

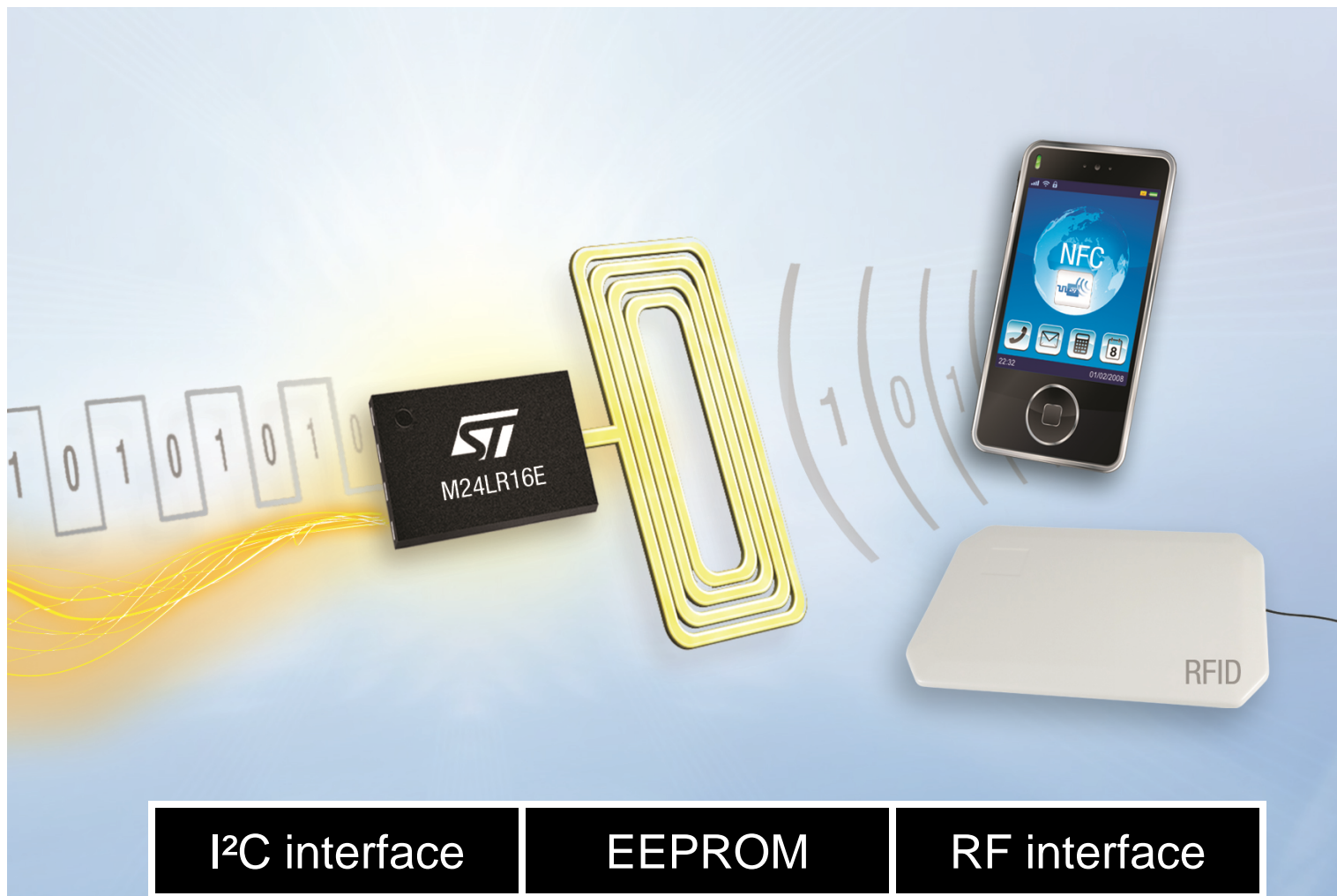


# Dual Interface EEPROM

Evaluation kits and boards



[www.BDTIC.com/ST](http://www.BDTIC.com/ST)



# Evaluation kits



**Demonstration kit**



**Development kit**

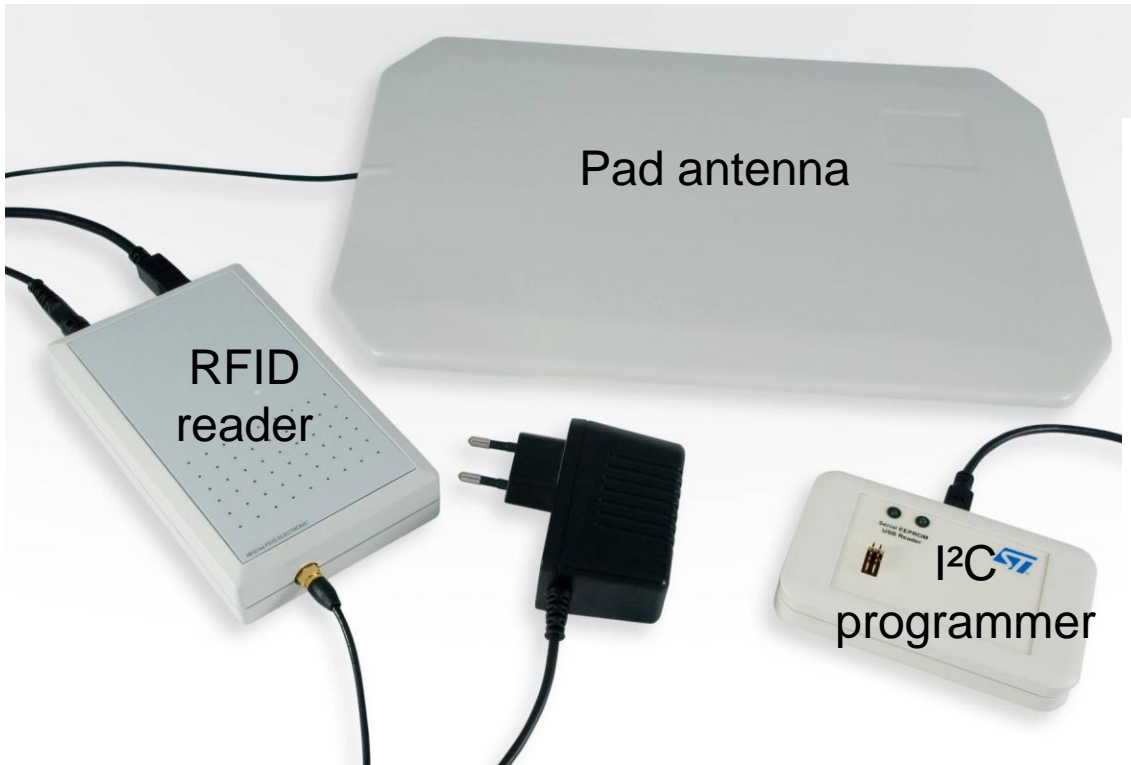
<b>Purpose</b>	Evaluation, proof-of-concept	Development, advanced evaluation
<b>RF operating distance</b>	Up to 8 cm*	Up to 40 cm*
<b>RF and I<sup>2</sup>C communication speed</b>	Slow *read 64 Kbit : 1” *write 64 Kbit : 1”	Fast *read 64 Kbit : 0’08” *write 64 Kbit : 0’31”
<b>RF capabilities</b>	1 tag at a time	Multi-tag capability
<b>Software</b>	Windows dll source code	Windows SDK for free (others platforms SDK with charge) <i>FEIG download access code available</i>
<b>Ordering information</b>	<b>DEMO-CR95HF-A</b>	<b>DEVKIT-M24LR-A</b>

\*Time depends on the computer and USB peripheral – times are representative but may vary

[www.BDTIC.com/ST](http://www.BDTIC.com/ST)

# Development kit – DEVKIT-M24LR-A

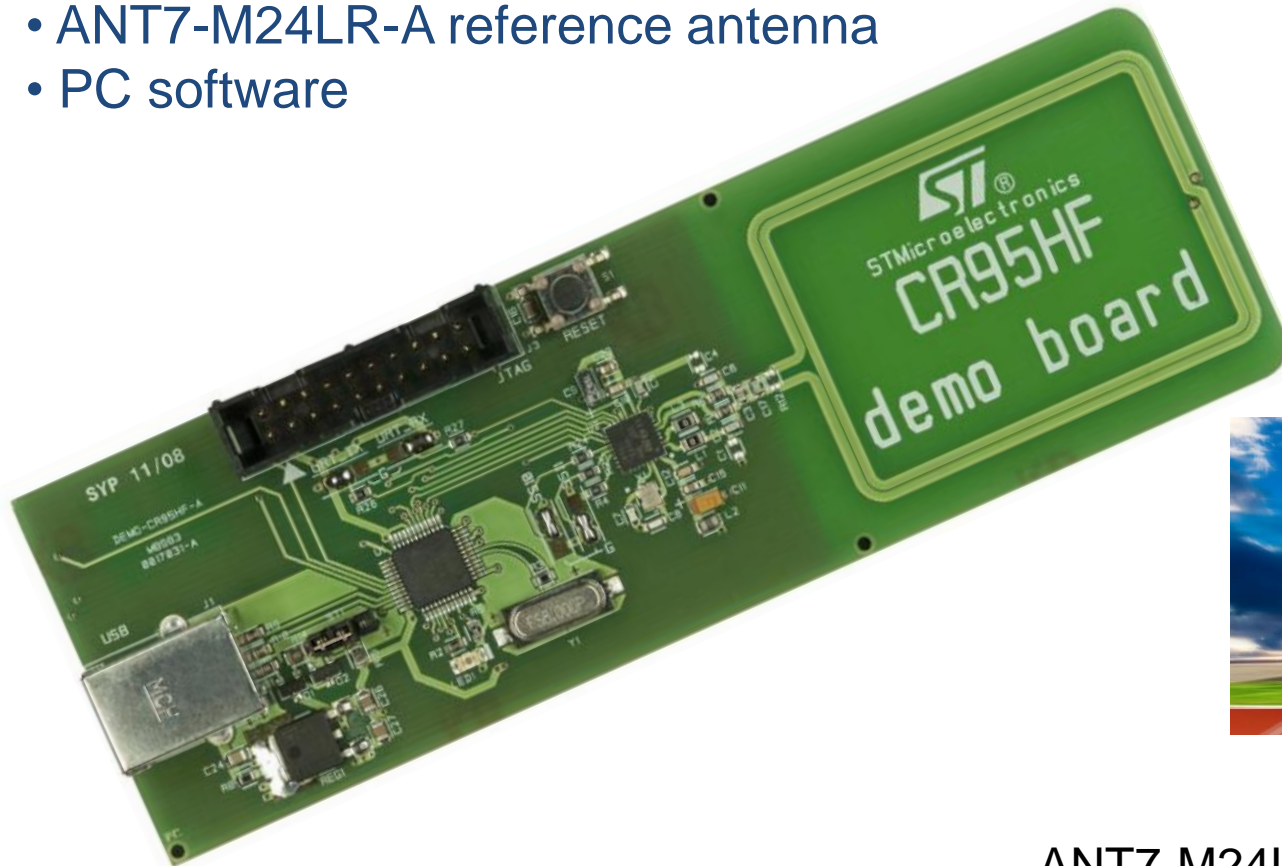
- Mid-range RFID reader
- I<sup>2</sup>C programmer
- ANT1-M24LR-A reference antenna
- PC software



ANT1-M24LR-A

# DEMO-CR95HF-A

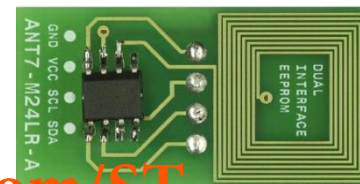
- Short-range RFID reader
- ANT7-M24LR-A reference antenna
- PC software



LRI2K



ANT7-M24LR-A



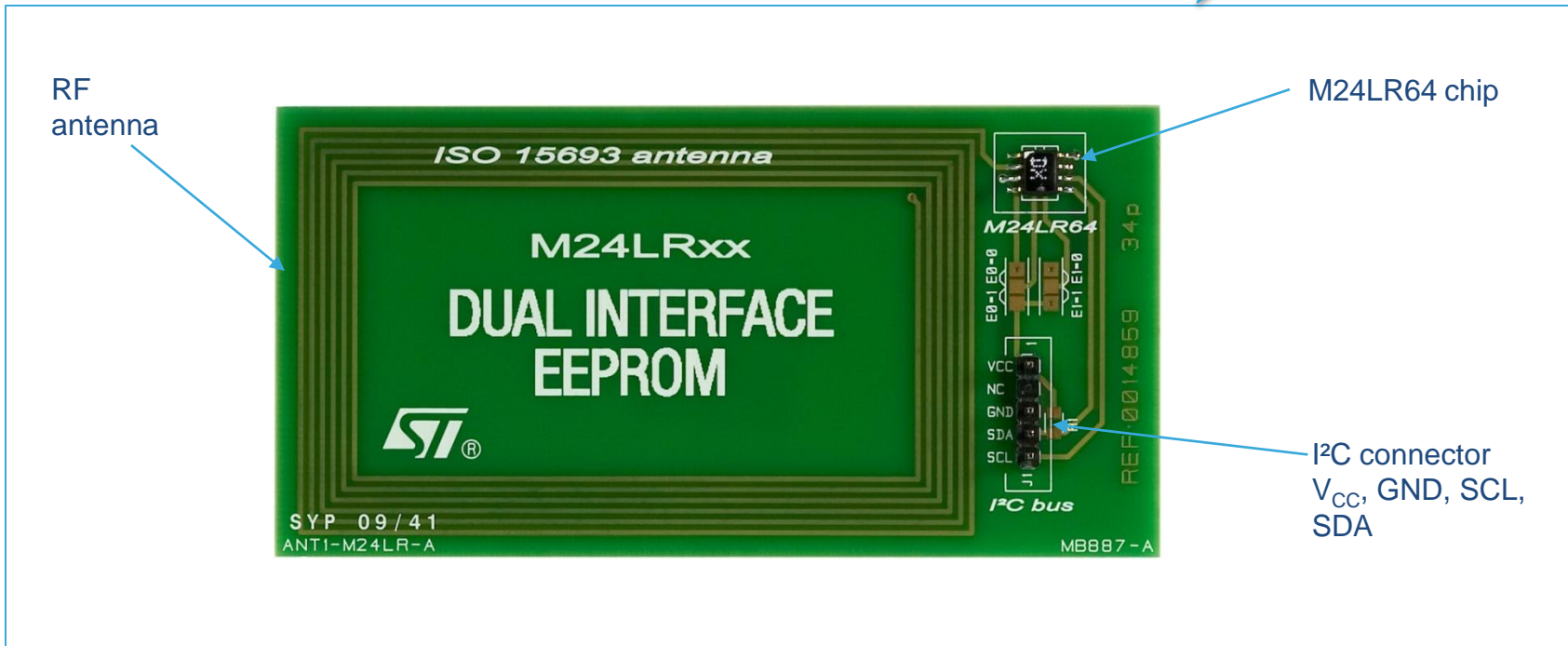
Note: Basic dll source files available for Windows only

# Evaluation boards for M24LR64

# ANT1-M24LR-A reference antenna

- The ANT1-M24LR-A board features:
  - M24LR64 memory chip
  - RF antenna: 75 mm x 45 mm (2.9 in x 1.77 in)
    - Credit card size
  - I<sup>2</sup>C connector

See AN2972 for more details



## ANT1-M24LR-A

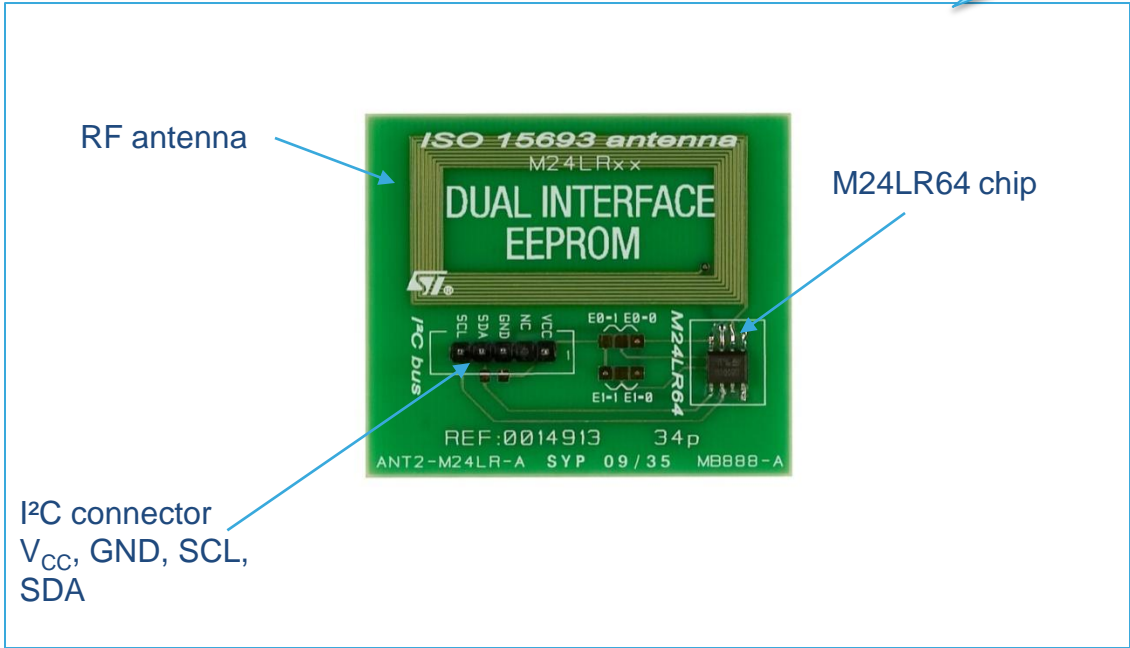
[www.BDTIC.com/ST](http://www.BDTIC.com/ST)



# ANT2-M24LR-A reference antenna

- The ANT2-M24LR-A board features:
  - M24LR64 memory chip
  - RF antenna: 20 mm x 40 mm (0.79 in x 1.57 in)
  - I<sup>2</sup>C connector

See AN2972 for more details

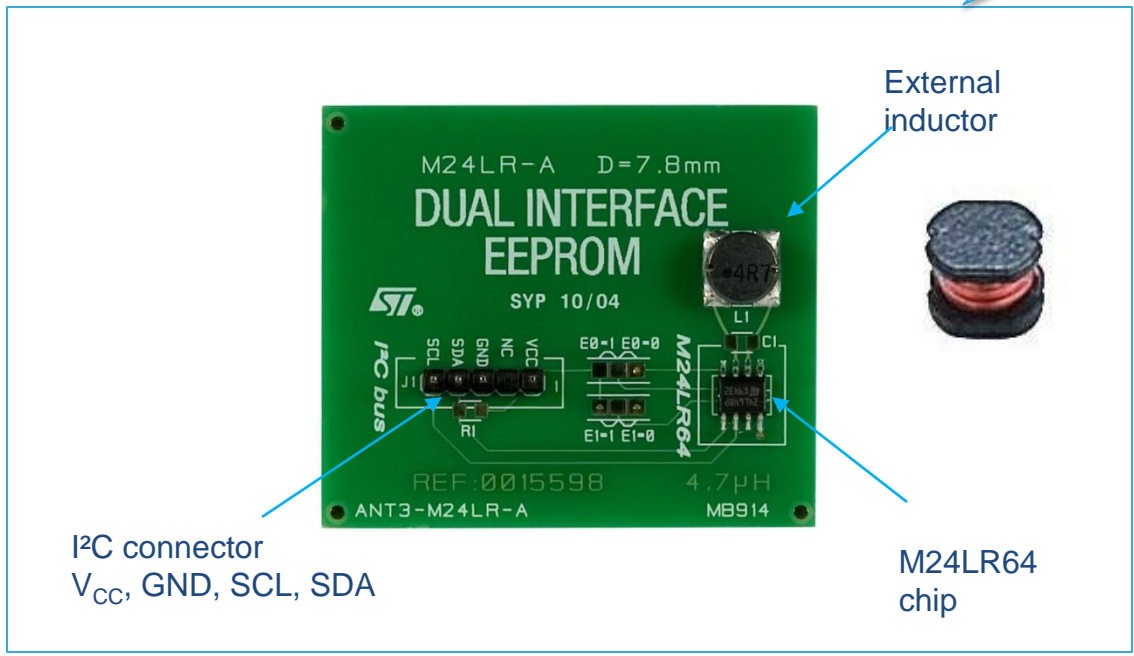


## ANT2-M24LR-A

# ANT3-M24LR-A reference antenna

- The ANT3-M24LR-A board features:
  - M24LR64 memory chip
  - Surface-mount (SMD) inductor
    - 4.7  $\mu$ H, 7.8 mm diameter, 5.3 mm height
  - I<sup>2</sup>C connector

See AN3178 for more details

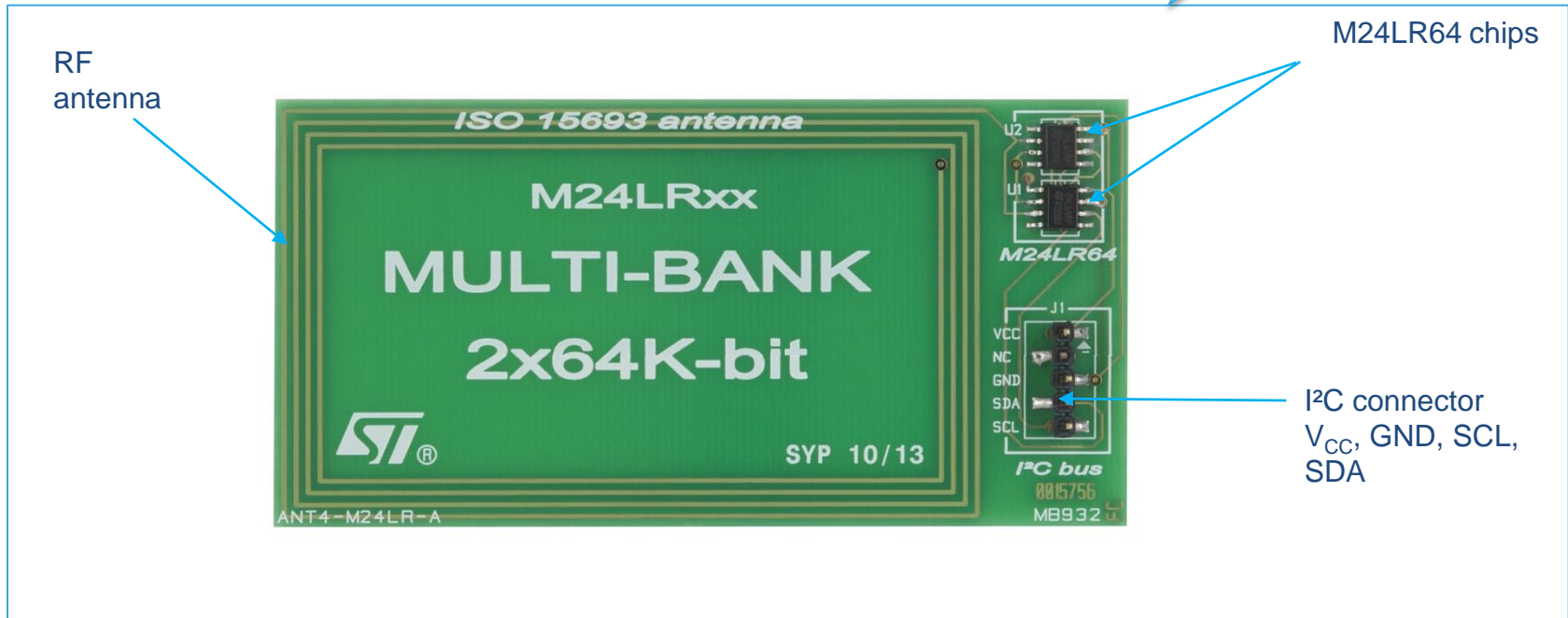


## ANT3-M24LR-A

# 128-Kbit multi-bank reference design

- The ANT4-M24LR-A board features:
  - 2x M24LR64 memory chips
    - > connected to the same antenna and I<sup>2</sup>C bus <
  - RF antenna: 75 mm x 45 mm (2.9 in x 1.77 in)
    - Credit card size
  - I<sup>2</sup>C connector

See AN3250 for more details

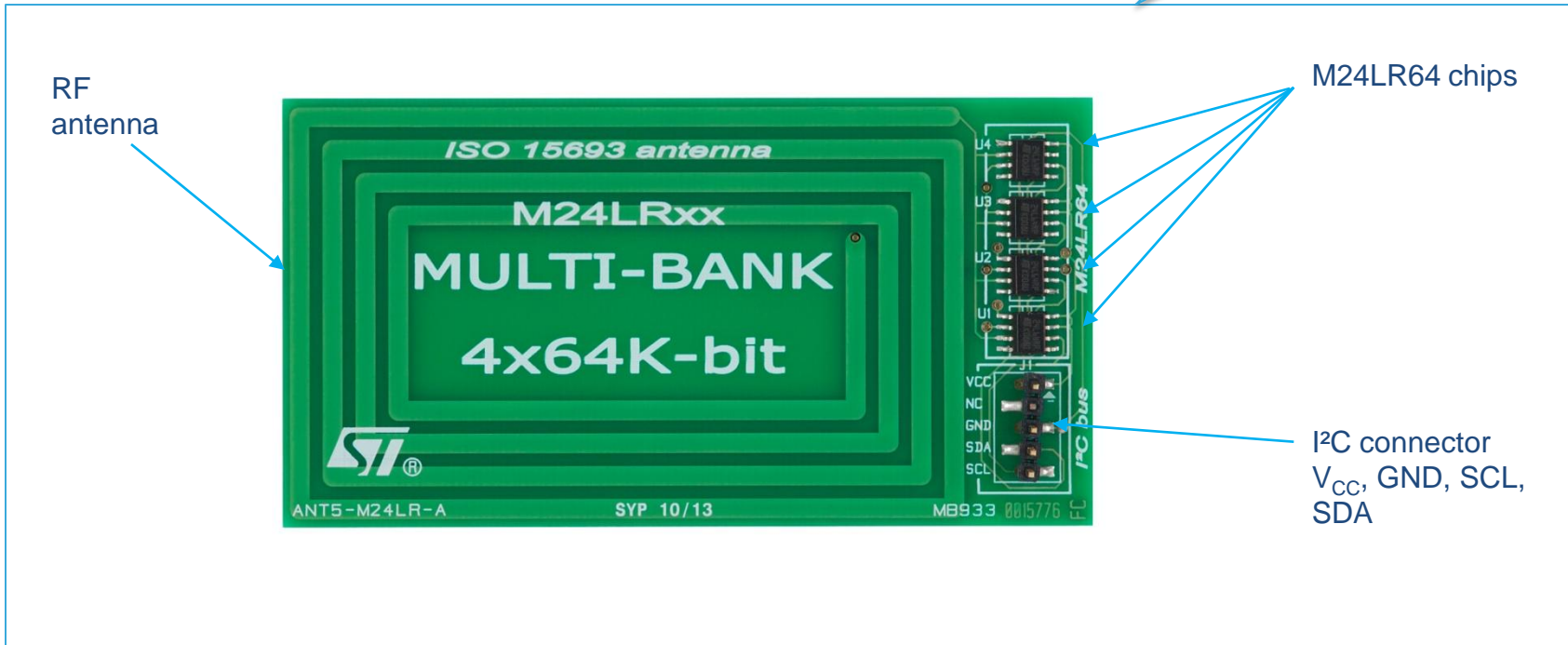


## ANT4-M24LR-A

# 256-Kbit multi-bank reference design

- The ANT5-M24LR-A board features:
  - 4x M24LR64 memory chips
    - > connected to the same antenna and I<sup>2</sup>C bus <
  - RF antenna: 75 mm x 45 mm (2.9 in x 1.77 in)
    - Credit card size
  - I<sup>2</sup>C connector

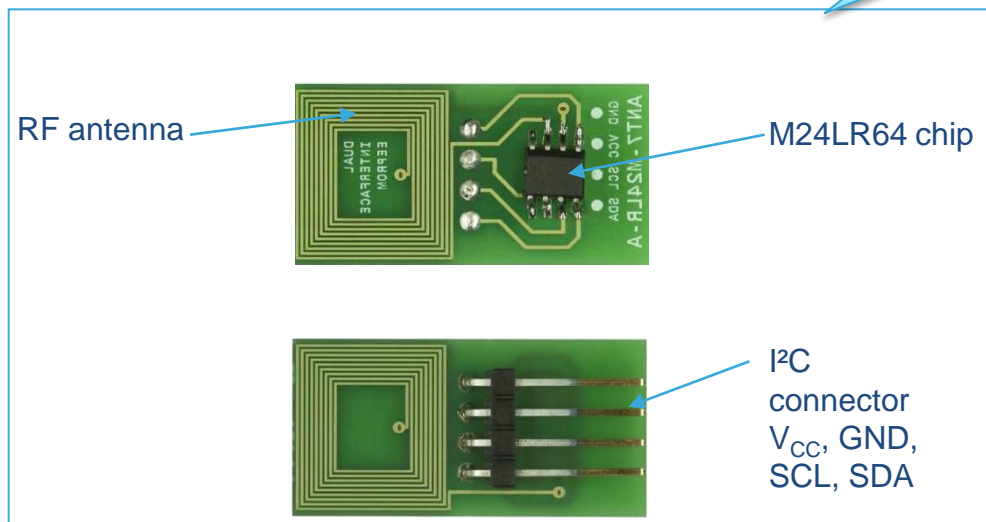
See AN3250 for more details



# ANT7-M24LR-A reference antenna

- The ANT7-M24LR-A board features:
  - M24LR64 memory chip
  - RF antenna: 20 mm x 40 mm (0.79 in x 1.57 in)
  - I<sup>2</sup>C connector

See AN2972 for more details



## ANT7-M24LR-A

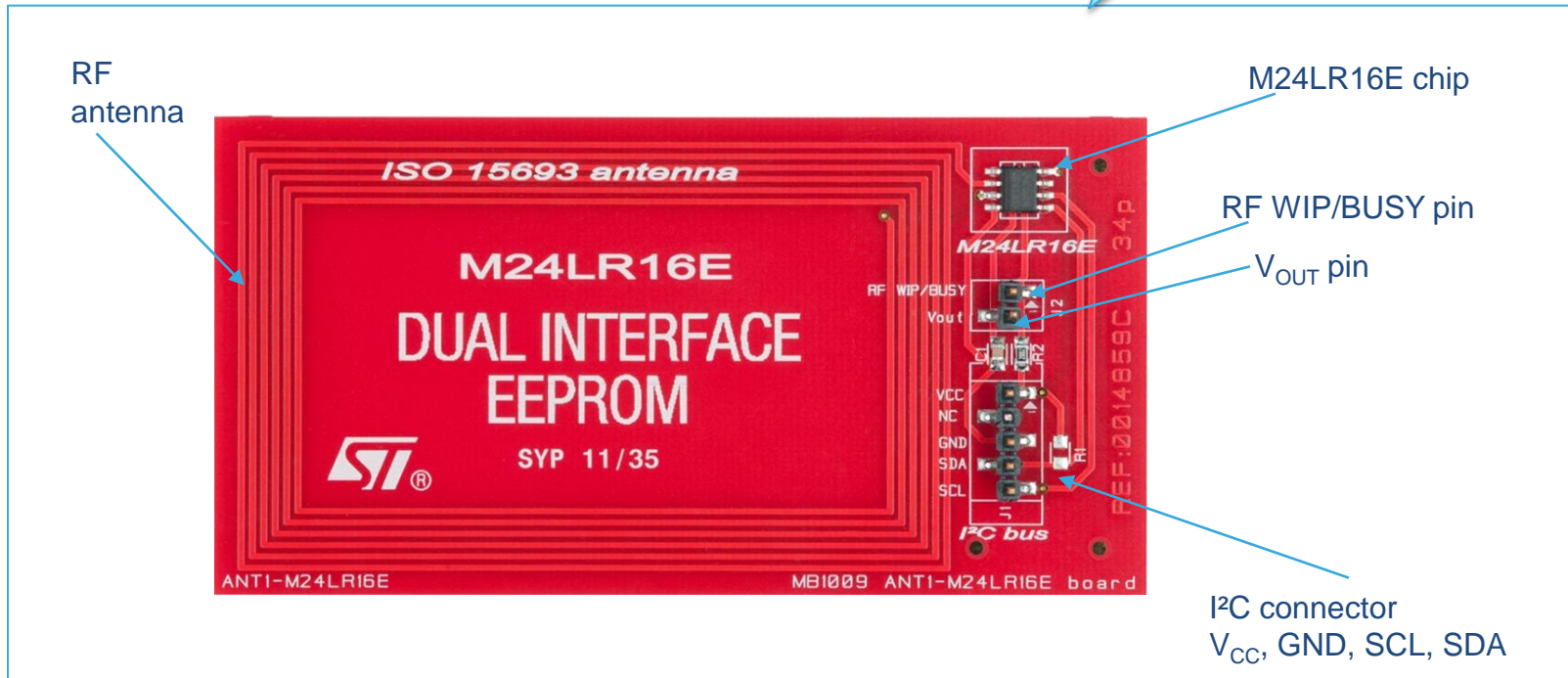
[www.BDTIC.com/ST](http://www.BDTIC.com/ST)

# Evaluation boards with M24LR16E

# ANT1-M24LR16E reference antenna

- The ANT1-M24LR16E board features:
  - M24LR16E memory chip
  - RF antenna: 75 mm x 45 mm (2.9 in x 1.77 in)
    - Credit card size
  - I<sup>2</sup>C connector
  - RF WIP/BUSY connector
  - Energy harvesting output V<sub>OUT</sub>

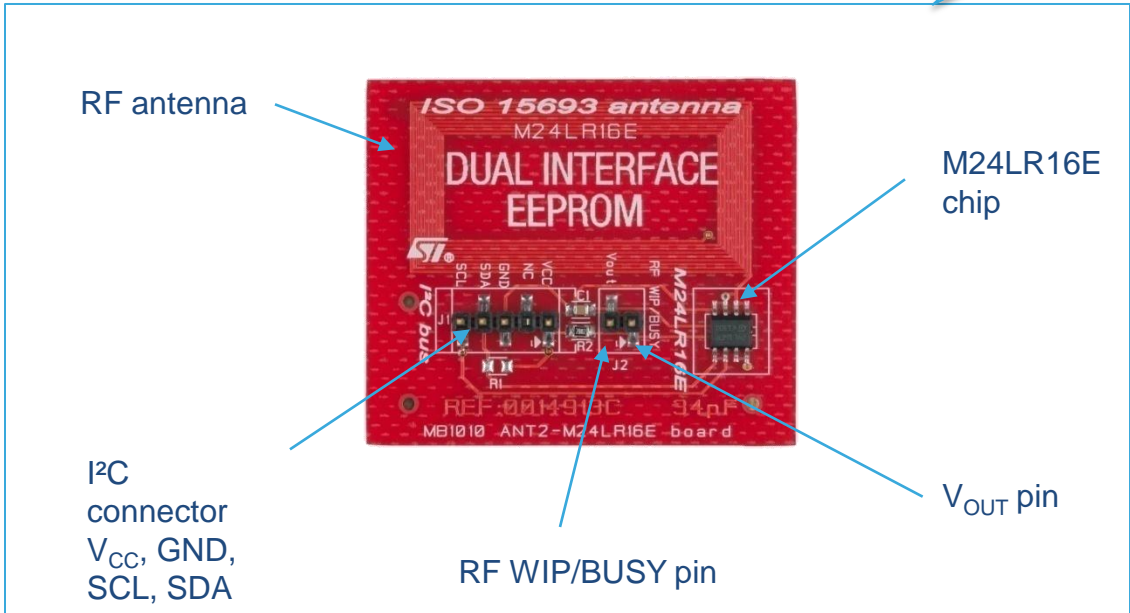
See AN2972 for more details



# ANT2-M24LR16E reference antenna

- ANT2-M24LR16 board features:
  - M24LR16E memory chip
  - RF antenna: 20 mm x 40 mm (0.79 in x 1.57 in)
  - I<sup>2</sup>C connector

See AN2972 for more details



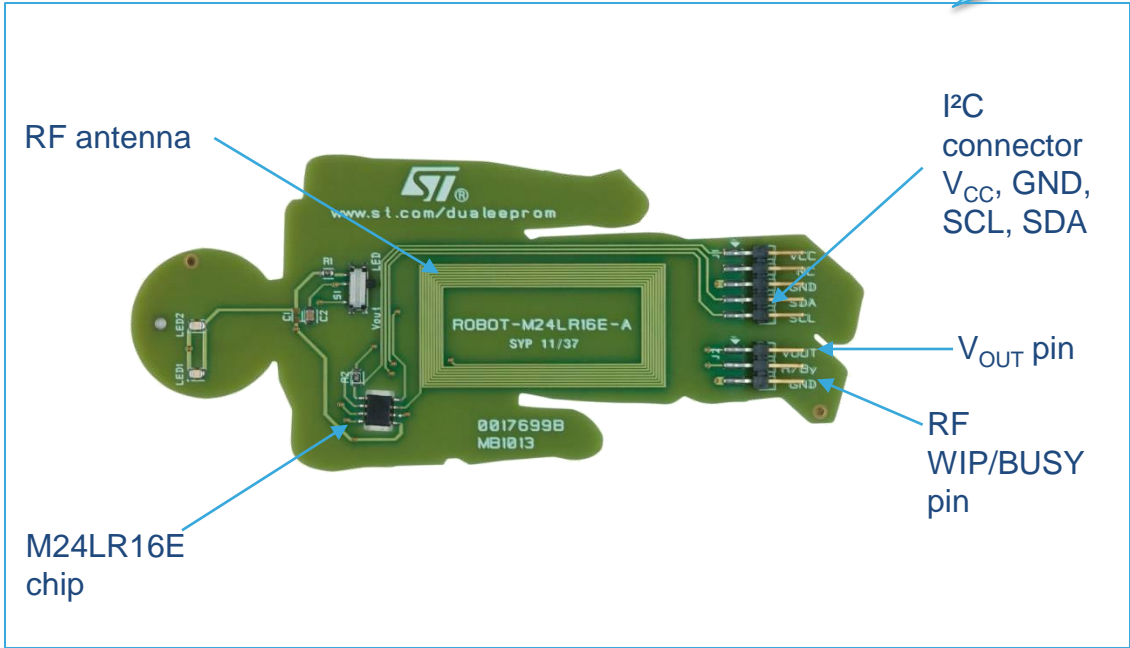
## ANT2-M24LR16E



# ROBOT-M24LR16E-A reference antenna

- The ROBOT-M24LR16-A board features:
  - M24LR16E memory chip
  - RF antenna: 20 mm x 40 mm (0.79 in x 1.57 in)
  - I<sup>2</sup>C connector

See AN2972 for more details



## ROBOT-M24LR16E-A

# M24LR64 datalogger reference design

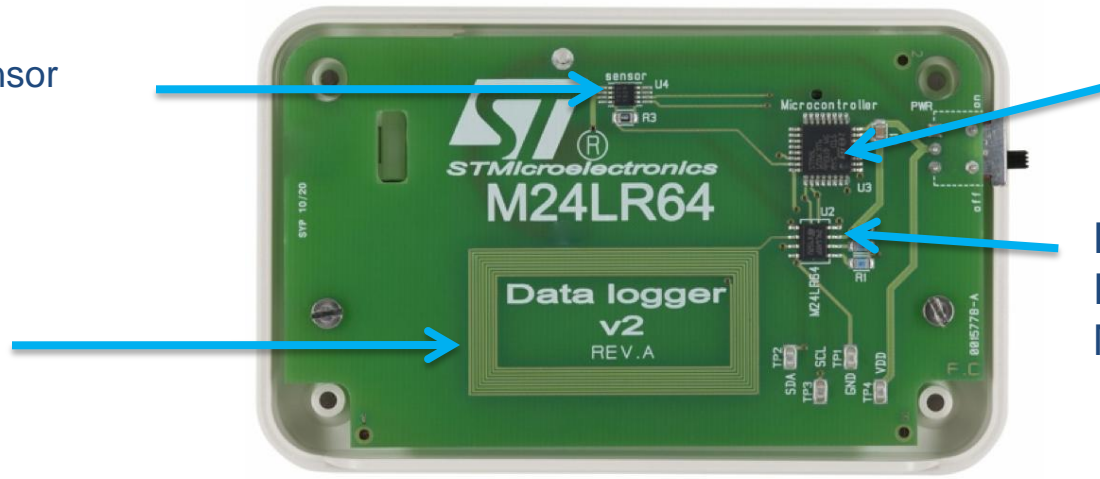
# DATALOG-M24LR-A evaluation board

Temperature sensor  
STTS75

Antenna  
20 x 40 mm

Microcontroller  
STM8L

Dual Interface  
EEPROM  
M24LR64-R

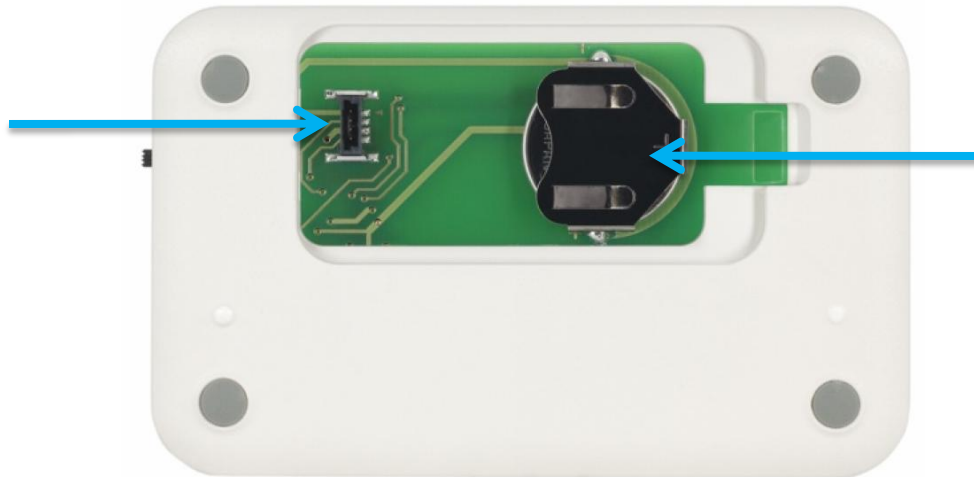


Front side view

Back side view

SWIM connector

3 V battery



# M24LR64-R datalogger reference design

- Demonstrates the use of the M24LR64 in a temperature data-logging application such as medical or industrial sensors
- Helps customers get started with their RFID-enabled datalogger design
- Can be extended to also sense shocks, vibrations, light (see *STEVAL-IPR002V1 evaluation board*)



DATALOG-M24LR-A



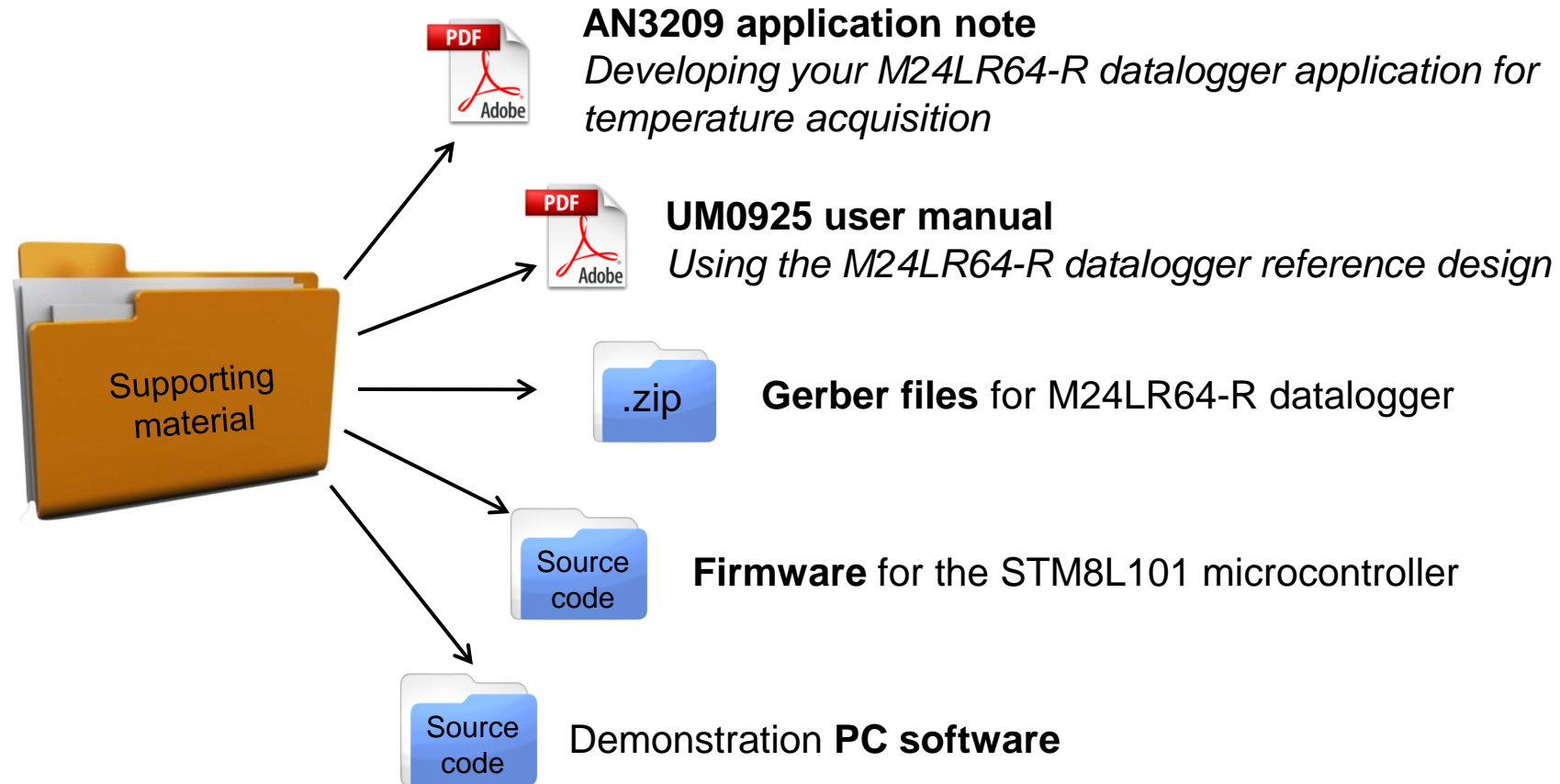
Demonstration software



Supporting material

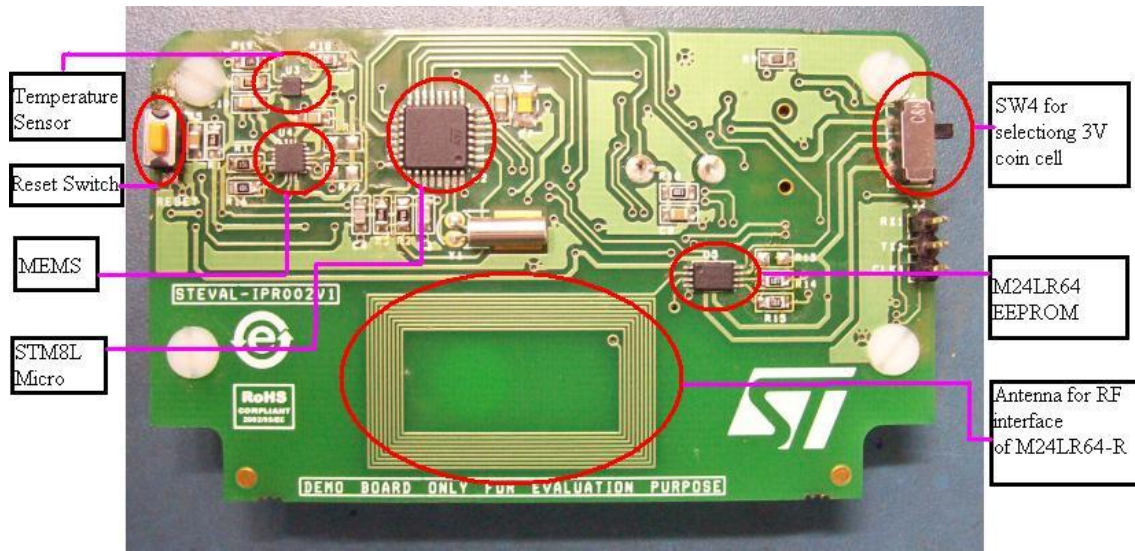
# M24LR64-R datalogger supporting material

21



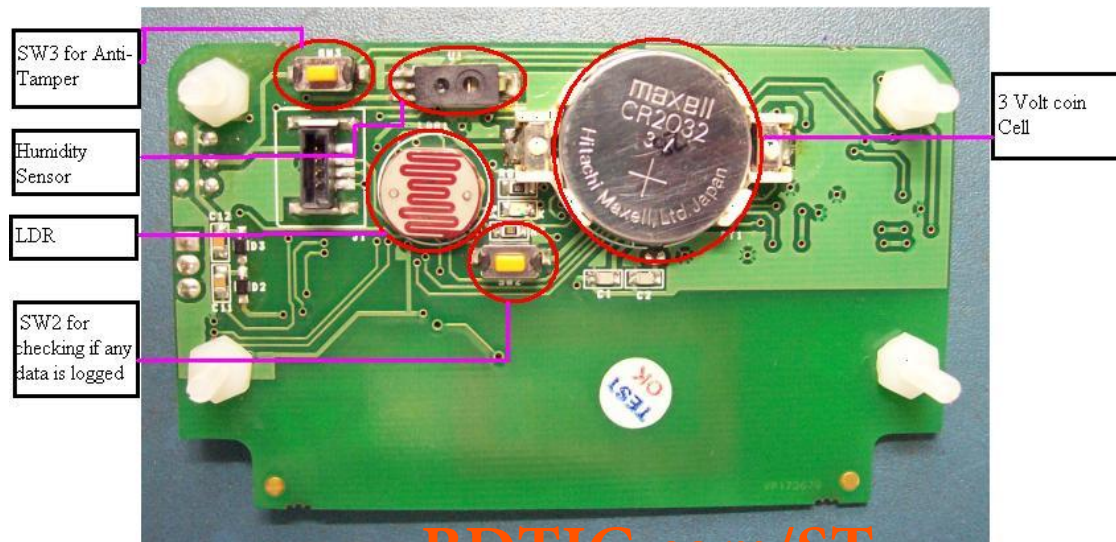
The M24LR64-R datalogger supporting material can be downloaded at [www.st.com/dualeeprom](http://www.st.com/dualeeprom)

# STEVAL-IPR002V1 evaluation board



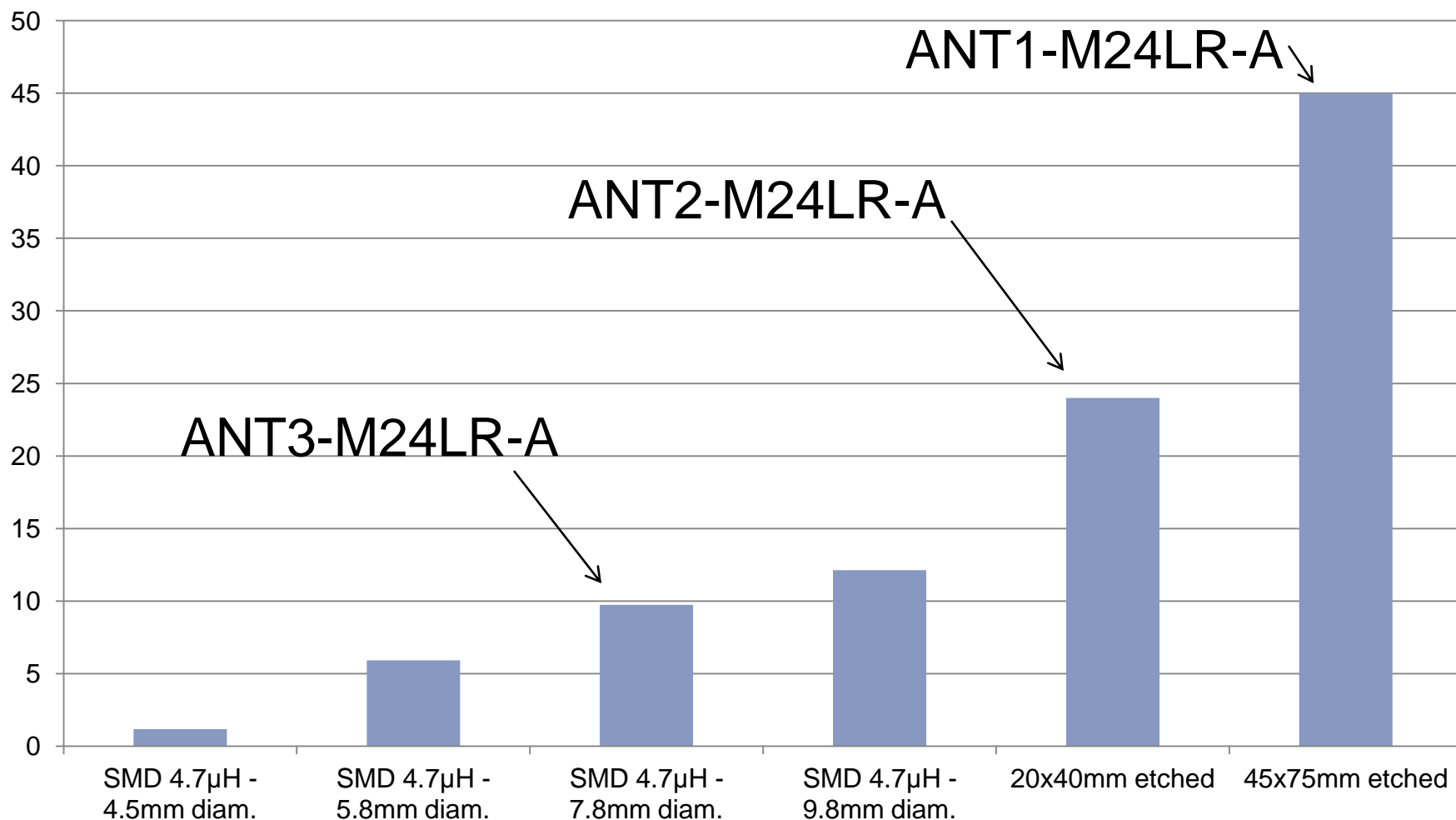
Front side view

The STEVAL-IPR002V1 is an autonomous battery-powered datalogger that can record and store 64 Kbits from six different sensors data using the M24LR64-R Dual Interface EEPROM (I<sup>2</sup>C and RF).



Back side view

# Read range (cm) versus antenna type



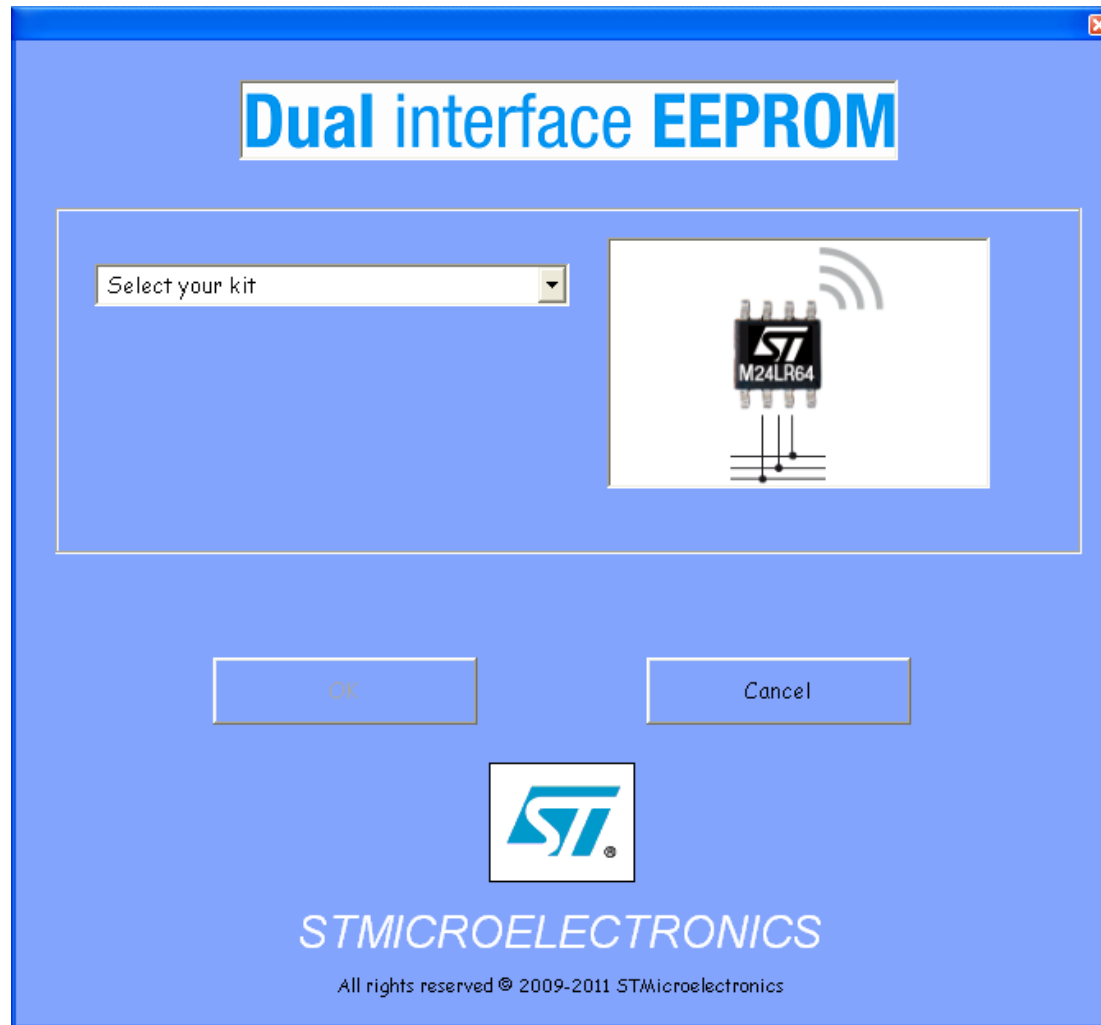
**Measurements with Feig MR101 pad antenna reader in free air**

# Dual Interface EEPROM

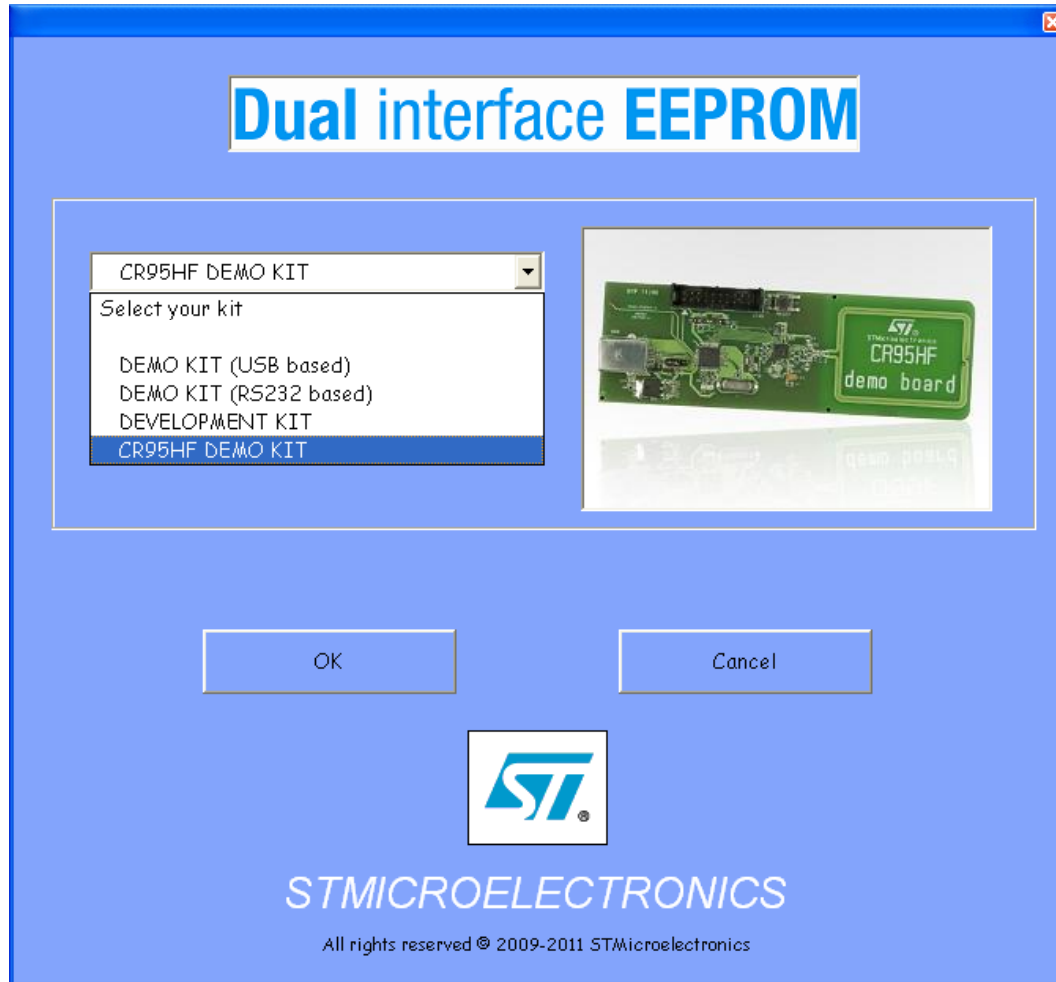
Software



# One user interface for all kits



# One user interface for all kits



Main menu

[www.BDTIC.com/ST](http://www.BDTIC.com/ST)

# I<sup>2</sup>C mode user interface

DUAL INTERFACE EEPROM - M24LR64

show RF interface

## I2C User Interface

**I2C READ**

Memory  
Address from 0000 to Address 1FFF

SSS (system)  
 I2C write Lock bits (system)  
 System Parameter Sector (system)

Read

**I2C WRITE**

Memory  
 SSS (system)  
 I2C write Lock bits (system)  
 System Parameter Sector (system)

Address from 0120 to Address 127 Page Size 4

Write Memory (memory area)  
12 34 56 78 Fill with Write

**I2C PASSWORD**

Present Password  
 Write Password

Present Password 00 00 00 00 Fill with Present

**MEMORY seen by I2C**


sector	memory	datas
	0000	FF D8 FF E0
	0004	00 10 4A 46
	0008	49 46 00 01
	000C	01 01 00 60
	0010	00 60 00 00
	0014	FF E1 00 72
	0018	45 78 69 66
	001C	00 00 49 49
	0020	2A 00 08 00
	0024	00 00 01 00
	0028	69 87 04 00
	002C	01 00 00 00
	0030	1A 00 00 00
	0034	00 00 00 00
	0038	01 00 86 92
	003C	02 00 3D 00
00	0040	00 00 2C 00
	0044	00 00 00 00
	0048	00 00 43 52
	004C	45 41 54 4F
	0050	52 3A 20 67
	0054	64 2D 6A 70
	0058	65 67 20 76
	005C	31 2E 30 20
	0060	28 75 73 69
	0064	6E 67 20 49
	0068	4A 47 20 4A
	006C	50 45 47 20
	0070	76 36 32 29
	0074	2C 20 64 65
	0078	66 61 75 6C
	007C	74 20 71 75

**Warning**

There is no way to retrieve RF or I2C password. If you change a Password, please don't forget it.

ACK OK

DUAL INTERFACE EEPROM



# RF mode user interface

DUAL INTERFACE EEPROM - M24LR64
RF POR

## RF User Interface

MEMORY seen by RF

sector	block	datas	sss
00E0		AB A9 5F C5	
00E1		A6 69 B7 17	
00E2		D3 7F AB 82	
00E3		32 E4 67 19	
00E4		F4 03 DC 9E	
00E5		3F 1A C5 F0	
00E6		7D F9 D4 7C	
00E7		2A 26 85 E3	
00E8		37 85 E5 32	
00E9		EE 1C 09 59	
00EA		8B 72 07 6E	
00EB		41 FA 56 17	
00EC		C4 ED 63 CB	
00ED		B7 B6 D2 23	
00EE		7C 34 BF BE	
00EF		9B 9F E1 07	
00F0	07	E5 1F 89 C9	XX
00F1		FF 00 80 8A	
00F2		E2 34 1F 10	
00F3		5D F8 7B 50	
00F4		17 36 AC 19	
00F5		1B 02 58 58	
00F6		FC B2 2F A1	
00F7		F4 3E 87 B7	
00F8		D3 20 FA B4	
00F9		30 2E A6 19	
00FA		C9 6E DD D7	
00FB		C8 F0 B1 59	
00FC		9C 68 E3 14	
00FD		1F C2 95 9F	
00FE		AB FF 00 2F	
00FF		F3 3A 2D 43	

Warning

There is no way to retrieve RF or I2C password. If you change a Password, please don't forget it.

01034AE0022C1347700711

**DUAL INTERFACE EEPROM**

from block  to block

Fill with

Tag	UID	DSFI
1	E0022C1347700711	4A

System infos	
UID	E0022C1347700711
DSFID	4Ah
AFI	25h
Memory size	0307FFh
IC reference	2Ch

DUAL INTERFACE EEPROM

## Dual interface EEPROM

### WRITE PICTURE TO M24LR64

1- select the image to transfer



2- select the transfer path

I2C  RF

3- Upload Picture

UpLoad

### READ M24LR64 CONTENT

1- select the transfer path

I2C  RF

2- DownLoad Picture

DownLoad



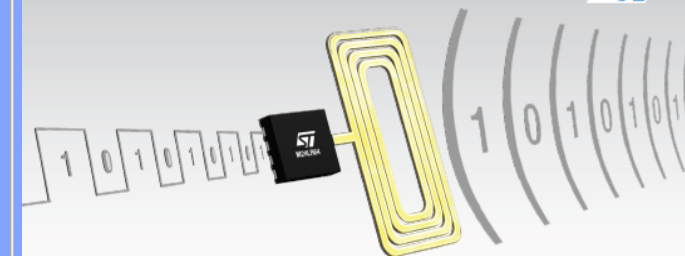
check RF communication

check I2C communication



All rights reserved © 2009 STMicroelectronics

## DUAL INTERFACE 64-Kbit EEPROM I<sup>2</sup>C & ISO 15693



STMicroelectronics

Based on contact and contactless interface, free your innovation with M24LR64 unique features



- High reliability EEPROM memory
  - 40 years data retention
  - 1 million read/write cycles (PC) and 100k cycles (RF)
  - 32-bit password protection scheme
- Serial Interface
  - PC 400 kHz, 1.8 V to 5.5 V
  - Supported by most microcontrollers and DSPs
- RF interface
  - ISO 15693 compliant, passive RFD technology
  - Read range from 0 to 1 meter

www.st.com

# Dual Interface EEPROM

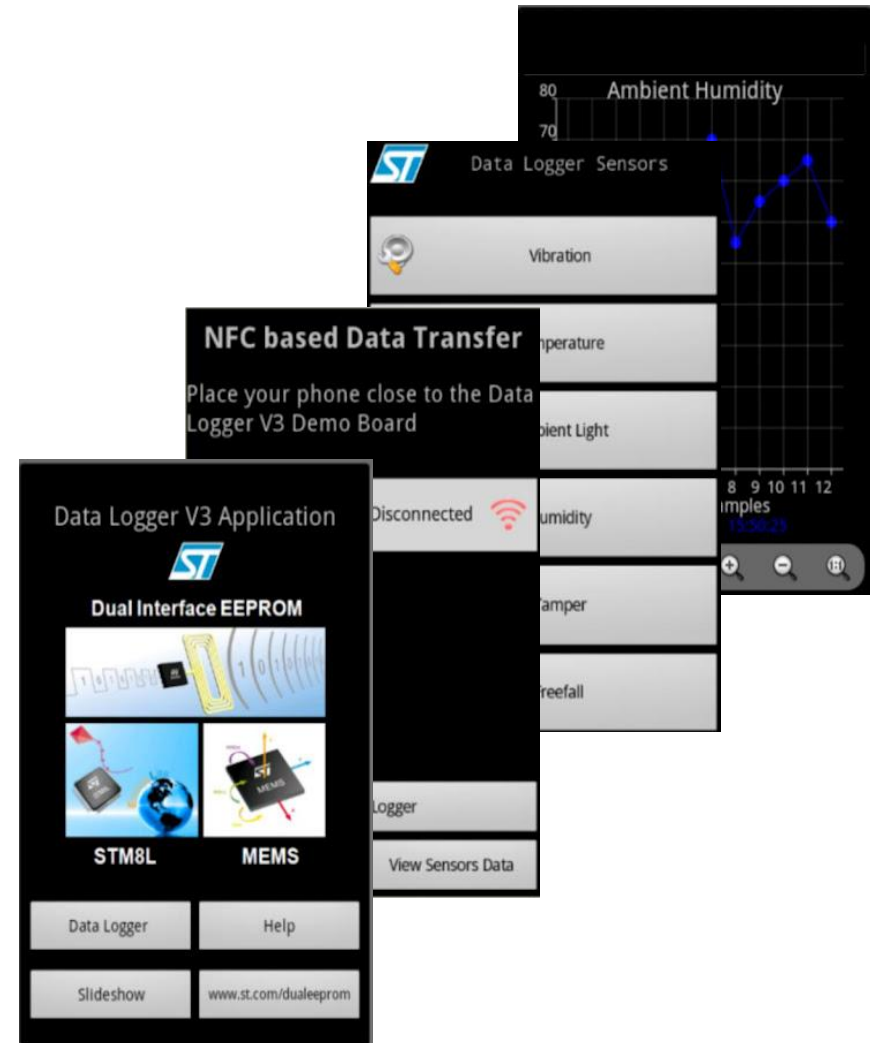
Android™ application

# Dual Interface EEPROM

- The Android application manages the phone's NFC chip (read and write operations) in order to exchange data with the datalogger-M24LR-A, such as:
  - Save new settings to the datalogger device\* Main features
  - Start/stop a temperature acquisition
  - Download acquired temperatures from the datalogger device\*
  - Trace a graph of downloaded values (vertical and horizontal orientation)
  - Display statistics (max/min/avg values, histogram, and more)
  - Change settings (frequency acquisition, overwrite option)



- This application allows your NFC phone to communicate with multi-sensor board STEVAL-IPR002V1. It is able to:
  - Download data from all of the sensors from the STEVAL-IPR002V1 board
  - Display the sensor data on 6 different graphical curves
- Main features
  - Start/stop sensor acquisition
  - Download acquired data's sensors from the STEVAL-IPR002V1 device
  - Trace a graph of downloaded values (vertical and horizontal orientation)





- The NfcV-Reader is an application for NFC ISO/IEC 15693 enabled Android™ smart phones to:
  - Read and write NDEF messages by using NFC features of Android™ OS  
*The NDEF message is a data format defined by NFC forum specification and offers interoperability of the different NFC devices*
- NfcV-Reader works with ISO/IEC 15693 and Dual Interface EEPROM contactless tag



# Dual Interface EEPROM summary

**Innovation based on 2 industry-standard protocols  
RF and I<sup>2</sup>C**

**Enables cost reduction and flexibility throughout product  
life**