nRF24L01+ Reference Modules**nRF24L01+-REFMOD**

GENERAL DESCRIPTION

This document describes the nRF24L01+ REFMOD with the Nordic Semiconductor nRF24L01+ Single Chip 2.4 GHz RF transceiver.

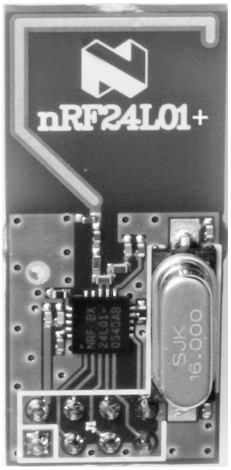


Figure 1: The nRF24L01+ Reference Module with PCB antenna and a HC49 crystal

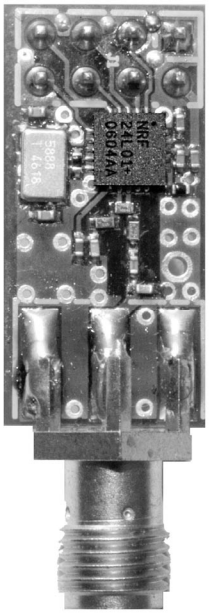


Figure 2: The nRF24L01+ Reference Module with SMA connector and SMD crystal

INTRODUCTION

The Reference Modules for the nRF24L01+ Single Chip 2.4 GHz RF Transceiver has been developed to enable customers to test functionality, run communication and verify the performance parameters of the device. The nRF24L01+ Reference Modules comes with the nRF24L01+ EVKIT, but can also be ordered as a separate product from Nordic Semiconductor ASA. The modules come in two versions; one with a SMA connector and one with a quarter wave PCB antenna. The module with SMA connector is intended for conducted measurements.

This document describes the hardware of the nRF24L01+ Reference Modules.

The nRF24L01+ Reference Modules are intended for evaluation purposes and can be used as a module in an end product.

nRF24L01+ REFERENCE MODULE DESCRIPTION

Appendix 1 shows the nRF24L01+ REFMOD circuit diagram and PCB layout. The component list is given in Appendix 2.

Figure 3 shows the block diagram of the nRF24L01+ REFMOD.

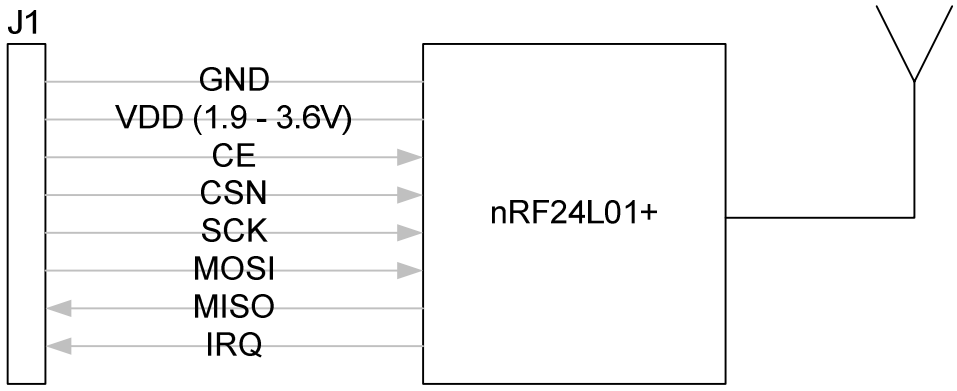


Figure 3: Block diagram of the nRF24L01+ REFMOD

All digital signals are routed through one connector (J1, pin out: Table 1) for easy connection to the nRF24L01+ EVSYSTEM, MCU evaluation boards or other control circuitry. To operate the nRF24L01+, a MCU must be present for device configuration and control.

Pin #	Signal name
1	GND
2	VDD (1.9V – 3.6V)
3	CE
4	CSN
5	SCK
6	MOSI
7	MISO
8	IRQ

Table 1: nRF24L01+ REFMOD, J1 pin out

For convenient connection of the differential antenna output/input pins to a single-ended antenna or 50Ω test equipment, a version of the nRF24L01+ REFMOD with differential to single ended matching network and a SMA connector is included. This network matches the 50Ω single end antenna or 50Ω test equipment impedance at the SMA connector, J2, to the recommended differential load impedance at the nRF24L01+'s RF I/O stage (pins ANT1 & ANT2). The employed matching network introduces an insertion loss of approximately 1dB at 2.4 GHz.

APPENDIX 1: CIRCUIT DIAGRAM AND PCB LAYOUT

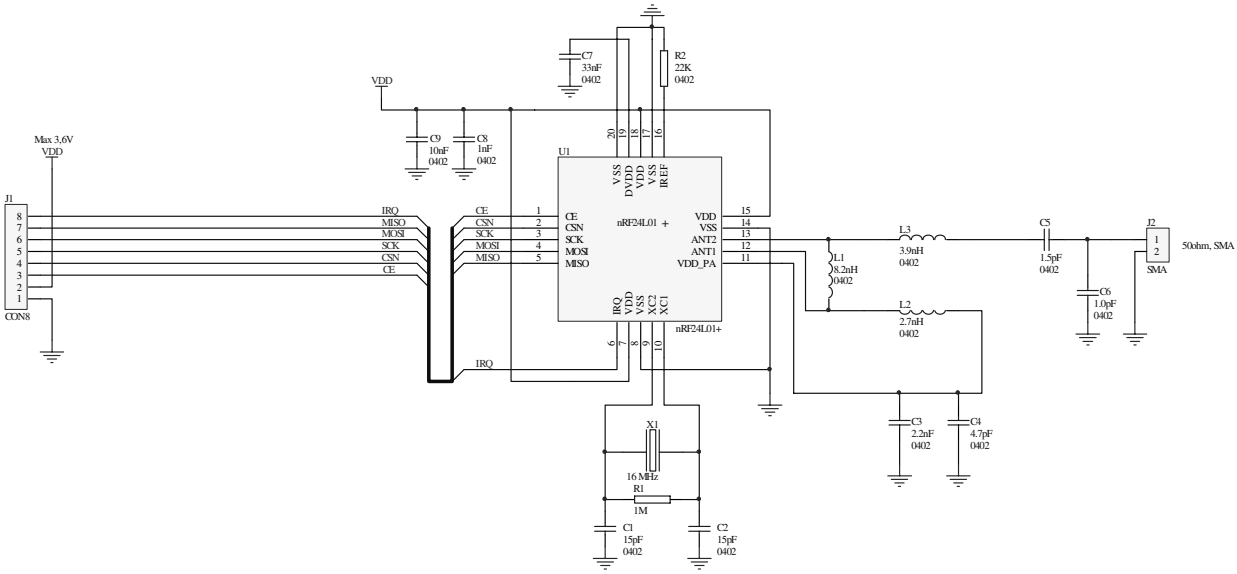


Figure 4: Schematics of the nRF24L01+ REFMOD

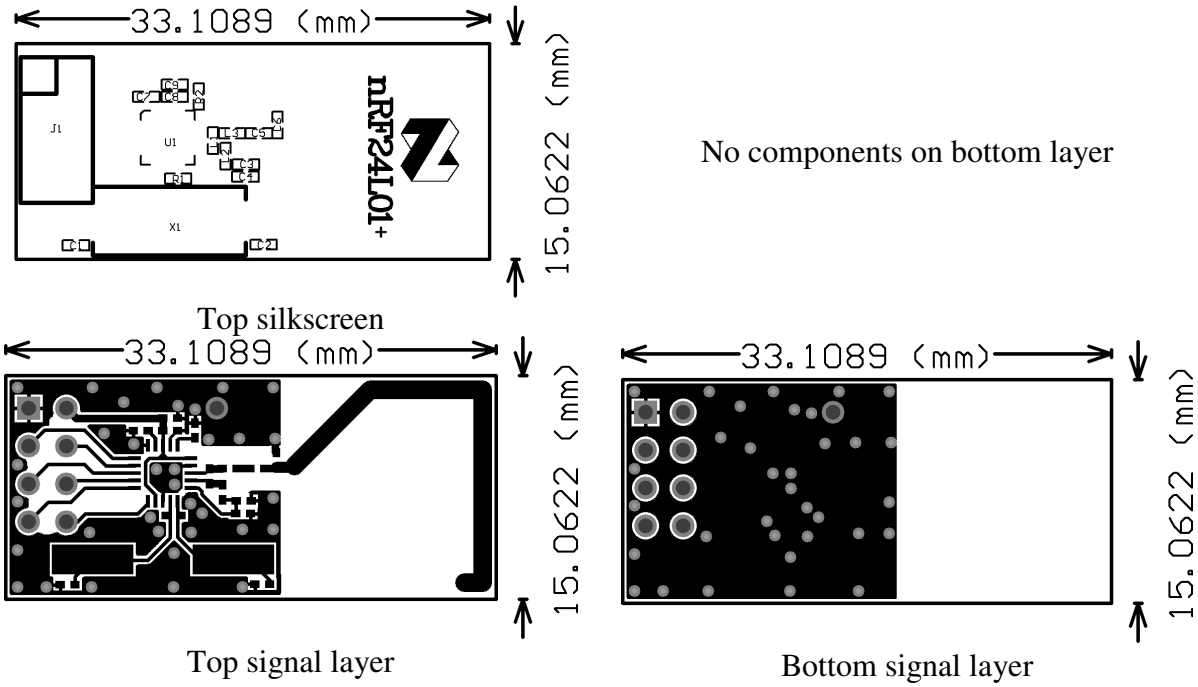
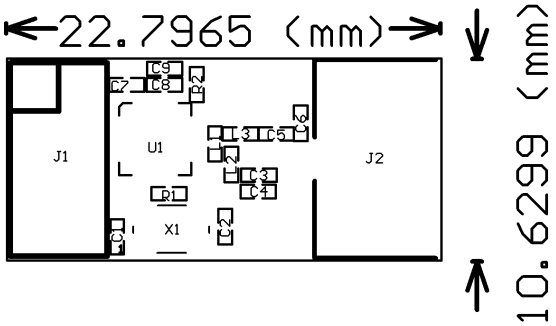
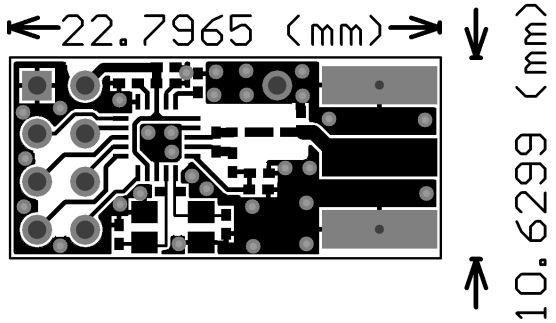


Figure 5: nRF24L01+ REFMOD with PCB antenna PCB layout

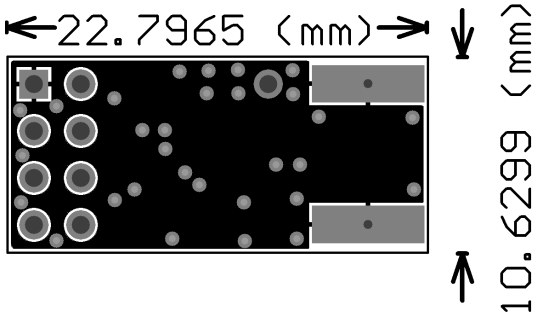


Top silkscreen

No components on bottom layer



Top signal layer



Bottom signal layer

Figure 6: nRF24L01+ REFMOD with SMA connector PCB layout

APPENDIX 2: COMPONENT LIST

Component list nRF24L01+ REFMOD			
Designator	Value	Footprint	Description
C1[1]	22pF	0402	NPO, +/- 5%, 50V
C2 [1]	22pF	0402	NPO, +/- 5%, 50V
C3	2.2nF	0402	X7R, +/- 10%, 50V
C4	4.7pF	0402	NPO, +/- 0.25 pF, 50V
C5	1.5pF	0402	NPO, +/- 0.1 pF, 50V
C6	1.0pF	0402	NPO, +/- 0.1 pF, 50V
C7	33nF	0402	X7R, +/- 10%, 50V
C8	1nF	0402	X7R, +/- 10%, 50V
C9	10nF	0402	X7R, +/- 10%, 50V
J1	CON8		
L1	8.2nH	0402	chip inductor +/- 5%
L2	2.7nH	0402	chip inductor +/- 5%
L3	3.9nH	0402	chip inductor +/- 5%
R1	1M	0402	+/-5%
R2	22K	0402	+/- 1 %
U1	nRF24L01+	QFN20L/5x5	
X1	16MHz	HC49	+/-60ppm, See nRF24L01+ Product Specification for full specification

Table 2: nRF24L01+ REFMOD component list, common to both versions

The nRF24L01+ REFMOD is manufactured on a 1.6mm thick, 2 layer FR4 substrate.

[1] C1 and C2 must have values that match the crystals load capacitance, Cl.

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