2.4 GHz antenna all-in-one design RF module

WR RF module

Manual

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- Specifications and appearance are subject to change without notice for improvement

1 Introduction

The WR RF module is a 2.4GHz transceiver.
WR RF module operates in 2.400-2.4835GHz ISM frequency band.
To design a radio system with the WR RF module, you simply need an MCU (microcontroller) and a few external passive components.
You can operate and configure the WR RF module through a Serial Peripheral Interface (SPI).

1.1 Features

Features of the nRF24L01+ include:

- Radio
  - Worldwide 2.4GHz ISM band operation
  - Common RX and TX interface
  - GFSK modulation
  - 2Mbps air data rate
- Power Management
  - Integrated voltage regulator
  - 1.9 to 3.6V supply range

1.2 Product specification

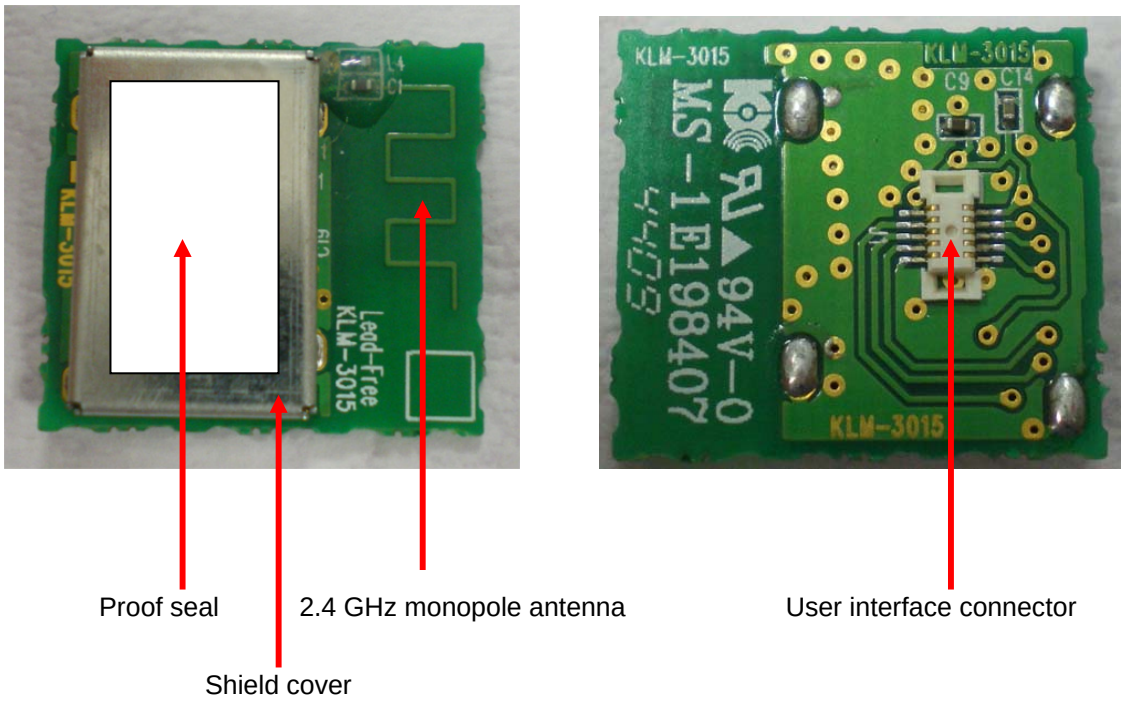
This module carries RF device nRF24L01P made in NORDIC company.
Please refer to a nRF24L01P data sheet submitted by NORDIC company about the details of the RF device.
The main specifications of this RF module are shown as follows.

Function	Item	Main specifications
General specifications	Use device	nRF24L01P made in NORDIC company
	Frequency band	2405MHz～2480MHz
	Antenna electricity	Max. 0dBm
	Oscillation	Crystal oscillation 16MHz are built in it (A PLL frequency synthesizer method)
	Power supply voltage	+1.9V～+3.6V(Normal +3.0V)
	External form dimensions	20.5±0.3 x 18.5±0.3 X 4.2±0.3 [mm]
	Weight	1.3g
	Operating temperature	0℃～40℃
RF transmission part	Transmitting power	Max. 0dBm
	Frequency deviation	50ppm or less
	Modulation method	GFSK
RF reception part	Frequency deviation	50ppm or less
Antenna	Built-in	Pattern antenna
	Form	Monopole λ/4
	Directivity	No directivity
User outside interface	Serial communication	SPI-IF

2 Module specifications

2.1 Partial explanation

Each part of this module is explained.



Part	Explanation
2.4 GHz monopole antenna	It is a built-in antenna of the RF module. The antenna is made by the copper foil pattern of PCB.
Proof seal	It is the certification label of this module.
User interface connector	It is an interface connector to use in a user. Please refer to interface specifications for the details.

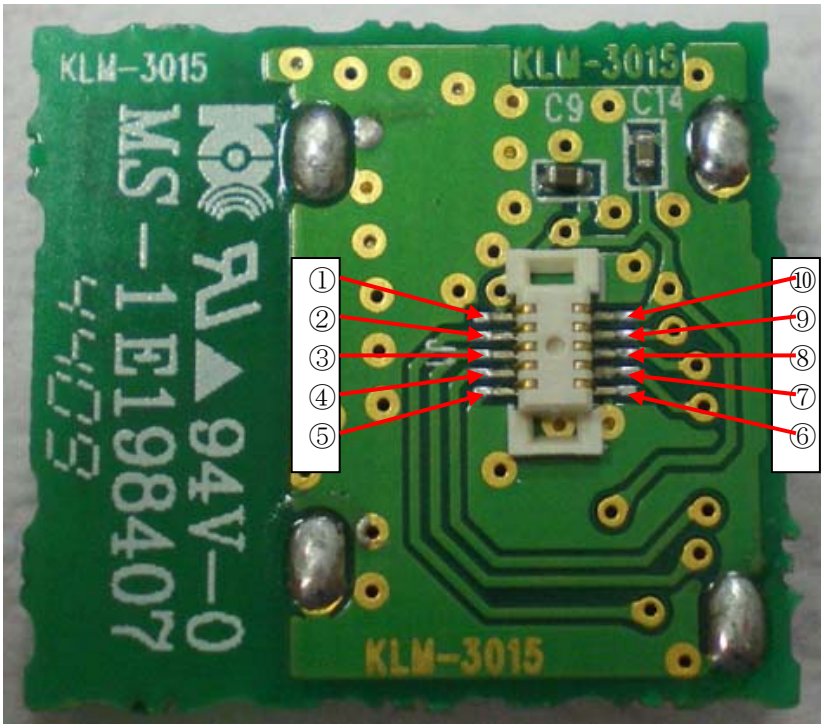
Attention: Please do not put the label etc. on the antenna.

When the seal and the label are put on the antenna, the characteristic of the antenna might be ruined.

2.2 Interface specification

The offered interface is shown below.

Mounting connector: Narrow Pitch Connector (0.5 mm pitch) Header AXK6F10347YG Panasonic
Combination connector: Narrow Pitch Connector (0.5 mm pitch) Socket AXK5F10xx7YG Panasonic



Pin functions

Pin	Name	Pin function	Description
1	VDD	Power	Power Supply (+1.9V – +3.6V DC)
2	IRQ	Digital	Output Maskable interrupt pin. Active low
3	MISO	Digital	Output SPI Slave Data Output, with tri-state option
4	MOSI	Digital	Input SPI Slave Data Input
5	VSS	Power	Ground (0V)
6	VSS	Power	Ground (0V)
7	SCK	Digital	Input SPI Clock
8	CSN	Digital	Input SPI Chip Select
9	CE	Digital	Input Chip Enable Activates RX or TX mode
10	VDD	Power	Power Supply (+1.9V – +3.6V DC)

Strict observance: The power supply connection must not make a mistake.
The protection circuit in the power supply part is not installed in this module.
There is fear of damage, and note the polarity and the voltage of the power supply enough, please.
Please do not touch the terminal of this module directly by the hand.
The inside might be destroyed by static electricity.

3 Electrical specifications

Conditions: **VDD** = +3V, **VSS** = 0V, T_A = - 40ºC to + 85ºC

3.1 Absolute maximum ratings

Note: Exceeding one or more of the limiting values may cause permanent damage to WR RF module.

Operating conditions	Minimum	Maximum	Units
Supply voltages			
VDD	−0.3	3.6	V
VSS		0	V
Input voltage			
VI	−0.3	5.25	V
Output voltage			
VO	VSS to VDD	VSS to VDD	
Total Power Dissipation			
PD (TA=85° C)		60	mW
Temperatures			
Operating Temperature	0	40	℃

3.2 DC characteristics

Symbol	Parameter (condition)	Notes	Min.	Typ.	Max.	Units
Operating conditions						
VDD	Supply voltage		1.9	3.0	3.6	V
VDD	Supply voltage if input signals >3.6V		2.7	3.0	3.3	V
Digital input pin						
VIH	HIGH level input voltage	a	0.7VDD		5.25	V
VIL	LOW level input voltage		VSS		0.3VDD	V
Digital output pin						
VOH	HIGH level output voltage (IOH=−0.25mA)		VDD −0.3		VDD	V
VOL	LOW level output voltage (IOL=0.25mA)				0.3	V
Power on reset						
TPUP	Power ramp up time	b			100	ms
TPOR	Power on reset	c	1		100	ms

a. If the input signal >3.6V, the VDD of the nRF24L01+ must be between 2.7V and 3.3V (3.0V±10%)

b. From 0V to 1.9V.

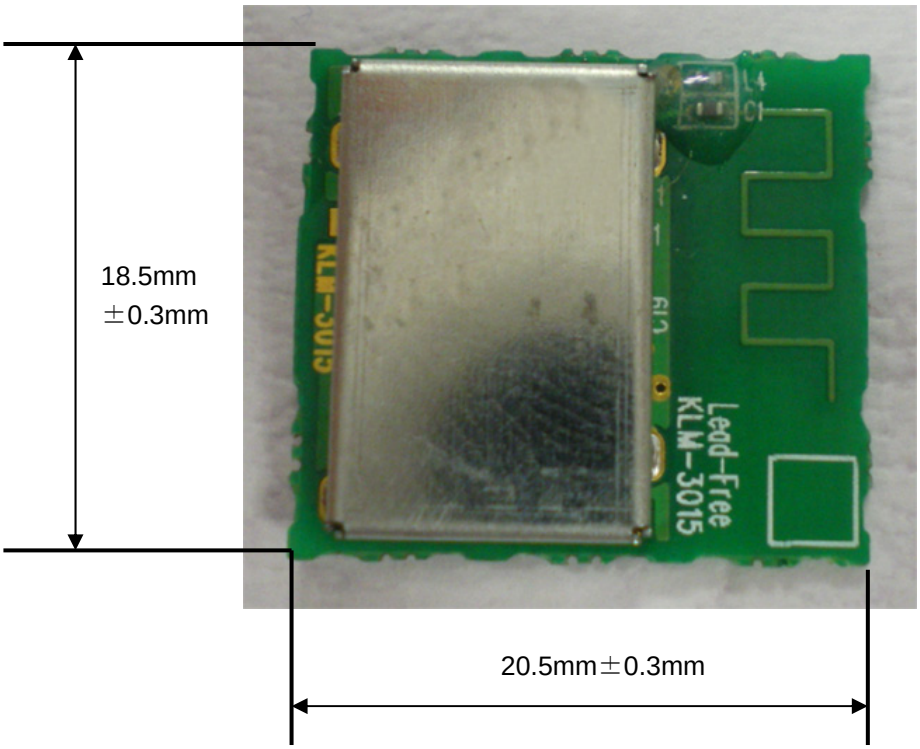
c. Measured from when the VDD reaches 1.9V to when the reset finishes.

3.3 Power consumption

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
Idle modes					
IVDD_PD	Supply current in power down mode		900		nA
IVDD_SU	Average current during 1.5ms crystal oscillator startup		400		uA
Transmit					
IVDD_TX0	Supply current @ 0dBm output power		11.3		mA
IVDD_TX6	Supply current @ −6dBm output power		9.0		mA
IVDD_TX12	Supply current @ −12dBm output power		7.5		mA
IVDD_TX18	Supply current @ −18dBm output power		7.0		mA
Receive					
IVDD_2M	Supply current 2Mbps		13.5		mA

4 Appendix

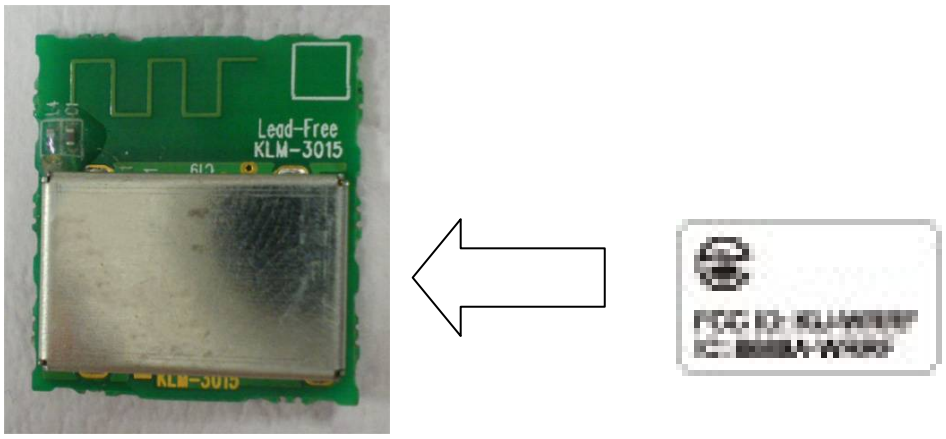
4.1 Dimensional outline drawing



Attention: Please do not make the pattern under the antenna of this module.
(Might it influence the antenna part if the pattern is made, and the communication distance performance be ruined.)

4.2 For technical standard certification of conformity

Please paste the proof seal to include "IC: 8689A-WRRF" "FCC ID: KIJ-WRRF "" on the module shield cover.



Label for end product must include “Contains FCC ID: KIJ-WRRF” “Contains IC: 8689A-WRRF”.

CHANGED OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE MANUFACTURER FOR COMPLIANCE COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT

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.

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

Complies with Canadian ICES-003 Class B.
Conforme au Reglement Canadian NMB-003 classe B.

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 this 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 étre prêt à accepter tout brouillage radioélectrique reçu, meme si ce brouillage est susceptible de compromettre le fonctionnement du dispositif.

The installer of this radio equipment must ensure that the antenna is located or pointed such that it does not emit RF field in excess of Health Canada limits for the general population; consult Safety Code 6, obtainable from Health Canada’s website www.hc-sc.gc.ca/rpb