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M24LR product presentation

MMY division

May 2020





Main M24LR market segments

Smart industry



Factory automation,
Industrial lighting

Smart Home



Home automation,
Security Systems

Smart Things



Healthcare, Wellness

Smart City



Metering, Street Lighting



M24LR combined use cases

Device programming in production



- **In-the-box** quick programming thanks to **Long range**
- **Simple** and **flexible**

Servicing and Maintenance



- Download records history **contactless**
- **Update** parameters even if device is off thanks to **NFC phone**

Pairing for Wireless Industrial Network



- **ID Activation**
- Parameter **settings**

Convenient Data Logging



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



Typical NFC type 5 range

NFC phones



ISO15693 (26kb/s)
Up to 7 cm / 3in.



RFID readers



Up to 40cm / 1.3ft
ISO15693 (26kb/s)
Up to 1.0 m / 3ft



Reduce your antenna dimension and make your product more robust thanks to ISO15693



M24LR product

M24LR chip belongs to ST25 NFC / RFID Tags & Readers family

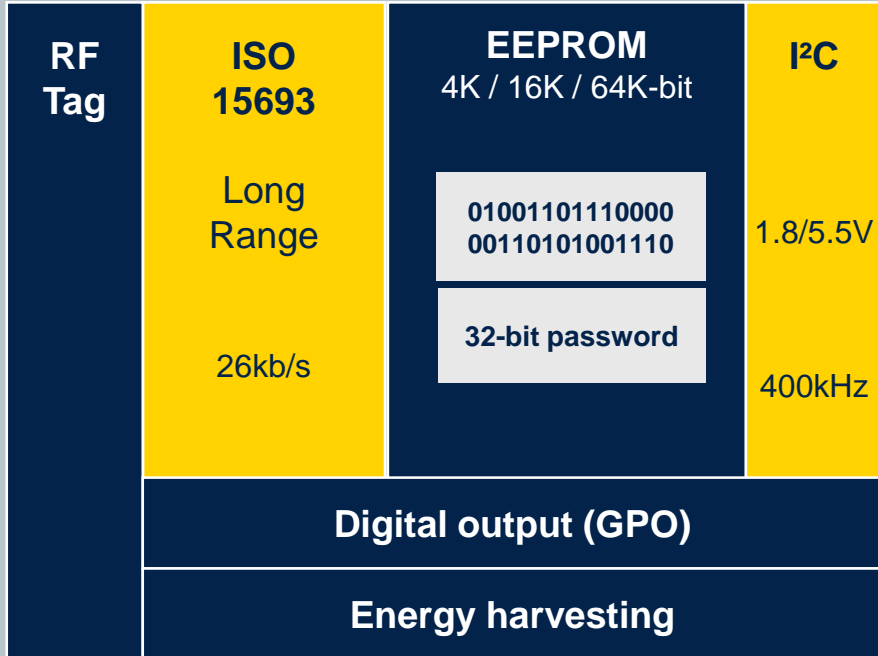
- **M24LR main features**
 - ISO15693 RF interface
 - I²C 400kHz interface (I²C fast mode) - 1.8V to 5.5V
 - Up to 64kbit EEPROM memory
 - 32-bit password for data protection
 - 40 years data retention & 1Mcycles erase/write
 - RF Write In Progress / RF busy GPO configurable output signal for MCU wake-up
 - Energy harvesting through RF
 - 8-pin packages



M24LR Dynamic NFC tag



M24LR04E / 16E / 64E



SO8



TSSOP8



FPN8

Use cases

- Dynamic data exchange with NFC phone
- Battery-less applications
- Parameter upgrade with RFID readers

Key Features

- **ISO15693** long-range RFID (with high power RFID readers)
- **Energy harvesting** function through RF

Key Benefits

- Easy of use (limited BOM, 8-pin package)
- Flexible interrupt pin for MCU wake-up
- Cost optimized discovery kit with Android app
- 40 years data retention, 1M cycles erase/write

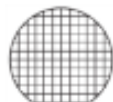




M24LR key features

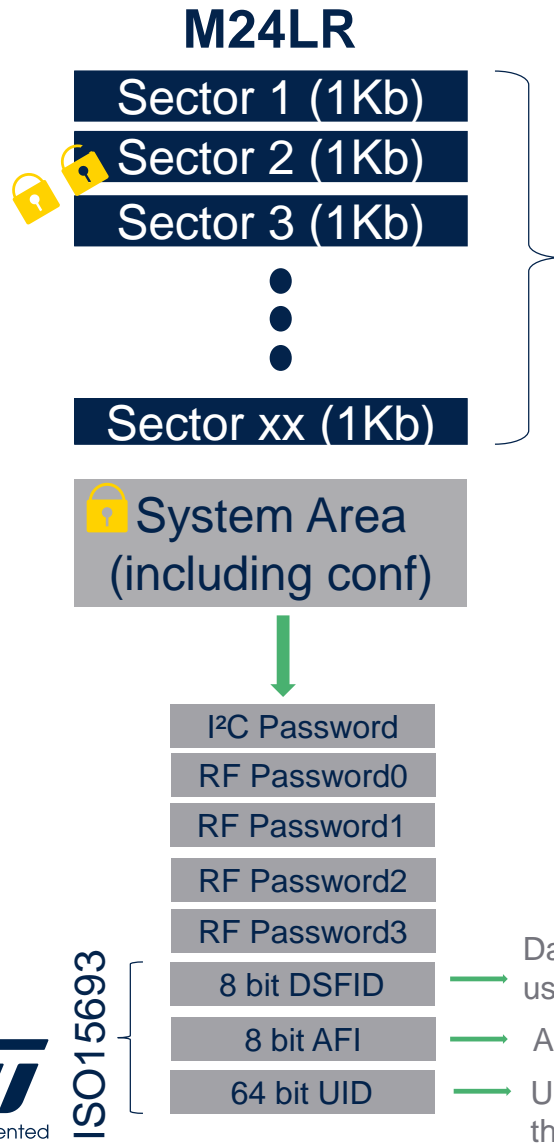
M24LR

Contactless Interface	ISO15693 NFC compatible
RF range	Long range (up to 1m)
RF speed	26kbps
Single supply voltage	1.8V to 5.5V
Serial Interface	I2C @400kHz
Extra features	MCU wake up Energy Harvesting
Memory format	EEPROM data
Memory size	4k / 16k / 64k-bit
Data retention	40-year at 55°C
Erase/Write cycles	1M cycles at +25°C
Data protection	Password 32-bit
Temperature range	-40°C to +85°C
Package	SO8 / TSSOP8 / FPN8





M24LR memory organization



- User Memory area: sector implementation
 - In RF mode
 - In one sector: 32 blocks of 32 bits = 1024 bits
 - Each read / write access is done by block
 - Read & Write block accesses are controlled by a Sector Security Status byte (5-bit) that defines the access rights to all the 32 blocks
 - In I²C mode
 - Sector provides 128 bytes that can be individually accessed in Read & Write modes
 - When protected by the corresponding I2C_Write_Lock bit, the entire sector is write protected
- Backward compatibility possible when using up to 4 sectors
 - Impact on memory protection to be taken into account (moving from 32-bit to 64-bit password)



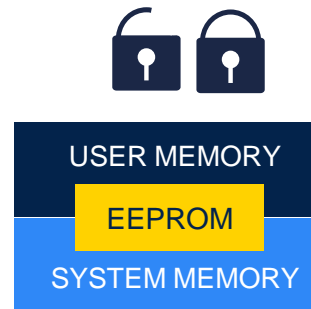
M24LR data protection

- User and System memory data protection thanks to a password
 - Password size 32-bit → 4.3 10⁹ combinations



Access from RF

- 3x passwords
- Each memory sector can be individually protected by 1 out of 3 available passwords.
- Each sector can have a Read / Write access conditions set.



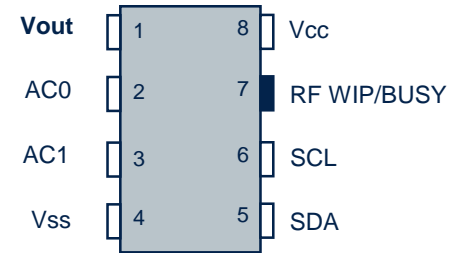
Access from I2C

- 1x password
- Write access can be protected thanks to I²C password.
- Read access is always allowed (no data protection).



M24LR - GPO feature

- The configurable output signal (GPO) is used either to indicate the M24LR is executing an internal write cycle from the RF channel or a RF command is in progress. RF WIP / BUSY are available only when Vcc is up

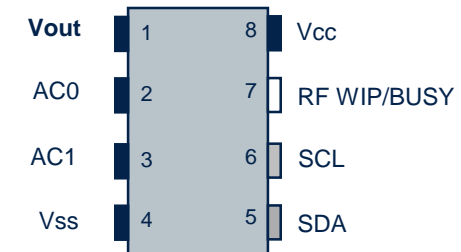


- 2 configurations
 - RF WIP (Write In Progress)**
 - The purpose of this mode is to indicate to the I²C bus master that some data has been changed in RF mode
 - RF Busy**
 - The purpose of this mode is to indicate to the I²C bus master whether the M24LRxxE-R is busy in RF mode or not
- Need of external pull-up resistor
 - GPO is based on open drain output and a pull-up resistor connected to Vcc is required**



M24LR I²C interface

- I²C (Inter-Integrated Circuit) is typically used for connecting M24LR to a micro-controller. It features:
 - Two-wires I²C serial interface supports 400kHz protocol (I²C fast mode)
 - Single supply voltage: 1.8V to 5.5V
 - Byte and Page Write (up to 4 bytes)
 - Random and sequential read modes
 - Self-timed programming cycle
- 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

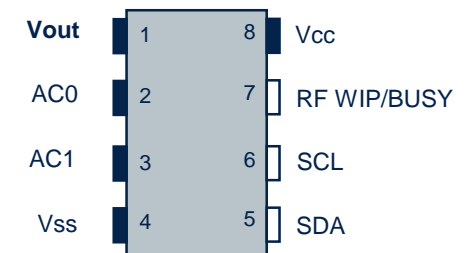




M24LR Energy Harvesting

- The M24LR provides an Energy harvesting mode on the analog output pin Vout
 - The general purpose of the Energy Harvesting mode is to deliver a part of the non necessary RF power received by the M24LR on the AC0-AC1 RF input in order to supply external devices thanks to Vout pin
 - In case the RF field strength is insufficient or when Energy harvesting mode is disabled, the analog output pin Vout goes into high-Z state and Energy harvesting mode is automatically stopped.

Range	H _{min}	P _{min}	V _{out} @I = 0	V _{out} @I _{sink_max}	I _{sink_max} @P _{min}
00	3.5 A/m	100mW	2.7V min 4.5V max	1.7V	6mA
01	2.4 A/m	60mW		1.9V	3mA
10	1.6 A/m	30mW		2.1V	1mA
11	1.0 A/m	16mW		2.3V	300μA





RF tuning capacitance

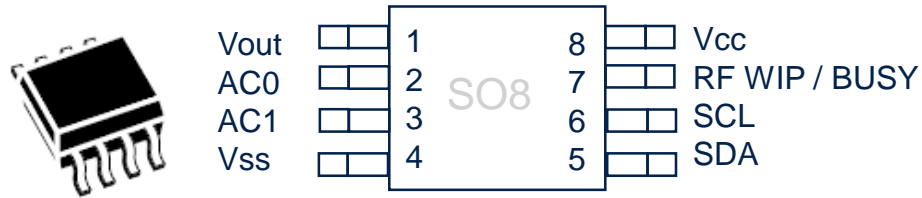
- The internal RF tuning capacitance is 27.5pF which is allowing antenna design from Class 1 to Class 6 form factor.

	M24LR
Standard	ISO15693
Main carrier frequency	13.56MHz
Data sub-carrier frequency	+ 424kHz
Optimal frequency tuning	13.6MHz – 14MHz
Internal capacitor (measured at 0.5V)	27.5pF
Recommended internal capacitor value for antenna design	29pF

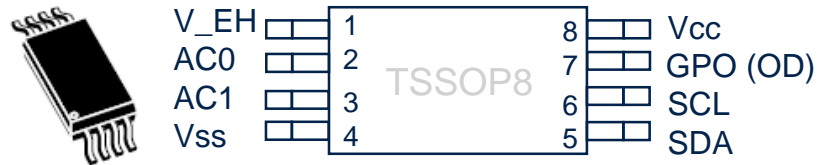


M24LR packages

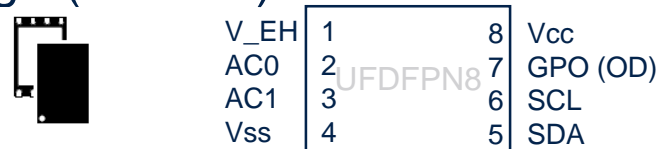
- SO8N Package (4.9x3.9mm)



- TSSOP8 Package (3x4.4mm)



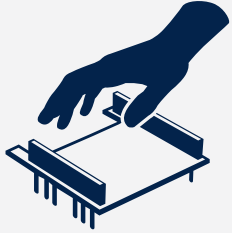
- UFDFPN8 Package (2x3mm)



Top view



M24LR 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 and iOS ST25 NFC tap app
- PC software tool
- MCU drivers firmware



- Documentation
- e2e community
- Webinar / MOOC
- Training



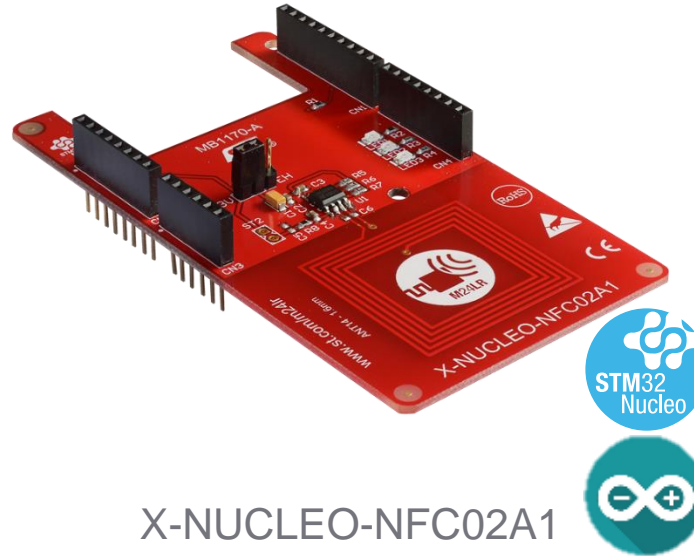
M24LR evaluation boards



M24LR-DISCOVERY

M24LR discovery kit

- **M24LR04E** Dynamic NFC/RFID tag IC
- 20x40mm 9 turns antenna
- STM8L152 micro-controller
- LCD display
- I2C & SWIP connectors
- Temperature sensor



X-NUCLEO-NFC02A1

M24LR Nucleo Shield

- **M24LR04E** Dynamic NFC/RFID tag IC
- 30x30mm 5 turns double layer antenna
- Energy harvesting feature
- Compatible with STM32 Nucleo boards
- I2C interface to MCU & Powered through Arduino™ connector



ANT7-T-M24LR

M24LR Tiny antenna

- **M24LR04E** Dynamic NFC/RFID tag
- 14x14mm dual layer antenna
- I2C test points to connect to MCU
- GPO RF WIP / RF BUSY (RF)
- Analog Energy Harvesting output (EH)



Product part numbers



M24LR	Package	4k-bit	16k-bit	64k-bit
Dynamic NFC Type 5 Tag ISO15693 + I2C IF + GPO + EH	SO8 TSSOP8 UFDFPN8	M24LR04E-RMN6T/2 M24LR04E-RDW6T/2 M24LR04E-RMC6T/2	M24LR16E-RMN6T/2 M24LR16E-RDW6T/2 M24LR16E-RMC6T/2	M24LR64E-RMN6T/2 M24LR64E-RDW6T/2 M24LR64E-RMC6T/2



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Solutions for NFC / RFID tags & readers



ST25 SIMPLY MORE CONNECTED



Thank you

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