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M24SR series dynamic NFC tags

MMY division

Main M24SR market segments

Smart Things

Consumer, wearable, healthcare & wellness

Smart Home

Home appliance & automation, home gateway

Smart Industry

Networking, lighting

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Key use cases

Seamless user interface simplicity

- **Device control** with a mobile phone

Wireless pairing “tap & connect”

- Ease Bluetooth or WiFi by **simple tap**

Servicing & maintenance

- Download records history
- **Update** parameters even if device is off

Convenient data logging

- Data **download**
- Data **tracking**

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Typical NFC type 4 range

NFC phones

ISO14443 (106kb/s)

Up to 5 cm / 2in.

RFID readers

Up to 10cm / 4in.

ISO14443 (106kb/s)

Modulation more simple (ISO 15693), data rate more limited & consume less so better range

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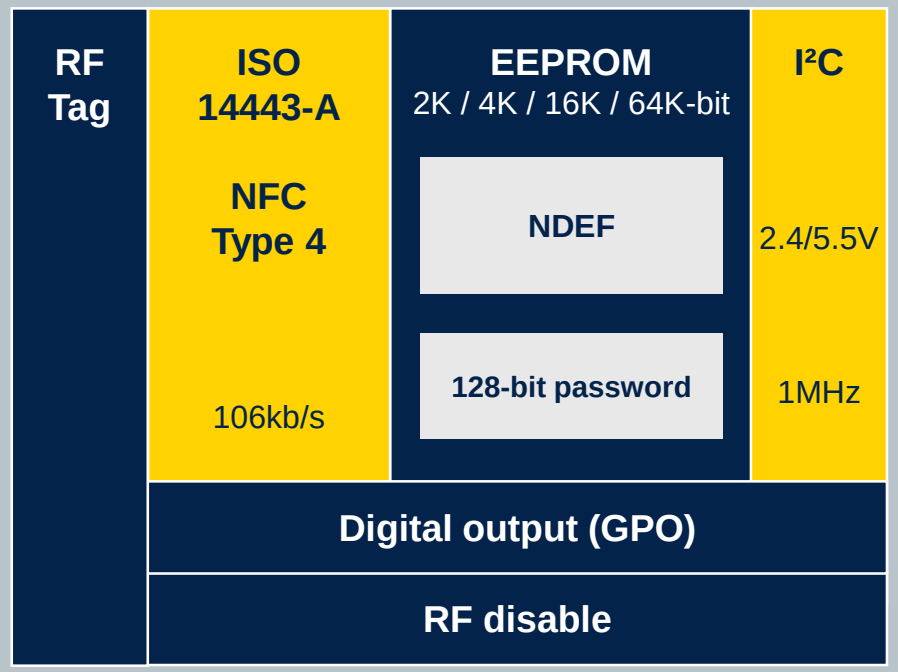
M24SR product

- The M24SR chip belongs to ST25 NFC / RFID Tags & Readers family.
- The M24SR product is Dynamic Tag based on ISO14443 standard with following main features:
  - ISO14443-A NFC Forum Type 4 RF interface
  - I²C 1MHz interface – 2.4V to 5.5V
  - Up to 64-kbit EEPROM memory
  - 128-bit password for data protection
  - 200 years data retention & 1Mcycles erase/write
  - Configurable General Purpose Output signal for MCU wake-up
  - RF disable feature

M24SR dynamic NFC tag

M24SR02 / 04 / 16 / 64



 **SO8**

 **TSSOP8**

 **FPN8**

 **SBN12**
Die form, sawn and Bumped inkless 8" wafer, 120µm/ thickness

Use cases

- Convenient wireless pairing (Bluetooth, Wi-Fi)
- Dynamic data exchange with NFC phone
  - User settings update, information log download,…

Key Features

- **ISO14443-A** Type A and **NFC Type 4**
- High speed operations (**106kb/s**)
- NDEF memory format
- Data protection thanks to **128-bit password**

Key Benefits

- Easy of use (limited BOM, 8-pin package)
- Flexible interrupt pin (configurable GPO)
- **200 years** data retention, **1M cycles** erase/write

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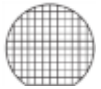
Key features

	M24SR series
Contactless Interface	ISO14443-A NFC Type 4
RF range	Short range, up to 10cm
RF speed	106kbps
Single supply voltage	2.4V (2.7V) to 5.5V
Serial Interface	I2C @1MHz
Extra features	MCU wake-up & RF Disable
Memory format	EEPROM preformatted NDEF file
Memory size	2 / 4 / 16 / 64-kbit
Data retention	200-year at +55°C
Erase / Write cycles	1M cycles at +25°C
Data protection	Password 128-bit
Temperature range	-40°C to +85°C -40°C to +105°C for I²C operation for M24SR64
Package	SO8 / TSSOP8 / DFN8 / SBN12 *



* SBN12: Die form, sawn and Bumped wafer, 120µm thickness, inkless 8” wafer

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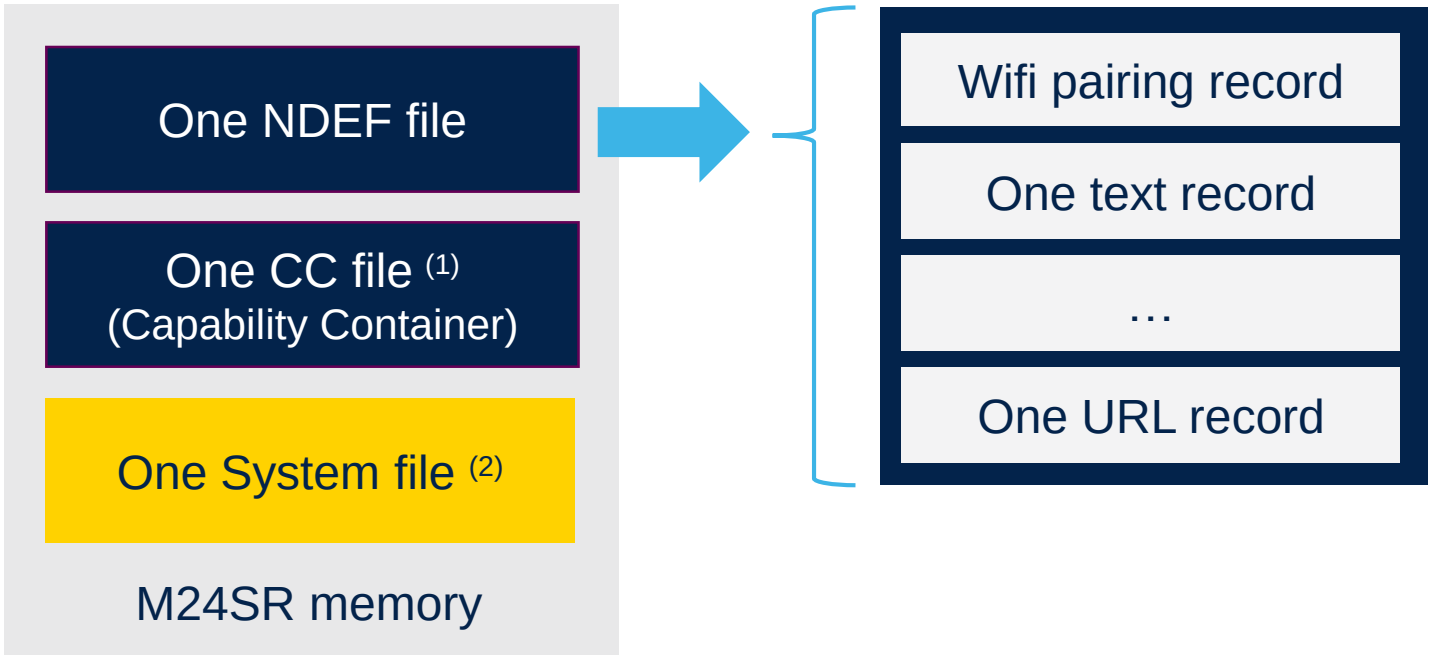
Memory organization

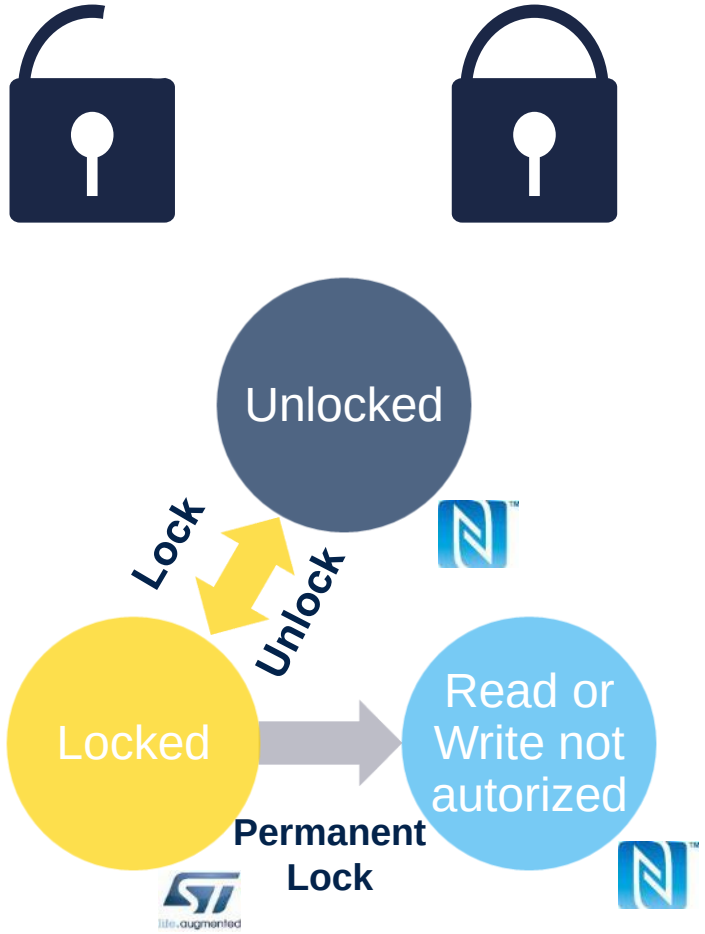
- The memory contains three types of file:
  - NDEF file, CC file and System file



(1) The CC file gives some information about the M24SR and the NDEF file (access conditions etc.). This file is a read-only file for the RF or I²C host and cannot be modified by issuing a write command.
(2) The system file is a ST proprietary file. It can be read by the RF or I²C host and written by the I²C host.

Data protection

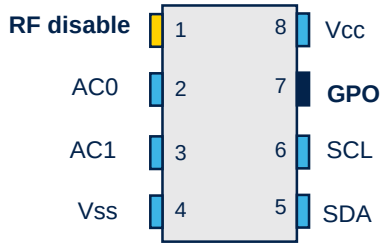
- Data protection thanks to a password. Why ?
  - To lock an NDEF file
- Password size: 128 bits
  - 3.4 10^{38} possibilities to find the right password
- 2 passwords,
  - One for read access
  - One for write access
- Possible to lock permanently in read or write access
- 2 bytes in the CC file are used to define the Read and Write access rights to the NDEF file.



GPO feature

- The configurable output signal (GPO) pad is mainly to wake-up or inform a micro-controller about one event. It's an open drain pad so external pull-up resistor to Vcc is required.

- 7 possible configurations
  - **Session Open**
    - An RF or I²C session ongoing
  - **MIP** (NDEF Message updating In Progress)
    - RF host writing an NDEF length different from 0x0000. This mode can be used to detect when the RF host changes the NDEF message as defined by NFC Forum
  - **WIP** (Writing In Progress)
    - M24SR is executing a writing operation
  - **INT** (interrupt)
    - RF or I²C host can force M24SR to send a negative pulse on the pin
  - **State mode**
    - RF or I²C host can control the state of the GPO pad during the RF session
  - **I²C ready response**
    - An I²C response is ready to be read by the I²C host
  - **RF busy**
    - RF host is communicating with M24SR



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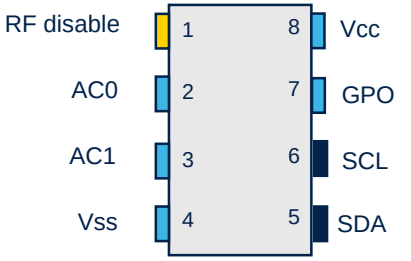
I²C interface

- I²C interface is typically used for connecting M24SR to a microcontroller. It features:
  - Two-wires I²C serial interface supports 1MHz protocol Single supply voltage
    - 2.4V to 5.5V for grade G (M24SR04)
    - 2.7V to 5.5V for grade Y (M24SR02/04/16/64)

- I²C uses only two bidirectional open-drain lines
  - Serial Clock (SCL)
    - Input signal used to strobe all data in and out of the device
    - Pull-up resistor must be connected from SCL to Vcc
  - Serial Data (SDA)
    - Bidirectional signal is used to transfer data in or out of the device
    - Pull-up resistor must be connected from SDA to Vcc



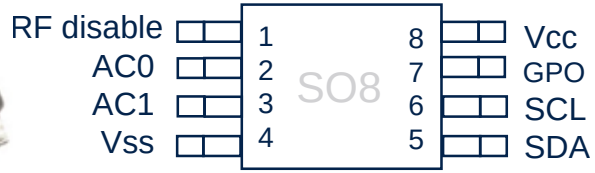
RF tuning capacitance

- The internal RF tuning capacitance is 25pF which is allowing antenna design from Class 1 to Class 6 form factor.

	M24SR
Standard	ISO14443
Main carrier frequency	13.56MHz
Data sub-carrier frequency	+ 848kHz
Optimal frequency tuning	14MHz – 14.4MHz
Internal capacitor (measured at 0.5V)	25pF
Recommended internal capacitor value for antenna design	27pF

M24SR packages

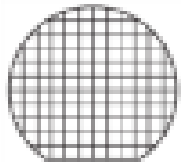
- SO8N Package – 4.9 x 3.9 mm



- TSSOP8 Package - 3.0 x 4.4 mm

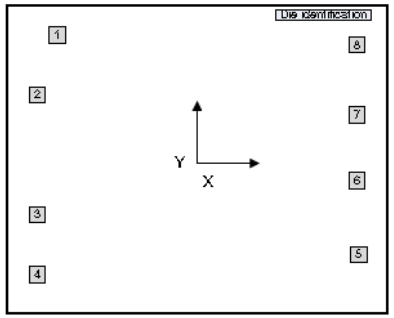
- UFDFPN8 Package - 2 x 3 mm

- Sawn & Bumped for wafer



SBN12 *

*** : sawn and bumped inkless 8” wafer, 120µm thickness (for M24LR04E and 64E)**



Bump	Signal name
1	RF disable
2	AC0
3	AC1
4	Vss
5	SDA
6	SCL
7	GPO
8	Vcc

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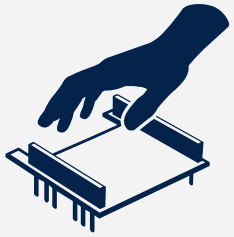
M24SR rich eco-system



- Discovery kits based on STM32 MCU
- STM32 Nucleo boards ecosystem
- STM32Cube software ecosystem

- Antenna e-design tool
- Schematic and BOM
- Gerber files

- Android ST25 NFC tap app
- PC software tool
- MCU drivers firmware

- Documentation
- e2e community
- Webinar / MOOC
- Training

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M24SR part numbers





M24SR	Package	2k-bit	4k-bit	16k-bit	64k-bit
Dynamic NFC Type 4 Tag ISO14443-A I2C IF + GPO + RF disable + Extended Temperature	SO8 TSSOP8 UFDFPN8 SBN12 SO8 TSSOP8	M24SR02-YMN6T/2 M24SR02-YDW6T/2 M24SR02-YMC6T/2 M24SR02-YSG12I/2	M24SR04-YMN6T/2 M24SR04-YDW6T/2 M24SR04-YMC6T/2 M24SR04-GSG12I/2	M24SR16-YMN6T/2 M24SR16-YDW6T/2 M24SR16-YMC6T/2	M24SR64-YMN6T/2 M24SR64-YDW6T/2 M24SR64-YMC6T/2 M24SR64-YSG12I/2 M24SR64-YMN8T/2 M24SR64-YDW8T/2

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Evaluation boards

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M24SR evaluation boards

M24SR-DISCO-PREM

M24SR discovery kit

- **M24SR64** Dynamic NFC Tag IC
- 30x30mm 5 turns double layer antenna
- STM32F1 MCU
- LCD Color display + Joystick + LEDs
- USB & JTAG connectors
- BT / Audio module with audio headset

X-NUCLEO-NFC01A1

M24SR Nucleo Shield

- **M24SR64** Dynamic NFC Tag IC
- 31x30mm 5 turns double layer antenna
- Compatible with STM32 Nucleo boards
- I2C interface to MCU through Arduino™ connector
- Open drain output for MCU wake-up

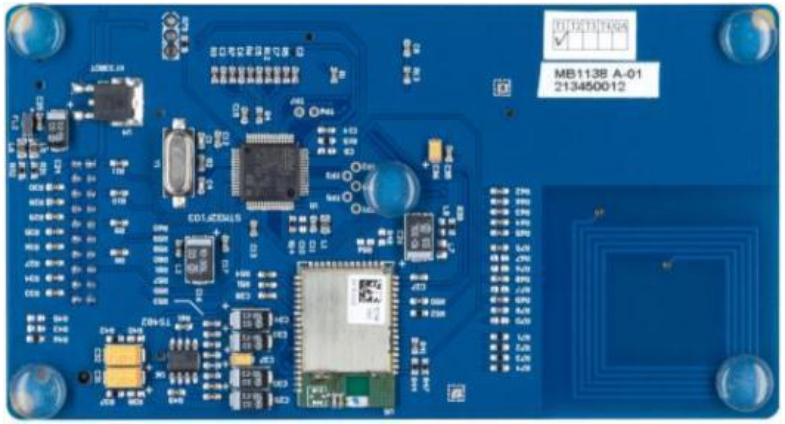
ANT7-T-M24SR64

M24SR Tiny antenna

- **M24SR64** Dynamic NFC Tag IC
- 14x14mm dual layer antenna
- I2C test points to connect to MCU
- GPO open drain user configurable output to indicate an ongoing RF operation

M24SR discovery kit

- M24SR evaluation and demonstration board
  - M24SR64 dynamic NFC tag IC
  - 30x30mm 5 turns double layer antenna
  - STM32F1 micro-controller
  - LCD color display + Joystick + LEDs
  - USB & JTAG connectors
  - BT / audio module with audio headset
- Reference: M24SR-DISCO-PREM



http://www.st.com/web/en/catalog/tools/PF259659

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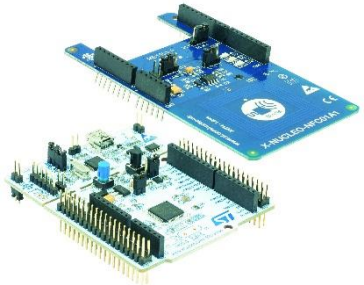
M24SR Nucleo shield

- M24SR Nucleo board for fast prototyping
  - M24SR64 dynamic NFC tag IC
  - 31x30mm 5 turns double layer antenna
  - Compatible with STM32 Nucleo boards
  - I2C interface to MCU through Arduino connector
  - Open drain output for MCU wake-up
  - Powered through the Arduino UNO R3 connector
  - 3 general purpose color LEDs
- Reference: X-NUCLEO-NFC01A1



http://www.st.com/web/en/catalog/tools/PF260759

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ANT7-T-M24SR antenna board

- ANT7-T-M24SR antenna reference board is a ready-to-use PCB that features a M24SR64-Y dynamic NFC tag.
  - M24SR64-Y dynamic NFC tag
  - 14 mm x 14 mm, 13.56 MHz dual layer etched antenna
  - I2C test points to connect to MCU
  - Open drain user configurable output to indicate an ongoing RF operation (GPO)
  - Digital RF disable input (DIS)

- Reference: ANT7-T-M24SR

http://www.st.com/content/st_com/en/products/evaluation-tools/product-evaluation-tools/st25-nfc-rfid-eval-boards/st25-nfc-rfid-eval-boards/ant7-t-m24sr64.html
Link does not work

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Solutions for NFC / RFID Tags & Readers

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