Date	February 6, 2024

For Radio Certification

Specifications / User Manual

24GHz Sensor Module

Model No. NJR4267F2A1 / NJR4267F3B1

Caution

1. Nissinbo Micro Devices strives to produce reliable and high-quality microwave components. Nissinbo Micro Devices's microwave components are intended for specific applications and require proper maintenance and handling. To enhance the performance and service of Nissinbo Micro Devices's microwave components, the devices, machinery or equipment into which they are integrated should undergo preventative maintenance and inspection at regularly scheduled intervals. Failure to properly maintain equipment and machinery incorporating these products can result in catastrophic system failures.

2. To ensure the highest levels of reliability, Nissinbo Micro Devices products must always be properly handled. The introduction of external contaminants (e.g. dust, oil or cosmetics) can result in failures of microwave components.

3. Nissinbo Micro Devices offers a variety of microwave components intended for particular applications. It is important that you select the proper component for your intended application. You may contact Nissinbo Micro Devices 's sales office or sales representatives, if you are uncertain about the products listed in the catalog and the specification sheets.

4. Special care is required in designing devices, machinery or equipment, which demand high levels of reliability. This is particularly important when designing critical components or systems whose foreseeable failure can result in situations that could adversely affect health or safety. In designing such critical devices, equipment or machinery, careful consideration should be given to, amongst other things, their safety design, fail-safe design, back-up and redundancy systems, and diffusion design.

＊Above Specifications are subject to change without notice.

5. The products listed in the catalog and specification sheets may not be appropriate for use in certain equipment where reliability is critical or where the products may be subjected to extreme conditions. You must consult our sales office or sales representatives before using the products in any of the following types of equipment.

   * Aerospace Equipment
   * Equipment Used in the Deep Sea
   * Power Generator Control Equipment (nuclear, steam, hydraulic)
   * Life Maintenance Medical Equipment
   * Fire Alarm/Intruder Detector
   * Vehicle Control Equipment (automobile, airplane, railroad, ship, etc.)
   * Various Safety Equipment

   This sensor module is NOT intended to be used in motor vehicles nor aircraft.

   Additional considerations are required for use in such environments.

   You (i.e. Host integrator of this module) must consult detail our sales office or sales representatives beforehand.

   As the product is a transmitter module to be incorporated in a host, the module complies with the following FCC rules and ISED Standard.

   For FCC, NJR4267F2A1: See the section 15.249,
   NJR4267F3B1: See the section 15.245.

   For ISED, NJR4267F2A1: See RSS-210 Annex B, B.10
   NJR4267F3B1: See RSS-210 Annex F, F.1

6. Nissinbo Micro Devices 's products have been designed and tested to function within controlled environmental conditions. Do not use products under conditions that deviate from methods or applications specified in the catalog and specification sheets. Failure to employ Nissinbo Micro Devices 's products in the proper applications can lead to deterioration, destruction or failure of the products. Nissinbo Micro Devices shall not be responsible for any bodily injury, fires or accidents, property damage or any consequential damages resulting from the misuse or misapplication of its products.

   PRODUCTS ARE SOLD WITHOUT WARRANTY OF ANY OF KIND, EITHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

7. The product specifications and descriptions listed in the catalog and specification sheets are subject to change at any time, without notice.

◆FCC Statement (For United States of America)

Appendix)

FCC Statements of 2ACUJR4267F2A1, 2ACUJR4267F3B1

Grant holder of the Transmitter module:

Nissinbo Micro Devices Inc.
1-1, Fukuoka 2-Chome Fujimino-City
Saitama Prefecture 356-8510 Japan
Tel: +81-49-278-1271, Fax: +81-49-278-1234

Caution:
DC power supply for each module should be conformed to the electrical specifications
as described in this section. A host in which a module is integrated should provide stable DC power through suitable regulator circuit to the module.

NOTE:
Changes or modifications to the device not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment(s).

The equipment complies with radio frequency exposure limits set forth by the FCC for an uncontrolled environment.
The device must not be co-located or operating in conjunction with any other antenna or transmitter.

Appedix)

WARNING:

The FCC regulations provide that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Limitation for use of the modules:

When the module is installed in a host product, the module shall be connected directly to a PCB of the host product. It shall NOT be extended by any cable. DC power supply for each module must strictly be conformed to each electrical specification as described in the section 1 of this document.

Manual and Product Labeling information to the End User:

End user manual must include all required regulatory information and/or warning as show in this manual.

OEM Integrator must indicate as described below with the outside of a host product such as label when the module is installed in the host product.

"Contains FCC ID: 2ACUJR4267F2A1" (to use NJR4267F2A1)

"Contains FCC ID: 2ACUJR4267F3B1" (to use NJR4267F3B1)

The following statement from FCC §15.19(a)(3) is required on the label of the host equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) This device must accept any interference received, including interference that may cause undesired operation.

OEM Integrator may be sure that the End user manual may not contain any information about the way to install or remove the modules from the host product.

APPLICABLE MODEL:

This FCC Statement is valid only for the following model number:
NJR4267F2A1 and NJR4267F3B1

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.

＊Above Specifications are subject to change without notice.

The following statement is required in the user manual of the host equipment.

Changes or modifications to the device not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment(s).

◆RF Exposure Statement (For FCC: United States of America)

This equipment complies with radio frequency exposure limits set forth by the FCC for an uncontrolled environment. This equipment must be installed and operated with a minimum distance of 2.0 cm between the device and the user or bystanders. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

◆ISED Statement（For Canada）

Note:

This device complies with Innovation, Science and Economic Development Canada's 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.

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

(1) L'appareil ne doit pas produire de brouillage.

(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Manual and Product Labeling information to The End User:
The end user manual shall include all required regulatory information/warning as show in this manual.
And when this module is installed in the host product, you must include a as described below in the label of the host product.

"Contains IC: 22589-R4267F2A1" (to use NJR4267F2A1)
"Contains IC: 22589-R4267F3B1" (to use NJR4267F3B1)

Informations sur le manuel et l'étiquetage du produit destinées à l'utilisateur final:
Le manuel de l'utilisateur final doit inclure toutes les informations / avertissements réglementaires requis, comme indiqué dans ce manuel.
Et lorsque ce module est installé dans le produit hôte, vous devez inclure un comme décrit ci-dessous dans l'étiquette du produit hôte.

" Contient IC: 22589-R4267F2A1" (pour utiliser NJR4267F2A1)
" Contient IC: 22589-R4267F3B1" (pour utiliser NJR4267F3B1)

◆RF Exposure Statement (For ISED : Canada)

This equipment complies with radio frequency exposure limits set forth by Industry Canada for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 2.0 cm between the device and the user or bystanders. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par Industrie Canada pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 2.0 cm de distance entre le dispositif et l'utilisateur ou des tiers. Ce dispositif ne doit pas être utilisé à proxi

Scope

This module is a sensor for detecting the human movement using a radio-wave in the 24 GHz band.

Table 1 List of Product Models

Model No.	Operating Frequency	Antenna Type	Region / Regulations
NJR4267F2A1	24.164～24.236GHz	1x1 type (Angle: 80°/110°,Distance:20m)	JAPAN / Article 38-24 Paragraph 1 of the Radio Low EU / Radio Equipment Directive (RED)2014/53/EU USA / FCC Part 15.249 Canada / RSS-210 (Issue 10):2019 + Amendment 1:2020
NJR4267F3B1	24.089～24.161GHz	2x1 type (Angle: 84°/66°,Distance:30m)	JAPAN / Article 38-24 Paragraph 1 of the Radio Low EU / Radio Equipment Directive (RED)2014/53/EU USA / FCC Part 15.245 Canada / RSS-210 (Issue 10):2019 + Amendment 1:2020

Main Structure

- Integrated antenna structure, the patch antenna is integrated on the module PCB.
- All of electric parts except interface connector are covered with metal cap.

Operation Overview

- 3.8～5.8 V input operation, LDO integrated.
- Implemented an internal MCU for RF frequency tuning of RF transceiver IC and intermittent operation.
- Internal MCU controls ON/OFF of input voltage of RF transceiver IC which is output from integrated LDO, and this is for intermittent operation.
- There are 10 frequency channels.
- The module operates in CW or intermittent.
- The intermittent rate is selectable at 1kHz/2kHz. And RF ON time is 4us.
- Internal MCU supplies the tuning voltage to RF transceiver IC and the RF frequency is controlled by tuning voltage.
- Monitors the output of the temperature sensor built into the RF transceiver IC, and if a temperature change above a certain level is detected, frequency adjustment is performed using AFC (frequency calibration)

＊Above Specifications are subject to change without notice.

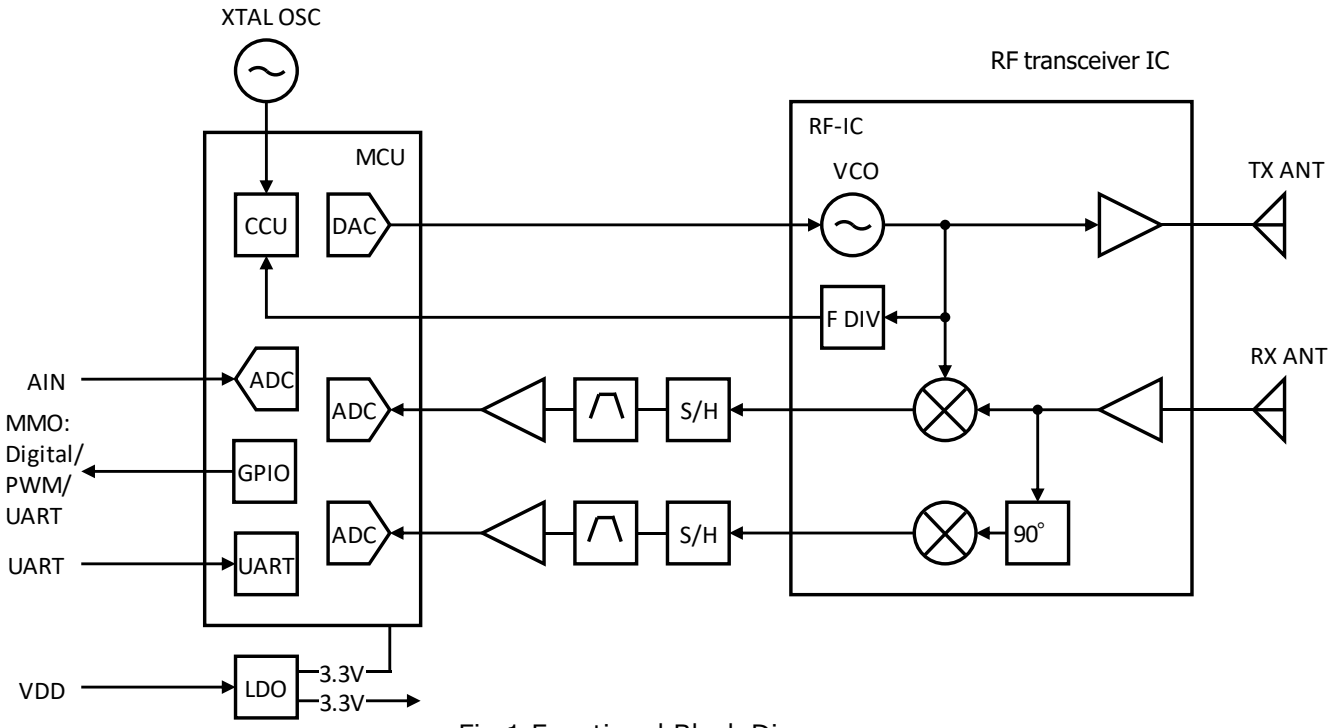

Fig.1 Functional Block Diagram

∗Above Specifications are subject to change without notice.

1. Electrical Specifications

Common measurement conditions Ta= +25 °C

Table 2 Electrical Characteristics 1

Items	Specs			Unit	Remarks
	Min	Typ	Max		
Supply Voltage	3.8	5	5.8	V	
Consumption current (at power supply voltage 5.0V)					
Peak Current	—	75	90	mA	
Average current during normal operation (at digital output/UART output)					
Sampling rate 1kHz	—	1.5	1.8	mA	
Sampling rate 2kHz	—	2.6	3.1	mA	
Sampling rate 4kHz	—	52.5	63.0	mA	
Sampling rate 8kHz	—	53.2	63.9	mA	
Sampling rate 16kHz	—	54.6	65.6	mA	
Average current during normal operation (at PWM output)					
Sampling rate 1kHz	—	6.5	7.8	mA	
Sampling rate 2kHz	—	7.0	8.4	mA	
Sampling rate 4kHz	—	52.7	63.3	mA	
Sampling rate 8kHz	—	53.5	64.2	mA	
Sampling rate 16kHz	—	55.0	66.0	mA	
Current during sleep mode	—	560	728	uA	
Current during deep sleep mode	—	220	280	uA	

＊Above Specifications are subject to change without notice.

Table 3 Electrical Characteristics 2

Items	Specs			Unit	Remarks
	Min	Typ	Max		
Input / Output Pin Characteristics					
AIN pin (AIN: Pin2)					
Input voltage range	0	—	3.3	V	
Connected device impedance	0	—	15	kΩ	
Multi-mode output pin (MMO: Pin3)					
High level output voltage	2	—	3.5	V	At 10mA source current
High level output voltage	2.8	3.3	3.5	V	At 0mA source current
Low level output voltage	0	—	1.3	V	At 10mA sink current
Low level output voltage	0	0	0.4	V	At 0mA sink current
Source current	0	—	10	mA	
Sink current	0	—	10	mA	
UART RX pin (UART RX: Pin4)					
High level input voltage range	2.31	3.3	5.5	V	
Low level input voltage range	-0.1	0	0.99	V	

Table 4 Electrical Characteristics 3

Items	Specs			Unit	Remarks
	Min	Typ	Max		
RF Circuit Specifications					
Transmission Frequency					
NJR4267F2A1	24.15	—	24.25	GHz	
NJR4267F3B1	24.075	—	24.175	GHz	
Output Power (Antenna Input Power)	2.2	4.4	6.6	mW	Common to all antenna types
E.I.R.P. (reference value)					
NJR4267F2A1	7.75	10.13	12.51	dBm	
NJR4267F3B1	10.25	12.63	15.01	dBm	
Second harmonic level	—	—	-30	dBm	
Antenna Characteristics					
NJR4267F2A1					
H-plane half width	—	80	—	deg.	
V plane half width	—	110	—	deg.	
Antenna gain	—	4.32	—	dBi	
NJR4267F3B1					
H-plane half width	—	84	—	deg.	
V plane half width	—	66	—	deg.	
Antenna gain	—	6.82	—	dBi	

＊Above Specifications are subject to change without notice.

Table 5 Transmission channel list

Channel	NJR4267F2A1 transmission frequency [GHz]	NJR4267F3B1 transmission frequency [GHz]
CH0	24.164	24.089
CH1	24.172	24.097
CH2	24.180	24.105
CH3	24.188	24.113
CH4	24.196	24.121
CH5	24.204	24.129
CH6	24.212	24.137
CH7	24.220	24.145
CH8	24.228	24.153
CH9	24.236	24.161

RF Timing Diagram

The timing diagram of RF transmission and reception during intermittent operation is shown below.
Ftx stands for intermittent rate. The intermittent rate is automatically determined from the sampling rate. When intermittent operation is disabled (CW operation), intermittent operation is not performed, so RF transmission/reception is always performed.

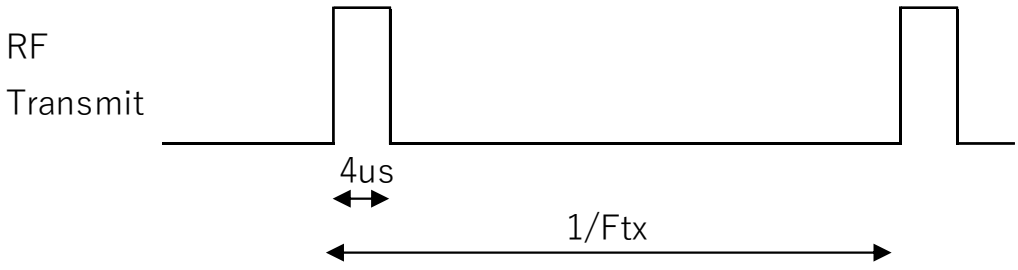

Fig.2 RF timing diagram

2. Environmental Specifications

Table 6 Environmental Performance

Item	Specification
Operating temperature	-30 ～ +85°C
Storage temperature	-40 ～ +85°C
Humidity	0 ～ 95%RH @+30°C
Vibration	49.03m/s^2 (5G) Conditions: 30-50Hz, 10 minutes, XYZ axis
Shock	196.13m/s^2 (20G) Half sine, 11 msec, XYZ direction, 3 times

＊Above Specifications are subject to change without notice.

3. Drawing

3.1. Outline

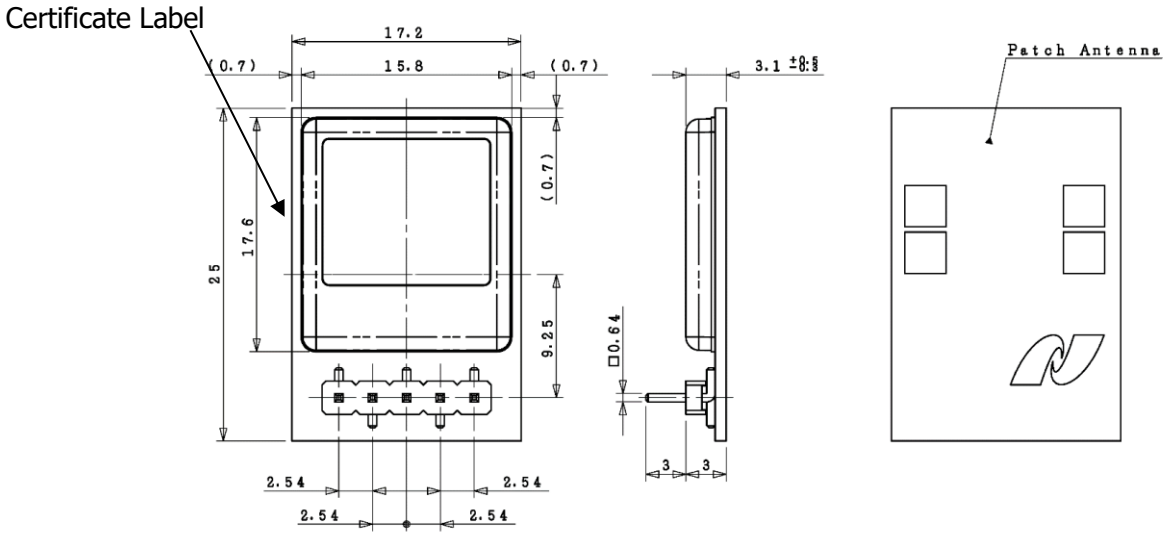

Fig. 3 NJR4267F2A1 Outline drawing

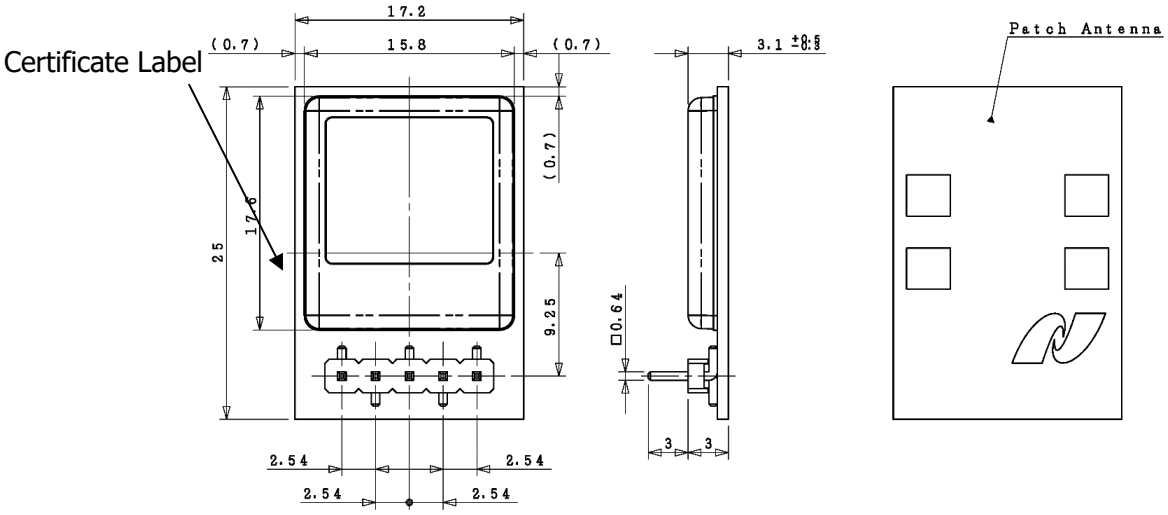

Fig. 4 NJR4267F3B1 Outline drawing

∗Above Specifications are subject to change without notice.

3.2. Interface

Connector: 2.54mm pitch pinheader

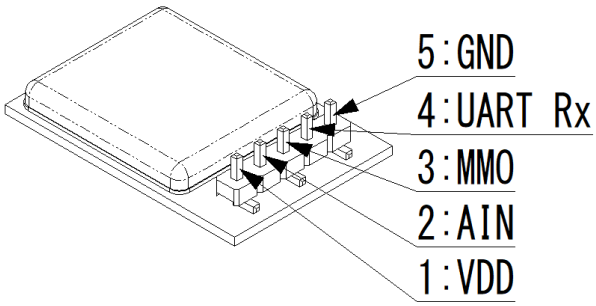

Fig. 5 Pinout Diagram

Table 7 Pinout

#	NAME	I/O	FUNCTION
1	VDD	—	Power supply
2	AIN	I	Analog input sensitivity setting
3	MMO	O	Multimode output
4	UART RX	I	UART reception (5V tolerant)
5	GND	—	GND

3.3. Label Drawing

NJR4267F2A1

NJR4267F3B1

＊Above Specifications are subject to change without notice.