

Braveridge

User Manual



Rev 1.0E

BVMCN52840CFSLR

Bluetooth Low Energy MODULE

DESIGNED BY Braveridge Co., Ltd.

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1 Product Details

- A Bluetooth 5.0 long-range compatible module featuring the Nordic nRF52840-CKAA.

1-1 Basic Specifications

- Frequency Range: 2402MHz to 2480MHz
- Transmission Power (Terminal Output): -40dBm to +8dBm
- Operating Voltage: 1.7V to 5.5V (Typ:3.0V)
- Main Clock: 32MHz Built-in
- Sub Clock: 32.768kHz Built-in
- Antenna: External Antenna

(Various antennas certified by the Japanese Radio Law are available. For details, please contact us.)

- Interface: 49pins (UART,SPI,I2C,ADC,GPIO,NFC,USB controller) SEGGER Port: 2pins, total 78pins
- Size: W: 11.0mmx D: 7.5mmx H: 1.85mm (For tolerances, see P16. Mechanical Drawing)
- Weight: 0.24g
- Lead-Free Process

1-2 Features

<Main Body>

- Certified by Japanese Radio Law and Bluetooth, ready for immediate use as a Bluetooth LE module.
- Capable of communication with apps via smartphone or PC and supports OTA (Over the Air) firmware updates.

<Firmware>

- The SoftDevice is pre-installed before shipment.

(The SoftDevice is certified by the Japanese Radio Law and Bluetooth SIG with the version specified in "3-1 Soft Device". Do not change to a version not listed in the table.)

- The application layer is programmed with a port test program and all ports are verified before shipment. (When writing to the application layer, please perform Erase first.)
- We offer a service to program the customer's application. (Programming after implementation is also possible.)

Please contact us for details.

< Quality Control System>

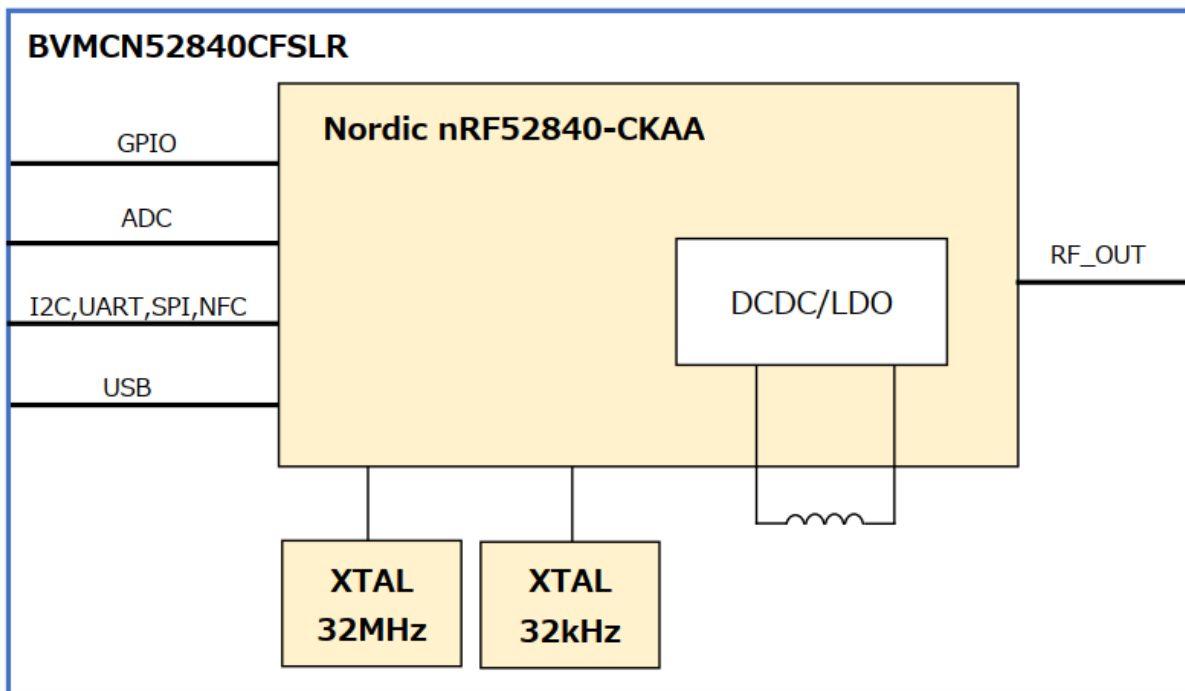
- We store individual manufacturing inspection information for all modules.

2 Electrical Specifications

2-1 Ratings

Categories		Ratings	Notes
Voltage Range (Vdd(N))	V	1.7 to 3.6	
Voltage Range (Vdd(H))	V	2.5 to 5.5	
Current Consumption		Based on the specification of nRF52840-CKAA	Please obtain the latest information from Nordic's website.
Operating Temperature Range	°C	-20 to 80	
Storage Temperature Range	°C	-20 to 80	

2-8 Block Diagram



Block Description	Description
Nordic nRF52840-CKAA	Nordic's Bluetooth Low Energy SOC
XTAL 32MHz	32MHz oscillator
XTAL 32.768kHz	32.768kHz oscillator

This device includes an NFC (Near Field Communication) function that operates passively. The NFC tag is passive component that does not emit RF energy by itself and is powered by the NFC reader's electromagnetic field. As such, it is not subject to FCC Part 15 intentional or unintentional radiator requirements.

3 OEM Design Considerations

This section covers OEM design considerations. Design guidance's presented below needs to be followed to guarantee a proper operation of the Module.

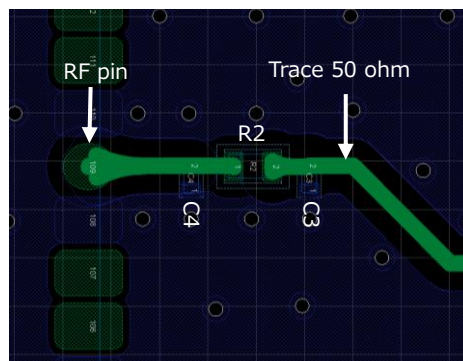
3-1 RF-OUTPUT AND ANTENNA REQUIREMENTS

The RF output impedance level is 50Ω so the trace leaving from the RF pad shall be kept in that same impedance level to avoid reflections and mismatch of the RF signal. From the module's point of view, it is important that the used antenna has a low VSWR value. The VSWR shall be better than 2:1 to avoid decrease in the sensitivity performance of the receiver.

3-1-1 RF-OUTPUT Layout Recommendations

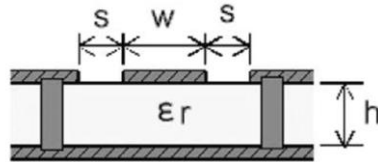
Because the Module is a wireless device, the RF section must be the top priority in terms of layout. It is very important that layout is made by following the proper RF design guidelines to get the optimal performance from the device. Poor layout can decrease the output power, sensitivity, and cause mask violations.

Component places; R2, C3 and C4 are for additional output matching. Additional matching is not used in the reference design. Thus, values are as follows: R2 = 0R, C3 & C4 = No Mounted.



3-1-2 RF Routing Guidelines

For user's PCB, the characteristic impedance of all RF traces should be controlled to 50Ω . The impedance of the RF traces is usually determined by the trace width (W), the materials' dielectric constant, the height from the reference ground to the signal layer (H), and the spacing between RF traces and grounds (S). Microstrip or coplanar waveguide is typically used in RF layout to control characteristic impedance. The following are reference designs of microstrip or coplanar waveguide with different PCB structures.



Recommended PCB values for 4-layer board (L2 is the GND plane for transmission line)

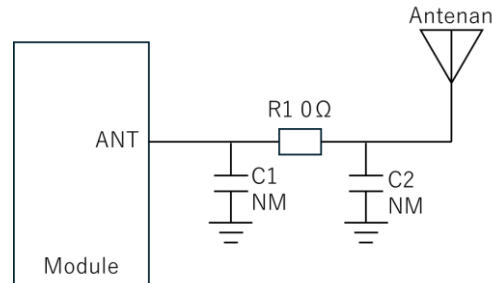
$W=0.35\text{ mm}$ $S > 0.2\text{ mm}$ $h=0.18\text{ mm}$ $\epsilon_r=4$

General recommendations:

1. RF traces must have 50 Ohm impedance because module is only rated to operate in 50 Ohm systems.
2. RF trace bends must be gradual and not have any sharp corners.
3. Grounded trace structure must have GND via stitching.
4. Only connect antennas which are approved.

At the end of the trace, there is an antenna on the module's EVB. The trace was used to connect the authorized antenna to the EVB during the modular approval measurements.

3-1-3 Antenna Design Guidelines



Place the matching components (R1 & C1 & C2) to the antenna as close as possible.

The matching components (R1, C1, and C2) may or may not include a resistor, capacitor, or inductor.

The RF output impedance level is 50Ω so the trace leaving from the RF pad shall be kept in that same impedance level to avoid reflections and mismatch of the RF signal.

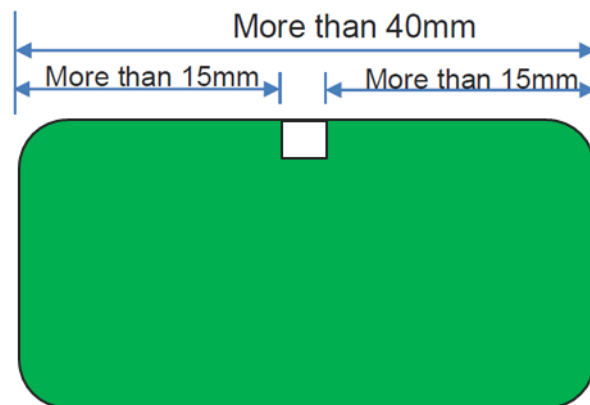
3-1-4 Antenna Design Recommendations

For optimal antenna performance, it is recommended that the PCB dimensions conform to those shown in the figure below.

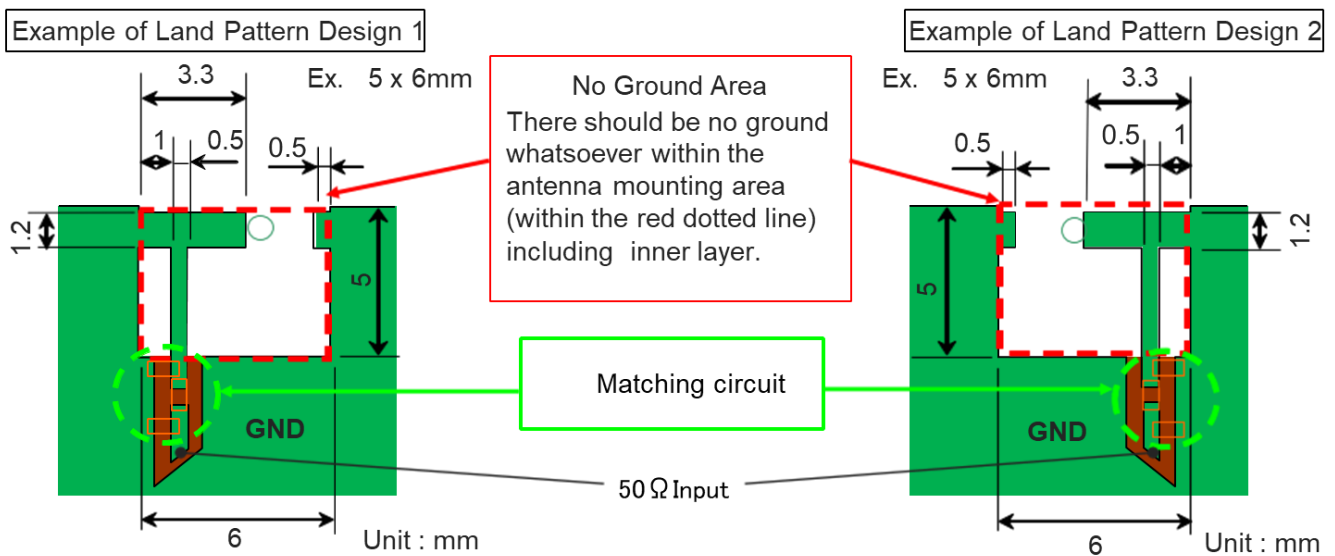
Authorized antenna Information

Manufacturer: Taiyo Yuden

Model number: TSA5NA2K2G45NS001T

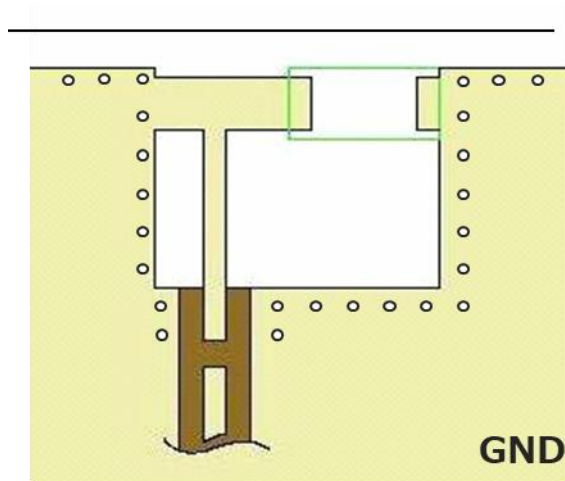


The recommended antenna layout pattern is shown in the figure below.



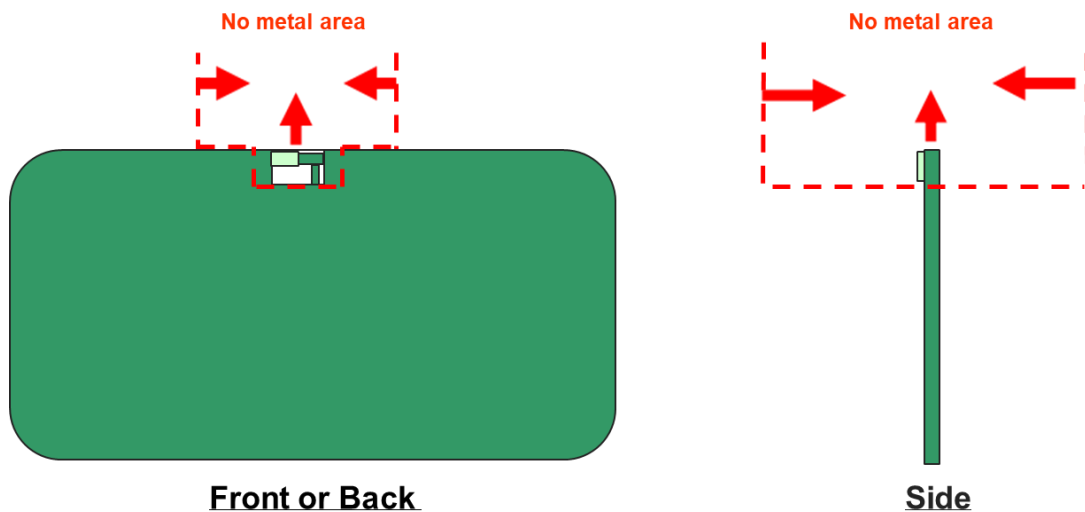
1. Surface GND layer around the antenna area should be connected with inner GND layer via through hole.
2. Matching circuit line should be designed as 50Ω.
3. Thickness of PCB can be flexible.
4. Matching circuit should be placed as close as possible to the antenna.
5. Use of E24 series Inductor and Capacitor as matching components are recommended for the optimized result.
6. Matching values may be required to get readjusted contingent upon the condition such as proximity to the metal and/or chassis, board size, etc.

The recommended VIA layout is shown in the figure below.



To achieve optimal antenna performance, refer to the layout illustrated in the figure below.

Do not place the antenna close to metal housings, metal-containing paint, board ground (GND), metal chassis, or similar structures.



3-5 Ensuring Trace Quality

Before the module is assembled onto the host PCB, the reflection coefficient of the trace can be measured using a VNA. The reflection coefficient of the antenna can also be measured. The attenuation should be equal to or better than -10 dB in both cases.

4 RF Exposure Statement

FCC Radiation Exposure Statement:

This equipment complies with FCC 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.

<Regulatory notice to host manufacturer according to KDB 996369 D03 OEM Manual v01>

List of applicable FCC rules

This module has been granted modular approval as below listed FCC rule parts. -FCC Rule parts 15C (15.247)

Summarize the specific operational use conditions

-The OEM integrator should use equivalent antennas which is the same type and equal or less gain than an antenna listed in 2.7 in this instruction manual.

RF exposure considerations

The module has been certified for integration into products only by OEM integrators under the following condition:

-The antenna(s) must be installed such that a minimum separation distance of at least 20 cm is maintained between the radiator (antenna) and all persons at all times.

-The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter

except in accordance with FCC multi-transmitter product procedures.

-Mobile use

As long as the three conditions above are met, further transmitter testing will not be required.

OEM integrators should provide the minimum separation distance to end users in their end-product manuals.

Antennas list

This module is certified with the following antenna.

-Type: Chip Antenna / Terminal Antenna

- Max. peak Antenna gain:5.03dBi

Any new antenna type, higher gain than listed antenna should be met the requirements of FCC rule 15.203 and 2.1043 as permissive change procedure.

Label and compliance information

End Product Labeling

The module is labeled with its own FCC ID and IC Certification Number. If the FCC ID and IC Certification Number are not visible when the module is installed inside another device, then the outside of the device into which the module is

installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: 2ABXRBM5284C"

"Contains IC: XXXX-XXXXXXXXXX"

Information on test modes and additional testing requirements

-OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, additional transmitter in the host, etc.).

Additional testing, Part 15 Subpart B disclaimer

-The final host product also requires Part 15 subpart B compliance testing with the modular transmitter installed to be properly authorized for operation as a Part 15 digital device.

5 Notice

FCC Statement

Approval Statement

FCC approval

This device complies with Part 15 of the FCC` s 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 undesirable operation.

To satisfy FCC exterior labeling requirements, the following text must be placed on the exterior of the end product.

Contains Transmitter module FCC ID: 2ABXRBM5284C

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.
- The OEM integrator is responsible for ensuring the end-user has no manual instruction to remove or install module.
- The module is limited to installation in mobile or fixed applications.

IMPORTANT NOTE

This device complies with FCC & IC radiation exposure limits set forth for an uncontrolled environment. This device should be installed and must not be co-located or operating in conjunction with any other antenna or transmitter.

This device is intended only for OEM integrators under the following conditions:

- 1) This module may not be co-located with any other transmitters or antennas.
- 2) The antenna must be installed such that 20cm is maintained between the antenna and users.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements with this module installed.

In the event that these conditions cannot be met, then the FCC & IC authorizations are no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product including this module and obtaining separate FCC & IC authorizations.

User Information

Caution: Any changed or modifications not expressly approved by the party responsible for compliance could void the user`s authority to operate this equipment.

6 Revision Management

Revision Records		
Revision	Date	Description
1.0	2025/8/19	First release.

7 Sales Agent

Braveridge's distributor information for modules and finished products related to Bluetooth LE.

8 Product Support

For inquiries regarding product defects, malfunctions, etc., please contact us via email at the following address:

Email: support@braveridge.com



Please visit our website for more information on Braveridge and Production information.

<http://www.braveridge.com/>

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