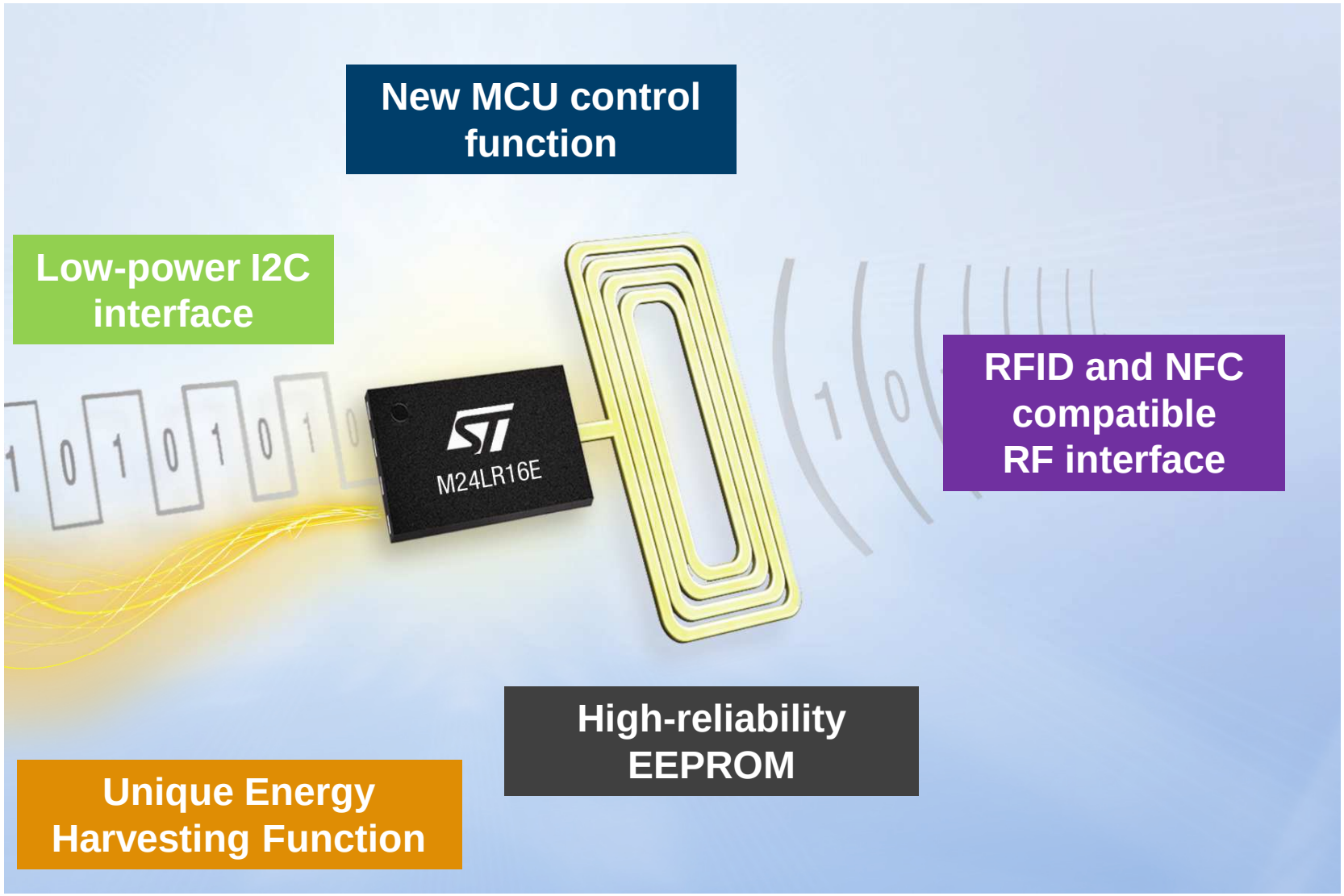
Dual Interface EEPROM

Product presentation

December 2011

Dual Interface EEPROM – Introduction



Enabling a wide range of use cases…

RFID

Parameter setting

Activation key

MANUFACTURING & LOGISTICS

Factory settings

In-line calibration

Traceability

User setting profile

Usage/load information

END USER

Datalogging

Personalization

Warranty management

Wireless pairing

NFC

Dual Interface EEPROM

SERVICING & MAINTENANCE

Event Log

Traceability

Calibration

After Sales

Warranty management

RFID

Dual Interface EEPROM - Concept

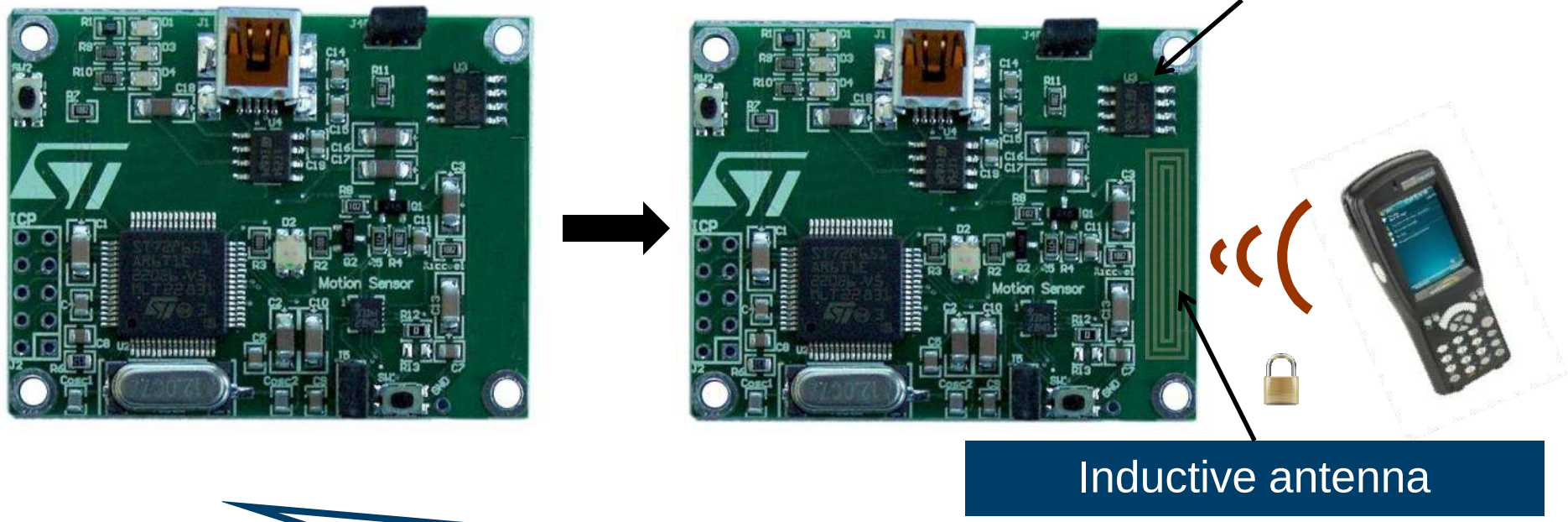
Read and write parameters

from *inside* (I²C) and *outside* (RF)

the application

Dual Interface EEPROM - How it works

- Based on Passive RFID technology
  - Just add a 13.56 MHz inductive antenna onto your PCB



No battery needed to operate the dual interface EEPROM in RF mode

Dual Interface EEPROM : targeted applications

Industrial
Medical
Metering
Factory automation

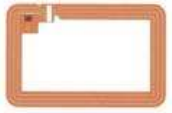
- Calibration
- Parameter update
- Diagnostics
- Maintenance
- Asset tracking
- Activation

Peripherals, Communication, Consumer Electronics

- Parameter update
- Diagnostics
- Maintenance
- Traceability
- Asset tracking
- Activation

Smart sensors, RFID

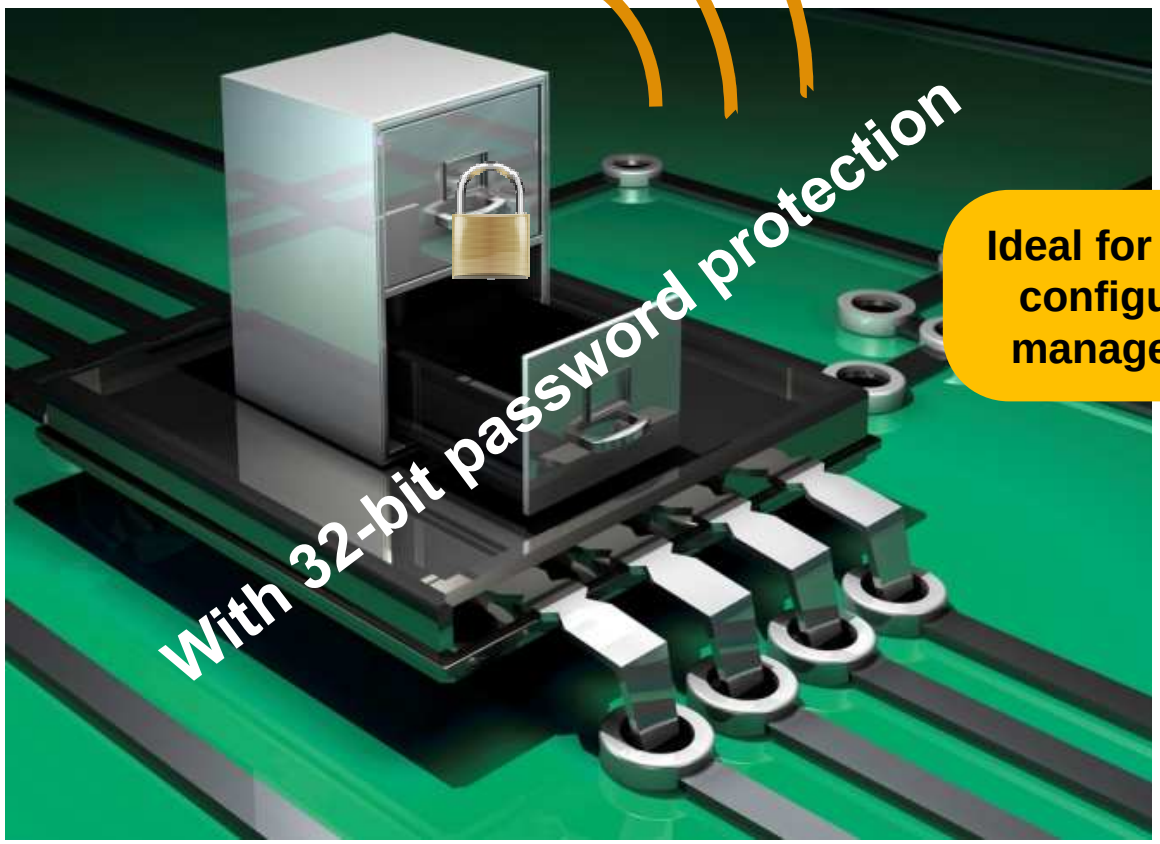
- Data loggers
- Identification
- Traceability
- Sensors/cold chain



Dual Interface EEPROM…
New perspectives for parameters management

Wireless access

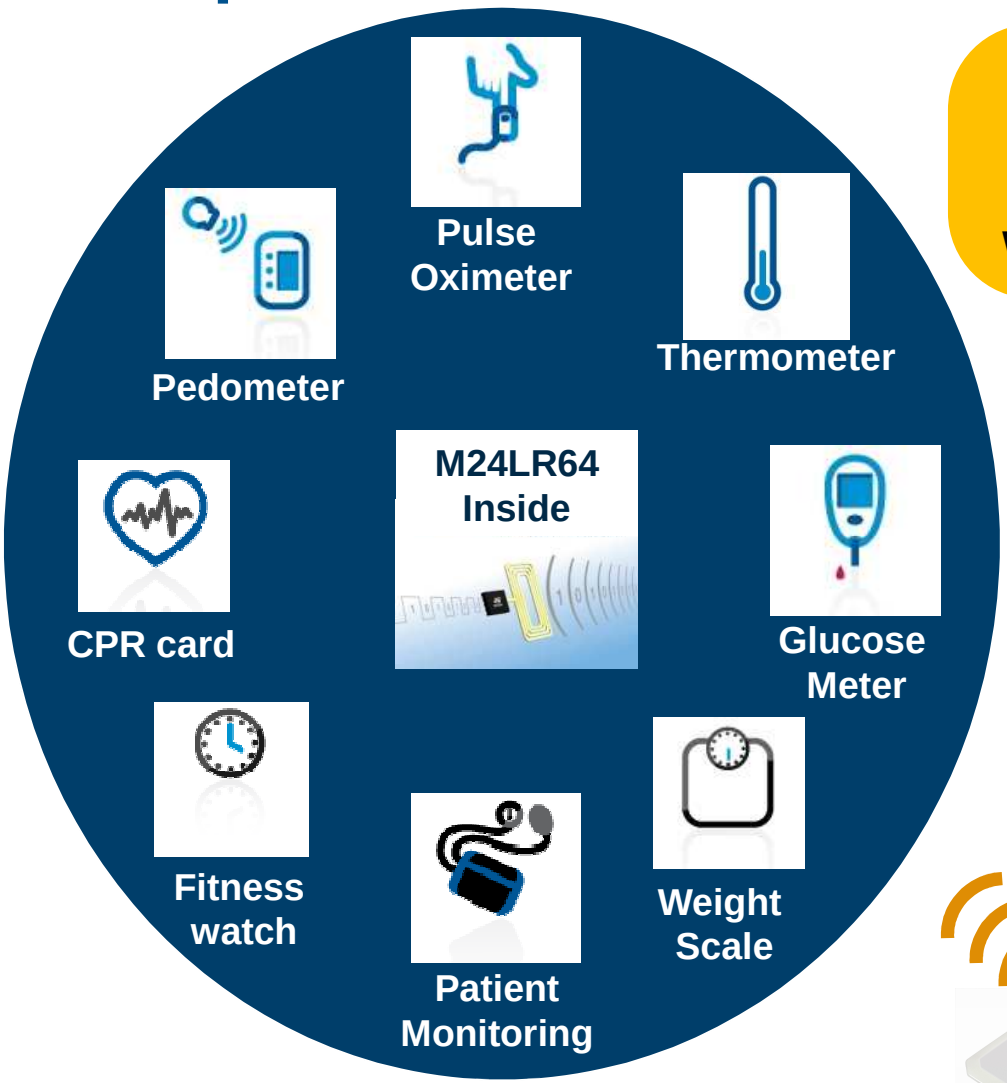
- Operating data
- User settings
- Traceability information
- Application data
- Event log
- Identification data



Ideal for product configuration management !

Dual Interface EEPROM…
Convenient zero-power RF data download

On-The-Go
Data Download



Ideal for portable devices such as healthcare and wellness products !

Home or Hospital
Data Analysis

Dual Interface EEPROM…
Improved consumer experience

New innovative use cases for consumer and home appliance products !

- User Manual's URL
- Usage / load information
- Power consumption history
- Warranty information
- Date of purchase
- User profile setting and reading
- Model ID
- Event recorder/temperature log
- Calibration data

Use smartphone for data processing and user-friendly interface

Dual Interface EEPROM…
Improved customer service

Static information

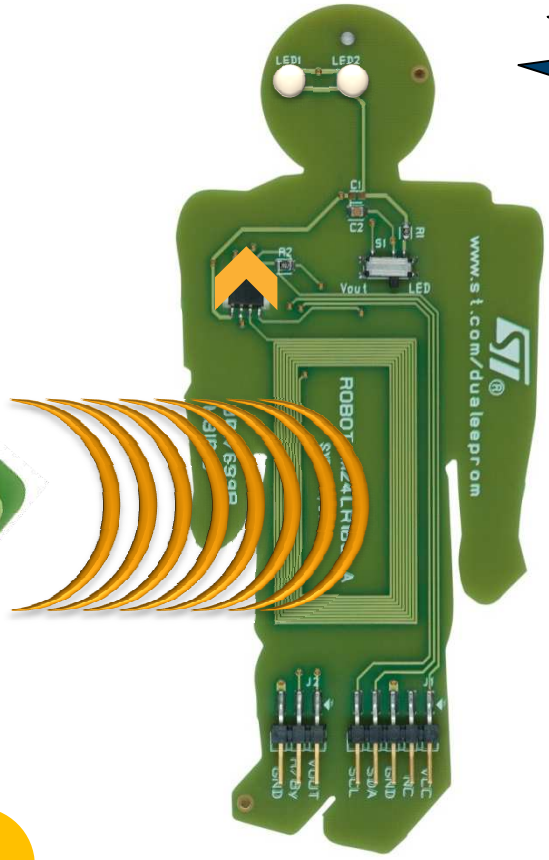
- Model ID
- Serial Number
- Manufacturing plant
- Date code
- BOM version
- Firmware version

Dynamic information

- Tamper detection information
- Incidents/defaults logs
- Tracking of critical components
- Last maintenance records

RF operations working even when device powered off !

Dual Interface EEPROM…
Enabling battery-less applications

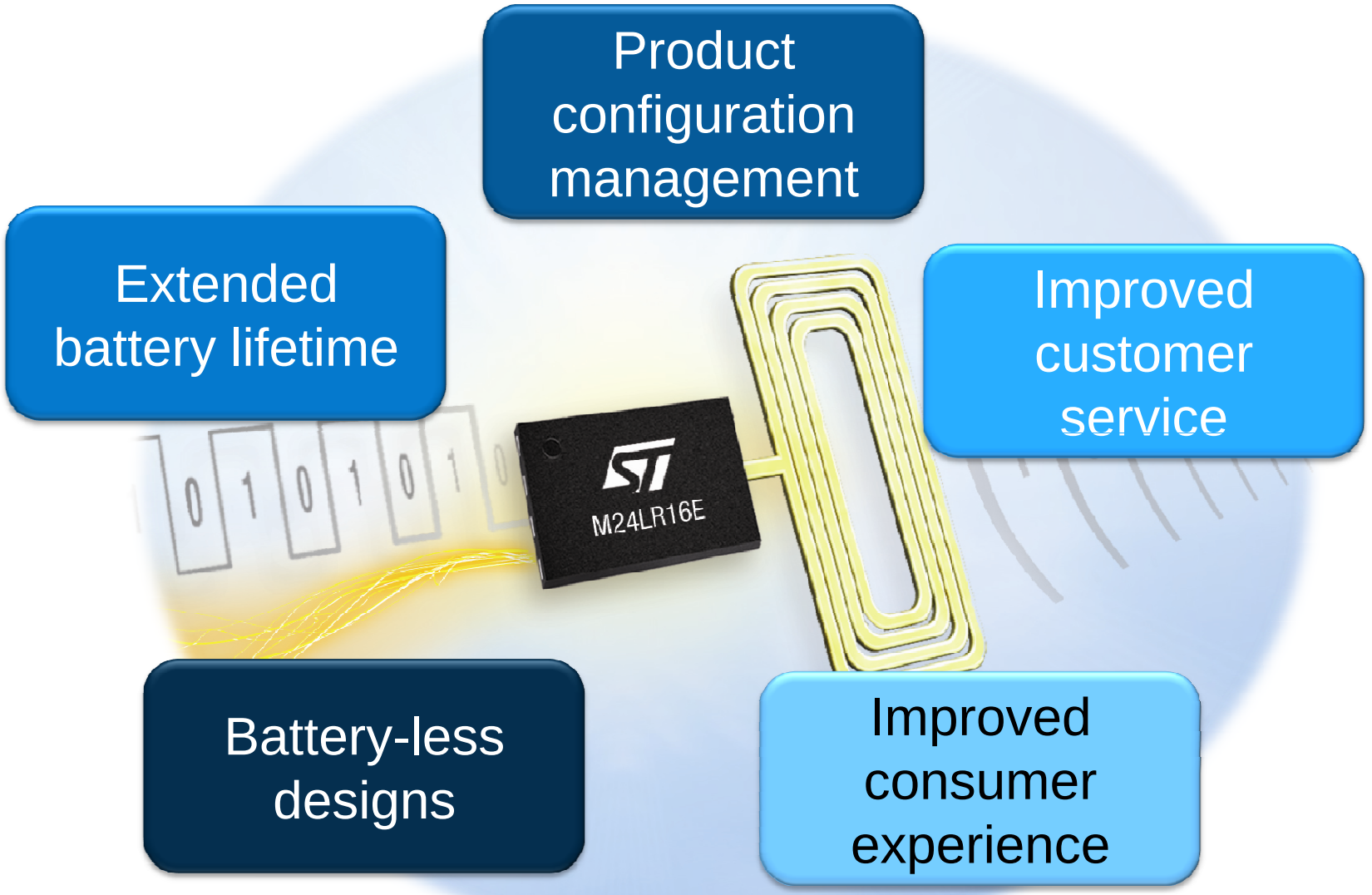


New M24LR16E

Innovative energy harvesting function enabling battery-less designs !

A few mA at ~2V delivered to your MCU and other components

Dual Interface EEPROM - benefits



Dual Interface EEPROM conclusion

Innovation based on 2 industry-standard protocols

Enables cost reduction and flexibility at all product life steps

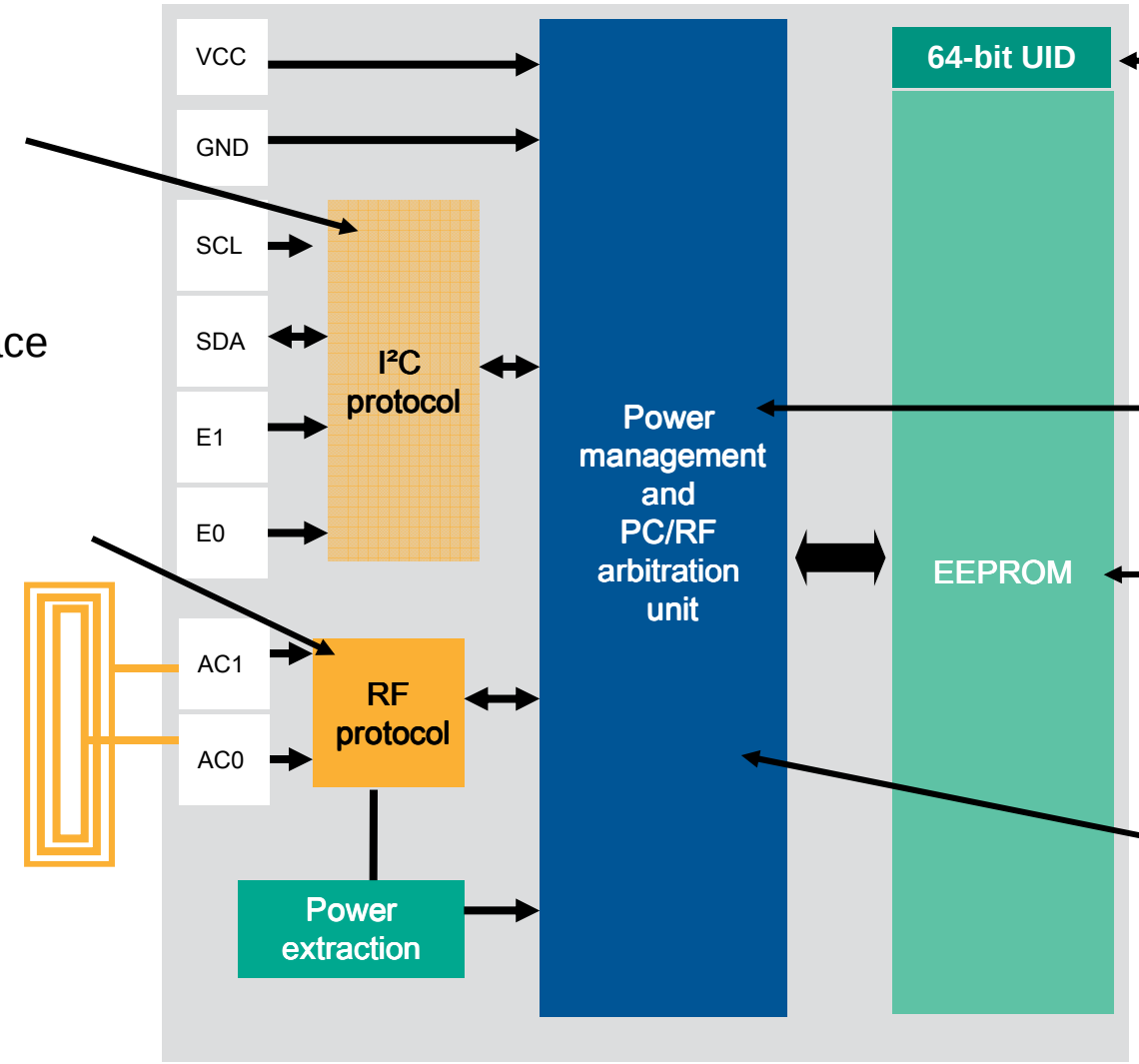
If you would like more details, go to the next slide

Product Features

M24LR64 block diagram

I²C interface
- industry standard
- 1.8-5.5V, 400kHz

ISO 15693 RF interface
- industry standard
- passive RFID technology
- high-speed mode (up to 53 Kbit/s)



64-bit Unique Identifier (Factory-Programmed and Locked)

I²C/RF arbitration

64-Kbit EEPROM

Password protection scheme

M24LR16E block diagram

NEW!

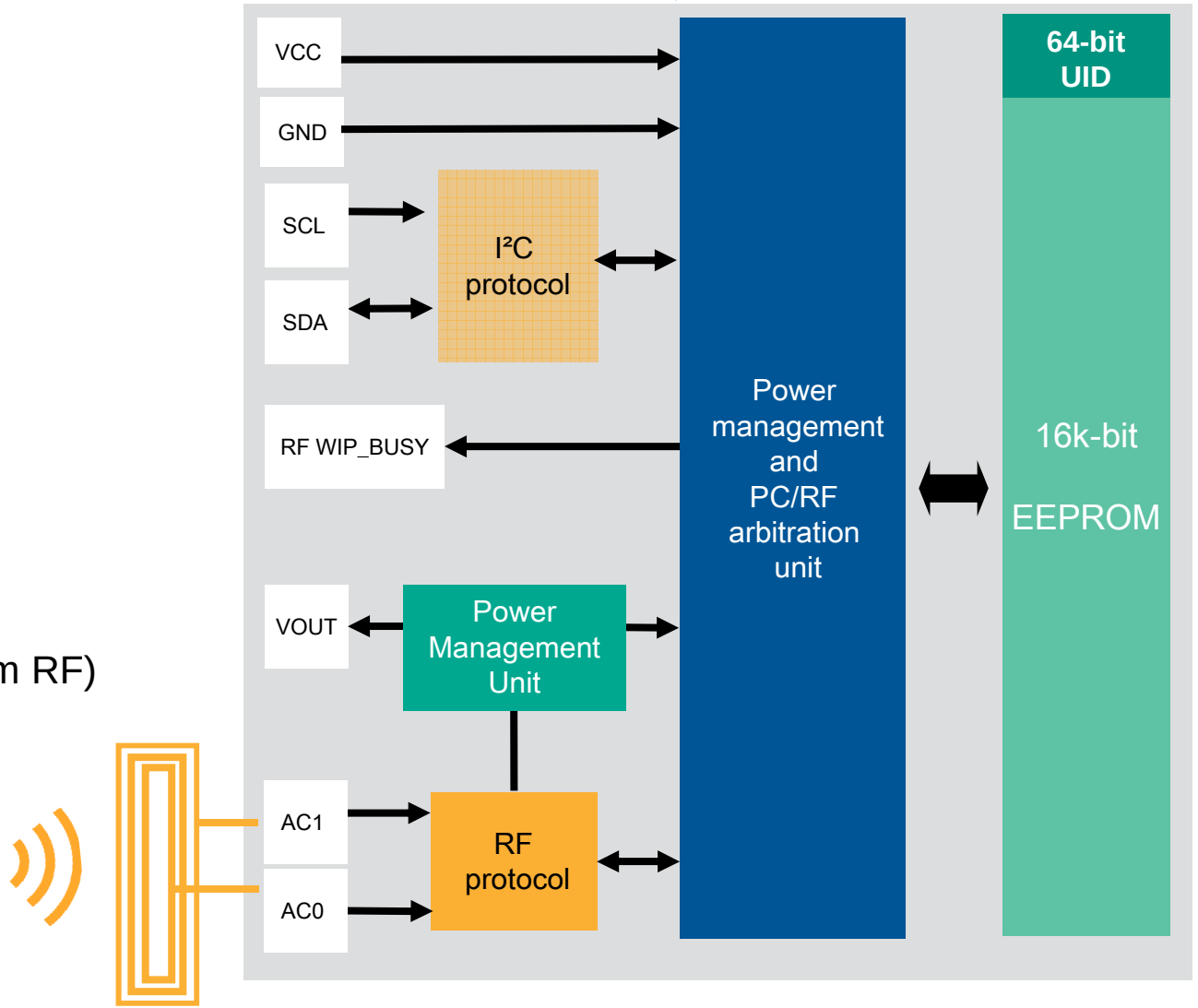
External power supply

I²C interface

RF WIP_BUSY
(Digital output)

Vout
(energy harvesting from RF)

ISO 15693
RF interface



ST Confidential

Antenna Integration

Antenna integration

On-board

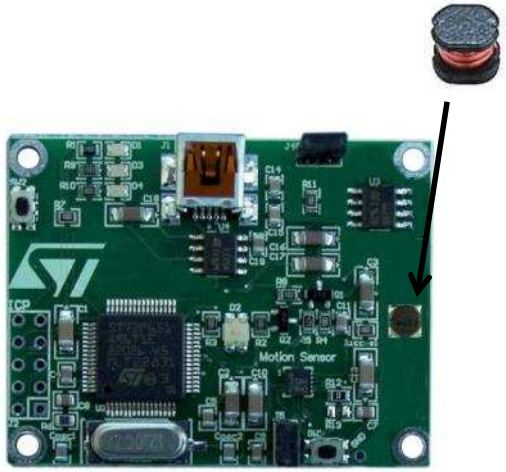
Pros

Integrated and compact solution

Cons

Probably less space available on the PCB for a large antenna. Read range may then be smaller

On-board inductor



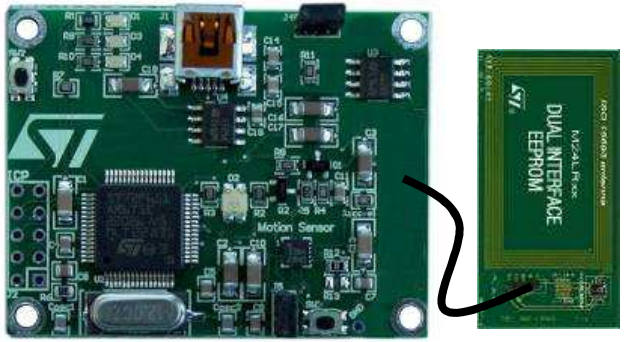
Pros

- Small footprint
- Standard component (4.7µH)
- Small design effort

Cons

- Limited read range
- More sensitive to orientation vs reader antenna

Off-board or Daughter board



I²C interface

Pros

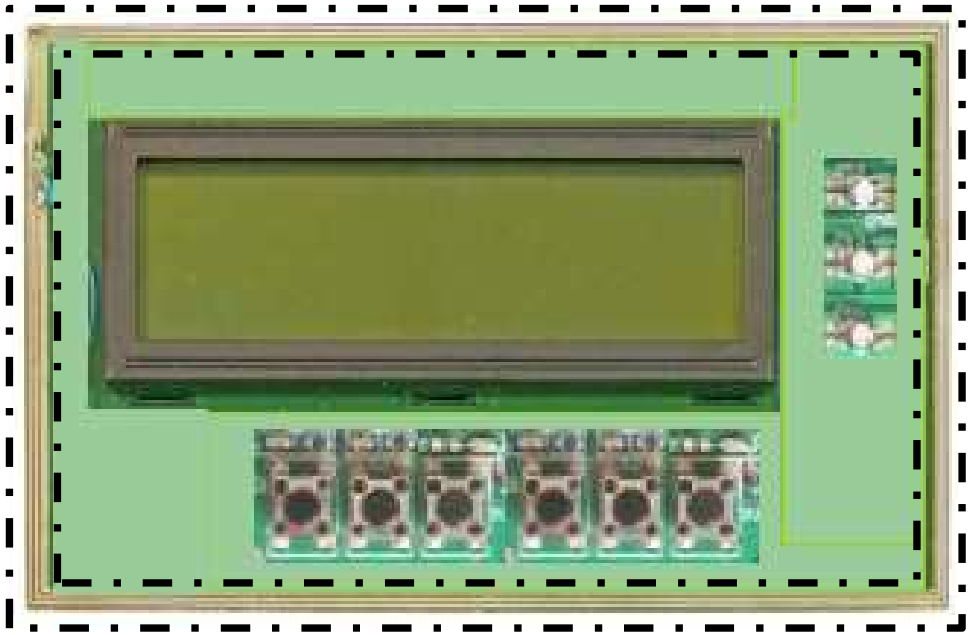
- Antenna may be placed closer to the outside of the device
- Larger antenna may be designed
- Eventually, better read ranges
- A 2-layer PCB is good enough

Cons

- Unless the antenna is connected, the M24LR64 may not be accessed in RF mode

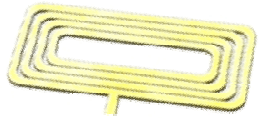
Designers support – antenna design

- There are other options for integrating the antenna into your PCB. An example is « surrounding antenna »
- Contact your ST technical support for specific antenna design support

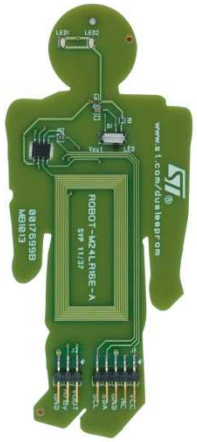


Designers support - antenna integration

- ST provides documents helping customers design the antenna by themselves



  - Application note
    - AN2972 Designing an antenna for the M24LR64-R dual interface
    - AN3178 Using a surface-mount inductor as M24LR64-R antenna
  - Software
    - Executable meant for computing a 13.56 MHz antenna
  - Reference designs



ROBOT-M24LR16E-A

ANT1-M24LR16E

ANT2-M24LR16E

ANTx-M24LR-A

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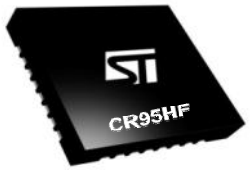
RF reader-writers

4 types of RF reader-writers

- Commercial ISO15693 RFID reader-writers, available through partners

- ST’s 13.56MHz transceiver IC for embedded RF reader-writer



- Mobile phones with ISO15693 capable NFC function

- ST’s evaluation kits for evaluation / development

Commercial RF reader-writers

- ISO15693 standard at 13.56 MHz - Firmware upgrade might be required
- Exists in various form factors providing wide range of price and performance

Handheld reader

RFID reader

Pad/desktop antenna

Tunnel station

Paddle reader

Conveyor tunnel reader

Gate antenna

CF module

Check out the video at www/st/com/edemoroom
(Play « Dual Interface EEPROM RF technology »)

Commercial RF reader-writer partners

- ST is developing a network of reader partners, which are supporting the M24LR64.

TAGSYS RFID™ e-connecting goods

FEIG ELECTRONIC

PSION TEKLOGIX

赞润科技 Estar Technology

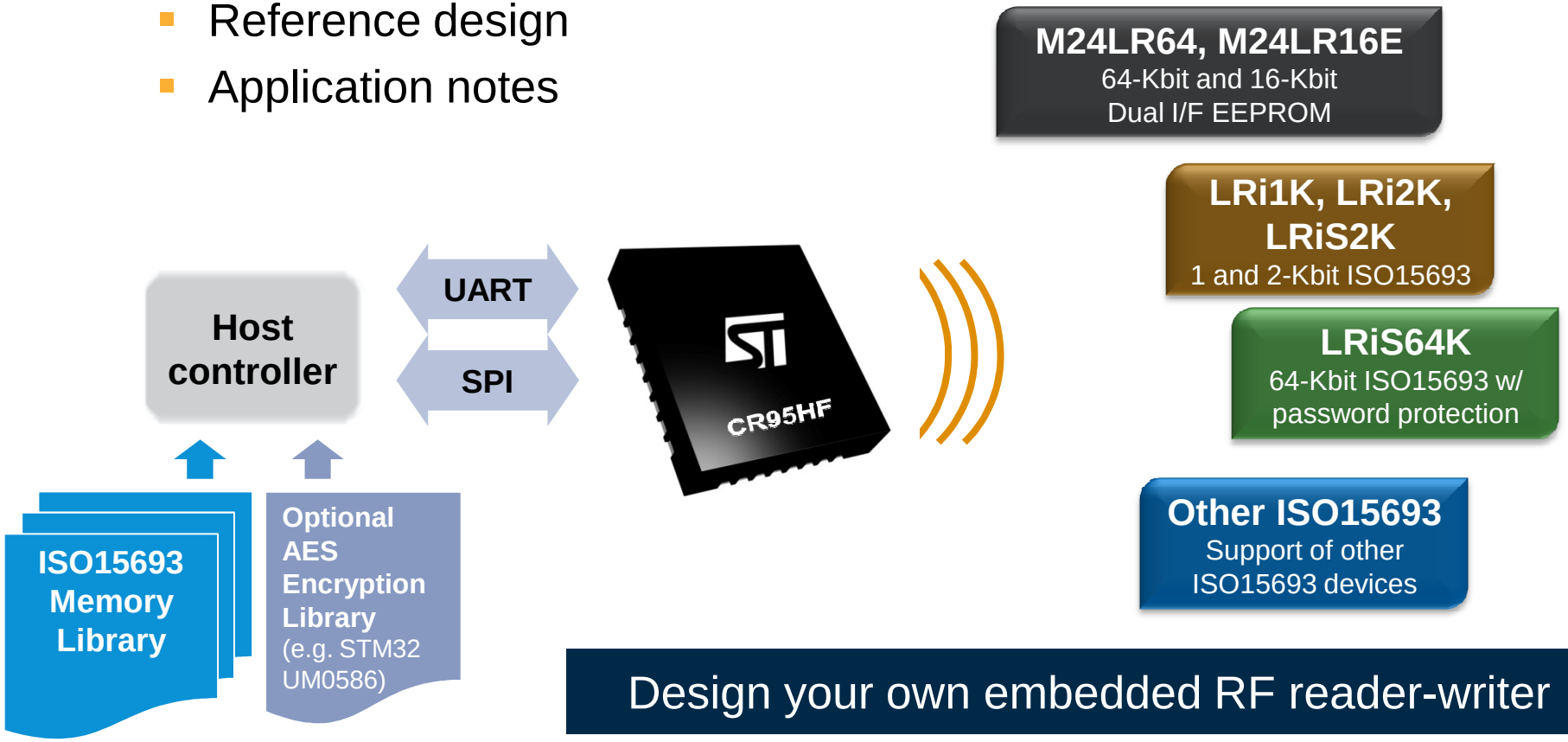
3DT SOLUTIONS

jogtek

- More information available at www.st.com/dualeeprom

Embedded reader-writer: CR95HF chip

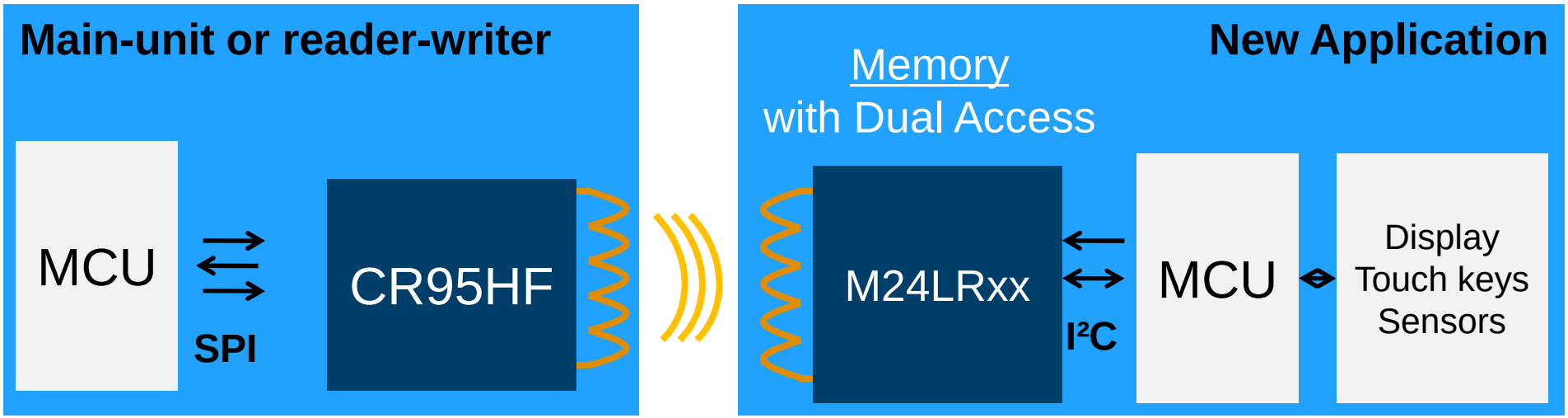
- ST ISO15693 products will be supported by the CR95HF with
  - Software libraries
  - Reference design
  - Application notes



Design your own embedded RF reader-writer

CR95HF with Dual Interface EEPROM

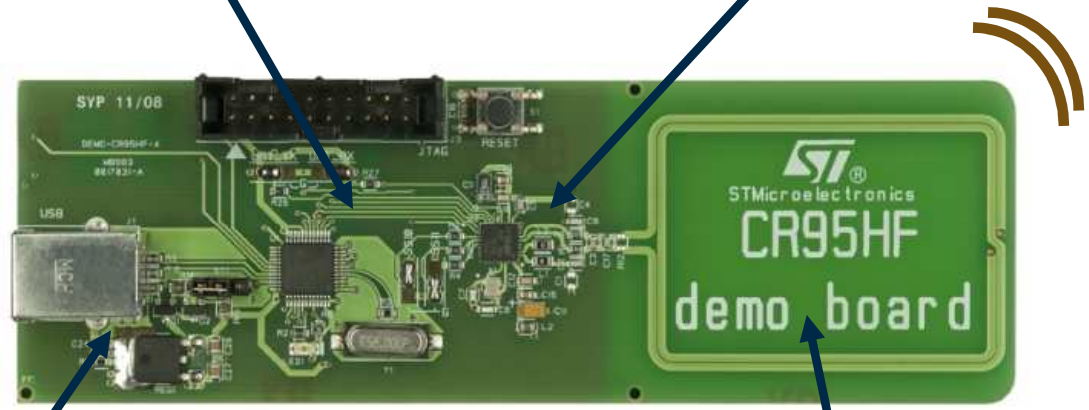
Enabling innovative interactive data exchange



CR95HF technical support

CR95HF drivers (ANSI C)
- Source code CR95HF drivers v1.0.rar
- Application note AN3355

Schematics and gerber files
- Schematics (0017031-B-SCM.pdf)
- Gerber files (0017031-B-Gerber.zip)

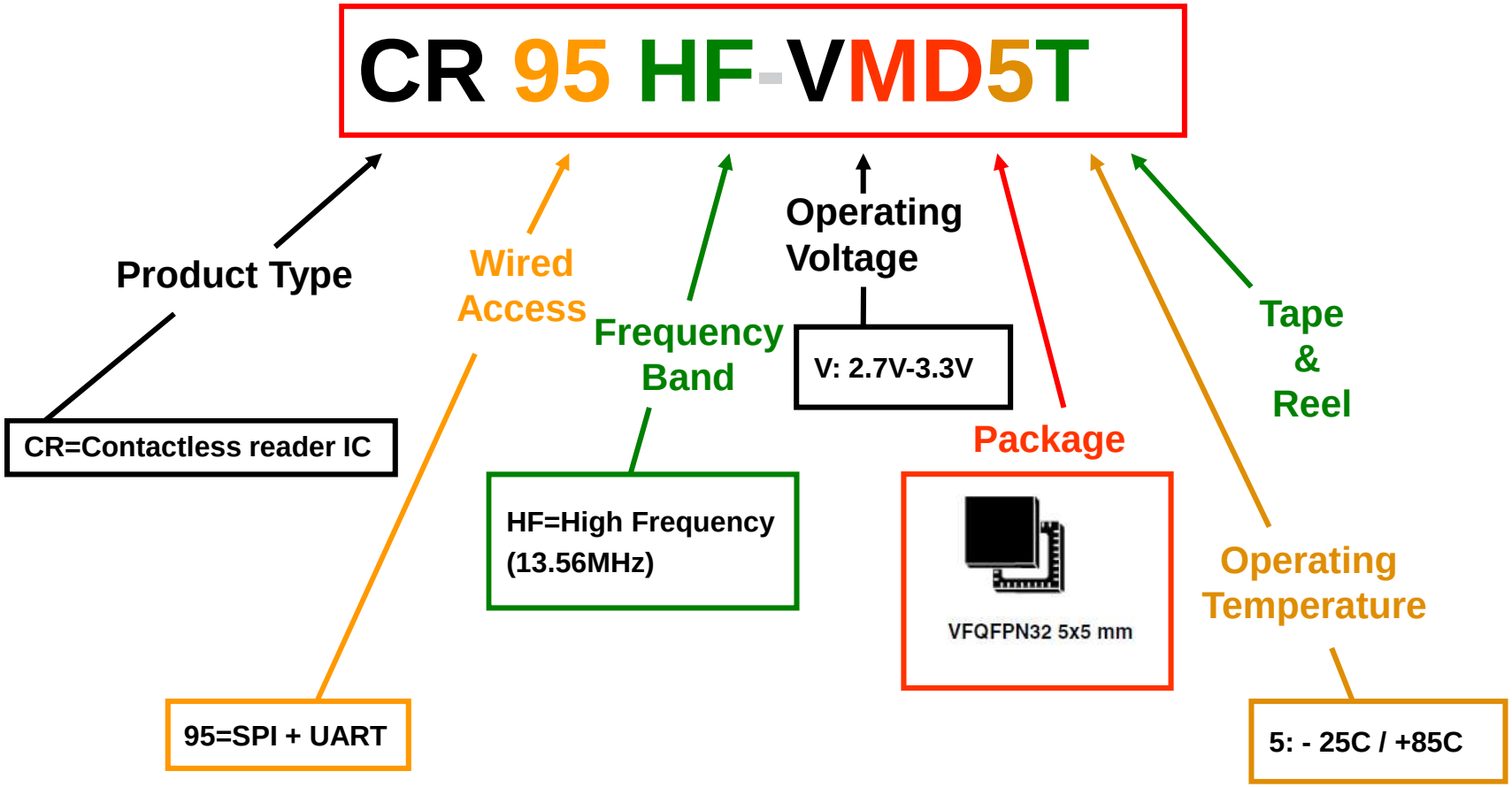


PC demonstration software
- M24LRxx Application Software 2.0.zip

Antenna design guidelines
-Application note AN3394
-Antenna design simplified basic tool

DEMO-CR95HF-A

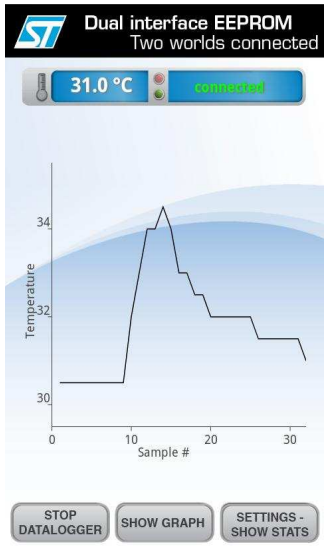
CR95HF ordering information

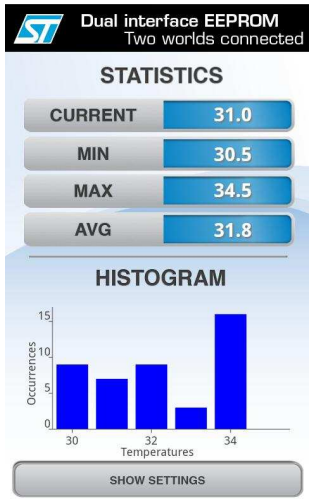


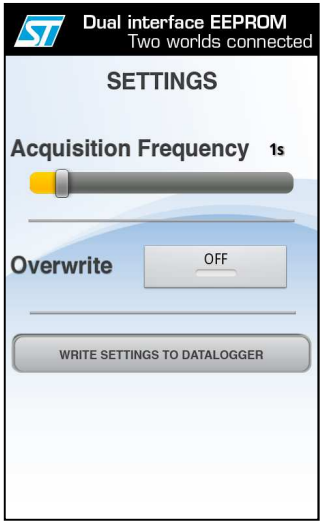
NFC: mobile phones as RF reader-writers

Compatible with ISO15693-capable NFC phones

Dual EE NFC Android App







Works with DATALOG-M24LR-A reference design

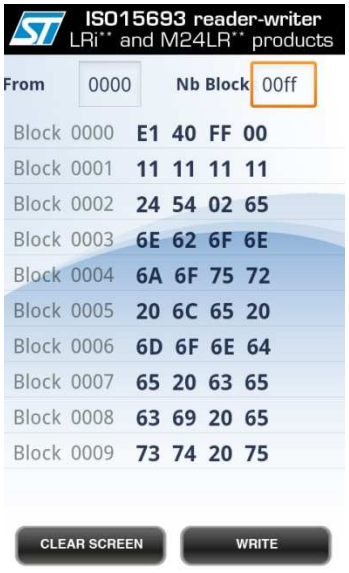
- **Dual EE app on the Android market**
- **Source code at www.st.com/dualeeprom**

Nfc-Vreader Android App

M24LR64, M24LR16E
64-Kbit and 16-Kbit
Dual I/F EEPROM

LRi1K, LRi2K, LRiS2K
1 and 2-Kbit

LRiS64K
64-Kbit w/ password protection

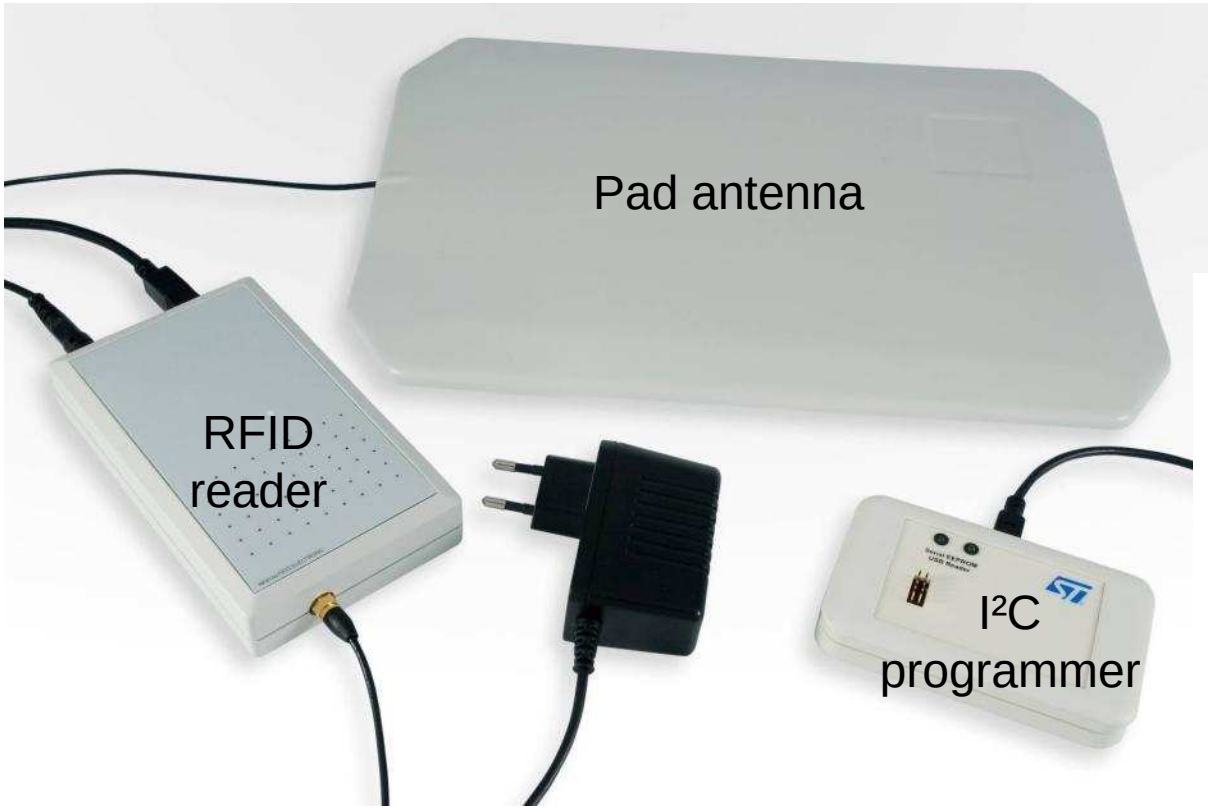


In development

- **Reader-writer application**
- **Works with ISO15693 products**
- **Contact your local sales team for support**

Evaluation Kits

Designers support
Development kit – “DEVKIT-M24LR-A’’



ANT1-M24LR-A

ANT2-M24LR-A

ANT3-M24LR-A

NB: SDK dll source files available for Windows for free. Charges apply for other platforms such as .Net, Java,…

Designers support
Starter kit – “STARTKIT-M24LR-A”

NB: basic dll source files available for Windows only

ANT1-M24LR-A

ANT2-M24LR-A

ANT3-M24LR-A

Designers support
Evaluation kits summary

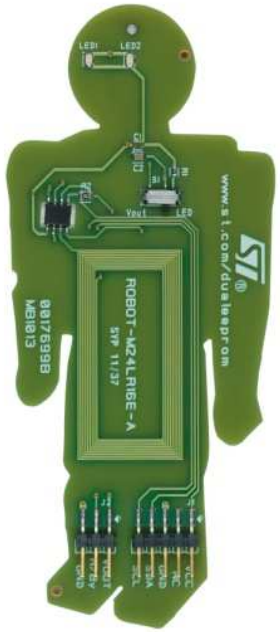
Starter kit

Development kit

Purpose	Evaluation, proof-of-concept	Development, advanced evaluation
RF operating distance	Up to 8 cm*	Up to 40 cm*
RF and I²C communication speed	Slow *read 64k-bit : 1’24’’* *write 64k-bit : 5’34’’*	Fast *read 64k-bit : 0’08’’* *write 64k-bit : 0’31’’*
RF capabilities	1 tag at a time	Multi-tag capability
Software	Windows dll source code	Windows SDK for free (others platforms SDK with charge) *FEIG download access code available*
Ordering information	STARTKIT-M24LR-A	DEVKIT-M24LR-A

Reference Designs

A wide range of antenna boards…

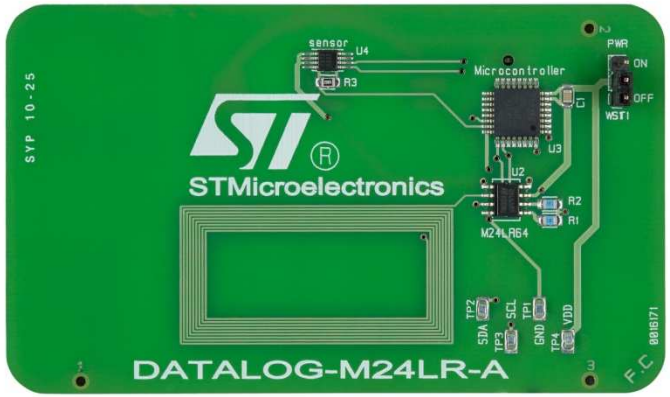


Contact your local ST sales team for more details

M24LR64-R Datalogger reference design

- DATALOG-M24LR-A is a complete reference design with
  - Hardware design (including antenna design)
  - MCU firmware (STM8L)
  - PC software

Turn-key data logging design



DATALOG-M24LR-A

M24LR64-R Datalogger reference design

- Demonstrates the use of the M24LR64 in a data logging application (medical, industrial sensors, …)
- helps customers get started with their RFID-enabled datalogger design
- Can be extended to also sense shocks/vibrations, pressure, light…

DATALOG-M24LR-A

Demonstration software

Supporting material

M24LR64-R Datalogger supporting material

AN3209 Application note
Developing your M24LR64-R datalogger application for temperature acquisition

UM0925 User Manual
Using the M24LR64-R datalogger reference design

Gerber files for M24LR64-R datalogger

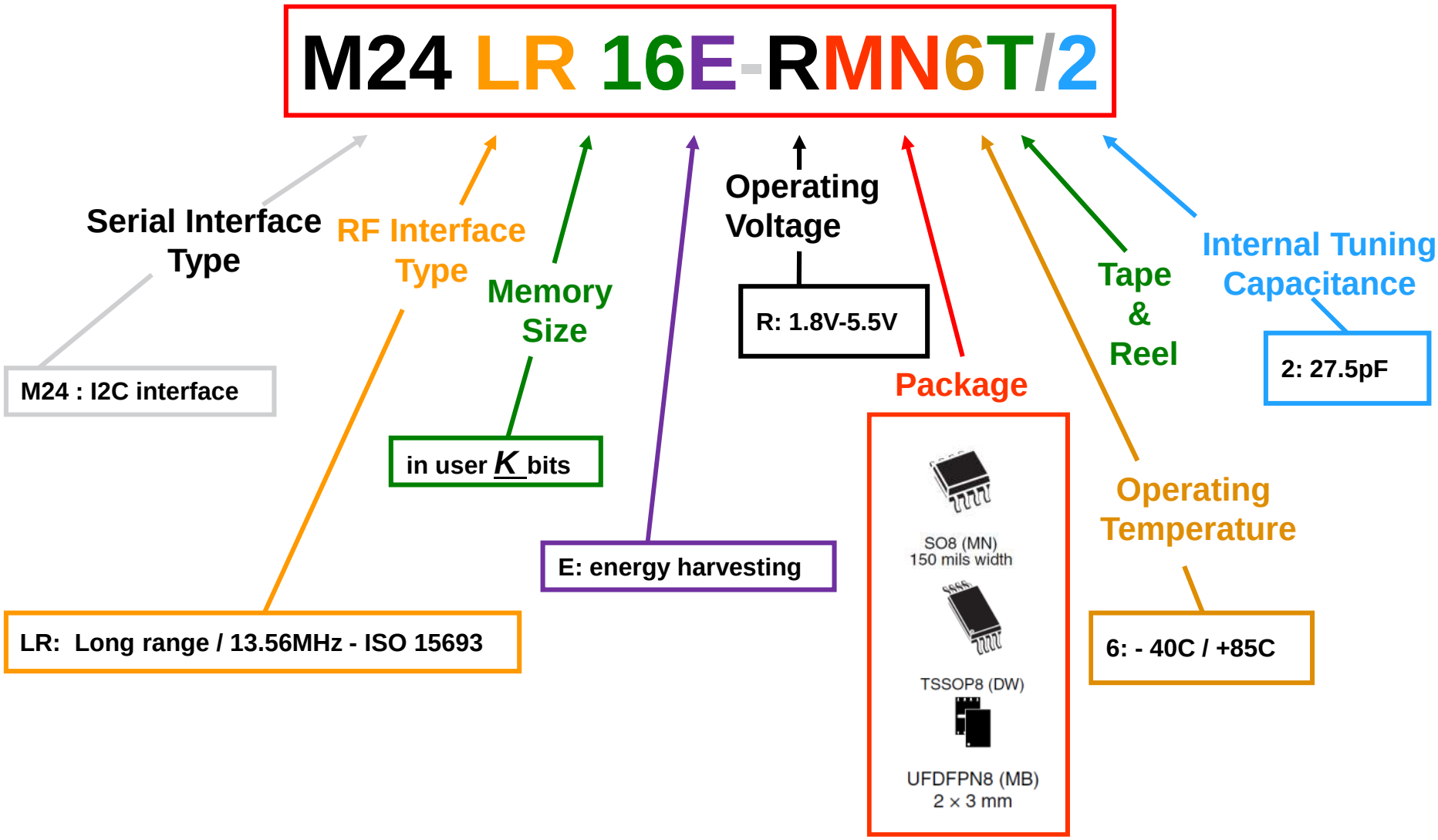
Firmware for the STM8L101 Microcontroller

Demonstration **PC software**

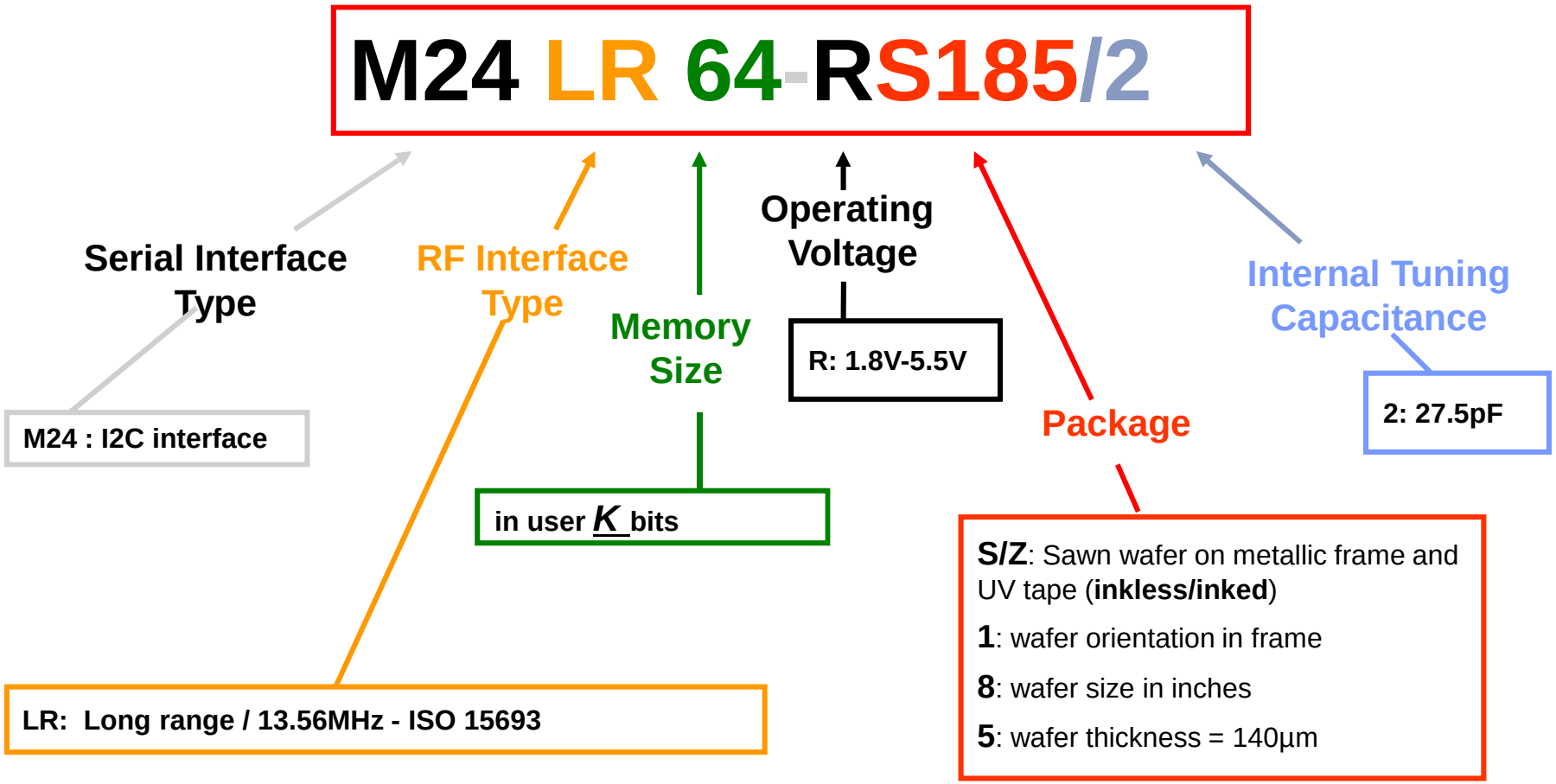
The M24LR64-R Datalogger supporting material can be downloaded at
www.st.com/dualeeprom

Ordering Information

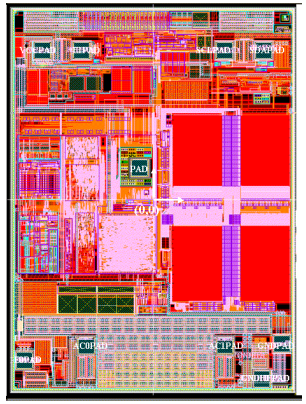
Dual Interface EEPROM
Nomenclature for package delivery



Dual Interface EEPROM
Nomenclature for die delivery



M24LR64-RS185/2 – die format



- M24LR64 chip in die form (meant for wire bonding technology)
- Ultra thin: 140µm thickness +/-10µm
- Sawn wafers on UV tape and 8’’ ring
  - S version: bad chips identified by electronic wafermap (« STIF » format) provided by ST
  - Z version: bad chips identified with ink dots on wafer
- 6 months lifetime @25 degC (UV tape limited)
- Production Minimum Ordering Quantity (MOQ) is 5 wafers, i.e. approximately 42.5ku

See TN0185 for complete die form delivery information

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