

***Bluetooth*<sup>®</sup> low energy Module**

**Bluetooth<sup>®</sup> 5.2 low energy**

**EYSPBNZUA**

Data Report

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**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

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## Revision History

~~27-Feb-2019~~ > Ver.1.0 Release

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A191077	(1/6)	Control name General Items
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## 1. Scope

This specification ("Specification") applies to the hybrid IC "EYSPBNZUA", a **Bluetooth**® 5.2 low energy module ("Product") manufactured by TAIYO YUDEN Co., Ltd. ("TAIYO YUDEN")

## 2. Description

a) User Code : EYSPBNZUA

Type : EYSPBN

\*User Code may be changed for mass production or other cases.

Note: Please use the User Code (EYSPBNZUA) to order this product

b) Chip : Nordic nRF52833 (512kB Flash, 128kB RAM)

c) Function : Radio frequency transceiver Module. Bluetooth®5.1 conformity.

d) Application : IoT devices, Health & Fitness Equipment, Sensor, Toys

e) Structure : Hybrid IC loaded with silicon monolithic semiconductor  
Containment of hazardous substance in this Product  
Can meet with RoHS compliance

f) Outline : 63-pin Land Grid Array

g) Marking : Part Number, Lot Number, Japan ID, FCC ID, ISED Number and manufacturer on Shielding Case

h) Country of origin : Japan or Thailand

i) Packaging : Packaging method: Tape & reel + aluminum moisture barrier bag  
Packaging unit: 1000

\*It might be provided as tray at sample stage.

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**EYSPBNZUA**

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Control No. HD-AG-A191077	(2/6)	Control name General Items
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## j) Notes:

## a. Limitation of Warranty

- 1) TAIYO YUDEN provides warranties only if the Product is operated under the condition set forth in this Specification. Please note that TAIYO YUDEN shall not be liable for any defect and/or malfunction arising from use of the Product under the terms and conditions other than the operating conditions hereof. In addition when this Product is used under environmental conditions such as over voltage which is not guaranteed, it may be destroyed in short mode. To ensure the security of customer's product, please add an extra fuse or/and a protection circuit for over voltage.
- 2) This Product is designed for use in products which comply with Bluetooth® Specifications. TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owned by third party in case the customer uses this Product in any product which does not comply with Bluetooth® Specifications (the "non-complying products"). Furthermore, TAIYO YUDEN warrants only that this Product complies with this Specification and does not grant any other warranty including warranty for application of the non-complying products.
- 3) In some cases, TAIYO YUDEN may use replacements as component parts of Products. Such replacement shall apply only to component part of Products, which TAIYO YUDEN deems it possible to replace or substitute according to (i) Scope of Warranty provided in this specification (e.g. Electric Characteristics, Outline, dimension, Conditions of Use, Reliability Tests, Official Standard (Type Approvals etc.)) and (ii) Quality of Products. TAIYO YUDEN also ensures traceability of such replacement on production lot basis.

## b. Instruction for Use (CAUTION)

- 1) Because Product is not designed for radiation durability, please refrain from exposing Product to radiation in the use.
- 2) Communication between this Product and other might not be established nor maintained depending upon radio environment or operating condition of this Product and other products with wireless technology.
- 3) This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference occurs between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.
- 4) This Product mentioned in this Specification is manufactured for use in Health & Fitness Equipment, Sensor, Toys. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safety operation of those special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added in design stage, all at the customer's sole risk.

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## 5) Japan Regulatory Information

- a) This module is approved with the specific antenna on this module.
- b) Please ensure that your product can bear a label with the following information. If the product is so small that it is not practicable to place the label, please place it in the instruction manual and package.

This product installs a radio system which has been approved as a radio station in a low power data communication system based on the Radio Law.

EYSPBN : \*\*\*-\*\*\*\*\*

## 6) Canada Regulatory Information

- a) This device complies with Industry Canada's applicable license-exempt RSSs. 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 radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) l'appareil ne doit pas direction produire de brouillage; 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

- b) This product is certified as type of the portable device with Industry Canada Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product and have a separation distance of minimum 15 mm between the user and/or bystander and the antenna and /or radiating element. This distance ensures that the output power (e.i.r.p.) of EYSPBN is below the SAR evaluation Exemption limits defined in RSS-102 issue 5.

Ce produit est certifié comme type de l'appareil portable avec Industrie Règles de Canada. Pour maintenir l'acquiescement avec exigence Exposition de RF, veuillez utiliser dans spécification de ce produit et respecter une distance de séparation d'au moins 15 mm entre l'utilisateur et / ou un tiers et l'antenne et / ou l'élément rayonnant. Cette distance garantit que la puissance de sortie (p.i.r.e.) d'EYSPBN est inférieure aux limites d'exemption de l'évaluation SAR définies dans le numéro 5 de la norme RSS-102.

- IC: \*\*\*\*-EYSPBN

- c) Please notify certified ID by either one of the following method on your product.
  - Spécifiez ID certifiée dans votre produit par une de méthode suivante.
  - Contains Transmitter module IC : \*\*\*\*-EYSPBN
  - Contains IC : \*\*\*\*-EYSPBN

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Control No. HD-AG-A191077	(4/6)	Control name General Items
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## 7) FCC Regulatory Information

- a) 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.
- b) Please notify certified ID by either one of the following method on your product.
  - Contains Transmitter Module FCC ID: ~~RYYEYSPBN~~
  - Contains FCC ID: ~~RYYEYSPBN~~
- c) CAUTION: changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment.
- d) This product is certified as type of the portable device with FCC Rules. To maintain compliance with RF Exposure requirement, please use within specification of this product and have a separation distance of minimum 10 mm between the user and/or bystander and the antenna and /or radiating element. This distance ensures that max output power of EYSPBN is below the SAR test exclusion limits presented in KDB 447498 D01v06.
- e) The antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- f) This module can change the output power depending on the circumstances by the application software which is developed by module installer. Any end user cannot change the output power.

## 8) CE Regulatory Information

- a) When your end product installs this module, it is required to proceed additional certification processes before placing on the market in EU member states to make your products fully comply with relative EU standards.
- b) TAIYO YUDEN can provide you the test reports of conducted measurement portion for the radio module. You can utilize the test reports for the certification processes of your end product as it requires radio testing.

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Control No. HD-AG-A191077	(5/6)	Control name General Items
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**c. Term of Support**

- 1) In the case that customer requests TAIYO YUDEN to customize the hardware of this Product in order to meet such customer's specific needs, TAIYO YUDEN will make commercially reasonable effort to modify such hardware or software at customer's expense; provide however, the customer is kindly requested to agree it doesn't mean that TAIYO YUDEN has obligations to do so even in the case it is technically difficult for TAIYO YUDEN.
- 2) Any failure arising out of this Product will be examined by TAIYO YUDEN regardless of before or after mass production. Customer agrees that once such failure is turned out not to be responsible for TAIYO YUDEN after aforesaid examination, some of the technical support shall be conducted by TAIYO YUDEN at customer's expense; provided however, exact cost of this technical support can be agreed through the negotiation by the parties.
- 3) Do not alter hardware and/or software of this Product. Please note that TAIYO YUDEN shall not be liable for any problem if it is caused by customer's alteration of Hardware without Taiyo Yuden's prior approvals.
- 4) TAIYO YUDEN does not guarantee functions and performances which depend on the customer's firmware. TAIYO YUDEN does not assume liabilities for defects and failures (i) in functions, performances and quality of the Customer's product incorporating the Products and (ii) which may occur as the Product is incorporated in the Customer's product.

**d. Caution for Export Control**

This Product may be subject to governmental approvals, consents, licenses, authorizations, declarations, filings, and registrations for export or re-export of the Product, required by Japanese Foreign Exchange and Foreign Trade Law (including related laws and regulations) and/or any other country's applicable laws or regulations related to export control.

In case you will export or re-export this Product, you are strongly recommended to check and confirm, before exporting or re-exporting, necessary procedures for export or re-export of this Product which is required by applicable laws and regulations, and if necessary, you have to obtain necessary and appropriate approvals or licenses from governmental authority at your own risk and expense.

**e. Term of Warranty**

TAIYO YUDEN warrants only that this Product is in conformity with this Specification for one year after purchase and shall in no event give any other warranty.

**f. Items of the Specification**

- 1) Any question arising from the Specification shall be solved in good faith through mutual discussion by the parties hereof.
- 2) The language of this "General items" is Japanese and this "General items" shall be interpreted by Japanese Any copies of translation is a reference purpose only and is not binding on both parties hereto.

**TAIYO YUDEN CO., LTD.**

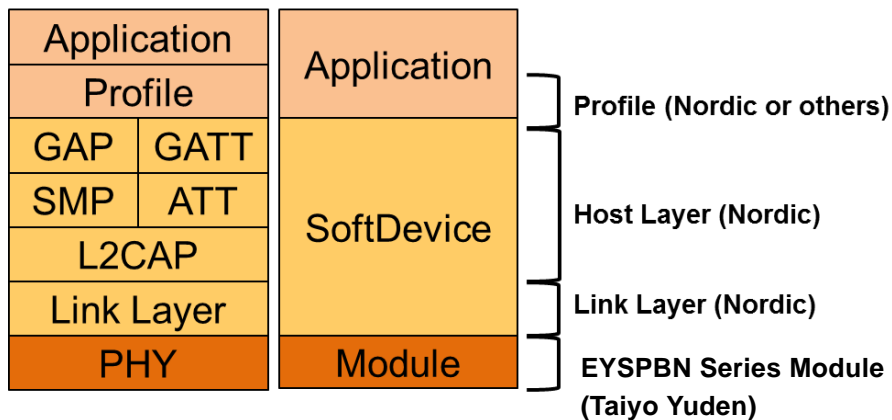
# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-AG-A191077	(6/6)	Control name General Items
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g. Special note

- 1) Taiyo Yuden writes firmware for and fixed SoftDevice (s140\_nrf52\_7.0.1\_softdevice.hex) to this product. Customer writes firmware that is match the customer applications including SoftDevice at the customer's own responsibility.
- 2) The Electrical Characteristics defined in this Specification are of the module with above Firmware (s140\_nrf52\_7.0.1\_softdevice.hex). If other firmware developed by Customer is installed, the characteristics may differ from the defined value in the Electrical Characteristics. Bluetooth qualification and radio type approval may become invalid.
- 3) 802.15.4 at 2.4GHz band is used 16ch from ch11 (2405MHz) to ch26 (2480MHz). Due to the wide occupied bandwidth of the 802.15.4 signal, the radiated emission level exceeds the FCC (Federal Communications Commission) regulation limit level if it transmits the ch26 near 2483.5MHz witch starting FCC restricted band. Therefore integrators of this module have to make the application software that should not be possible to transmit the 26ch, and cannot be unlocked by an end-user.
- 4) EYSPBN series module is qualified as PHY only with Component category by Bluetooth SIG. The QDID of this module is 420042. The final product needs to get qualification as End product combining with PHY (module), SoftDevice and Profile before selling the product. The combination of Link and Host layer is differ with SoftDevice. Please refer to following combination and consult with your qualification body and BQC.





**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HD-AM-A191077	(1/1)	Control name Absolute maximum ratings
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**Absolute maximum ratings**

Symbol	Parameter	Min.	Max.	Units
VDD		-0.3	+3.9	V
VDDH		-0.3	+5.8	V
VBUS		-0.3	+5.8	V
GND			0	V
VIO, VDD $\leq$ 3.6V		-0.3	VDD+ 0.3	V
VIO, VDD $>$ 3.6V		-0.3	+3.9	V
Storage temperature		-40	+125	Deg-C
MSL	Moisture Sensitivity Level	3		
ESD HBM	Human Body Model		1	kV
ESD MM	Machine Model		100	V
Endurance	Flash Memory Endurance	10000		write/erase cycles
Retention	Flash Memory Retention	10 years		At 40 deg-C

**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HD-AE-A191077	(1/4)	Control name Electrical characteristics
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**Electrical characteristics****Recommendation operating range**

Symbol	Parameter	Min.	Typ.	Max.	Units
VDD	VDD supply voltage, independent of DCDC enable	1.7	3.0	3.6	V
VDDH	VDDH supply voltage, independent of DCDC enable	2.5	3.7	5.5	V
VBUS	VBUS USB supply voltage	4.35	5	5.5	V
VDD,POR	VDD supply voltage needed during power-on reset.	1.75			V
tR_VDD	Supply rise time (0V to 1.7V)*1			60	ms
tR_VDDH	Supply rise time (0V to 1.7V)*1			100	ms
TA	Operation temperature*2	-40	25	85	Deg-C
TA,EXT	Extended operating temperature	85		105	Deg-C

\*1 The on-chip power-on reset circuitry may not function properly for rise times longer than the specified maximum. Also after power off, it must start up from below 0.3V. The on-chip power-on reset circuitry may not function properly.

\*2 ANT specification requires +/-50ppm accuracy for 32.768kHz clock. The internal 32.768kHz crystal does not meet to +/-50ppm over the whole recommended operation temperature range.

**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HD-AE-A191077	(2/4)	Control name Electrical characteristics
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**DC Specifications**

The Specification applies for Topr.= 25 degrees C, VDD and VDDH = 3.0V

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
VIH	Input high voltage	0.7 x VDD		VDD	V
VIL	Input low voltage	GND		0.3 x VDD	V
VOH	Output high voltage (high drive 5 mA)	VDD-0.4		VDD	V
VOL	Output low voltage (high drive 5 mA)	GND		GND+0.4	V
RPU	Pull-up resistance	11	13	16	Kohm
RPD	Pull-down resistance	11	13	16	Kohm
ITX,+8dBm ,DCDC	TX only run current (DCDC, 3V) PRF=+8 dBm		14.8		mA
ITX,+8dBm	TX only run current PRF=+8 dBm		32.7		mA
IRX,1M, DCDC	RX only run current (DCDC, 3V) 1Msps BLE		4.6		mA
IRX,1M	RX only run current 1Msps BLE		9.9		mA
IRX,2M, DCDC	RX only run current (DCDC, 3V) 2Msps BLE		5.2		mA
IRX,2M	RX only run current 2Msps BLE		11.1		mA
IOFF	System OFF, no RAM retention, wake on reset		0.40		uA

**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HD-AE-A191077	(3/4)	Control name Electrical characteristics
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**RF Specifications**

Symbol	Description	Min.	Typ.	Max.	Units
Fop	Operating frequencies	2402		2480	MHz
PLLchsp	PLL channel spacing		1		MHz
DfBLE1M	Frequency deviation @ BLE 1Msps		+/-250		kHz
DfBLE2M	Frequency deviation @ BLE 2Msps		+/-500		kHz
PRF	Maximum output power		8.0		dBm
PRFC	RF power control range		28		dB
PRFCR	RF power accuracy			+/-4	dB
PRF1	1st Adjacent Channel Transmit Power 1 MHz (1 Mbps)		-24.8		dBc
PRF2	2nd Adjacent Channel Transmit Power 2 MHz (1 Mbps)		-54.0		dBc
PRXMAX	Maximum received signal strength at < 0.1% PER		0		dBm
PSENS,IT,1M,BLE	Receiver sensitivity 1Msps BLE Ideal transmitter <=37bytes (0.1% BER)		-95		dBm
PSENS,IT,2M,BLE	Receiver sensitivity 2Msps BLE Ideal transmitter Packet length<=37bytes		-92		dBm
PSENS,IT,BLE LE125k	Sensitivity, 125 kbps BLE mode		-103.0		dBm
PSENS,IT,BLE LE500k	Sensitivity, 500 kbps BLE mode		-99		dBm

**Many documents of nRF52833, such as product specification and the errata, can be found at the link below. Please be sure to check these latest documents when using our module.**

nRF52833\_Product Specification

[https://infocenter.nordicsemi.com/topic/ps\\_nrf52833/keyfeatures\\_html5.html?cp=4\\_1\\_0](https://infocenter.nordicsemi.com/topic/ps_nrf52833/keyfeatures_html5.html?cp=4_1_0)

nRF52833 Rev 1 Errata

[https://infocenter.nordicsemi.com/topic/struct\\_nrf52/struct/nrf52833\\_errata.html?cp=4\\_1\\_1](https://infocenter.nordicsemi.com/topic/struct_nrf52/struct/nrf52833_errata.html?cp=4_1_1)

S140\_SoftDevice Specification

[https://infocenter.nordicsemi.com/topic/struct\\_nrf52/struct/s140.html?cp=4\\_6\\_3](https://infocenter.nordicsemi.com/topic/struct_nrf52/struct/s140.html?cp=4_6_3)

For more information

<https://infocenter.nordicsemi.com/index.jsp>

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# EYSPBNZUA

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Control No. HD-AE-A191077	(4/4)	Control name Electrical characteristics
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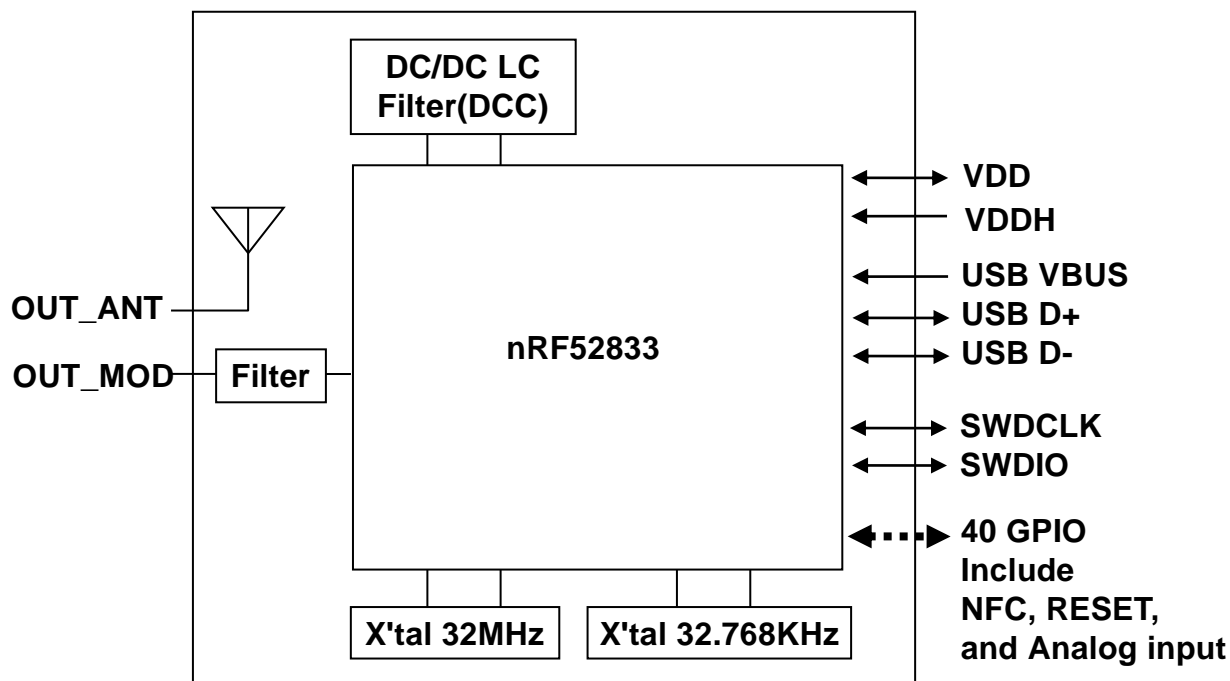
TBD

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-MC-A191077	(1/4)	Control name Circuit Schematic
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## Block Diagram



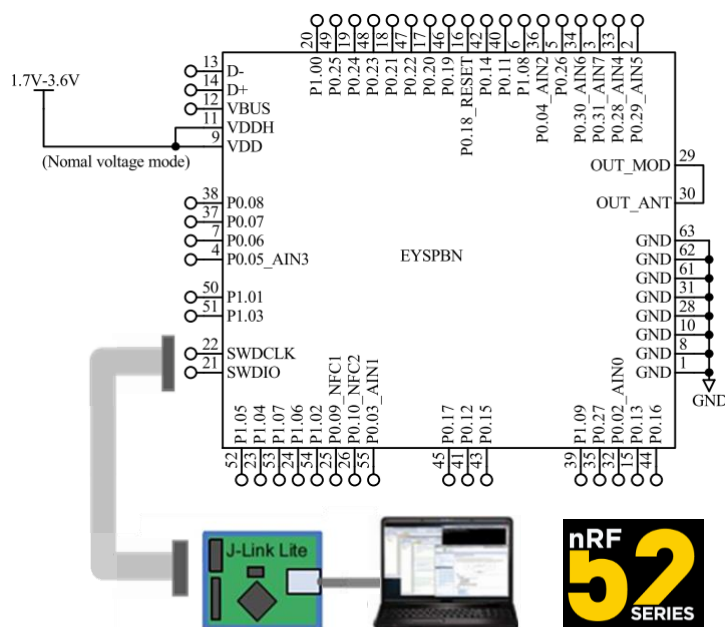
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# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-MC-A191077	(2/4)	Control name Circuit Schematic
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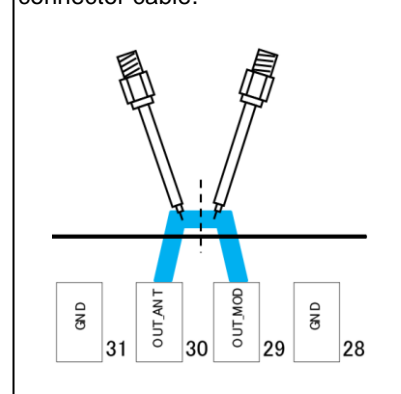
## Reference Circuits



When using the internal antenna of the module, connect PAD29 and PAD30 as short as possible.

If you need to measure the antenna performance and RF conduction performance, please draw a tie line of PAD29 and PAD30 outside a module in advance.

When measuring, please cut off the signal line and attach the RF connector cable.



SWD (Serial Wire Debug) is a high performance 2-pin debug port that replaces JTAG. You can debug and program with J-link Lite. When using J-LINK Lite, it is convenient to mount a socket on the customer's main board. The socket will be "10-pin connector two rows of 1.27mm pitch (Ex: PSS-720153-05, Hirose instrument). J-Link Lite operates at 3.3 V. do not operate at 1.8 V, so please be careful. The SWDIO line has a 13kΩ internal pull-up resistor. The SWDCLK line has a 13kΩ internal pull-down resistor.

The bypass capacitor necessary for the power supply line is installed inside the module. So you do not need to add external capacitors. However, in case of the operation with the battery, we recommend that you add a bypass capacitor about 100uF in view of the voltage drop during TX/RX. Please consider whether it is necessary according to the performance of the customer's battery.

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-MC-A191077	(3/4)	Control name Circuit Schematic
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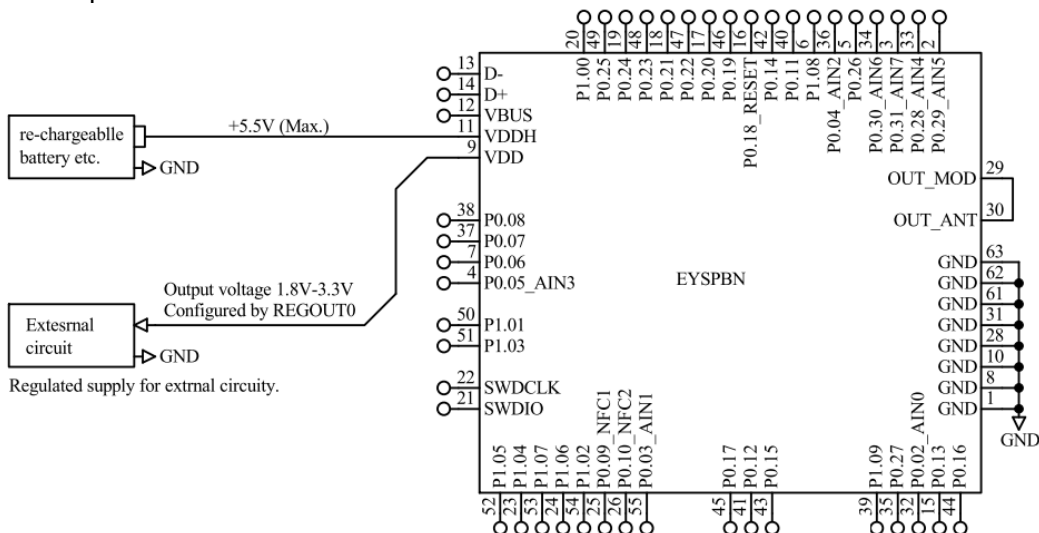
## 1. Normal voltage mode

Normal voltage mode is entered when the supply voltage is connected to both the VDD and VDDH pins (so that VDD equals VDDH).

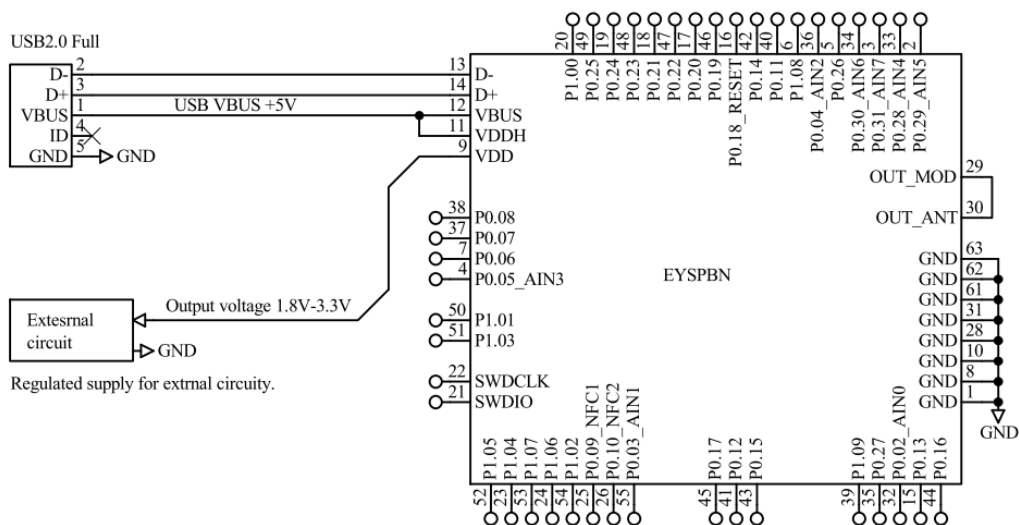
## 2. High voltage mode

This module supports supply voltage up to 5.5V, such as lithium-ion battery or USB bus power. High voltage mode is entered when the supply voltage is only connected to the VDDH pin and the VDD pin is not connected to any voltage supply.

### Non USB operation



### USB operation



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Control No. HD-MC-A191077	(4/4)	Control name Circuit Schematic
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### 3.Other

P0.02-0.31 and P1.00-1.09 are GPIOs. By setting in the application software, it is assigned to pin as UART, etc. Although unused pins can be made OPEN, please do not recommend to draw signal line from them.

The GPIO high reference voltage always equals the level on the VDD pin. In **normal voltage mode**, the GPIO high level equals the voltage supplied to the VDD pin, and in **high voltage mode** it equals the level specified in register REGOUT0.

GPIO high (V): 0.7xVDD to VDD  
GPIO low (V): GND to 0.3xVDD

In high voltage mode, the output from internal regulator can be used to supply external circuitry from the VDD pin. The VDD output voltage is configured in register REGOUT0 and the supported output voltage range depends on the supply voltage provided to the VDDH pin. In addition, the external current draw is defined as the sum of all the GPIO currents and the currents being drawn from VDD, and the maximum value depends on the operating condition.  
Please refer to the product specification of nRF52833 chip.

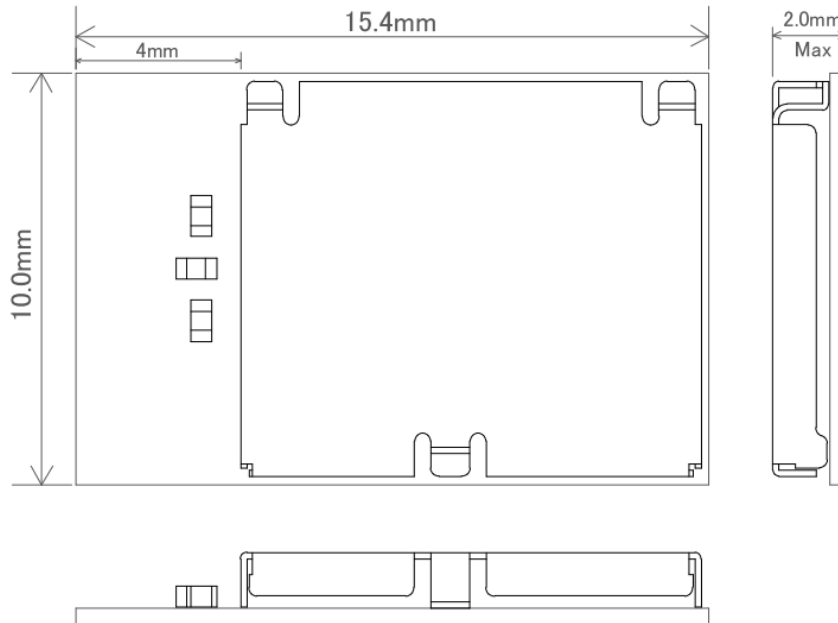
nRF52833\_Product Specification  
[https://infocenter.nordicsemi.com/topic/ps\\_nrf52833/keyfeatures\\_html5.html?cp=4\\_1\\_0](https://infocenter.nordicsemi.com/topic/ps_nrf52833/keyfeatures_html5.html?cp=4_1_0)

# EYSPBNZUA

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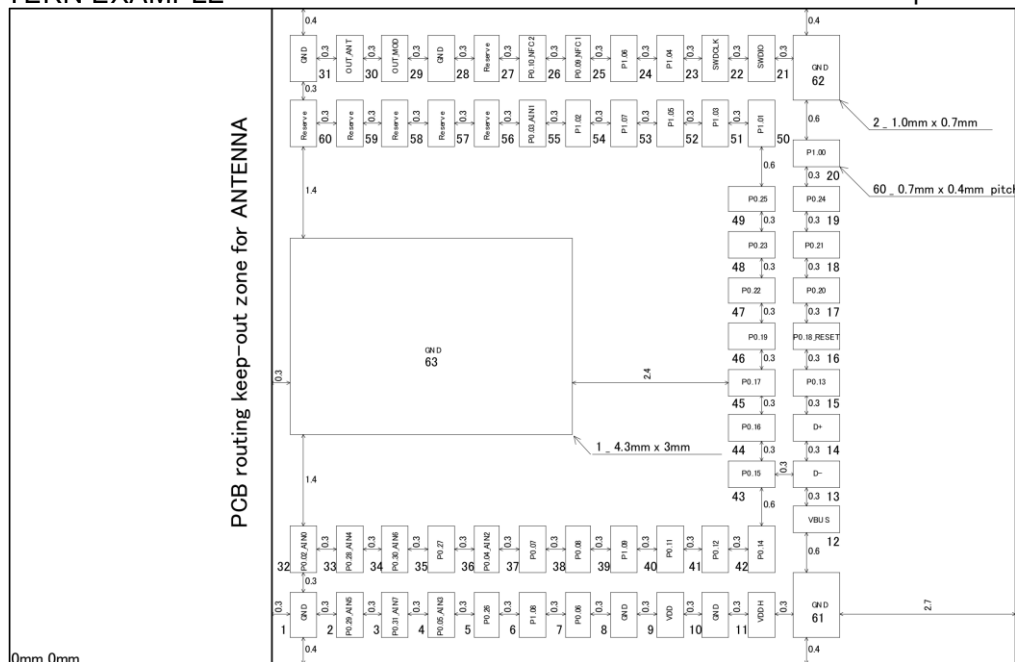
Control No. HD-AD-A191077	(1/1)	Control name Outline/Appearance
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Outline  
Tolerance:  
+/- 0.2mm



## LAND PATTERN EXAMPLE

Top view

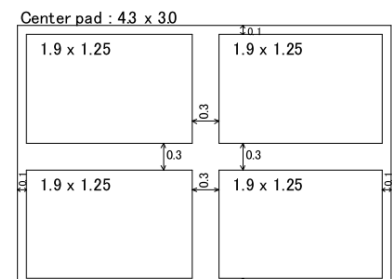


The dimension of the land pattern is the same as a foot pattern.

### Recommended metal mask for solder printing

Pad size	Metal mask opening
Signal pad 60 – 0.7 x 0.4 mm	0.7 x 0.4 mm
Corner pad 2 – 1.0 x 0.7 mm	1.0 x 0.7 mm
Center pad 1 – 4.3 x 3.0 mm	1.9 x 1.25 mm x 4

The metal mask thickness: t=0.1mm



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**EYSPBNZUA**

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Control No. HD-BA-A191077	(1/3)	Control name Pin Layout
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**Pin Descriptions**

Pin	Pin name	Pin function	Description
1	GND	Ground	Ground
2	P0.29_AIN5	Digital I/O Analog input	General purpose I/O Analog input
3	P0.31_AIN7	Digital I/O Analog input	General purpose I/O Analog input
4	P0.05_AIN3	Digital I/O Analog input	General purpose I/O Analog input
5	P0.26	Digital I/O	General purpose I/O
6	P1.08	Digital I/O	General purpose I/O
7	P0.06	Digital I/O	General purpose I/O
8	GND	Ground	Ground
9	VDD	Power	Power supply
10	GND	Ground	Ground
11	VDDH	Power	High voltage power supply
12	VBUS	Power	5 V input for USB 3.3 V regulator
13	D-	Digital I/O	USB D-
14	D+	Digital I/O	USB D+
15	P0.13	Digital I/O	General purpose I/O
16	P0.18_RESET	Digital I/O	General purpose I/O Configurable as system RESET (Factory default : RESET)
17	P0.20	Digital I/O	General purpose I/O
18	P0.21	Digital I/O	General purpose I/O
19	P0.24	Digital I/O	General purpose I/O
20	P1.00	Digital I/O	General purpose I/O
21	SWDIO	Debug	Serial wire debug I/O for debug and programming
22	SWDCLK	Debug	Serial wire debug clock input for debug and programming
23	P1.04	Digital I/O	General purpose I/O
24	P1.06	Digital I/O	General purpose I/O
25	P0.09_NFC1	Digital I/O NFC input	General purpose I/O NFC antenna connection
26	P0.10_NFC2	Digital I/O NFC input	General purpose I/O NFC antenna connection
27	N.C.	N.C.	Reserved
28	GND	Ground	Ground

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Control No. HD-BA-A191077	(2/3)	Control name Pin Layout
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Pin	Pin name	Pin function	Description
29	OUT_MOD	RF In/Out	RF I/O pin. It should be connected to <b>Pin30</b> OUT_ANT for normal operation.
30	OUT_ANT	Antenna In/Out	Internal antenna. It should be connected to <b>Pin29</b> OUT_MOD for normal operation
31	GND	Ground	Ground
32	P0.02_AIN0	Digital I/O Analog input	General purpose I/O Analog input
33	P0.28_AIN4	Digital I/O Analog input	General purpose I/O Analog input
34	P0.30_AIN6	Digital I/O Analog input	General purpose I/O Analog input
35	P0.27	Digital I/O	General purpose I/O
36	P0.04_AIN2	Digital I/O Analog input	General purpose I/O Analog input
37	P0.07	Digital I/O	General purpose I/O
38	P0.08	Digital I/O	General purpose I/O
39	P1.09	Digital I/O	General purpose I/O
40	P0.11	Digital I/O	General purpose I/O
41	P0.12	Digital I/O	General purpose I/O
42	P0.14	Digital I/O	General purpose I/O
43	P0.15	Digital I/O	General purpose I/O
44	P0.16	Digital I/O	General purpose I/O
45	P0.17	Digital I/O	General purpose I/O
46	P0.19	Digital I/O	General purpose I/O
47	P0.22	Digital I/O	General purpose I/O
48	P0.23	Digital I/O	General purpose I/O
49	P0.25	Digital I/O	General purpose I/O
50	P1.01	Digital I/O	General purpose I/O
51	P1.03	Digital I/O	General purpose I/O
52	P1.05	Digital I/O	General purpose I/O
53	P1.07	Digital I/O	General purpose I/O
54	P1.02	Digital I/O	General purpose I/O
55	P0.03_AIN1	Digital I/O Analog input	General purpose I/O Analog input

**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HD-BA-A191077	(3/3)	Control name Pin Layout
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Pin	Pin name	Pin function	Description
56	N.C.	N.C.	Reserved
57	N.C.	N.C.	Reserved
58	N.C.	N.C.	Reserved
59	N.C.	N.C.	Reserved
60	N.C.	N.C.	Reserved
61	Corner pad	Ground	Ground 1.0mm x 0.7mm
62	Corner pad	Ground	Ground 1.0mm x 0.7mm
63	Center pad	Ground	Ground 4.3mm x 3.0mm

**EYSPBNZUA**

TAIYO YUDEN CO., LTD.

Control No. HQ-BA-537	(1/2)	Control name Handling Precaution
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This specification describes desire and conditions especially for mounting.

## Desire/Conditions

- (1) Environment conditions for use and storage
1. Store the components in an environment of < **40deg-C/90%RH** if they are in a moisture barrier bag packed by TAIYO YUDEN.
  2. Keep the factory ambient conditions at < **30deg-C/60%RH**.
  3. Store the components in an environment of < **25±5deg-C/10%RH** after the bag is opened.  
(The condition is also applied to a stay in the manufacture process).

- (2) Conditions for handling of products

Make sure all of the moisture barrier bags have no holes, cracks or damages at receiving. If an abnormality is found on the bag, its moisture level must be checked in accordance with 2 in (2).

Refer to the label on the bag.

1. All of the surface mounting process (reflow process) must be completed **in 12 months** from the bag sea date.
2. Make sure humidity in the bag is less than **10%RH** immediately after open, using a humidity indicator card sealed with the components.
3. **All** of the surface mounting process (reflow process including rework process) must be completed in **168 hours** after the bag is opened (inclusive of any other processes).
4. If any conditions in (1) or condition 2 and 3 in (2) are not met, bake the components in accordance with the conditions at **125deg-C 24hours**
5. As a rule, baking the components in accordance with conditions 4 in (2) shall be once.
6. Since semi-conductors are inside of the components, they must be free from static electricity while handled.(<100V) Use ESD protective floor mats, wrist straps, ESD protective footwear, air ionizers etc. , if necessary.
7. Please make sure that there are lessen mechanical vibration and shock for this module, and do not drop it.
8. Please recognize pads of back side at surface mount.
9. Washing the module is not recommended. If washing cannot be avoided, please test module functionality and performance after thoroughly drying the module. We cannot be held responsible for any failure due washing the module..
10. Please perform temperature conditions of module at reflow within the limits of the following.

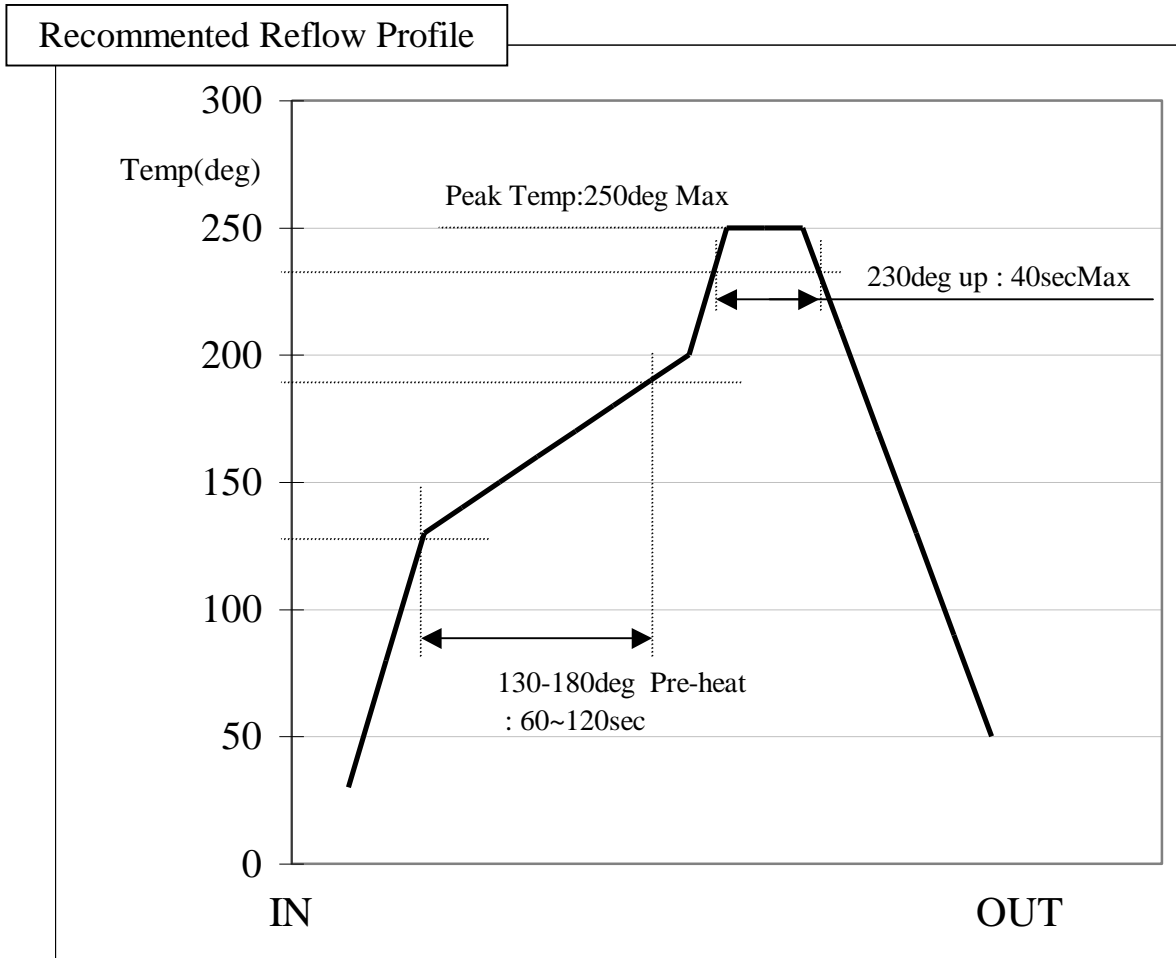
Please give the number of times of reflow as a maximum of 2 times.

**TAIYO YUDEN CO., LTD.**

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HQ-BA-537	(2/2)	Control name Handling Precaution
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TAIYO YUDEN CO., LTD.

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. HD-BB-A191077	(1/3)	Control name Packaging Specification
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Packaging Specification

梱包仕様

(1) Packaging Material 梱包材料

Name 部材名	Outline 概要	Materials 材質	Note 備考
Emboss エンボス	24mm wide - 16mmPitch 24mm幅 - 16mmピッチ	Conductive PS 導電性 PS	
Cover Tape カバーテープ			
Reel リール	φ 330 mm	Conductive PS 導電性 PS	
Desiccant 乾燥剤	30g×1		
Humidity indicator card 湿度インジケータ			
Aluminum moisture barrier bag アルミ防湿袋	420×460(mm)	(AS)PET/AL/NY/PE(AS)	
Label ラベル			
Corrugated cardboard box(Inner) 個装箱	339×351×74(mm)		
Corrugated cardboard box(Outer) 外装箱	369×369×277(mm)		

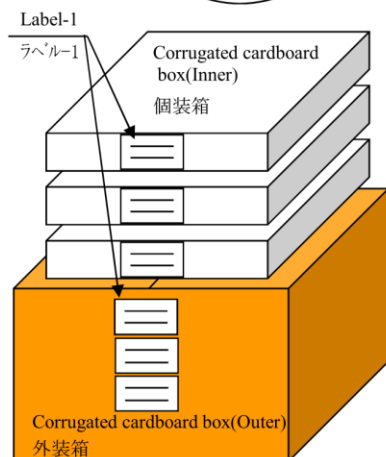
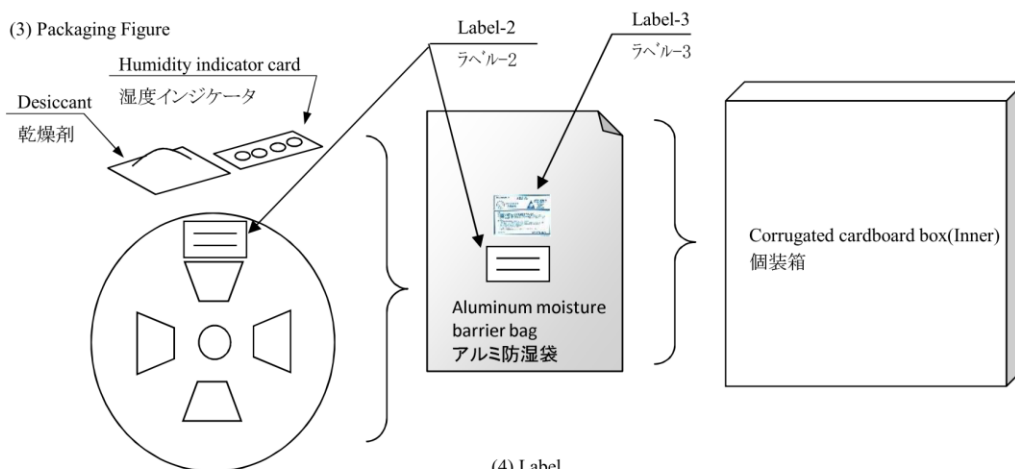
(2) Packaging Unit

梱包数量

Max 1,000 pieces/Reel

Max 3,000 pieces/Box(Outer)

(3) Packaging Figure



(4) Label

ラベル

Label-1

- CAMpany NAME 御社名
- PURCHASE ORDER 注文番号
- DESCRIPITON 品名
- QUANTITY 数量
- LotNo. ロット番号

Label-2

- PURCHASE ORDER 注文番号
- DESCRIPITON 品名
- QUANTITY 数量
- LotNo. ロット番号

Label-3

- CAUTION LABEL  
注意ラベル
- MSL Level3

TAIYO YUDEN CO., LTD.

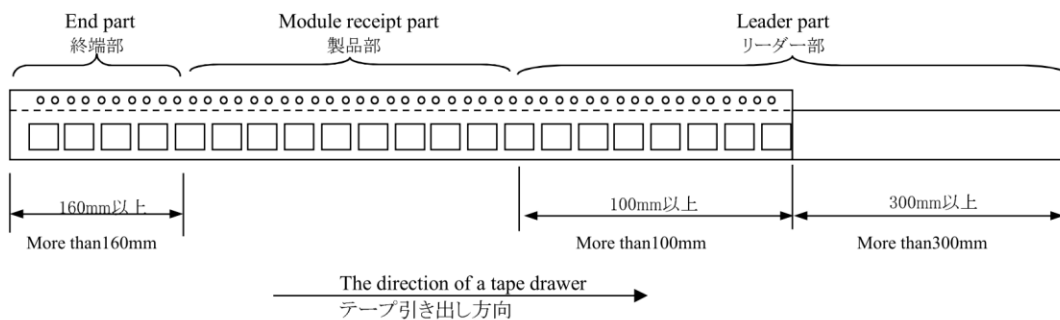
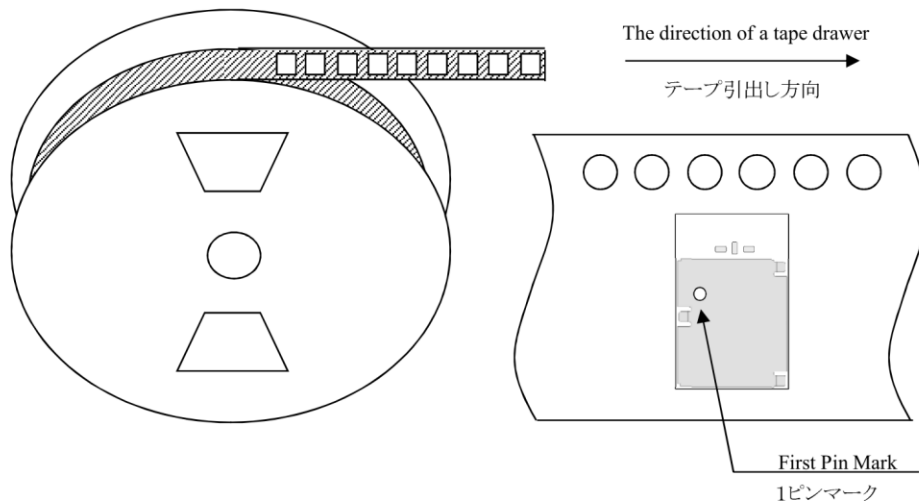


# EYSPBNZUA

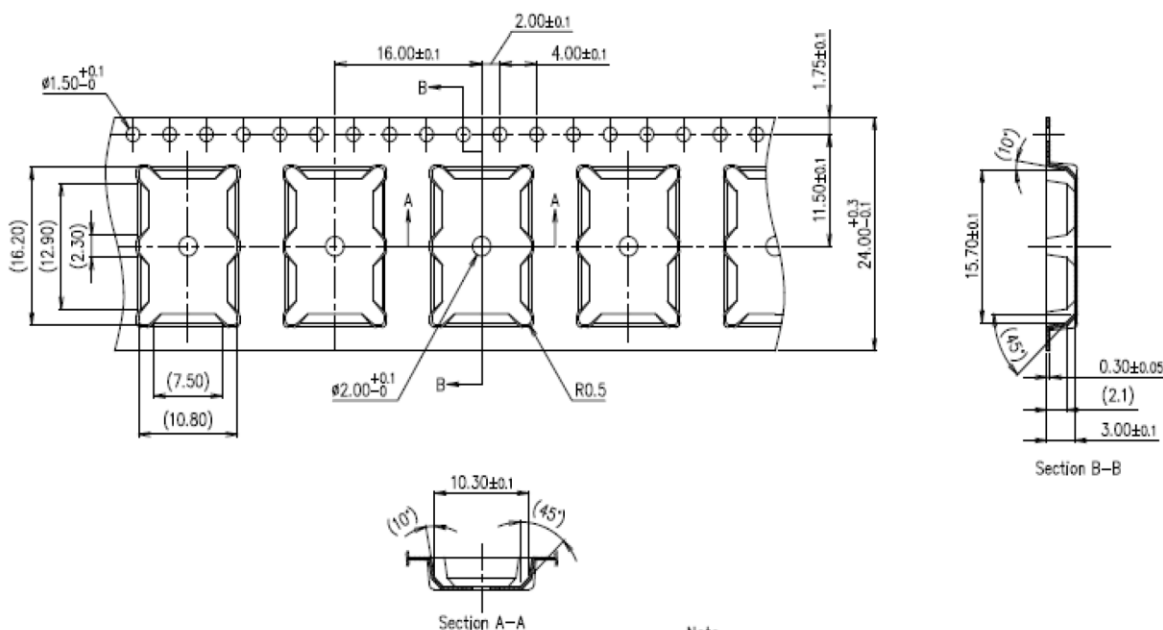
TAIYO YUDEN CO., LTD.

Control No. HD-BB-A191077	(2/3)	Control name Packaging Specification
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Tape specification  
テーピング仕様



キャリアエンボス図面



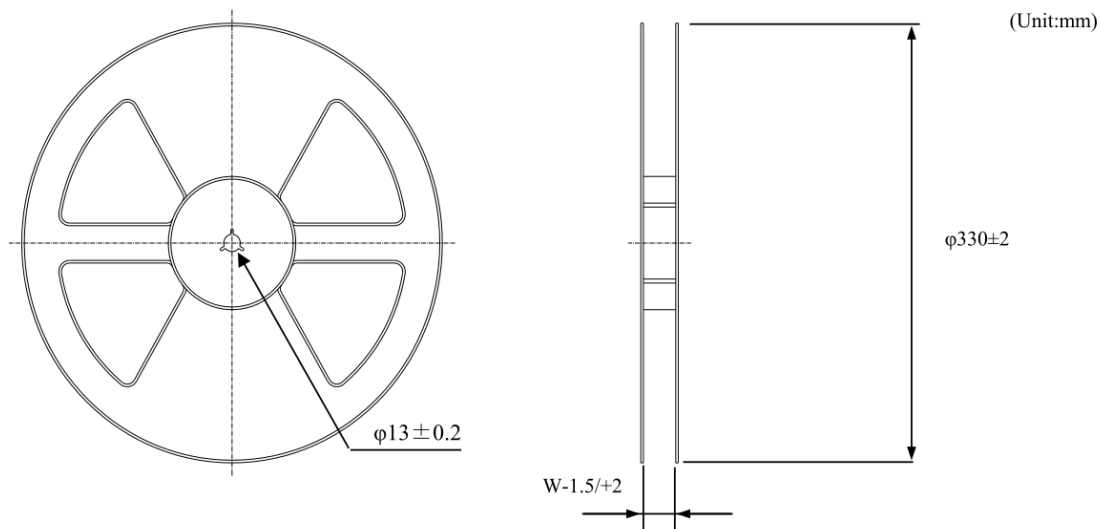
TAIYO YUDEN CO., LTD.

## EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No.  
HD-BB-A191077

(3/3)

Control name  
Packaging SpecificationReel specification  
リール仕様

Tape wide	8mm	12mm	16mm	24mm	32mm	44mm
W	9.4mm	13.4mm	17.4mm	25.4mm	33.4mm	45.4mm

Taping performance  
テーピング性能

Both of an embossing tape top cover tape bear this, when the power of 10N is applied in the direction of a drawer.  
 ・エンボステープ、トップカバーテープともに、引き出し方向に10Nの力を加えた場合に、これに耐えること。

The exfoliation adhesion of a top cover tape is the intensity of 0.1~1.3N.

(The angle to pull is 165~180 degrees. The speed to pull is 300 mm/min.)

・トップカバーテープの剥離強度は、角度165~180度に保ち、300mm/minのスピードでトップカバーテープを引っ張ったとき、0.1~1.3Nとする。

Note  
備考

Lack of the parts in 1 reel is with two or less pieces.

1リール中の部品の欠落は2個までとします。(ラベル表示数量と梱包数は同じです。欠落とはテープ内でのモジュール抜けが2個まで許容させていただくという意味になります。)

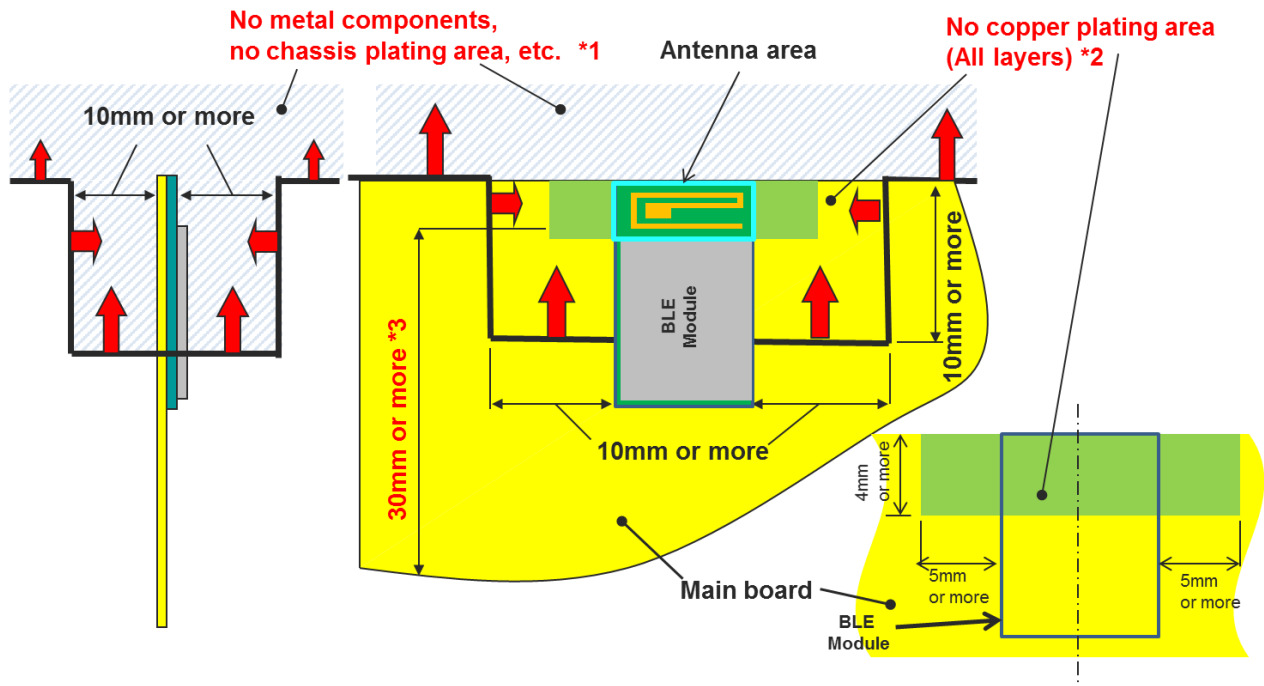
MSL Level 3 Under control

MSL はレベル3 で管理しています。

TAIYO YUDEN CO., LTD.

Control No. (1/3)	Control name Antenna application note
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### Recommended module mounting example



\*1 Please do not place any metal components in **blue shaded space**. \*1) We do not recommend to place any metal objects upper space of the module in the above figure. If it needs to place metal objects, please consider to keep the metal off from the antenna as far as you can. Such as signal line and metal chassis as possible except for main board while mounting the components in \*1 space on the main board is allowed except for no copper plating area. (\*2).

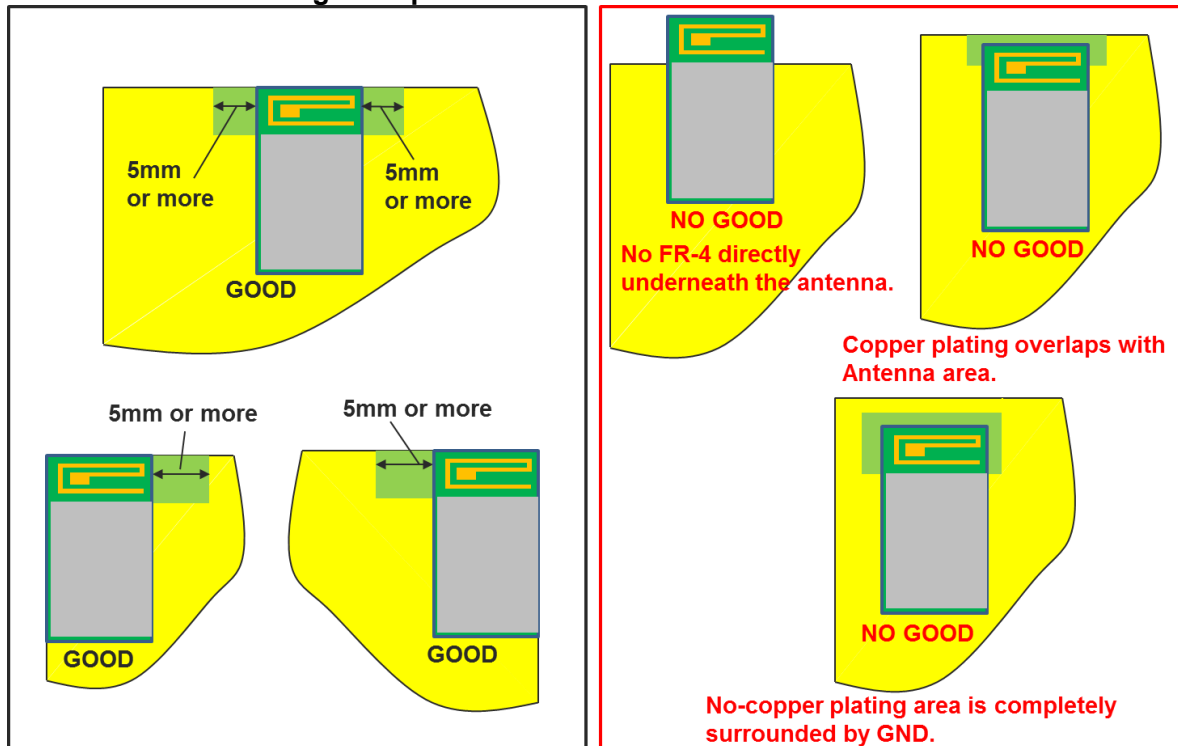
\*2 This area is routing prohibited area on the main board. Please do not place copper on any layer. Please remain use of FR-4 dielectric material. The antenna is tuned with the FR-4.

\*3 Characteristics may deteriorate when GND pattern length is less than 30mm. It should be 30 mm or more as possible.

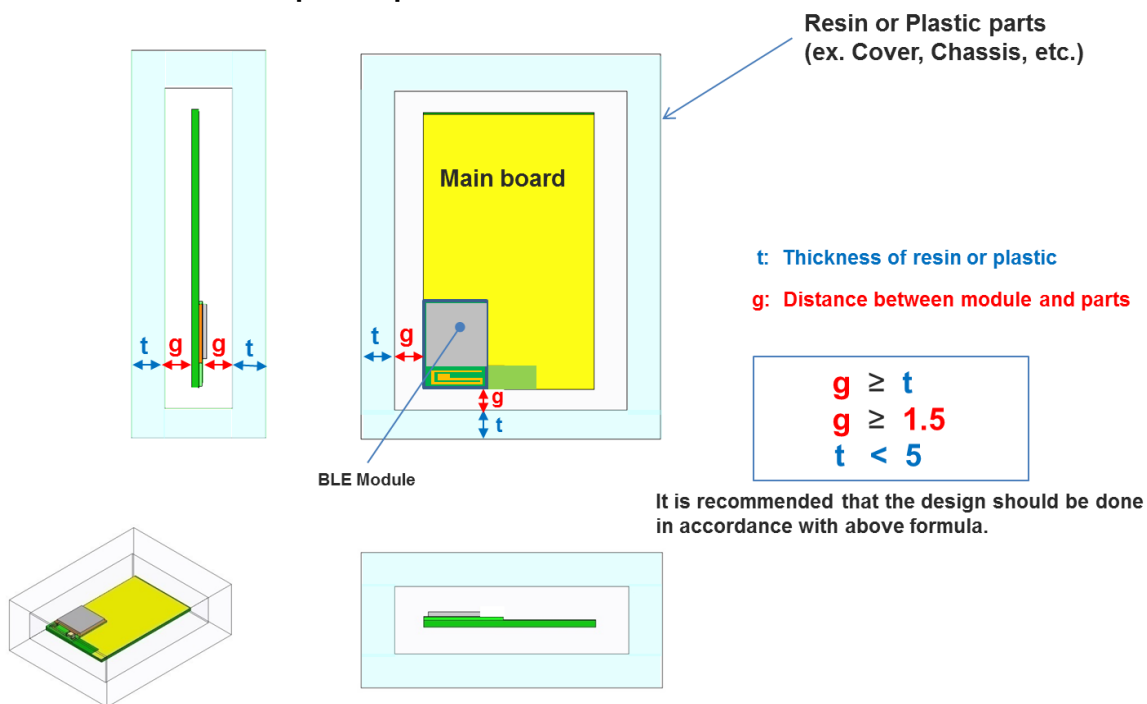
Even when above mentioned condition is satisfied, communication performance may be significantly deteriorated depending on the structure of the product.

Control No.  (2/3)	Control name Antenna application note
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Other module mounting examples



Placement of resin or plastic parts



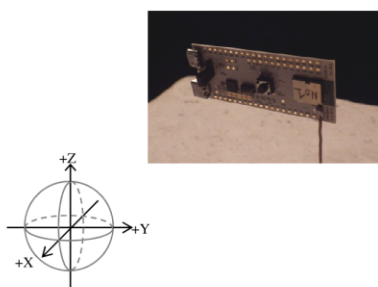
Please do not apply molding over the antenna area of BLE module.

Control No. (3/3)	Control name Antenna application note
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**Directional characteristics example (when mounted on evaluation board)**

Measured in Satimo Stargate system at TAIYO YUDEN R&D CENTER.

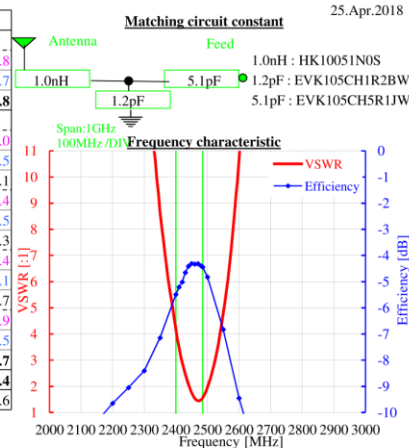
**Appearance and coordinates definition**



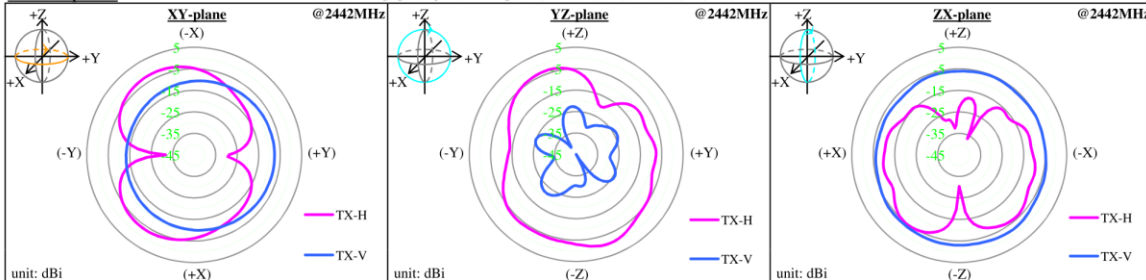
**Measurement data of antenna**

Frequency [MHz]	@ 2400	@ 2442	@ 2484	
Peak gain [dBi]	3-plane			
	TX-H	-2.8	-0.6	-0.8
	TX-V	-3.8	-2.2	-1.7
-----				
Average gain [dBi]	XY-plane			
	TX-H	-7.9	-7.0	-7.0
	Plus(H,V)	-11.0	-10.0	-9.5
-----				
YZ-plane	TX-H	-7.1	-5.6	-5.4
	TX-V	-29.3	-26.7	-26.5
	Plus(H,V)	-7.0	-5.6	-5.3
-----				
ZX-plane	TX-H	-11.4	-10.2	-9.4
	TX-V	-5.5	-4.6	-5.1
	Plus(H,V)	-4.5	-3.6	-3.7
-----				
3-plane	TX-H	-8.4	-7.2	-6.9
	TX-V	-9.2	-8.3	-8.5
	Plus(H,V)	-5.8	-4.7	-4.7
-----				
Efficiency [dB]	-5.5	-4.4	-4.4	
VSWR [-:1]	4.2	2.1	1.6	

\*Note: Peak gain(3-plane)=Peak(XY[H],XY[V],YZ[H])YZ[V],ZX[H]ZX[V])  
 \*Note:The value is average value in 1 round of each inclination direction angle.  
 \*Note: Average gain(3-plane)=Average(XY[Plus(H,V)],YZ[Plus(H,V)],ZX[Plus(H,V)])



**Radiation pattern**



**About this Application Note**

- This Application Note has been prepared as a reference material to help obtaining the antenna performance mounted on BLE module better while it is not guaranteed or assured to obtain better communication performance and distance.
- This product “BLE module” has been certified and matching circuit constant for antenna within module cannot be changed when ambient environment condition changes. The product must be re-certified when matching circuit constant is changed.

# EYSPBNZUA

TAIYO YUDEN CO., LTD.

Control No. (1/1)	Control name Design guide
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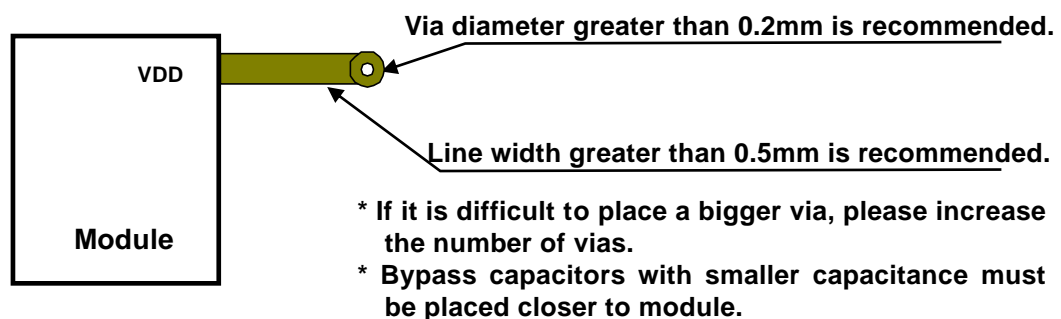
## 1. Battery operation

When using a small battery (e.g. CR2032), a large capacitor (e.g. 100uF low leakage capacitor) should be placed near the battery. This will reduce the voltage drop especially when the module is operated at low temperatures

## 2. Pattern Design Guide

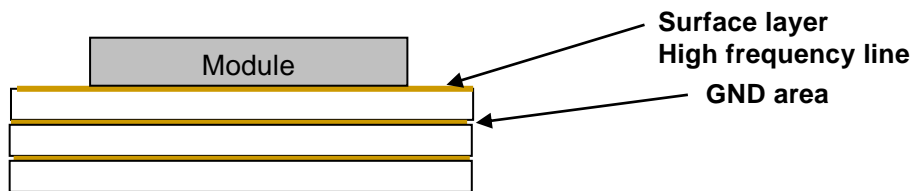
### 2-1. Power Supply System

The VDD trace is preferable greater than 0.5mm and a bigger a via diameter is recommended.



### 2-2. GND Pattern

Wide GND area must be provided to ensure isolation for each layer.



GND pattern of each layer should be connected to GND area with large number of via.

## その他、注意事項について (Precautions)

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- Please conduct validation and verification of our products in actual condition of mounting and operating environment before using our products.
- The products listed in this specification are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment including, without limitation, mobile phone, and PC). Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment, disaster prevention equipment, medical equipment classified as Class I, II or III by IMDRF, highly public information network equipment including, without limitation, telephone exchange, and base station).  
Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, medical equipment classified as Class IV by IMDRF, nuclear control equipment, undersea equipment, military equipment).  
When our products are used even for high safety and/or reliability-required devices or circuits of general electronic equipment, it is strongly recommended to perform a thorough safety evaluation prior to use of our products and to install a protection circuit as necessary.  
Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this specification for any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.
- Information contained in this specification is intended to convey examples of typical performances and/or applications of our products and is not intended to make any warranty with respect to the intellectual property rights or any other related rights of TAIYO YUDEN or any third parties nor grant any license under such rights.
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## HQ-BK-002\_02

- The contents of this specification are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter “TAIYO YUDEN’s official sales channel”). Please note that the contents of this specification are not applicable to our products purchased from any seller other than TAIYO YUDEN’s official sales channel.
- Caution for Export  
Some of our products listed in this specification may require specific procedures for export according to “U.S. Export Administration Regulations”, “Foreign Exchange and Foreign Trade Control Law” of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.