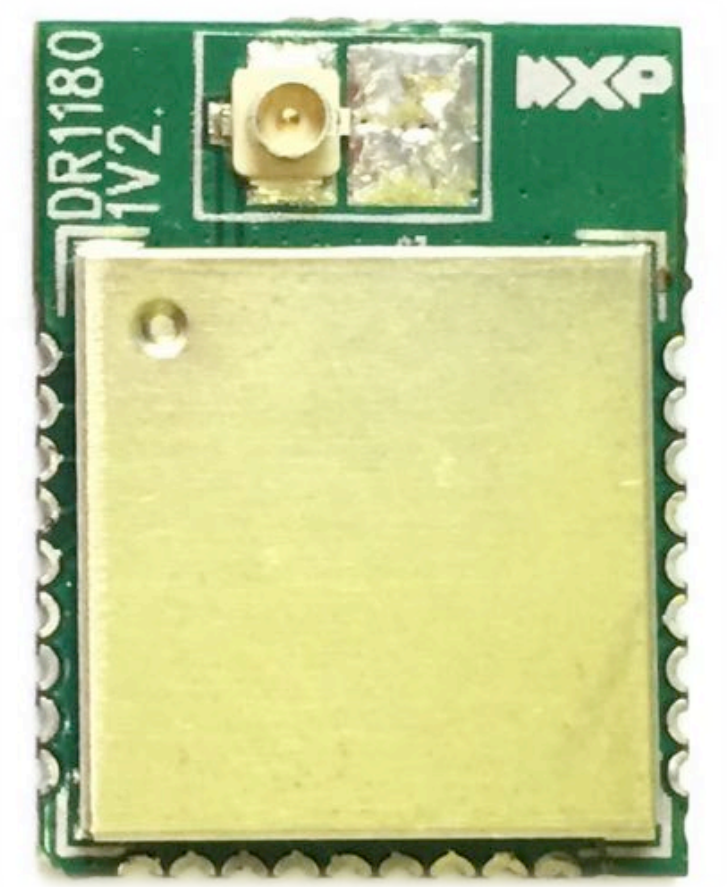
LiSeng technology ltd.

IoT Module



Model No: **SH-IOTML3XBP-XX**

Rev 2.0

November 4, 2016

1. Description

SH-IOTML3XBP module is a low cost, compact size, low power, high performance surface mount transceiver with 2.4GHz IEEE 802.15.4, Zigbee compliance, by using the high performance NXP JN5169 microcontroller.

It is targeted for Smart Home Control customers. With this module, customers may develop their own Smart Home Device (like: lighting, door lock and home appliances) easily with provided SDK. It may work with Li Seng Gateway to achieve Smart Home Control features.

2. Features

Modules General

- ❖ 2.4GHz IEEE 802.15.4, Zigbee Light Link & Home Automation 1.2 Compatible
- ❖ Lead-free and RoHS compliant

- TX power +8.5dBm
- Receive sensitivity -96dBm
- TX current 21mA
- RX current 13mA
- 2.0V to 3.6V operation
- 128-bit AES security processor
- MAC accelerator with packet formatting, CRCs, address check, auto-acks, timers

Microcontroller

- 32-bit RISC CPU, up to 32MIPs with low power
- Data EEPROM with guaranteed 100k write operations
- ZigBee stacks
- JTAG debug interface
- 4-input 10-bit ADC, 1 comparator
- 5 x PWM (4 x timer, 1 x timer/counter)
- 2 UARTs
- SPI Master & Slave port with 3 selects
- 2-wire serial interface
- Battery and Temperature Sensor
- Watchdog timer and BOR
- Up to 20 DIO

3. Dimension and Pin Assignment

a. Dimension:

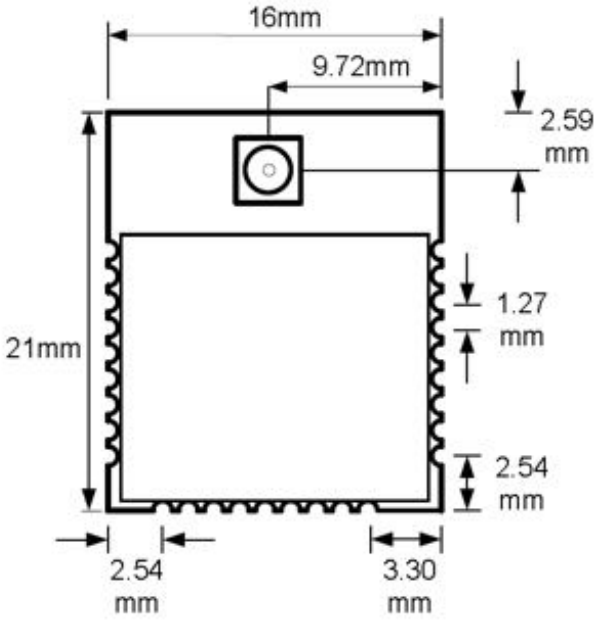


Fig 1. Dimension of the module

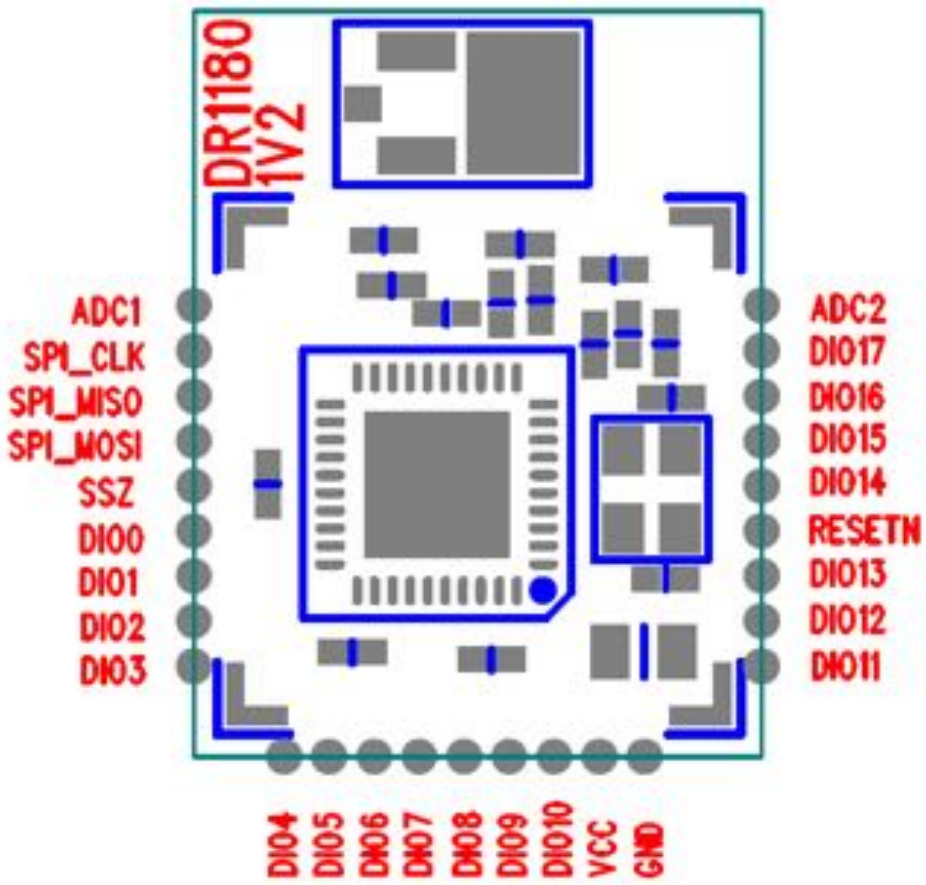


Fig 2. Location of the pins

b. Pin Assignment:

Pin No	Pin Fucntions					Description
	Primary	Alternate Functions				
1	ADC1					Analogue to Digital Input
2	DO0	SPICLK			PWM2	SPI Master Clock Output or PWM2 Output
3	DO1	SPIMISO			PWM3	SPI Master In Slave Out Input or PWM3 Output
4	DIO18	SPIMOSI				SPI Master Out Slave In Output
5	DIO19	SPISEL0				SPI Master Select Output 0
6	DIO0	SPISEL1	ADC3			DIO0, SPI Master Select Output 1 or ADC input 3
7	IO1	SPISEL2	ADC4	PC0		DIO1, SPI Master Select Output 2, ADC input 4 or Pulse Counter 0 Input
8	DIO2*		RFRX	TIM0CK_GT		DIO2, Radio Receive Control Output or Timer0 Clock/Gate Input
9	DIO3*		RFTX	TIM0CAP		DIO3, Radio Transmit Control Output or Timer0 Capture Input
10	DIO4	CTS0	JTAG_TCK	TIM0OUT	PC0	DIO4, UART 0 Clear To Send Input, JTAG CLK Input, Timer0 PWM Output, or Pulse Counter 0 input
11	DIO5	RTS0	JTAG_TMS	PWM1	PC1	DIO5, UART 0 Request To Send Output, JTAG Mode Select Input, PWM1 Output or Pulse Counter 1 Input
12	DIO6	TXD0	JTAG_TDO	PWM2		DIO6, UART 0 Transmit Data Output, JTAG Data Output or PWM2 Output
13	DIO7	RXD0	JTAG_TDI	PWM3		DIO7, UART 0 Receive Data Input, JTAG Data Input or PWM 3 Output
14	DIO8	TIM0CK_GT	PC1	PWM4		DIO8, Timer0 Clock/Gate Input, Pulse Counter1 Input or PWM 4 Output
15	DIO9	TIM0CAP	32KXTALIN	RXD1	32KIN	DIO9, Timer0 Capture Input, 32K External Crystal Input, UART 1 Receive Data Input or 32K external clock Input
16	DIO10	TIM0OUT	32KXTALOUT			DIO10, Timer0 PWM Output or 32K External Crystal Output
17	VDD					Supply Voltage
18	GND					Digital Ground
19	DIO11	PWM1		TXD1		DIO11, PWM1 Output or UART 1 Transmit Data Output
20	DIO12	PWM2	CTS0	JTAG_TCK	ADO or SPISMOSI	DIO12, PWM2 Output, UART 0 Clear To Send Input, JTAG CLK Input, Antenna Diversity Odd Output or SPI Slave Master Out Slave In Input
21	DIO13	PWM3	RTS0	JTAG_TMS	ADE or SPISMISO	DIO13, PWM3 Output, UART 0 Request To Send Output, JTAG Mode Select Input, Antenna Diversity Even output or SPI Slave Master In Slave Out Output
22	RESETN					Reset input
23	DIO14	SIF_CLK	TXD0 TXD1	JTAG_TDO	SPISEL1 or SPISSEL	DIO14, Serial Interface Clock UART 0 Transmit Data Output, UART 1 Transmit Data Output, JTAG Data Output, SPI Master Select Output 1 or SPI Slave Select Input
24	DIO15	SIF_D	RXD0 RXD1	JTAG_TDI	SPISEL2	DIO15, Serial Interface Data or Intelligent Peripheral Data Out
25	DIO16	COMP1P	SIF_CLK	SPISMOSI		DIO16, Comparator Positive Input, Serial Interface clock or SPI Slave Master Out Slave In Input
26	DIO17	COMP1M	PWM4	I2C DATA	SPISIMO	DIO17, Comparator Negative Input, Serial Interface Data or SPI Slave Master In Slave Out Output
27	VREF/ADC2					Analogue peripheral reference voltage or ADC input 2

4. Electrical Characteristics (Module)

Typical DC Characteristics		Notes
Deep Sleep current	50nA	
Sleep current	0.7µA	With active sleep timer
Radio transmit current	21mA	CPU in doze, radio transmitting @8.5dBm
Radio receive current	13mA	CPU in doze, radio receiving @0dBm
Centre frequency accuracy	+/-25ppm	Additional +/-15ppm allowance for temperature and ageing
Supply voltage	2.0 to 3.6V	
Operating Temperature	-40°C to +125°C	Standard range
Typical RF Characteristics		**Notes**
Frequency range	2.4 to 2.485GHz	
Receive sensitivity	-95dBm	Nominal for 1% PER, as per 802.15.4
Transmit power	8.5dBm	Normal
Maximum receiver input power	9dBm	1% PER, measured as sensitivity, supply current at 14.7 mA
RSSI range	-4 to +4 dB	-95 dBm to -10 dBm
RF Port impedance – uFL connector	50 ohm	2.4 - 2.485GHz
Rx Spurious Emissions	-70dBm	Measured conducted into 50ohms
Tx Spurious Emissions	-65dBm	Measured conducted into 50ohms
Peripherals		**Notes**
Master SPI port	3 selects	Up to 16MHz
Slave SPI port	Available	Up to 8MHz
Two UARTs	Available	16550 compatible
Two-wire serial I/F (compatible with SMbus & I^2C)	Available	Up to 400kHz
5 x PWM (4 x timer, 1 x timer/counter)	Available	16MHz clock
Two programmable Sleep Timers	Available	32kHz clock
Digital IO lines (multiplexed with UARTs, timers and SPI selects)	20	
6 channel Analogue-to-Digital converter	Available	10-bit, up to 100ks/s
Programmable analogue comparators	Available	Ultra low power mode for sleep

Antenna Specification (*For Reference Only)

Antenna plate	FPC antenna
Antenna gain	2dBi
Frequency range	2.4GHZ-2.483GHZ
POWER	0dBm
Connector type	External antenna

(*1)●Ordering Information

SH-IOTML①②③P-④⑤

Designator	Item	Symbol	Description
①	Communication Format	1	Jennet-IP Format
		3	Zigbee Format
②	Light Bulb drive channels	0	Single Color Light
		1	Dual color Light
		2	RGBW color Light (TBD)
③	Version Number	A	JN5168 Version
		B	JN5169 Version
④	Antenna Option	--	External Antenna model
		I	Internal PCB Antenna model
		P	Internal PA, External Antenna model
⑤	Output protocol	--	Jennet-IP protocol
		L	Zigbee Light Link protocol
		H	Zigbee Home Automation 1.2 protocol

CC Statement:
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 has been tested and found to comply with the limits for a Class B digital device, pursuant to 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 into 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.
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 equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.
This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

The module is designed to comply with the FCC statement. FCC ID is RR3-SH-IOTML30BP. The host system using this modular should have label indicated it contain modular's FCC ID RR3-SH-IOTML30BP.

This radio module must not installed to co-locate and operating simultaneously with other radios in host system, additional testing and equipment authorization may be required to operating simultaneously with other radio."