

**MBN52832 Data
Sheet**

BLE Module



Revision History

Revision	Date	Author	Change Description
0.1	06/03/2016	RF PD	Preliminary version
0.2	06/16/2016	RF PD	Modified the module block diagram.
0.3	8/25/2016	RF PD	Update test data points
0.4	8/27/2016	RF PD	Update module dimension and reference schematic
0.5	12/15/2016	RF PD	Applied model/type name MBN52832 to the datasheet
0.6	02/01/2017	RF PD	Update Table 2.1 and Figure 2.2
0.7	03/15/2017	RF PD	Add sleep current
0.8	05/26/2017	RF PD	Table 2.2, change pin 36, 37 pin 36 description to NC. Add section 6.1 and 6.2, recommendation for host PCB landing and placement. Updated reference schematic. Add section 9 and section 10, assembly and packaging information. Add section 12 Notice. Add section 13 Preconditions to use the module.
0.9	07/27/2017	RF PD	Add regulatory section
0.92	8/23/2017	RF PD	Update layout guidance for antenna connection; updated regulatory information
1.0	10/06/2017	Murata	Update the max height to 0.9mm, remove the sample part number.
1.1	06/14/2018	Murata	Remove Section 17, support contact.
1.2	10/10/2018	Murata	Added FCC and IC certification update for portable application in section 11.6
1.3	11/13/18	Murata	Corrected typos in section 7.

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1 Introduction

MBN52832 is a Bluetooth Low Energy module. It enables ultra-low power connectivity for data communication. The product integrates Nordic Bluetooth Low Energy IC, RF front end, and crystal. This is an ideal solution for Internet of Things (IOT) application.

1.1 Features

- Bluetooth® v5
 - Higher throughput
 - Increased broadcast capacity
 - Improved channel co-existence algorithm (SCA)
- ANT, NFC Tag
- Nordic nRF52832 Bluetooth Smart®
- Built-in ARM Cortex M4 core with 64KB RAM and 512KB flash
- Dimension 7.4 x 7.0 x 0.9 mm
- Packaging: LGA
- Bluetooth/ANT Antenna Configuration:
 - On-board PCB antenna
 - Supports external antenna from pin pad
- Maximum transmit power: +4dBm @ antenna port (LDO Mode)
- Receive sensitivity: -93dBm @ 1Mbps (LDO Mode)
- Power consumption
 - TX 7mA @ 3.5dBm (DCDC Mode)
 - RX 6mA (DCDC Mode)
- Host interface: UART, SPI
- Other interfaces: 20 GPIO, 5 ADC, UART, SPI (master and slave), I2C, PWM and Debug SWD
- Operating temperature range: -40 °C to 85 °C
- RoHS compliant
- MSL Level 3 in accordance with JEDEC J-STD-020
- Regulatory certificates: FCC, IC, ETSI (plan)

1.2 Applications

- Home Automation
- Proximity Services
- Building automation
- Medical/Healthcare
- Beacon

1.3 Block Diagram

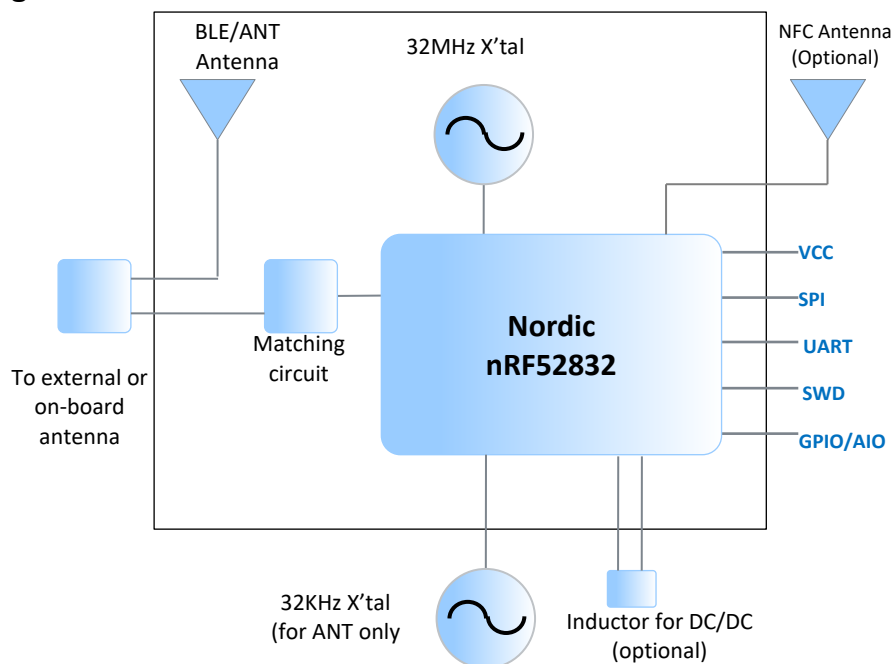


Figure 1.1 Block Diagram

1.4 Acronyms

- AIO	Analog Input / Output
- GPIO	General Purpose Input / Output
- I2C	Inter-Integrated Circuit
- LPCOMP	Low Power Comparator
- SPI	Serial Peripheral Interface
- UART	Universal Asynchronous Receiver Transmitter

1.5 References

- [1] Nordic Semiconductor, nRF52832 - Product Specification v1.3, 2017
- [2] Nordic Semiconductor, nRF52832-CIAA Pin assignment and mechanical dimensions, 2016

2 Mechanical Specification

2.1 Module Dimensions

Table 2.1: Module Dimensions

Parameter	Typical	Unit
Dimension (L x W x H)	7.4 ±0.2mm x 7.0 ±0.2mm x 0.9 (max)	mm

2.2 Top and Side View

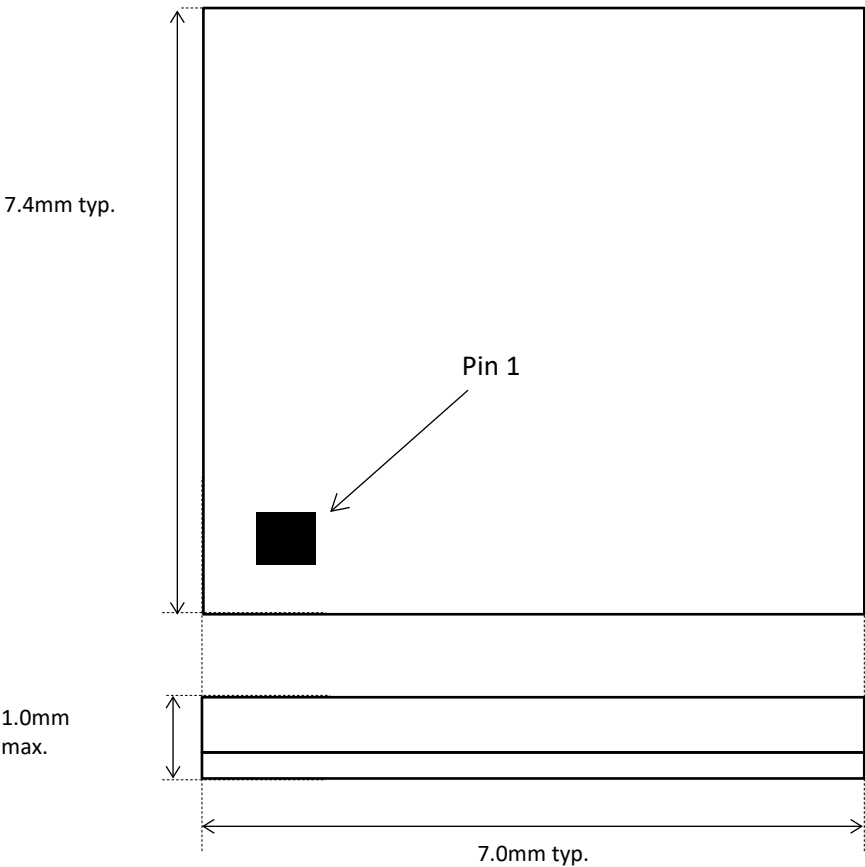


Figure 2.1 Module Top and Side View (Unit: mm)

2.3 PCB Footprint Top View

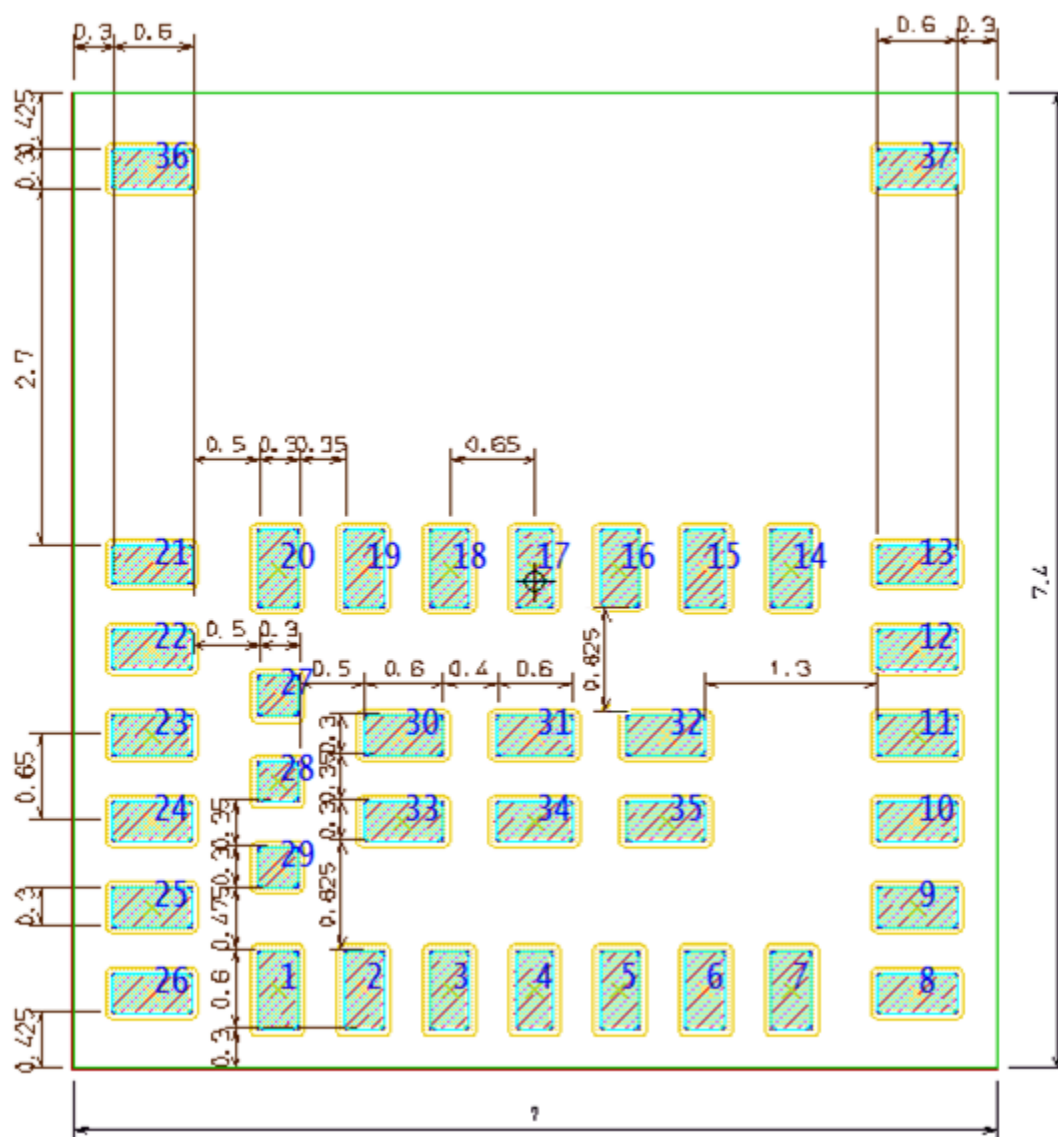


Figure 2.2 Module Footprint Top View (Unit: mm)

2.4 Pin Configuration

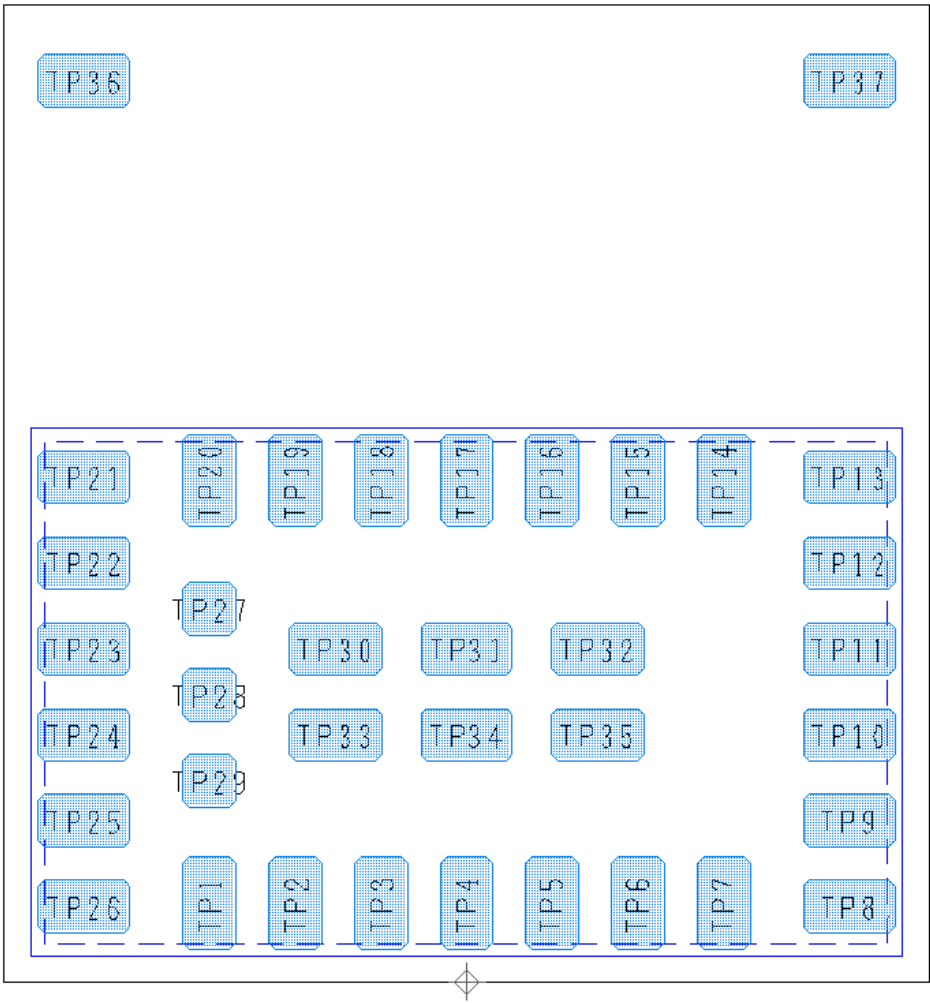


Figure 2.3 Pinout Diagram Top View

Table 2.2 Pinouts

Pin #	Pin Name	Nordic IC Pin	I/O	Description
1	P0_09/NFC ANT	P0.09/NFC	I/O	GPIO; NFC antenna connection.
2	P0_06	P0.06	I/O	GPIO
3	P0_00/XL1	P0.00/XL1	I/O	Connection for 32.768kHz crystal (LFXO); GPIO
4	P0_01/XL2	P0.01/XL2	I/O	Connection for 32.768kHz crystal (LFXO); GPIO
5	GND			GND
6	VCC	VDD		Module power supply
7	DCC	DCC		DC/DC converter output pin. *Refer to reference schematic.
8	DEC	DEC4		1V3 regulator supply decoupling. Input from DC/DC converter. Output from 1.3V LDO. *Refer to reference schematic.
9	P0_02/AIN0	P0.02/AIN0	I/O	GPIO; SAADC/COMP/LPCOMP input
10	P0_05/AIN3	P0.05/AIN3	I/O	GPIO; SAADC/COMP/LPCOMP input
11	P0_03/AIN1	P0.03/AIN1	I/O	GPIO; SAADC/COMP/LPCOMP input
12	P0_04/AIN2	P0.04/AIN2	I/O	GPIO; SAADC/COMP/LPCOMP input
13	P0_29/AIN5	P0.29/AIN5	I/O	GPIO; SAADC/COMP/LPCOMP input
14	P0_07	P0.07	I/O	GPIO
15	P0_08	P0.08	I/O	GPIO
16	SWDIO	SWDIO	I/O	Serial Wire Debug I/O for debug and programming.
17	P0_21/RESET	P0.21/RESET	I/O	GPIO; Configurable as system RESET pin
18	SWDCLK	SWDCLK	I/O	Serial Wire Debug clock input for debug and programming.
19	GND	GND		GND
20	ANTIN			*Refer to reference schematic.
21	ANTOUT			RF signal output. Connect to ANTIN for on-board antenna or to external antenna. *Refer to reference schematic.
22	P0_18/TRACE0	P0.18/TRACE DATA[0]	I/O	GPIO; Trace port output;
23	P0_16/TRACE1	P0.16/TRACE DATA[1]	I/O	GPIO; Trace port output.
24	P0_15/TRACE2	P0.15/TRACE DATA[2]	I/O	GPIO; Trace port output.
25	P0_14/TRACE3	P0.14/TRACE DATA[3]	I/O	GPIO; Trace port output.
26	P0_10/NFC ANT	P0.10/NFC	I/O	GPIO; NFC antenna connection.
27	P0_20	P0.20	I/O	GPIO
28	P0_17	P0.17	I/O	GPIO
29	P0_13	P0.13	I/O	GPIO
30	GND			Ground.
31	GND			Ground.
32	GND			Ground.
33	GND			Ground.

Pin #	Pin Name	Nordic IC Pin	I/O	Description
34	GND			Ground.
35	GND			Ground.
36	NC			NC
37	NC			NC

3 DC Electrical Specification

3.1 Typical Power Consumption

Table 3.1 Typical Power Consumption

		Current	Unit
TX Active @3.5dBm	LDO mode	16	mA
	DCDC mode	7	mA
RX Active	LDO mode	14	mA
	DCDC mode	6	mA
Sleep Mode	System Off	0.36	uA
	System On with internal RC	2.13	uA
	System On with external 32kHz crystal	1.79	uA

4 RF Specification

Conditions: 25°C, VCC=3.3V, Parameters measured at RF connector.

Table 4.1 RF Characteristics

RF Characteristics		Specification			Unit
		Min.	Typ.	Max.	
Center frequency		2402	-	2480	MHz
Channel Spacing		-	2	-	MHz
Number of RF Channels		-	40	-	-
Max output power	LDO mode	-	4.0	-	dBm
	DCDC mode		3.5		dBm
Modulation Characteristics					
$\Delta f_{1\text{avg}}$		225	-	275	kHz
$\Delta f_{2\text{max}}$ (at 99.9%)		185	-	-	kHz
$\Delta f_{2\text{avg}} / \Delta f_{1\text{avg}}$		0.8	-	-	-
Carrier frequency offset and drift					
1) Frequency offset: $ f_n - f_{\text{TX}} $		-	-	150	kHz
2) Frequency drift: $ f_0 - f_n $		-	-	50	kHz
3) Drift rate #0: $ f_1 - f_0 $		-	-	20	kHz
4) Drift rate #n: $ f_n - f_{n-5} $		-	-	20	kHz
Receiver sensitivity (PER < 30.8%)	LDO mode	-	-93	-70	dBm
	DCDC mode		-90	-70	dBm
Maximum input signal level (PER < 30.8%)		-10	-	-	dBm

5 Environmental Specification

5.1 Absolute Maximum Rating

Table 5.1 Absolute Maximum Rating

Description	Min	Max	Unit
Storage temperature	-40	+125	°C
Operating temperature	-40	85	°C
VCC	-0.3	+3.9	V
V _{IO} , VDD ≤ 3.6 V	-0.3	VCC+0.3	V
V _{IO} , VDD > 3.6 V	-0.3	3.9	V
NFC antenna pin current		80	mA
RF input level		10	dBm

5.2 Recommended Operating Condition

Table 5.2 Recommended Operating Condition

Parameter	Min	Max	Unit
Operating Temperature Range	-40	85	°C
VCC	1.7	3.6	V
Supply rise time (0V to 1.7V)		60	ms

6 Power Sequence

For device start up sequence, please refer to Nordic Semiconductor, nRF52832 - Product Specification [1].

7 Application Information

7.1 Recommended PCB Landing Pattern

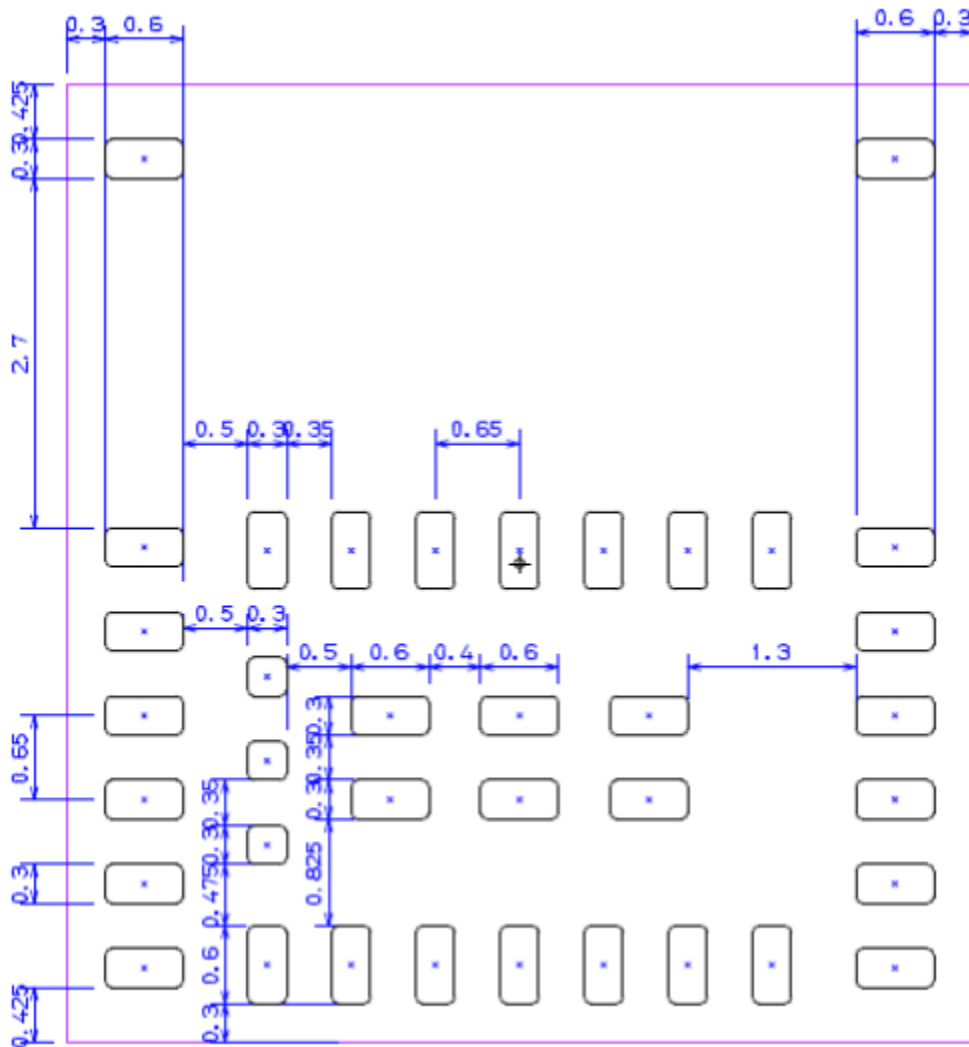


Figure 8.1 Recommended PCB Landing Pattern

7.2 Host PCB Layout Recommendations

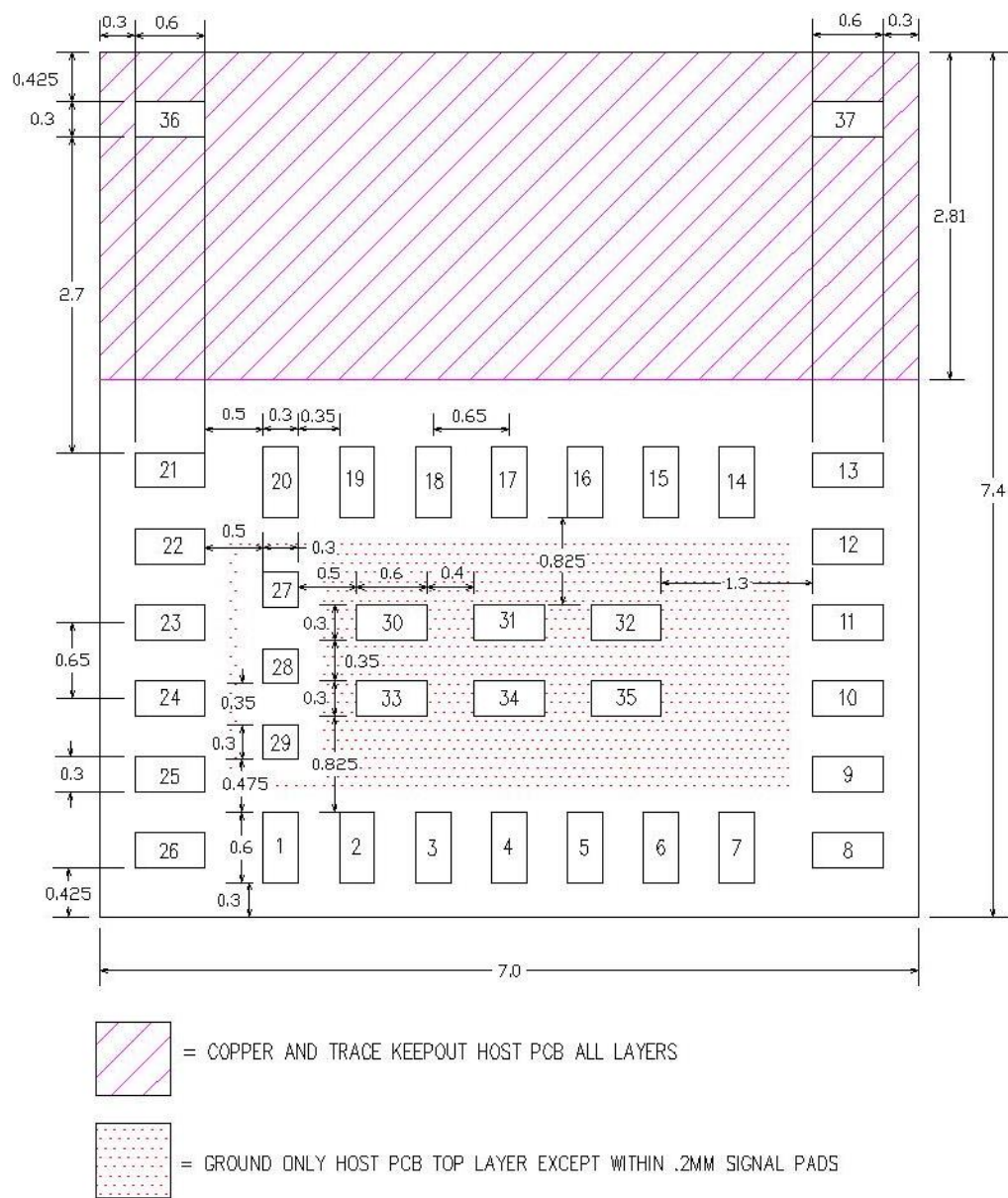


Figure 8.2 Host PCB Layout Recommendation, top view

7.3 Layout Guidance for Using Internal PCB Antenna

The MBN52832 module is certified with an internal PCB antenna physically located on the module. For optimum EIRP (Effectively Isotropically Radiated Power) when use the on-board antenna, please follow the following recommendations in the customer host circuit board design.

- A. The module is recommended is be placed on top left corner of the host circuit board.
- B. Around the antenna area, all layers of the customer circuit board should be free of any metal objects. Specifically, there should be no ground plane, traces or metal shield case
- C. Host circuit PCB length is longer than 40mm to get optimal performance by using ground plane.
- D. Right side of antenna area also should be free of grounds.
- E. Metal and plastic materials should be away from the module. (more than 3mm)

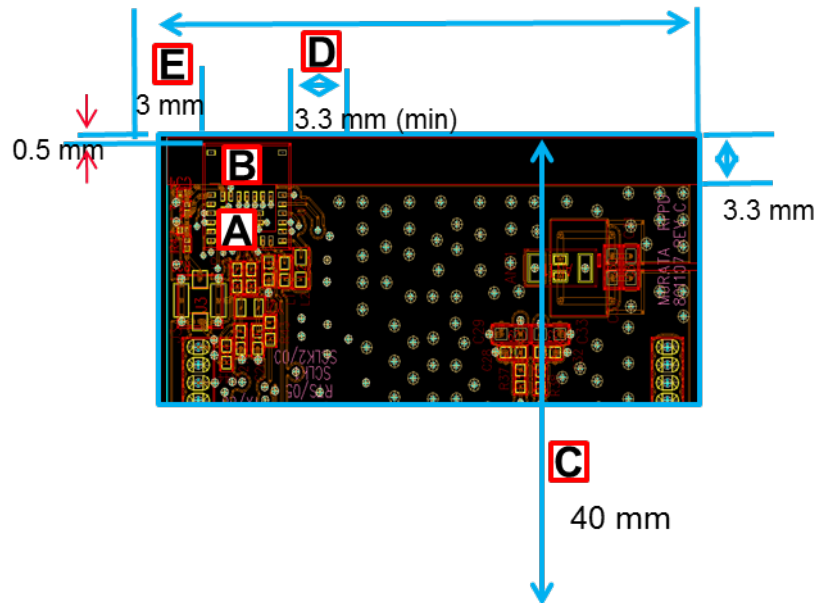
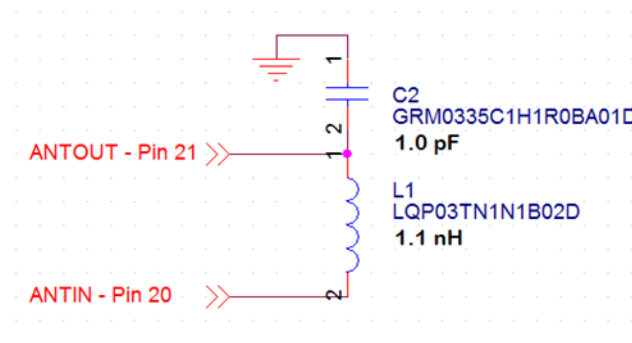


Figure 8.3 Layout Guide for Antenna Performance (1)

- F. To use this internal antenna, the integrator must provide a simple two-component matching circuit between pins 20 and 21 of the module. This circuit will connect the RF I/O of the module directly to the PCB antenna. The picture below shows the location of pins 20 and 21.



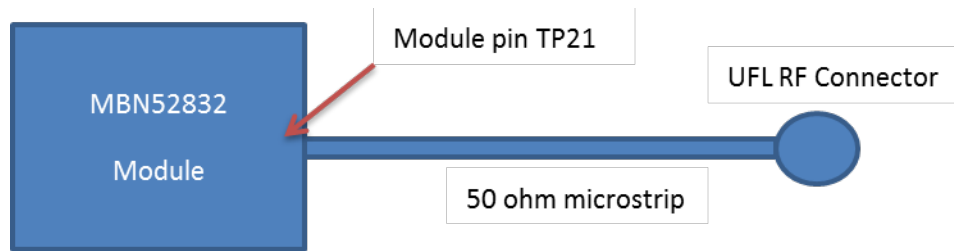


Figure 8.5 Layout Guide for External Antenna (1)

The design of the 50 ohm microstrip on the customer's PCB is crucially important. Compliant operation of the MBN is dependent on proper construction of this 50 ohm line and the following guidelines must be followed to ensure legal operation of the product.

The diagram below shows the required microstrip structure to be routed between module pin TP21 and the UFL connector.

The top PCB trace carries the RF energy from module to UFL connector. The Layer2 ground plane provides a return path for the circuit. The Dielectric material (along with the dimensions of the microstrip structures) determines the characteristic impedance of the microstrip transmission line.

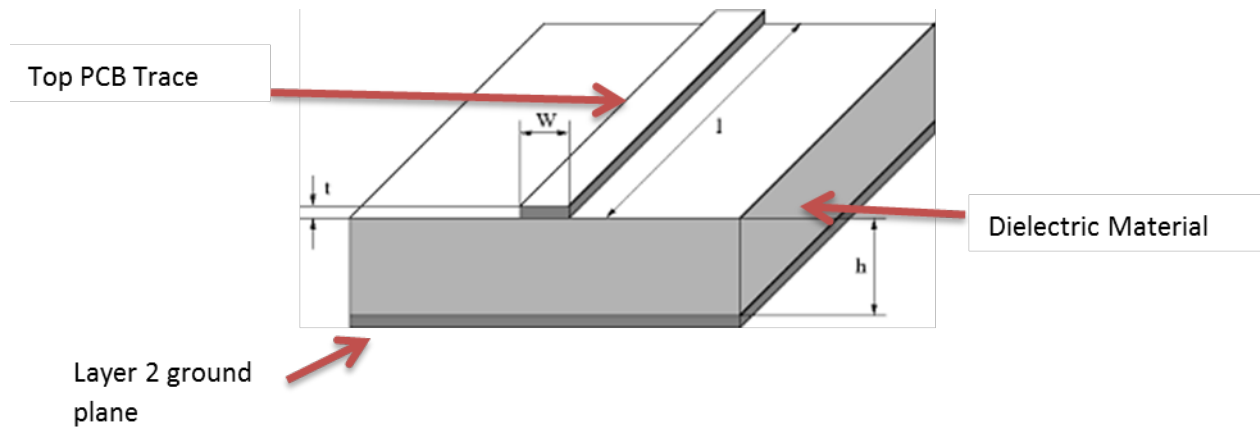


Figure 8.6 Layout Guide for External Antenna (2)

Note the representative dimensions shown in the drawing above. It is imperative that the module customer (the integrator) use the exact dimensions we recommend to ensure a 50-ohm impedance for this transmission line.

The following dimensions and/or ratios should be used to set the microstrip impedance to 50 ohms.

Dielectric (PCB) Material – We recommend standard FR-4 PCB material. Other dielectrics will work but will require recalculation of microstrip dimensions. The following guidance is predicated on the use of FR-4 Dielectric. If FR-4 is not used for PCB material, please contact Murata Electronics at (678) 684-2009 to determine new dimensions for microstrip structure.

H (Dielectric Height) – this is the thickness of dielectric between the trace layer (layer 1) and the ground plane on layer 2. Note that layer 2 must be electrical ground. We recommend a dielectric thickness of 8-15 mils. This range provides the customer with some flexibility in board construction.

t (trace thickness) – Microstrip impedance is not severely affected by the thickness dimension. Standard 1oz or 2oz copper deposition is recommended. Equivalent thickness is 1-2 mils.

W (trace width) – this is the crucial dimension. This width must be set correctly to obtain the desired 50 ohms impedance. When using FR-4 dielectric, the width (W) of the microstrip trace should be set to:

$$W = H * 1.8$$

Where W is microstrip trace width and H is Dielectric height. Note that both values must be measured in identical units (mils or mm)

Example:

$$H = 12 \text{ mils}, W = 12 * 1.8 = 21.6 \text{ mils}$$

$$H = 0.4 \text{ mm}, W = 0.4 * 1.8 = 0.72 \text{ mm}$$

l (trace length) – the impedance of the microstrip line is not dependent on its length. However, regulatory and performance limitations practically determine the actual length to be used by the customer (integrator). The length of this microstrip line must be longer than 7 mm to mimic the length used during FCC/IC certification of the MBN52832 module. Lengths longer than 7 mm are acceptable although additional signal loss will occur as a result. Given these restrictions, Murata recommends microstrip trace lengths between 7 mm and 25 mm.

In any event, the microstrip line must operate over the same Dielectric-Ground Plane configuration shown above to act as a 50 ohm transmission line. Do not run the microstrip trace through sections of PCB that do not have the Dielectric-Ground plane configuration shown above.

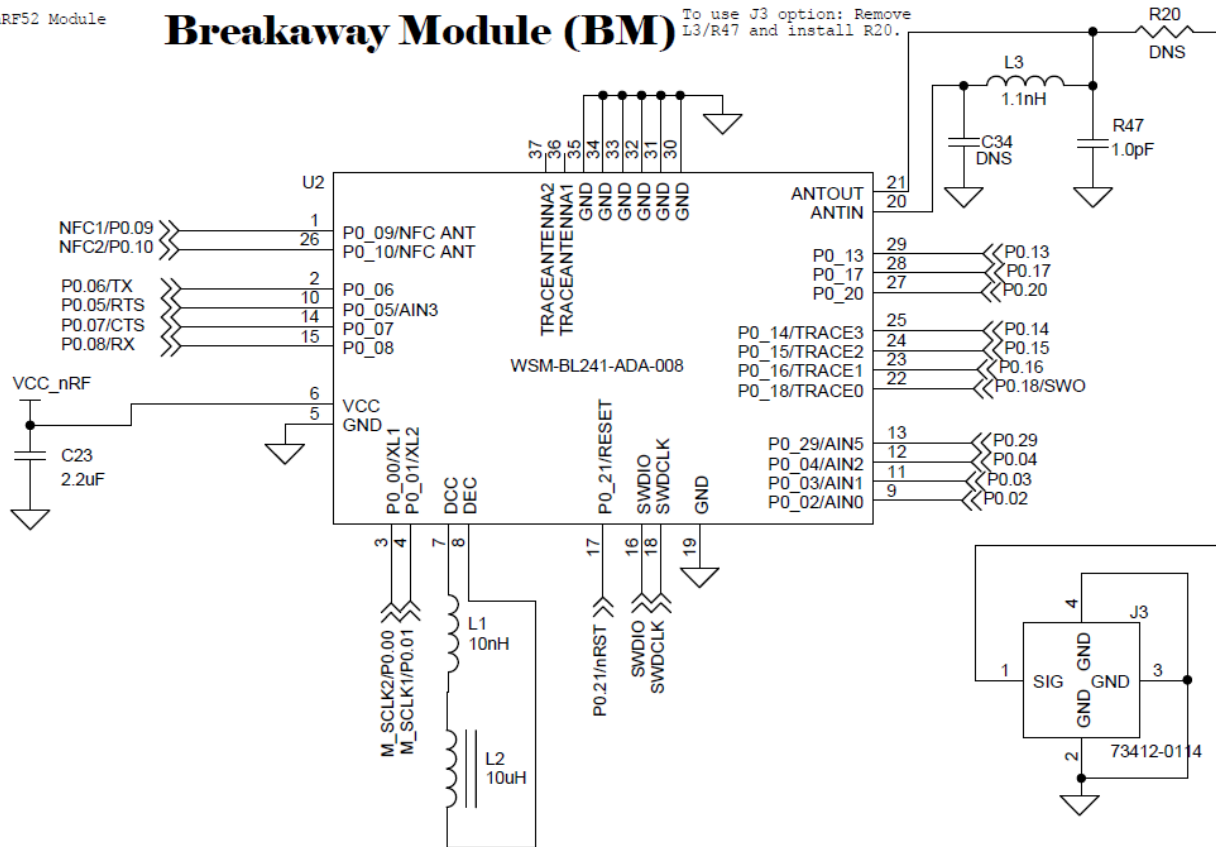
A reliable 50 ohm transmission line will be produced if the above guidance is closely followed. Any deviations from the guidance above may cause the module to operate in noncompliant manner. Any implementation questions or concerns should be directed to Murata module technical support. .

8 Application Reference

nRF52 Module

Breakaway Module (BM)

To use J3 option: Remove L3/R47 and install R20.



Notes:

Option #1: DC/DC converter: as it is

Option #2: LDO: remove L1 and L2

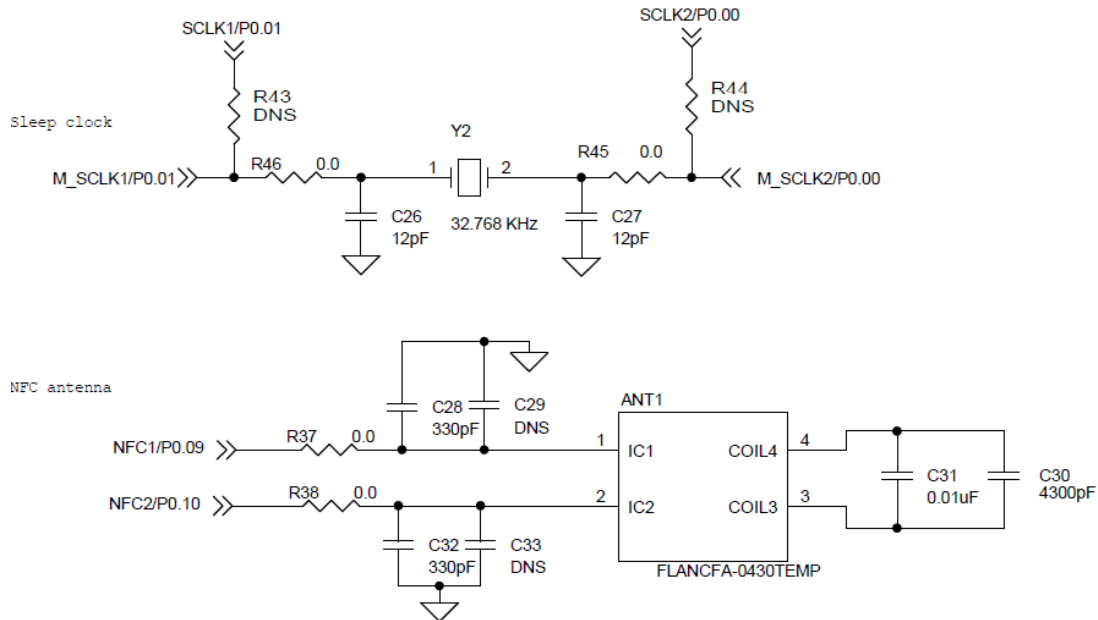


Figure 9.1 Reference Design

9 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 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

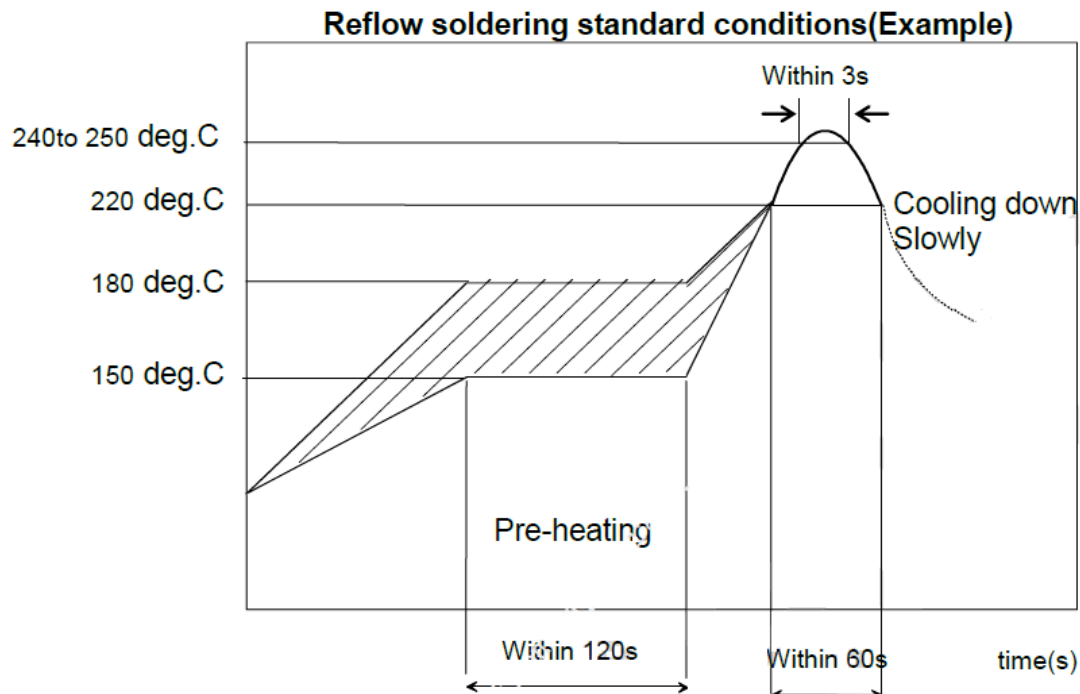


Figure 10.1 Reflow Profile

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.

10 Packaging and Marking Information

10.1 Dimensions of Tape (Plastic tape)

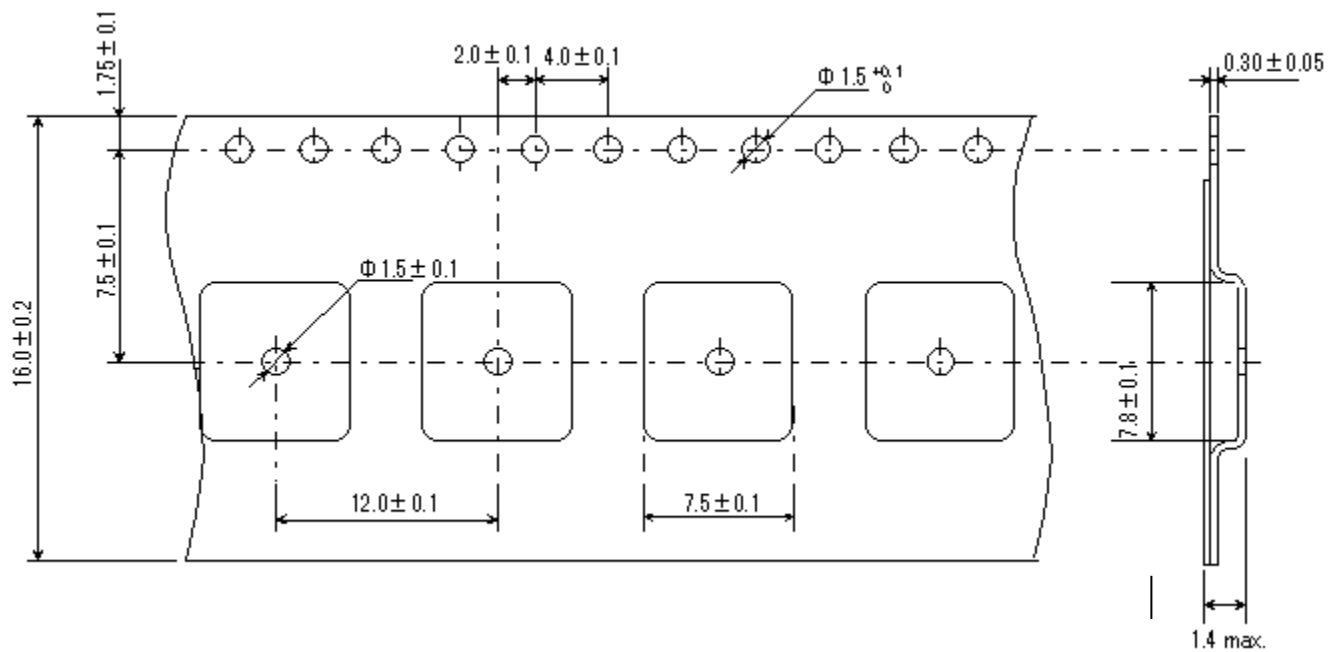


Figure 11.1 Tape Dimensions (Unit in mm)

10.2 Dimensions of Reel

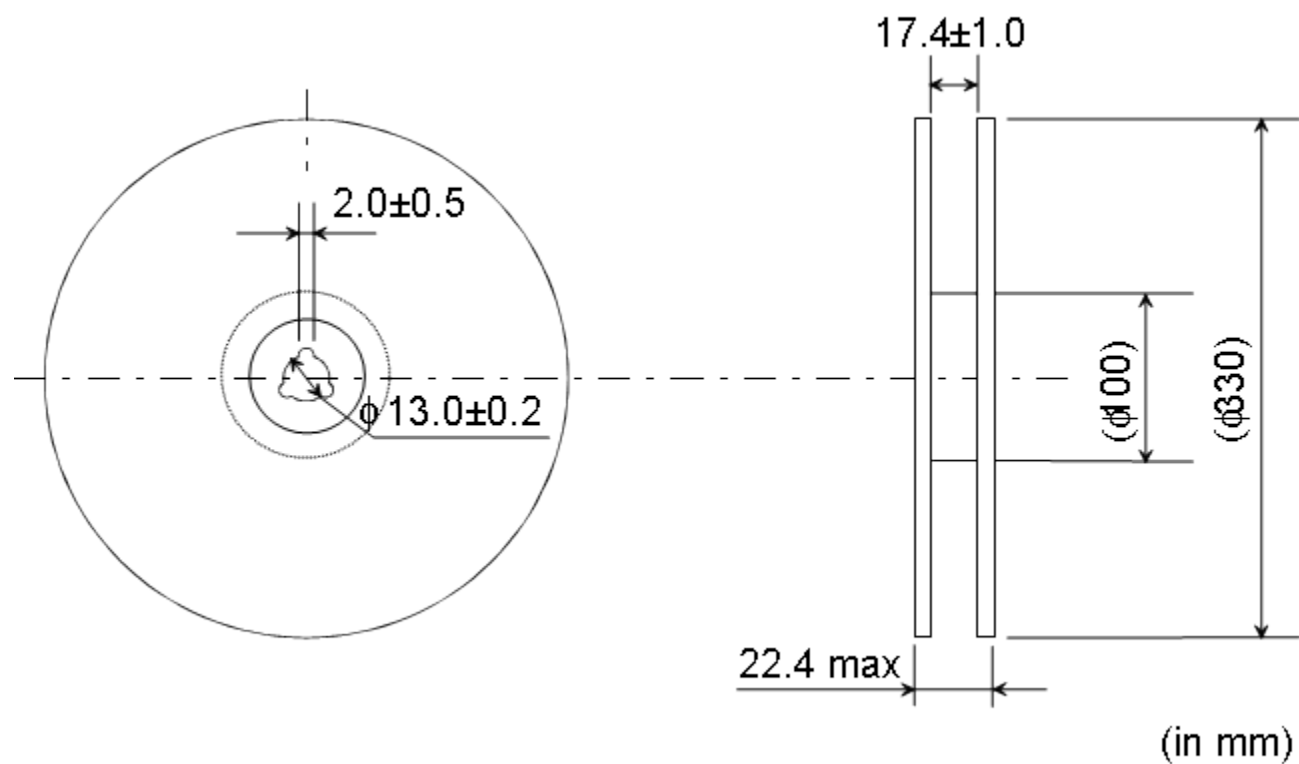


Figure 11.2 Reel Dimensions (Unit: mm)

10.3 Taping Diagrams

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

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

[3] Cover tape : 62 μ m in thickness

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

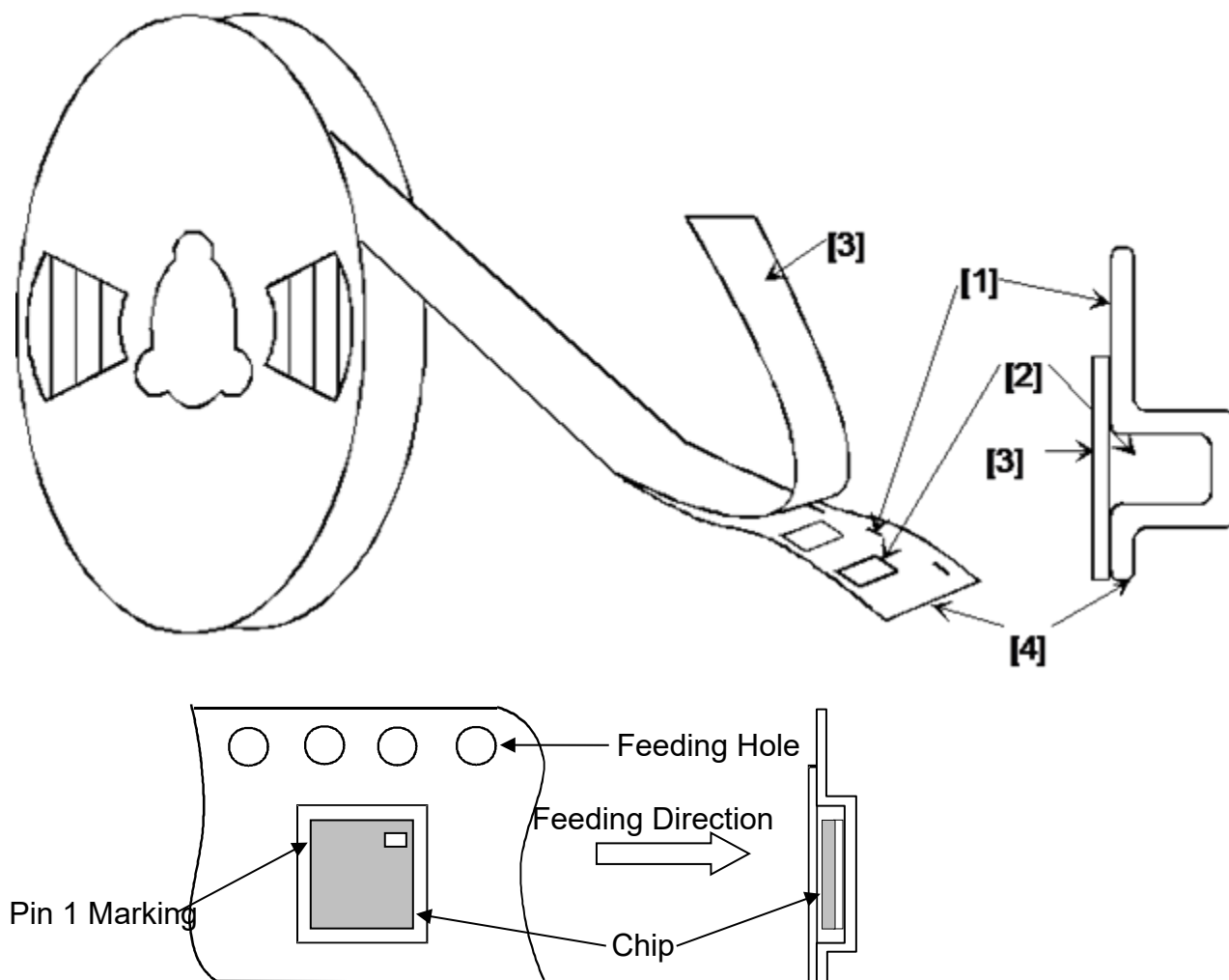


Figure 11.3 Tape Diagram

10.4 Leader and Tail tape

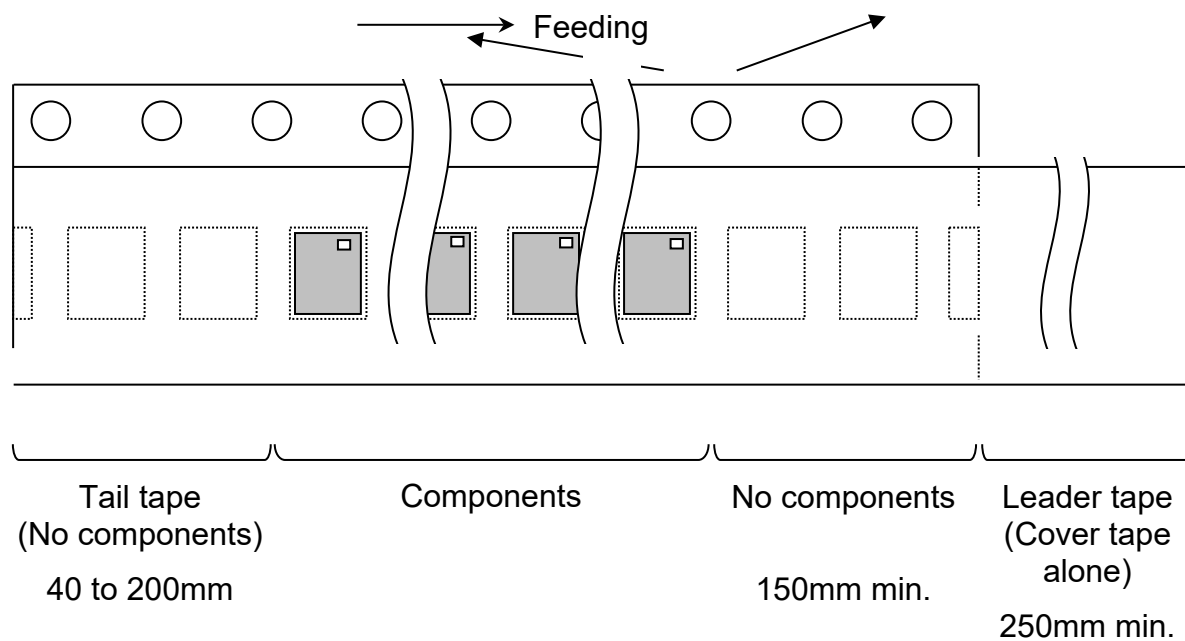


Figure 11.4 Tape Leader and Tail

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: 1000 pcs./ reel

Material:

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

10.5 Peeling Force

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

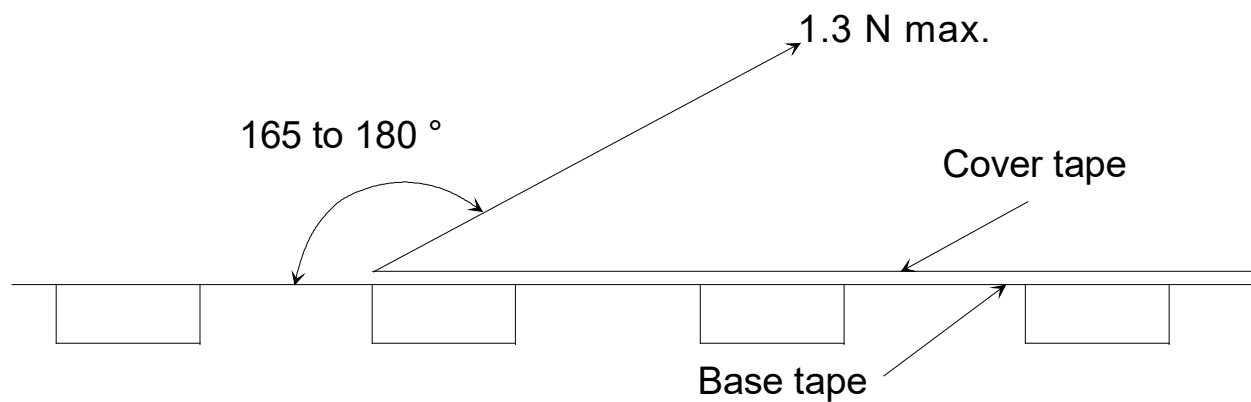


Figure 11.5 Peeling Force Diagram

10.6 PACKAGE (Humidity proof Packaging)

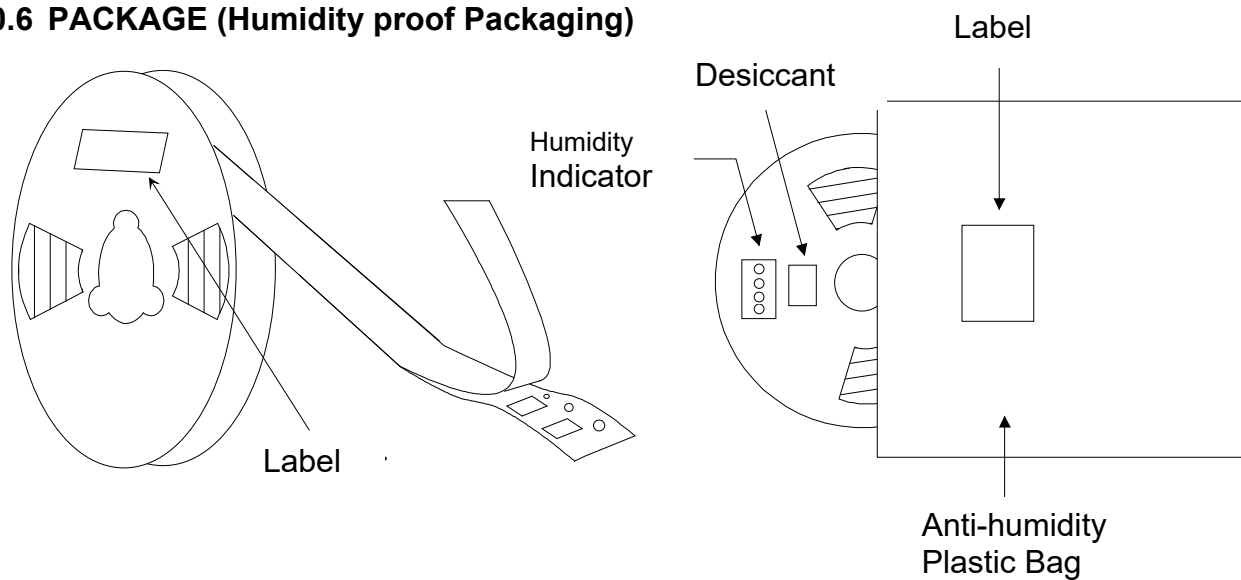


Figure 11.6 Packaging Diagram

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

10.7 Module Marking Information

Figure 11.7 shows the module marking. Dimensions are nominal, not absolute.

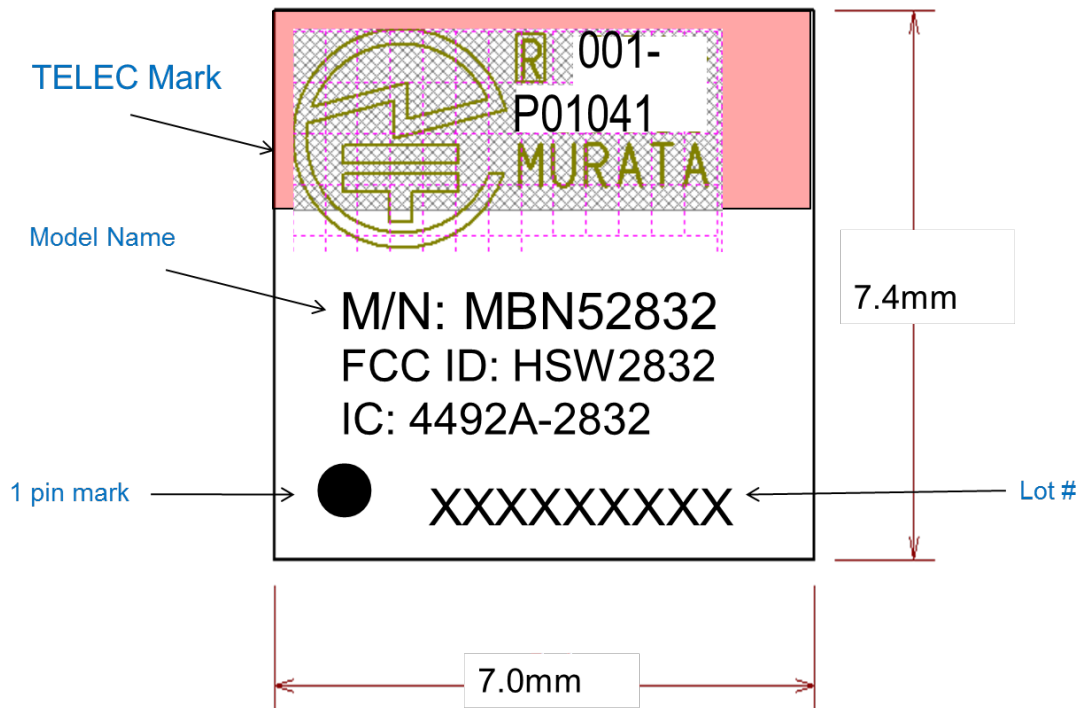


Figure 11.7 Module Marking Diagram

10.8 Moisture Sensitivity Level

The MBN52832 is planned to be qualified to moisture sensitivity level 3 in accordance with JEDEC J-STD-020.

11 Regulatory Information

The table below shows the regulatory compliance status of the MBN52832 module.

Table 12.1 Regulatory Standards Conformance

Regulatory Body	Standard	Certificate ID
FCC	Part 15	HSW2832
IC	RSS-210	4492A-2832
ETSI	EN300 328, Ver. 2.1.1 ETSI EN301.489 - 17	Compliant
TELEC	Article 38-24 Paragraph 1 of the Radio Law	001-P1041
BT SIG	BT 5.0	Declaration ID: D036210 QDID: 97989

MBN52832 also has been certified with a particular external antenna (see table below).

Table 12.2 External Antenna to comply with FCC and IC

Part Number	Vendor	Gain (dBi)	Type	Connector	Remarks
S2406PL	Cushcraft	6.0	Patch	U.FL	Necessary for FCC/IC compliance only.
HG2407RD-RSP	L-Comm	7.0	Dipole	U.FL	Necessary for FCC/IC compliance only.

To be compliant with RED Directive while using MBN52832 module with external antenna, the total EIRP including the antenna gain should be less than or equal to 10dBm.

11.1 FCC Notice (USA)

Warning: Changes or modifications to this device not expressly approved by Murata 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.

The FCC requires the OEM to be notified that any changes or modifications not expressly approved by Murata may void the user's authority to operate the equipment. While an application of the MBN52832 module in a product is not required to obtain a new FCC authorization for the module, this does not preclude the possibility that some other form of authorization or testing may be required for that end product.

This device using the integrated antenna has been tested to comply with FCC CFR Part 15. The device meets the requirements for modular transmitter approval as detailed in the FCC 47 CFR 15.212.

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.

11.2 FCC Labeling Requirements

When integrating the MBN52832 into a product the FCC labeling requirements must be met. This includes a clearly visible label on the outside of the finished product specifying the MBN52832 FCC identifier (FCC ID: HSW2832) as well as the notice above. The exterior label can use wording such as “Contains Transmitter Module FCC ID: HSW2832” or “Contains FCC ID: HSW2832” although any similar wording that expresses the same meaning may be used.

11.3 IC Notice (Canada)

The term “IC” before the certification/registration number only signifies that the Industry Canada technical specifications were met.

Le terme “IC” devant le numéro de certification /d’enregistrement signifie seulement que les spécifications techniques Industrie Canada ont été respectées.

This device complies with Industry Canada license-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.

Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence (s). Son utilisation est soumise à Les deux conditions suivantes: (1) cet appareil ne peut pas provoquer d’interférences et (2) cet appareil doit accepter Toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.

This device complies with Health Canada’s Safety Code 6 / IC RSS-210. The installer of this device should ensure that RF radiation is not emitted in excess of the Health Canada’s requirement. Information can be obtained at: http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php

Cet appareil est conforme avec Santé Canada Code de sécurité 6 / IC RSS-210. Le programme d’installation de cet appareil doit s’assurer que les rayonnements RF n’est pas émis au-delà de l’exigence de Santé Canada. Les informations peuvent être obtenues: http://www.hc-sc.gc.ca/ewh-semt/pubs/radiation/radio_guide-lignes_direct-eng.php

This radio transmitter MBN52832 has been approved by Industry Canada to operate with the antenna types listed below 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.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s’il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d’antenne énumérés ci-dessous et ayant un gain admissible maximal et l’impédance requise pour chaque type d’antenne. Les types d’antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l’exploitation de l’émetteur.

Table 12.3 External Antenna to comply with IC

Part Number	Vendor	Gain (dBi)	Type	Connector	Remarks
S2406PL	Cushcraft	6.0	Patch	U.FL	Necessary for FCC/IC compliance only.
HG2407RD-RSP	L-Comm	7.0	Dipole	U.FL	Necessary for FCC/IC compliance only.

11.4 IC Labeling Requirements

The host device should be properly labeled to identify the module within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains transmitter module IC: 4492A-2832, where 4492A-2832 is the module's certification number.

11.5 ESTI compliance (Europe)

This device has been tested for use in the European Union. Both MBN52832 comply with the following regulation test.

ETSI EN300 328, Ver. 2.1.1

ETSI EN301.489 - 17

If this device is used in a product, the OEM has responsibility to verify compliance of the final product to the EU standards. A Declaration of Conformity must be issued and kept on file as described in Annex II of the Radio and Telecommunications Terminal Equipment Directive.

11.6 RF Exposure

11.6.1 Using on-board PCB antenna

This equipment complies with radiation exposure limits set forth for an uncontrolled environment. This equipment is in direct contact with the body of the user under normal operating conditions. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement est en contact direct avec le corps de l'utilisateur dans des conditions de fonctionnement normales. Cet émetteur ne doit pas être co-localisées ou opérant en conjonction avec tout autre antenne ou transmetteur.

11.6.2 Using external antenna

This equipment complies with radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiations dans un environnement non contrôlé. Cet équipement doit être installé et utilisé à distance minimum de 20 cm entre le radiateur et votre corps. Cet émetteur ne doit pas être co-localisées ou opérant en conjonction avec tout autre antenne ou transmetteur.

If the module will be used for portable applications, the device must undergo SAR testing.

The following statement must be included as a CAUTION statement in manuals for the products to alert users on FCC RF exposure compliance:

"WARNING: To satisfy FCC RF exposure requirements for mobile transmitting devices, a separation distance of 20 cm or more should be maintained between the antenna of this device and persons during operation. To ensure compliance, operations at closer distances than this are not recommended."

12 RoHS Information

The MBN52832 module is conformed to RoHS requirement.

13 Ordering Information

Product	Model Name	Murata Ordering Part Number	Standard Order Increment
BLE Module	MBN52832	WSM-BL241-ADA-008	1000 pc
Development Kit	MBN52832DK	WSM-BL241-ADA-008DK	1 pcs

14 Notice

14.1 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 MSL3 (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.

14.2 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.

14.3 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.

14.4 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.

14.5 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, SO_x, NO_x 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.

14.6 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.

15 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.

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