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### Dynamic NFC tag expansion board based on M24SR for STM32 Nucleo

## Introduction

The X-NUCLEO-NFC01A1 is a demonstration kit to evaluate the features and capabilities of the M24SR series. It is based on the M24SR64 device. This shield can be plugged on the Arduino UNO R3 connectors of any STM32 Nucleo board. This module is compatible with the following STM32 class of microcontrollers: STM32L0, STM32L1, STM32F0, STM32F1, STM32F3, STM32F4.

The M24SR64 device is a dynamic NFC/RFID tag IC with a dual interface. It embeds a 64 Kbit EEPROM memory. It can be operated from:

- an I<sup>2</sup>C interface
- a 13.56 MHz RFID reader or a NFC phone.

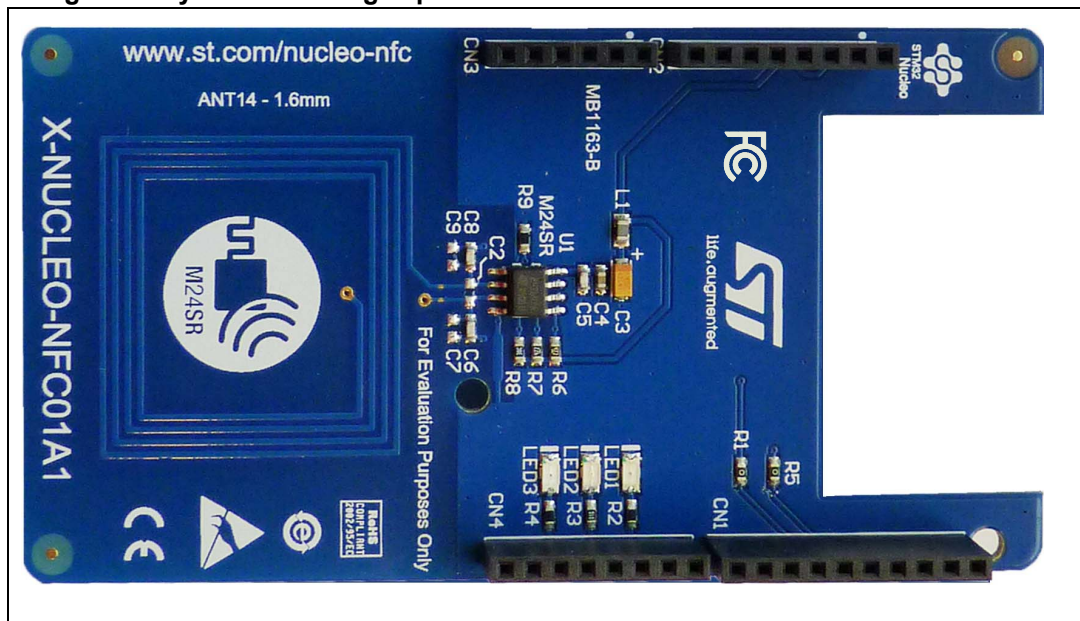
The I<sup>2</sup>C interface uses a two-wire serial interface, consisting of a bidirectional data line and a clock line. It behaves as a slave with respect to the I<sup>2</sup>C protocol.

The RF protocol is compatible with ISO/IEC 14443 Type A and NFC Forum Type 4 Tag.

The board is powered through the Arduino UNO R3 connectors. It also includes three LEDs for general purpose.

The X-NUCLEO-NFC01A1 (MB1163) schematics, BOM, gerber files, drivers and firmware are available for download on [www.st.com](http://www.st.com).

Figure 1. Dynamic NFC tag expansion board based on M24SR for STM32 Nucleo



# 1 Description

The X-NUCLEO-NFC01A1 board contains the M24SR64-Y chip. It is a dynamic NFC/RFID tag IC. It features a 64 Kbit EEPROM memory, preformatted for NFC transactions, and which can be protected by a unique and flexible 128-bit password scheme. The memory bank can be accessed by any of its two interfaces, either from an I<sup>2</sup>C interface or by a 13.56 MHz passive NFC interface. The I<sup>2</sup>C interface is a two-wire serial interface, consisting of a bidirectional data line and a clock line. It behaves as a slave with respect to the I<sup>2</sup>C protocol. The NFC interface is based on the ISO/IEC 14443 type A and NFC Forum type 4 tag specifications. Because it is a passive RF interface, it operates when the board is powered on but also when the board is powered off. Two control pins are also available from the M24SR64-Y chip, allowing flexible management of the NFC interface.

## 2 Features

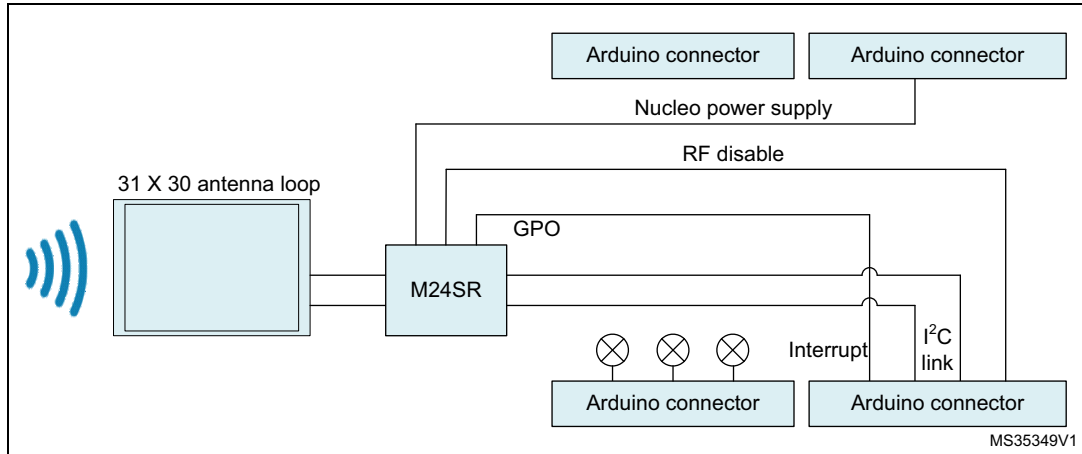
Ready-to-use printed circuit board (PCB) including:

- M24SR64-Y dynamic NFC/RFID tag
- 31 mm x 30 mm 13.56 MHz double layer inductive antenna etched on the PCB (ANT14)
- Different color LEDs
- Arduino UNO R3 connectors for Nucleo Board.

### 3 Hardware and layout description

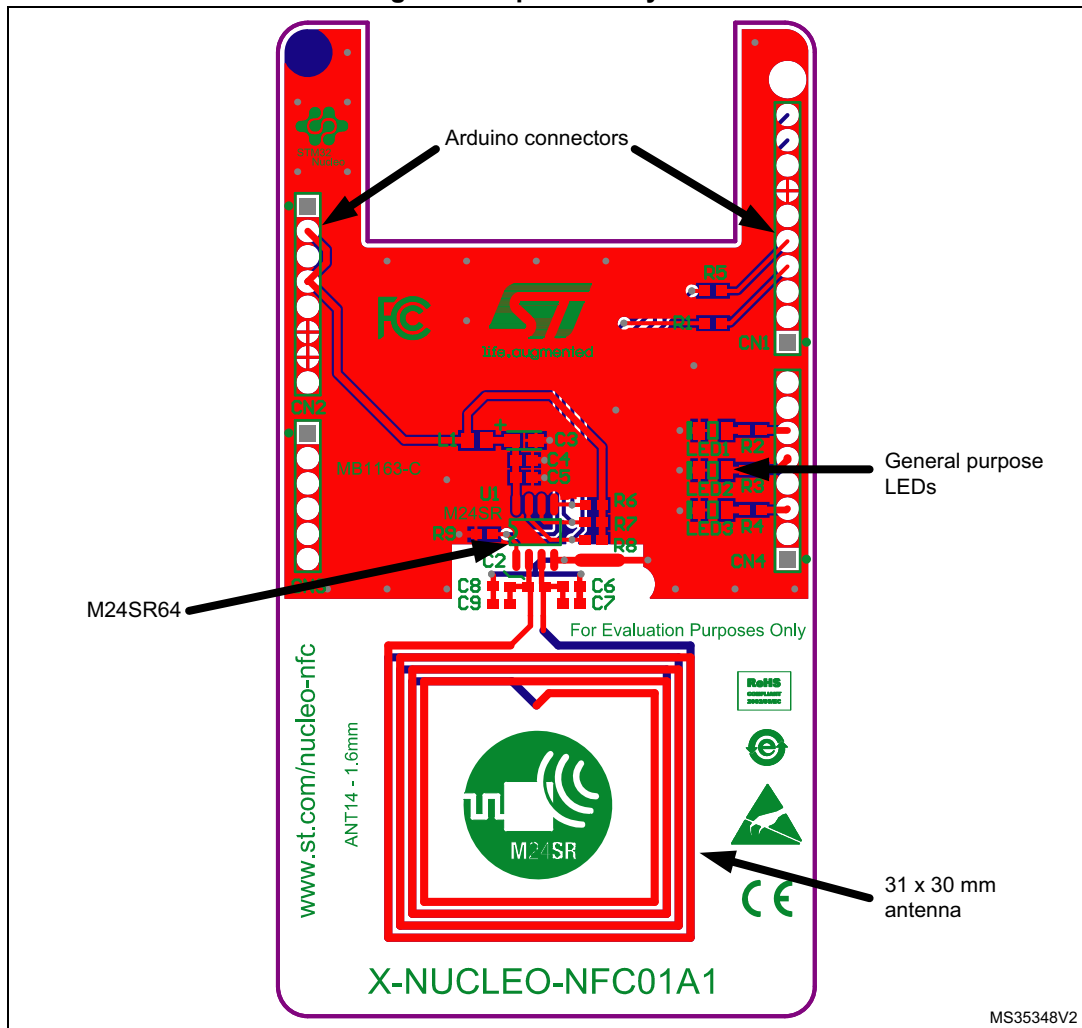
The X-NUCLEO-NFC01A1 board contains the M24SR64-Y chip. In addition to basic functionalities (NFC & I<sup>2</sup>C) of this dynamic NFC/RFID tag IC, some LEDs driven by MCU GPIOs can be used for global purpose.

Figure 2. Functional block diagram



### 3.1 X-NUCLEO-NFC01A1 assembly drawing.

Figure 3. Top assembly view



### 3.2 X-NUCLEO-NFC01A1 board powering and startup

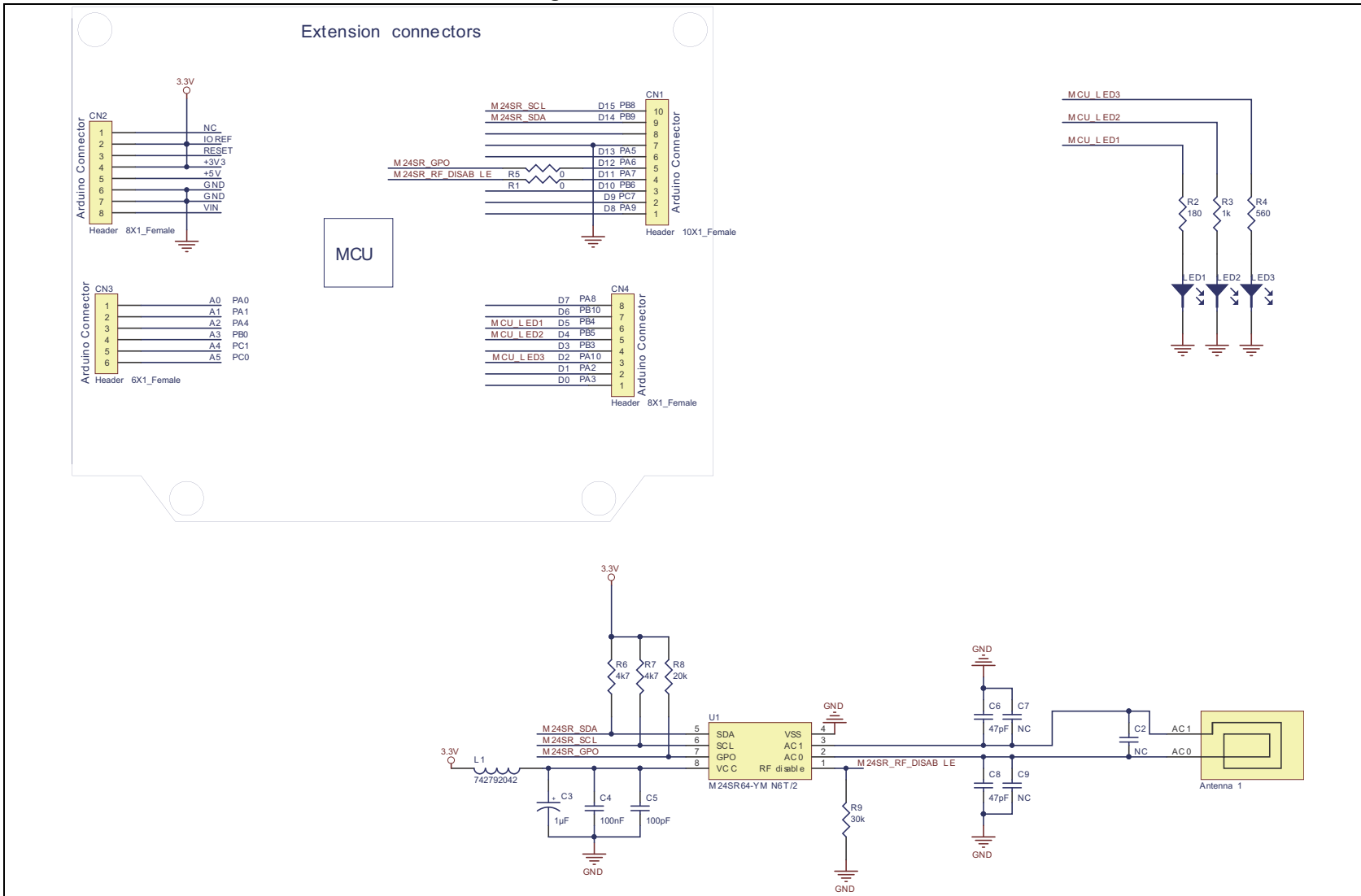
Proceed as follow:

1. Plug the X-NUCLEO-NFC01A1 on a Nucleo STM32 board
2. Connect the Nucleo board to a PC via the Type A / mini B USB cable
3. Download firmware in STM32 microcontroller
4. The demonstration kit is ready to be used



# 4 Electrical schematics

### Figure 4. Electrical schematics



## 5 An overview of FCC regulations

### 5.1 Part 15.105

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 or television reception. 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's by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the 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.

### 5.2 Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause, harmful interference and void the FCC authorization to operate this equipment.



## 6 Revision history

Table 1. Document revision history

Date	Revision	Changes
19-Jun-2014	1	Initial release.
31-Oct-2014	2	Updated <i>Figure 1: Dynamic NFC tag expansion board based on M24SR for STM32 Nucleo</i> . Updated <i>Figure 3: Top assembly view</i> . Updated <i>Figure 4: Electrical schematics</i> . Added <i>Section 5: An overview of FCC regulations</i> .

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