LBAD0ZZ1SE

LTE CAT M1/NB-IoT Module

RoHS Compliance
This component is compliant with RoHS directive.
This component was always RoHS compliant from the first date of manufacture.

Features

- LTE Cat M1 – Class 3, up to 23dBm
- NB-IoT (NB1) Rel. 13
- STM32L462RE/Cortex M4 w/512KB Flash and 160 KB SRAM
- 1MB on-board Serial Flash
- Dimension: 15.4 x 18.0 x 2.5 mm (max)
- Package: LGA
- SIM card: internal eSIM (WLCSP)
- Antenna configurations: U.FL antenna connection
- 3GPP eDRX and PSM modes
- Power Consumption: enables up to 10-year battery life
- Support PSM and eDRX
- Operating temperature range: -40 °c to 85 °c
- OTA firmware upgrade
- Global Certifications: GCF and PTCRB
- IPv4/IPv6 stack with TCP and UDP protocol
- SSL/TLS
- LTE universal modem supports (low-band and mid-band):
  - Low-band B5/B8/B12/B13/B14(CAT M1 Only)/B17/B18/B19/B20/B26/B28
  - Mid-band B1/B2/B3/B4/B25

Benefits

- Certified as a host device for ease of integration with several different types of applications
  - Quicker time to market (no additional carrier or regulatory certification)
  - Less development time and costs for developer/device manufacturer in need of LTE Cat M1/NB-IoT connectivity
  - eSIM included in certification
- Build/Develop applications with the use of ST's vast set of software modules
- Availability of ST's Community and Development Forums
- Secure boot architecture and a robust hardware-based security framework

Revision History

Revision	Date	Author	Change Description
1.0	10/05/2020	RF PD	Initial release

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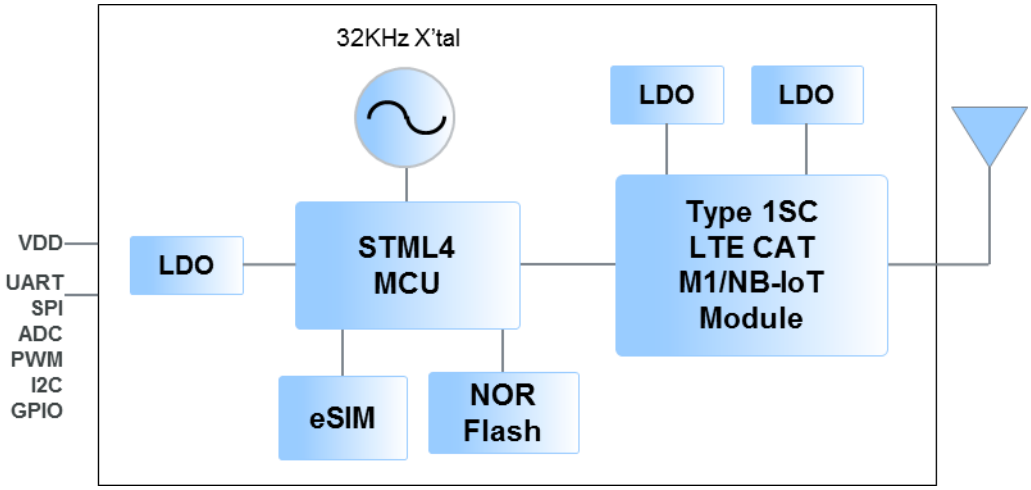


Figure 1 Type 1SE Block Diagram

2 Module Specifications

Table 2-1 Module Specifications

Part Number	LBAD0ZZ1SE
Connectivity	3GPP Release 13/Optimized for LTE Class 3 output power (+23 dBm)
Universal LTE (LB & MB)	Low-band: B5/B8/B12/B13/B14(CAT M1 Only) /B17/B18/B19/B20/B26/B28 Mid-band: B1/B2/B3/B4/B25
GNSS	GPS and GLONASS
Voltage Input	3.3-5V
Antenna	Off board multi-band antenna
Dimension	15.4 x 18.0 x 2.5 mm (max)
Peripheral Interfaces	GPIO, ADC, I2C, PWM, SPI, UART
Operating Temp	-40° to 85° C

3 Mechanical Specification

3.1 Module Dimensions

Table 3-1: Module Dimensions

Parameter	Typical	Unit
Dimension (L x W x H)	15.4 ±0.2mm x 18.0 ±0.2mm x 2.5 (max)	mm

3.2 Top and Side View

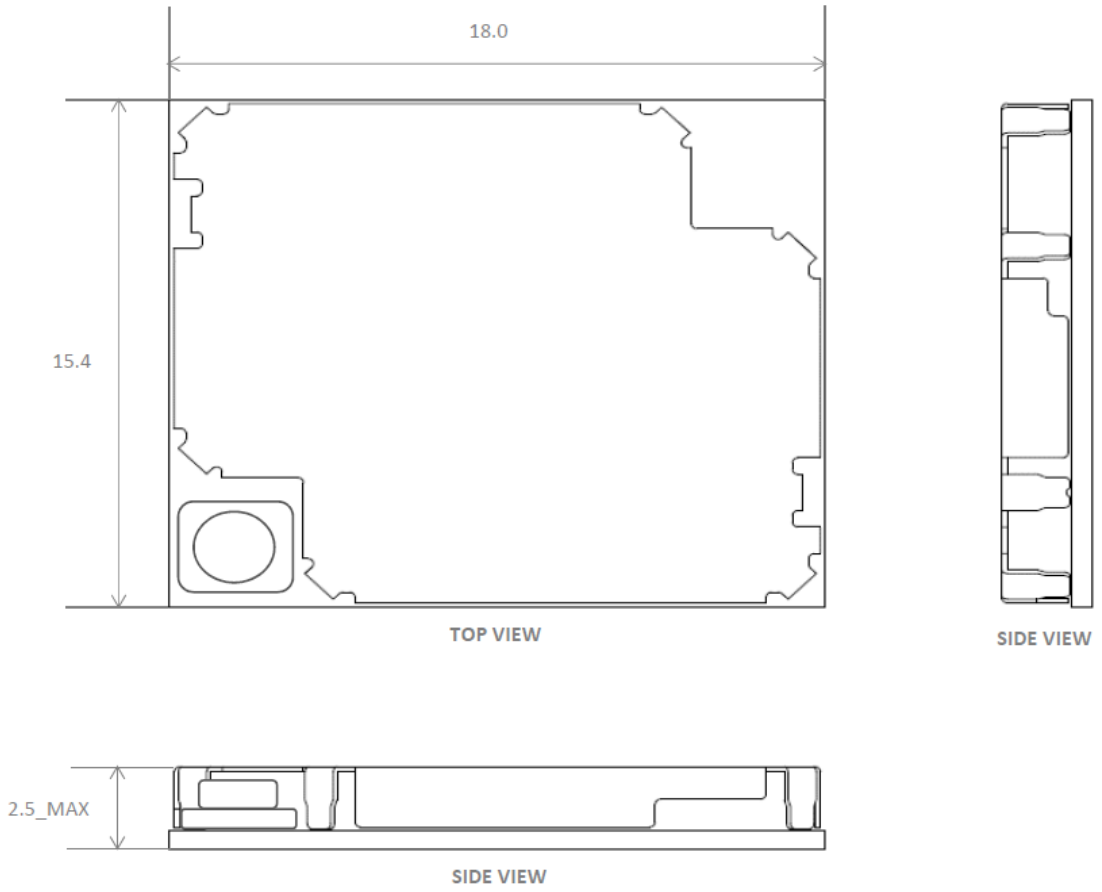


Figure 3.1 Module Top and Side View (Unit: mm)

3.3 PCB Footprint Top View

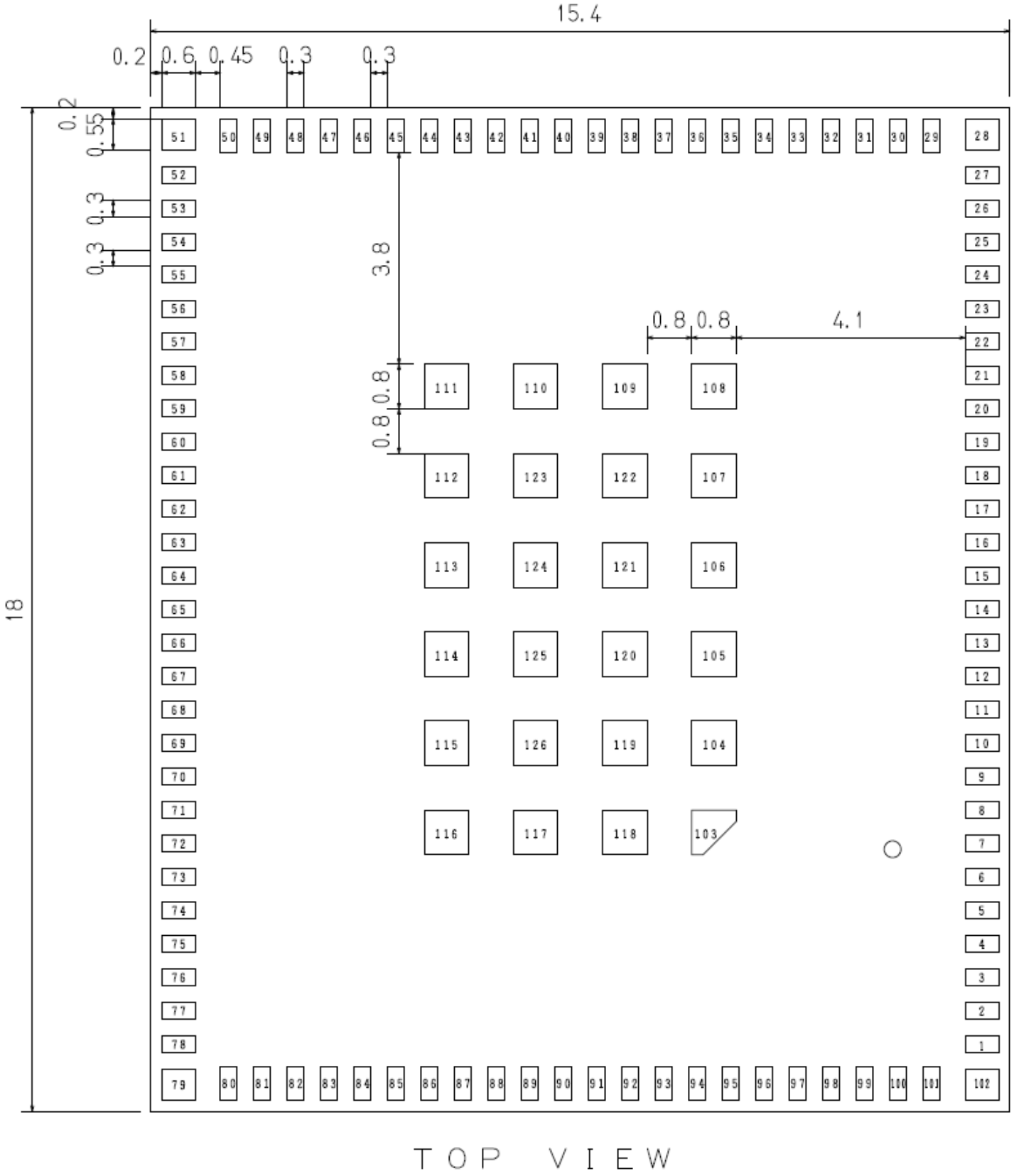


Figure 3.2 Module Footprint Top View (Unit: mm)

3.4 Pin Configuration

For further detail of the built-in STM32, please refer to the STM32L462CE STM32L462RE STM32L462VE datasheet [1].

Table 3-2 Pinouts

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
1	USART2_RTS		E6	I/O	PA1/USART2_RTS
2	USART2_RX		F6	I/O	PA3/USART2_RX
3	USART2_TX		G7	I/O	PA2/USART2_TX
4	USART2_CTS		H8	I/O	PA0/USART2_CTS
5	VDDA		F7	Power	ADC power; connect to VDD_1V8 if not used
6	VSSA		G8	Power	ADC GND
7	NRST		F8	Reset	Reset STM32
8	NC				No Connect
9	NC				No Connect
10	GPIO_EXTI7		E1	I/O	PC7/GPIO_EXTI7
11	NC_RST_IND			I/O	Reserved for internal usage and testing
12	NC				No Connect
13	NC				No Connect
14	NC				No Connect
15	NC				No Connect
16	RFT_UART2_CTS	21		I/O	Recovery UART_CTS
17	RFT_UART2_TX	22		I/O	Recovery UART_RX
18	RFT_UART2_RTS	74		I/O	Recovery UART_RTS
19	RFT_UART2_RX	20		I/O	Recovery UART_TX
20	NC				No Connect
21	NC				No Connect
22	NC				No Connect
23	RFT_UART1_RTS	43		I/O	Log UART_RTS
24	RFT_UART1_TX	46		I/O	Log UART_TX
25	RFT_UART1_RX	45		I/O	Log UART_RX
26	RFT_UART1_CTS	94		I/O	Log UART_CTS
27	NC				No Connect
28	GND			GND	GND
29	NC				No Connect
30	NC				No Connect
31	NC				No Connect
32	NC				No Connect
33	NC				No Connect
34	NC				No Connect
35	NC				No Connect

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
36	NC				No Connect
37	PMU_AT_IN	5		I	Connect to GND
38	NC				No Connect
39	NC				No Connect
40	NC				No Connect
41	NC				No Connect
42	GND			GND	
43	VDD			Power	Power supply for Type1SE
44	VDD			Power	Power supply for Type1SE
45	VDD			Power	Power supply for Type1SE
46	GND			GND	GND
47	NC				No Connect
48	NC				No Connect
49	NC_SIM_CLK	69		I/O	SIM clock
50	NC_VSIM	8		O	SIM power supply
51	GND			GND	GND
52	NC_SIM_DETECT	70		I/O	SIM detect
53	NC_SIM_RST	68		I/O	SIM reset
54	PH1_OSC_OUT		E8	I/O	PH1/RCC_OSC_OUT
55	PH0_OSC_IN		D8	I/O	PH0/RCC_OSC_IN
56	NC				No Connect
57	NC_SIM_IO	11		I/O	SIM data
58	ADC1_IN1		D7	I/O	PC0/ADC1_IN1
59	ADC1_IN3		D6	I/O	PC2/ADC1_IN3
60	ADC1_IN2		D5	I/O	PC1/ADC1_IN2
61	ADC1_IN4		E7	I/O	PC3/ADC1_IN4
62	RTC_TAMP1		B8	I/O	PC13/RTC_TAMP1
63	BOOT0		B6	I/O	PH3/BOOT0
64	SF_EN		B5	I/O	PB6/SF_EN
65	RCC_MCO		E3	I/O	PA8/RCC_MCO
66	NC				No Connect
67	NC				No Connect
68	VDD_1V8			Power	Reserved for codec supply/MCU VBAT/MCU VDDA
69	I2C1_SDA		C6	I/O	PB9/I2C1_SDA
70	I2C1_SCL		A6	I/O	PB8/I2C1_SCL
71	VBAT		B7	Power	Backup supply; connect to VDD_1V8 if not used
72	SPI1_SCK		F5	I/O	PA5/SPI1_SCK
73	SPI1_MOSI		C5	I/O	PB5/SPI1_MOSI
74	SPI1_MISO		A4	I/O	PB4/SPI1_MISO/NJTRST
75	SPI1_NSS		A2	I/O	PA15/SPI1_NSS/JTDI

Pin #	Pin Name	Type1SC	STM32L462	Type	Description
76	TIM2_CH2		B4	I/O	PB3/TIM2_CH2/JTDO/TRACESWO
77	NC				No Connect
78	NC				No Connect
79	GND			GND	GND
80	NC				No Connect
81	eSIM_SWP			I/O	SWP for NFC to ST33
82	NC				No Connect
83	NC				No Connect
84	VDDUSB		A1	Power	3.0 to 3.6 V supply for USB; connect to VDD_1V8 if not used
85	SWCLK		C3	I/O	PA14/JTCK/SWCLK
86	SWDIO		C2	I/O	PA13/JTMS/SWDIO
87	USB_DP		D3	I/O	PA12/USB_DP
88	USB_DM		D2	I/O	PA11/USB_DM
89	USART1_RX		C1	I/O	PA10/USART1_RX
90	USART1_TX		D1	I/O	PA9/USART1_TX
91	TIM15_CH2		F1	I/O	PB15/TIM15_CH2
92	TIM15_CH1		G1	I/O	PB14/TIM15_CH1
93	TIM3_CH4		E2	I/O	PC9/TIM3_CH4
94	TIM3_CH1		F2	I/O	PC6/TIM3_CH1
95	QUADSPI_IO0		F4	I/O	PB1/QUADSPI_BK1_IO0
96	QUADSPI_CLK		H4	I/O	PB10/QUADSPI_CLK
97	QUADSPI_nCS		H3	I/O	PB11/QUADSPI_BK1_NCS; connect to 98 to use internal serial flash
98	SF_nCS			I/O	Internal serial flash chip select
99	QUADSPI_IO1		H5	I/O	PB0/QUADSPI_BK1_IO1
100	QUADSPI_IO3		H6	I/O	PA6/QUADSPI_BK1_IO3
101	QUADSPI_IO2		E5	I/O	PA7/QUADSPI_BK1_IO2
102-126	GND			GND	Ground

4 DC Electrical Specification

4.1 Tx Output Power

The module is compliant to the 3GPP spec for release 13 and rated at a Class 3 device (23 dBm)

4.2 Rx Sensitivity

Table 4-1 Rx Sensitivity

Items		Contents			
		Min	Typ.	Max	Unit
Frequency Range	LB	703		960	MHz
	MB	1710		2170	MHz
Rx Sensitivity	MCS5, BER<5%		-103		dBm

5 Environmental Specification

5.1 Absolute Maximum Rating

Table 5-1 Absolute Maximum Rating

Description	Min	Max	Unit
VDD	-0.3	6	V
PA Stability		6:1	VSWR

5.2 Recommended Operating Condition

Table 5-2 Recommended Operating Condition

Parameter	Min	Max	Unit
Operating Temperature Range	-40	85	°C
VDD	3.3	5.0	V

5.3 Temperature Range

Table 5-3 Temperature Range

	Range	Note
Storage temperature range	-40 ºC – 85 ºC	Storage and non-operational
Operating temperature range	-40 ºC – 85 ºC	Module is fully functional†
	-10 ºC – 55 ºC	Module is fully functional† and fully meets 3GPP specification
(†) Functional: the module is able to connect to PDN and transfer data.		

6 Application Information

6.1 Recommended PCB Landing Pattern

The recommended PCB landing pattern is the same as the module footprint, see Figure 3.2.

6.2 External Antenna

The Type 1SE module has a built-in standard u.FL RF connector. To select any external antenna please read the regulatory information in section 9 Regulatory Information first. Make sure that you pick the antenna that covers the correct frequency for the appropriate band and make sure 50-Ohm impedance matching.

6.3 Development Kit and Reference Design

The development kit of type 1SE module is jointly developed by Murata and ST Micro Semiconductor. The kit offered by ST Micro Semiconductor. Please refer to ST Micro B-L462E-CELL1 Discovery Kit and related documents for detail [2].

7 Assembly Information

The recommendation conditions of soldering are as in the following figure.

When products are immersed in solvent after mounting, pay special attention to maintain the temperature difference within 100 °C. Soldering must be carried out by the conditions mentioned above 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

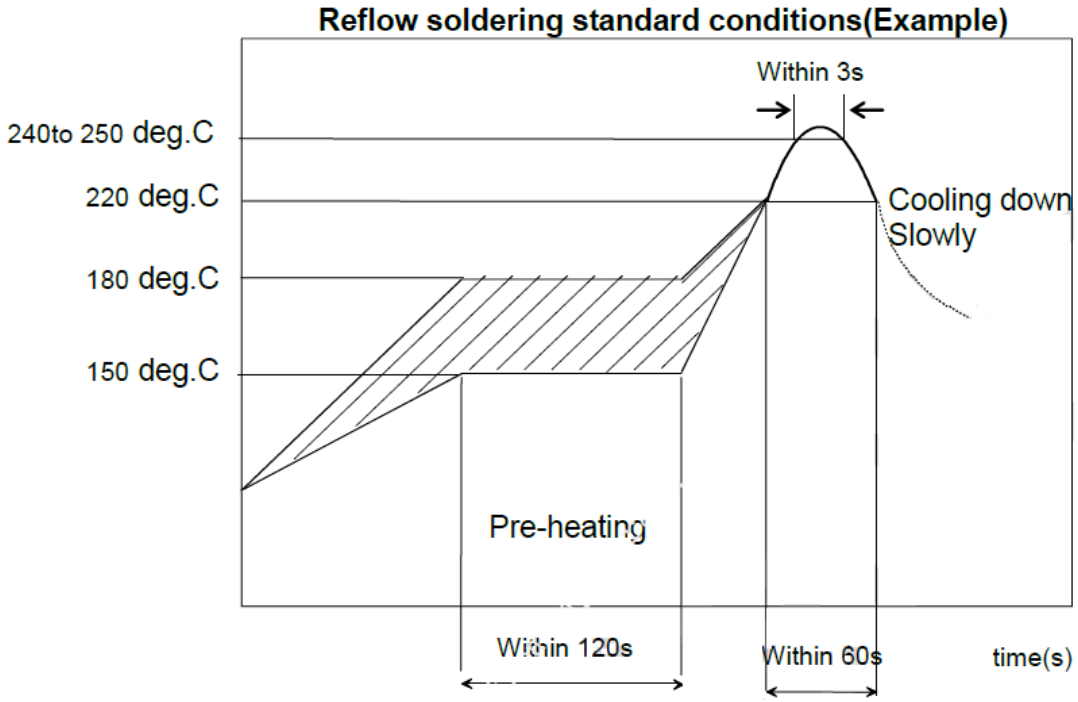


Figure 7.1 Reflow Profile

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.

Since this Product is Moisture Sensitive, any cleaning is NOT permitted.

8 Packaging and Marking Information

8.1 Dimensions of Tape (Plastic tape)

To be added

Figure 8.1 Tape Dimensions (Unit in mm)

8.2 Dimensions of Reel

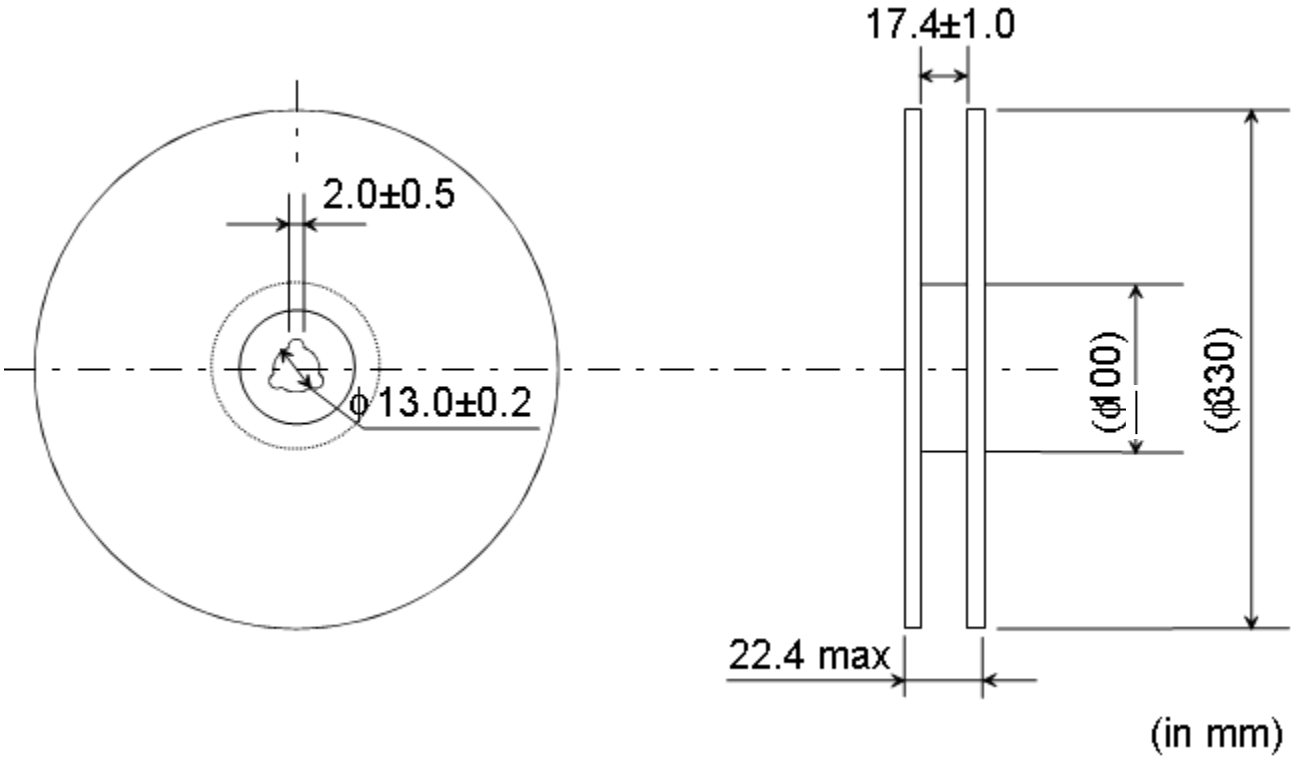


Figure 8.2 Reel Dimensions (Unit: mm)

8.3 Taping Diagrams

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

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

[3] Cover tape : 62 um in thickness

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

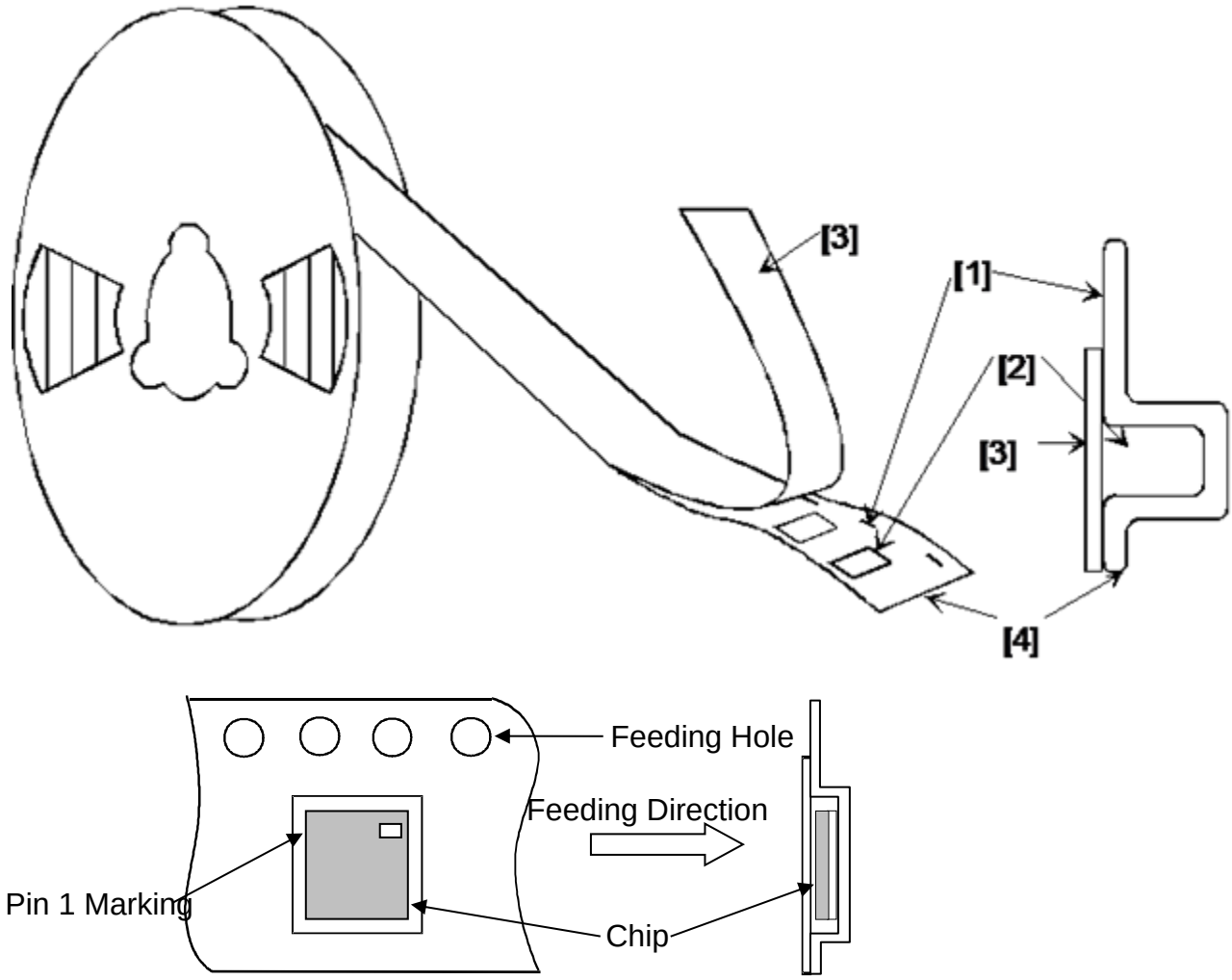


Figure 8.3 Tape Diagram

8.4 Leader and Tail tape

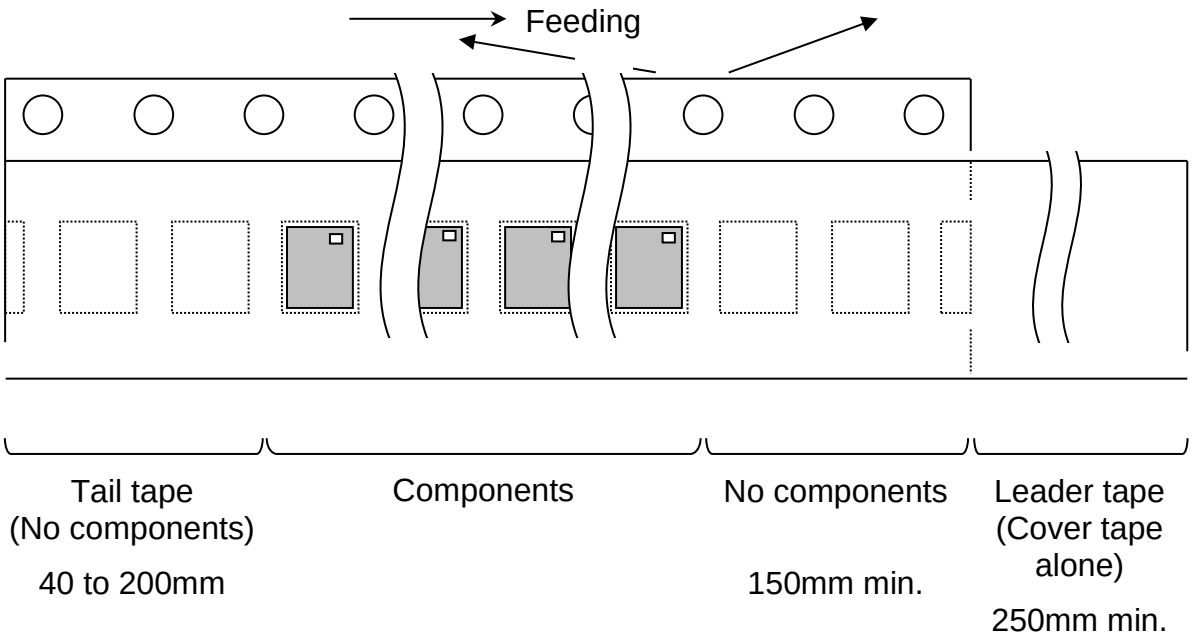


Figure 8.4 Tape Leader and Tail

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 none components area for 250 mm min.

Tear off strength against pulling of cover tape: 5 N min.

Packaging unit: 500 pcs./ reel

Material:

- Base tape : Plastic
- Reel : Plastic
- Cover tape, cavity tape and reel are made the anti-static processing.

8.5 Peeling Force

1.3 N max. in the direction of peeling as shown below.

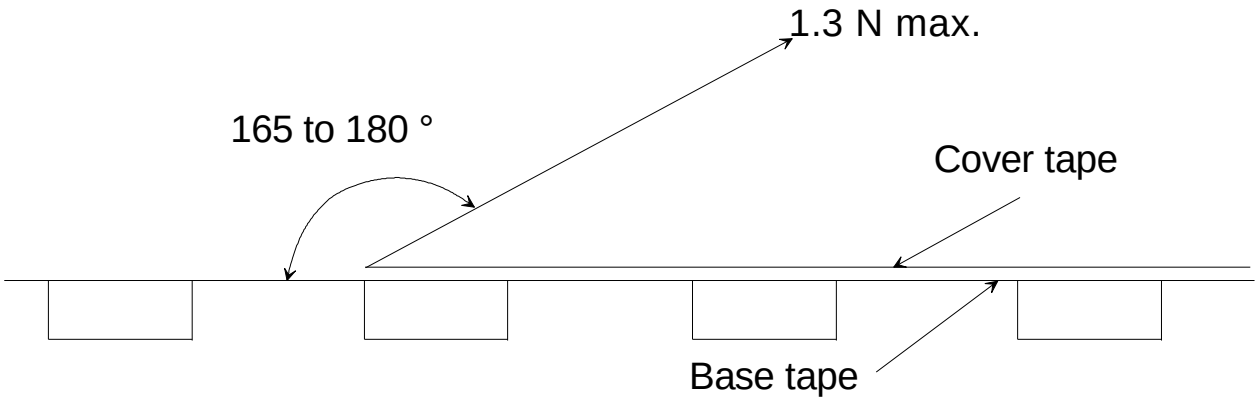


Figure 8.5 Peeling Force Diagram

8.6 PACKAGE (Humidity proof Packaging)

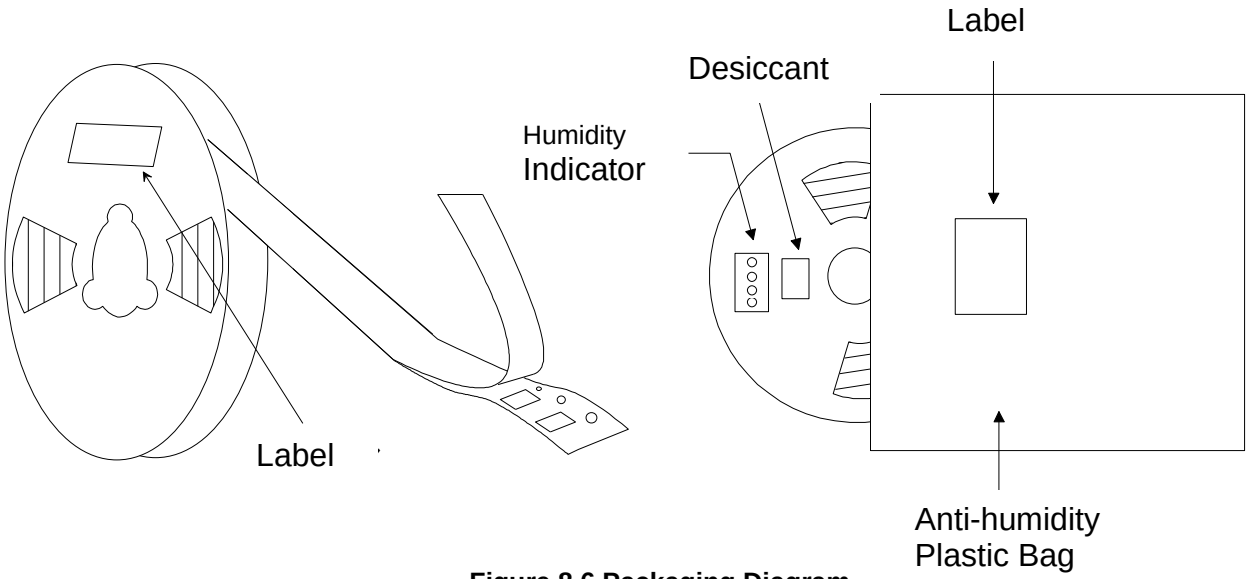
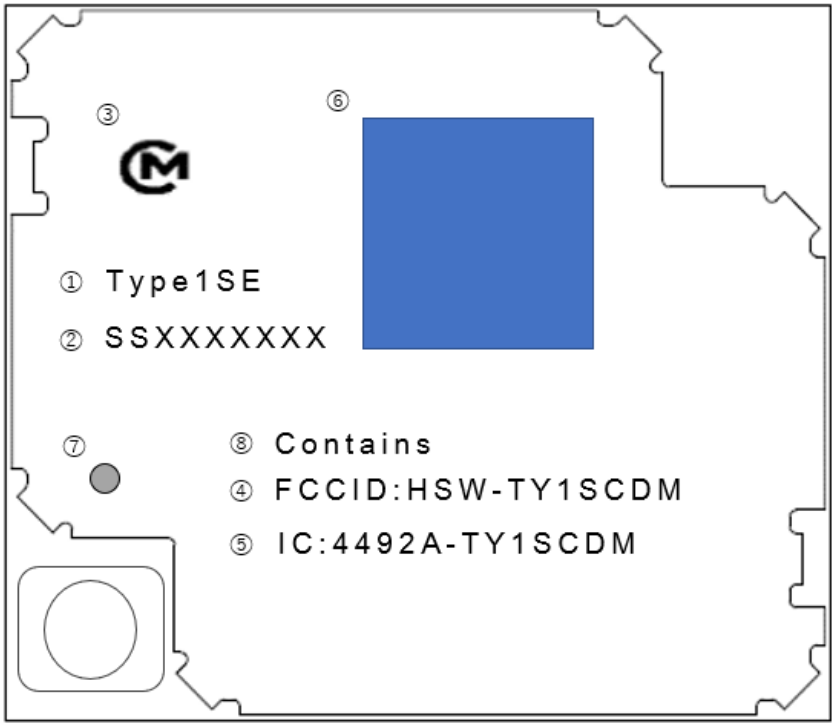


Figure 8.6 Packaging Diagram

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

8.7 Module Marking Information

Error! Reference source not found. shows the module marking. Dimensions are nominal, not absolute.



	Items	Description	Character size	Remark
1	P/N	Type1SE	0.6mm*0.4mm	
2	Inspection #	SSXXXXXXX	0.6mm*0.4mm	Defined by SMM
3	CM mark	Ⓜ	1.5mm*1.5mm	
4	FCC	FCCID:HSW-TY1SCDM	0.6mm*0.4mm	
5	IC	IC:4492A-TY1SCDM	0.6mm*0.4mm	
6	2D code	IMEI inforamtion	4.9mm*4.9mm	0.35mm/cell,14cells
7	#1 pin mark	•	Φ0.6mm	
8	Others	Contains	0.6mm*0.4mm	

Figure 8.7 Module Marking Diagram

8.8 Moisture Sensitivity Level

The LBAD0ZZ1SE is planned to be qualified to moisture sensitivity level 4 (MSL4) in accordance with JEDEC J-STD-020.

9 Regulatory Information

9.1 FCC Info

This device has Single Modular Approval. This device is approved for mobile and fixed use with respect to RF exposure compliance and may only be marketed to OEM installers. The antenna(s) used for this transmitter, as described in this filing, must be installed to provide a separation distance of at least 20 cm from all persons. Installers and end-users must be provided with operating conditions for satisfying RF exposure compliance. Maximum permitted antenna gain including cable loss should be determined from tables 8.1 and 8.2. Failure to follow these guidelines will result in radiated RF levels that exceed FCC MPE limits

9.2 FCC Test Data

Table 9-1 FCC Test Data

FCC CAT M1

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (mW/cm^2)	PD Limit (mW/cm^2)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.7	20	22.80	23.00	10.20	33.00	2089.30	0.416	1.000	10.20	14.01	10.20
Band 4	1710.7	20	22.97	23.00	7.03	30.00	1006.93	0.200	1.000	7.03	14.01	7.03
Band 5	824.7	20	22.46	23.00	11.41	38.45	2762.20	0.550	0.550	15.99	11.41	11.41
Band 12	699.7	20	20.85	23.00	10.70	34.77	2343.53	0.466	0.466	13.92	10.70	10.70
Band 13	779.5	20	20.71	23.00	11.17	34.77	2610.81	0.520	0.520	14.06	11.17	11.17
Band 14	788.1	20	21.51	23.00	11.22	34.77	2639.61	0.525	0.525	13.26	11.22	11.22
Band 17	704.1	20	22.94	23.00	10.73	34.77	2358.27	0.469	0.469	11.83	10.73	10.73
Band 25	1850.7	20	21.11	23.00	11.89	33.00	3083.19	0.614	1.000	11.89	14.01	11.89
Band 26	814.7	20	20.85	23.00	11.36	38.45	2728.70	0.543	0.543	17.60	11.36	11.36

FCC NB IoT

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (mW/cm^2)	PD Limit (mW/cm^2)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.2	20	22.75	23.00	10.25	33.00	2113.49	0.421	1.000	10.25	14.01	10.25
Band 4	1710.2	20	22.92	23.00	7.08	30.00	1018.59	0.203	1.000	7.08	14.01	7.08
Band 5	824.2	20	22.46	23.00	11.41	38.45	2760.52	0.549	0.549	15.99	11.41	11.41
Band 12	699.2	20	23.49	24.00	9.70	34.77	2341.85	0.466	0.466	11.28	9.70	9.70
Band 13	777.2	20	23.43	24.00	10.15	34.77	2603.10	0.518	0.518	11.34	10.15	10.15
Band 17	704.2	20	23.55	24.00	9.73	34.77	2358.60	0.469	0.469	11.22	9.73	9.73
Band 25	1850.2	20	20.85	22.00	12.15	33.00	2600.16	0.518	1.000	12.15	15.01	12.15
Band 26	814.1	20	23.40	24.00	10.36	38.45	2726.69	0.543	0.543	15.05	10.36	10.36

9.3 ISED Test Data

Table 9-2 ISED Test Data

ISED CAT M1

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (W/m^2)	Limit (W/m^2)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.7	20	22.80	23.00	10.20	33.00	2089.30	4.159	4.477	10.20	10.52	10.20
Band 4	1710.7	20	22.97	23.00	7.03	30.00	1006.93	2.004	4.243	7.03	10.29	7.03
Band 5	824.7	20	22.46	23.00	8.12	38.45	1294.74	2.577	2.577	15.99	8.12	8.12
Band 12	699.7	20	20.85	23.00	7.63	34.77	1157.17	2.303	2.303	13.92	7.63	7.63
Band 13	779.5	20	20.71	23.00	7.95	34.77	1245.81	2.480	2.480	14.06	7.95	7.95
Band 17	704.1	20	22.94	23.00	7.65	34.77	1162.14	2.313	2.313	11.83	7.65	7.65
Band 25	1850.7	20	21.11	23.00	10.52	33.00	2249.48	4.477	4.477	11.89	10.52	10.52
Band 26	814.7	20	20.85	23.00	8.09	38.45	1283.99	2.556	2.556	17.60	8.09	8.09

ISED NB IoT

Operation Mode	Freq. (MHz)	Operation Distance (cm)	Conducted Average output power (dBm)	Max. output Power include tolerance (dBm)	Antenna Gain (dBi)	EIRP (ERP) Limit (dBm)	Max. output Power (mW)	Power Density (PD) (W/m^2)	Limit (W/m^2)	Allowable Gain according to EIRP (dBi)	Allowable Gain according to PD (dBi)	Max Allowable Gain (dBi)
Band 2	1850.2	20	22.75	23.00	10.25	33.00	2113.49	4.207	4.477	10.25	10.52	10.25
Band 4	1710.2	20	22.92	23.00	7.08	30.00	1018.59	2.027	4.242	7.08	10.29	7.08
Band 5	824.2	20	22.46	23.00	8.12	38.45	1294.20	2.576	2.576	15.99	8.12	8.12
Band 12	699.2	20	23.49	24.00	6.63	34.77	1156.61	2.302	2.302	11.28	6.63	6.63
Band 13	777.2	20	23.43	24.00	6.95	34.77	1243.30	2.475	2.475	11.34	6.95	6.95
Band 17	704.2	20	23.55	24.00	6.65	34.77	1162.25	2.313	2.313	11.22	6.65	6.65
Band 25	1850.2	20	20.85	22.00	11.52	33.00	2249.07	4.477	4.477	12.15	11.52	11.52
Band 26	814.1	20	23.40	24.00	7.08	38.45	1283.34	2.554	2.554	15.05	7.08	7.08

9.4 List of Applicable FCC Rules

This module complies with below part 22, 24, 27 and 90 of the FCC Rules.

Part 22 Subpart H
Part 24 Subpart 24E
Part 27 Subpart B, C & L
Part 90 R & S

9.5 Labeling Requirements

Any device incorporating this module must include an external, visible, permanent marking or label which states: “Contains FCC ID: HSW-TY1SCDM” and “Contains IC :4492A-TY1SCDM”

Obligation d'étiquetage du produit final:
Tout dispositif intégrant ce module doit comporter un externe, visible, marquage permanent
ou une étiquette qui dit: "Contient IC : 4492A-TY1SCDM”

9.6 Additional Testing Requirements

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

9.7 Test Modes

Murata Manufacturing Co., Ltd.uses various test mode programs for test set up which operate separate from production firmware. Host integrators should contact Murata Manufacturing Co., Ltd.for assistance with test modes needed for module/host compliance test requirements.

Federal Communications Commission (FCC) Statement
15.21
You are cautioned that changes or modifications not expressly approved by the part 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 of the device.

ISED
Canadian Notice
This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. *This device may not cause interference.*
2. *This device must accept any interference, including interference that may cause undesired operation of the device.*

Avis Canadien
L’émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d’Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes :

1. *L’appareil ne doit pas produire de brouillage;*
2. *L’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.*

10 RoHS Information

The LBAD0ZZ1SE module is conformed to RoHS requirement.

11 Ordering Information

Table 11-1 Ordering Information

Product	Model Name	Murata Ordering Part Number	Standard Order Increment
Sample Module	Type 1SE	LBAD0ZZ1SE-TEMP	1 pcs
Production Module	Type 1SE	LBAD0ZZ1SE-493	500 pcs
Development Kit	STMirco B-L462E-CELL1 Discovery kit	B-L462E-CELL1	1 pcs

12 Notice

12.1 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 35deg.C and humidity from 20 to 70%RH.
(Packing materials, in particular, may be deformed at the temperature over 40deg.C.)
- The product left more than 6months after reception, it needs to be confirmed the solderbility 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 MSL4 (Based on JEDEC Standard J-STD-020)
- After the packing opened, the product shall be stored at <30deg.C / <60%RH and the product shall be used within 168hours.
- When the color of the indicator in the packing changed, the product shall be baked before soldering.

Baking condition: 125+5/-0deg.C, 24hours, 1time
The products shall be baked on the heat-resistant tray because the material (Base Tape, Reel Tape and Cover Tape) are not heat-resistant.

12.2 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 bear hands that may result in poor solder ability and destroy by static electrical charge.

12.3 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. If use non-standard lands, contact Murata beforehand.

12.4 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.

12.5 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.

12.6 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.

13 PRECONDITIONS TO USE MURATA 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.
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 IN SUCH APPLICATIONS.
- Aircraft equipment. - Aerospace equipment - Undersea equipment.
- Power plant control equipment - Medical equipment.
- Transportation equipment (vehicles, trains, ships, elevator, etc.).
- Traffic signal equipment. - Disaster prevention / crime prevention equipment.
-Burning / explosion control equipment
- 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
- the use of the engineering sample other than for evaluation purposes, particularly the installation or integration in the product to be sold by you,
-deviation or lapse in function of engineering sample,
-improper use of engineering samples.
We disclaim any liability for consequential and incidental damages.
If you can’t agree the above contents, you should inquire our sales.

14 References

[1] STMicro Semiconductor, STM32L462CE STM32L462RE STM32L462VE datasheet, May 2018.
[2] STMicro Semiconductor, B-L462E-CELL1 Discovery Kit for NB/M1 communication Discovery Board, UMxxxx, User Manual