K-Band
Doppler Sensor Module

RF Frequency: 24.05 to 24.25 GHz

Model No. NJR4266 series

Frequency Line-up:	J: 24.05 to 24.25 GHz / JAPAN
	F2: 24.15 to 24.25 GHz / EU
	F3: 24.075 to 24.175 GHz / US
Antenna Type:	A: TX/RX 1x1 (80°/120°, 7m)
	B: TX/RX 2x1 (80°/50°, 10m)
	C: TX/RX 4x1 (80°/28°, 14m)
	D: TX/RX 2x2 (52°/60°, 13m)
Interface Type:	1: UART
	2: Digital Output / Analog Range Setting

Specifications
Rev.01e   July 19, 2017

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New Japan Radio Co., Ltd.
Microwave Division

24GHz Microwave Intelligent Motion Sensor
for Short Distance, Low Speed Applications
with Low-profile and Low-power-consumption

NJR4266 is intelligent human motion sensor module that can detect objects moving at low speed like a pedestrian in a short distance range (7 to 14 m) by itself and it incorporates a 24 GHz band microwave circuit, antenna, signal processing circuit, and also MCU in a 17.2 x 27.3 x 5.1 mm low profile package. Signal processing of original technology greatly reduces false detection due to environmental noise, achieves stable detection results, and identifies directions of approach and separation.   And also it has a function to reduce power consumption by sensitivity setting.

It has multiple antenna types so that users can select the optimum detection angle according to the application, and has UART and standalone (digital output / analog range setting) as interface type. It is possible to use in a wide range of applications form these lineups

Features:

- Motion sensor using the 24GHz Microwave Doppler
- Antenna, Microwave RF circuit, IF amp, MCU and voltage regulator are integrated in a low-profile package (17.2 x 27.3 x 5.1 mm)
- Low-power-consumption
  <u>Minimum 1.9 mA @ 3.3 V power supply</u>
- Sleep mode for reducing power when unnecessary
- Signal processing software for the steady sensing
  - Enhancing the signal from movement object and decreasing random noises
  - Decreasing the mutual interference between sensors
  - Identification of direction for movement object (approaching and leaving).
- Interface selectable from UART and digital output / analog sensitivity setting
- Selectable from 4 types of antenna types *Note1
  - 1 x 1 type (Angle: 80° / 120°, Distance: 7 m)
  - 2 x 1 type (Angle: 80° / 50°, Distance: 10 m)
  - 4 x 1 type (Angle: 80° / 28°, Distance: 14 m)
  - 2 x 2 type (Angle: 52° / 60°, Distance: 13 m)

  *Note1) As 1x1 type, 4x1 type and 2x2 type are being developed, design values are listed for detection angle and detection distance.
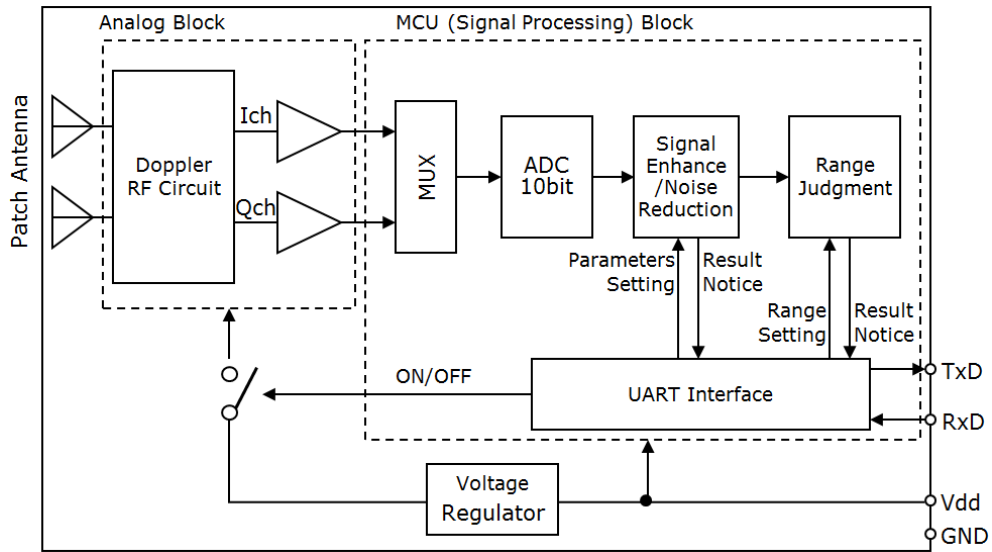
Applications:

- Various equipment control by human sensing
  - Lighting equipment
  - Safety and security sensor
  - Housing electric equipment
  - Energy saving management
  - Entrance and exit management
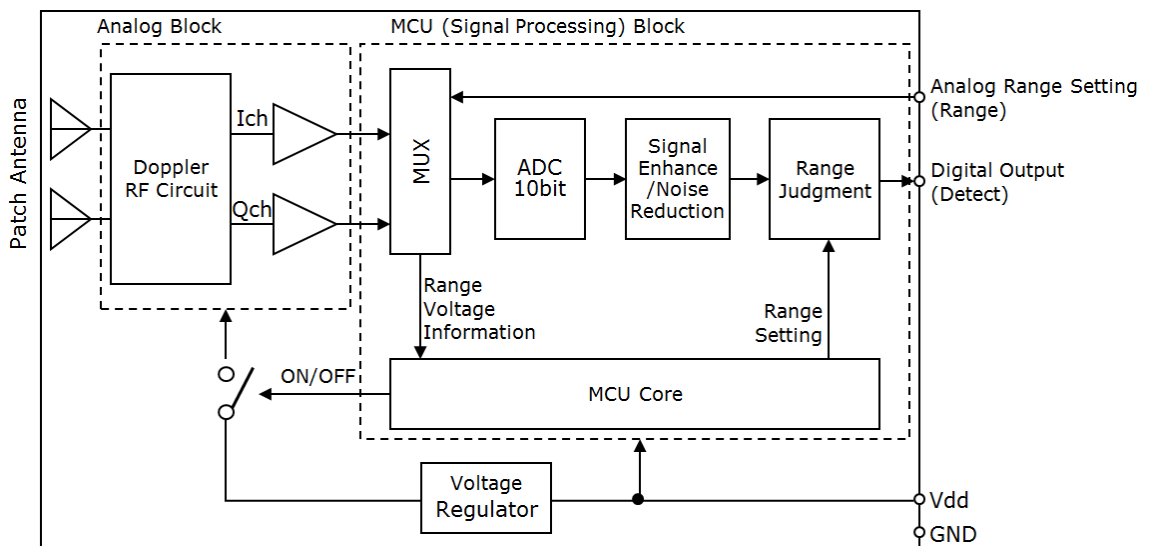 - Hobby / robot
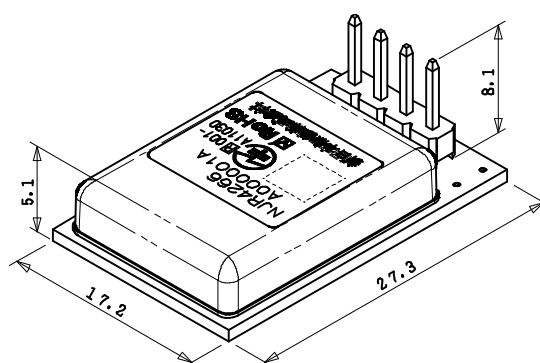
Functional Brock diagram:

● Type of UART

● Type of Digital Output / Analog Range Setting

NJR4266 series

Products Line-up:

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N J R 4 2 6 6 J A 1
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Interface Type:
1: UART
2: Digital Output / Analog Range Setting

Antenna Type: *note1
A: 1x1 Type (Detection Angle: 80°/120°, Detection Distance: 7m)
B: 2x1 Type (Detection Angle: 80°/50°, Detection Distance: 10m)
C: 4x1 Type (Detection Angle: 80°/28°, Detection Distance: 14m)
D: 2x2 Type (Detection Angle: 52°/60°, Detection Distance: 13m)

RF Frequency: *note2
J: 24.05 to 24.25 GHz / Japan
F2: 24.15 to 24.25 GHz / All of EU resions
F3: 24.075 to 24.175 GHz / United States

Product Series Number

Model Number List:

Model No.	RF Frequency	Antenna Type	Interface Type	Region / Regurations
NJR4266JA1	24.05 to 24.25 GHz (J type)	1x1 type *note1 (Angle: 80°/120°, Distance: 7m)	UART	JAPAN / MIC Technical Conformity ARIB STD-T73
NJR4266JA2			Digital Output / Analog Range Setting	
NJR4266JB1		2x1 type (Angle: 80°/50°, Distance: 10m)	UART	
NJR4266JB2			Digital Output / Analog Range Setting	
NJR4266JC1		4x1 type *note1 (Angle: 80°/28°, Distance: 14m)	UART	
NJR4266JC2			Digital Output / Analog Range Setting	
NJR4266JD1		2x2 type *note1 (Angle: 52°/60°, Distance: 13m)	UART	
NJR4266JD2			Digital Output / Analog Range Setting	
NJR4266F2A1	24.15 to 24.25 GHz (F2 type) *note2	1x1 type *note1 (Angle: 80°/120°, Distance: 7m)	UART	All of EU regions / Radio Equipment Directive (RED) 2014/53/EU (CE Marking)
NJR4266F2A2			Digital Output / Analog Range Setting	
NJR4266F2B1		2x1 type (Angle: 80°/50°, Distance: 10m)	UART	
NJR4266F2B2			Digital Output / Analog Range Setting	
NJR4266F2C1		4x1 type *note1 (Angle: 80°/28°, Distance: 14m)	UART	
NJR4266F2C2			Digital Output / Analog Range Setting	
NJR4266F2D1		2x2 type *note1 (Angle: 52°/60°, Distance: 13m)	UART	
NJR4266F2D2			Digital Output / Analog Range Setting	
NJR4266F3A1	24.075 to 24.175 GHz (F3 type) *note2	1x1 type *note1 (Angle: 80°/120°, Distance: 7m)	UART	US / FCC Part 15.245
NJR4266F3A2			Digital Output / Analog Range Setting	
NJR4266F3B1		2x1 type (Angle: 80°/50°, Distance: 10m)	UART	
NJR4266F3B2			Digital Output / Analog Range Setting	
NJR4266F3C1		4x1 type *note1 (Angle: 80°/28°, Distance: 14m)	UART	
NJR4266F3C2			Digital Output / Analog Range Setting	
NJR4266F3D1		2x2 type *note1 (Angle: 52°/60°, Distance: 13m)	UART	
NJR4266F3D2			Digital Output / Analog Range Setting	

*Note1) As 1x1 type, 4x1 type and 2x2 type are being developed, design values are listed for detection angle and detection distance.
*Note2) Contact NJRC for compliance status of RED and FCC for F2 type and F3 type.
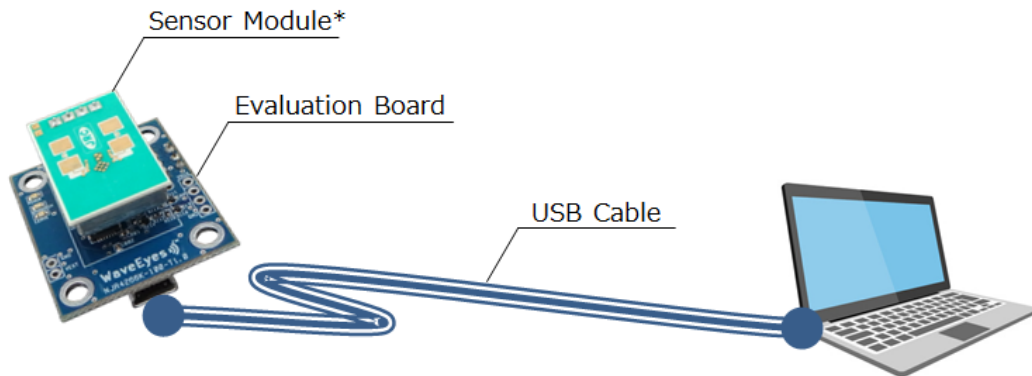
Evaluation Kit:

The evaluation kit is available for NJR4266 series. The contents of the evaluation kit are as follows.

- ➢ **Evaluation Kit P/N.: NJR4266K**
- ➢ **Contents**
    1. Evaluation Board (Functions are UART-to-USB convertor and analog threshold setting)
    2. GUI Software
    3. USB Cable

(*) The sensor module itself needs to be prepared separately.

1. Absolute Maximum Rating

ITEM	MIN.	TYP.	MAX.	UNITS	REMARKS
Supply Voltage	0	—	6.5	V	
Operating Temperature	-40	—	+85	°C	
Storage Temperature	-40	—	+85	°C	

2. Electrical Characteristics

Common measure condition Ta= +25 °C

ITEM	MIN.	TYP.	MAX.	UNITS	REMARKS
Power Supply					
Operating Voltage	3.0	3.3/5.0	5.25	V	
Operating Current (* depends on interface type)					
1) Type of UART					
i) Detection mode					
● CW mode	—	50	60	mA	
● Peak current of intermittent mode					
● Average current of intermittent mode (@ Vdd = 3.3 V)					
Intermittent of 1 kHz	—	1.9	2.3	mA	Intermittent Operation Condition: 1 ms cycle, 11 us ON
Intermittent of 2 kHz	—	2.5	3.2	mA	Intermittent Operation Condition: 500 us cycle, 11 us ON
Intermittent of 3 kHz	—	3.0	3.8	mA	Intermittent Operation Condition: 333 us cycle, 11 us ON
Intermittent of 7 kHz	—	5.0	6.2	mA	Intermittent Operation Condition: 143 us cycle, 11 us ON
● Average current of intermittent mode (@ Vdd = 5 V)					
Intermittent of 1 kHz	—	10.9	11.3	mA	Intermittent Operation Condition: 1 ms cycle, 11 us ON
Intermittent of 2 kHz	—	11.5	12.2	mA	Intermittent Operation Condition: 500 us cycle, 11 us ON
Intermittent of 3 kHz	—	12.0	12.8	mA	Intermittent Operation Condition: 333 us cycle, 11 us ON
Intermittent of 7 kHz	—	14.0	15.2	mA	Intermittent Operation Condition: 143 us cycle, 11 us ON
ii) Initialization mode					
● Peak Current	—	50	60	mA	
● Average Current (@ Vdd = 3.3 V)	—	1.9	2.3	mA	
● Average Current (@ Vdd = 5 V)	—	10.9	11.3	mA	
iii) Sleep mode					
● Operating Current (@ Vdd = 3.3 V)	—	—	1.0	mA	
● Operating Current (@ Vdd = 5 V)	—	—	10	mA	
2) Type of Digital Output / Analog Range Setting					
● Peak Current	—	50	60	mA	
● Average Current	1.9 to 60			mA	Depends on analog range setting and Vdd. Refer to figure 1.

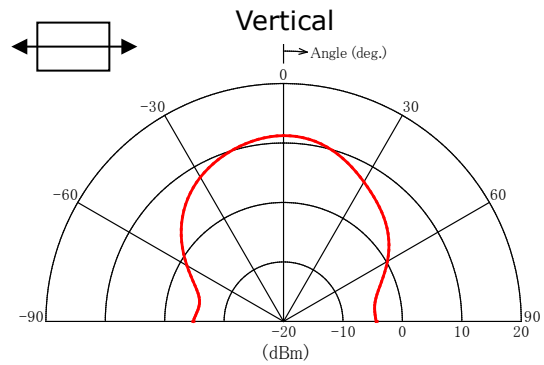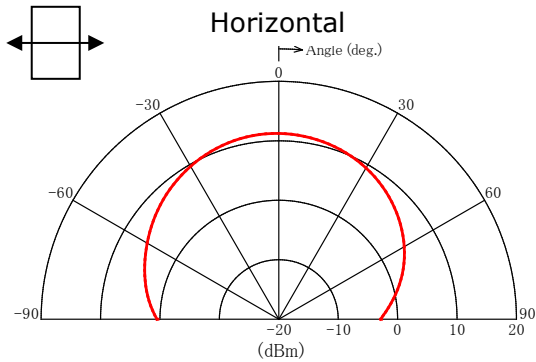| ITEM	MIN.	TYP.	MAX.	UNITS	REMARKS
Sensor RF					
Conformity Standard	● MIC Technical Conformity (Japan): ARIB STD-T73 ● EU Regulation: Radio Equipment Directive 2014/53/EU *note1 ● FCC Regulation: Part 15.245 *note1				
Operating Frequency					
J1 type	24.05	—	24.25	GHz	Technical Conformity
F2 type	24.15	—	24.25	GHz	EU Regulation *note1
F3 type	24.075	—	24.175	GHz	FCC Regulation *note1
Frequency Stability (Temp.)	—	+/-0.2	—	MHz/°C	Ta = -20 to +60 °C
Output Power	1.55	3.10	4.65	mW	
E.I.R.P. (Reference)					
1 x 1 antenna type	6	9	11	dBm	* Design value
2 x 1 antenna type	8	11	13	dBm	
4 x 1 antenna type	11	14	16	dBm	* Design value
2 x 2 antenna type	10.5	13.5	15.5	dBm	* Design value
2nd Harmonics (E.I.R.P.)	—	—	-30	dBm	
Antenna					
1 x 1 antenna type * Design value					
-3dB beam width / Horizontal	—	80	—	deg.	
-3dB beam width / Vertical	—	120	—	deg.	
Side-lobe suppression / Horizontal	—	—	—	dB	No Side lobe
Side-lobe suppression / Vertical	—	—	—	dB	No Side lobe
2 x 1 antenna type					
-3dB beam width / Horizontal	—	80	—	deg.	
-3dB beam width / Vertical	—	50	—	deg.	
Side-lobe suppression / Horizontal	—	—	—	dB	No Side lobe
Side-lobe suppression / Vertical	—	—	—	dB	No Side lobe
4 x 1 antenna type * Design value					
-3dB beam width / Horizontal	—	80	—	deg.	
-3dB beam width / Vertical	—	28	—	deg.	
Side-lobe suppression / Horizontal	—	—	—	dB	No Side lobe
Side-lobe suppression / Vertical	—	13	—	dB	
2 x 2 antenna type * Design value					
-3dB beam width / Horizontal	—	52	—	deg.	
-3dB beam width / Vertical	—	60	—	deg.	
Side-lobe suppression / Horizontal	—	—	—	dB	No Side lobe
Side-lobe suppression / Vertical	—	—	—	dB	No Side lobe

*Note1) Contact NJRC for compliance status of RED and FCC for F2 type and F3 type.
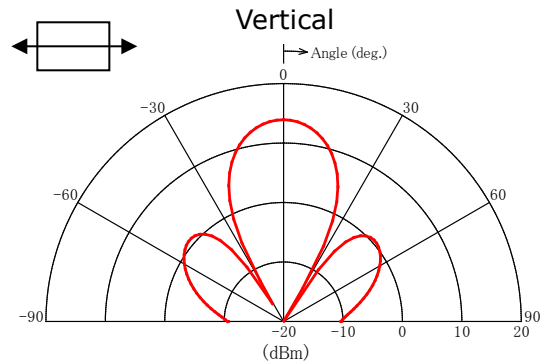
Typical Radiation Pattern *Design value

1 x 1 antenna type
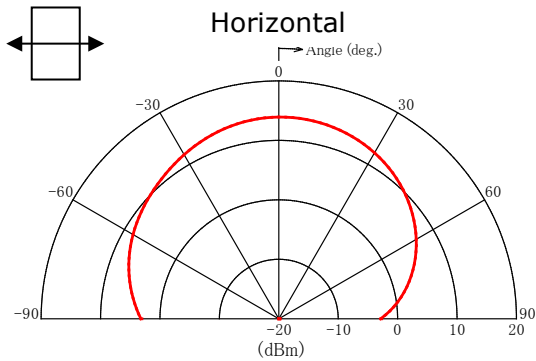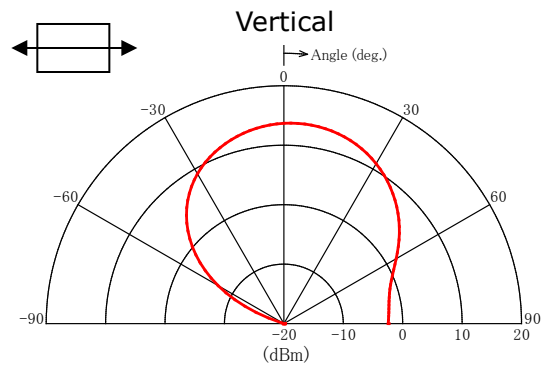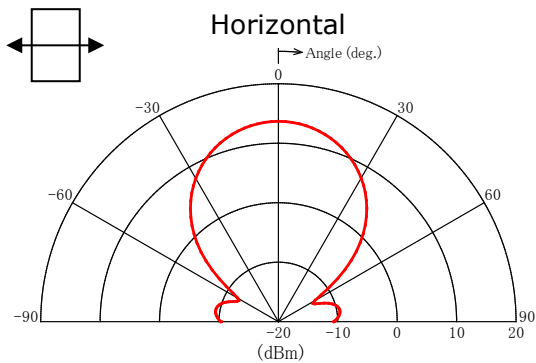
Horizontal

Vertical

2 x 1 antenna type

Horizontal

Vertical

4 x 1 antenna type

Horizontal

Vertical

2 x 2 antenna type

Horizontal

Vertical
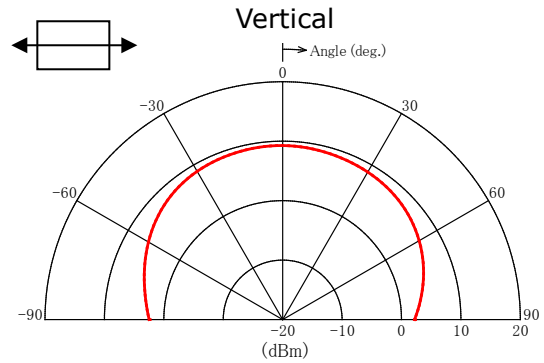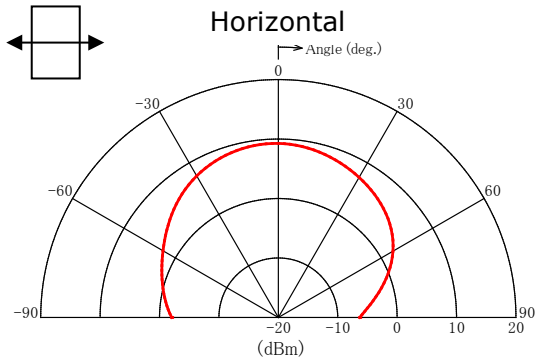
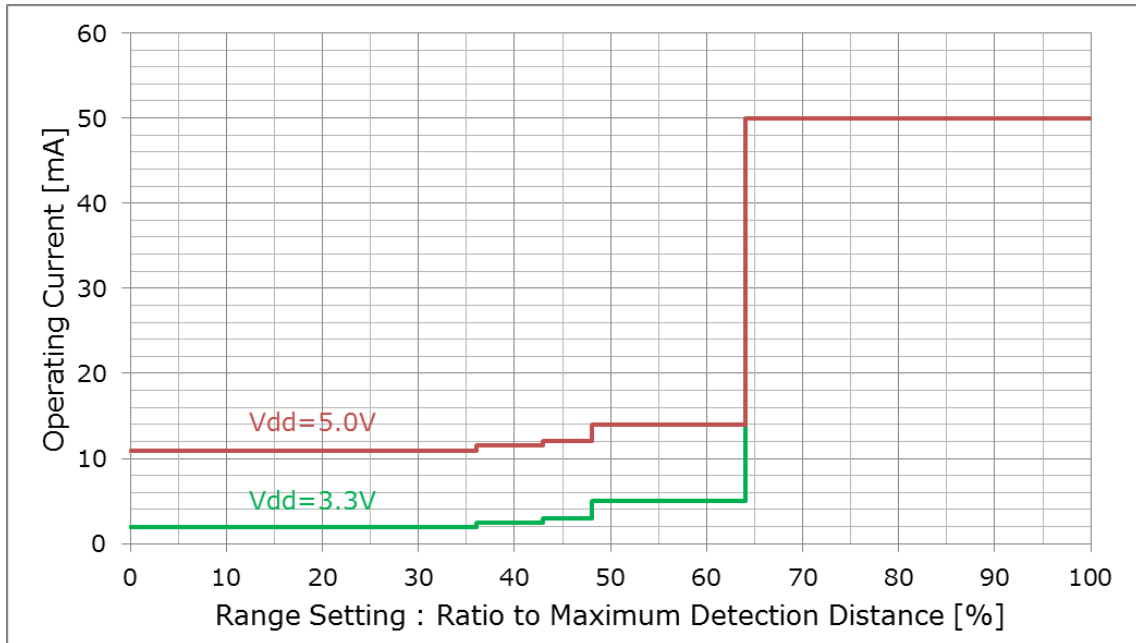Correlation between Analog Range Setting and Operating Current

Fig. 1   Operating current relative to analog range setting

3. Environmental Characteristics

ITEM	SPECIFICATION
Operation Temperature	-20 to +60 °C
Storage Temperature	-40 to +80 °C
Humidity	0 to 95 % @+30 °C
Vibration	49.03 m/s^2 (5 G), 30 to 50 Hz, 10 minutes, XYZ direction
Shock	196.13 m/s^2 (20 G), Half sine, 11 msec, XYZ direction, 3 times

4. Sensing Specifications

4.1. Sensing Performance *note1

Common measure condition Ta= +25 °C

ITEM	PERFORMANCE	UNITS	REMARKS
Speed Range of Target	0.25 to 1.0	m/sec.	
Maximum Detection Distance			
1 x 1 antenna type	7	m	* Design value
2 x 1 antenna type	10	m	
4 x 1 antenna type	14	m	* Design value
2 x 2 antenna type	13	m	* Design value

*Note1) This is not the specification to guarantee the performance of this product. As for the specification of the product, the electric characteristic standard is applied. Sensing performance shown here is an example of the result of being likely to obtain it when this product is used on the following conditions. Actual sensing performance would be greatly different in each environment used.   Please do enough confirmation in the environment actually used.

Definition of Sensing Performance
* Speed Range of Target: The range of the speed that the detection distance become 70 % of the detection distance of 0.5 m/s
* Maximum Detection Distance: Detectable distance that can be detected in front of sensor when a threshold value set to [999] or when VDD is added to a threshold setting terminal

Measurement condition of detection performance
* Temperature: Ta = +25 °C
* Target of Measurement: An adult of 170 cm / 70 kg approaching at the rate of 0.5 m/s from the front of sensor
(Refer to figure 2 and fig.3)
* Installation of the Sensor: The sensor is installed as the antennas horizontal horizontally in a height of 1 m from the ground.
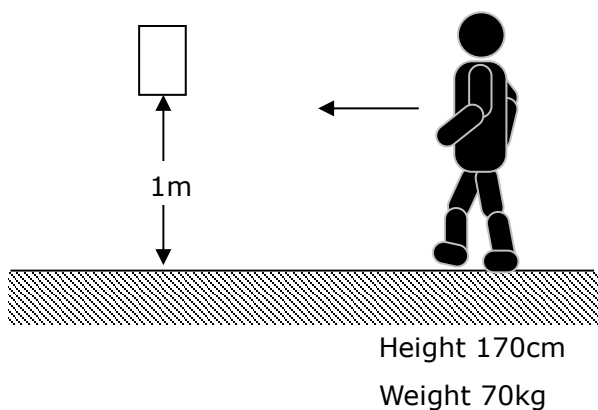(Refer to figure 2 and fig.3)

1m

Height 170cm

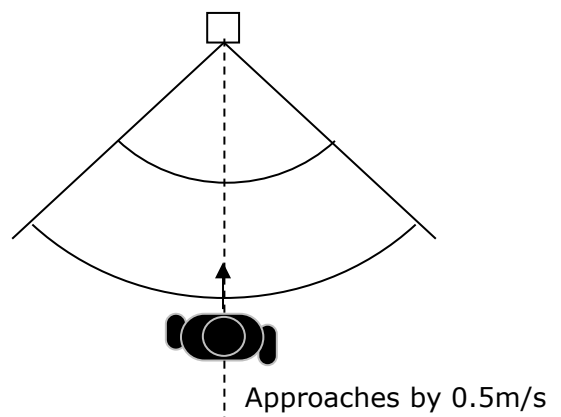Weight 70kg
Fig. 2   Side View

Approaches by 0.5m/s
Fig.3   Top View

4.2. Range Setting and Intermittent Operation Condition

Intermittent operation condition depends on range setting of detection distance.

4.2.1. Type of UART

The range setting can be changed by the command of UART and it is set with the ratio (%) to the maximum detection distance.

RANGE SETTING: R_{Ratio} *note1	INTERMITTENT OPERATION CONDITION *note2
$1 \le R_{Ratio} \le 36$	Intermittent operation of 1 kHz: 1 ms cycle, 11 us ON
$37 \le R_{Ratio} \le 43$	Intermittent operation of 2 kHz: 500 us cycle, 11 us ON
$44 \le R_{Ratio} \le 48$	Intermittent operation of 3 kHz: 333 us cycle, 11 us ON
$49 \le R_{Ratio} \le 64$	Intermittent operation of 7 kHz: 147 us cycle, 11 us ON
$65 \le R_{Ratio} \le 100$	CW operation

*Note1) The range setting is lager value of either the approaching and leaving setting.
*Note2) The intermittent condition is automatically set by the range setting. Nevertheless it can also be arbitrarily changed by the command.

4.2.2. Type of Digital Output / Analog Range Setting

The range setting can be changed by the analog voltage and it is set with the ratio (%) to the maximum detection distance. The detail of the analog voltage for the range setting is mentioned in item 4.3.

RANGE SETTING: R_{Ratio} (Vdd Ratio)	INTERMITTENT OPERATION CONDITION *note3
$1 \le R_{Ratio} \le 36$	Intermittent operation of 1 kHz: 1 ms cycle, 11 us ON
$36 < R_{Ratio} \le 43$	Intermittent operation of 2 kHz: 500 us cycle, 11 us ON
$43 < R_{Ratio} \le 48$	Intermittent operation of 3 kHz: 333 us cycle, 11 us ON
$48 < R_{Ratio} \le 64$	Intermittent operation of 7 kHz: 147 us cycle, 11 us ON
$64 < R_{Ratio} \le 100$	CW operation

*Note3) The intermittent condition is automatically set by the range setting.

4.3. Analog Voltage for Range Setting (for only Type of Digital Output / Analog Range Setting)

The range setting is defined by the following equation:

$$\frac{R_{Range}}{R_{max}} = \frac{V_{Range}}{V_{dd}}\left(\frac{5.25}{V_{dd}}\right)^{(2/3)}$$

R$_{Range}$: Setting of detection distance
　　　　 *note1

R$_{max}$: Maximum detection distance

V$_{Range}$: Voltage of analog range setting

V$_{dd}$: Voltege of power supply

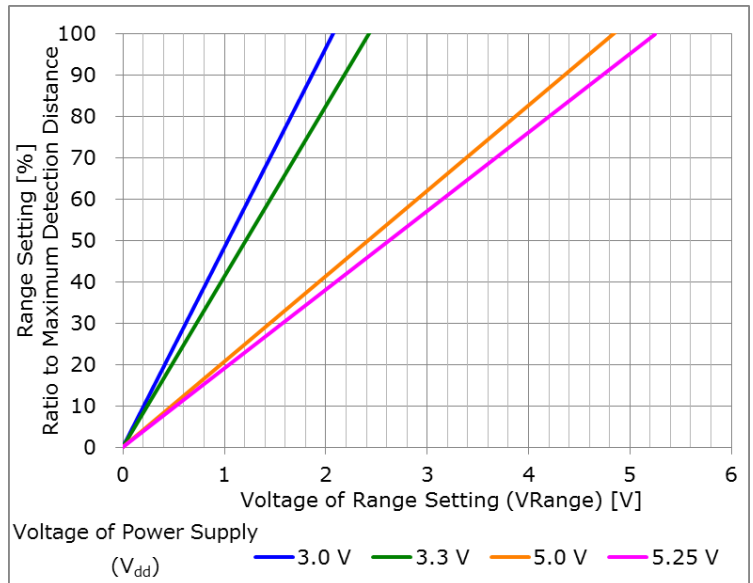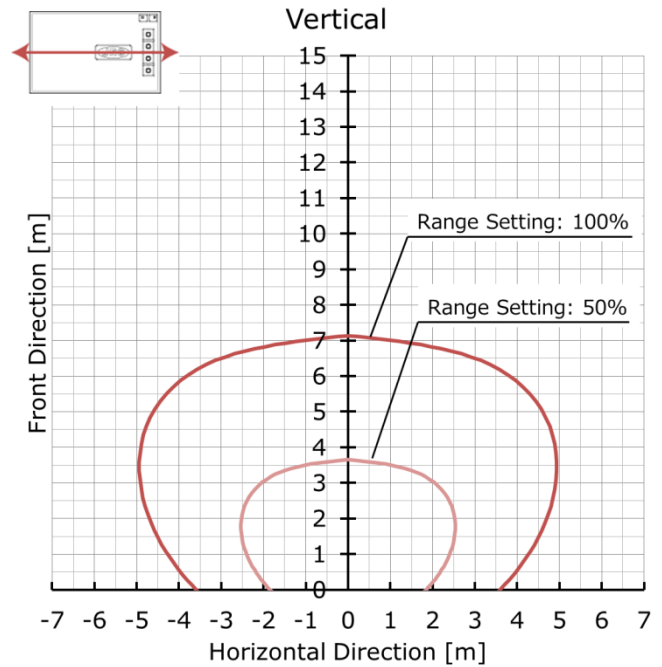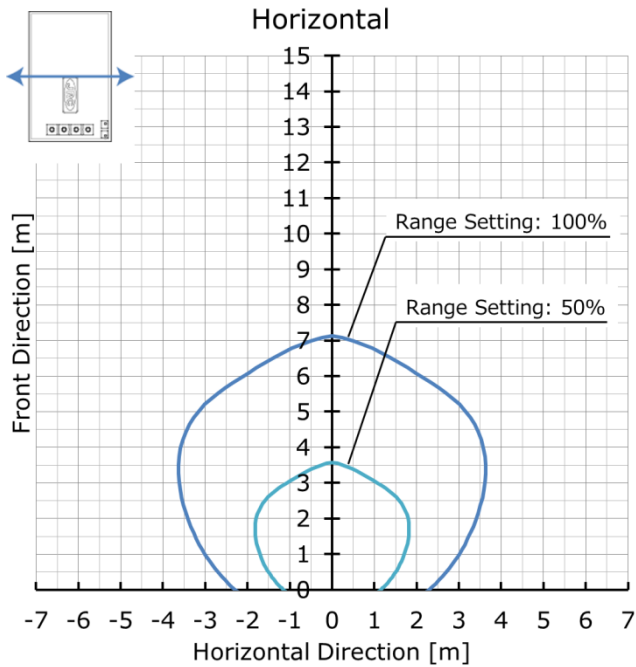The range setting against V$_{dd}$ and V$_{Range}$ is shown in figure 4.

Fig. 4　Ratio of Range Setting against Voltage

*Note1) Detection distance assumes the case that an adult of 170 cm / 70 kg approaches at the rate of 0.5 m/s from the front.

NJR4266 series

4.4. Detection Area

1 x 1 antenna type

Horizontal

Range Setting: 100%
Range Setting: 50%

Vertical

Range Setting: 100%
Range Setting: 50%

2 x 1 antenna type

Horizontal

Range Setting: 100%
Range Setting: 50%

Vertical

Range Setting: 100%
Range Setting: 50%

NJR4266 series

4 x 1 antenna type

Horizontal

Vertical

2 x 2 antenna type

Horizontal

Vertical
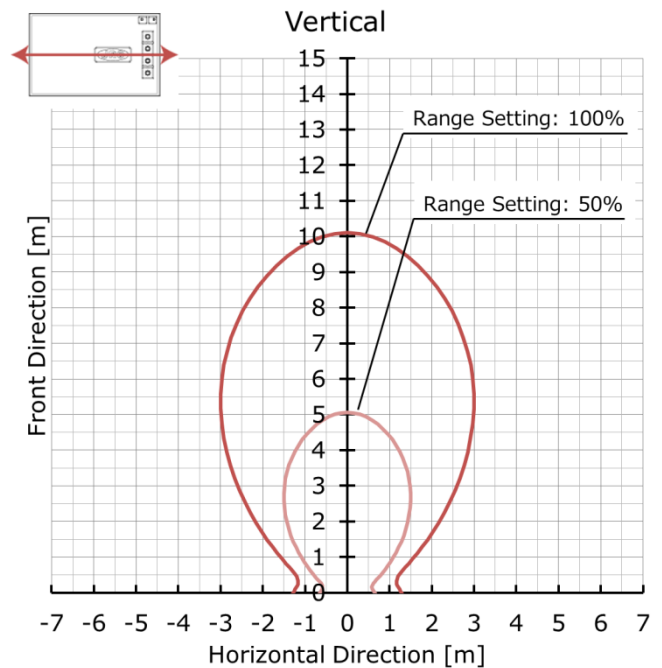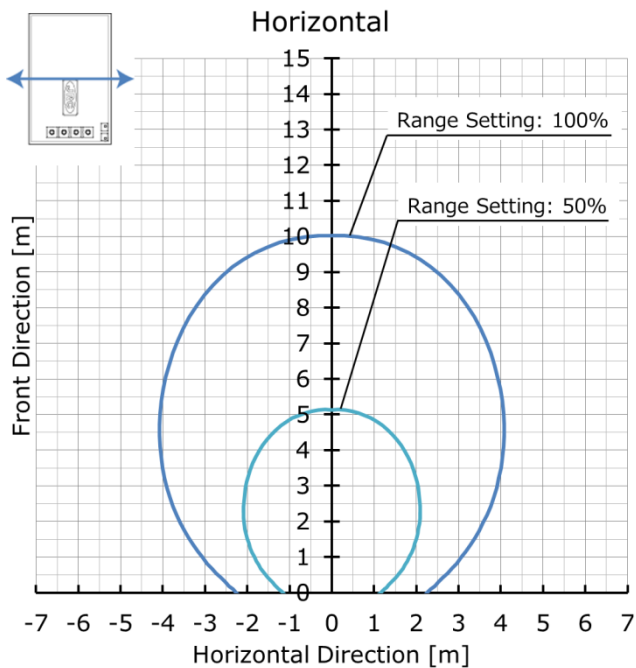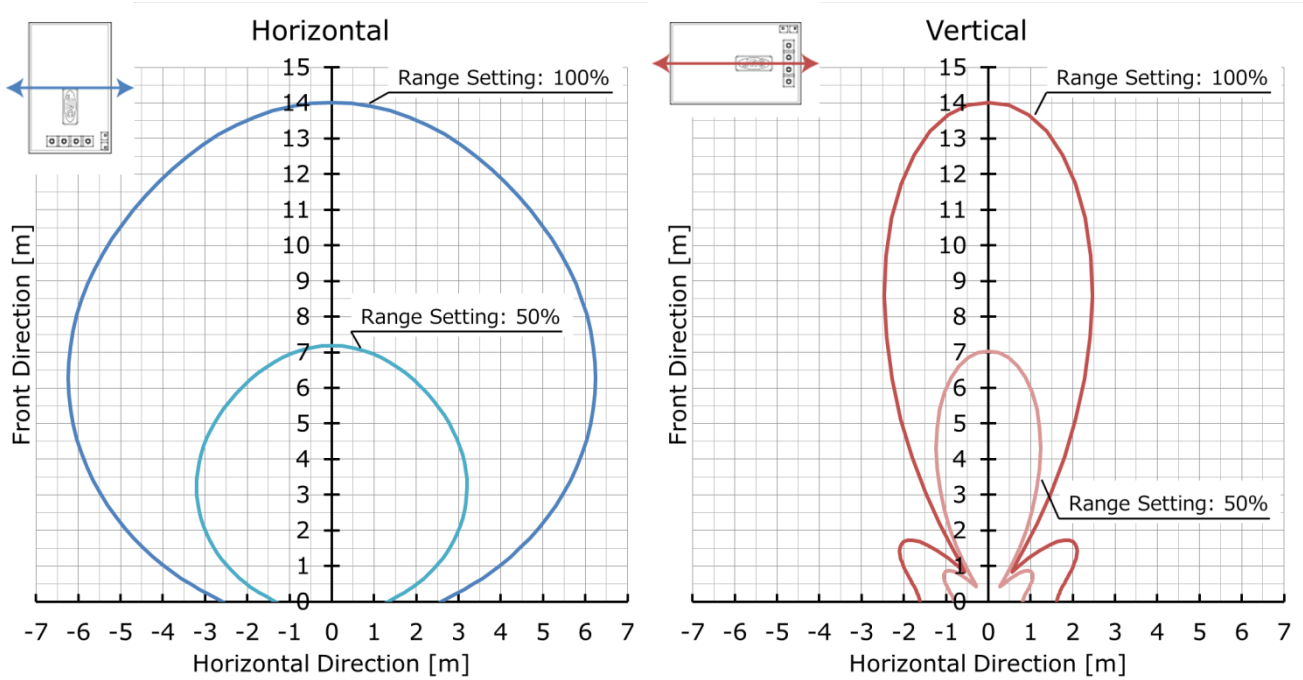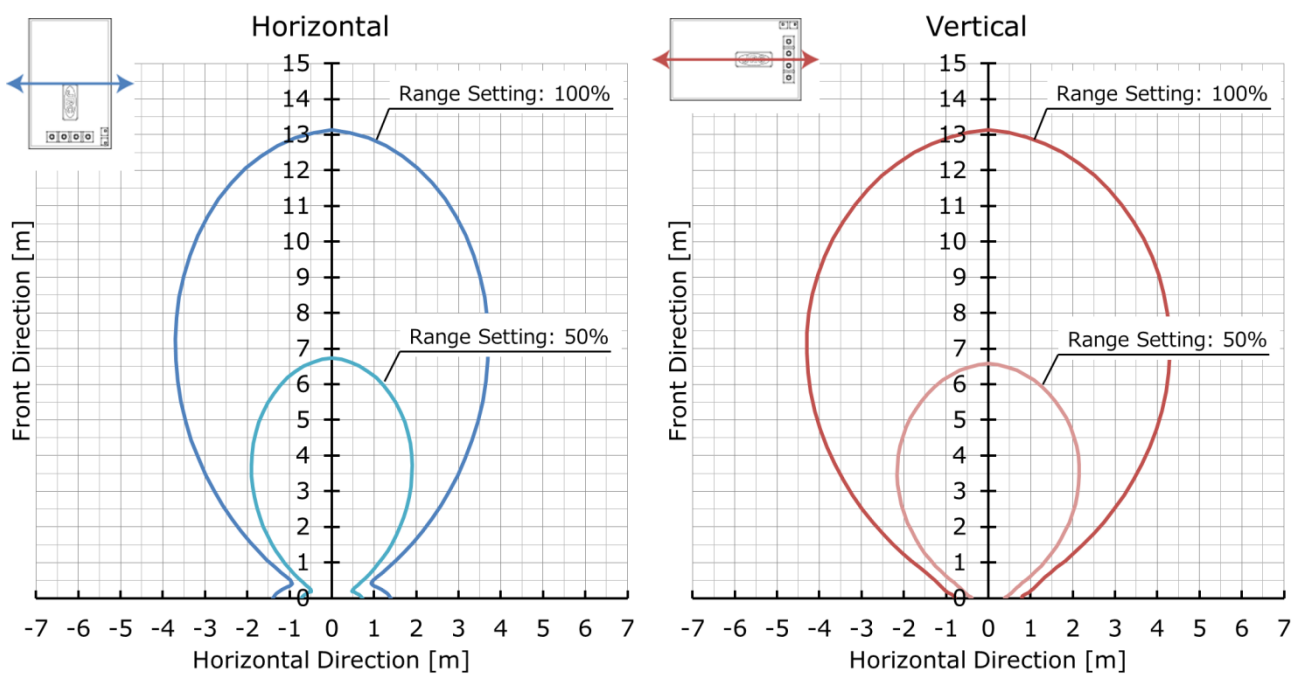
5. Signal Processing of Environmental Noise Reduction

This product is embedding software for the steady sensing of moving object. It is enhance the signal from movement object of pedestrian etc. and is reduce random noise and sudden signal which caused an incorrect detection by using the signal from IQ mixer, namely **Environmental Noise Reduction**.

The following effects are expectable. *note1

- Reduction of false detection by random movement such as the shakes of plant by wind or the noise of rain etc.
- Reduction of the false detection by sudden movement such as the insect etc. which cross just before a sensor
- Steady detection of movement objects such as pedestrian under the environment where the above-mentioned noise exists.
- Reduction of the mutual interference of sensors
- Identification of direction of movement (approach and leaving)

*Note1) This signal processing function assumes the following noises are reduced, and pedestrian's movement is emphasized. However, it is likely to become a counter productivity for a signal outside assumption.

6. Interface

6.1. Type of UART

6.1.1. Pin Assignment
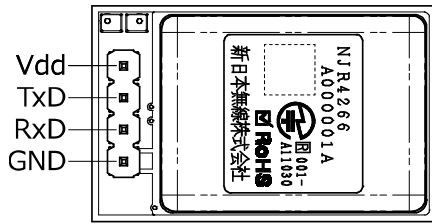
Pin diagram (Bottom View)

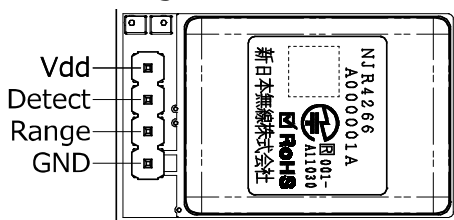| #	NAME	I/O	DESCRIPTION
1	Vdd	I	Power Supply: 3.0 to 5.25 V
2	TxD	O	UART TxD
3	RxD	I	UART RxD
4	GND	—	GND Pin

Connector: Pin-header of 2.54mm pitch

6.1.2. UART Communication Interface

NJR4266 is able to control of sensor mode, set of threshold level, acquisition of detection result and acquisition of various information of sensor states from PC or MCU, etc. by using UART Interface.

ITEM	FORMAT	UNITS	REMARKS
Signal Level	CMOS	—	Equivalent to Vdd Voltage
Communication Parameters			
Baud Rates	115200	bps	
Data Bits	8	bits	
Stop Bits	1	bits	
Parity	odd	—	
Handshake	no	—	
Byte Order	LSB	—	

6.2. Type of Digital Output / Analog Range Setting

6.2.1. Pin Assignment

Pin diagram (Bottom View)

#	NAME	I/O	DESCRIPTION
1	Vdd	I	Power Supply: 3.0 to 5.25 V
2	Detect	O	Digital output of CMOS level for either approaching and leaving detection Output is changed to H level when the movements of approaching or leaving is detected. H: Detect / L: No detect Output current < 14 mA max.
3	Range	I	Analog range setting Refer to Item 4.3.
4	GND	—	GND Pin

Connector: Pin-header of 2.54mm pitch

7. Operational mode

7.1. Type of UART

| MODE	DESCRIPTION
Power ON / Reset *note1	CPU Reset.
Initialization Mode	Initialize and wait until sensor is stabilized. (approx. 1 second)
Detection Mode	Detection command is sent when following changes arise in the state of the sensor detection. 1. Detect approaching object 2. Detect leaving object 3. State change from detection to no-detection Please perform the range setting of approaching / leaving and voltage of power supply by UART command. There are four modes in this mode: • Automatic Intermittent Setting Mode • Selectable Intermittent Setting Mode • CW Mode • Intermittent Mode
Automatic Intermittent Setting Mode *note2	The appropriate intermittent operation condition is automatically set according to the range setting.
Selectable Intermittent Setting Mode *note2	User can set range setting, intermittent operation condition and sensitivity time independently by command. The false detection would occur depending on above setting.
CW Mode	Continuously operate the sensor RF part.
Intermittent Mode	Intermittently operate the sensor RF part to reduce the operating current.
Sleep Mode	Shutdown of all analog circuit for reducing the operating current. When returning to detection mode, approx. one second needs for stabilization of the sensor.
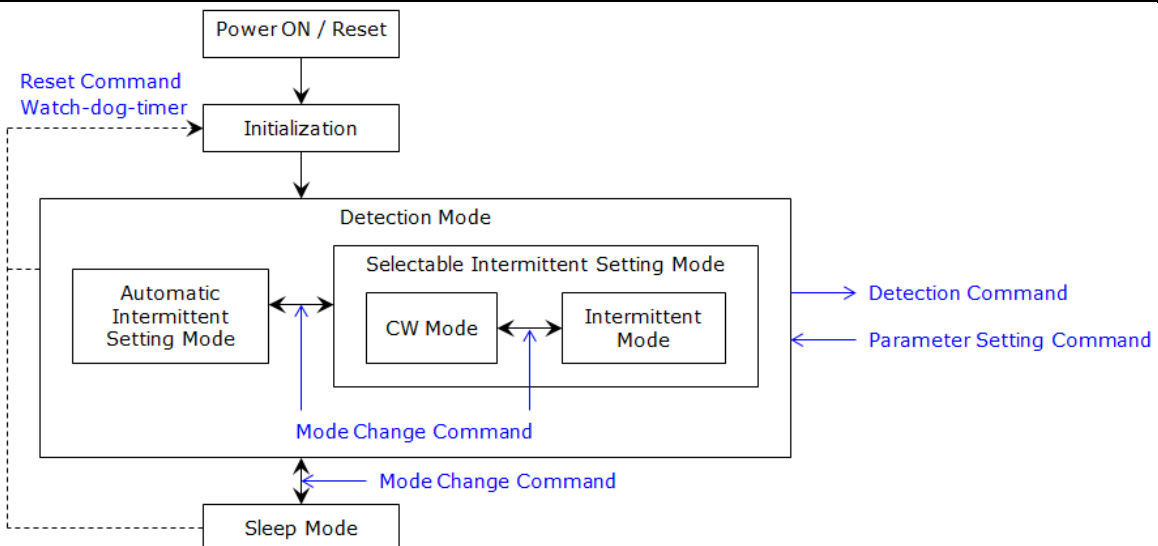
Fig.5   State Transition Diagram (Type of UART)

*Note1) When the watch dog timer overflows, it is reset from any mode.
*Note2) The operating current of the sensor is reduced by intermittent operation. The detection distance might decrease depending on intermittent operation conditions.

- After turning the power on and resetting, please set the following items. It can be set even in the initialization mode.
  1) Set the range setting and power supply voltage
     (Default: Range 30 / Power Supply Voltage 66)
  2) Set the detection mode form automatic and selectable intermittent setting mode
     (Default: Automatic Intermittent Setting Mode)
  3) Set the range setting, intermittent operation condition and sensitivity speed, When Selectable Intermittent Setting Mode

7.2. Type of Digital Output / Analog Range Setting

| MODE	DESCRIPTION
Power ON / Reset *note1	CPU Reset.
Initialization Mode	Initialize and wait until sensor is stabilized. (approx. 1 second)
Detection Mode	Based on the analog range setting, when the following changes occur, the voltage of the digital detect output is controlled. 1. Detect approaching object (Voltage: H) 2. Detect leaving object (Voltage: H) 3. State change from detection to no-detection (Voltage: L) The analog voltage of range setting is monitored in initialization mode and about every 1 second.
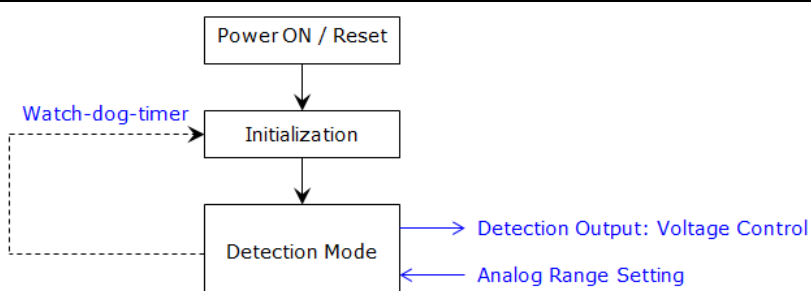
Fig.6   State Transition Diagram (Type of Digital Output / Analog Range Setting)

*Note1) When the watch dog timer overflows, it is reset from any mode.

8. Communication command (for only type of UART)

8.1. Communication Command List

Both Sensor-to-Host (S-to-H) and Host-to-Sensor (H-to-S) are a 2-byte (fixed length) binary code. The MSB of the 1st byte is always bit set.

ITEM	Host-to-Sensor 1st BYTE	Host-to-Sensor 2nd BYTE	Sensor-to-Host 1st BYTE	Sensor-to-Host 2nd BYTE	DESCRIPTIONS
Detection Status Notice & Command					
Approaching Detection	NA		1000 0000 (0x80)	0000 0001 (0x01)	Sent when state changes
Leaving Detection	NA		1000 0000 (0x80)	0000 0010 (0x02)	
No-detection	NA		1000 0000 (0x80)	0000 0000 (0x00)	
Inquiry	1000 0000 (0x80)	0000 0000 (0x00)	1000 0000 (0x80)	0000 0001 (0x01)	Approaching Detection
			1000 0000 (0x80)	0000 0010 (0x02)	Leaving Detection
			1000 0000 (0x80)	0000 0000 (0x00)	No-detection
Mode Change Command					
Detection Mode	1000 0001 (0x81)	0000 0000 (0x00)	NA		Default
Sleep Mode	1000 0001 (0x81)	0000 0001 (0x01)	NA		
Automatic Intermittent Setting Mode	1000 0001 (0x81)	0000 0100 (0x04)	NA		Default
Selectable Intermittent Setting Mode	1000 0001 (0x81)	0000 0101 (0x05)	NA		
CW Mode	1000 0001 (0x81)	0000 0010 (0x02)	NA		
Intermittent Mode	1000 0001 (0x81)	0000 0011 (0x03)	NA		Default
Mode Inquiry Command					
Detection / Sleep Mode	1000 0001 (0x81)	0001 0000 (0x10)	1000 0001 (0x81)	0000 0000 (0x00)	Detection Mode
			1000 0001 (0x81)	0000 0001 (0x01)	Sleep Mode
Automatic / Selectable Intermittent Setting Mode	1000 0001 (0x81)	0001 0010 (0x12)	1000 0001 (0x81)	0000 0100 (0x04)	Automatic Intermittent Setting Mode
			1000 0001 (0x81)	0000 0101 (0x05)	Selectable Intermittent Setting Mode
CW / Intermittent Mode	1000 0001 (0x81)	0001 0001 (0x11)	1000 0001 (0x81)	0000 0010 (0x02)	CW Mode
			1000 0001 (0x81)	0000 0011 (0x03)	Intermittent Mode

ITEM	Host-to-Sensor		Sensor-to-Host		DESCRIPTIONS
	1st BYTE	2nd BYTE	1st BYTE	2nd BYTE	
Range Setting & Inquiry Command					
Setting Approaching Range	1000 0010 (0x82)	0XXX XXXX (0xXX)	NA		XX: 0 to 100 Correspond to ratio of maximum detection distance (%) *note1 Default: 30
Inquiry Approaching Range	1000 0011 (0x83)	0000 0000 (0x00)	1000 0011 (0x83)	0XXX XXXX (0xXX)	
Setting Leaving Range	1000 0100 (0x84)	0XXX XXXX (0xXX)	NA		
Inquiry Leaving Range	1000 0101 (0x85)	0000 0000 (0x00)	1000 0101 (0x85)	0XXX XXXX (0xXX)	
Power Supply Voltage Setting & Inquiry Command					
Setting Power Supply Voltage	1000 1010 (0x8A)	0XXX XXXX (0xXX)	NA		XX: 60 to 105 Correspond to power supply voltage between 3.0 and 5.25 V *note2 Default: 66 (Equivalent to 3.3 V)
Inquiry Power Supply Voltage	1000 1011 (0x8B)	0000 0000 (0x00)	1000 1011 (0x8B)	0XXX XXXX (0xXX)	
Sensitivity Time Setting & Inquiry Command (for only Selectable Intermittent Setting Mode)					
Setting Approaching Sensitivity Time	1000 0110 (0x86)	00XX XXXX (0xXX)	NA		XX: 1 to 32 Correspond to sensitivity time between 128 and 4,096 ms. *note3 Default: 1
Inquiry Approaching Sensitivity Time	1000 0111 (0x87)	0000 0000 (0x00)	1000 0111 (0x87)	00XX XXXX (0xXX)	
Setting Leaving Sensitivity Time	1000 1000 (0x88)	00XX XXXX (0xXX)	NA		
Inquiry Leaving Sensitivity Time	1000 1001 (0x89)	0000 0000 (0x00)	1000 1001 (0x89)	00XX XXXX (0xXX)	
Intermittent Operation Condition Setting & Inquiry Command (for only Selectable Intermittent Setting Mode)					
Setting Intermittent Operation Condition	1000 1100 (0x8C)	0000 0XXX (0x0X)	NA		X: 1/2/3/7 Correspond to intermittent operation condition *note4 Default depends on condition when changing Selectable Intermittent Setting Mode
Inquiry Intermittent Operation Condition	1000 1101 (0x8D)	0000 0000 (0x00)	1000 1101 (0x8D)	0000 0XXX (0x0X)	
Reset & Error Command					
Reset	1111 1111 (0xFF)	0000 0000 (0x00)	NA		Equivalent to Power ON
UART Error	NA		1111 1111 (0xFF)	0000 ABCD (0xXX)	A bit is set when the following error. A: Syntax error B: Framing error C: Parity error D: Overrun error

*Note1) The ratio of maximum detection distance assumes the case that an adult of 170 cm / 70 kg approaches at the rate of 0.5 m/s from the front.

*Note2) Please set power supply voltage by command when using at power supply voltage other than 3.3 V.
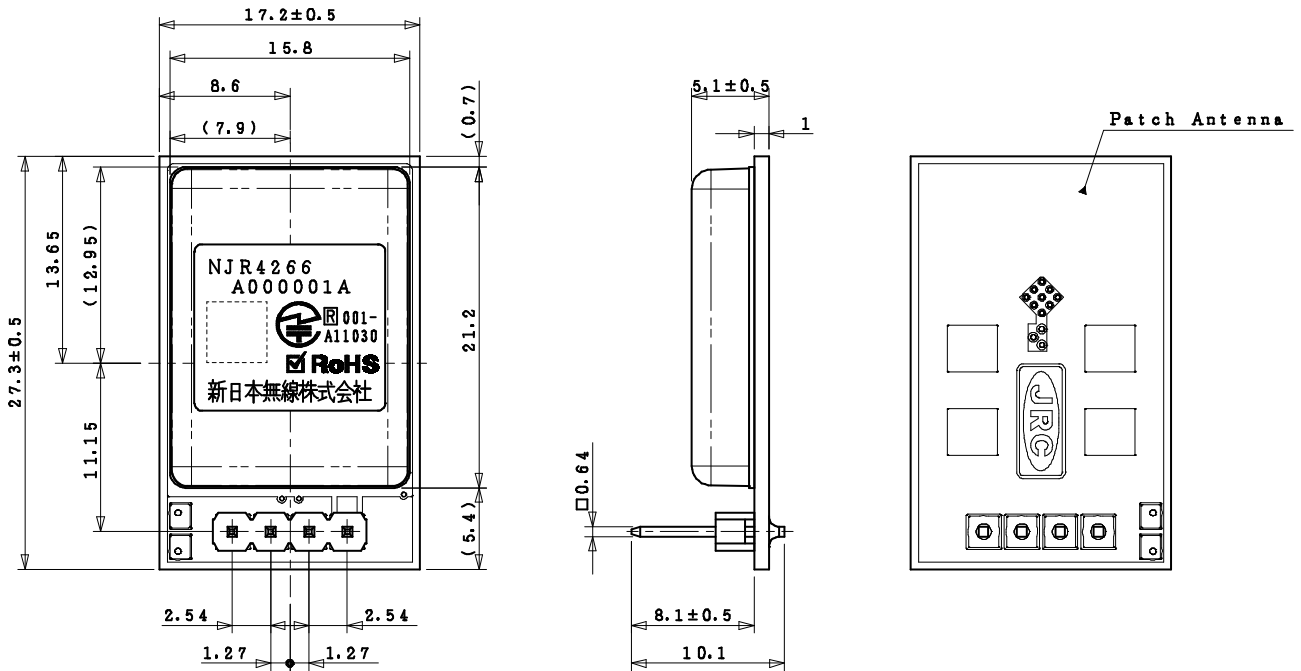
*Note3) The sensitivity time is the setting value of the time during which the signal level of the continuously exceeded the range setting by internal signal processing.

*Note4) The intermittent operation condition is in below.

    1: Intermittent operation of 1 kHz: 1 ms cycle, 11 us ON
    2: Intermittent operation of 2 kHz: 500 us cycle, 11 us ON
    3: Intermittent operation of 3 kHz: 333 us cycle, 11 us ON
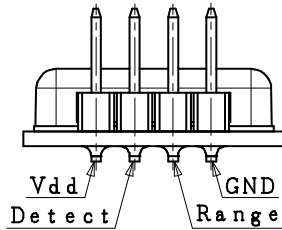   7: Intermittent operation of 7 kHz: 147 us cycle, 11 us ON

9. Drawing

9.1. Outline

● Type of UART

Vdd   GND
TxD   RxD

● Type of Digital Output / Analog Range Setting

Vdd   GND
Detect   Range
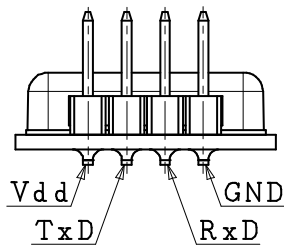
Unit: mm
Tolerance: +/-0.5

9.2. Label
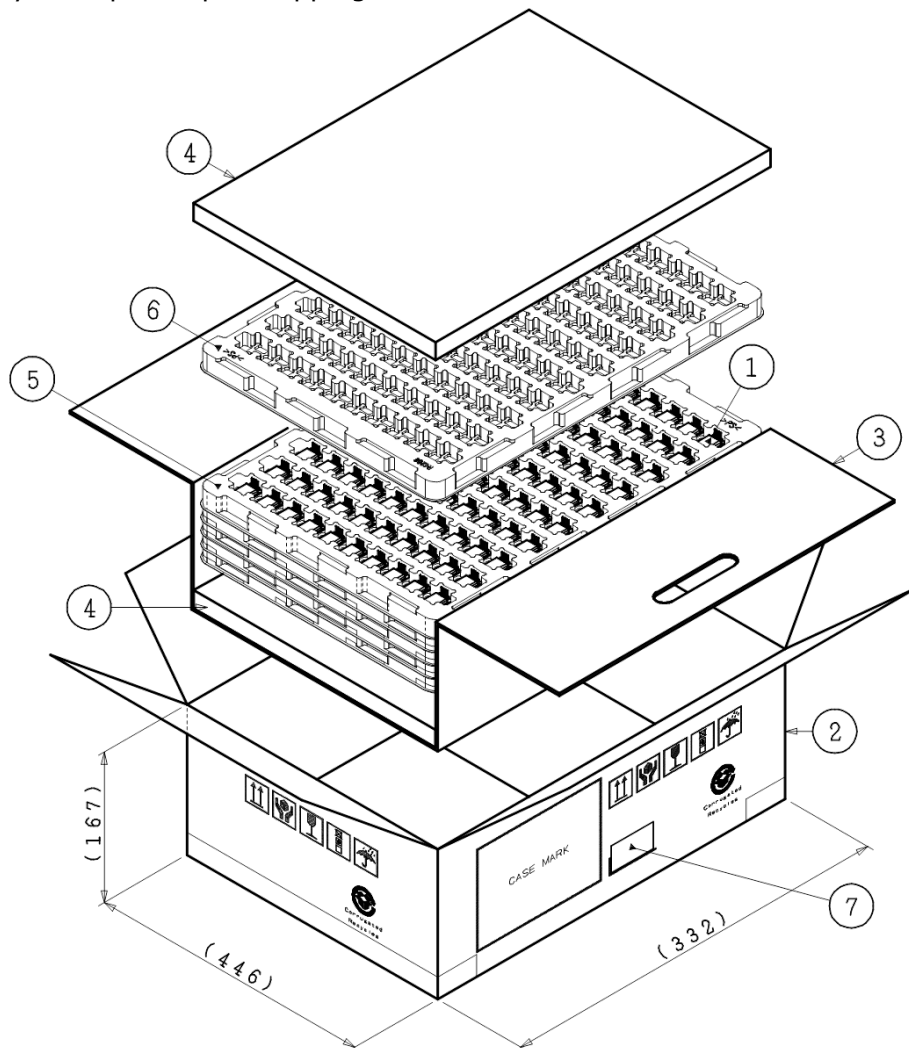ex) NJR4266JB1

NJR4266 JB1
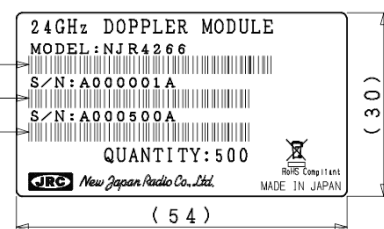A000001A
® 001-
A11030
☑ RoHS
新日本無線株式会社

10. Package

Standard Package
Packing Quantity: 500 pieces per shipping box

Code39 for Part number
Code39 for first S/N in carton
Code39 for end S/N in carton

```
24GHz DOPPLER MODULE
MODEL:NJR4266
S/N:A000001A
S/N:A000500A
QUANTITY:500
JRC New Japan Radio Co.,Ltd.        RoHS Compliant
                                    MADE IN JAPAN
            (54)
```
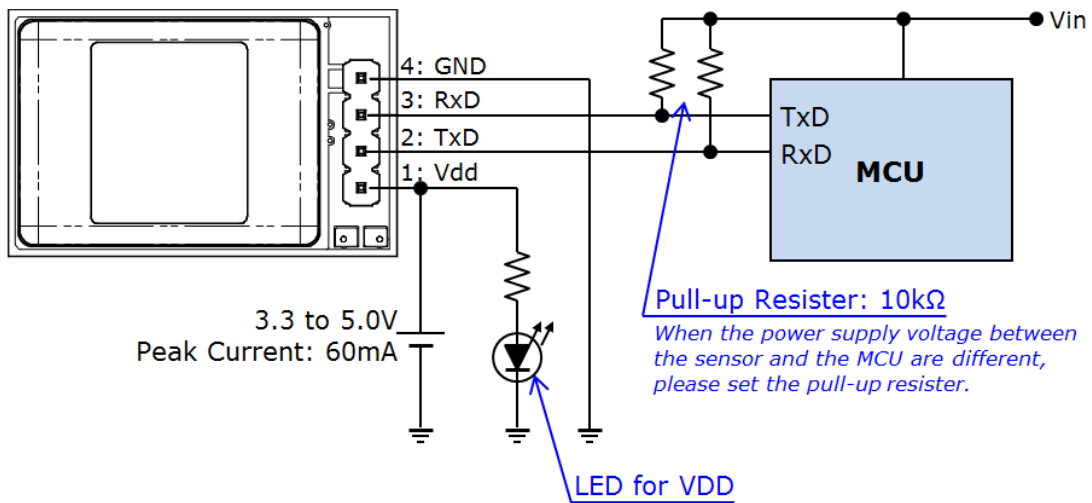(30)

⑦:Package label
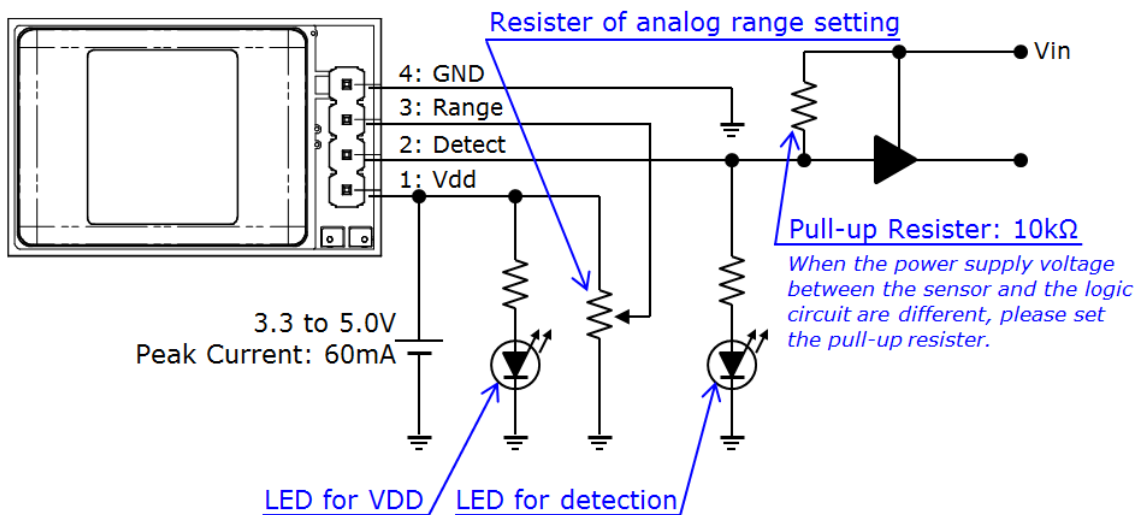
①NJR4266 24GHz Doppler module
②Outer packaging:double wall corrugated fiberboard
③Inner packaging:single wall corrugated fiberboard
④Package cushioning:polyethylene foam
⑤Tray for modules(100 pcs×5 trays):conductive polystyrene
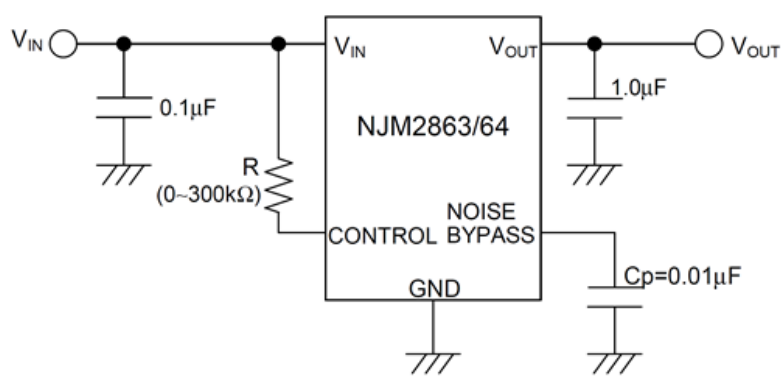⑥Dummy tray:conductive polystyrene
⑦Package label

11. Reference Circuit

11.1. Example for Type of UART

4: GND
3: RxD
2: TxD
1: Vdd

TxD
RxD **MCU**

3.3 to 5.0V
Peak Current: 60mA

Pull-up Resister: 10kΩ
When the power supply voltage between the sensor and the MCU are different, please set the pull-up resister.

LED for VDD

Vin

11.2. Example for Type of Digital Output / Analog Range Setting

Resister of analog range setting

4: GND
3: Range
2: Detect
1: Vdd

Vin

Pull-up Resister: 10kΩ
When the power supply voltage between the sensor and the logic circuit are different, please set the pull-up resister.

3.3 to 5.0V
Peak Current: 60mA

LED for VDD / LED for detection

11.3. Recommendation Power Supply Circuit

V_{IN} V_{IN} V_{OUT} V_{OUT}

0.1µF
1.0µF
R (0~300kΩ)
NJM2863/64
NOISE
CONTROL BYPASS
GND
Cp=0.01µF

Recommendation linear regulator: NJM2863F33 or NJM2864F33

12. Recommendation Mounting Conditions

12.1. Footprint dimensions
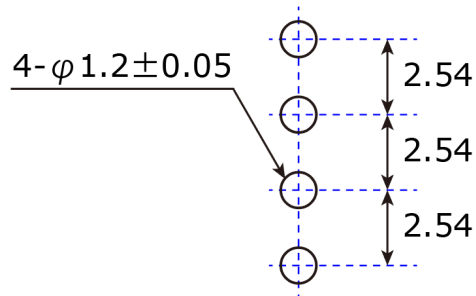
4-φ1.2±0.05   2.54   2.54   2.54   Unit: mm

*Note) In actual design, please optimize in accordance with the situation of your board design and soldering condition.

12.2. Soldering conditions
● Soldering way: Solder iron *Note
● Solder iron temperature: 350 °C or less
● Soldering time: in below

#	NAME	Soldering time
1	Vdd	3 second or less
2	TxD / Detect	3 second or less
3	RxD / Range	3 second or less
4	GND	6 second or less

*Note) The soldering iron to be used must be grounded via a resistance of about 1 MΩ.

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   * Life Maintenance Medical Equipment
   * Fire Alarm/Intruder Detector
   * Vehicle Control Equipment (automobile, airplane, railroad, ship, etc.)
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