Introduction

The M24SR-DISCOVERY is a demonstration kit to evaluate the features and capabilities of the M24SR series and is based on the M24SR64 device. Two versions of this kit are available: the Standard Edition and the Premium Edition.

The Premium Edition includes all of the Standard edition features, plus a headset and a Bluetooth module to demonstrate the convenience to pair it with a smartphone via NFC. The M24SR64 device is a dynamic NFC/RFID tag IC with a dual interface. It embeds a 64 Kbits EEPROM memory. It can be operated from an I²C interface or by a 13.56 MHz RFID reader or an NFC phone.

The I²C 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 I²C protocol.

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

The board is powered through the USB bus. It also includes a microcontroller STM32F103 to drive the EEPROM via I²C and the LCD screen via SPI bus.

The M24SR-DISCOVERY (MB1138) schematics, BOM, gerber files, drivers and firmware can be downloaded from www.st.com.

Figure 1. M24SR-Discovery Board
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1 Description

Standard and premium editions of M24SRXX-Y family’s discovery kit (M24SR-DISCOVERY) are discovery kits meant to evaluate the features and capabilities of the M24SRxx-Y products.

They come with application notes, I2C drivers for M24SR, BOM board schematics, gerber files, firmware schematics which help reduce design effort and can be downloaded at www.st.com.

The features of Standard Edition are the M24SR64 IC (64-Kbit), a 30x31mm NFC antenna, a 2.4”QVGA LCD display, a Micro USB connector, the STM32F103 MCU, a JTAG connector for possible firmware upgrades, a Joystick and a reset button.

The board is powered through the USB bus. It also includes a microcontroller STM32F103 to drive the EEPROM via I2C and the LCD screen via SPI bus.

The Premium Edition includes all of the features of the standard edition plus a headset and a Bluetooth module which demonstrates the ease of pairing a smartphone to the kit over NFC. The Bluetooth module is driven by the STM32F103 microcontroller via UART link.

The Figure 2 shows the M24SR-Discovery board block diagram.

*Available only on premium edition.*
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)
- STM32F103RGT6 64LQFP 32-bit microcontroller, with 1Mbytes of Flash memory
- LCD Color Screen (320*200 pixels)
- Different color LEDs
- USB micro-B connector for board powering
- JTAG connector for microcontroller firmware upgrade and debug
- Joystick for menu selection
- Bluetooth module with audio outputs connected to Jack 3.5(a)
- Headset\(^{(a)}\)

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\(^{(a)}\) Available with the Premium edition only: M24SRDISCO-PREM
3 Hardware and layout description

The M24SR-DISCO board contains the M24SR64-Y chip. It is a dynamic NFC/RFID tag IC. It features a 64 Kbits of 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 interfaces, either from an I2C interface or by a 13.56 MHz passive NFC interface. The I2C interface uses a two-wire serial interface, consisting of a bidirectional data line and a clock line. It behaves as a slave in the I2C 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 but also when the board is unpowered. Two control pins are also available from the M24SR64-Y chip, allowing flexible management of the NFC interface.

3.1 M24SR-Discovery board description

The following figures show:
- M24SR-Discovery board front layout
- M24SR-Discovery board back layout
Figure 3. M24SR-Discovery board front layout

Figure 4. M24SR-Discovery board back layout

*Available only on premium edition.
3.2 M24SR-Discovery board powering and startup

The M24SR-Discovery board is powered by the USB bus via a Type A / micro B USB cable connected to a PC.

When powered up, the microcontroller starts the firmware already downloaded in the Flash memory. This is a demonstration of the different capability of the M24SR64 (RF on/off, change Vcard message, etc.). There is no modification or configuration to be done on the board to run the demo. Please refer to the firmware user manual available on ST web site www.st.com to get more detail.

3.3 Program and debug the M24SR-Discovery board

In order to flash or debug an STM32 microcontroller application on the M24SR-Discovery board, simply connect the 20-pin JTAG/SWD flat ribbon of the STLINK/V2 in-circuit debugger and programmer to the discovery kit board JTAG connector (J2).

Launch STLink Utility PC software. STM32F103RGT6 is part of the STM32F10x XL-density family.

(It can be downloaded from ST web site: www.st.com)

For more information or documentation on the STLINK/V2 in-circuit debugger and programmer, please visit www.st.com.

3.4 Hardware implementation

The Figure 5, Figure 6 and Figure 7 show the M24SR-Discovery Schematics (board reference MB1138).

The Figure 8 shows the Premium Bill of Material (MB1138_B01_BOM_PREMIUM).
Signals to/from BT Module

- U1
- USB_Disconnect
- BT_GPIO1
- PA0-WKUP14
- PB0
- PA1
- PA2
- PA3
- PA4
- PA5
- PA6
- PA7
- PA8
- PA9
- PA10
- PA11
- PA12
- PA13
- PA14
- PA15
- PA16
- PA17
- PA18
- PA19
- PA20
- PA21
- PA22
- PA23
- PA24
- PA25

Signals to/from LCD Screen

- U2
- USB_DM
- USB_DP
- OSC_IN/PD05
- OSC_OUT/PD16
- BOOT0
- PD2
- PD3
- PD4
- PD5
- PD6
- PD7
- PD8
- PD9
- PD10
- PD11
- PD12
- PD13
- PD14
- PD15
- PD16
- PD17
- PD18
- PD19
- PD20
- PD21
- PD22
- PD23
- PD24
- PD25

Components:

- R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11
- C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12
- C13, C14, C15, C16, C17, C18
- L1, L2, L3, L4
- Q1, Q2
- U3, U4, U5, U6, U7, U8, U9, U10, U11, U12
- STMicroelectronics Discovery Kit M24SR (MCU & M24SR)
Figure 6. Discovery Kit M24SR (LCD Screen)
Figure 8. BOM (Bill Of Material)

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Hardware and layout description
4 Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements

4.1 FCC Compliance Statement

4.1.1 Part 2.1077

STMicroelectronics Part No. M24SR-Discovery

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.

For purposes of FCC Rule 2.909, the Responsible Party is STMicroelectronics Inc., located at 750 Canyon Drive, Suite 300, Coppell, TX 75019, USA, with telephone number (972) 466-6000.

4.1.2 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 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'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.

4.1.3 Part 15.21

Any changes or modifications to this equipment not expressly approved by STMicroelectronics may cause harmful interference and void the user’s authority to operate this equipment.
4.2 IC Compliance Statement

4.2.1 Compliance Statement

This device complies with Industry Canada licence-exempt RSS standard(s). 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.

4.2.2 Déclaration de conformité

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes: (1) l’appareil ne doit pas produire de brouillage, et (2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.
5 Revision history

Table 2. Document revision history

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<td>Added Section 4: Federal Communications Commission (FCC) and Industry Canada (IC) Compliance Statements Updated Figure 2: M24SR-Discovery board block diagram, Figure 3: M24SR-Discovery board front layout and Figure 4: M24SR-Discovery board back layout</td>
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