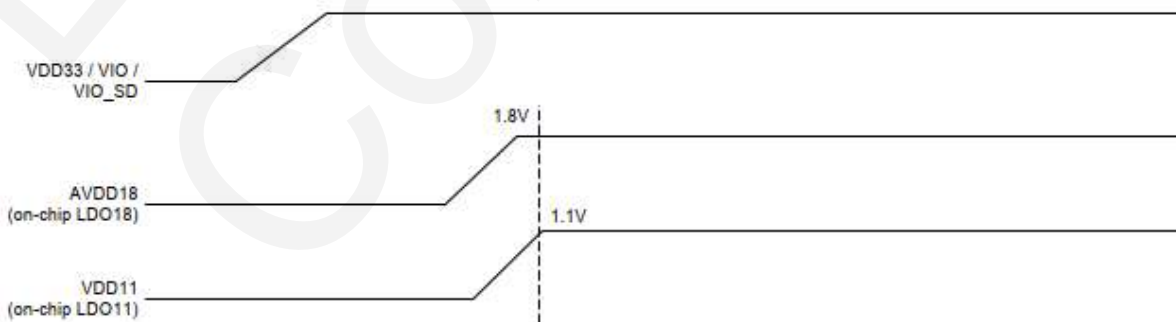
6.3.1 VIO DC characteristics-3.3V/1.8V operation

Symbol	Parameter	Condition	Min	Typ	Max	Units
V _{IH}	Input high voltage	--	0.7*V _{IO}	--	V _{IO} +0.4	V
V _{IL}	Input low voltage	--	-0.4	--	0.3*V _{IO}	V
V _{HYS}	Input hysteresis	--	100	--	--	mV
V _{OH}	Output high voltage	--	V _{IO} -0.4	--	--	V
V _{OL}	Output low voltage	--	--	--	0.4	V

6.3.2 VIO_SD DC characteristics-3.3V/1.8V operation

Symbol	Parameter	Condition	Min	Typ	Max	Units
V _{IH}	Input high voltage	--	0.7*V _{IO_SD}	--	V _{IO_SD} +0.4	V
V _{IL}	Input low voltage	--	-0.4	--	0.3*V _{IO_SD}	V
V _{HYS}	Input hysteresis	--	100	--	--	mV
V _{OH}	Output high voltage	--	V _{IO_SD} -0.4	--	--	V
V _{OL}	Output low voltage	--	--	--	0.4	V

6.3.3 Power up Timing Sequence



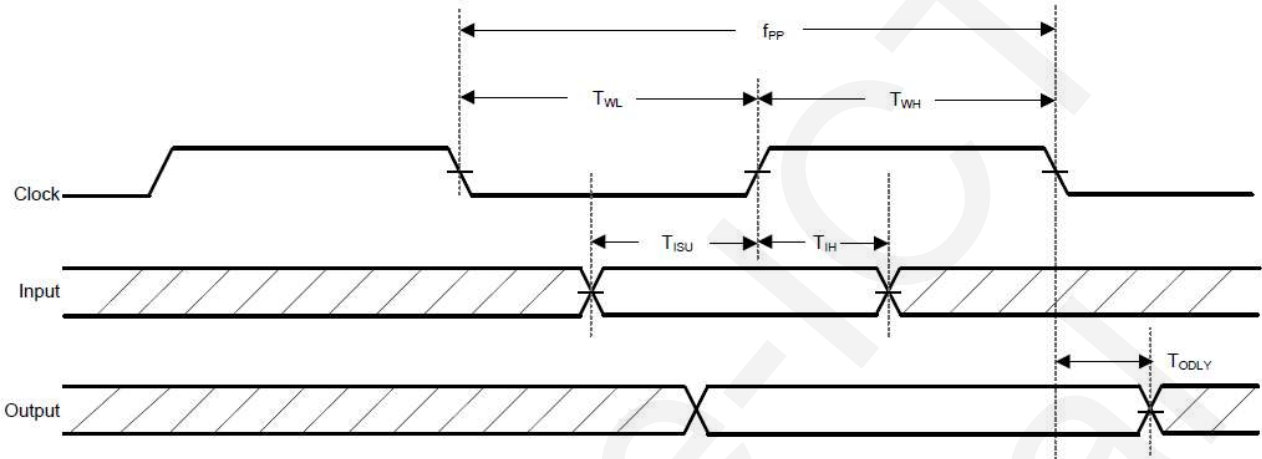
7. Host Interface

7.1 SDIO2.0 Host Interface

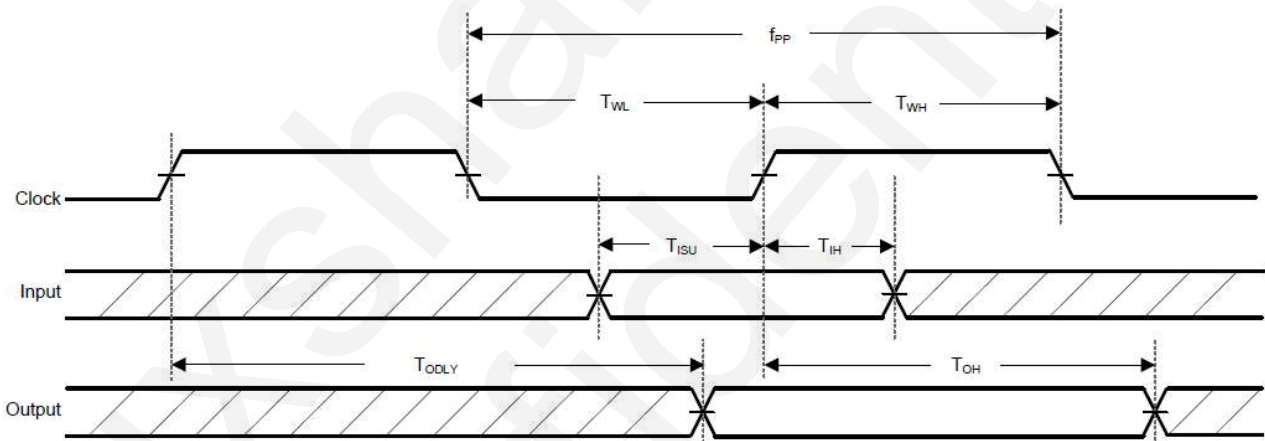
7.1.1 SDIO Interface Signals

Pin Name	Type	Description
SD_CLK	I	SDIO 4-bit Mode: Clock input SDIO 1-bit Mode: Clock input SDIO SPI Mode: Clock input
SD_CMD/ USB_VBUS_ON	I/O	SDIO 4-bit Mode: Command/response (input/output) SDIO 1-bit Mode: Command line SDIO SPI Mode: Data input
SD_D0	I/O	SDIO 4-bit Mode: Data line Bit[0] SDIO 1-bit Mode: Data line SDIO SPI Mode: Data output
SD_D1	I/O	SDIO 4-bit Mode: Data line Bit[1] SDIO 1-bit Mode: Interrupt SDIO SPI Mode: Interrupt
SD_D2	I/O	SDIO 4-bit Mode: Data line Bit[2] or read wait (optional) SDIO 1-bit Mode: Read wait (optional) SDIO SPI Mode: Reserved
SD_D3	I/O	SDIO 4-bit Mode: Data line Bit[3] SDIO 1-bit Mode: Reserved SDIO SPI Mode: Card select (active low)

7.1.2 SDIO Timing Diagram—Default-Speed/High-Speed Modes



SDIO Timing Diagram—Default-Speed Mode



SDIO Timing Diagram—High-Speed Mode

7.1.3 SDIO Timing Data

Symbol	Parameter	Condition	Min	Typ	Max	Units
fPP	Clock frequency	Default-speed	0	--	25	MHz
		High-speed	0	--	50	MHz
TWL	Clock low time	Default-speed	10	--	--	ns
		High-speed	7	--	--	ns
TWH	Clock high time	Default-speed	10	--	--	ns
		High-speed	7	--	--	ns
TISU	Input setup time	Default-speed	5	--	--	ns
		High-speed	6	--	--	ns
TIH	Input hold time	Default-speed	5	--	--	ns
		High-speed	2	--	--	ns
TODLY	Output delay time	Default-speed	--	--	14	ns
		High-speed	--	--	14	ns
ToH	Output hold time	High-speed	2.5	--	--	ns

7.2 USB2.0 Host Interface

7.2.1 USB Interface Signals

Pin Name	Type	Description
USB_DN	I/O	USB Serial Differential Data Negative
USB_DP	I/O	USB Serial Differential Data Positive
SD_CMD/ USB_VBUS_ON	I	USB Mode: USB_VBUS_ON (input)

8. FCC Warning Statement

This equipment has been tested and found to comply with the limits for Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

9. RF Exposure Warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

10. User manual FCC Warning Statement

Please take attention that changes or modification 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, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

The module is limited to OEM installation ONLY

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

When the FCC identification number or ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains FCC ID: 2A2 EX-LS004” and the information should be also contained in the devices’ user manual.

