Embedded Connectivity

May 2012

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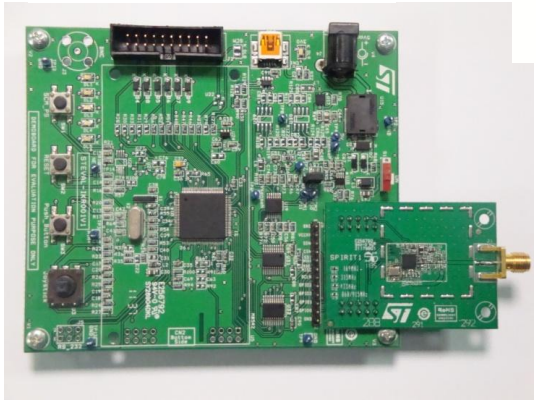
Embedded connectivity

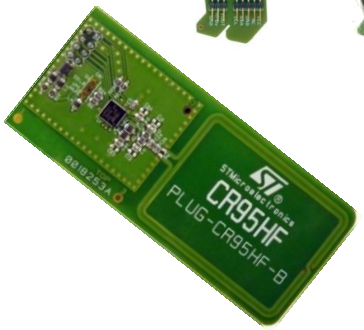
Stands for the integration of built-in wired and wireless communication interfaces including software and communication protocol support in non-phone devices, machines and vehicles and thus enables the rapid introduction of compute solutions to meet the sector's ever evolving needs

Demo Session
Embedded Connectivity

802.15.4 @ 2.4GHz STM32W + MEMS Wireless Sensor Gateway



Wireless SubGHz Communication with SPIRIT-I and STM32L



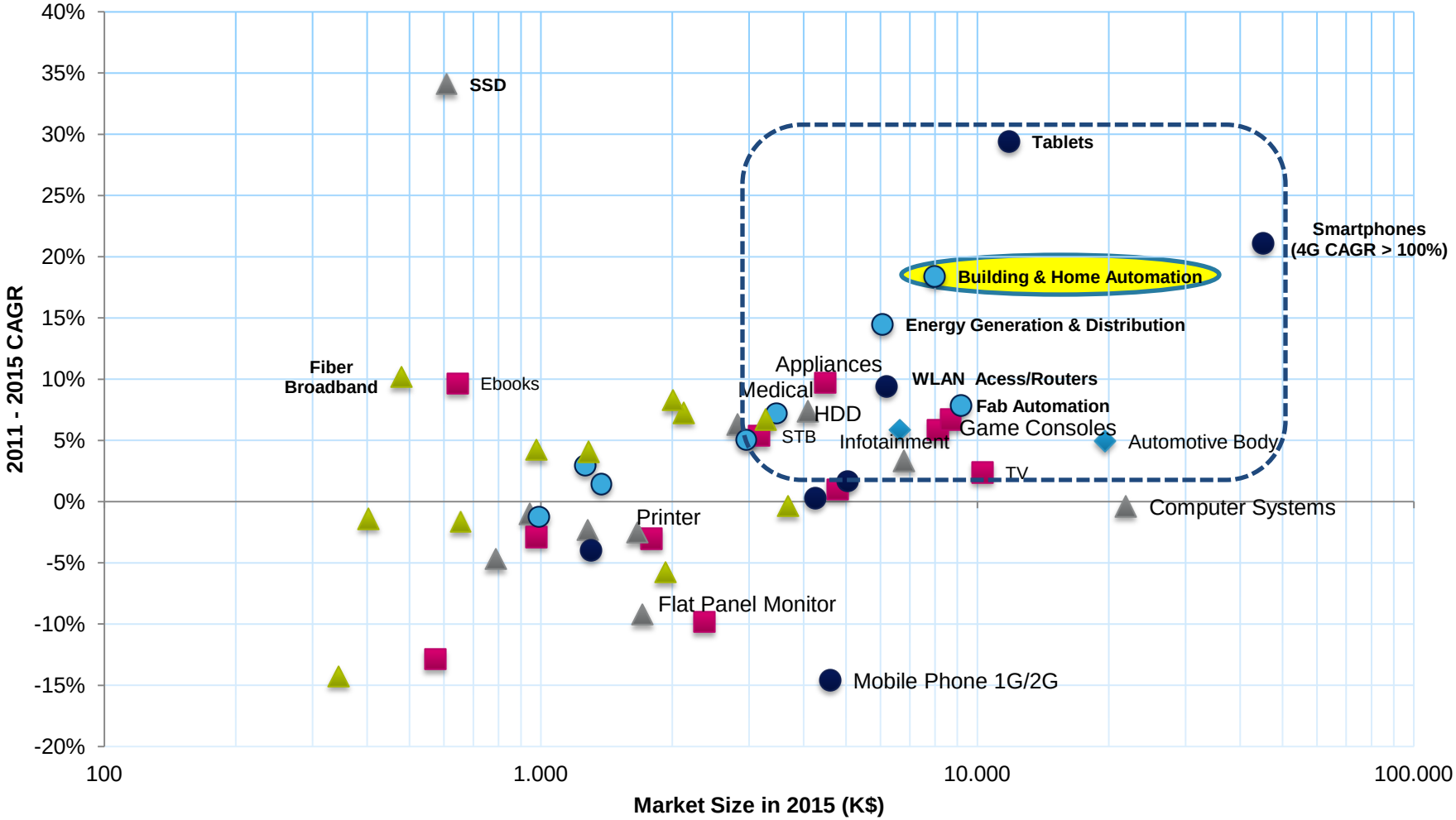
13.56MHz ISO15693 / NFC RFID Solutions

Embedded Ethernet

Content

- Demo Session: Embedded Connectivity
- Sub GHz Solutions based on SPIRIT-1
- MBUS and KNX Communication Protocols for Smart Buildings and Smart Grid
- STM8L/STM32L1: Ultra Low Power Microcontroller for wireless communication
- Bluetooth Modules with embedded Firmware and BT Smart outlook
- Solutions for 13.56MHz (ISO15693 / RFID / NFC)
- Solutions for 2.4GHZ 802.15.4 (STM32W , STM32L1W, GreenNet)
- Embedded Ethernet
- Solution for CANopen on STM32
- Powerline Communication for Metering

Application Drivers towards 2015



Source : IHS iSuppli
(SAM, ie excl DRAM, Flash, MPUs, Opto)

SPIRIT1
sub GHz RF transceiver

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What is SPIRIT1 ?

- **Low power RF Transceiver, intended for RF applications in the sub-1 GHz Band, with integrated packet handler targeting Smart Metering Applications**
- **Designed to operate in 169 / 315/ 433 / 868 / 915 MHz, Frequency Bands ISM (Industrial, Scientific and Medical) and SRD (Short Range Device)**
- **For Systems with channel spacing down to 12.5 kHz, complying with the EN300 220 standard.**
- **Applications**
  - **Wireless Metering and Wireless Smart Grid (AMR and ISM)**
  - **Home & Building Automation**
  - **Wireless Sensor Network (WSN)**
  - **Industrial Monitoring and Control**
  - **Wireless Fire and Security Alarms**

- **Suitable for Systems targeting compliance with :**
  - **Europe** **ETSI EN 300 220**
  - **US** **FCC CFR47 Part 15**
  - **Japan** **ARIB STD T-67**
  - **Europe Systems targeting compliance with the Wireless MBUS standard EN 13757-4:2005, EN13757-4:2011**
- **Main operating parameters controlled via SPI**
- **Integrated SMPS allowing very low power consumption**

Key Features

- Wide supply voltage range from 1.8 V to 3.6V
- Configurable data rate from 1 to 500 kbps
- Supported modulation schemes:
  2-FSK (Binary Frequency shift keying),
  GFSK (Gaussian Frequency Shift Keying),
  MSK (Minimum Shift Keying)
  GMSK (Gaussian Minimum Shift Keying),
  ASK (Amplitude Shift keying) / OOK (On-off keying)
- RF Receiver
  - Excellent receiver sensitivity (169 MHz)
    - **- 120 dBm at 1.2 kbps**
    - **- 103 dBm at 50 kbps**
  - Adjacent channel selectivity (1% PER – 20 bytes packet length)
    - **55 dB at 12.5 kHz channel spacing**
  - Blocking performance :
    - **-28 dBm at 10 MHz offset, -36 dBm at 2MHz offset**
  - IIP3 (Input third order intercept)
    - **(Input Power -50 dBm 915 MHz) : -31 dBm**
- RF Transmitter
  - Programmable Output Power
    -36 dBm to +11 dBm, in 0.5 dB steps

Key Features

- **Integrated SMPS allows very low power consumption**

Power mode	Power consumption	Description
Shutdown	2.5 nA	Everything off
Standby	650 nA	SPI On, register retention
Sleep	950 nA	SPI on, register retention, Wakeup timer on
Ready	400 uA	SPI on, XTAL on
RX	**9 mA ***	**SPI on, XTAL on, RF Synth on**
TX	**21 mA****	**SPI on, XTAL on, RF Synth on**

- SPI access is available in all the modes (except Shutdown) since the SPI block is powered by a dedicated LDO (no SMPS required)

- * (9mA RX, 433 MHz, FSK, 38.4kbps), similar also for other bands; SMPS ON, Vcc = 3.0V
- ** (21mA TX, +11dBm, 169 MHz)

Key Features

- **Peripherals & Support functions**

  - **Integrated packet handler**, Support for Automatic acknowledgment of received packets, retransmission and time-out protocol
  - **Automatic clear channel assessment** (CCA) Engine :
    - Channel access mechanism, based on the rule ‘’Listen-before-talk’’ systems before transmitting ; this avoids the simultaneous use of the channel by different transmitter.
  - **AES 128-bit encryption co-processor** is available for secure data transfer
  - Separate **96-byte RX/TX FIFOs**, accessible via the SPI interface for host processing
  - Supports **frequency hopping** under MCU control
    - Calibration can be made each time the MCU decide to change frequency or MCU can save and restore calibration data to make the frequency hopping faster

- **Package QFN 20 (4 x 4 mm)**

Main Block Description

- **Data link layer**
  - Support for channel configuration, packet handling and data buffering
  - Support Packet Formats (Basic, Stack, Wireless M-BUS)

  - The Host MCU can stay in power down until a valid RF packet has been received, and then burst read the data, greatly reducing the power consumption and computing power required from the host MCU

- **AES encryption co-processor**
  - Provides data security support as it embeds an advanced encryption standard (AES) core which implements a cryptographic algorithm

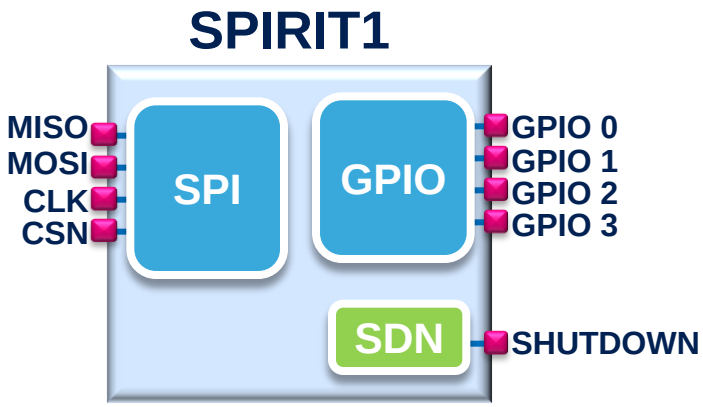
- **Analog temperature sensor**
  - The Host MCU can be used to read the chip temperature (e.g. it can be used to force radio recalibration)

- **Battery indicator and low battery detector**

MCU interface

SPI communication

- Write registers or FIFOs
- Read registers or FIFOs
- 17 Commands (State diagram, AES, FIFO flush)



GPIO communication

- Interrupt signals
- Monitoring signals ()
- Commands (TX/RX mode, Wake-up from external input)
- Input/output data (direct mode)
- Input/output reference clock (MCU clock out, 34.7 kHz for LDC mode input)
- Analog output: temperature sensor (GPIO 0)

SDN pin

- Shutdown signal

The SPIRIT1 has more than 200 registers for flexible usage of the transceiver

SPIRIT1 SW Library

An abstraction layer is provided.

Each module of the library manages a specific feature of the SPIRIT1.

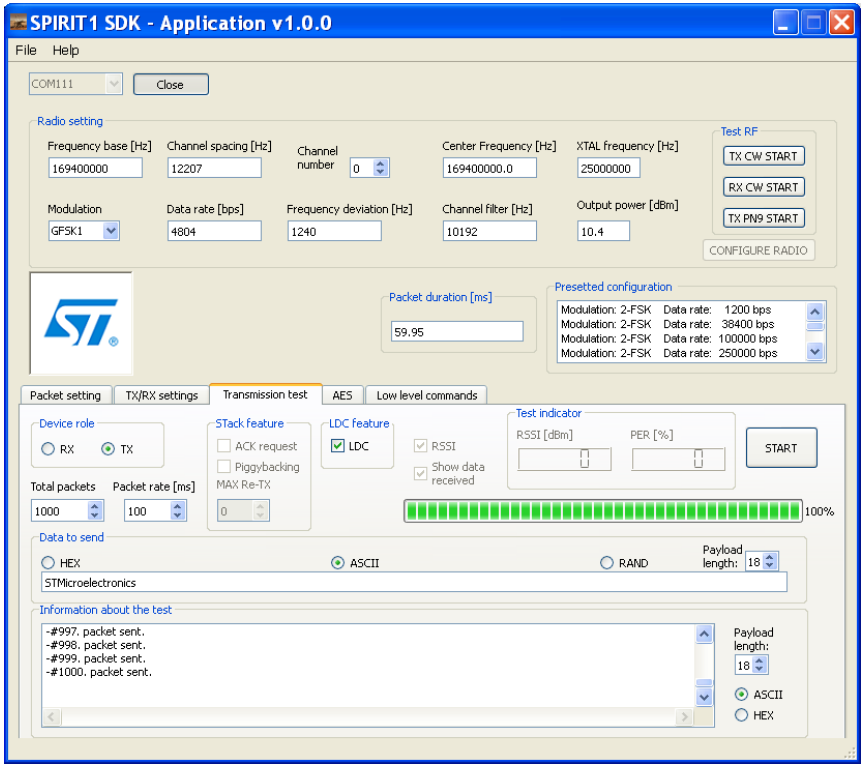
AES	CALIBRATION	COMMANDS	CSMA	DIRECT RF	GENERAL
GPIO	IRQ	LINEAR FIFO	PACKET COMMON	PACKET BASIC	PACKET MBUS
PACKET STACK	REGISTERS	QI	RADIO	TIMER	TYPES

The SPIRIT1 library is developed in order to be platform independent.

Every API function translate the high level command in a bit sequence to program the SPIRIT1.

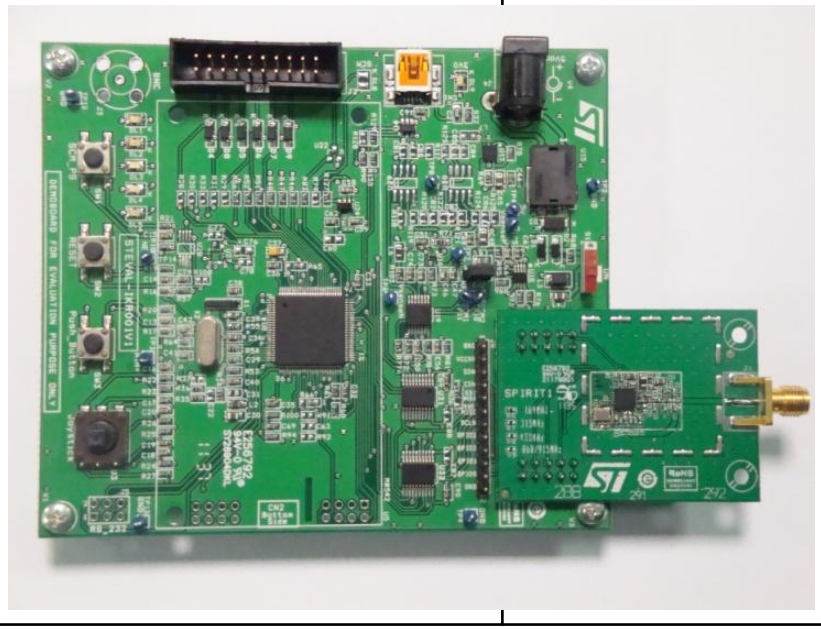
SPIRIT1 SDK Suite GUI RF performance evaluation

- SPIRIT1 contains a GUI allowing to perform:
  - Radio configuration
  - RF tests (TX of un modulated carrier, TX PN9 sequence, RX activation)
  - Packet transmission/reception test with PER evaluation
  - AES engine encryption/decryption tests
  - Register read/write and dump



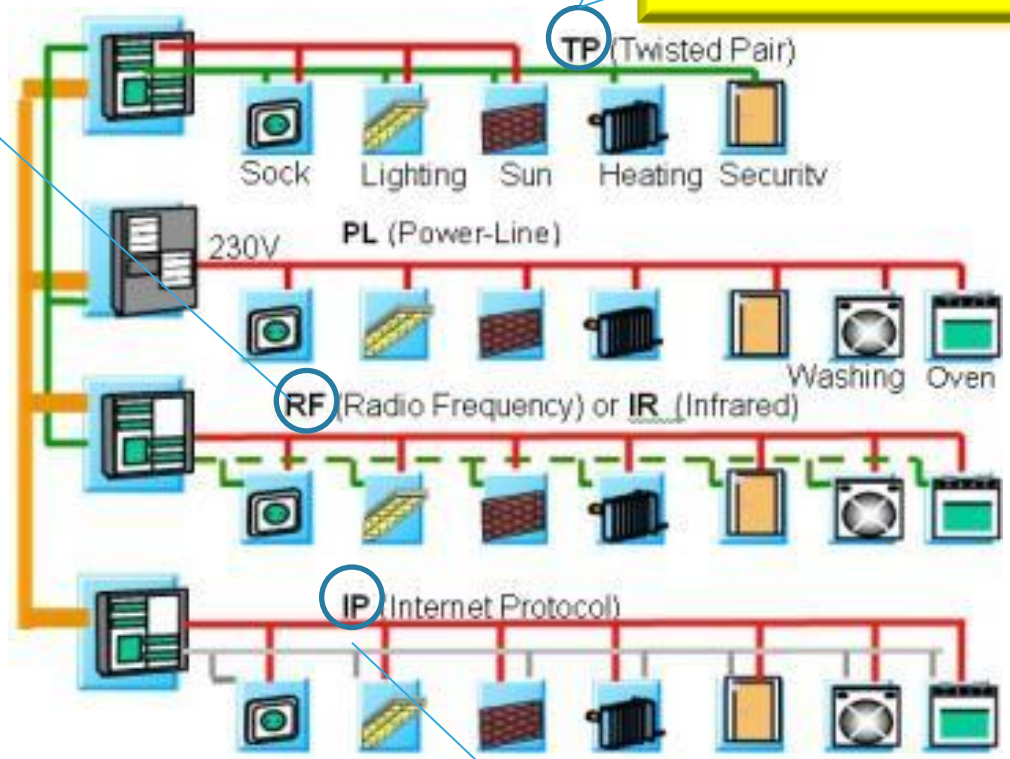
SPIRIT1 Kits Part number

Type	Purpose	Content	Order code
Dev kit	RF performance evaluation, Point to Point RF communication, System Prototype development	2 x STM32L based motherboard 2 x SPIRIT1 RF modules	STEVAL-IKR001V1 (169 MHz)
			STEVAL-IKR001V2 (315 MHz)
			STEVAL-IKR001V3 (433 MHz)
			STEVAL-IKR001V4 (868 MHz)
			STEVAL-IKR001V5 (915 MHz)
			STEVAL-IKR001V6 (920 MHz, ARIB T-108)



ST with 3rd parties supports KNX

- STM32L + SPIRIT-1
- STM32L + KNX Transceiver
- STM8L + KNX Transceiver

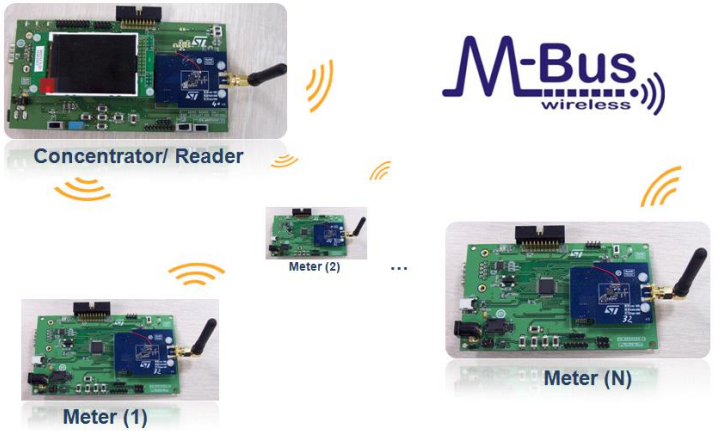


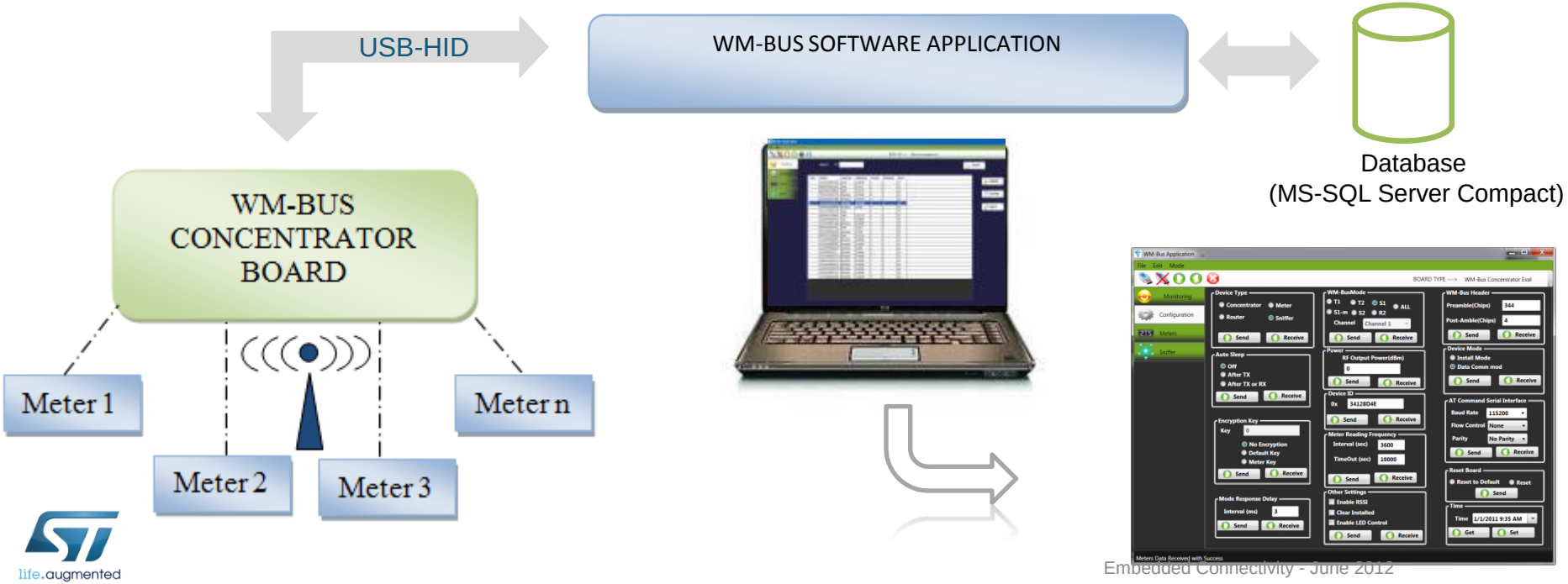
Solutions for Smart Buildings

- STM32F4 + KNX Transceiver

ST Wireless M-BUS Stack features

- → EN13757-4:2005 (S1, S1m, T1, T2, R2).
  - Radio band: 868 MHz
- → EN13757-4:2011 (N mode)
  - Radio band 169 Mhz
- GUI over USB Interface
- Features under development:
- Device type: Meter/Concentrator/Sniffer





STM8L/STM32L1

EnergyLite™ platform – Ultra-low-power devices

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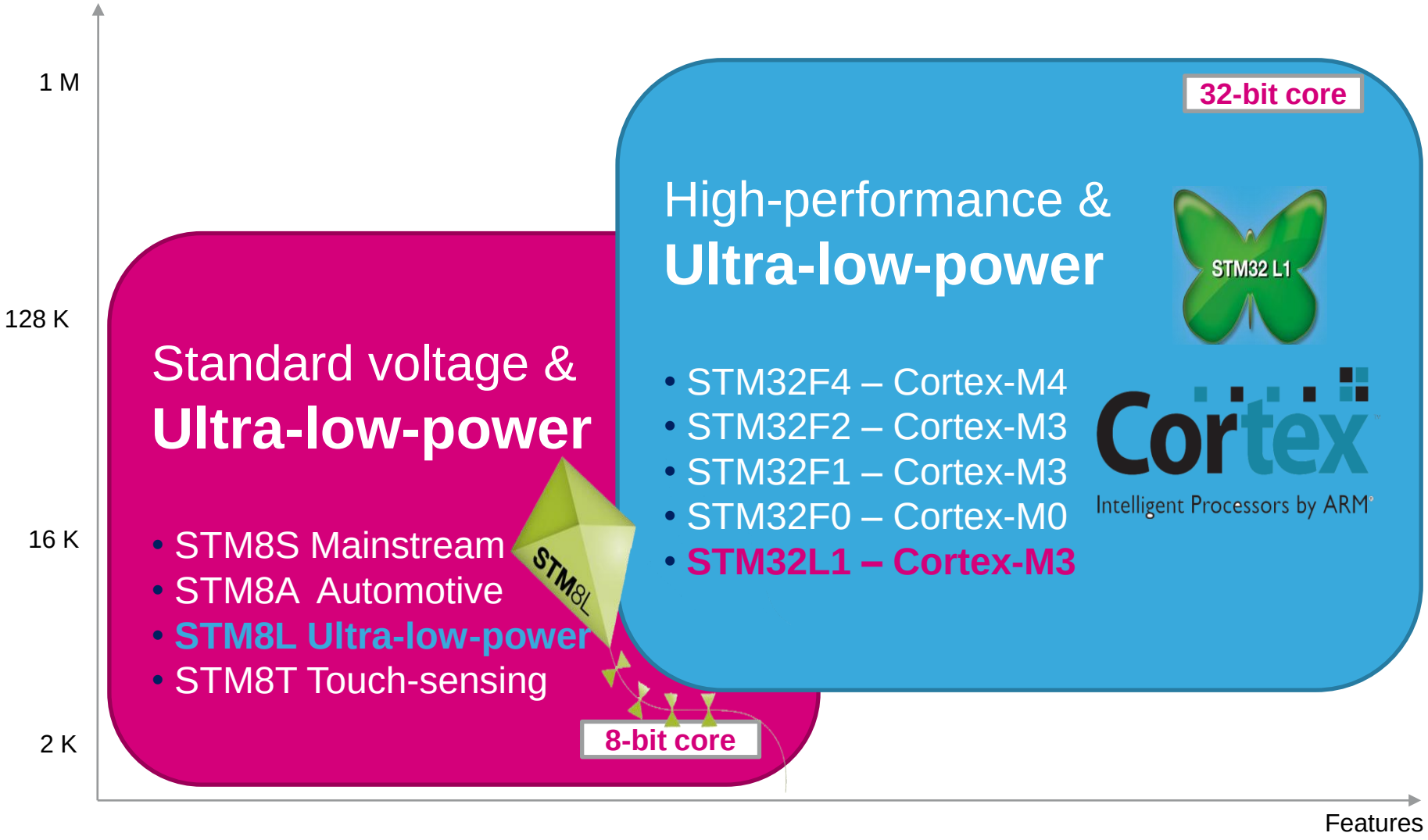
8-bit and 32-bit MCU families



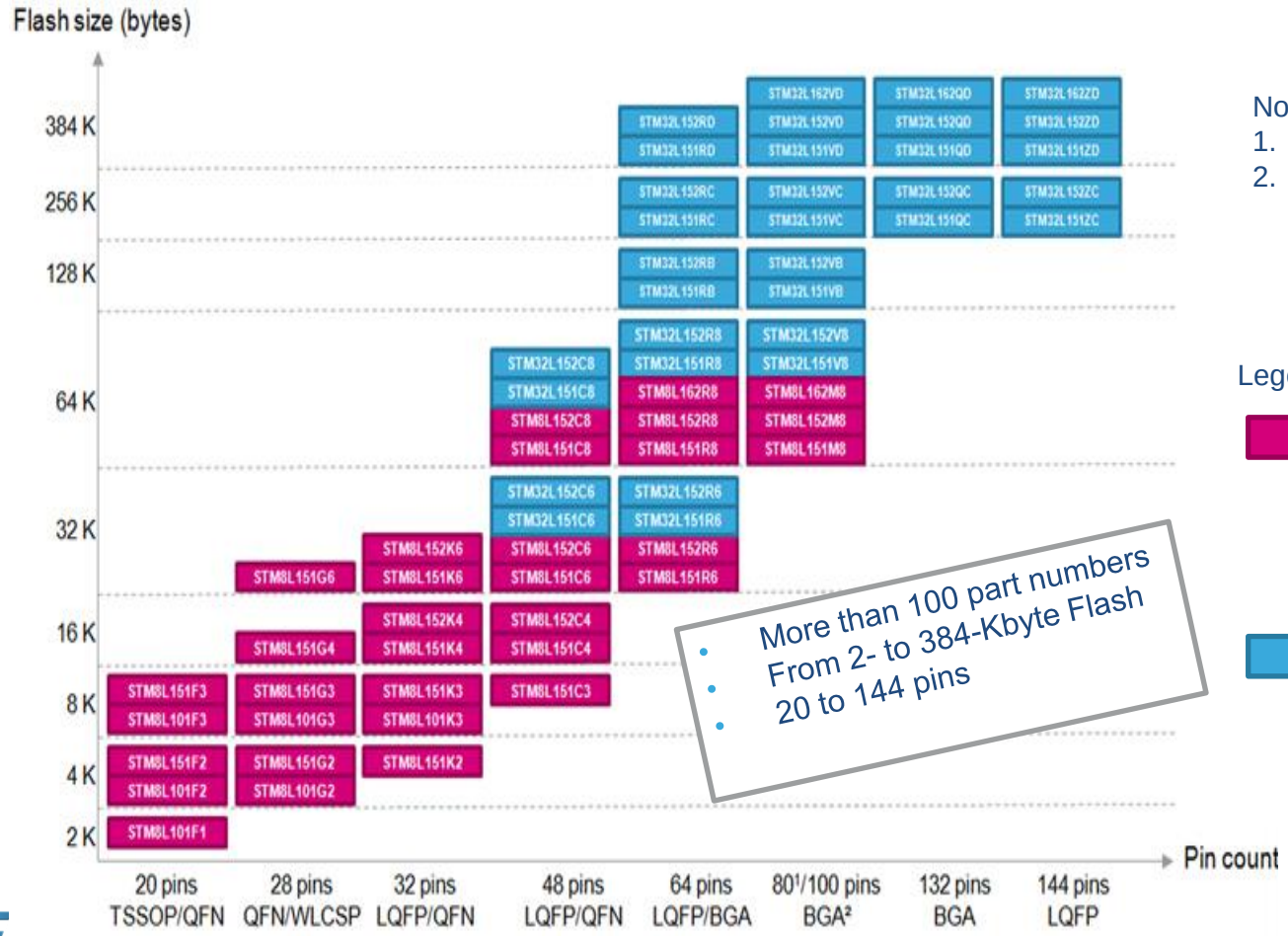
STM8L/STM32L1 - Ultra-low-power MCUs

- With the EnergyLite™ platform, STMicroelectronics is strongly committed to ultra-low-power MCUs

- Energy saving
  - Ultra-low-power advanced architecture
  - High-performance core
  - Ultra-low-power in dynamic and static modes
- New STM8L/STM32L1 series increase STM8/STM32 offer
  - Enriches both the ultra-low-power EnergyLite™ platform and STM8/STM32 portfolio
  - More than 100 part numbers for ultra-low-power lines

Ultra-low-power portfolio

- ST's 130 nm **ultra-low-leakage** process technology



- More than 100 part numbers
- From 2- to 384-Kbyte Flash
- 20 to 144 pins

Notes:
1. 80 pins for STM8L15x/16x only
2. BGA100 on STM32L15x up to 128 Kbytes only

Legend:

STM8L: 151 without LCD, 152 with LCD and 162 with LCD and 128-bit AES

STM32L1:151 without LCD, 152 with LCD and 162 with LCD and 128-bit AES

Ultra-low-power series – 3 lines

Common core peripherals and architecture:

- Multiple communication peripherals USART, SPI, I²C
- Multiple timers
- Internal 16 MHz and 38 kHz RC oscillators
- 2x watchdogs
- Reset circuitry POR/PDR
- 2x comparators
- Touch sensing

Feature-rich 32-bit solution: STM32L151/152/162 line

32 MHz Cortex-M3 CPU	Up to 384-Kbyte Flash / Dual bank / RWW	Up to 48-Kbyte SRAM	BOR PVD	Main osc. input 1-24 MHz	Up to 12-Kbyte data EEPROM	RTC with 32 kHz osc.	Up to 12 channel DMA	12-bit ADC (1 µs) 2x 12-bit DAC	LCD 8x40 4x44	AES 128-bit	ULP MSI	MPU ETM	USB FS	SDIO	FSMC	3x op-amps

Feature-rich 8-bit solution: STM8L151/152/162 line

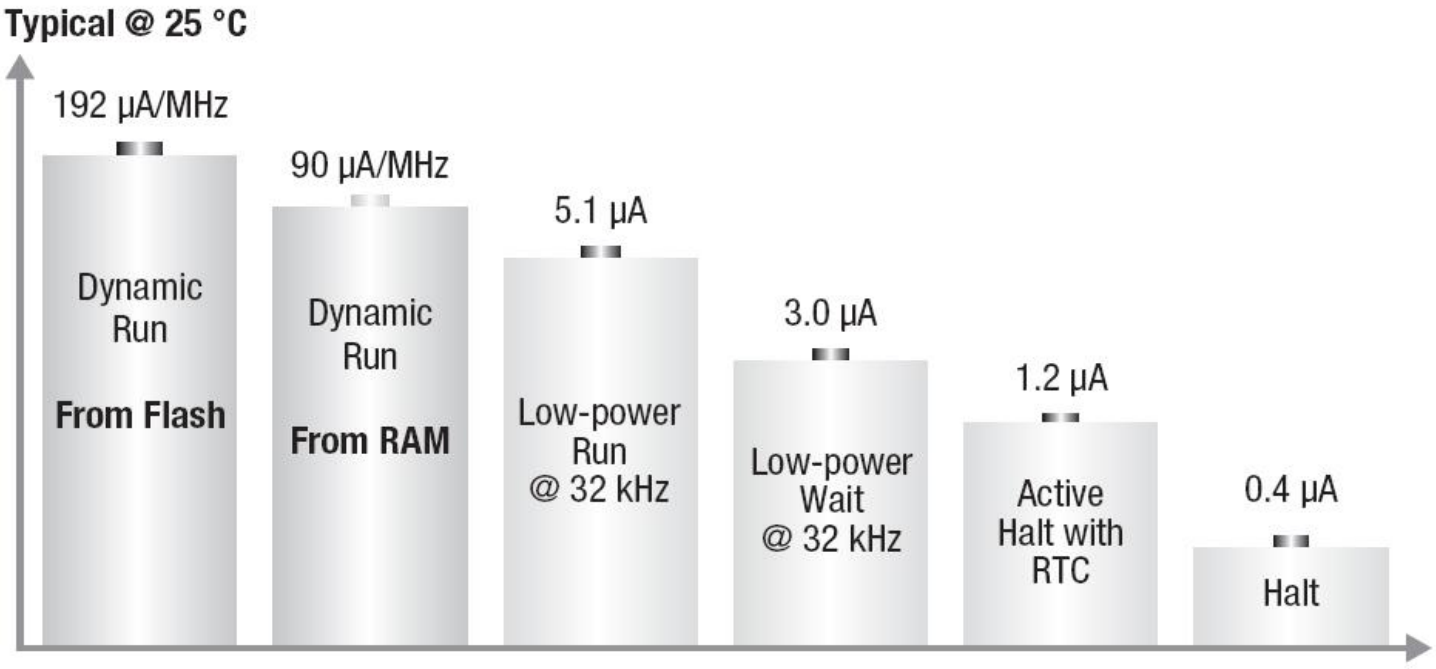
STM8 core @ 16 MHz	Up to 64-Kbyte Flash	Up to 4-Kbyte SRAM	BOR PVD	Main osc. input 1-16 MHz	Up to 2-Kbyte data EEPROM	RTC with 32 kHz osc.	Up to 4 channel DMA	12-bit ADC (1 µs) 12-bit DAC	LCD 8x40 4x44	AES 128-bit

Entry level 8-bit solution: STM8L101 line

STM8 core @ 16 MHz	Up to 8-Kbyte Flash*	Up to 1.5-Kbyte SRAM

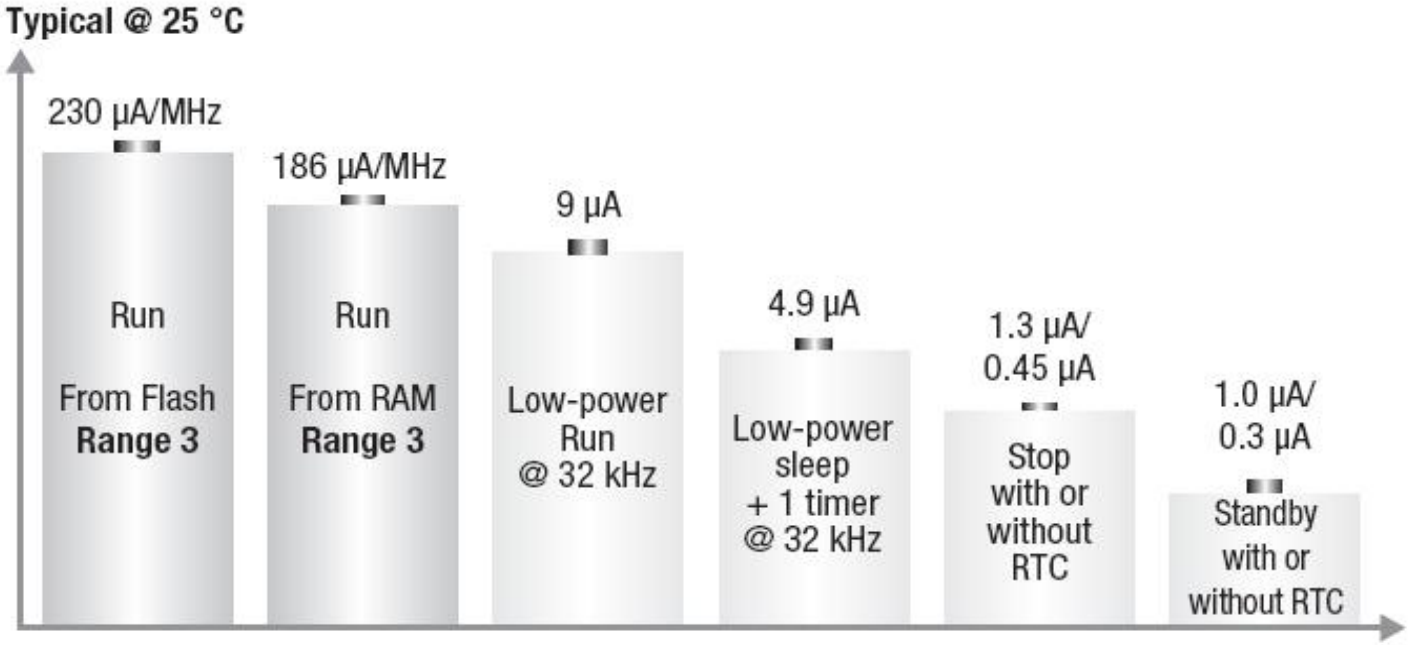
Note: * Embedded EEPROM in the Flash

STM8L – Ultra-low-power modes



Notes:
- POR/PDR on
- RAM content preserved
- BOR option at 2.4 µA
- Startup time from active Halt 5 µs
- Run and Wait consumption values are independent of V_{DD}
- Active Halt and Halt values measured at V_{DD} = 1.8 V

STM32L1 – Ultra-low-power modes



Notes:
- POR/PDR on
- RAM content preserved
- BOR option at 2.4 µA
- Startup time from Stop 8 µs
- Run and Sleep consumption value are independent of V_{DD}
- Stop and standby values measured at V_{DD} = 1.8 V
- Low-power Run and Low-power Sleep are measured with Flash off

Ultra-low-power Discovery kits

Dual Interface EEPROM

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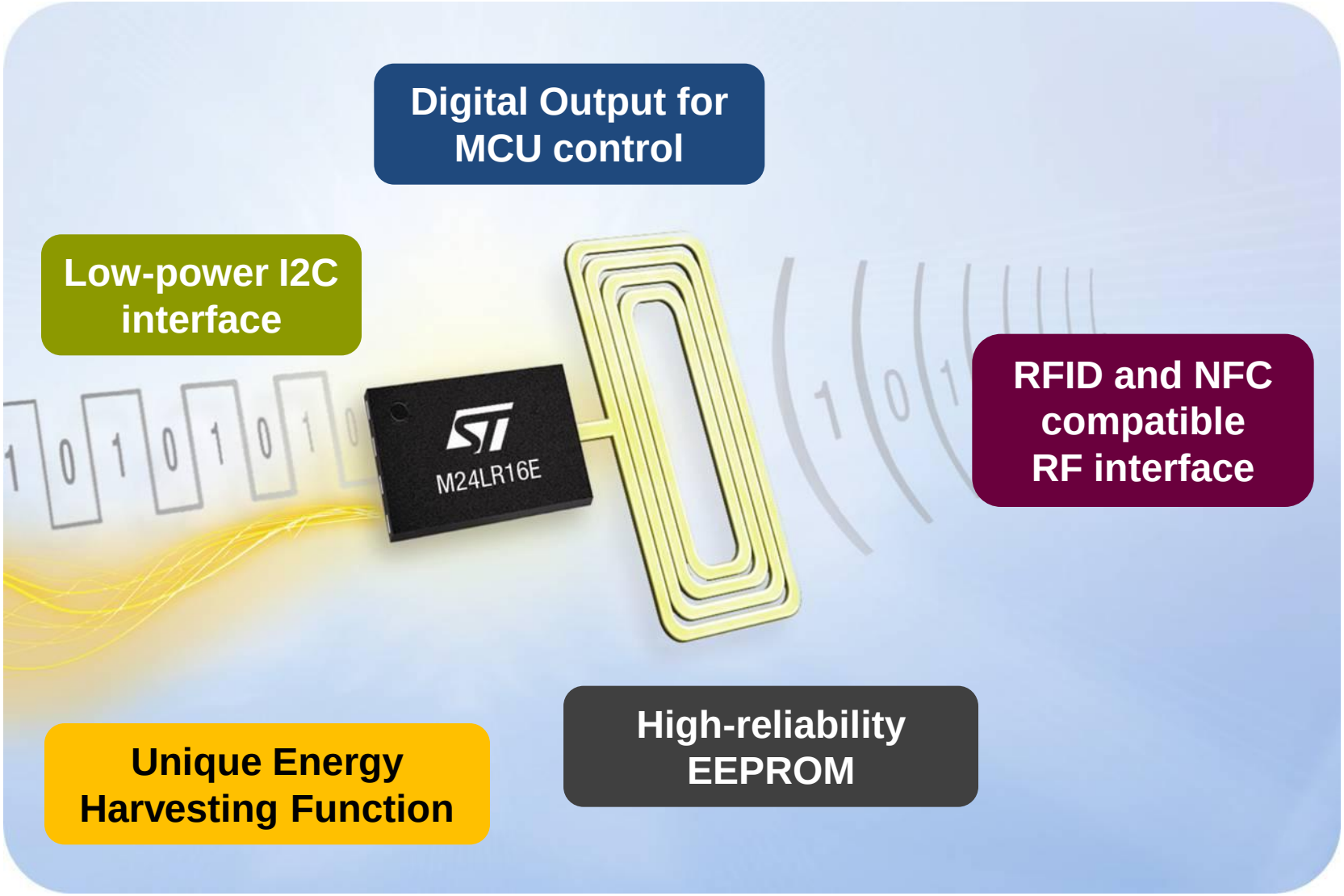
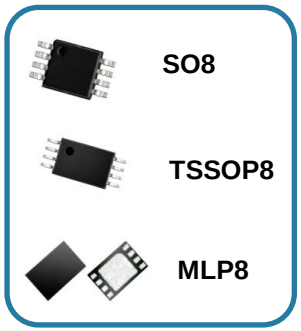
Dual Interface EEPROM – Introduction



Dual Interface EEPROM - M24LR product line

- **Comprehensive portfolio**
  - Memory density: 4-Kbit, 16-Kbit and 64-Kbit
  - Large package choice

- **RF interface:**
  - Long range RFID
  - NFC (ISO15693)



M24LR04E (4-Kbit)

M24LR16E (16-Kbit)

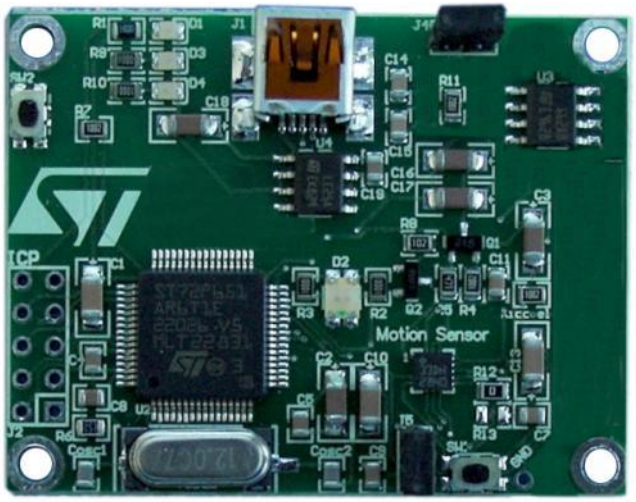
M24LR64E (64-Kbit)

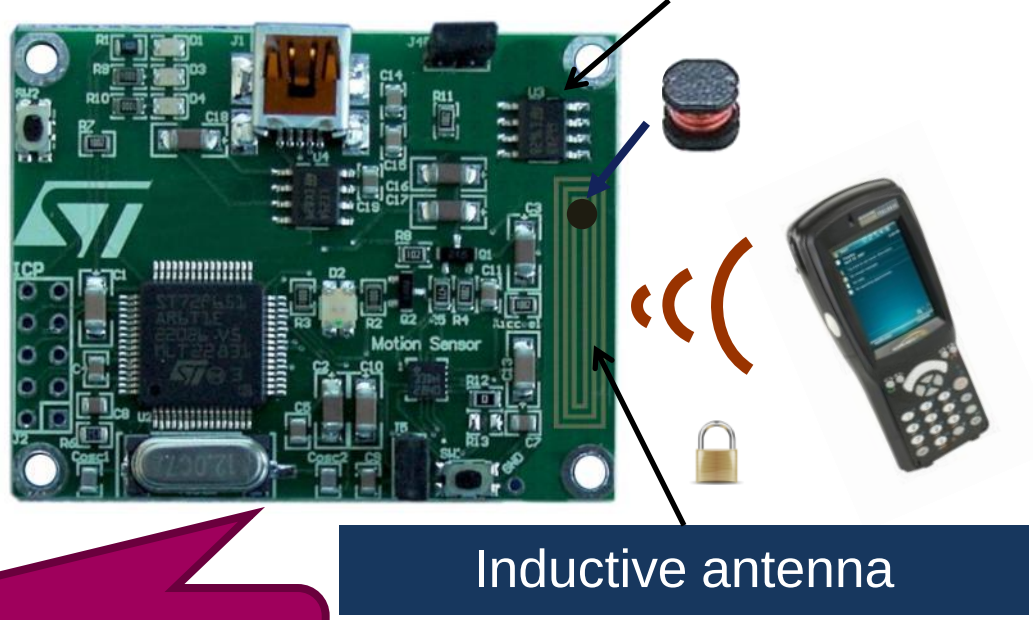
Serial Interface: low-power I2C

Energy Harvesting from RF

Dual Interface EEPROM - How it works

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



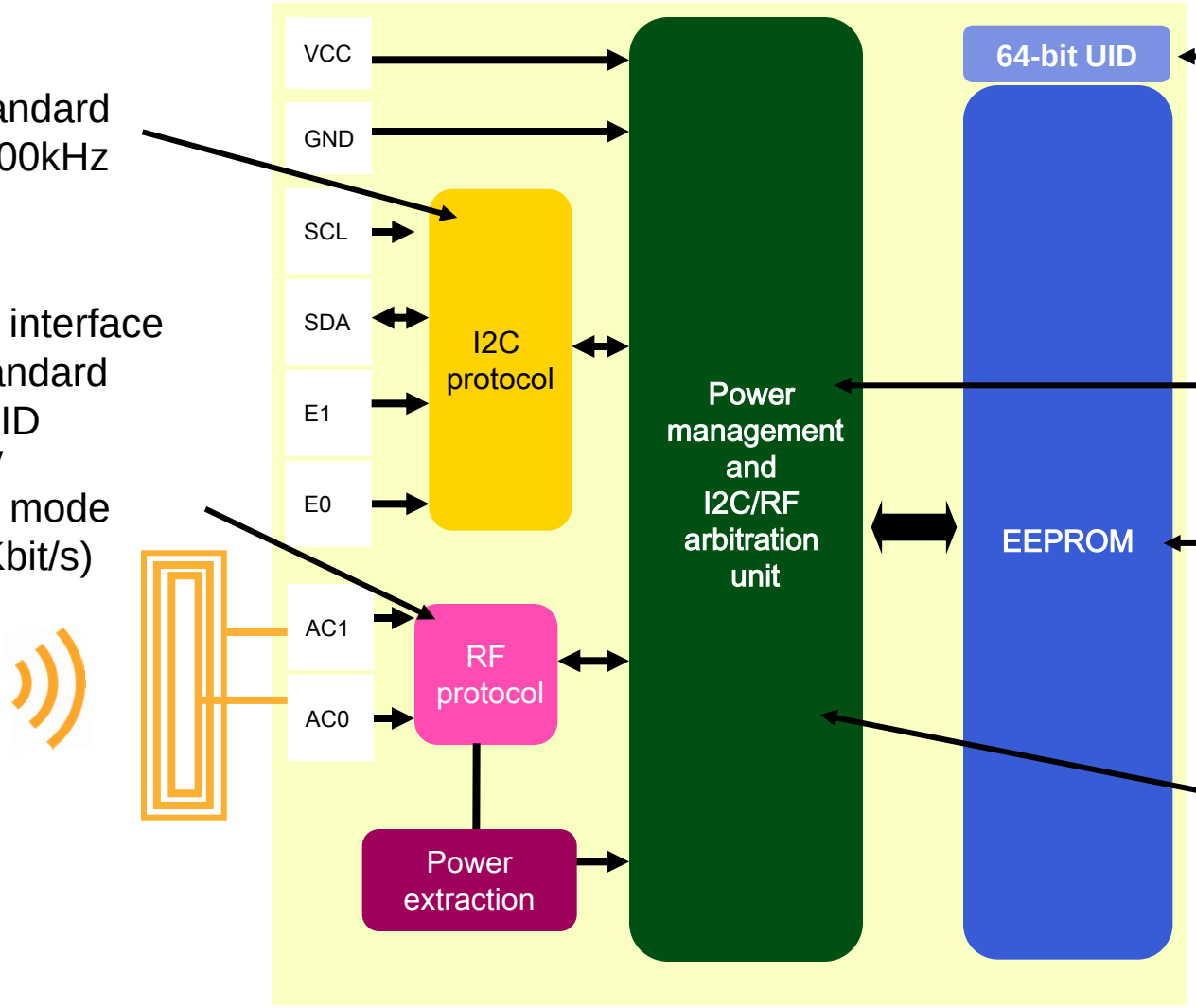


No battery needed to operate the dual interface EEPROM in RF mode

M24LR64 block diagram

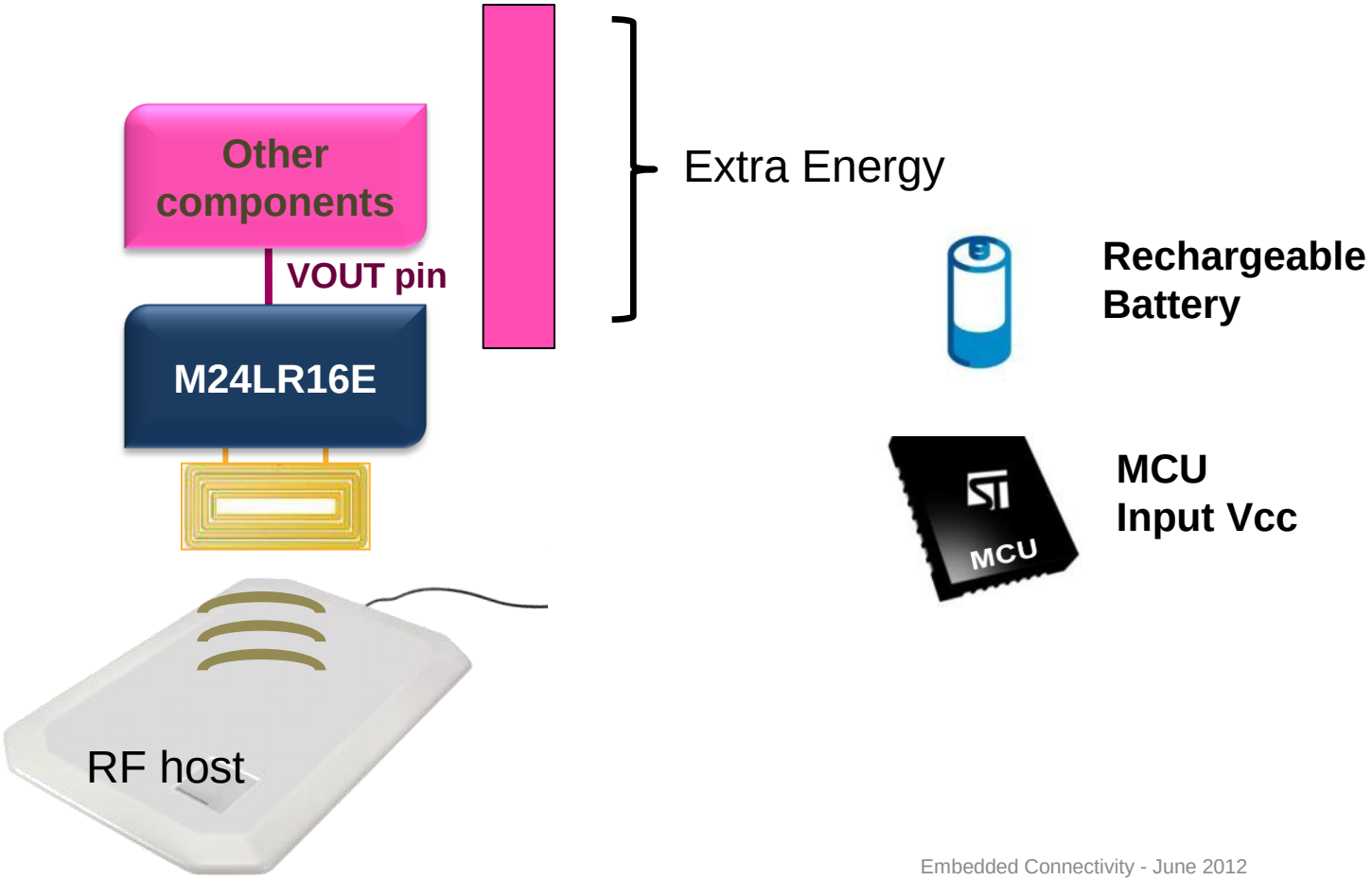
I²C interface
- industry standard
- 1.8-5.5V, 400kHz

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



What is M24LR16E Energy Harvesting?

- When the Energy Harvesting function is ON, the M24LR16E can deliver the extra energy to other components



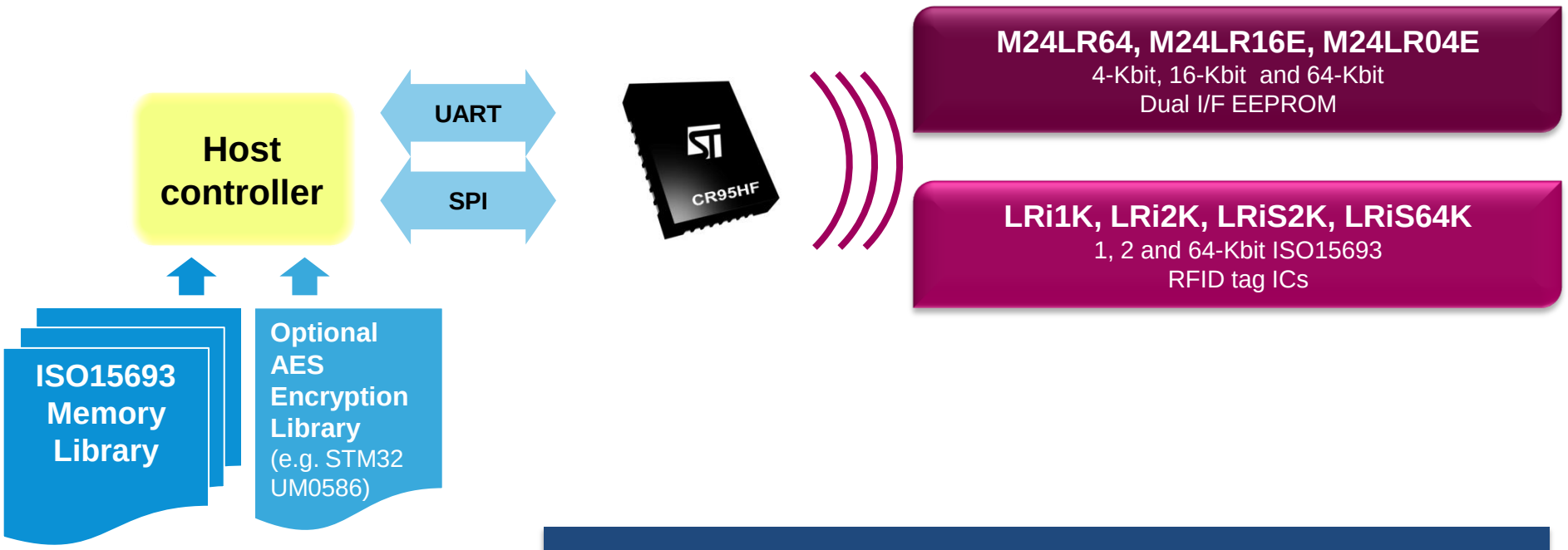
M24LR16E Energy Harvesting Performance

Range	H_{min}	P_{min}	V_{out} @ I=0	V_{out} @ I_{sink_max}	I_{sink_max} @ P_{min}
00	3,5 A/m	100 mW	2,7 to 4,5 V	1,7 V	6 mA
01	2,4 A/m	66 mW	2,7 to 4,5 V	1,9 V	3 mA
10	1,6 A/m	33 mW	2,7 to 4,5 V	2,1 V	1 mA
11	1,0 A/m	18 mW	2,7 to 4,5 V	2,3 V	300 uA

- Enables to remotely
  - Recharge your battery!
  - Power your board!

Embedded reader-writer: CR95HF chip

- Full support of ST ISO15693 products with CR95HF
  - Software libraries
  - Reference design
  - Application notes



Design your own embedded RF reader-writer

DEMO-CR95HF-A support

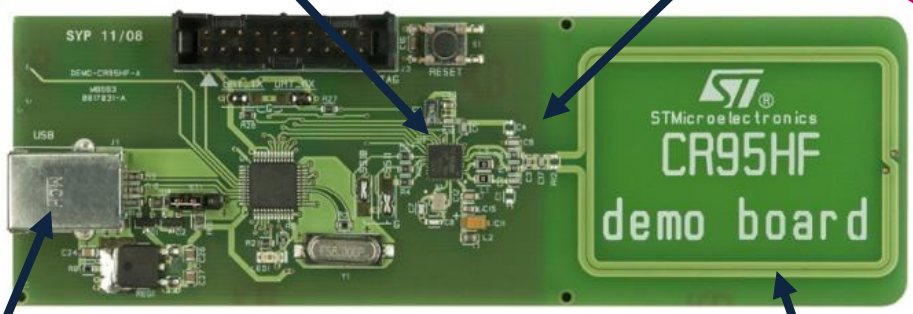
- Ideal for demonstrations and performance assessment
- Directly plugs on your computer (USB), comes with PC software

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

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

Host system

USB



PC demonstration software
- M24LRxx Application Software 2.0.zip

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

2.4GHz WIRELESS @ ST

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OEM Modules

BlueTooth (Blue Modules)

SPBT Series

SPBT2532 (BT 2.1)

SPBT2632 (BT 3.0)

IEEE 802.15.4

ZigBee
Control your world

SPZB32W Series

SPZB32W1 (STM32W108CB)

- Off-the-shelf RF **plug&play solutions**
  - Enable short **time-to-market** product development
  - **No RF specific knowledge** is required for the integration of the modules in the target application
- **Cost-effective** for design of multiple platforms or multiple versions of the same platform
  - Save 8-12 months in design cycle
  - Significantly reduce engineering and production costs
- **Pre-certified** RF modules
  - reduce the effort and certification cost on the customer side

CE FC

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Blue Modules Key Features

- Multiple antenna and trasmission range options available
- BT 2.1 EDR / BT 3.0 Compliant
- Integrated Serial Port Profile and AT layer command interface
- FW upgradable via UART
- Micro sized Form Factor
- Support of Low Power Use Modes
- Industrial Operating Temperature Range
- Bluetooth Qualified and RF Certified (FCC, CE, IC)

•SPBT2532C2.AT
•SPBT2632CxA.AT2

ST core leading industry technology inside

STM32F103

+

STLC2500D
STLC2690

SW Libraries Available

AmpedRF

AT-command layer
IAP Profile
SPP profile

Blue Modules - Certifications

Blue Modules are **CE** and **Bluetooth® certified**. **Radio type compliant** for US and Canada.

	BQB qualified design	CE Statement of opinion*	FCC and IC
SPBT2532C2.AT SPBT2532C2.AT2	QD ID: **B016360** Product type: End Product TGP Version: Core 2.1/2.1 + EDR TCRL-2009-1 Core Spec Version: 2.1/2.1 +EDR Product Description: Bluetooth Module	**0307-ARAJ00079** Measurements in accordance with : EN 300 328 V 1.7.1 (2004-11) EN 301 489-17 V 1.2.1:2002 EN 60950-1 CE 0051	**Not Applicable** FCC qualification is strictly related to RF section design; therefore it doesn't apply to module without antenna on board. For this reason SPBT2532C2.AT module is not formally qualified, however it is FCC ready.
SPBT2632C1A.AT2	QD ID: **B019224** Product type: End Product TGP Version: Core 3.0 Core Spec Version: 3.0 Product Description: Bluetooth Module, spec V3.0	**0447-ARAM00002** Measurements in accordance with: EN 300 328 V 1.7.1 (2006-10) EN 301 489-17 V 2.1.1 (2009) EN 60950-1:2006 +A11:2009+A1:2010 CE 0051	FCC ID: **X3ZBTMOD3** IC: **8828A-MOD3** In accordance with FCC part 15, the SPBT2632C1A.AT2 is listed above as a modular transmitter device
SPBT2632C2A.AT2	QD ID: **B019224** Product type: End Product TGP Version: Core 3.0 Core Spec Version: 3.0 Product Description: Bluetooth Module, spec V3.0	**0307-ARMJ00003** Measurements n accordance with : EN 300 328 V 1.7.1 (2006-10) EN 301 489-17 V 2.1.1 (2009) EN 60950-1:2006 +A11:2009+A1:2010 CE 0051	FCC ID: **X3ZBTMOD4** IC: **8828A-MOD4** In accordance with FCC part 15, the SPBT2632C2A.AT2 is listed above as a modular transmitter device

* Reports available on request

Bluetooth™

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Hardware Architecture and RF Performances

BT 3.0
STE STLC2690 *Bluetooth* IC

SPBT2632C1A.AT2

Class 1
Tx Power: +10 dBm.
Rx Sensitivity: -90 dBm
Size: 15 mm x 27 mm

BT 3.0
STE STLC2690 *Bluetooth* IC

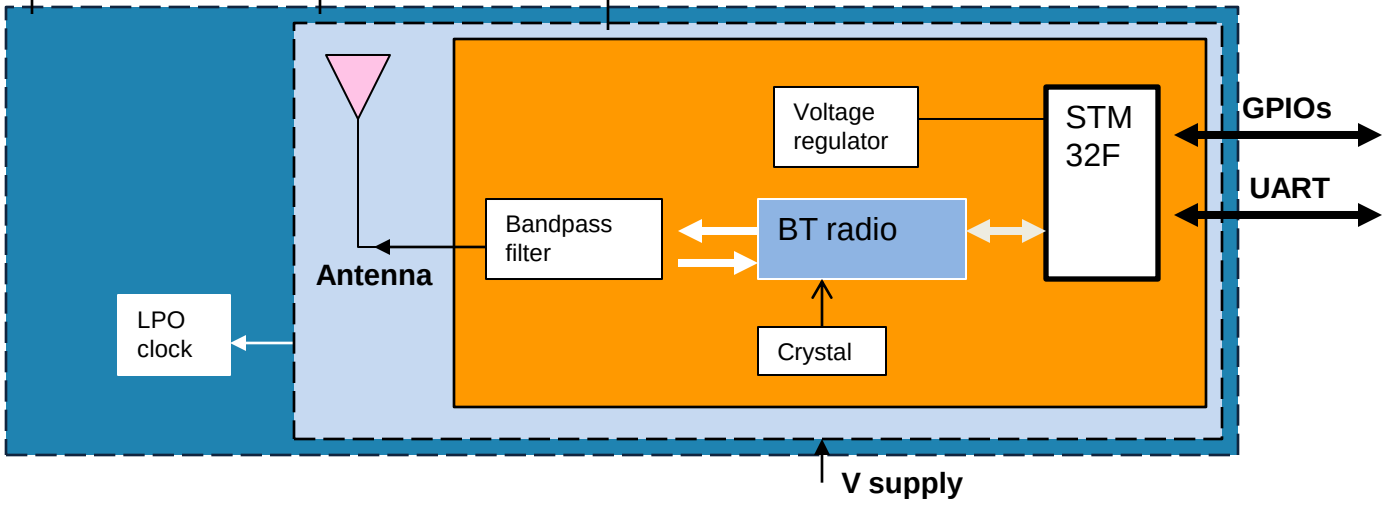
SPBT2632C2A.AT2

Class 2
Tx Power: +0 dBm.
RX Sensitivity: - 86 dBm
Size: 11.6 mm x 13.5 mm

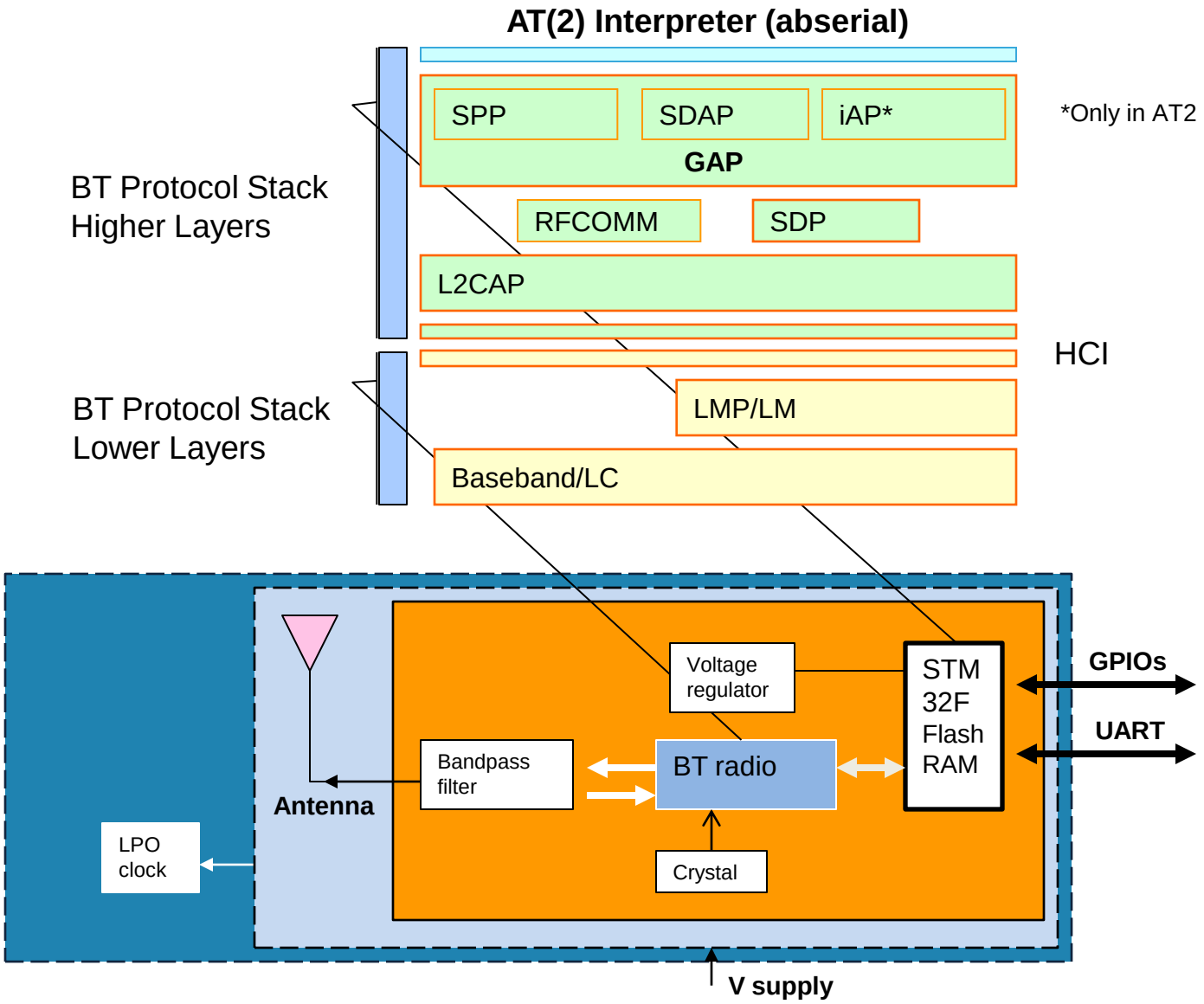
BT 2.1 + EDR
STE STLC2500D *Bluetooth* IC

SPBT2532C2.AT
SPBT2532C2.AT2

Class 2
Tx Power: +4 dBm.
Rx Sensitivity: -85 dBm
Size: 10.5 mm x13.5 mm



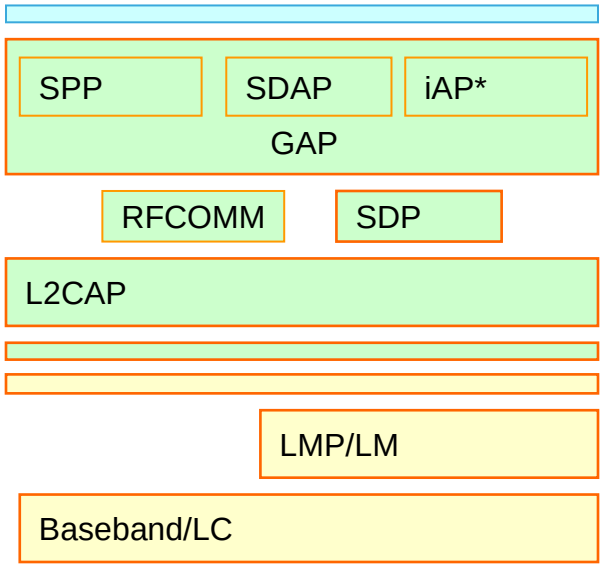
Software Architecture



Profiles and AT Command Layer

PART NUMBER SCHEMA: SPBT2x32Cxx.*AT(2)*

AT(2) Interpreter



Integrated Profiles

- Generic Access Profile (GAP)
  - Discovers and connects to other devices
  - Security (authentication)
  - idle mode procedure: inquiry
  - linking, paging, connection
- Service Discovery Profile (SDP)
  - Locates/describes services from/to other devices
- Serial Port Profile (SPP)
  - Emulates legacy serial communication
- iPOD Accessory Protocol (iAP)
  - Supports communication with Apple iOS Bluetooth enabled device*

(*) The external Apple authentication coprocessor and MFI certification are required

	AT command	AT2 command
	SPBT2532C2	**SPBT2532C2 SPBT2632C2A SPBT2632C1A**
Bluetooth version	2.1 + EDR	3.0
Point-to-point communication	X	X
Multipoint communication	-	X
Profiles		
SPP	X	X
iAP	-	X
Smart Phone support		
Android	-	X
iPhone	-	X

HW Features

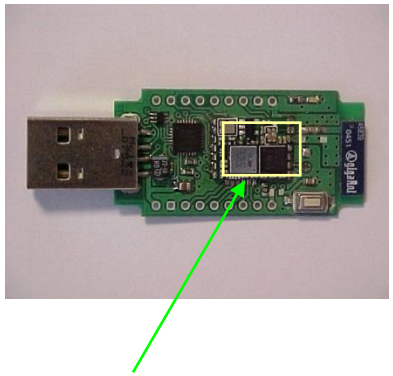
SPBT2532C2 	SPBT2632C2A 	SPBT2632C1A 
RESET (Nrst) pin		
BOOT pin		
4x UART(I2C) pins (Tx, Rx, Cts, Rts)		
6x pins JTAG interface (Jtdi, Jtdo, Jtms, Jtck, Jtrst, Nrst)		
2.1V to 3.6V supply	2.7V to 3.6V supply	
GPIO High Level = 3V	GPIO High Level = 2.1V	
4x GPIOs	7x GPIOs	16x GPIOs
Antenna pin	LPA pin	

Power Consumption Performances

	SPBT2532C2.AT SPBT2532C2.AT2 	SPBT2632C2A.AT2 	SPBT2632C1A.AT2 
High Speed CPU Mode 32 MHz	Av. Values	Av. Values	Av. Values
ACL data 115KBaud UART at max throughput (Master)	39.0 mA	23 mA	23 mA
ACL data 115KBaud UART at max throughput (Slave)	39.0 mA	27.5 mA	27.5 mA
Connection, no data traffic, Master	28.9 mA	9.1 mA	9.1 mA
Connection, no data traffic, Slave	34.5 mA	11.2 mA	11.2 mA
Connection 375 ms sniff	----	490 (ext. LPO) uA	490 uA
Standby, (page/inquiry scan), without deep sleep	28.3 (33.2) mA	8.6 (9.5) mA	8.6 (9.5) mA
Standby, (page/inquiry scan), with deep sleep, no external LPO	2.1 (7.2) mA	1.7 (2.7) mA	----
Standby, (page/inquiry scan), with deep sleep, with external LPO	----	70 (520) uA	70 (520) uA

Evaluation Boards

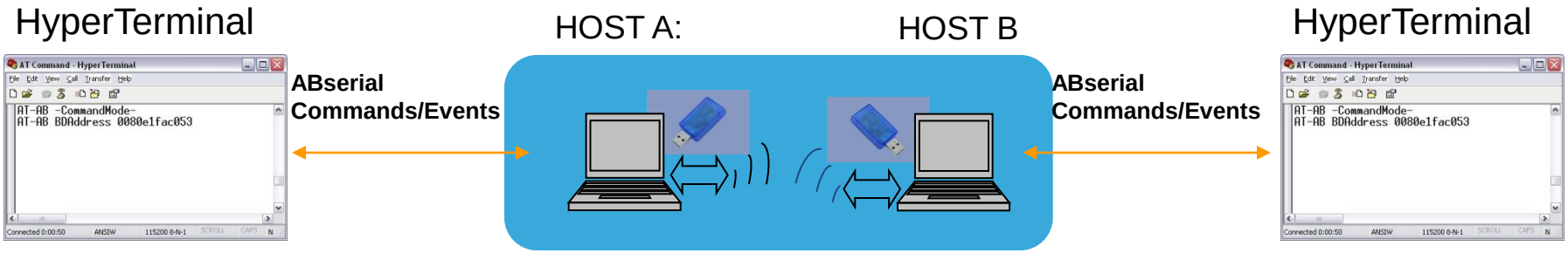
STEVAL-SPBTxATVx



SPBT2x32CxA

- Blue Modules reference designs and evaluation boards for a fast evaluation of AT commands
- Power Supplied via the USB interface
- Compact and Small form factor
- LEDS connected to GPIO for testing purposes
- UART/USB bridge from Silicon Lab

Typical Usage

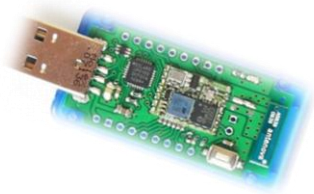


Support tools

Order codes

Order code	Description
SPBT2532C2.AT	Bluetooth V2.1+EDR, Class2, antennaless, AT command FW
SPBT2532C2.AT2	Bluetooth V2.1+EDR, Class2, antennaless, AT2 command FW
SPBT2632C2A.AT2	Bluetooth V3.0, Class2, antenna, AT2 command FW
SPBT2632C1A.AT2	Bluetooth V3.0, Class1, antenna, AT2 command FW

Evaluation boards



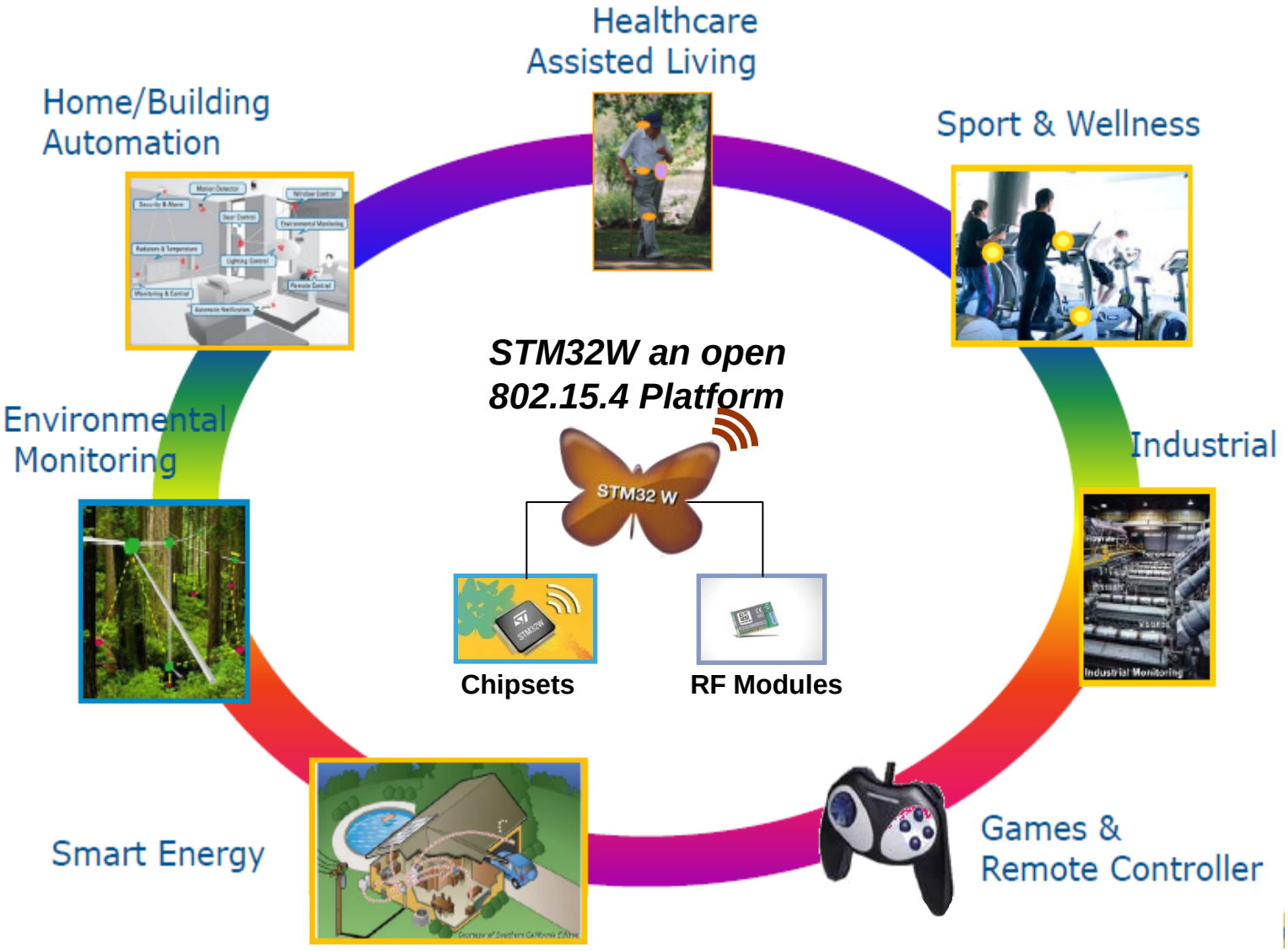
Order code	Description	Status
STEVAL-SPBT2ATV2	USB dongle, evaluation board for SPBT2532C2.AT	available
STEVAL-SPBT2ATV3	USB dongle, evaluation board for SPBT2532C2.AT2	available
STEVAL-SPBT3ATV3	USB dongle, evaluation board for SPBT2632C2A.AT2	available
STEVAL-SPBT4ATV3	USB dongle, evaluation board for SPBT2632C1A.AT2	available

Other tools

Documentation
Datasheets
Application note
AT command user manual

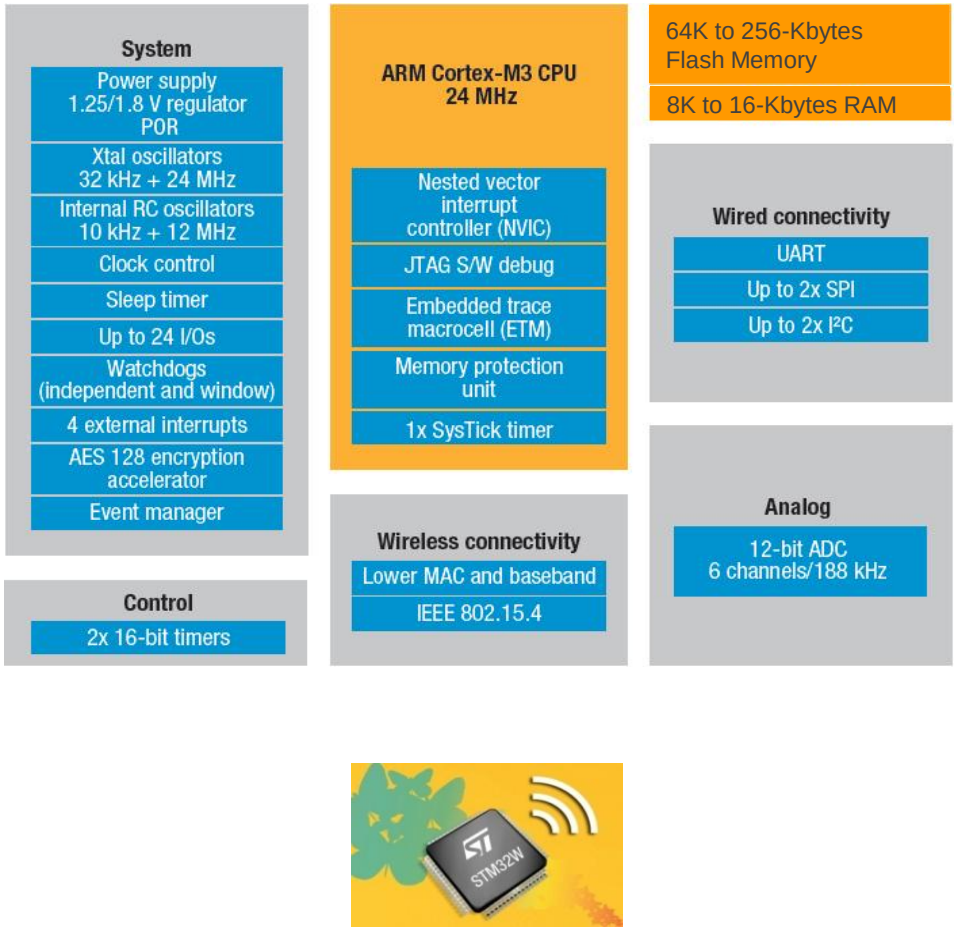
Technical support
Contact us @ onlinesupport@st.com

802.15.4 Target Applications



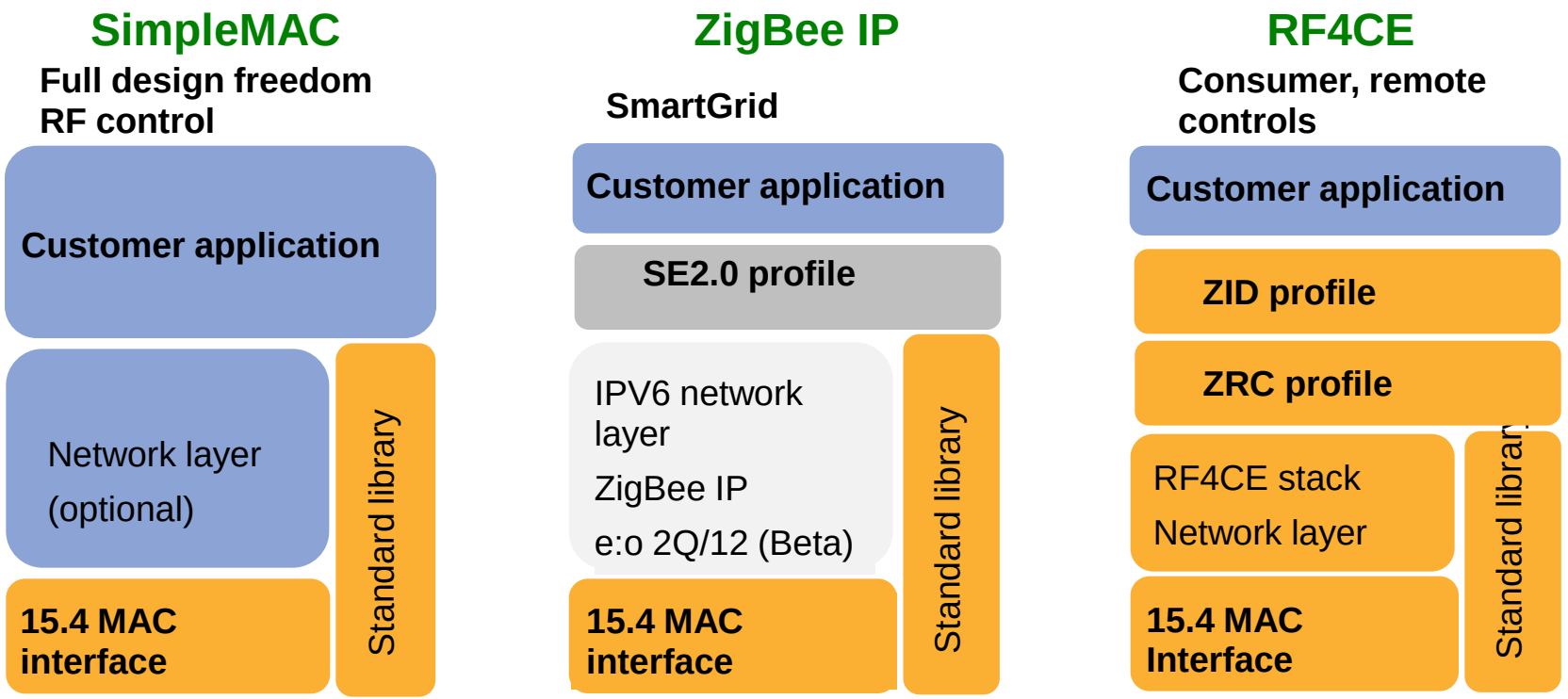
STM32W architecture overview

- 32-bit ARM Cortex-M3 core running at 24 MHz
- Up to 256-Kbyte Flash and 16-Kbyte RAM
- Fully IEEE 802.15.4 compliant radio at 2.4 GHz
- Power management
  - Deep sleep mode: <1 µA with RAM retention
- On-chip debug support
  - ARM JTAG/SWD
  - Packet trace interface enables remote monitoring of radio messages
- ARM memory protection unit
  - To detect erroneous software accesses
- Sleep timer, watchdog timer and GP timers
- AES-128 encryption acceleration
- Serial communication (UART/SPI/I²C)
- GPIO
- ADC (6 channels, first-order 12-bit sigma delta)



STM32W F/W combinations/portfolio

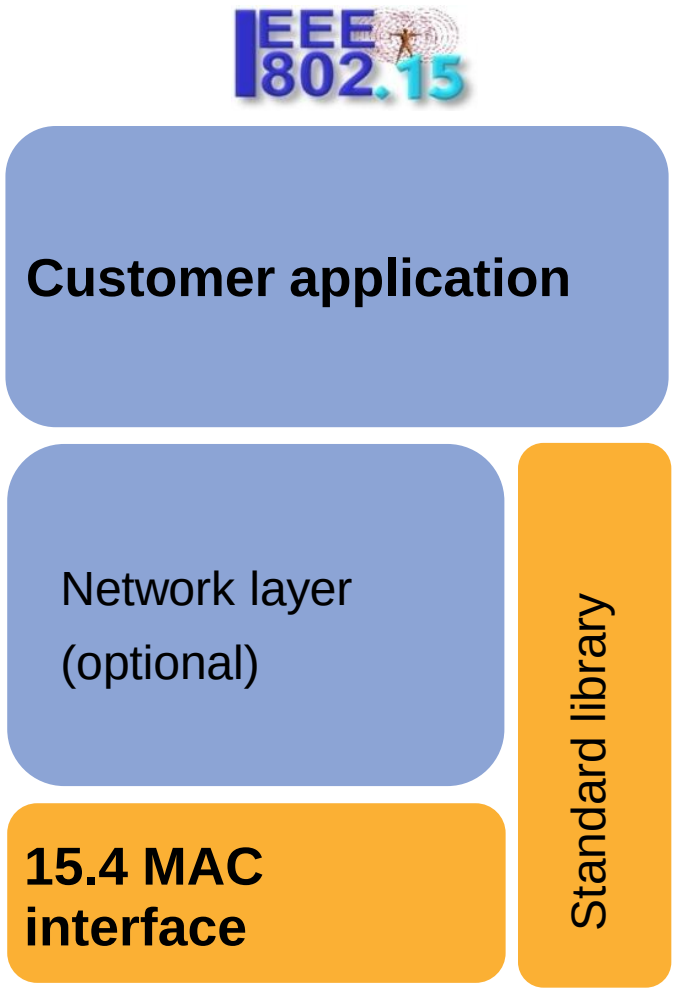
(for all versions)



Part Number last digit mapping

- **Customer code**
- **Libraries available**
- **Alpha released, Beta planned in June 2012 (depends on Zigbee Alliance specification ratification)**
- **Alpha released, Beta planned Q4 2012 (depends on CSEP specification ratification)**

IEEE 802.15.4 Simple MAC Library



- The ST **IEEE 802.15.4** Simple MAC Library provides a set of APIs allowing access to the **PHY** and **lower-MAC** functionality of the STM32W SoC:
  - RX/TX functionalities
  - Radio channel selection
  - **Transmit power level** control
  - Boost mode control
  - Radio **sleep** and **wakeup** control
  - LQI and RSSI for received packets
  - Implementes Unslotted CSMA transmit support including CCA
  - Ability to enable/disable receiver
  - Automatic acknowledgement management

Customer code **Productized Libraries** **Under Design**

SPZB32W Series Options

Part Number Schema

SPZB	32Wx	y	z	.t

Product Family
802.15.4/ZigBee
RF Modules

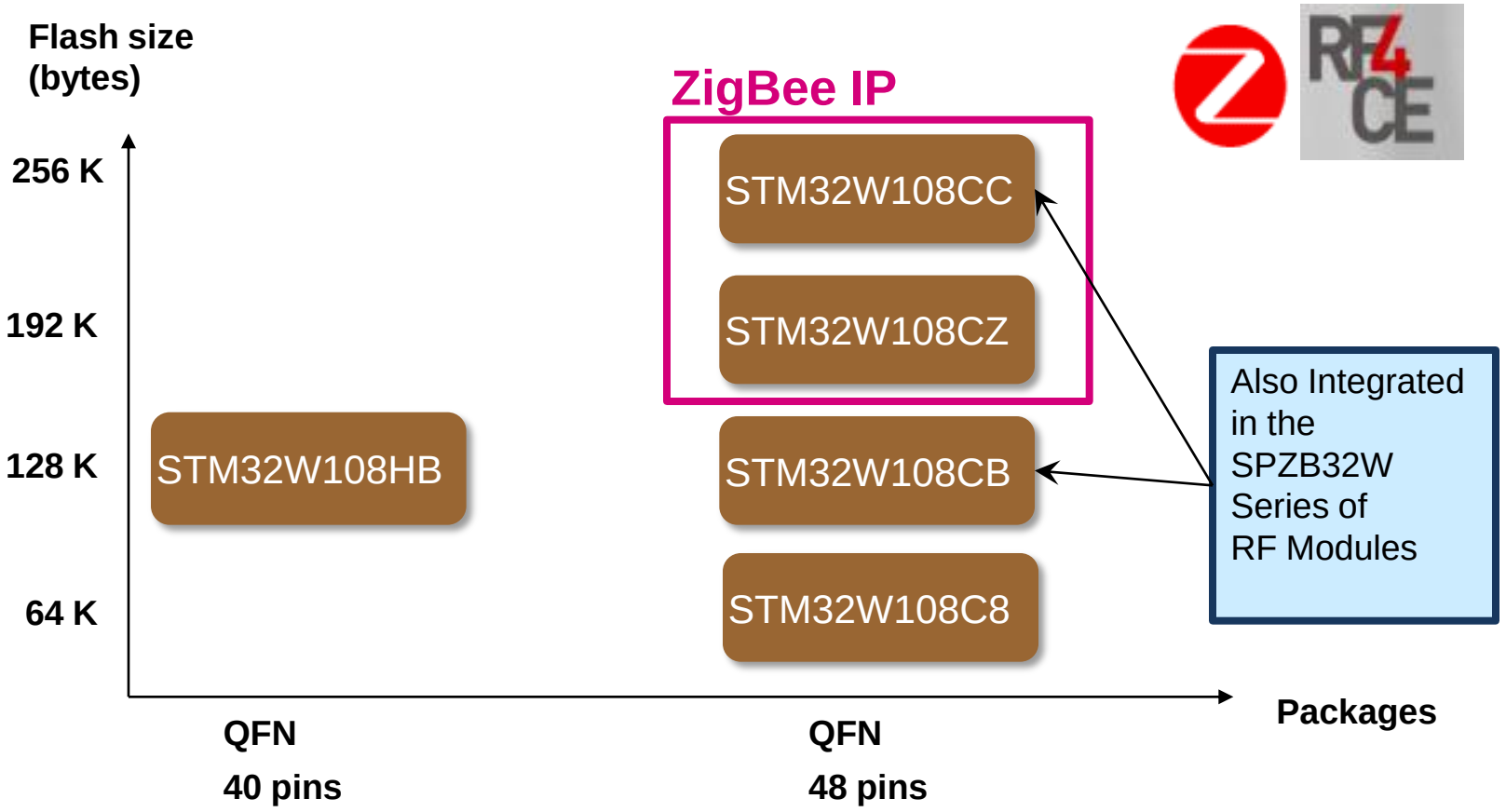
Memory Options (integrated micro)
32Wx → 32W1: 8/128 kB STM32W108CBU6
32Wx → 32W2: 16/256 kB STM32W108CCU7

Antenna Options
y→A: Integrated Antenna
y→C: Integrated UFL Connector

Power Transmission Options
z→1: Long Range (Integrated PA) (up to +20 dBm/100 mW)
z→2: Normal Range (+3 dBm /2 mW typical)

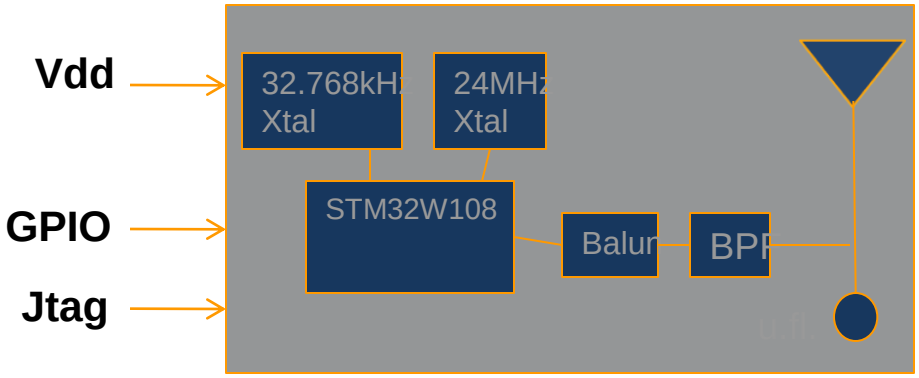
Stack Options
Blank: Open (only for evaluation boards)
t→4: SimpleMAC

STM32W – PRODUCT PORTFOLIO

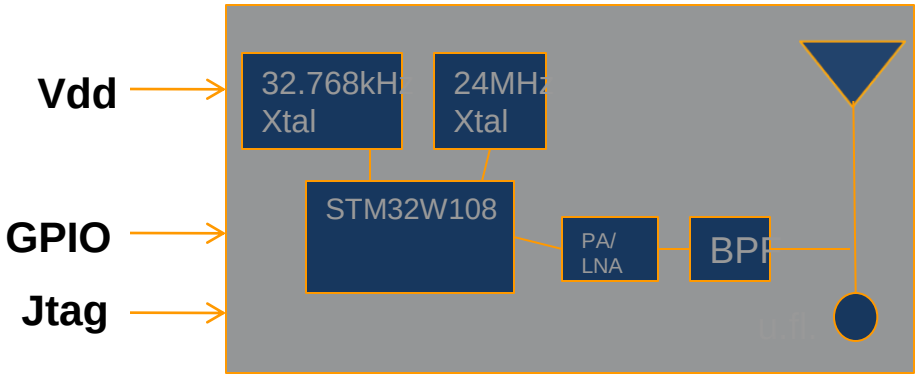


SPZB32W Key Features – Block Diagrams

- Onboard 24MHz and 32kHz stable Xtals
- Supply Range 2.1 V – 3.3 V
- Exported the STM32W peripherals (UART, I2C, SPI, ADC)
- JTAG interface for programming and debugging
- SMD Modules with side pads for easy soldering and optical inspection
- Operating in the industrial temperature range: -40 °C to + 85 °C
- Small Form Factor: 26.5 mm x 16.4 mm
- All the versions are pintopin compatible
  - Unless one GPIO between the normal and long range versions



SPZB32Wxy2.t –
(TX: +3dbm : ITX: 32mA)

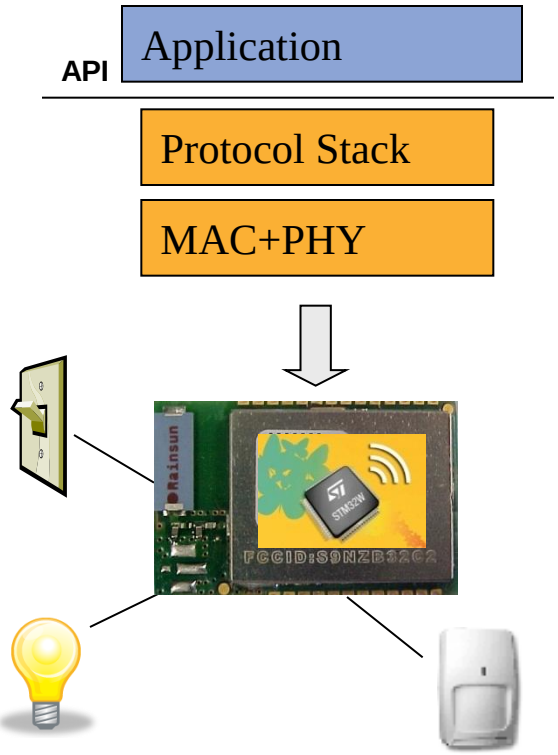


SPZB32Wxy1.t –
(TX: up to 20dBm: ITX: 130 mA)

SPZB32W Use modes

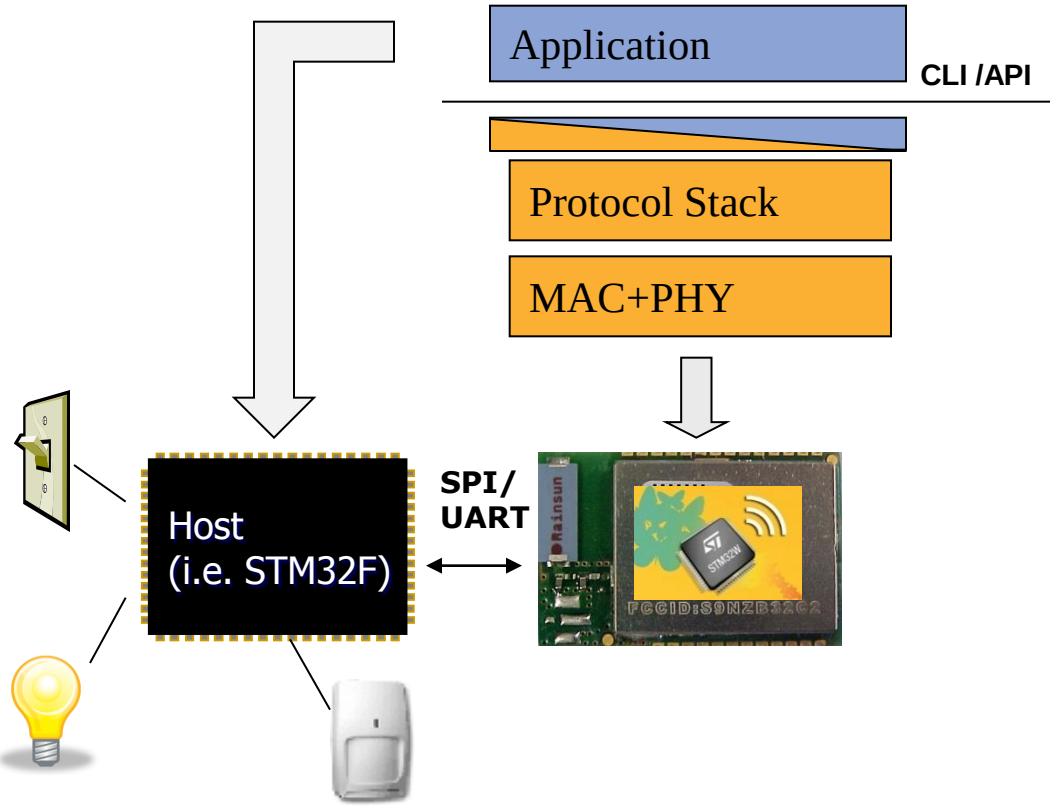
SOC Use Mode:

STM32W runs both the protocol and the application both stored in the integrated Flash



Network Coprocessor Use Mode:

STM32W runs the protocol while an host processor runs and store the application



Tools and Reference Boards

STM32W Development Kits

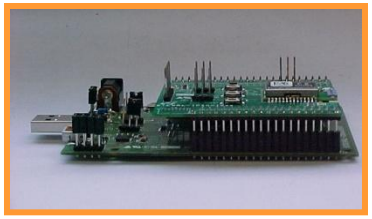
STM32W Starter and Extension Kit

STM32W Control Kit

SPZB32W Reference and Evaluation Boards

STEVAL-IDZ401V1

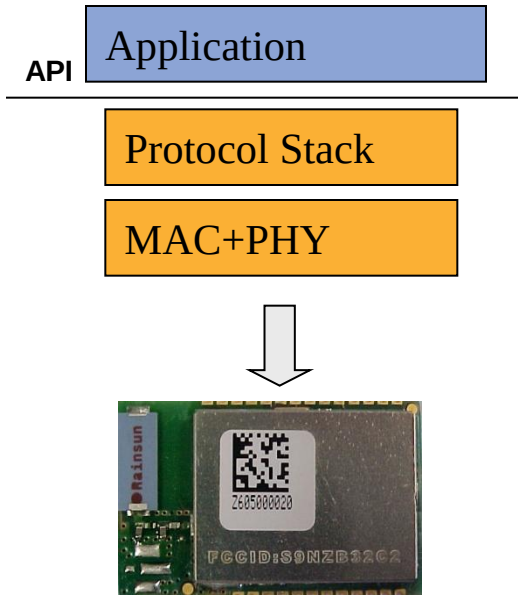
STEVAL-IDZ30xV1

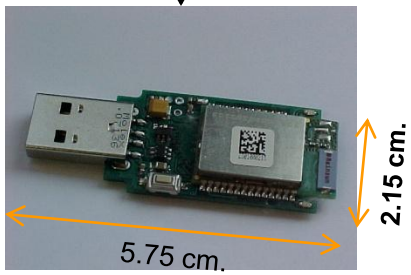


STEVAL-IDX001V1 (motherboard) + STEVAL-IDX001V1x (daughterboard)

SPZB32W Reference Designs

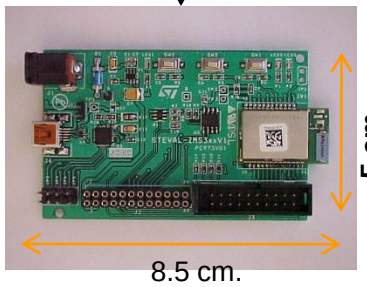
SOC Use Mode:
STM32W stores and runs both the protocol and the application





STEVAL-IDZ401V1

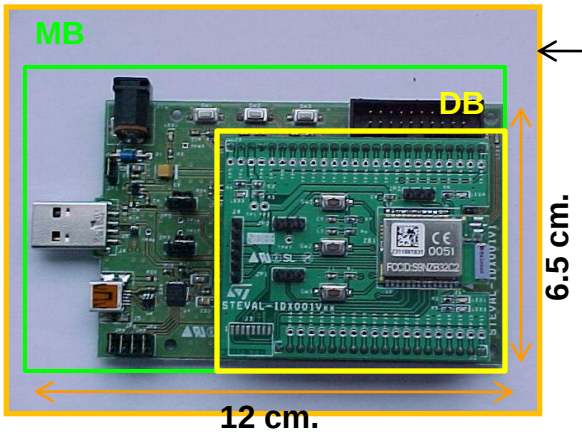
- **Optimized USB Dongle Design**
- **Powered and programmable via USB**
- **STM32F USB Bridge**
- **Integrated JTAG**



STEVAL-IDZ30xV1

- **Flexible and expandable development board**
- **Multiple Power Supply Options**
- **SiLab USB Bridge**
- **Integrated temperature sensor, configurable buttons, configurable leds and voltage battery measurement circuitry**

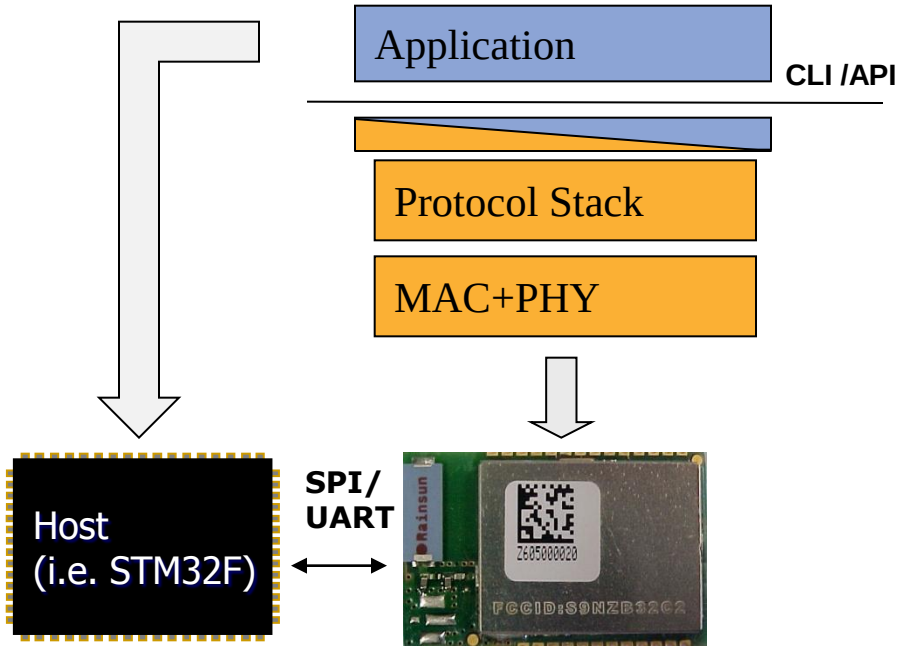
SPZB32W Reference Design



MB: STEVAL-IDX001V1
DB: STEVAL-IDX001V11

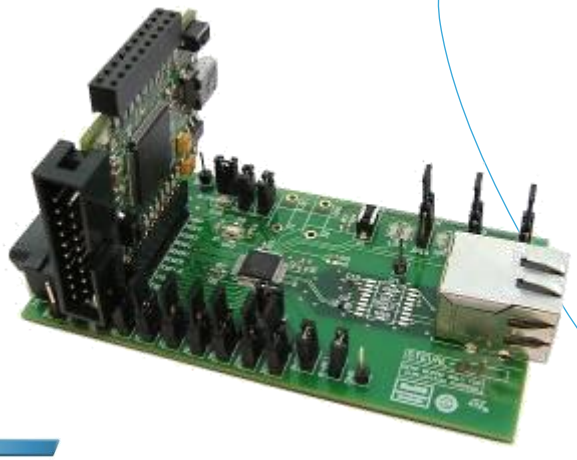
- General Purpose Motherboard (MB - STEVAL-IDX001V1) based on an STM32F103RE micro (512 kBytes)
- Companion Daughterboard (DB - STEVAL-IDX001V12) based on an SPZB32W module
- Included multiple configurable buttons and leds in both the motherboard and the daughterboard
- Enabled evaluation of the EZSP library of ZigBee PRO available from ST

Network Coprocessor Use Mode:
STM32W stores and runs the protocol while an host processor stores and runs the application



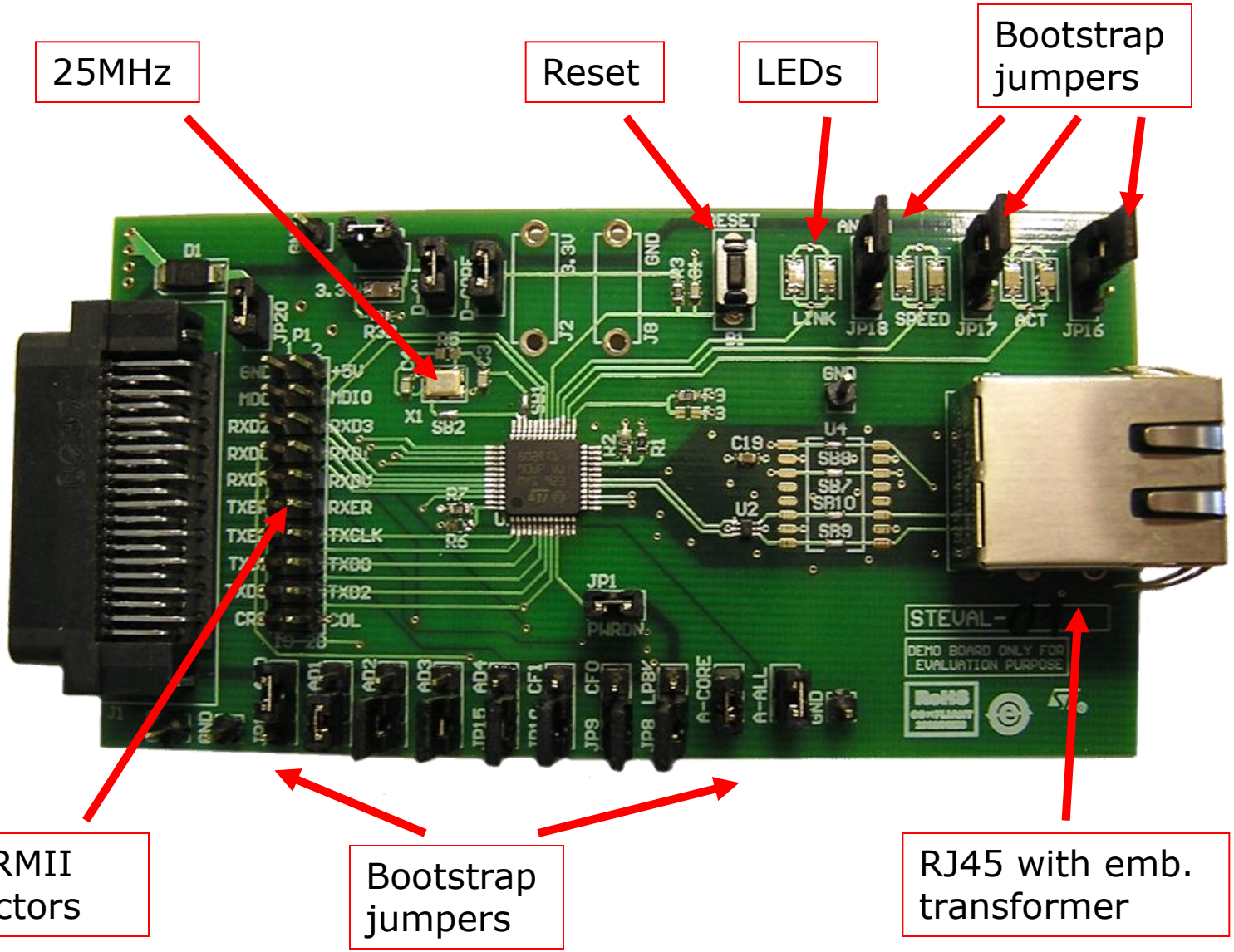
STM32F207 in STEVAL-PCC010V2

Embedded Ethernet



life.augmented

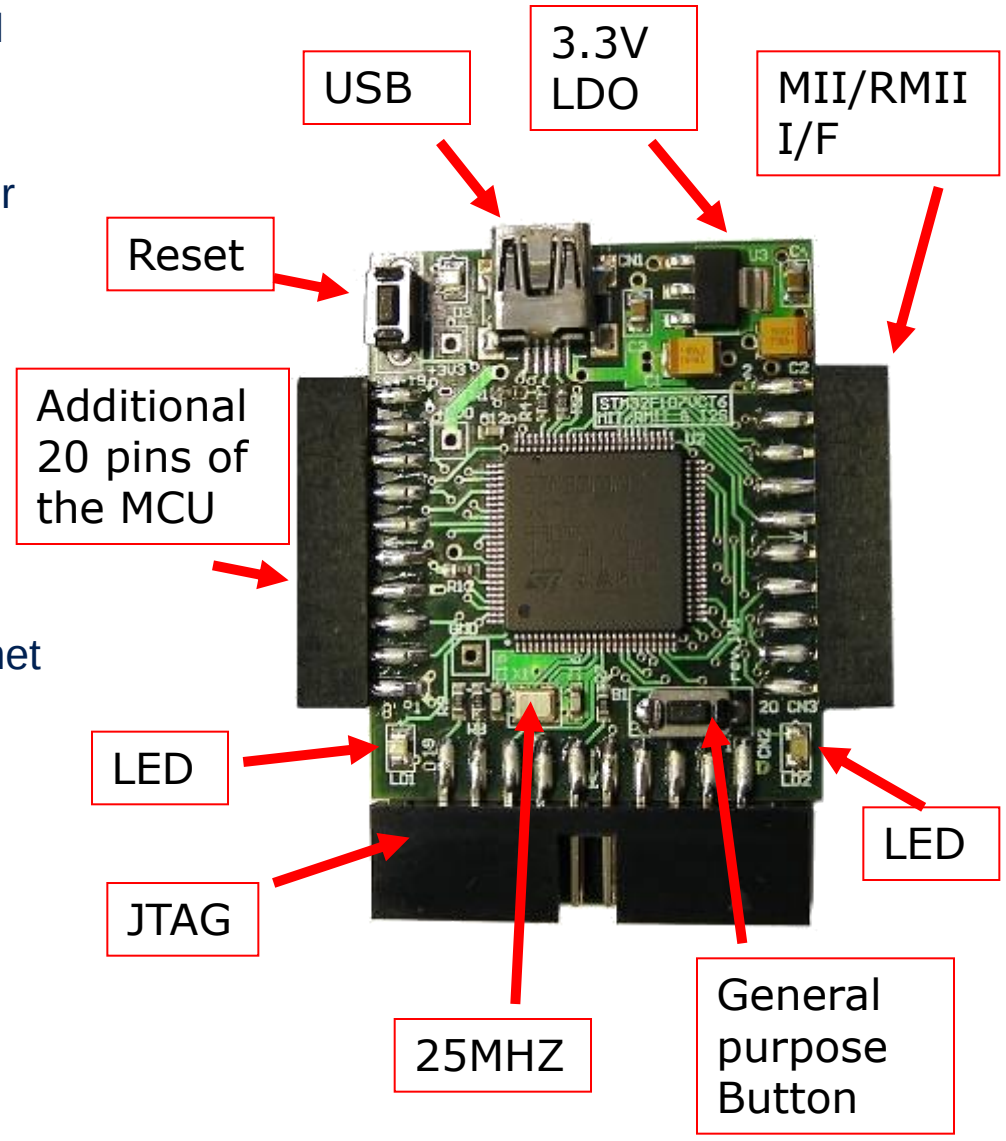
Evaluation board STEVAL-PCC010V2



STM32F207 MII/RMII controller board STEVAL-PCC010V2

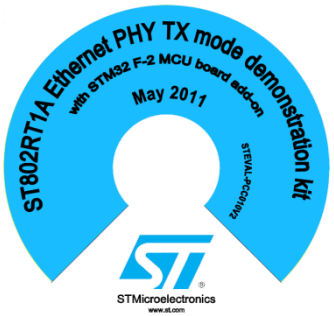
- STM32F207 MCU with Ethernet MAC, MII and RMII I/F
- USB connector: used to deliver +5V power
- On board LDO to deliver 3.3V
- Reset and general purpose button
- 25MHz on board crystal
- MII Connector compatible with the Ethernet PHY evaluation boards
- Full JTAG connector (20 pin)
- Firmware: lwIP TCP/IP based web server

  Board dimensions only 35 x 45 mm



SW support - firmware

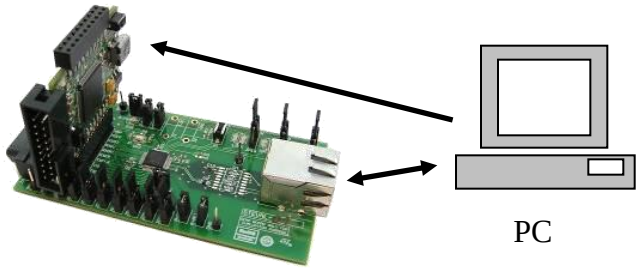
- Simple webserver demo
- Based on MCD STM32F2x7_ETH_LwIP (light weight IP TCP/IP stack demo) – free of charge
  - Only low level Ethernet driver files adapted to support ST802RT1A (stm32_eth.c, stm32_eth.h)
  - Webserver webpages modified



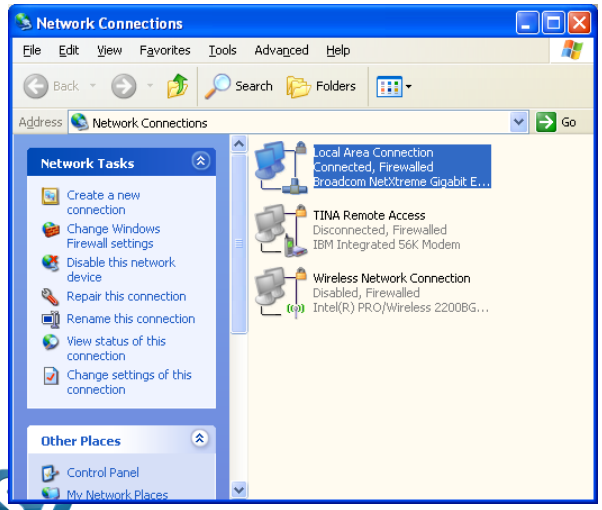
- Official STM32F2x7_ETH_LwIP is not yet available (we will distribute updated version for STEVAL-PCC010V2 when available)

Getting started with STEVAL-PCC010V2

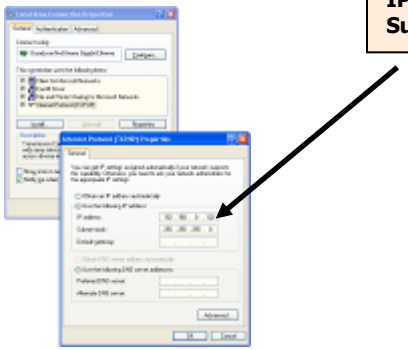
1) Connect CAT5 Ethernet cable to the ST802RT1A Ethernet PHY board on one side and to the PC on the other side. Power up the board with USB cable.



2) Setup network settings: In Control Panel – Network Connections right click on your network card and open Properties

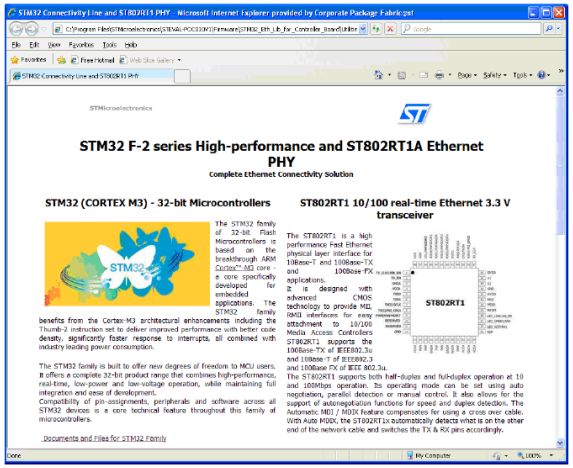


3) Select IP protocol properties: Select Internet Protocol (TCP/IP), click Properties and set Static IP address



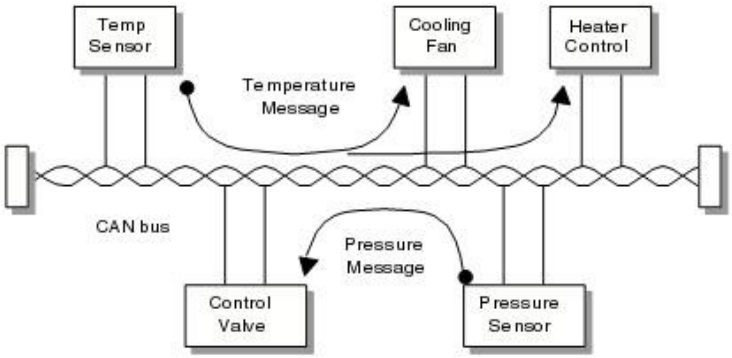
IP Address: 192.168.0.4
Subnet mask: 255.255.255.0

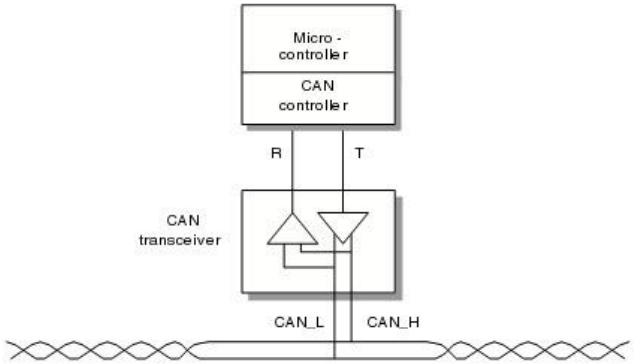
4) Run your web browser and open page http://192.168.0.8. You should be able to see the first page of the web server running on the demonstration kit.



You can also ping to the board using ping command on your PC.

- Higher-layer protocol for embedded control systems
- Internationally standardized (EN 50325-4)
- Profiles for
  - Communication
  - Devices
  - Application
- CANopen provides very flexible configuration capabilities.
- These specifications are developed, maintained and certified by CAN in Automation members.
- Quality assured by conformance test





CANopen STM3210C-EVAL evaluation kit

- Application example demonstrates
  - SDO, PDO protocol processing, heartbeat, simple digital and analog input and output via the STM32 peripherals of the microcontroller and the color TFT LCD
    - PDO - Process Data Object
    - SDO – Service Data Object

- System requirements
  - 1 x STM3210C-EVAL board
  - CAN interface with CAN/CANopen bus monitor, for example USB-to-CAN compact HW and MiniMon v3 or canAnalyser v2.7 PC SW by IXXAT
  - FlashLoader tool supporting download of Intel HEX files into the STM32F107 microcontroller


Thank you