Raffel MDLNRF24L01+ 02 Module User Manual

MDLNRF24L01+ 02 Module
User Manual

Contents

Introduction

The MDL NRF24L01+ 02 Transceiver Module (the module) is a System in Package (SiP) module used to transmit and receive in the 2.4GHz band.
The module has Nordic Semiconductor nRF24L01+ Single Chip 2.4GHz Transceiver on-board to perform RF send and receive functions on the front end with an SPI interface and input/output buffers to communicate with a microprocessor.

List of Applicable FCC Rules

This module must comply with all guidelines specified for Single Modular Transmitters as defined by FCC 47 CFR § 15.212(a) (1):
(a) Single modular transmitters consist of a completely self-contained radiofrequency transmitter device that is

typically incorporated into another product, host or device. Split modular transmitters consist of two components: a radio front end with antenna (or radio devices) and a transmitter control element (or specific hardware on which the software that controls the radio operation resides). All single or split modular transmitters are approved with an antenna. All of the following requirements apply, except as provided in paragraph (b) of this section.
(1) Single modular transmitters must meet the following requirements to obtain a modular transmitter approval.
(i) The radio elements of the modular transmitter must have their own shielding. The physical crystal and tuning capacitors may be located external to the shielded radio elements.
(ii) The modular transmitter must have buffered modulation/data inputs (if such inputs are provided) to ensure that the module will comply with part 15 requirements under conditions of excessive data rates or over-modulation.
(iii) The modular transmitter must have its own power supply regulation.
(iv) The modular transmitter must comply with the antenna and transmission system requirements of §§ 15.203, 15.204(b) and 15.204(c). The antenna must either be permanently attached or employ a “unique” antenna coupler (at all connections between the module and the antenna, including the cable). The “professional installation” provision of § 15.203 is not applicable to modules but can apply to limited modular approvals under paragraph (b) of this section.
(v) The modular transmitter must be tested in a stand-alone configuration, i.e., the module must not be inside another device during testing for compliance with part 15 requirements. Unless the transmitter module will be battery-powered, it must comply with the AC line conducted requirements found in § 15.207. AC or DC power lines and data input/output lines connected to the module must not contain ferrites unless they will be marketed with the module (see § 15.27
(a)). The length of these lines shall be the length typical of actual use or, if that length is unknown, at least 10 centimeters to insure that there is no coupling between the case of the module and supporting equipment. Any accessories, peripherals, or support equipment connected to the module during testing shall be unmodified and commercially available (see § 15.31(i)).
(vi) The modular transmitter must be equipped with either a permanently affixed label or must be capable of electronically displaying its FCC identification number.
(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is 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. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: YZHMDLNRF24L0102” or “Contains FCC ID: YZHMDLNRF24L0102”. Any similar wording that expresses the same meaning may be used. The Grantee may either provide such a label, an example of which must be included in the application for equipment authorization, or, must provide adequate instructions along with the module which explains this requirement. In the latter case, a copy of these instructions must be included in the application for equipment authorization.
(B) If the modular transmitter uses an electronic display of the FCC identification number, the information must be readily accessible and visible on the modular transmitter or on the device in which it is installed. If the module is installed inside another device, then the outside of the device into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains FCC certified transmitter module(s).” Any similar wording that expresses the same meaning may be used. The user manual must include
instructions on how to access the electronic display. A copy of these instructions must be included in the application for equipment authorization.
(vii) The modular transmitter must comply with any specific rules or operating requirements that ordinarily apply to a complete transmitter and the manufacturer must provide adequate instructions along with the module to explain any such requirements. A copy of these instructions must be included in the application for equipment authorization.
(viii) The modular transmitter must comply with any applicable RF exposure requirements in its final configuration.

Allowable Antennas to Use with the SiP Module

MDL NRF24L01+ 02 has a straight solid core, 24AWG, 30 +/-1 mm long wire antenna soldered to the wire pad labeled ANT1. The antenna serves as a quarter-wave monopole in the 2.4GHz band. There are no additional connectors on the PCB for use with other antennas

Required Regulatory Wording for User Guide

IC statement

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science, and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.

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

The term "IC: " before the certification/registration number only signifies that the Industry Canada technical specifications were met.

This product meets the applicable Industry Canada technical specifications.

Please notice that if the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed o displays a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains IC: 9314A-MDLNRF24L01" any similar wording that expresses the same meaning may be used.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

FCC Compliance Information

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated, must be labeled with an auxiliary label stating the FCC ID of the RF Module, such as:

"Contains FCC ID: YZH MDLNRF24L0102

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

(1) This device does not cause harmful interference and (2) This device must accept any interference received, including interference that may cause undesired operation."

NOTE: 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 instruction, may 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

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

Module Statement

This single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

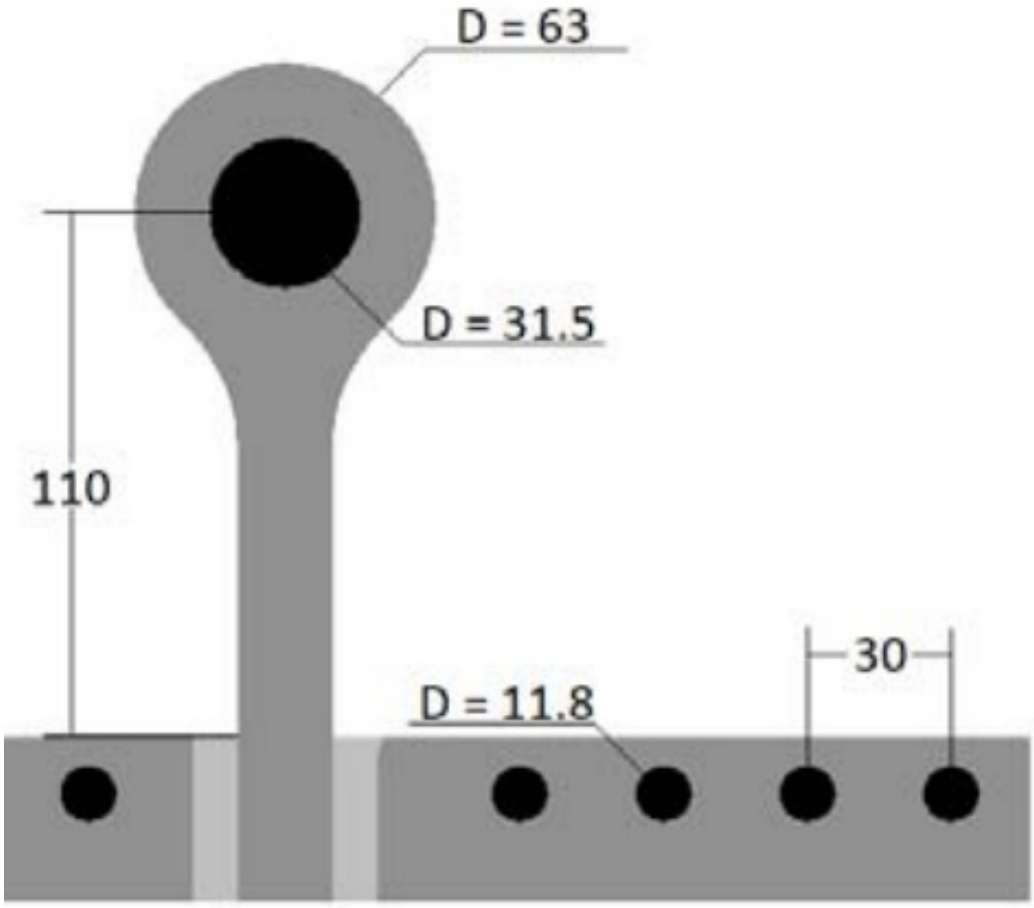
1. The radio elements have the radio frequency circuitry shielded.
2. The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.
3. The module contains power supply regulations on the module.
4. The module contains a permanently attached antenna.
5. The module demonstrates compliance in a stand-alone configuration.
6. The module is labeled with its permanently affixed FCC ID label
7. The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.

8. The module complies with RF exposure requirements.

The transmitter/module must not be collocated or operating in conjunction with any other antenna or transmitter.

Module Integration Instructions

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01
2.2 List of applicable FCC rules
FCC Part 15.249
2.3 Specific operational use conditions
For use with other modules of this type, where one or more devices is a primary transmitter and one or more devices is a primary receiver. For operation only in the band 2.4046-2.4796 GHz.
2.4 Limited module procedures
This module is not a limited module
2.5 Antenna designs MDL NRF24L01+ 02 shall be manufactured with a straight, solid core, 24AWG wire 30+/-1 mm long, and soldered into the wire pad labeled “ANT1” on the Board. PCB layout specifications are as follows:
PCB Wire Antenna Layout



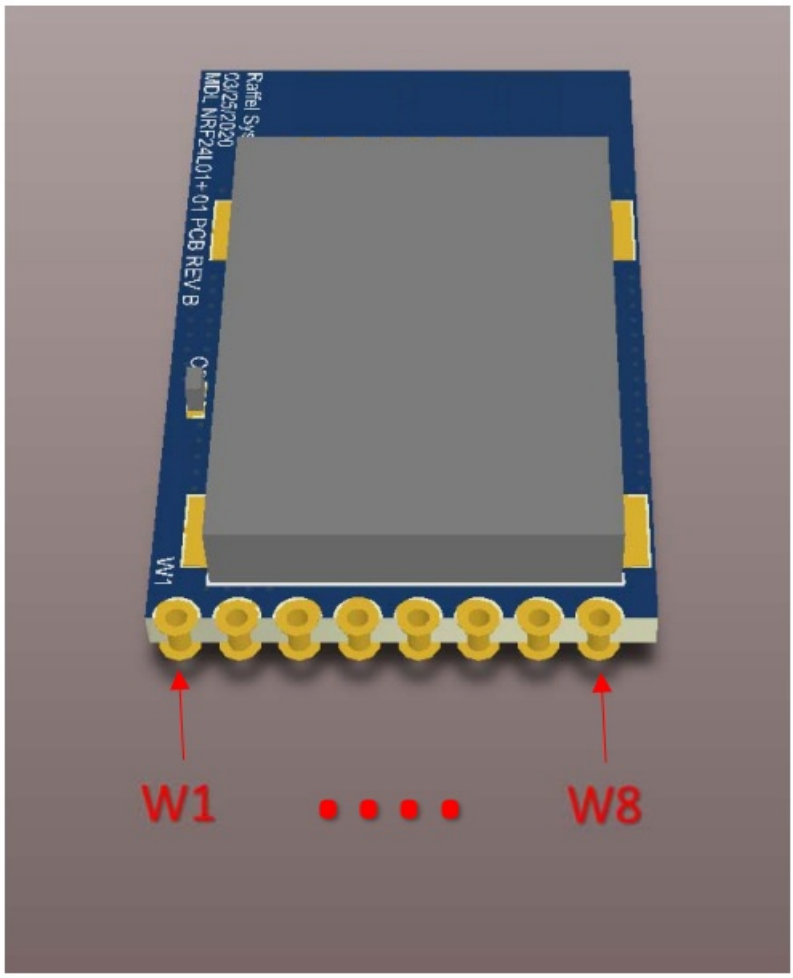
A deviation(s) from the defined parameters of the antenna of either module, as described by the instructions, requires that the host product manufacturer must notify the module grantee that they wish to change the antenna design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
2.6 RF exposure considerations
This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, for a minimum separation of 5mm between antenna and body. The host product manufacturer will provide the above information to end-users in their end-product manuals.
2.7 Antennas
Quarter wave monopole antenna; 5.19dBi; 2.4046-2.4796GHz 2.8 Label and compliance information The end product must carry a physical label, following KDB784748D01 and KDB 784748 stating “Contains Transmitter Module FCC ID: YZHMDLNRF24L0102”.
2.9 Information on test modes and additional testing requirements

To test the module as a standalone unmodulated constant carrier, refer to Appendix C in “nRF24L01+ Product Specification.pdf” which is supplied along with this document

As noted in Appendix C, the nRF24L01+ IC requires communication via the SPI lines on the IC. These are routed to the module connection pins.
The pin definitions are as follows:

Pin	Name	SPI Function	Specifications
W1	Vdd	Power supply for IC	Supply must be 1.9-3.6V DC
W2	GND	GND	
W3	CE	N/A	Chip Enable, is not used for SPI com munication
W4	CSN	Slave Select, Active Low	Pull low to enable communication wi th this device
W5	SCK	SPI Clock	
W6	MOSI	Master Out Slave In for SPI communication	MDL NRF24L01+ 02 is the slave device
W7	MISO	Master In Slave Out for SPI communication	MDL NRF24L01+ 02 is the slave device
W8	IRAQ	N/A	Interrupt

A 3D representation similar to MDL NRF24L01+ 02 is below. The pin locations of MDL NRF24L01+ 02 are identical to this representation.
The pin locations on the module are from W1 through W8 as follows:



2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.249) listed on the grant, and the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed if it contains digital circuity.

Document History

Document Revision	Change description	Engineer	Engineer Peer-Review	Date
REV A	Initial Release	Dylan Klepps		9/2/2020

Documents / Resources

	Raffel MDLNRF24L01+ 02 Module [pdf] User Manual MDLNRF24L01 02 Module, Module