LoRa Module Data Sheet

Semtech SX1262 Chipset for LoRa

Design Name: Type1SJ
Sample P/N : LBAA0QB1SJ-295SMP
MP P/N : LBAA0QB1SJ-295

This Datasheet is preliminary version, and subject to change without notice

Revision History

Revision Code	Date	Description	Comments
	May 4, 2018	Initial Draft	
A	May 18, 2018	Updated Electrical Characteristics	
B	Apr 10, 2019	Changed the module size, block diagram, terminal configuration etc.	
C	May 16, 2019	Updated the module Weight, Electrical Characteristics, Tape and Reel Packing	
D	Aug 9, 2019	Updated Tape and Reel Packing Added Label information	
E	May 9,2020	Added the certification statements Added the description of 2 antennas Update some information Updated Electrical Characteristics Updated block diagram Updated reference circuit	
F	May 18,2020	Update Scope , Notice and PRECONDISION TO USE OUR PRODUCTS	
G	Nov 9, 2020	Updated Packing (Humidity proof Packing)	
H	Nov 12,2020	Added the Anatel statements	
I	Jan 18,2021	Added comment in LoRa transmit specification	
J	Apr 12,2021	Changed Part Number of Evaluation board	
K	July 9, 2021	Updated Certification Info	
L	Oct 27, 2021	Delete comment in LoRa transmit specification	
M	Feb 27,202	Change the sample part number and EVK part number on p1,4	

TABLE OF CONTENTS

1. Scope

Interfaces	: UART, I2C, USB, SPI
Main ICs	: STM32L, SX1262
Reference Clocks	: Integrated 32MHz clock (TCXO with frequency error=±3.0 ppm) and 32.768KHz clock (frequency error=±20 ppm)
Supported Frequencies	: 868 MHz, 915 MHz
Module Size	: 10.0 mm x 8.0 mm x 1.60 (max) mm.
Weight	: 0.28g (Typ.)
Package	: Resin mold
RoHS	: This module is compliant with the RoHS directive
MSL*	: Level 3

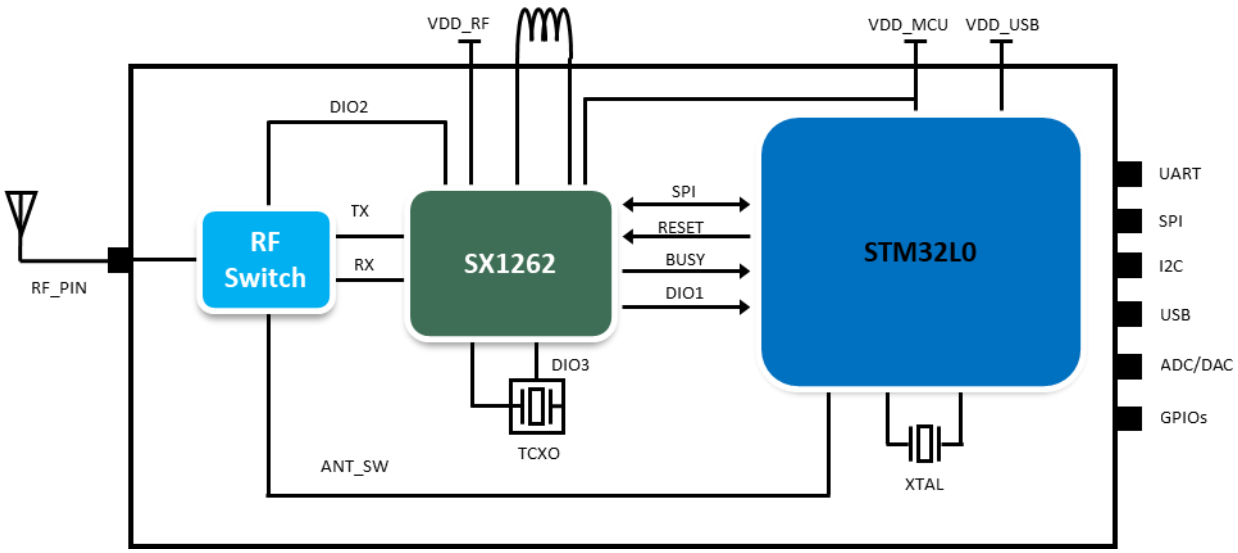
*This product is moisture sensitive. Please check the detail in 13.1 Storage Condition section.

2. Part Number

Ordering Part Number	Description
LBAA0QB1SJ-295SMP	Engineering sample
LBAA0QB1SJ-TEMP-EVK	Evaluation board
LBAA0QB1SJ-295	MP P/N

"Type1SJ" is design name of this module. Design name may be used in certification test report.

3. Block Diagram



4. Certification info

USA/Canada

FCC ID	VPYLBAA0QB1SJ
IC	772C-LBAA0QB1SJ

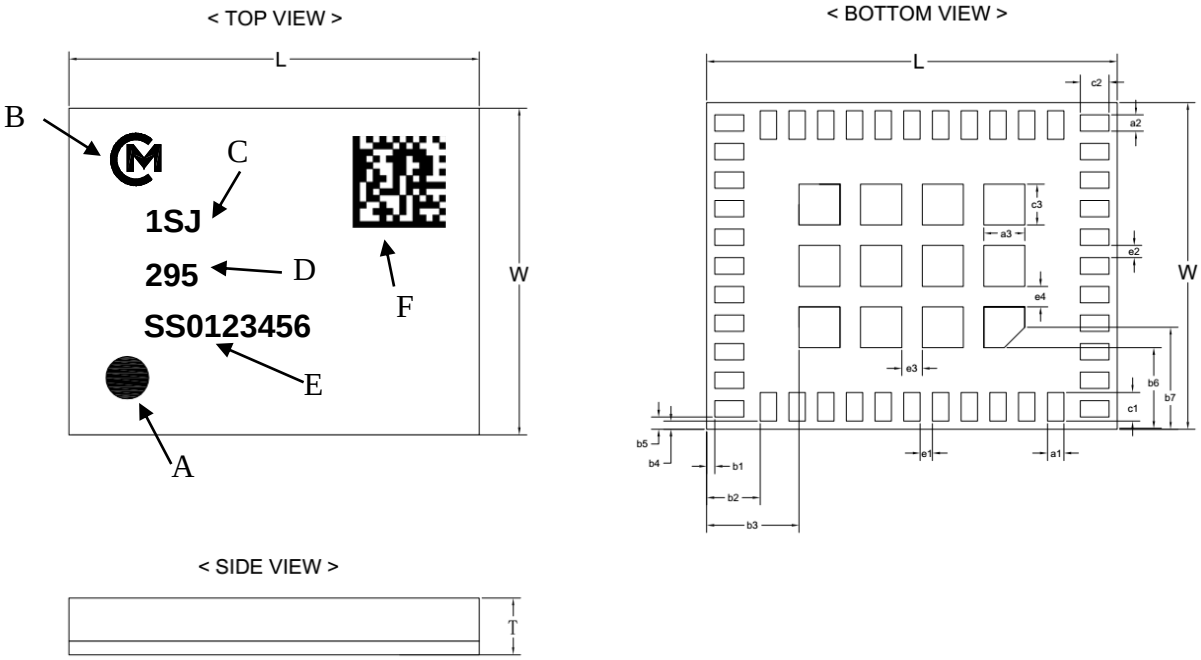
Europe

EN300 220-2 V3.2.1 compliant.

Brazil

Anatel ID : 14760-20-08488

5. Dimensions, Marking and Terminal Configurations

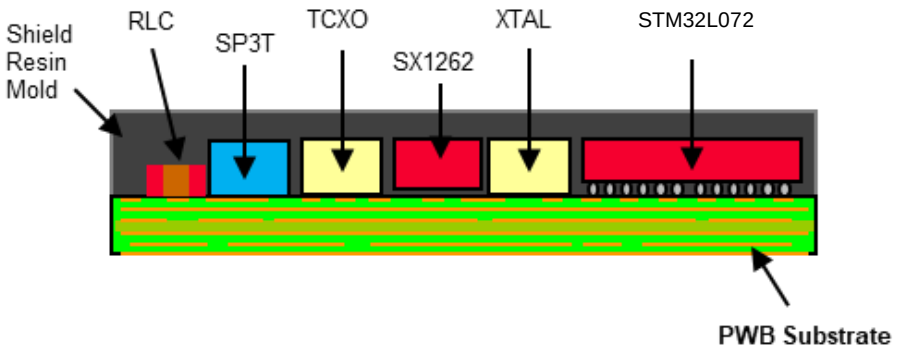


Marking	Meaning
A	Pin 1 Marking
B	Murata Logo
C	Module Type
D	Module Number
E	Inspection Number
F	2D code (internal use)

Table 1 Dimension (Unit: mm)

Mark	Dimension	Mark	Dimension	Mark	Dimension
L	10.0±0.2	**W**	8.0±0.2	**T**	1.60 max
a1	0.4±0.1	**a2**	0.4±0.1	**a3**	1.0±0.1
b1	0.2±0.15	**b2**	1.3±0.15	**b3**	2.3±0.15
b4	0.2±0.15	**b5**	0.3±0.15	**b6**	2.0±0.15
b7	2.5±0.15	**c1**	0.7±0.1	**c2**	0.7±0.1
c3	1.0±0.1	**e1**	0.3±0.1	**e2**	0.3±0.1
e3	0.5±0.1	**e4**	0.5±0.1		

Structure



Terminal Configurations

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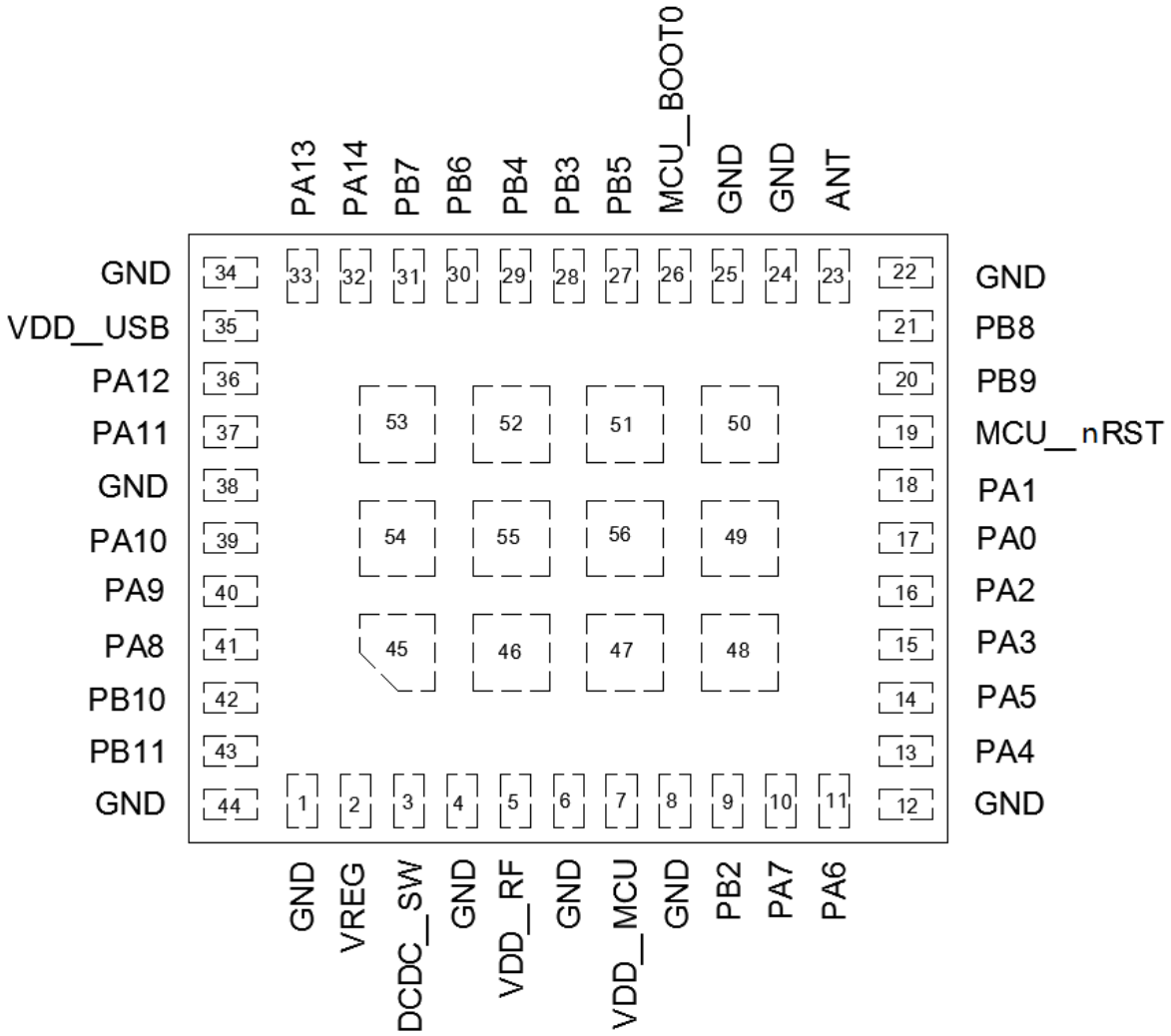


NO.	Terminal Name	NO.	Terminal Name	NO.	Terminal Name	NO.	Terminal Name
1	GND	13	PA4	25	GND	37	PA11
2	VREG	14	PA5	26	MCU_BOOT0	38	GND
3	DCDC_SW	15	PA3	27	PB5	39	PA10
4	GND	16	PA2	28	PB3	40	PA9
5	VDD_RF	17	PA0	29	PB4	41	PA8
6	GND	18	PA1	30	PB6	42	PB10
7	VDD_MCU	19	MCU_nRST	31	PB7	43	PB11
8	GND	20	PB9	32	PA14	44	GND
9	PB2	21	PB8	33	PA13	45~56	GND
10	PA7	22	GND	34	GND		
11	PA6	23	ANT	35	VDD_USB		
12	GND	24	GND	36	PA12		

Table 2 Terminal Configurations

Pin NO.	Terminal Name	Type	Connection to IC terminal	Description
1	GND	Ground	-	Ground
2	VREG	O	SX1262_VREG	Regulated output voltage from internal regulator LDO/DC-DC
3	DCDC_SW	O	SX1262_DCC_SW	DC-DC Switcher Output
4	GND	Ground	-	Ground
5	VDD_RF	Power	SX1262_VBAT / VDD_IN	Power supply for RF IC
6	GND	Ground	-	Ground
7	VDD_MCU	Power	SX1262_VBAT_IO, STM32L072_VDD / VDDA / VREF+	Power supply for MCU and RF IC
8	GND	Ground	-	Ground
9	PB2	I/O	STM32L072_PB2	GPIO mode:PB2 LPTIM1_OUT I2C3_SMBA
10	PA7	I/O	STM32L072_PA7	GPIO mode:PA7 SPI1_MOSI COMP2_OUT ADC_IN7
11	PA6	I/O	STM32L072_PA6	GPIO mode:PA6 SPI1_MISO LPUART1_CTS COMP1_OUT ADC_IN6
12	GND	Ground	-	Ground
13	PA4	I/O	STM32L072_PA4	GPIO mode:PA4 SPI1_NSS UART2_CK COMP1_INM/COMP2_INM ADC_IN4 DAC_OUT1
14	PA5	I/O	STM32L072_PA5	GPIO mode:PA5 SPI1_SCK COMP1_INM/COMP2_INM ADC_IN5 DAC_OUT2
15	PA3	I/O	STM32L072_PA3	GPIO mode:PA3 ADC_IN3 USART2_RX LPUART1_RX COMP2_INP

Pin NO.	Terminal Name	Type	Connection to IC terminal	Description
16	PA2	I/O	STM32L072_PA2	GPIO mode:PA2 ADC_IN2 USART2_TX LPUART1_TX COMP2_OUT/COMP2_INM
17	PA0	I/O	STM32L072_PA0	GPIO mode:PA0 ADC_IN0 USART2_CTS USART4_TX COMP1_OUT/COMP1_INM
18	PA1	I/O	STM32L072_PA1	GPIO mode:PA1 ADC_IN1 USART2_RTS USART4_RX COMP1_INP
19	MCU_nRST	I	STM32L072_nRST	Reset for MCU
20	PB9	I/O	STM32L072_PB9	GPIO mode: PB9 I2C1_SDA SPI2_NSS I2S2_WS
21	PB8	I/O	STM32L072_PB8	GPIO mode:PB8 I2C1_SCL
22	GND	Ground	-	Ground
23	ANT	A, I/O	-	Transmit / Receive antenna
24	GND	Ground	-	Ground
25	GND	Ground	-	Ground
26	MCU_BOOT0	I	STM32L072_BOOT0	BOOT0 for MCU
27	PB5	I/O	STM32L072_PB5	GPIO mode:PB5 LPTIM1_IN1 SPI1_MOSI I2C1_SMBA USART1_CK USART5_RTS COMP2_INP
28	PB3	I/O	STM32L072_PB3	GPIO mode:PB3 COMP2_INM SPI1_CLK USART1_RTS USART5_TX

Pin NO.	Terminal Name	Type	Connection to IC terminal	Description
29	PB4	I/O	STM32L072_PB4	GPIO mode:PB4 COMP2_INP SPI1_MISO USART1_CTS USART5_RX I2C3_SDA
30	PB6	I/O	STM32L072_PB6	GPIO mode:PB6 I2C1_SCL USART1_TX LPTIM1_ETR COMP2_INP
31	PB7	I/O	STM32L072_PB7	GPIO mode:PB7 I2C1_SDA USART1_RX LPTIM1_IN2 USART4_CTS COMP2_INP VREF_PVD_IN
32	PA14	I/O	STM32L072_PA14	GPIO mode:PA14 SWCLK USART2_TX LPUART1_TX
33	PA13	I/O	STM32L072_PA13	GPIO mode:PA13 SWDIO USB_OE LPUART1_RX
34	GND	Ground	-	Ground
35	VDD_USB	Power	STM32L072_VDD_USB	Power supply for MCU USB Interface
36	PA12	I/O	STM32L072_PA12	GPIO mode:PA12(power supply by VDD_USB) USB_DP SPI1_MOSI USART1_RTS COMP2_OUT
37	PA11	I/O	STM32L072_PA11	GPIO mode:PA11(power supply by VDD_USB) USB_DM SPI1_MISO USART1_CST COMP1_OUT
38	GND	Ground	-	Ground
39	PA10	I/O	STM32L072_PA10	GPIO mode:PA10 USART1_RX I2C1_SDA
Pin NO.	**Terminal Name**	**Type**	**Connection to IC terminal**	**Description**
40	PA9	I/O	STM32L072_PA9	GPIO mode:PA9

				USART1_TX I2C1_SCL I2C3_SMBA MCO
41	PA8	I/O	STM32L072_PA8	GPIO mode:PA8 MCO USB_CRS_SYNC USART1_CK I2C3_SCL
42	PB10	I/O	STM32L072_PB10	GPIO mode:PB10 LPUART1_TX/LPUART1_RX SPI2_SCK I2C2_SCL
43	PB11	I/O	STM32L072_PB11	GPIO mode:PB11 LPUART1_RX/ LPUART1_TX I2C2_SDA
44	GND	Ground	-	Ground
45~56	GND	Ground	-	Ground

Notes: GPIO pins are to be left OPEN if not used.

6. Absolute Maximum Ratings

Table 3 Maximum ratings

Parameters		Min	Typ	Max	Unit
Storage Temperature		-40	25	+85	degC
Input RF Level		-	-	10	dBm
Supply Voltage	VDD_RF, VDD_MCU, VDD_USB	-0.3	-	3.9	V

7. Operating Condition

Table 4 Operating specification

Parameters		Min	Typ	Max	Unit
Operating Temperature		-40	25	+85	degC
Supply Voltage	VDD_RF, VDD_MCU	2.0	-	3.6	V
	VDD_USB (USB peripheral used) (1)	3.0	-	3.6	V
	VDD_USB(USB peripheral not used) (1)	VDD_MCU_min	VDD_MCU	VDD_MCU_max	V

(1) VDD_USB must respect the following conditions:
- When VDD_MCU is powered on (VDD_MCU < VDD_MCU_min), VDD_USB should be always lower than VDD_MCU.
- When VDD_MCU is powered down (VDD_MCU < VDD_MCU_min), VDD_USB should be always lower than VDD_MCU.
- In operating mode, VDD_USB could be lower or higher than VDD_MCU.
- If the USB is not used, VDD_USB must be tied to VDD_MCU to be able to use PA11 and PA12 as standard I/O.

8. Electrical Characteristics

8.1. FSK Transceiver Specification

Conditions:

Supply voltage =3.3 V, Temperature = 25 °C, TCXO = 32 MHz, F_{RF} =868/915 MHz, all RF impedances matched, transmit mode output power defined in 50 Ohm load, FSK BER = 0.1%, 2-level FSK modulation without pre-filtering, BR = 4.8 kb/s, FDA = 5 kHz, BW_F = 20 kHz double-sided, unless otherwise specified.

FSK Receive Specification

Symbol	Description	Conditions	Min	Typ	Max	Unit
RXS_2FB	Sensitivity 2-FSK, RX Boosted, Split RF path for RX and TX	BR_F = 4.8 kb/s, FDA = 5 kHz, BW_F = 20 kHz		-117		dBm

FSK Transmit Specification

Symbol	Description	Conditions	Min	Typ	Max	Unit
TXOP	Power setting = 22 dBm	868MHZ Band		21.5		dBm
		915MHZ Band		20.8		dBm
IDDTX	Power setting = 22 dBm	868MHZ Band		124		mA
		915MHZ Band		112		mA

8.2. LoRa Transceiver Specification

Conditions:

The table below gives the electrical specifications for the transceiver operating with LoRaTM modulation. Following conditions apply unless otherwise specified: Supply voltage = 3.3 V, Temperature = 25 °C, TCXO = 32 MHz, F_{RF} =868/915 MHz, all RF impedances matched, transmit mode output power defined in 50 Ohm load, Error Correction Code (EC) = 4/5, Packet Error Rate (PER)= 1%, CRC on payload enabled, Payload length = 10 bytes.

LoRa Receive Specification

Symbol	Description	Conditions	Min	Typ	Max	Unit
IDDRX	Receive mode, DC-DC mode used, RX Boosted,	868MHZ Band		15.5(1)		mA
		915MHz Band		15.5(1)		mA
IDDRX	Receive mode, LDO mode used, RX Boosted	868MHZ Band		20.0(1)		mA
		915MHz Band		20.0(1)		mA
RXS_LB (125KHz)	Sensitivity Lora, RX Boosted, Split RF path for RX and TX. 125KHz bandwidth	SF = 7		-124		dBm
		SF = 12		-137		dBm
RXS_LB (250KHz)	Sensitivity Lora, RX Boosted, Split RF path for RX and TX. 250KHz bandwidth	SF = 7		-121		dBm
		SF = 12		-134		dBm

(1) IDDRX is tested under test FW, and MCU is not in sleep mode.

LoRa Transmit Specification

Symbol	Description	Conditions	Min	Typ	Max	Unit
TXOP	TXOP setting = 22 dBm	868MHZ Band		21.5		dBm
		915MHZ Band[1]		20.8		dBm
IDDTX	TXOP setting = 22 dBm	868MHZ Band		124		mA
		915MHZ Band		112		mA

8.3. Low power mode current

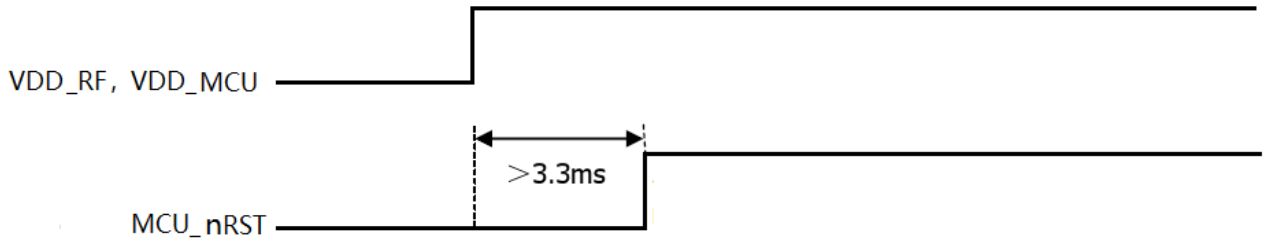
Conditions: Power supply=3.3 V, Temperature=25 °C;

Description	Min	Typ	Max	Unit
STM32L072 in stop mode with RTC (Real Time Clock) SX1262 in cold start sleep mode[1]		1.3		uA
STM32L072 in stop mode with RTC (Real Time Clock) SX1262 in warm start sleep mode without RC64K(64kHz RC oscillator)[2]		2.0		uA
STM32L072 in stop mode with RTC (Real Time Clock) SX1262 in warm start sleep mode with RC64K(64kHz RC oscillator)[2]		2.5		uA

1. Cold start is equivalent to device at POR or when the device is waking up from sleep mode with all blocks OFF.
2. Warm start is only happening when device is waking up from sleep mode with its configuration retained.

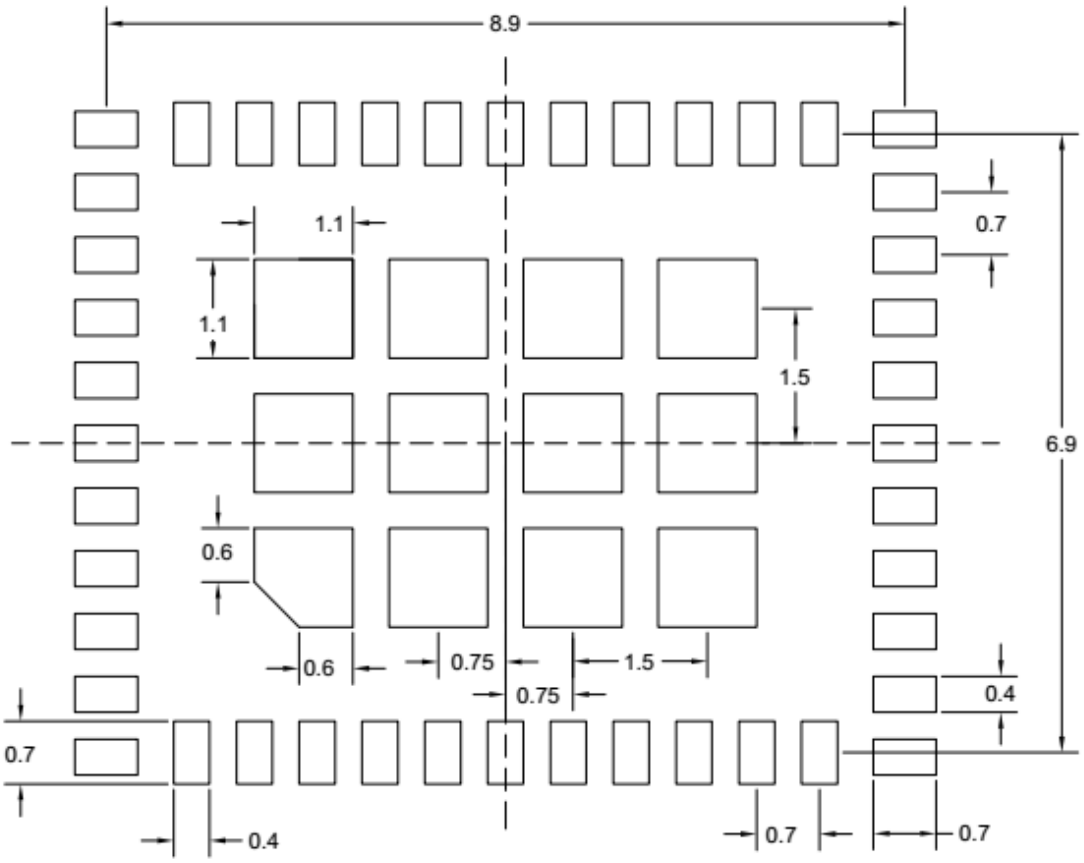
9. Power Sequences

9.1 Power Up Sequence



10. Recommend Land Pattern

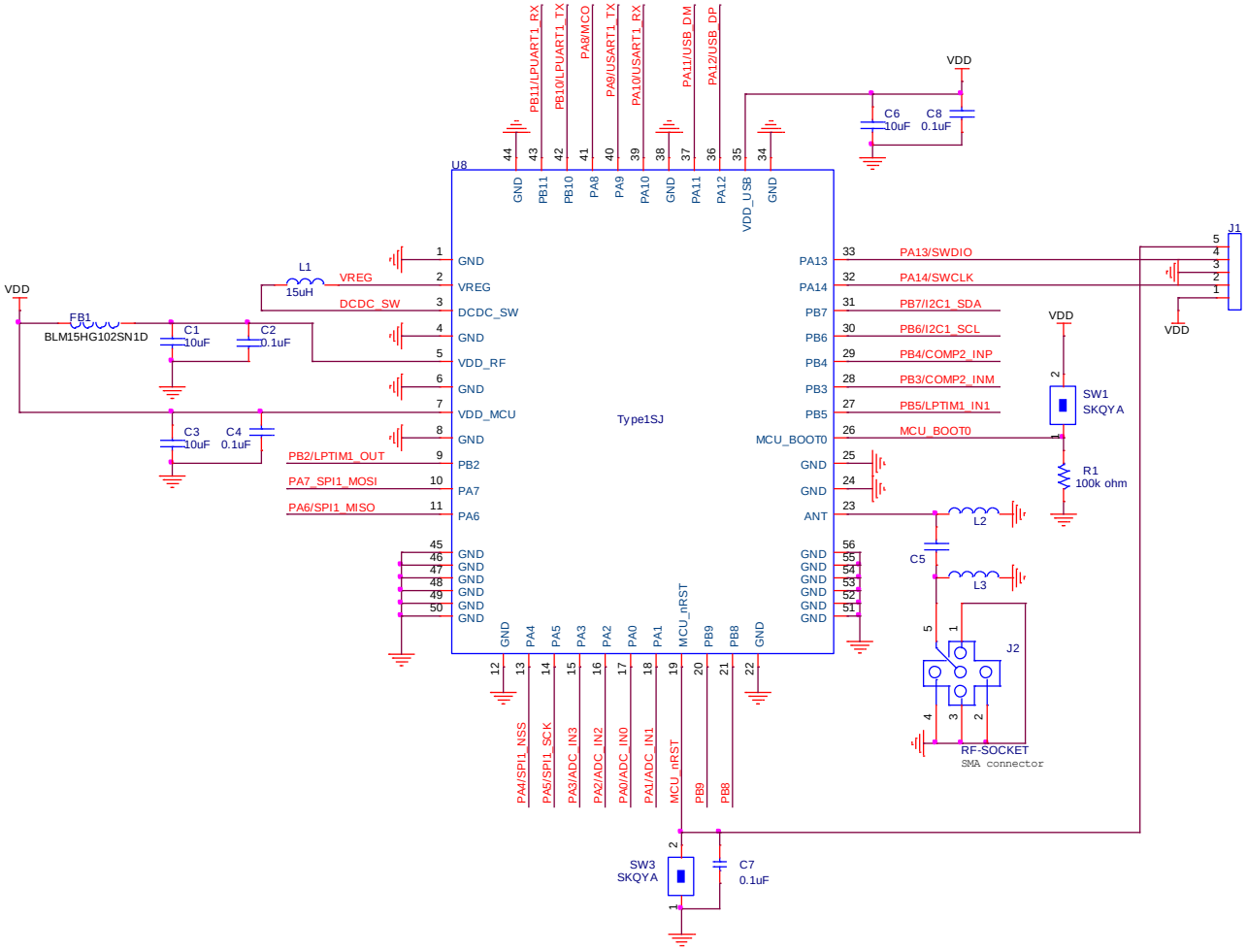
< TOP VIEW >



Notes:

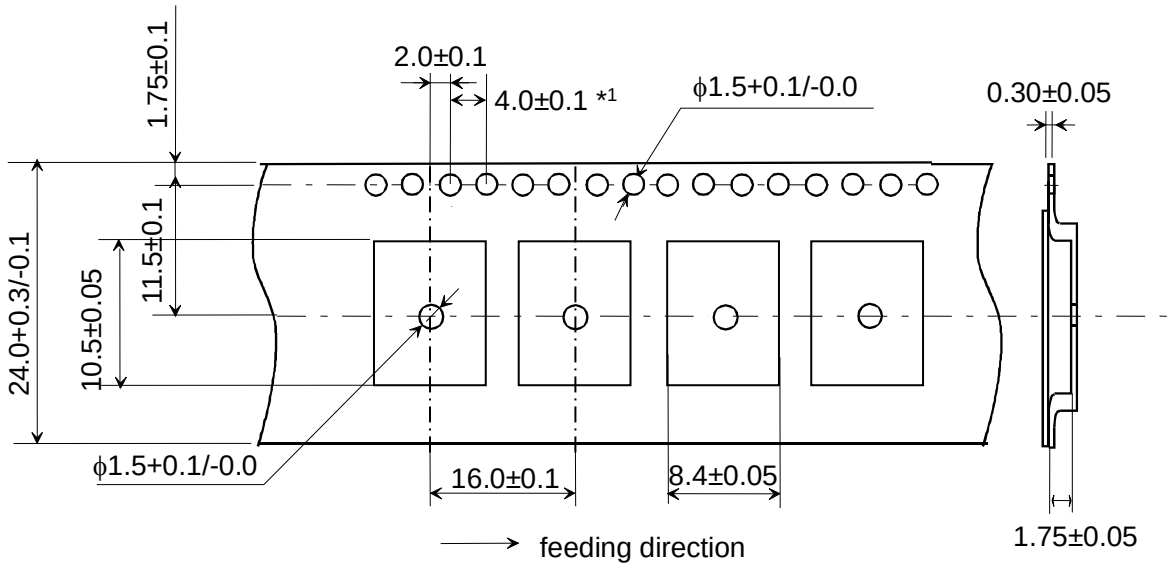
1. Dimension unit is millimeter (Angle unit is degree).
2. This land pattern is for reference only.
   Consult your manufacturing group to ensure your company's manufacturing guidelines are met.
3. Thermal vias in the land pattern of the exposed pad shall be connected to a system ground plane. Failure to do so may compromise the thermal and/or functional performance of the device.
4. Square package-dimension apply in both "X" and "Y" directions.

11. Reference Circuit



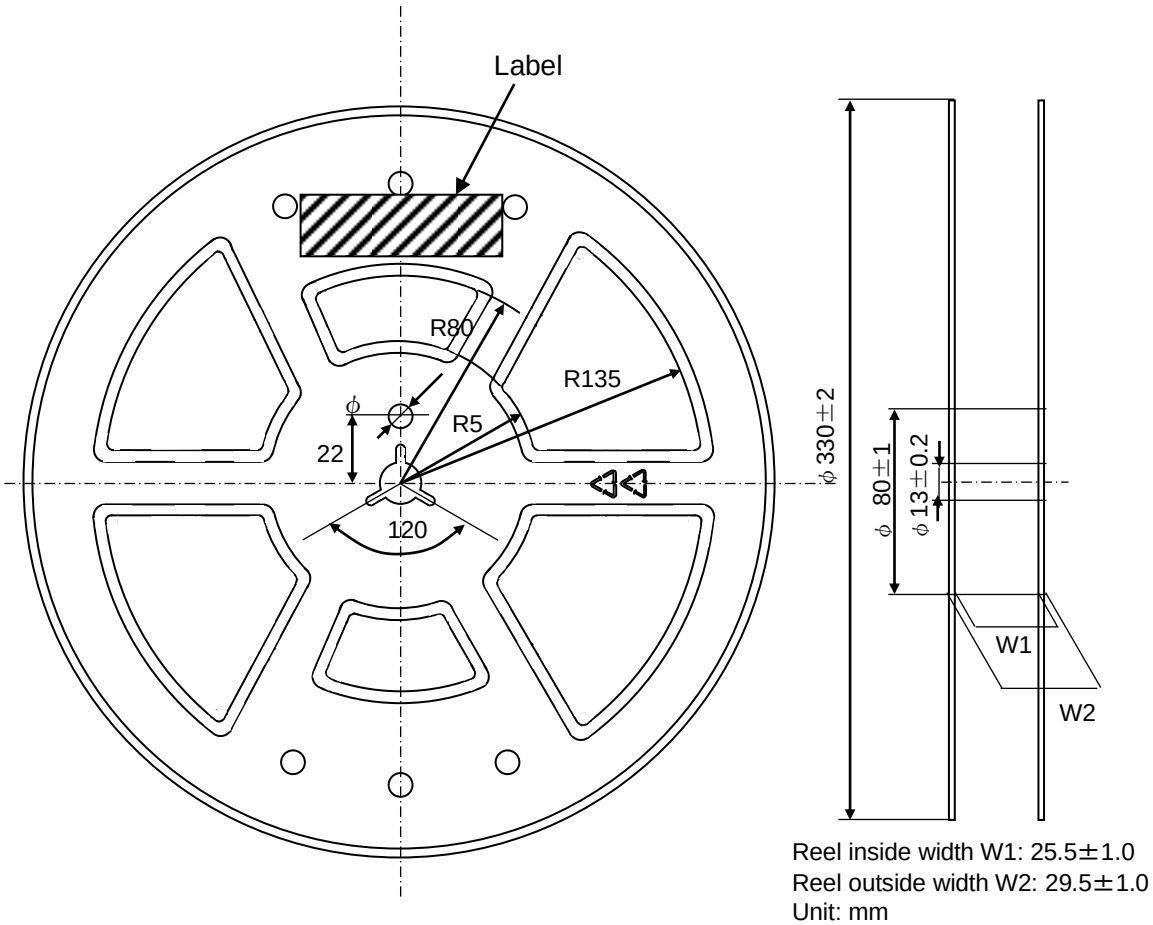
12. Tape and Reel Packing

12.1. Dimension of Tape



(unit: mm)

12.2. Dimensions of Reel



Reel inside width W1: 25.5±1.0
Reel outside width W2: 29.5±1.0
Unit: mm

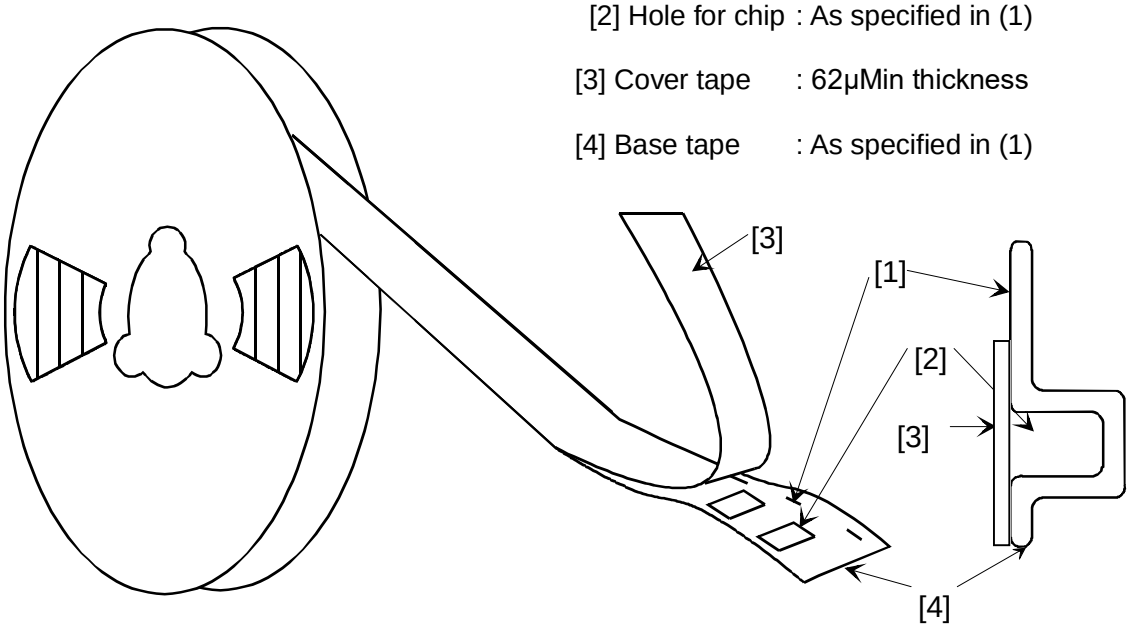
12.3. Taping Diagrams

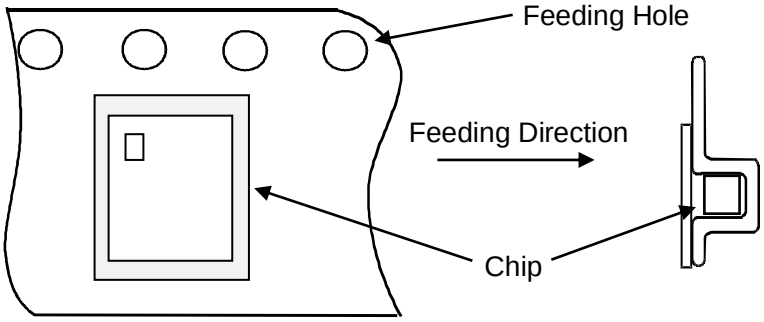
[1] Feeding Hole : As specified in (1)

[2] Hole for chip : As specified in (1)

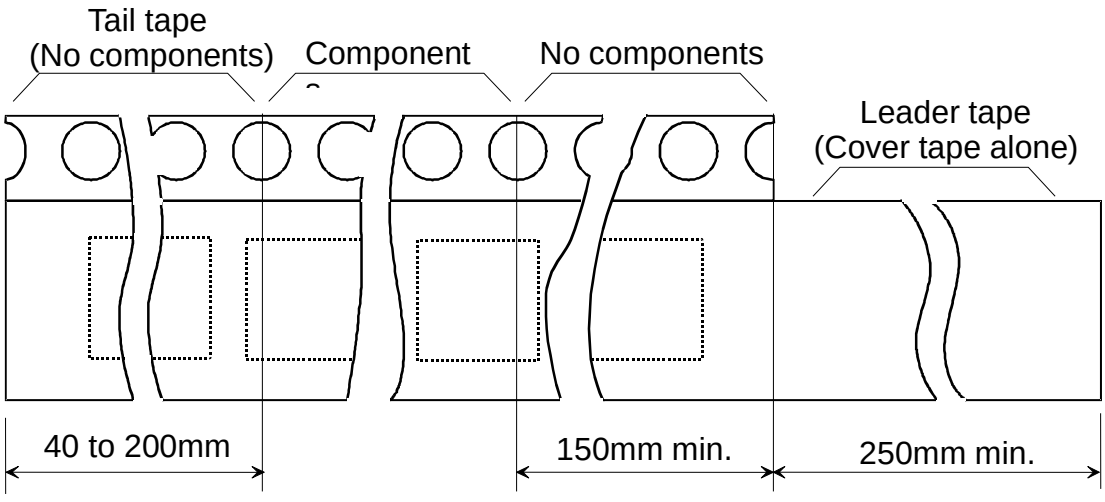
[3] Cover tape : 62μMin thickness

[4] Base tape : As specified in (1)



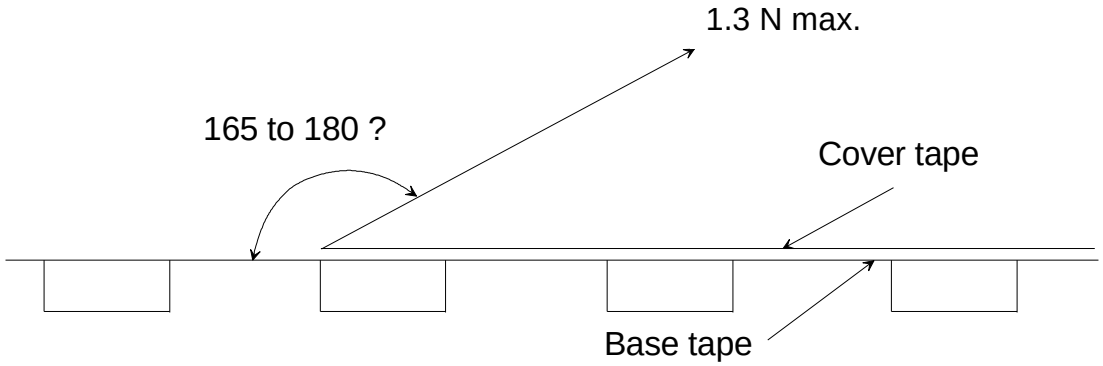


12.4. Leader and Tail Tape

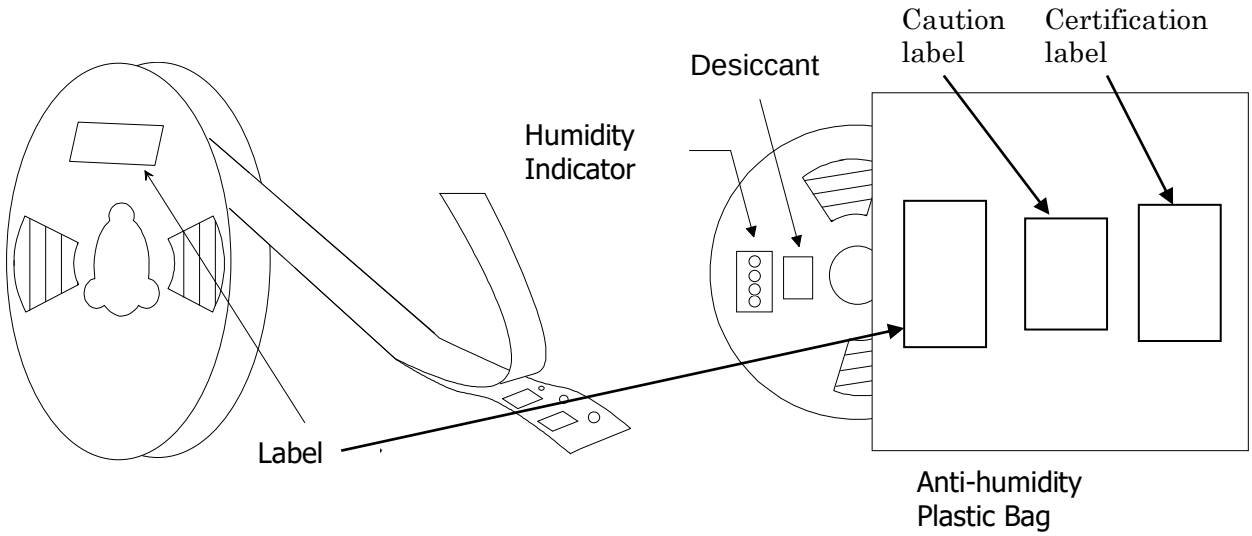


Feeding direction

- The tape for chips are wound clockwise, the feeding holes to the right side as the tape is pulled toward the user.
- The cover tape and base tape are not adhered at no components area for 250mm Min.
- Tear off strength against pulling of cover tape: 5N Min.
- Packaging unit : 1000 pcs/ reel
- Material
  - Base tape : Plastic
  - Reel : Plastic
  - Cover tape, cavity tape and reel are made the anti-static processing.
- Peeling of force: 1.3N max. in the direction of peeling as shown below.



- Packaging (Humidity proof Packing)



Tape and reel must be sealed with the anti-humidity plastic bag. The bag contains the desiccant and the humidity indicator.

13. Notice

13.1. Storage Conditions

Please use this product within 6month after receipt.
- The product shall be stored without opening the packing under the ambient temperature from 5 to 35 °C and humidity from 20 ~ 70 %RH.
(Packing materials, in particular, may be deformed at the temperature over 40 °C)
- The product left more than 6months after reception, it needs to be confirmed the solder ability before used.
- The product shall be stored in non-corrosive gas (CL2, NH3, SO2, NOx, etc.).
- Any excess mechanical shock including, but not limited to, sticking the packing materials by sharp object and dropping the product, shall not be applied in order not to damage the packing materials.

This product is applicable to MSL3 (Based on IPC/JEDEC J-STD-020)
- After the packing opened, the product shall be stored at <30 °C / <60 %RH and the product shall be used within 168 hours.
Please record and manage the time after opening.
- Product should be repacked with desiccating agent immediately after using.
- When the color of the indicator in the packing changed, the product shall be baked before soldering.
Baking condition: 125 +5/-0 °C, 24 hours, 1 time
The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

*For the MSL standard, see IPC/JEDEC J-STD-020 (can be downloaded from www.jedec.org).
If the storage environment is not conducted above standard conditions, it will cause some issue (e.g., Operation issue, Overcurrent, Malfunction) we shall not be responsible for that.
Before using please refer to “PRECONDITIONS TO USE MURATA PRODUCTS”

13.2. Handling Conditions

Be careful in handling or transporting products because excessive stress or mechanical shock may break products.

Handle with care if products may have cracks or damages on their terminals, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

13.3. Standard PCB Design (Land Pattern and Dimensions)

All the ground terminals should be connected to the ground patterns. Furthermore, the ground pattern should be provided between IN and OUT terminals. Please refer to the specifications for the standard land dimensions.

The recommended land pattern and dimensions is as Murata's standard. The characteristics of products may vary depending on the pattern drawing method, grounding method, land dimensions, land forming method of the NC terminals and the PCB material and thickness. Therefore, be sure to verify the characteristics in the actual set. When using non-standard lands, contact Murata beforehand.

13.4. Notice for Chip Placer :

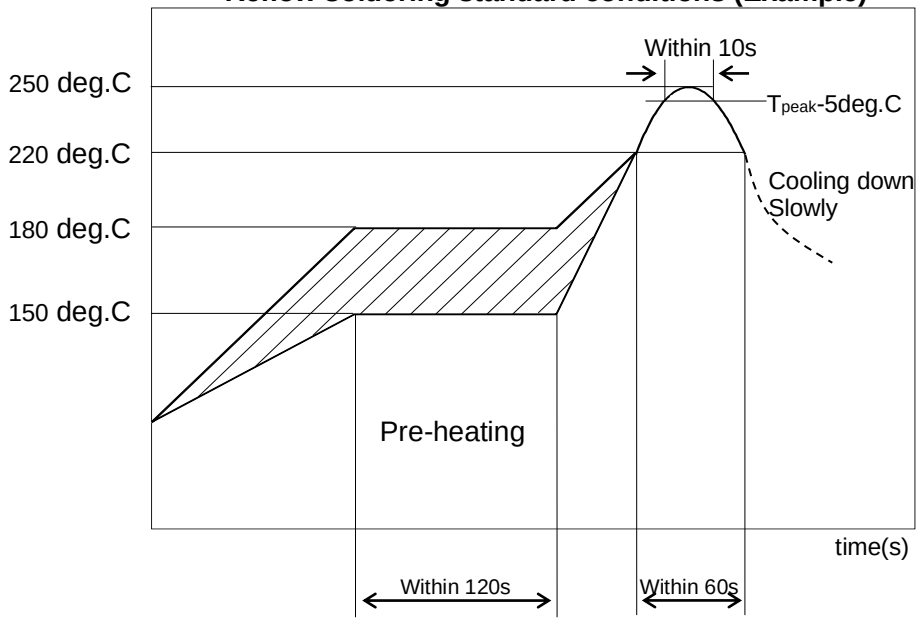
When placing products on the PCB, products may be stressed and broken by uneven forces from a worn-out chucking locating claw or a suction nozzle. To prevent products from damages, be sure to follow the specifications for the maintenance of the chip placer being used. For the positioning of products on the PCB, be aware that mechanical chucking may damage products.

13.5. Soldering Conditions :

The recommendation conditions of soldering are as in the following figure.
Soldering must be carried out by the above mentioned conditions to prevent products from damage. Set up the highest temperature of reflow within 260 °C. Contact Murata before use if concerning other

soldering conditions.

Reflow soldering standard conditions (Example)



Please use the reflow within 2 times.
Use rosin Type flux or weakly active flux with a chlorine content of 0.2 wt % or less.

13.6. Cleaning :

Since this Product is Moisture Sensitive, any cleaning is not recommended. If any cleaning process is done the customer is responsible for any issues or failures caused by the cleaning process.

13.7. Operational Environment Conditions :

Products are designed to work for electronic products under normal environmental conditions (ambient temperature, humidity and pressure). Therefore, products have no problems to be used under the similar conditions to the above-mentioned. However, if products are used under the following circumstances, it may damage products and leakage of electricity and abnormal temperature may occur.

- In an atmosphere containing corrosive gas (CL2, NH3, SOx, NOx, etc.).
- In an atmosphere containing combustible and volatile gases.
- Dusty place.
- Direct sunlight place.
- Water splashing place.
- Humid place where water condenses.
- Freezing place.

If there are possibilities for products to be used under the preceding clause, consult with Murata before actual use.

As it might be a cause of degradation or destruction to apply static electricity to products, do not apply static electricity or excessive voltage while assembling and measuring.

13.8. Input Power Capacity :

Products shall be used in the input power capacity as specified in this specification.
Inform Murata beforehand, in case that the components are used beyond such input power capacity range.

14. Regulatory Statements

14.1. FCC Statements

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.

Cet appareil est conforme à la section 15 des réglementations de la FCC. Le fonctionnement de l'appareil est sujetaux deux conditions suivantes :
(1) cet appareil ne doit pas provoquer d'interférences néfastes, et
(2) cet appareil doit tolérer les interférences reçues, y compris celles qui risquent de provoquer un fonctionnement indésirable.

Note: This product 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 product 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 product 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.

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

Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps

When the FCC ID 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 be use wording "Contains transmitter module FCC ID: VPYLBAA0QB1SJ" or "Contains FCC ID: VPYLBAA0QB1SJ".

14.2. IC Statements

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radioexempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

When the Industry Canada 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 be use wording “Contains transmitter module IC: 772C-LBAA0QB1SJ”or “Contains IC: 772C-LBAA0QB1SJ”.

14.3. General Statements

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.

Therefore, the final host product must be submitted to Murata for confirmation that the installation for the module into the host is in compliance with regulations of FCC and IC Canada. Specially, if an antenna other than the model documented in the Filing is used, a Class 2 Permissive Change must be filed with the FCC.
Changes or modifications not expressly approved by the manufacturer could void the user’s authority to operate the equipment.

The LoRa module is for use with external antenna ONLY.

The certified antennas include:
(1) Monopole Antenna (LPRS: ANT-SS900) with peak gain 1.04dBi.
(2) PCB pattern Antenna with peak gain 1.0dBi.
(3) Flexible Antenna (Molex: 2111400100) with peak gain 1.0dBi.

This module has been approved by FCC to operate with the antenna types with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

14.4. ANATEL Statements

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

15. PRECONDITION TO USE OUR PRODUCTS

PLEASE READ THIS NOTICE BEFORE USING OUR PRODUCTS.

Please make sure that your product has been evaluated and confirmed from the aspect of the fitness for the specifications of our product when our product is mounted to your product.
All the items and parameters in this product specification/datasheet/catalog have been prescribed on the premise that our product is used for the purpose, under the condition and in the environment specified in this specification. You are requested not to use our product deviating from the condition and the environment specified in this specification.
Please note that the only warranty that we provide regarding the products is its conformance to the specifications provided herein. Accordingly, we shall not be responsible for any defects in products or equipment incorporating such products, which are caused under the conditions other than those specified in this specification.
WE HEREBY DISCLAIMS ALL OTHER WARRANTIES REGARDING THE PRODUCTS, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE, THAT THEY ARE DEFECT-FREE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.
You agree that you will use any and all software or program code (including but not limited to hcd, firmware, nvram, and blob) we may provide or to be embedded into our product ("Software") provided that you use the Software bundled with our product. YOU AGREE THAT THE SOFTWARE SHALL BE PROVIDED TO YOU "AS- IS" BASIS, MURATA MAKES NO REPRESENTATIONS OR WARRANTIES THAT THE SOFTWARE IS ERROR-FREE OR WILL OPERATE WITHOUT INTERRUPTION. AND MORE, MURATA MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED WITH RESPECT TO THE SOFTWARE. MURATA EXPRESSLY DISCLAIM ANY AND ALL WARRANTIES OR CONDITIONS OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE NOR THE WARRANTY OF TITLE OR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS.
You shall indemnify and hold harmless us, our affiliates and our licensor from and against any and all claims, costs, expenses and liabilities (including attorney's fees), which arise in connection with the using the Software.
The product shall not be used in any application listed below which requires especially high reliability for the prevention of such defect as may directly cause damage to the third party's life, body or property. You acknowledge and agree that, if you use our products in such applications, we will not be responsible for any failure to meet such requirements. Furthermore, YOU AGREE TO INDEMNIFY AND DEFEND US AND OUR AFFILIATES AGAINST ALL CLAIMS, DAMAGES, COSTS, AND EXPENSES THAT MAY BE INCURRED, INCLUDING WITHOUT LIMITATION, ATTORNEY FEES AND COSTS, DUE TO THE USE OF OUR PRODUCTS AND THE SOFTWARE IN SUCH APPLICATIONS.

- Aircraft equipment.
- Aerospace equipment
- Undersea equipment.
- Power plant control equipment
- Medical equipment.
- Traffic signal equipment.
- Burning / explosion control equipment
- Disaster prevention / crime prevention equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Application of similar complexity and/ or reliability requirements to the applications listed in the above.

We expressly prohibit you from analyzing, breaking, reverse-engineering, remodeling altering, and reproducing our product. Our product cannot be used for the product which is prohibited from being manufactured, used, and sold by the regulations and laws in the world.
We do not warrant or represent that any license, either express or implied, is granted under any our patent right, copyright, mask work right, or our other intellectual property right relating to any combination, machine, or process in which our products or services are used. Information provided by us regarding third-party products or services does not constitute a license from us to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from us under our patents or other intellectual property.
Please do not use our products, our technical information and other data provided by us for the purpose of developing of mass-destruction weapons and the purpose of military use.
Moreover, you must comply with "foreign exchange and foreign trade law", the "U.S. export administration regulations", etc.
Please note that we may discontinue the manufacture of our products, due to reasons such as end of supply of materials and/or components from our suppliers.
By signing on specification sheet or approval sheet, you acknowledge that you are the legal representative for your company and that you understand and accept the validity of the contents herein. When you are not able to return the signed version of specification sheet or approval sheet within 30 days from receiving date of specification sheet or approval sheet, it shall be deemed to be your consent on the content of specification sheet or approval sheet. Customer acknowledges that engineering samples may deviate from specifications and may contain defects due to their development status. We reject any liability or product warranty for engineering samples. In particular we disclaim liability for damages caused by
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