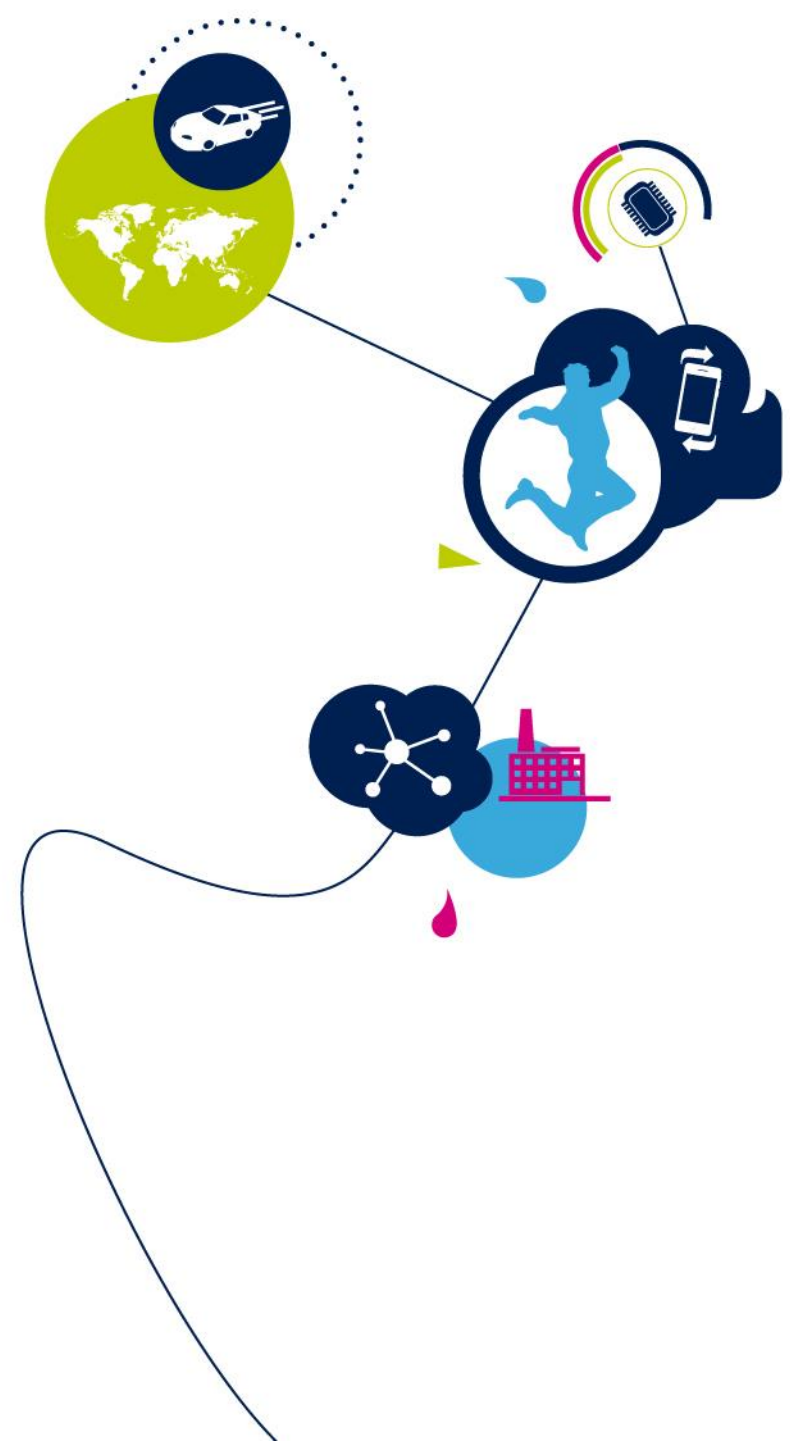


ST Smart Grid Products

Application overview
September 2018



ST Pioneered the Smart Grid

The Smart Meter

2

Broad system know-how thanks to 20+ years of proven partnerships with key players worldwide



Over 100 Million PLC and metering
SoCs installed

Driving standards worldwide with
market leaders

The most highly integrated, secure
and flexible solutions in the market

Future-Proof Smart-Grid Solutions

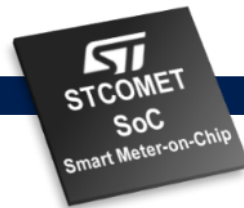
3

To meet any application requirement

Metering



- Higher accuracy over extended current range
- Multi-sensor support, multi-phase scalability
- Integrated power quality parameter monitoring



Performance

PLC

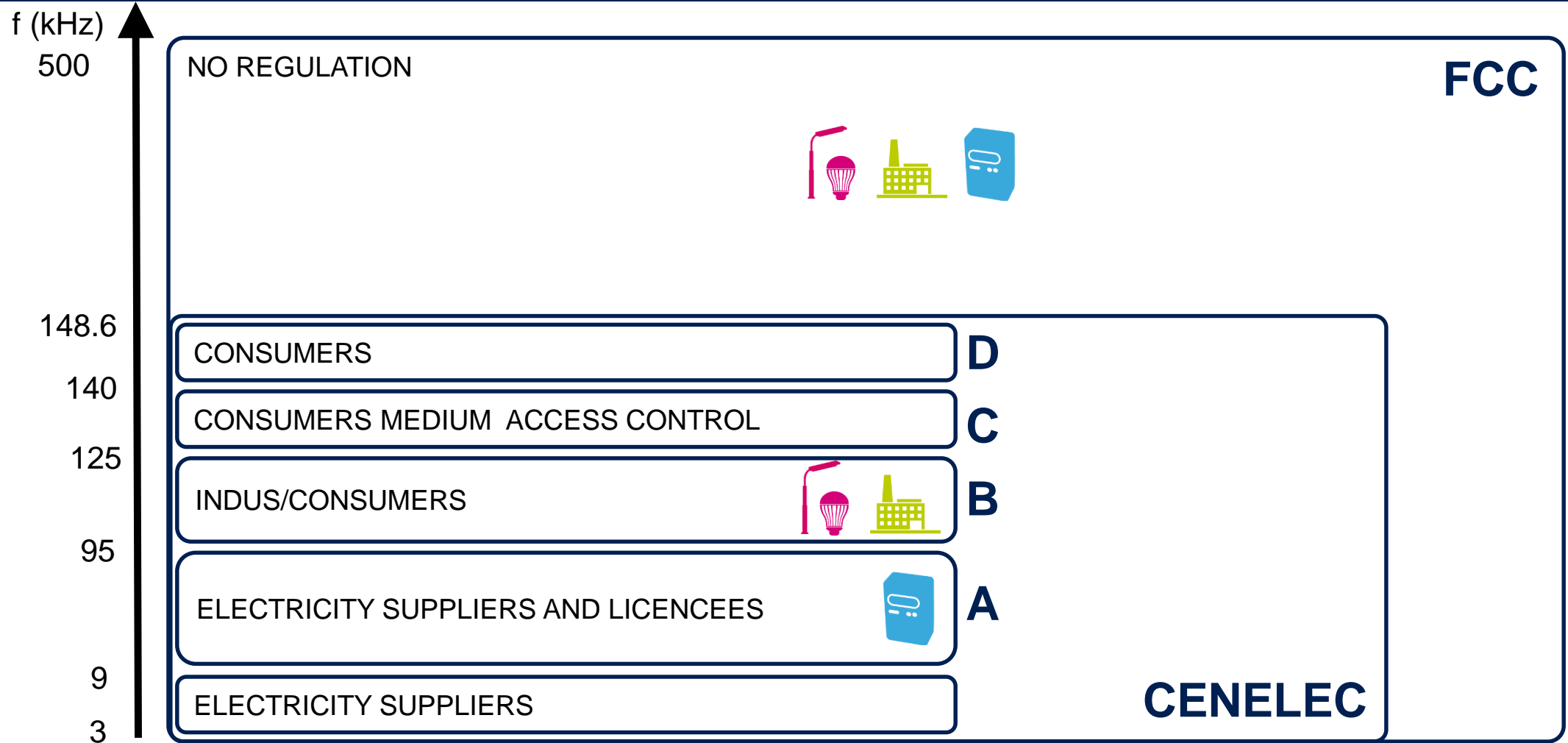


- Widest PLC field-proven deployments
- Highest coverage of protocols and data rates
- Highly flexible with the most number of functions integrated (IS THIS CORRECT??)

PLC Frequency Bands Regulation

4

EUROPEAN REGULATION CENELEC EN 50065-1



Industrial



Smart metering



Lighting









life.augmented

ST PLC SOLUTIONS

5

For industrial and smart metering

Order code	Modulation	Max. bit rate (kbit/s)	Band	Embedded Protocol Stack	Network Size	Application
ST7540	FSK	4.8	CENA, CENB, CENC	Point-to-Point PROPRIETARY	< 50 nodes	
ST7580	FSK, BPSK, QPSK, 8PSK	28.8	CENA, CENB, FCC	Point-to-Point PROPRIETARY	From 50 to 100 nodes	
STCOMET	OFDM	50 G3 128 PRIME	CENA	PRIME, G3	Up to 1200 nodes	
ST8500 + STLD1	OFDM	250 G3 128 PRIME	CENA, CENB, FCC	PRIME, G3	Up to 1200 nodes	  

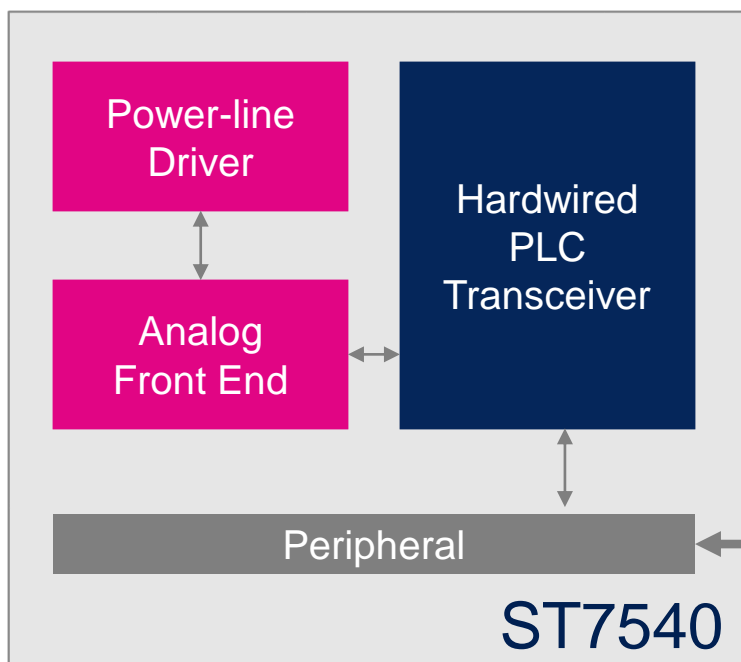




ST7540 Power-line Transceiver

6

Narrowband power-line hardwired transceiver



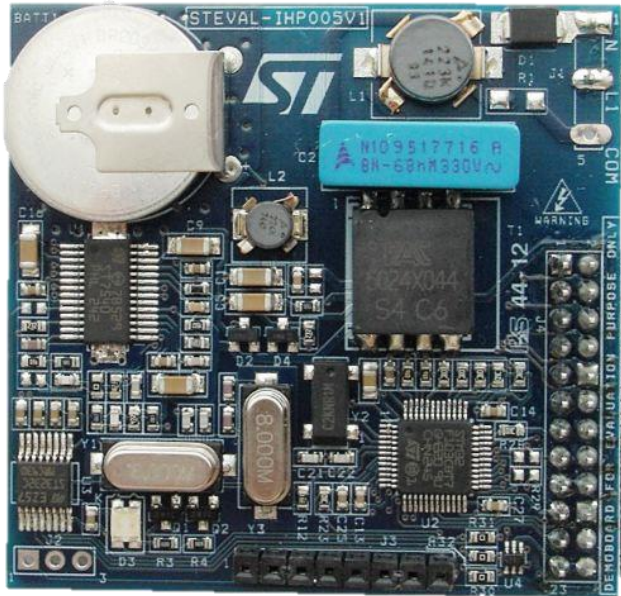
- Point-to-Point communication
- 8 programmable channels from 60 to 132 kHz
- Integrated AFE and Power-line driver
- Carrier and preamble detection



ST7540 Evaluation Board

7

STEVAL-IHP005V1



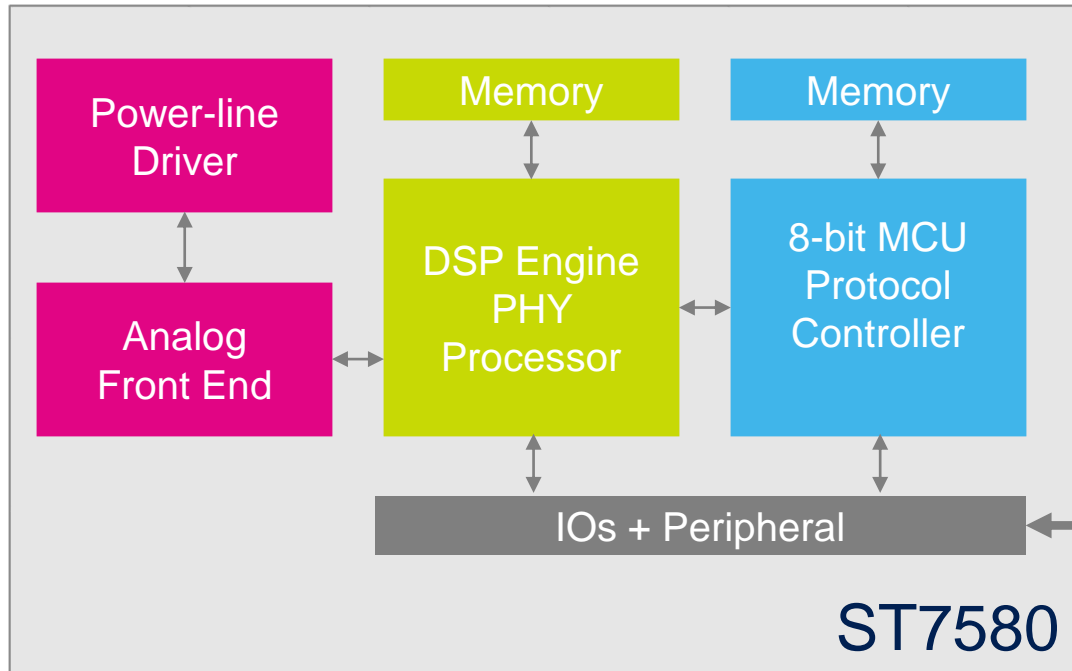
- PLM communication compliant with EN50065-1
- FSK modulation with low frequency deviation
- Centre frequency 132.5 kHz \pm 0.2%
- Bitrate: 4800 bits/s
- Microcontroller for interfacing PLM with other serial device through RS-232, SPI, USB



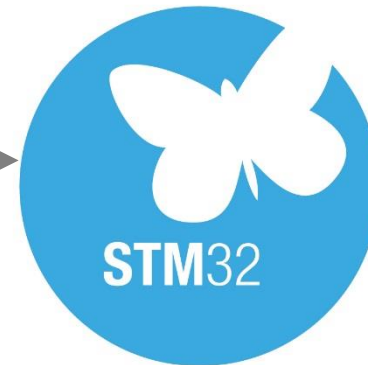
ST7580 Power-line Modem

8

Narrowband power-line communication platform



- Multiple CENELEC band compliancy
- Programmable frequency from 9 to 250 kHz
- Modulation FSK, BPSK, QPSK, and 8PSK
- Integrated AFE & Power-line driver



ST7580 Evaluation Boards

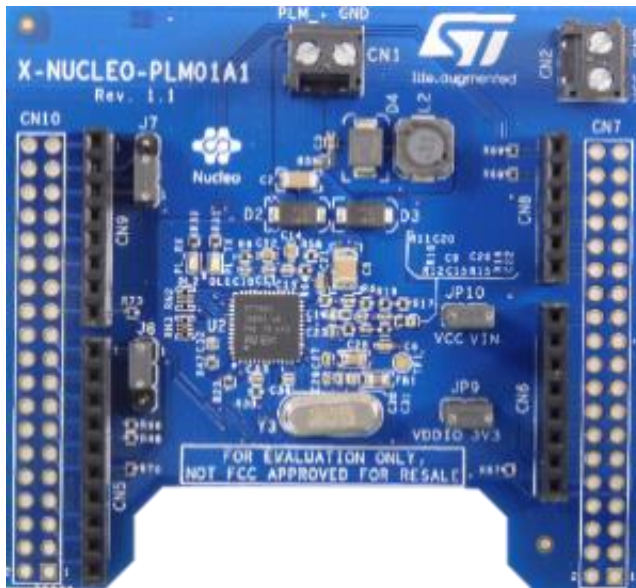
9

X-NUCLEO-PLM01A1

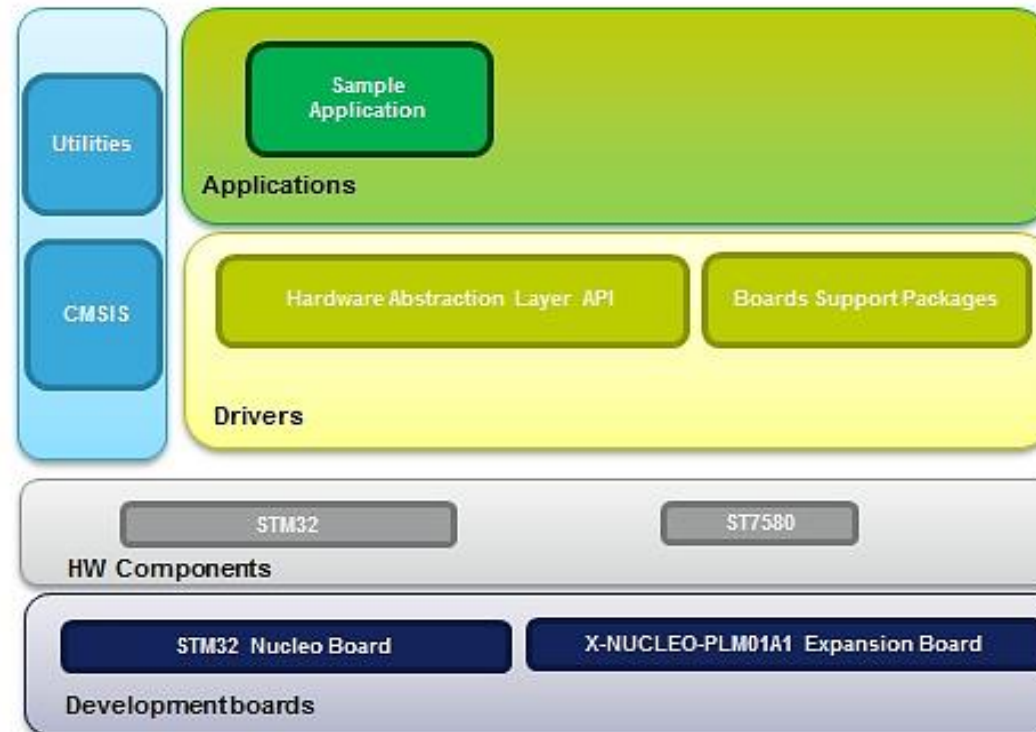
STEVAL-XPLM01CPL



X-NUCLEO-PLM01A1



- Expansion board for STM32 Nucleo based on ST7580
- Working on DC or AC with STEVAL-XPLM01CPL (coupling + isolation)
- Example firmware available for point-to-point communication, compatible with STM32Cube firmware (NUCLEO-F401RE and NUCLEO-L053R8)



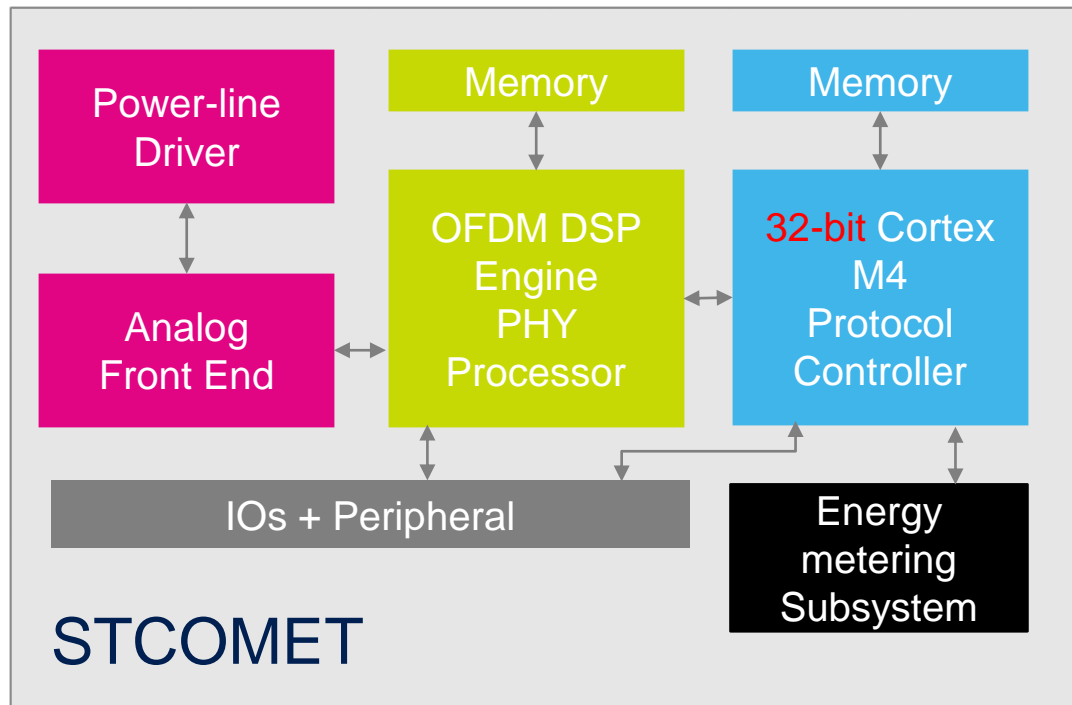
SW available under
[X-CUBE-PLM1](#)



STCOMET SoC Platform

10

Smart Meter / Power-line modem system-on-chip



- Programmable PLC DSP
- Multiple OFDM PLC standards (PRIME, G3)
- Embedded RX and TX PLC AFE & PLC Line Driver
- Cortex M4 @ 96 MHz
- Up to 1 Mbyte of Flash memory, 128 Kbytes of RAM
- AES-256 bit encryption engine
- Metering block with 3 measurement channels



STCOMET Evaluation Board

11

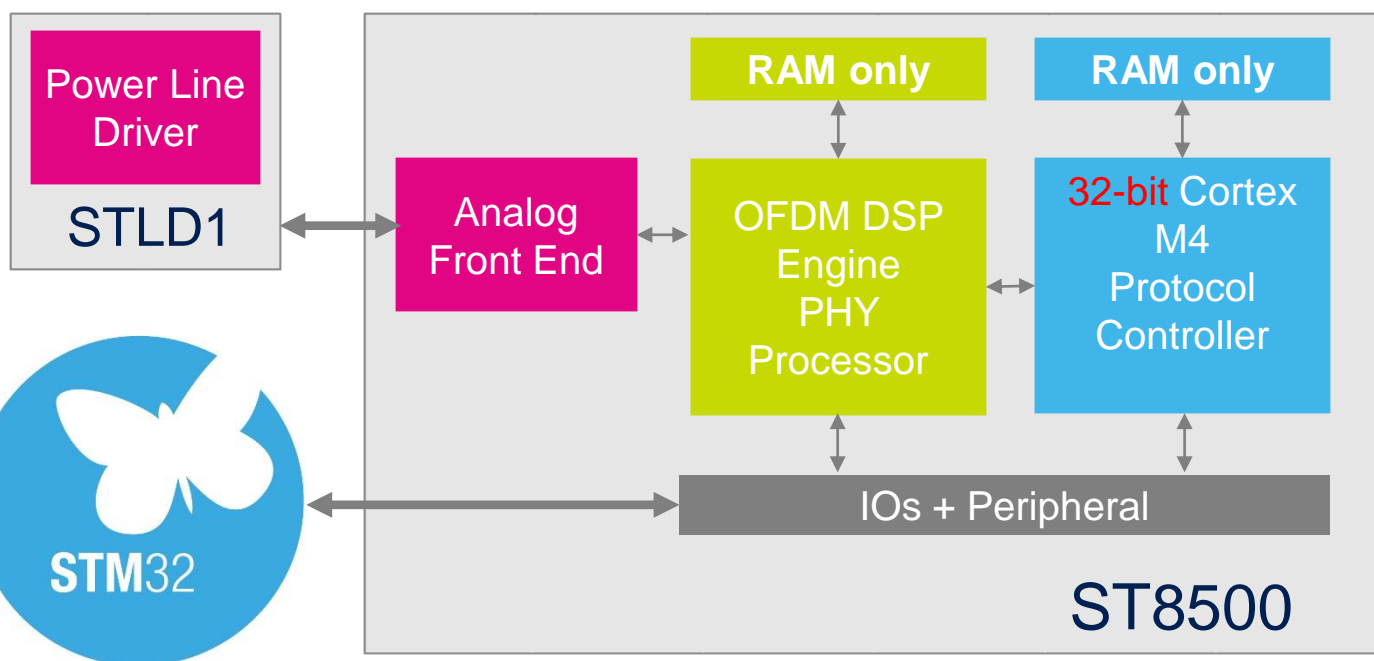
EVLKSTCOMET10-1



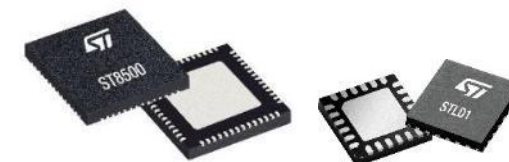
- Complete single-phase meter development kit based on the STCOMET smart meter SOC
- Suitable to evaluate PLC protocols in CENELEC A band
- Metering up to Class 0.2
- Up to 3 measurement channels
- Two LEDs for active and reactive energy signalling
- Two tamper-detect inputs
- Digital connector for 3-phase metering extension with the EVALSTPM34
- Relay driving circuit for unipolar and bipolar relay based on ST L2293Q monolithic driver device
- Power supply module based on ST VIPER26H
- JTAG debug (J-Link OB)



Programmable, **ultra-low-power** and compact PLC solution



- **Fully programmable, high performance**
400 MHz DSP and 200 MHz ARM® 32-bit Cortex®-M4F core, **360 Kbytes of RAM**
- **Ultra-low power consumption**
<100 mW in Receive mode
- **Embedded AES cryptography engine**
up to 256-bit key and multi-security modes
- **Multi-standards, full 500 kHz bandwidth**
support any band: CENELEC, and FCC
- **Extended temperature range**
-40 to 105°C
- **Small footprint package**
QFN56 (**7x7 mm**)



ST8500 Application Block Diagram

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ST8500

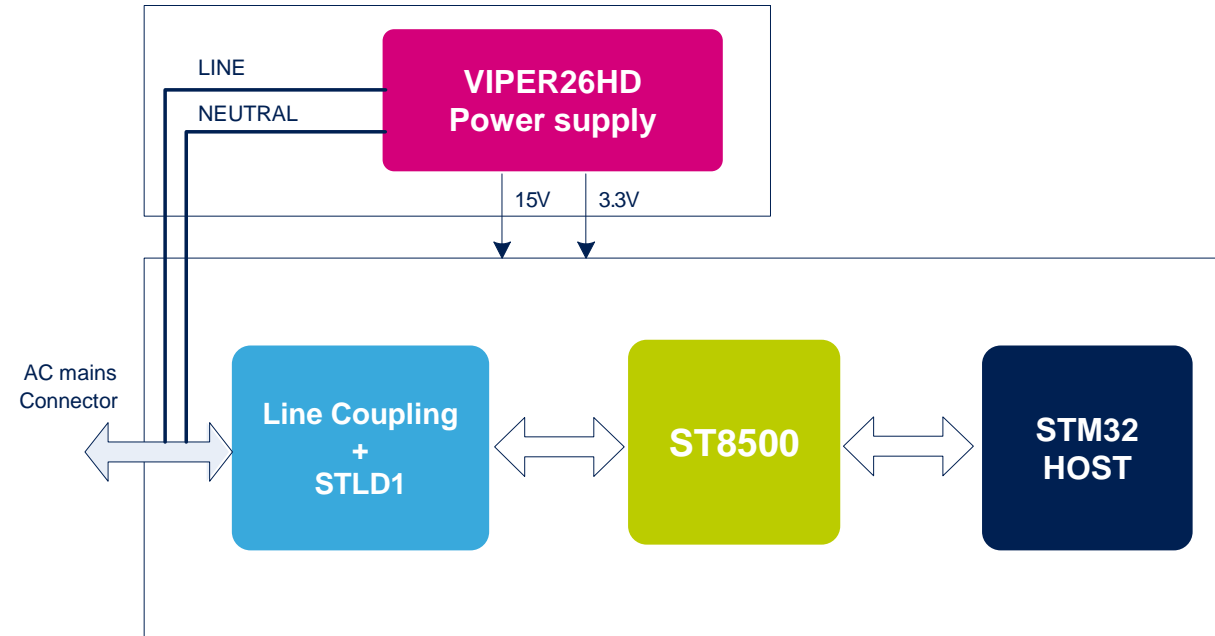
- Reprogrammable **Power-line modem**
- Integrated Analog Front-End (0 to 500 kHz)
- **Full-duplex** interface via UART
- Security: OTP, AES-128 and -256 with support for GCM, CCM, ECB, etc. modes
- A unique **firmware** solution for G3 to support device and coordinator, CENA/B & FCC

STM32 Host MCU

- Store **firmware** images in eFlash or external SPI Flash memory
- Download image to ST8500 & drive modem
- Manage customer **firmware** application

STLD1 – Line Driver

- Dual line driver 18 V p-p single ended, 36 V p-p differential output range
- Up to 1.5 A_{RMS} driving capability
- Thermal and **current** feedback



ST8500 Evaluation Board

14

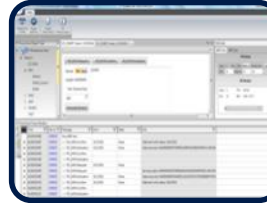
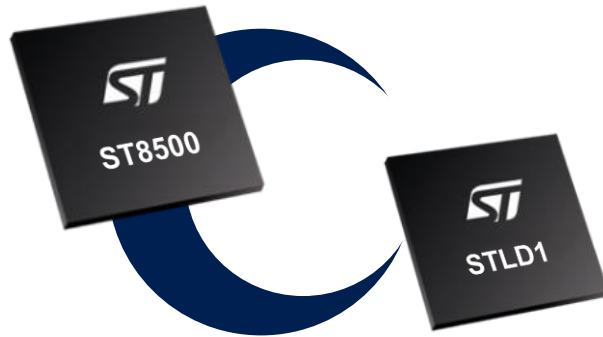
EVALKITST8500-1



- The kit **includes** three boards:
 - ✓ the ST8500 PLC module including the companion STLD1 line driver
 - ✓ the STM32 **motherboard**
 - ✓ the power supply board based on the VIPER26H
- Suitable to implement PLC protocols in CENELEC A, B and FCC
- Enable CENELEC/FCC band selection through **firmware** control (automatic **hardware** tuning)
- Additional module interface for future development of **hardware** add-ons (e.g. **Sub-GHz** transceiver)

ST8500 Development ecosystem

15



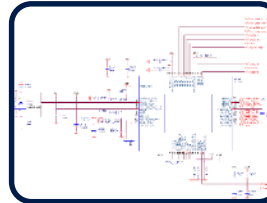
PC Tools

- Firmware download
- PLC Protocol tests
- Performance tests and debug
- Graphical User Interface



Evaluation Kit

- Schematics and gerber files
- For evaluation purposes
- Enabling customer product development



Technical documentation

- Datasheets
- Application notes
- User manuals



Software packages

- G3 and PRIME Firmware deliveries
- Host API drivers for STM32 and Linux
- Documentation

ST8500/STLD1 Platform

16

- A complete and scalable platform:

Order code	Description	Package
ST8500TR	Programmable Modem + AFE	VFQFPN 56 (7x7x1 mm)
STLD1TR	Line Driver	QFN-24L
EVALKITST8500-1	Evaluation kit	NA

- Further information and full design support available at:

www.st.com/powerline

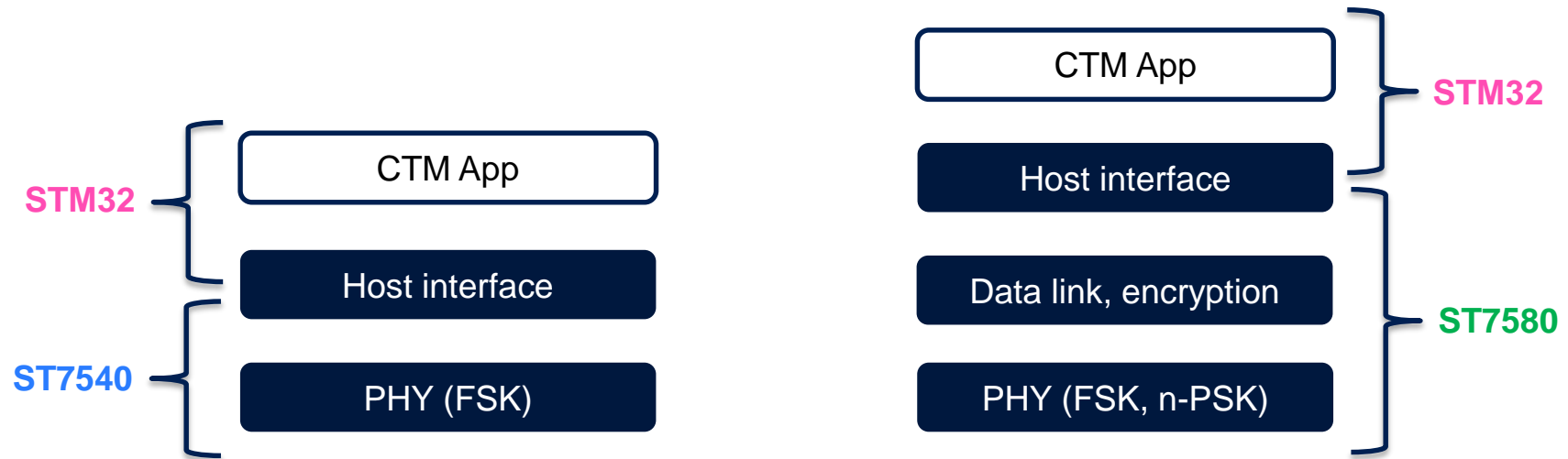
ST Power-line software offer

17

Simple PLC applications

NOT ST

ST



ST Power-line software offer

18

Advanced smart grid solutions

NOT ST

ST

PRIME
ALLIANCE

G3-PLC
Alliance

STM32

DLMS/COSEM

Host interface

PRIME CL 4-32

ST8500

PRIME MAC RT

PRIME PHY (OFDM)

STCOMET

DLMS/COSEM

UDP

IPV6

Host interface

6LowPAN

MAC

G3 PHY (OFDM)

STM32

ST8500

