Bluetooth® Smart Module

Bluetooth® 4.2 Low Energy

EYSGJNZXX (16kB RAM)
EYSGJNZWY (32kB RAM)

Data Report

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EYSGJNZXX, EYSGJNZWY   TAIYO YUDEN

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Revision History
    14-Sep.-2015 > Ver.1.00 Release

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-AG-A150049	(1/4)	General Items

Scope
This specification ("Specification") applies to the hybrid IC "EYSGJNZXX" and "EYSGJNZWY", a **Bluetooth**® 4.2 Low Energy module ("Product") manufactured by TAIYO YUDEN Co., Ltd. ("TAIYO YUDEN")

1. Type: EYSGJN
   User Code: EYSGJNZXX (16kB RAM), EYSGJNZWY (32kB RAM)
   *User Code may be changed for mass production or other cases.

2. Function:
   Radio frequency module.   **Bluetooth**® standard Ver 4.2 Low Energy conformity

3. Application: Health & Fitness Equipment, Sensor, Toys

4. Structure:
   Hybrid IC loaded with silicon monolithic semiconductor
   Compatible with industrial standard reflow profile for Pb-free solders
   Can meet with RoHS compliance (Pb, Cd, Hg, Cr^{+6}, PBB, PBDE)

5. Outline: 11.3 x 5.1 x 1.3 mm
          28-pin Land Grid Array

6. Marking: Part number, Lot number

7. Features:
   - Small outline by PCB substrate
   - Low power consumption
   - Integrated antenna
   - Integrated system clock
   - **Bluetooth**® 4.2 Low Energy conformity
     - Slave or Master Role

8. Packaging:
   Packaging method: Tape & reel + aluminum moisture barrier bag
   Packaging unit: 2000
          *It might be provided as tray at sample stage.

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-AG-A150049	(2/4)	General Items

9. Note:

    a. Any question arising from this Specification shall be solved through mutual discussion by the parties hereof.

    b. This Product is not designed to be radiation durable and should not be used under the circumstance of radiation.

    c. The operating conditions of this Product are as shown in this Specification. Please note that TAIYO YUDEN shall not be liable for a failure and/or abnormality which is caused by use under the conditions other than the operating conditions hereof.

    d. The Product mentioned in this Specification is manufactured for use in Health & Fitness Equipment, Sensor and 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 safe operation of these 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 during the design stage, all at the customer's sole risk.

    e. a) You are requested to fully check and confirm by the start of mass production of this Product that (1) no bug, defect or other failure is included in firmware incorporated in this Product ("Incorporated Software"), (2) no bug defect or other failure arising from installation of this Product in which is contained Incorporated Software into your products is included in Incorporated Software, and that Incorporated Software fully meets your intended use, although TAIYO YUDEN sufficiently inspects or verifies quality of Incorporated Software.

    b) Please note that TAIYO YUDEN is not responsible for any failure arising out of bugs or defects in Incorporated Software.

    f. 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.

    g. Communication between this Product and others might not be established nor maintained depending on radio environment or operating conditions of this Product and other *Bluetooth*® products.

    h. In order to test for Radio Law certification with a device incorporating this module, the Host Software must be able to put the module into test mode. Please contact TAIYO YUDEN for further details.

    i. 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 may occur 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.

    j. Please thoroughly evaluate our module with your products before going mass production.

    k. User Code Modification Notice.

    User Code for sample modules or part numbers in this Specification are TAIYO YUDEN standard part numbers. When any modification is made to a module to meet requested specifications, the part number will be changed. Please contact TAIYO YUDEN to confirm whether your part number needs to be modified.

    Please see the following examples for cases when part numbers are modified:

      - for specific firmware version (our standard item firmware will be upgraded occasionally)

      - for other relevant cases (specific or different setting, form, sizes, or display etc..)

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Control No.	Control name
HD-AG-A150049 (3/4)	General Items

l. Alternative components may used to this module.　The intended components is used within the warranty written in this document (characteristics, size, operating condition, reliability, public regulation such as radio type approval) and Taiyo Yuden confirmed there are not any problems with the replacement. The traceability of the components is secured each production lot.

m. 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.

If you plan to export or re-export this Product, it is strongly recommended that you check and confirm, the necessary procedures to export or re-export of this Product as 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.

n. Japan Regulatory Information

This module is approved with the specific antenna on this module.

Please ensure that the sentence below is clearly stated on your product or product manual.

This product has a radio system which was approved as a radio station in a low power data communication system based on the Radio Law and the Telecommunication Business Law.

Name of the radio system: 001-A05676

R 001-A05676

o. Canada Regulatory Information

a) This device complies with Industry Canada license-exempt RSS standards.

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.

L'utilisation de ce dispositif est autorisée seulement aux conditions suivantes: (1) il ne doit pas produire de brouillage et (2) l'utilisateur du dispositif doit être prêt à accepter tout brouillage radioélectrique reçu, même si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

b) This product is certified as type of the portable device with Industry Canada.

c) Please ensure that one of the following is clearly stated on your product.

　-Contains Transmitter module IC : 4389B-EYSGJN

　-Contains IC : 4389B-EYSGJN

p. 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 ensure that one of the following is clearly stated on your product.

　-Contains Transmitter Module FCC ID: RYYEYSGJN

　-Contains FCC ID: RYYEYSGJN

c) CAUTION: changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment
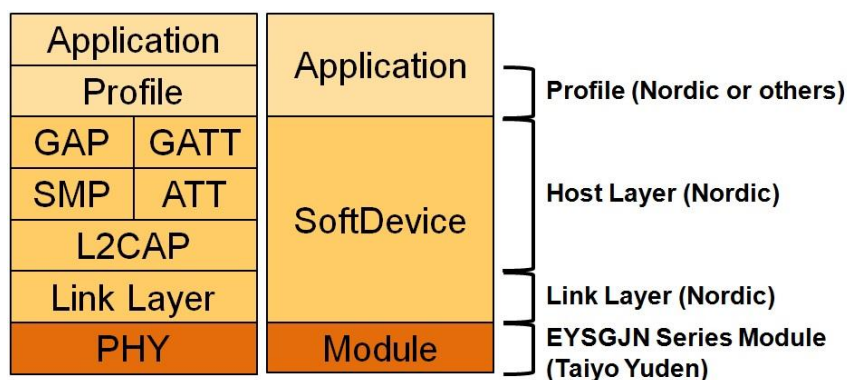
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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-AG-A150049	(4/4)	General Items

d) This product is certified as type of the portable device with FCC.

q. This Product is designed for use in products which comply with *Bluetooth*® Specifications (Ver 4.2 LE) ("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.

r. Taiyo Yuden writes firmware for fixed SoftDevice (EYSGJNZXX : S110 V8.0.0, EYSGJNZWY : S120 V2.1.0) to this product. Customer writes firmware that is match the customer applications including SoftDevice at the customer's own responsibility.

s. The Electrical Characteristics defined in this Specification are of the module with above SoftDevice. If other firmware is installed, the characteristics may differ from the defined value in the Electrical Characteristics. Bluetooth qualification and radio type approval may become invalid.

t. EYSGJN series module is qualified as PHY only with Component category by Bluetooth SIG.. The QDID of this module is 69825.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 BQE.

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Control No.		Control name
HD-AM-A150049	(1/1)	Absolute maximum ratings

Absolute maximum ratings

Symbol	Parameter	Min.	Max.	Units
VCC_NRF		-0.3	+3.6	V
GND			0	V
VIO		-0.3	VCC_NRF+ 0.3	V
Storage temperature		-40	+85	Deg-C
MSL	Moisture Sensitivity Level	2		
ESD HBM	Human Body Model		1	kV
ESD CDM	Charged Device Model		100	V
Endurance	Flash Memory Endurance	20000		write/erase cycles
Retention	Flash Memory Retention	10 years		At 40 deg-C
Number of times an address can be written between erase cycles			2	times

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-AE-A150049	(1/7)	Electrical characteristics

Electrical characteristics

Recommendation operating range

Symbol	Parameter	Min.	Typ.	Max.	Units
VCC_NRF	Supply voltage, normal mode	1.8	3.0	3.6	V
VCC_NRF	Supply voltage, normal mode, DC/DC converter output voltage 1.9 V	2.1	3.0	3.6	V
tR_VCC_NRF	Supply rise time (0V to 1.8V)			100	ms
TA	Operation temperature	-25	25	75	Deg-C

The on-chip power-on reset circuitry may not function properly for rise times outside the specified interval.

DC Specifications

The Specification applies for Topr.= 25 degrees C, VCC_NRF = 3.0V

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
VIH	Input high voltage	0.7 VCC_NRF		VCC_NRF	V
VIL	Input low voltage	GND		0.3 VCC_NRF	V
VOH	Output high voltage (std. drive, 0.5 mA)	VCC_NRF-0.3		VCC_NRF	V
VOH	Output high voltage (high-drive, 5 mA)	VCC_NRF-0.3		VCC_NRF	V
VOL	Output low voltage (std. drive, 0.5 mA)	GND		0.3	V
VOL	Output low voltage (high-drive, 5 mA)	GND		0.3	V
RPU	Pull-up resistance	11	13	16	kohm
RPD	Pull-down resistance	11	13	16	kohm
ITX,+4dBm	TX only run current @ POUT =+4 dBm		16		mA
ITX,0dBm	TX only run current @ POUT = 0 dBm		10.5		mA
IRX	RX only run current		13		mA
IOFF	Current in SYSTEM-OFF, no RAM retention		0.6		uA
IOFF,8k	Current in SYSTEM-OFF mode 8 kB SRAM retention		0.6		uA
ION	SYSTEM-ON base current		2.6		uA

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EYSGJNZXX, EYSGJNZWY

Control No. HD-AE-A150049 (2/7)	Control name Electrical characteristics

UART specifications

Symbol	Description	Note	Min.	Typ.	Max.	Units
I_{UART1M}	Run current at max baud rate.			230		μA
$I_{UART115k}$	Run current at 115200 bps.			220		μA
$I_{UART1k2}$	Run current at 1200 bps.			210		μA
f_{UART}	Baud rate for UART.		1.2		1000	kbps

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EYSGJNZXX, EYSGJNZWY

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Control No.		Control name
HD-AE-A150049	(3/7)	Electrical characteristics

SPI Slave specifications

Symbol	Description	Min.	Typ.	Max.	Units
$I_{SPIS125K}$	Run current for SPI slave at 125 kbps.[1]		180		μA
I_{SPIS2M}	Run current for SPI slave at 2 Mbps.[1]		183		μA
f_{SPIS}	Bit rates for SPIS.	0.125		2	Mbps

1. CSN asserted.
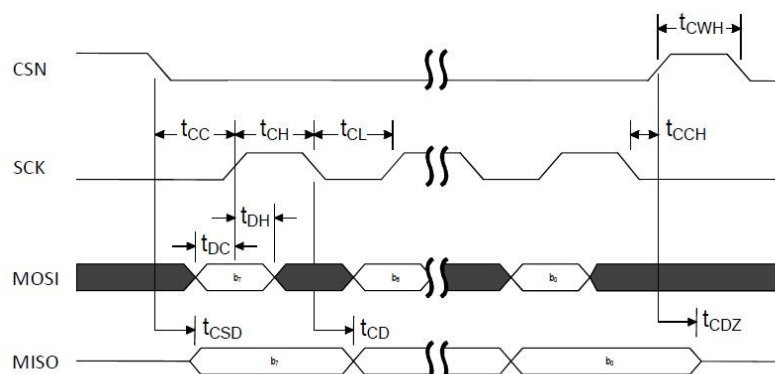
SPIS timing diagram, one byte transmission, SPI Mode 0

Symbol	Description	Note	Min.	Typ.	Max.	Units
t_{DC}	Data to SCK setup.		10			ns
t_{DH}	SCK to Data hold.		10			ns
t_{CSD}	CSN to Data valid.	Low power mode.[1] Constant latency mode.[1]			7100 2100	ns
t_{CD}	SCK to Data Valid.	$C_{LOAD} = 10$ pF			97[2]	ns
t_{CL}	SCK Low time.		40			ns
t_{CH}	SCK High time.		40			ns
t_{CC}	CSN to SCK Setup.	Low power mode.[1] Constant latency mode.[1]	7000 2000			ns
t_{CCH}	Last SCK edge to CSN Hold.		2000			ns
t_{CWH}	CSN Inactive time.		300			ns
t_{CDZ}	CSN to Output High Z.				40	ns
f_{SCK}	SCK frequency.		0.125		2	MHz
t_R, t_F	SCK Rise and Fall time.				100	ns

1. For more information on how to control the sub power modes, see the *nRF51 Series Reference Manual*.
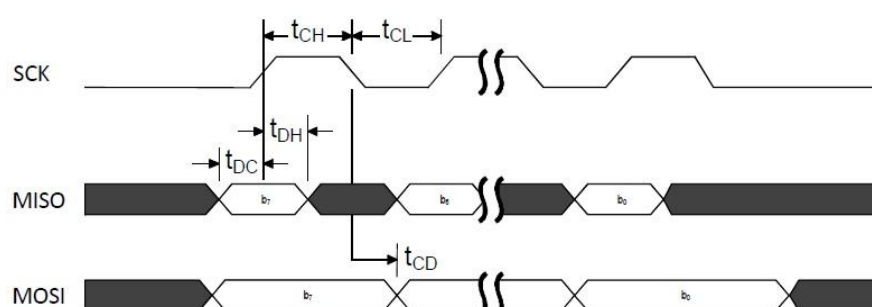2. Increases/decreases with 1.2 ns/pF load.

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EYSGJNZXX, EYSGJNZWY

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Control No.	Control name
HD-AE-A150049 (4/7)	Electrical characteristics

SPI Master specifications

Symbol	Description	Min.	Typ.	Max.	Units
$I_{SPI125K}$	Run current for SPI master at 125 kbps.		180		µA
I_{SPI4M}	Run current for SPI master at 4 Mbps.		200		µA
f_{SPI}	Bit rates for SPI.	0.125		4	Mbps

Symbol	Description	Note	Min.	Typ.	Max.	Units
t_{DC}	Data to SCK setup.		10			ns
t_{DH}	SCK to Data hold.		10			ns
t_{CD}	SCK to Data valid.	$C_{LOAD} = 10\ pF$			97[1]	ns
t_{CL}	SCK Low time.		40			ns
t_{CH}	SCK High time.		40			ns
f_{SCK}	SCK Frequency.		0.125		4	MHz
t_R, t_F	SCK Rise and Fall time.				100	ns

1. Increases/decreases with 1.2 ns/pF load.

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-AE-A150049	(5/7)	Electrical characteristics

TWI specifications

Symbol	Description	Note	Min.	Typ.	Max.	Units
I_{2W100K}	Run current for TWI at 100 kbps.			380		μA
I_{2W400K}	Run current for TWI at 400 kbps.			400		μA
f_{2W}	Bit rates for TWI.		100		400	kbps
$t_{TWI,START}$	Time from STARTRX/STARTTX task is given until start condition.	Low power mode.[1] Constant latency mode.[1]		3 1	4.4	μs

1.   For more information on how to control the sub power modes, see the *nRF51 Series Reference Manual*.
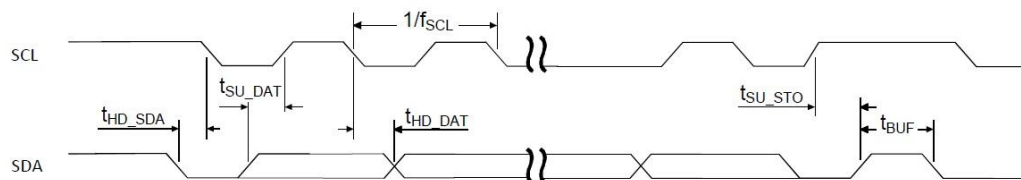
Symbol	Description	Standard Min.	Standard Max.	Fast Min.	Fast Max.	Units
f_{SCL}	SCL clock frequency.		100		400	kHz
t_{HD_STA}	Hold time for START and repeated START condition.	5200		1300		ns
t_{SU_DAT}	Data setup time before positive edge on SCL.	300		300		ns
t_{HD_DAT}	Data hold time after negative edge on SCL.	300		300		ns
t_{SU_STO}	Setup time from SCL goes high to STOP condition.	5200		1300		ns
t_{BUF}	Bus free time between STOP and START conditions.	4700		1300		ns

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EYSGJNZXX, EYSGJNZWY

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Control No.		Control name
HD-AE-A150049	(6/7)	Electrical characteristics

GPIOTE specifications

Symbol	Description	Min.	Typ.	Max.	Units
$I_{GPIOTE,IN}$	Run current with 1 or more GPIOTE active channels in Input mode.		22		µA
$I_{GPIOTE,OUT}$	Run current with 1 or more GPIOTE active channels in Output mode.		0.1		µA
$I_{GPIOTE,IDLE}$	Run current when all channels in Idle mode. PORT event can be generated with a delay of up to t_{1V2}.		0.1		µA

Note: Setting up one or more GPIO DETECT signals to generate PORT EVENT, which can be used either as a wakeup source or to give an interrupt, will not lead to an increase of the current consumption.

RF Specifications

Symbol	Description	Min.	Typ.	Max.	Units
Fop	Operating frequencies	2402		2480	MHz
PLLres	PLL programming resolution		1		MHz
Df	Frequency deviation	+/-225	+/-250	+/-275	kHz
P_{RF}	Maximum output power		4		dBm
P_{RFC}	RF power control range	20	24		dB
PRFCR	RF power accuracy			+/-4	dB
P_{WHISP}	RF power whisper mode		-30		dBm
P_{BW}	20 dB bandwidth for modulated carrier		950	1100	kHz
P_{RF1}	1st Adjacent Channel Transmit Power 1 MHz			-20	dBc
P_{RF2}	2nd Adjacent Channel Transmit Power 2 MHz			-45	dBc
P_{RXMAX}	Maximum received signal strength at < 0.1% PER		0		dBm
P_{SENS} IT	Receiver sensitivity (0.1% BER) Ideal transmitter		-93		dBm
P_{SENS} DT	Receiver sensitivity (0.1% BER) dirty transmitter		-91		dBm

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TAIYO YUDEN

Control No.		Control name
HD-AE-A150049	(7/7)	Electrical characteristics

DFU Specifications

```
HOST                              Module

        P0.17 Low
  |------------------------------>|
                              ( Power On )

        P0.19 High
  |<------------------------------|
                              ( DFU Mode )

     * Firmware image transmission
  |------------------------------>|

             ACK
  |<------------------------------|
              .
              .
                              ( DFU Complete )

        P0.19 Low
  |<------------------------------|
  |                               |
```
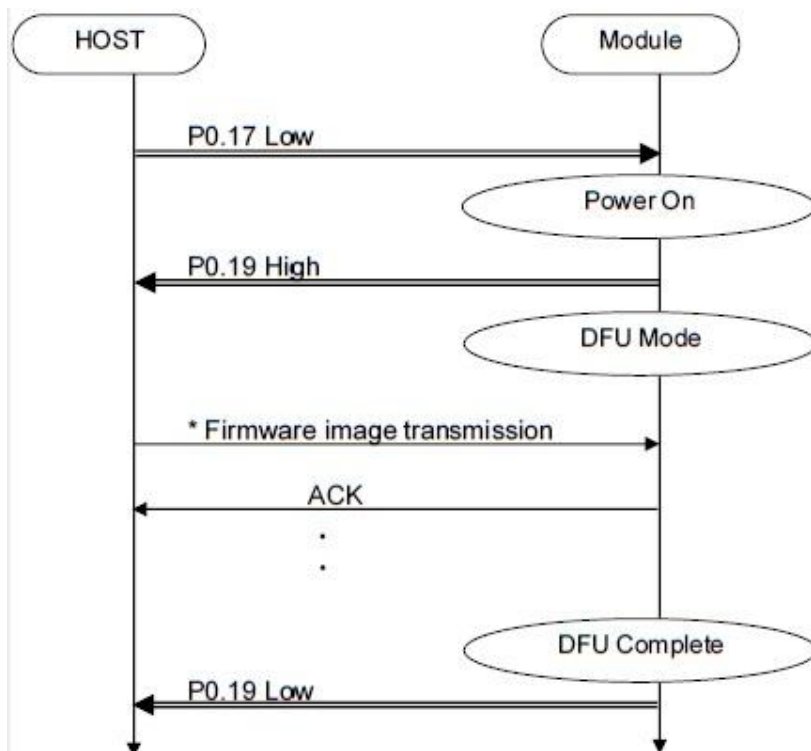
UART	
Baud rate : 38400 bps	UART PIN :
Data : 8 bit	RX : P0.03
Parity : none	TX : P0.01
Stop : 1 bit	CTS : P0.02
Hardware flow control : Enabled	RTS : P0.00

* see Nordic Infocenter and nRFgo Studio help

[Nordic Infocenter] http://infocenter.nordicsemi.com/index.jsp
   Software Development Kit > nRF51 SDK > nRF51 SDK v9.0.0 > Examples > BLE DFU Bootloader
     > Transport layers > Serial (HCI) packet format
   Software Development Kit > nRF51 SDK > nRF51 SDK v9.0.0 > Examples > BLE DFU Bootloader
     > Creating a DFU bootloader
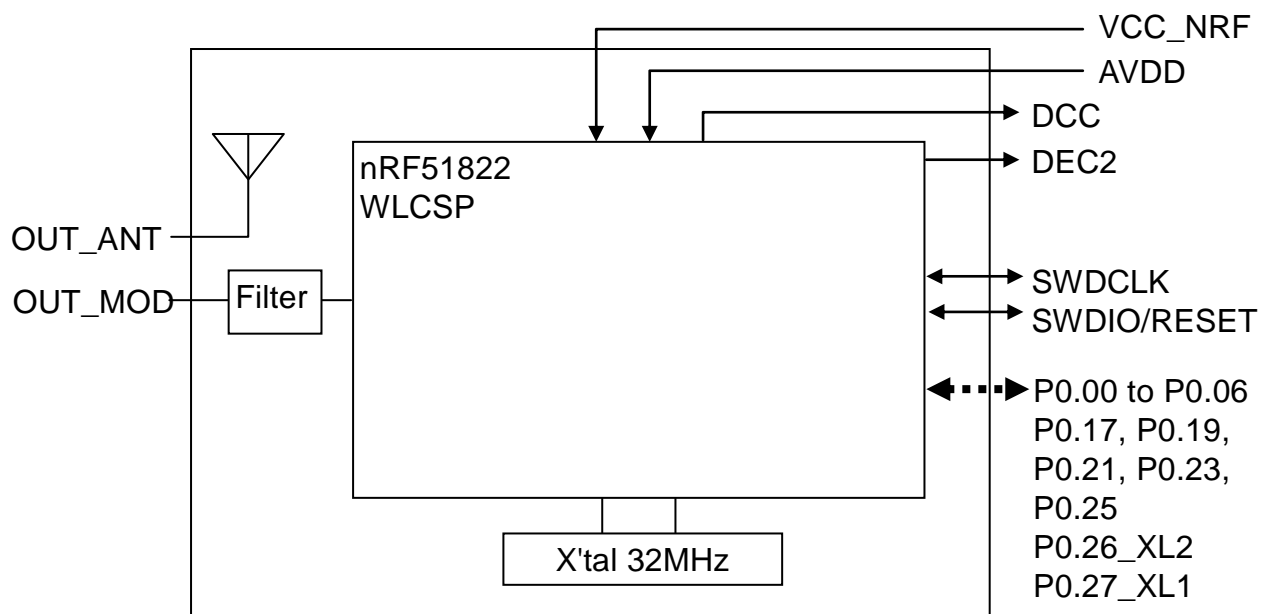
[nRFgo Studio] Download from Nordic web site http://www.nordicsemi.com
   nRFgo Studio help > Program nRF51 devices > Serial Bootloader

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HD-MC-A150049	(1/3)	Circuit Schematic

Block Diagram

```
                                              ──── VCC_NRF
                                              ──── AVDD
                                           ──► DCC
        ┌─────────────────────────┐        ──► DEC2
        │  nRF51822               │
        │  WLCSP                  │
OUT_ANT ─┤                        │
OUT_MOD ─┤ Filter │               │        ◄──► SWDCLK
        │                         │        ◄──► SWDIO/RESET
        │                         │
        │                         │        ◄┈┈► P0.00 to P0.06
        │                         │            P0.17, P0.19,
        │                         │            P0.21, P0.23,
        │                         │            P0.25
        │      ┌──────────────┐   │            P0.26_XL2
        │      │ X'tal 32MHz   │   │            P0.27_XL1
        └──────┴──────────────┴───┘
```

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EYSGJNZXX, EYSGJNZWY

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Control No.	Control name
HD-MC-A150049　　　　　　　(2/3)	Circuit Schematic

Sample circuits
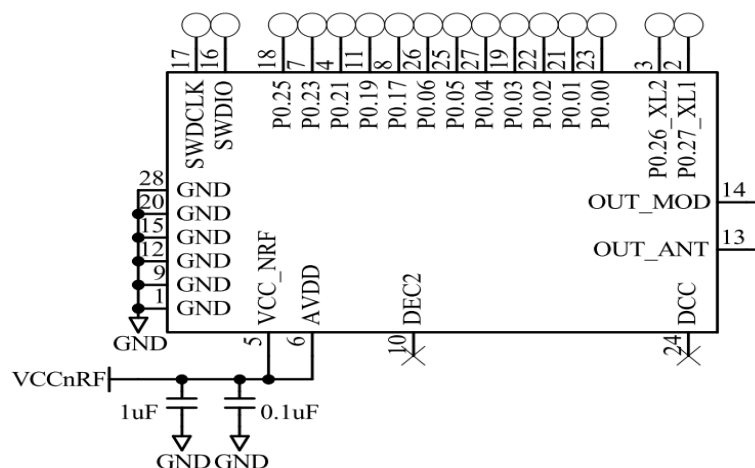
with external 32.768KHz X'tal

32.768KHz
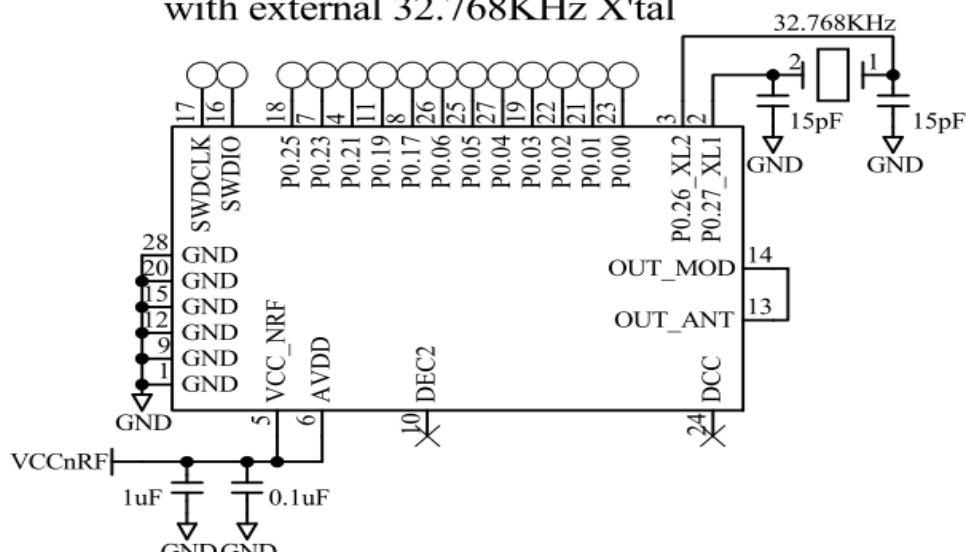
with internal DC/DC convertor

10uH:LB1608T100M
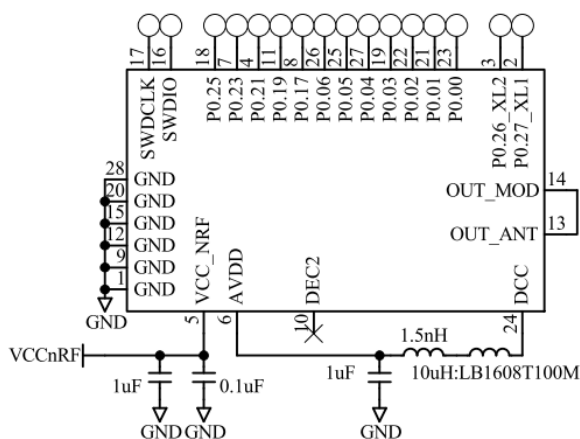
with 1.8V low voltage mode
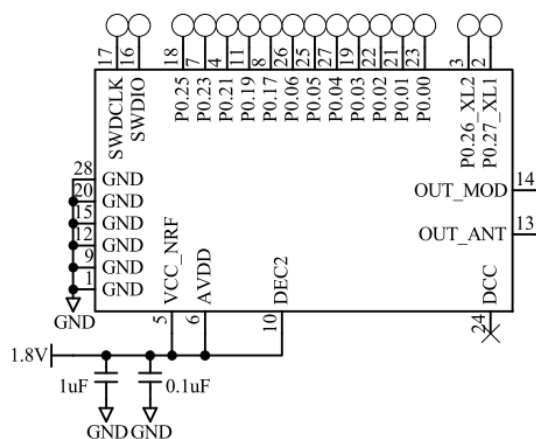
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EYSGJNZXX, EYSGJNZWY

Control No.	Control name
HD-MC-A150049 (3/3)	Circuit Schematic

Reference Circuits

SWDIO is also system reset (active low).

with external 32.768KHz X'tal

FC-12M (EPSON)
NX2012SA (NDK)
CL=12.5pF

P0.00-P0.27 are GPIOs. By setting in the application software, it is assigned to pin any such as UART, etc. Please make Open Status about unused pins.
VIO is connected to VCC in a module. Please use IO voltage under the following conditions.
Input high (V): 0.7VCC to VCC
Input low (V): GND to 0.3VCC

In order to use the built-in antenna on the module, please connect PAD13 and PAD14 as short as possible.

SWD (Serial Wire Debug) is a high-performance 2-pin debug port low-pin-count alternative to JTAG. It can write the application software and firmware by those pins through the J-Link Lite. Example and Applications written for Keil uVision IDE.

In case of the operation with the battery, we recommend that you add a capacitor of about 100uF in view of the voltage drop during TX/RX

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EYSGJNZXX, EYSGJNZWY

Control No.	Control name
HD-AD-A150049 (1/1)	Outline/Appearance

Tolerance: +/− 0.2mm

1.3mm MAX

Tolerance: +/- 0.2mm

Unit : (mm)

11.3mm

5.1mm

20 GND	19 P0.03	18 P0.25	17 SWDCLK	16 SWDIO	15 GND	14 OUT_MOD	13 OUT_ANT	12 GND

21 P0.01

25 P0.05

22 P0.02

26 P0.06

23 P0.00

27 P0.04

24 DCC

GND
4.4mm 2.55mm

28

4 _ 0.8mm x 0.55mm

0.95

P0.19 11

DEC2 10

1 _ 2.8mm x 1.5mm

1 GND	2 P0.27_XL.1	3 P0.26_XL.2	4 P0.21	5 VCC_NRF	6 AVDD	7 P0.23	8 P0.17	9 GND

0mm 0mm

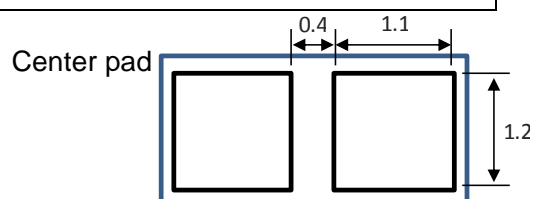Reference Corner
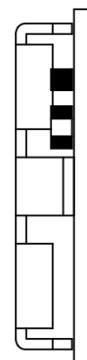
23 _ 0.8mm x 0.4mm pitch 0.8mm
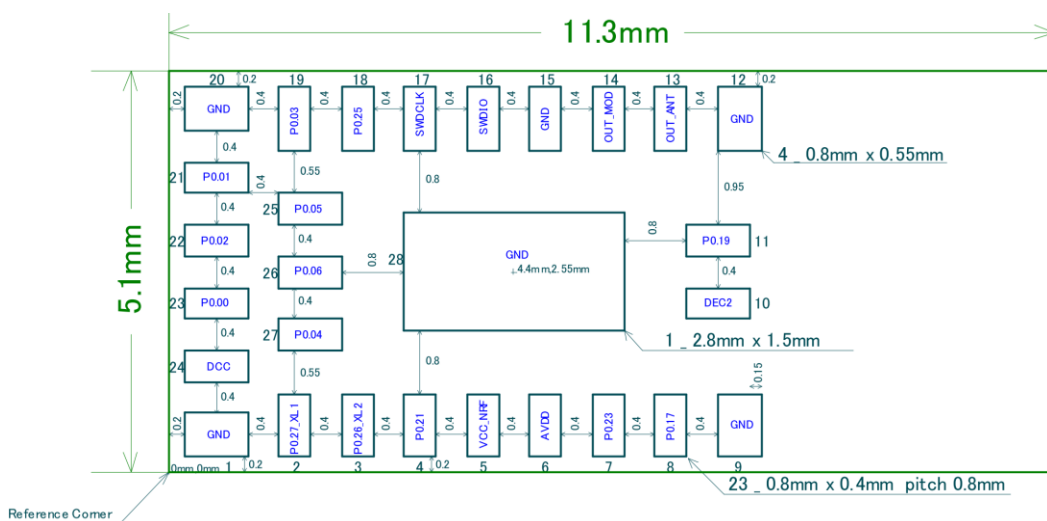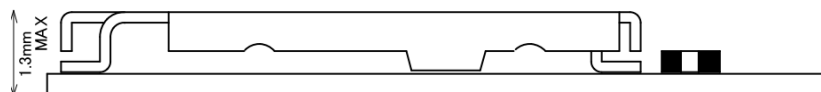
Top view

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 23 – 0.4 x 0.8 mm	0.35 x 0.7 mm
Corner pad 4 – 0.55 x 0.8 mm	0.45 x 0.75 mm
Center pad 1 – 2.8 x 1.5 mm	1.1 x 1.2 mm x 2

The metal mask thickness: t=0.1mm

0.4   1.1

Center pad

1.2

TAIYO YUDEN

EYSGJNZXX, EYSGJNZWY

TAIYO YUDEN

Control No.		Control name
HD-BA-A150049	(1/2)	Pin Layout

Pin Descriptions

Pin	Pin name	Pin function	Description
1	GND	Ground	Ground (0 V)
2	P0.27 AIN1 XL1	Digital I/O Analog input Analog input	General purpose I/O pin ADC input 1 Crystal connection for 32.768kHz crystal oscillator or external 32.768kHz crystal reference
3	P0.26 AIN0 XL2	Digital I/O Analog input Analog output	General purpose I/O pin ADC input 0 Crystal connection for 32.768kHz crystal oscillator
4	P0.21	Digital I/O	General purpose I/O pin
5	VCC_NRF	Power	Power supply
6	AVDD	Power	Analog Power supply
7	P0.23	Digital I/O	General purpose I/O pin
8	P0.17	Digital I/O	General purpose I/O pin
9	GND	Ground	Ground (0 V)
10	DEC2	Power	Power supply for low voltage mode
11	P0.19	Digital I/O	General purpose I/O pin
12	GND	Ground	Ground (0 V)
13	OUT_ANT	Antenna In/Out	Internal antenna. It should be connected to Pin 14 OUT_MOD for normal operation.
14	OUT_MOD	RF In/Out	RF I/O pin. It should be connected to Pin 13 OUT_ANT for normal operation.
15	GND	Ground	Ground (0 V)
16	SWDIO	Digital I/O	System reset (active low). Also HW debug and flash programming I/O
17	SWDCLK	Digital input	HW debug and flash programming I/O
18	P0.25	Digital I/O	General purpose I/O pin
19	P0.03 AIN4	Digital I/O Analog input	General purpose I/O pin ADC input 4
20	GND	Ground	Ground (0 V)
21	P0.01 AIN2	Digital I/O Analog input	General purpose I/O pin ADC input 2
22	P0.02 AIN3	Digital I/O Analog input	General purpose I/O pin ADC input 3

TAIYO YUDEN

EYSGJNZXX, EYSGJNZWY

Control No.			Control name
HD-BA-A150049		(2/2)	Pin Layout

Pin	Pin name	Pin function	Description
23	P0.00	Digital I/O	General purpose I/O pin
	AREF0	Analog input	ADC Reference voltage
24	DCC	Power	DC/DC output
25	P0.05	Digital I/O	General purpose I/O pin
	AIN6	Analog input	ADC input 6
26	P0.06	Digital I/O	General purpose I/O pin
	AIN7	Analog input	ADC input 7
	AREF1	Analog input	ADC Reference voltage
27	P0.04	Digital I/O	General purpose I/O pin
	AIN5	Analog input	ADC input 5
28	GND	Ground	Ground (0 V)

TAIYO YUDEN

EYSGJNZXX, EYSGJNZWY

Control No.		Control name
HQ-BA-523	(1/2)	Handling Precaution

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. Please do not wash this module.
   10. Please perform temperature conditions of module at reflow within the limits of the following.
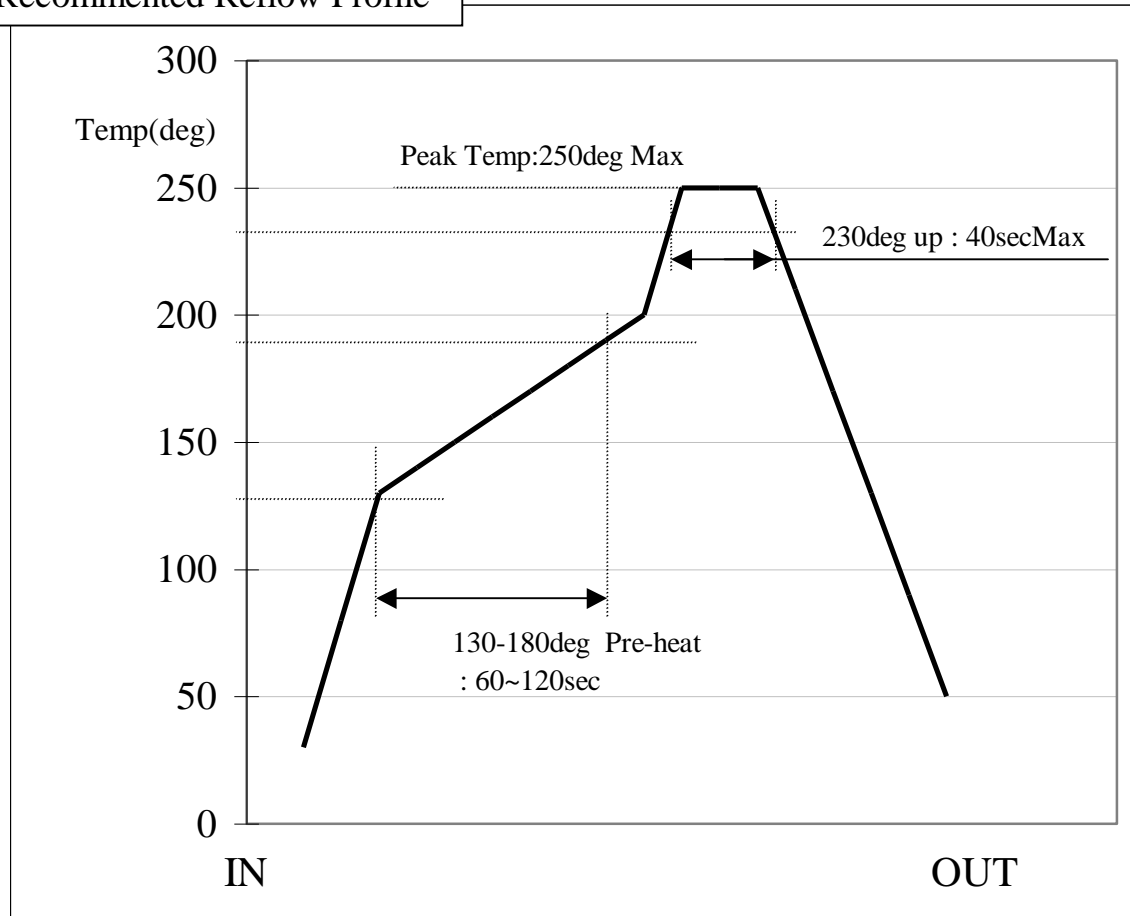   Please give the number of times of reflow as a maximum of 2 times.

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EYSGJNZXX, EYSGJNZWY

TAIYO YUDEN

Control No.		Control name
HQ-BA-523	(2/2)	Handling Precaution

Recommended Reflow Profile

Temp(deg)

300

250 — Peak Temp:250deg Max

230deg up : 40secMax

200

150

100

130-180deg Pre-heat
: 60~120sec

50

0

IN   OUT

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EYSGJNZXX, EYSGJNZWY　　　　　　　　TAIYO YUDEN

Control No. HD-BB-A150049　　　　　　　　(1/3)	Control name Packaging Specification

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 － 12mmPitch 24mm幅 － 12mm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　2000　pieces/Reel　　　　　　　Max　6000　pieces/Box(Outer)

(3) Packaging Figure
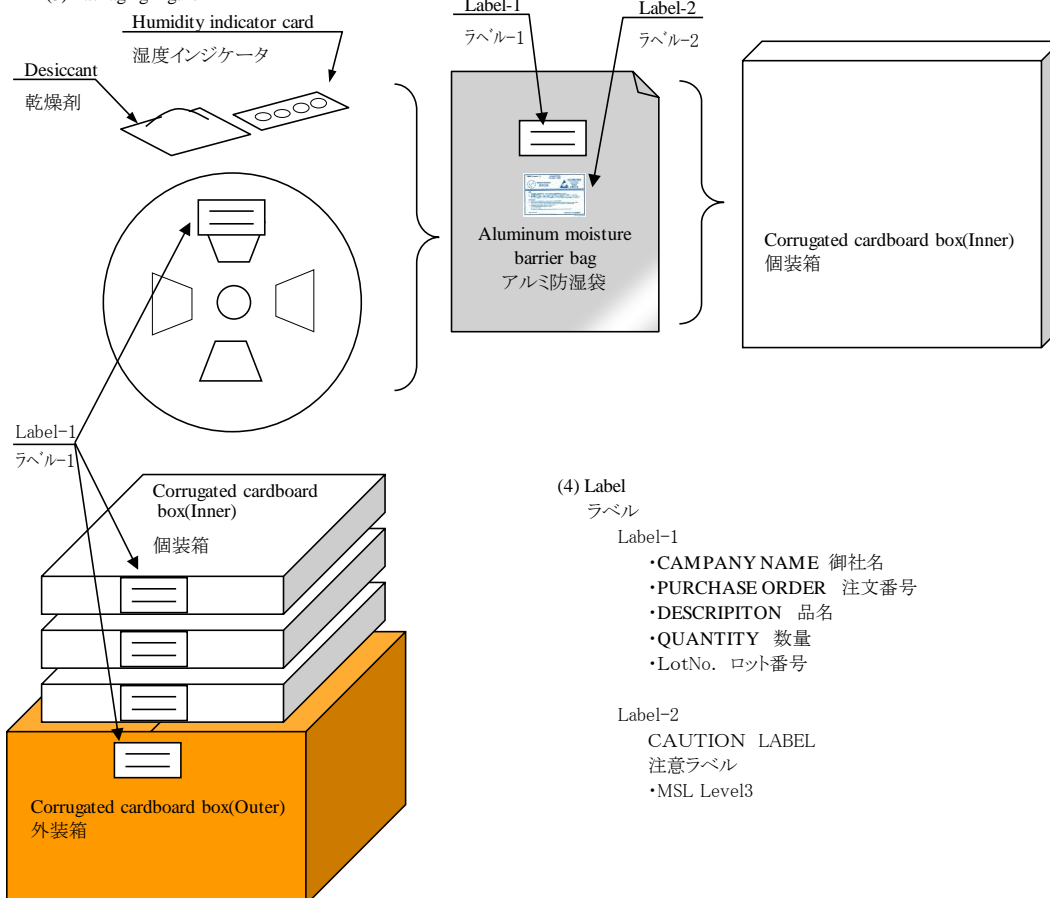
(4) Label
　　ラベル
　　　Label-1
　　　　・CAMPANY NAME　御社名
　　　　・PURCHASE ORDER　注文番号
　　　　・DESCRIPITON　品名
　　　　・QUANTITY　数量
　　　　・LotNo.　ロット番号

　　　Label-2
　　　　CAUTION LABEL
　　　　注意ラベル
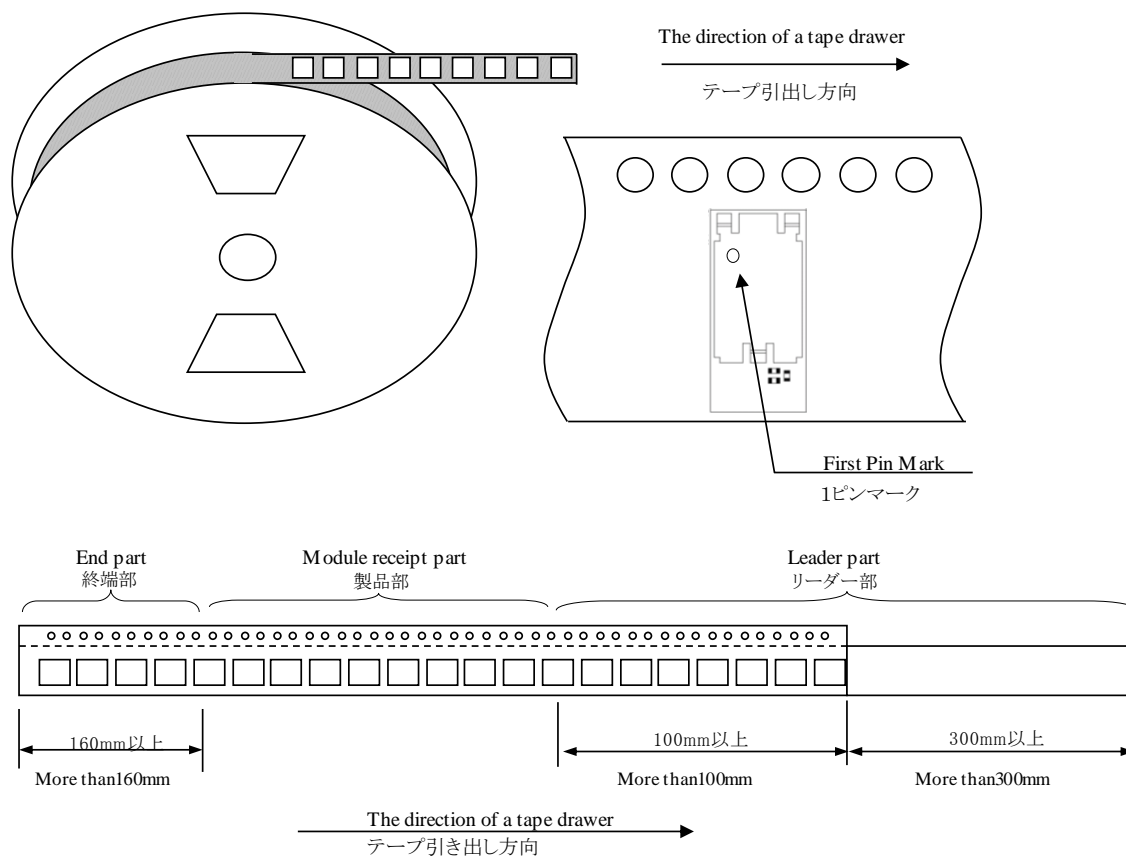　　　　・MSL Level3

TAIYO YUDEN

EYSGJNZXX, EYSGJNZWY

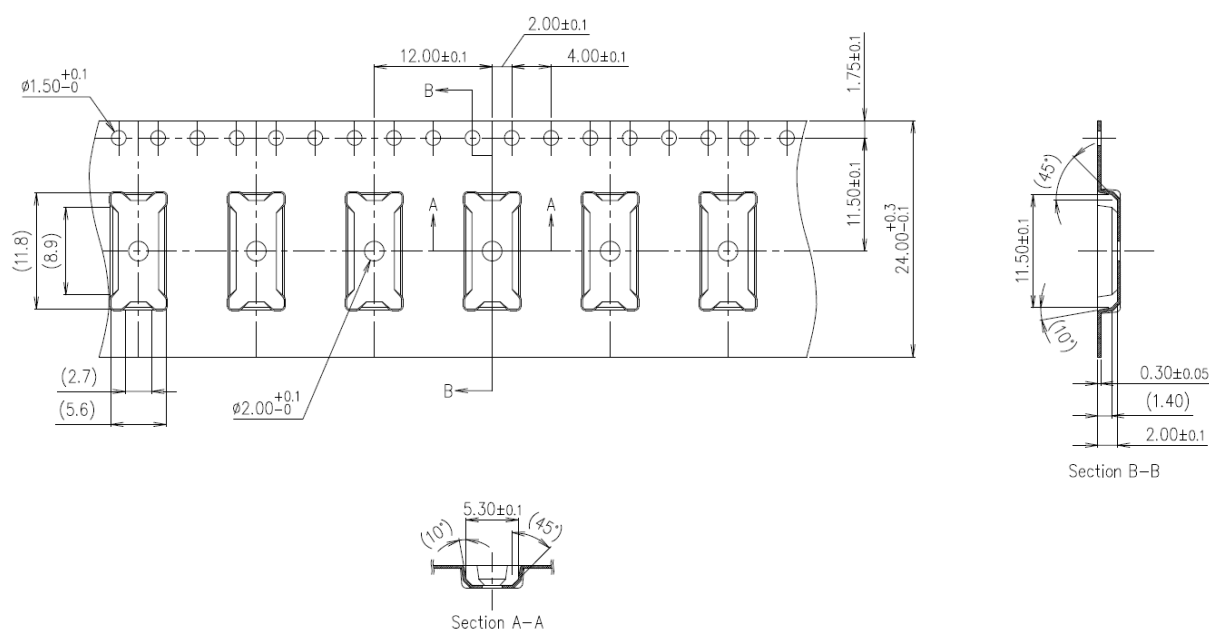| Control No.	Control name
HD-BB-A150049 (2/3)	Packaging Specification

Tape specification
テーピング仕様

The direction of a tape drawer
テープ引出し方向

First Pin Mark
1ピンマーク

End part 終端部	Module receipt part 製品部	Leader part リーダー部

160mm以上
More than160mm

100mm以上
More than100mm

300mm以上
More than300mm

The direction of a tape drawer
テープ引き出し方向

キャリアエンボス図面

2.00±0.1

12.00±0.1   4.00±0.1

1.75±0.1

$\phi 1.50^{+0.1}_{-0}$

(11.8)
(8.9)

11.50±0.1

$24.00^{+0.3}_{-0.1}$

(2.7)
(5.6)

$\phi 2.00^{+0.1}_{-0}$

11.50±0.1

0.30±0.05
(1.40)
2.00±0.1

Section B-B

5.30±0.1
(10°)   (45°)

Section A-A

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EYSGJNZXX, EYSGJNZWY

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Control No.		Control name
HD-BB-A150049	(3/3)	Packaging Specification

Reel specification
リール仕様

(Unit:mm)

$\phi 330\pm2$

$\phi 13\pm0.2$

W-1.5/+2
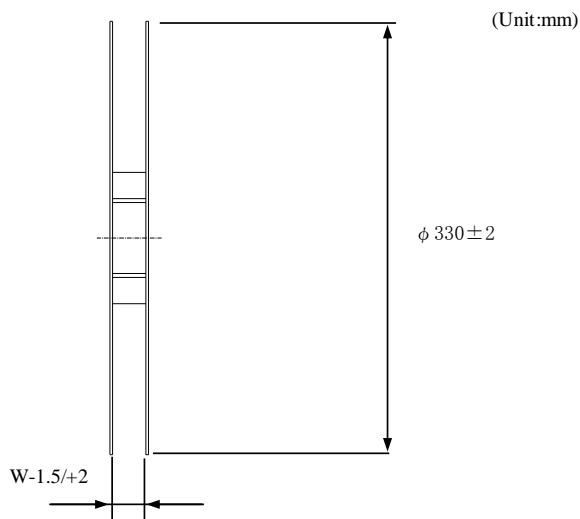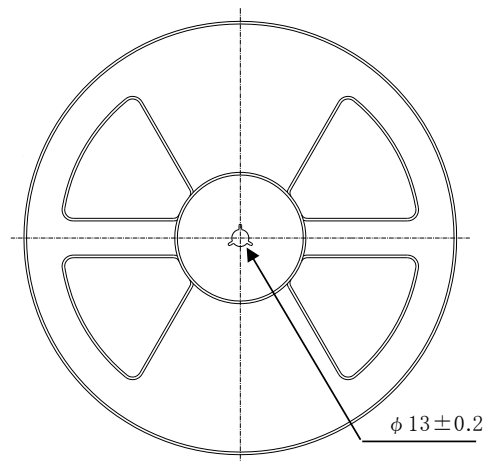
Tape wide	8mm	12mm	16mm	24mm	32mm	44mm
W	9.4mm	13.4mm	17.4mm	25.4mm	33.4mm	45.4mm

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、これに耐えうること.

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
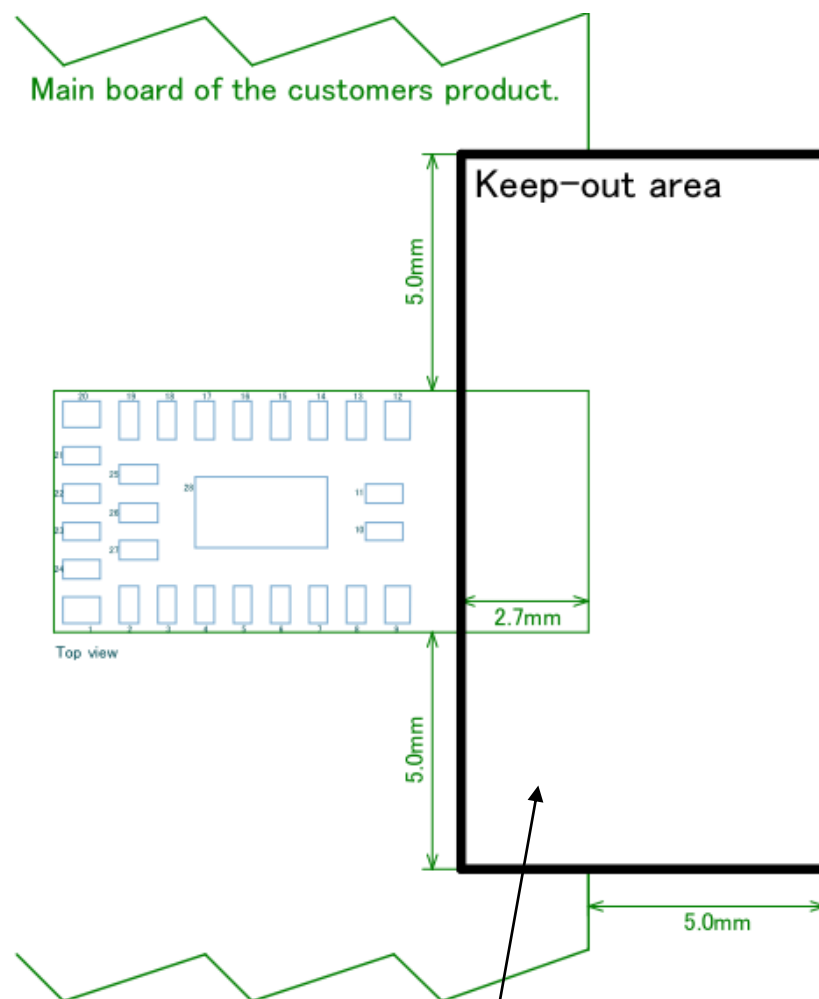が2個まで許容させていただくという意味になります。)

MSL Level 3 Under control
MSL はレベル3 で管理しています。

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EYSGJNZXX, EYSGJNZWY

Control No.	Control name
(1/3)	Antenna application note

Keep-out area

In order to keep the antenna performance on the module, please do not place any components, ground of main board, signal line, conductive plating in Keep-out area.

Keep-out area will be applicable in all layers of the customer's substrate.

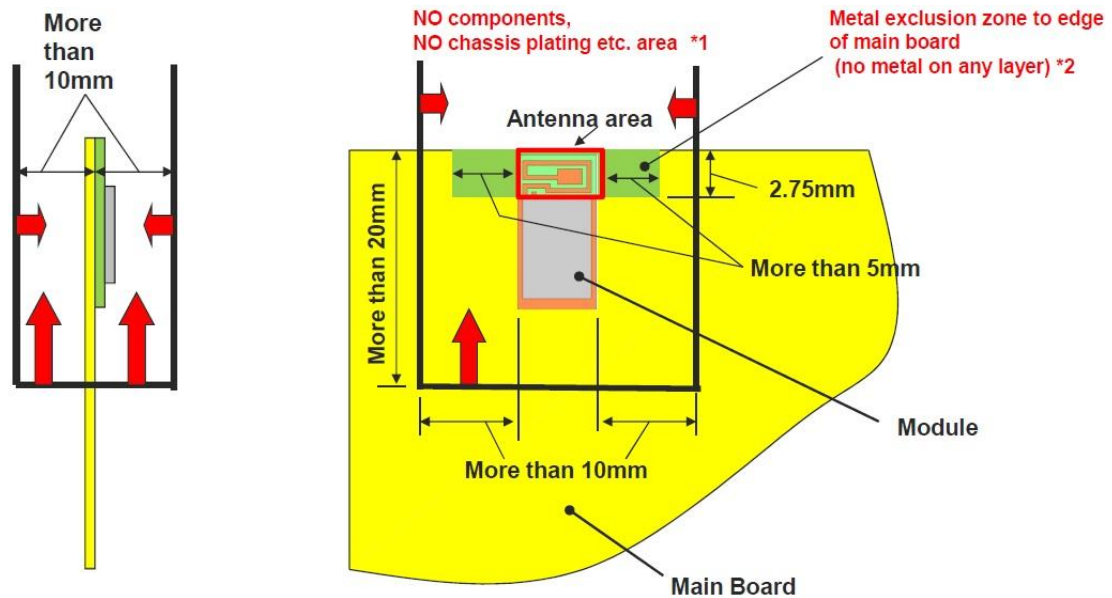Please consider on the occasion of pattern design.

EYSGJNZXX, EYSGJNZWY

Control No.	Control name
(2/3)	Antenna application note

Recommended arrangement of the module

*1 It should not exist a component, conductive plating for chassis and so on in this area.
   In addition, main board, chassis etc. may exist outside of the "NO components, NO chassis plating etc.area".
*2 Metal pattern on the main board should not exist under the antenna area.
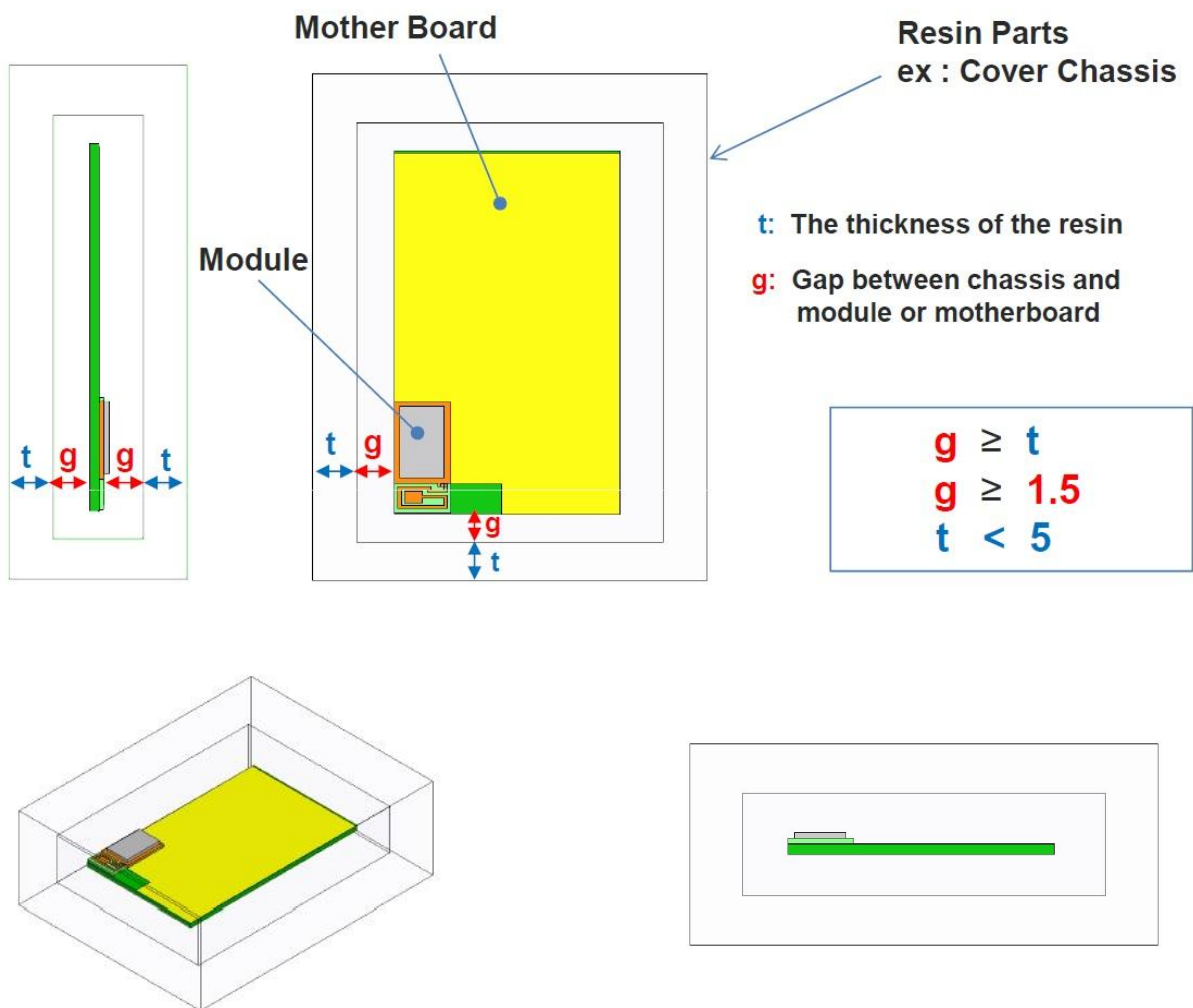
Example layout on main board

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EYSGJNZXX, EYSGJNZWY

Control No.		Control name
	(3/3)	Antenna application note

Antenna arrangement near resin

Mother Board

Resin Parts
ex : Cover Chassis

Module

t: The thickness of the resin

g: Gap between chassis and
module or motherboard

$$g \geq t$$
$$g \geq 1.5$$
$$t < 5$$

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EYSGJNZXX, EYSGJNZWY

Control No.	Control name
(1/1)	Design guide

1. Power Up Sequence
VCC_NRF power supply rise time (0V to 1.8V) must not exceed 100ms.

2. Recommended Power Circuit
VCC_NRF is the main power supply (1.8 – 3.6V) for this module. The supply voltage range of VCC_NRF is 1.8V to 3.6V in LDO mode and 2.1V to 3.6V in DCDC mode.
For more information of internal DC/DC converter operation, please refer to chapter 12.1.3 of "nRF51 _Series_Reference_Manual v3.0" by Nordic Semiconductor.
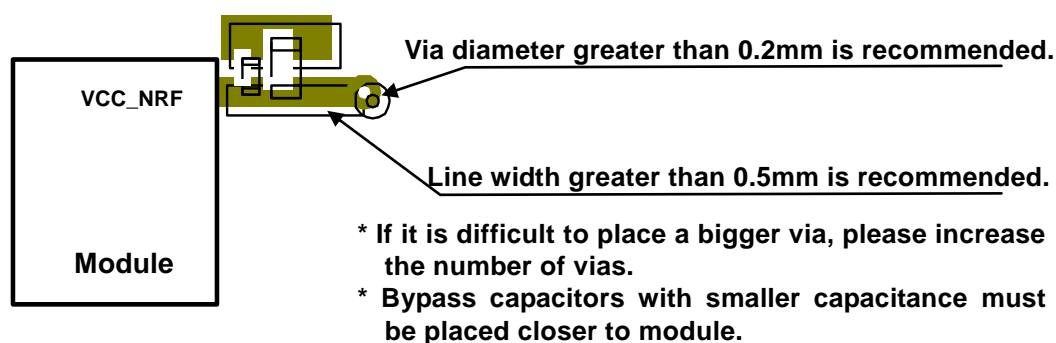
3. Battery operation
When using a small battery (e.g. CR2032), a large capacitor (e.g.100uF low leakage capacitor) should be placed near the battery.   This will reduce the voltage drop especially when the module is operated at low temperatures

4. Pattern Design Guide
4-1. Power Supply System
Power supply bypass capacitors must be placed close to the VCC_NRF pin of the module. The VCC_NRF trace should be greater than 0.5mm and a bigger a via diameter is recommended.

VCC_NRF

Module

Via diameter greater than 0.2mm is recommended.

Line width greater than 0.5mm is recommended.

* If it is difficult to place a bigger via, please increase the number of vias.
*** Bypass capacitors with smaller capacitance must be placed closer to module.**

4-2. Bypass Capacitor Layout
A parallel combination of a small capacitance (about 10pF) and a large capacitance (1uF to 10uF) is recommended for bypass capacitors. The GND of the bypass capacitor must be placed close to an adjacent module GND to ensure the shortest closed loop.

4-3. GND Pattern
Power supply bypass capacitor GND must be placed in proximity of module GND.   Wide GND area must be provided to ensure isolation for each layer.

Module

Surface layer
High frequency line
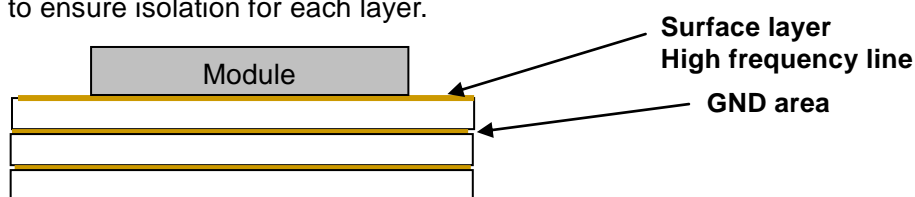
GND area

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

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EYSGJNZXX, EYSGJNZWY

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Control No.	Control name
(1/1)	Notes

Clock frequency

The evaluation board included with the Nordic Development Kit uses a 16MHz clock. Therefore the sample code from Nordic is designed to be used with a 16MHz clock. On the other hand, the EYSGJN series module uses a 32MHz system clock, making it incompatible with the Nordic sample code (i.e. sample code does not configure HFCLK: XTALFREQ register for 32MHz). To fix this issue, we need to write the value 0xFFFFFF00 to the UICR (User Information Configuration Register) at address 0x10001008. Please note that the UICR is erased whenever you download a SoftDevice.

The UICR can be written by using the debug tools:
nrfjprog.exe --snr <your_jlink_debugger_serial_number> --memwr 0x10001008 --val 0xFFFFFF00

Or the following code can be added to the SystemInit function in the system_nRF51.c file, right before launching the TASK_HFCLKSTART task:

```
if (*(uint32_t *)0x10001008 == 0xFFFFFFFF)
 {
     NRF_NVMC->CONFIG = NVMC_CONFIG_WEN_Wen << NVMC_CONFIG_WEN_Pos;
     while (NRF_NVMC->READY == NVMC_READY_READY_Busy){}
     *(uint32_t *)0x10001008 = 0xFFFFFF00;
     NRF_NVMC->CONFIG = NVMC_CONFIG_WEN_Ren << NVMC_CONFIG_WEN_Pos;
     while (NRF_NVMC->READY == NVMC_READY_READY_Busy){}
     NVIC_SystemReset();
     while (true){}
 }
```

32kHz Clock

This module does not installed 32.768kHz crystal. In case of operating without external crystal, please use following example code in order to enable internal 32.768kHz RC oscillator (32k RCOSC).

SOFTDEVICE_HANDLER_INIT(NRF_CLOCK_LFCLKSRC_RC_250_PPM_250MS_CALIBRATION, false);

Note that when you choose to use the RC oscillator, it will add around 10uA average current consumption compared to a 20ppm external crystal.

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