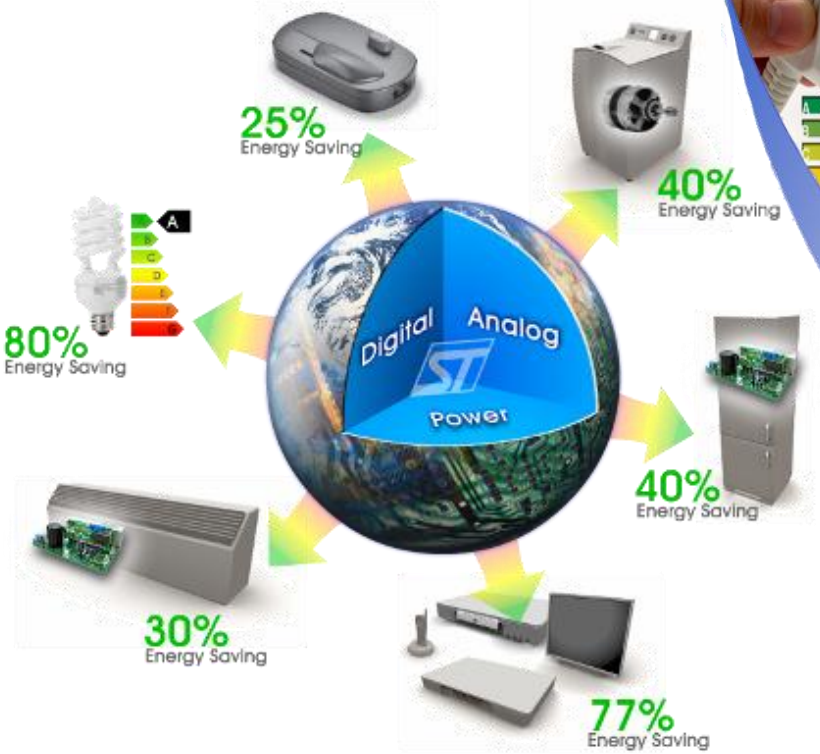
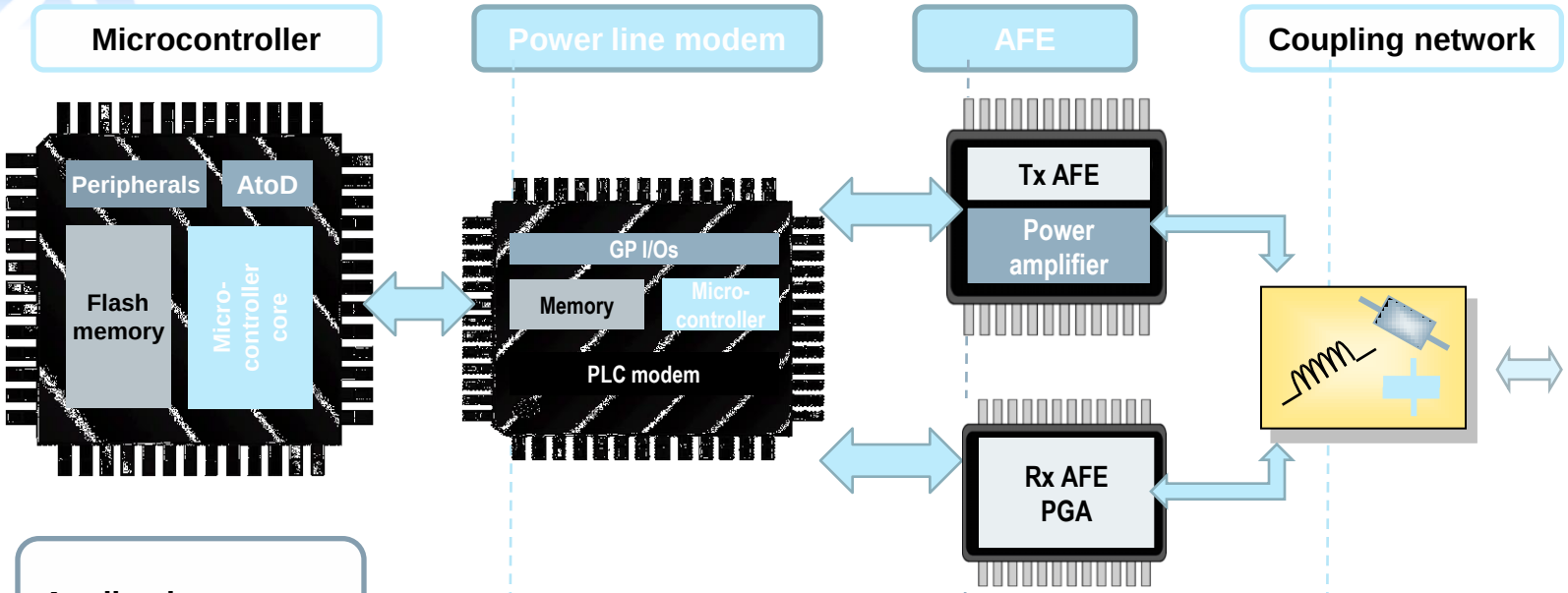


Microelectronics

ST's Smart Grid Solutions:
Power Line Communication and Metering

PLC node partitioning:

from typical approach …



Application process

OSI7: application layer

OSI3: network layer

OSI2 data link layer

OSI1 : physical layer modulation/demodulation

DAC
ADC
Filtering
Rx signal amplifier
Tx power amplifier

Line coupling
Signal filtering
Protection

- Greater bill of material
- High power consumption
- Not flexible

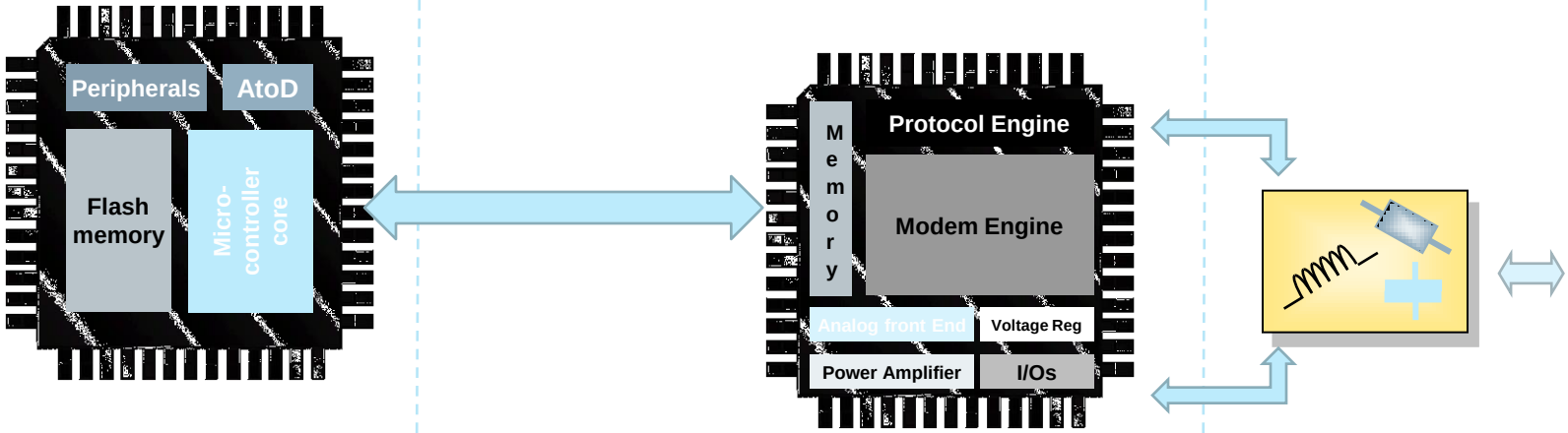
PLC node partitioning:

…to STarGRID SoC approach

Microcontroller

Power line system on chip

Coupling network



Application process

OSI7: application layer

OSI3: network layer

OSI2 data link layer

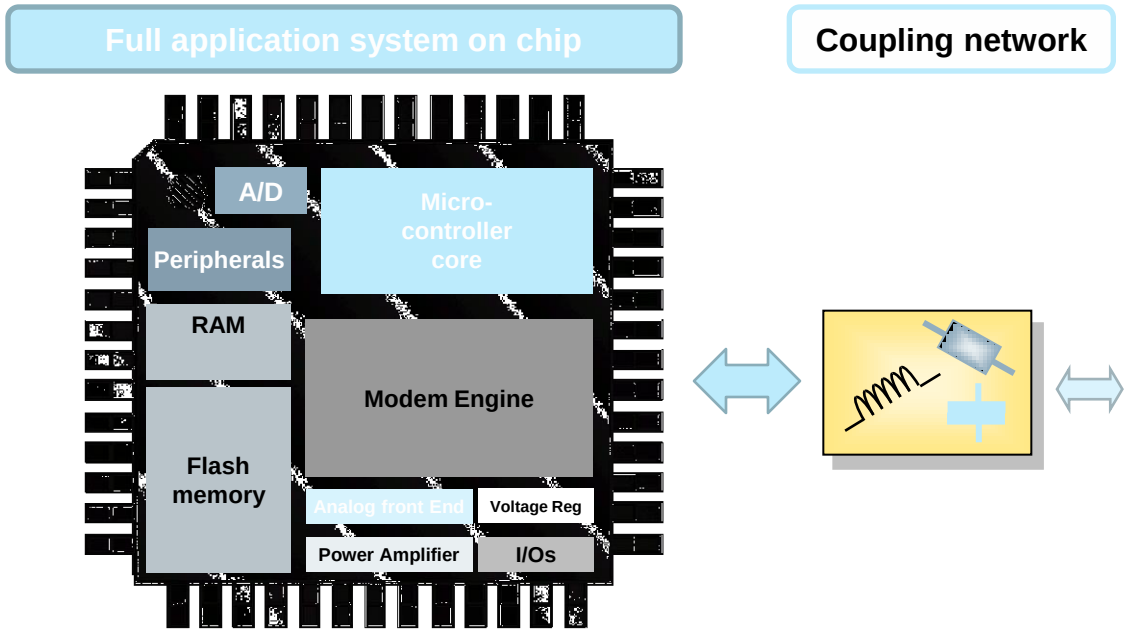
OSI1 : physical layer modulation/demodulation

DAC
ADC
Filtering
Rx signal amplifier
Tx power amplifier

Line coupling
Signal filtering
Protection

- **Lower bill of material**
- **Low power consumption**
- **Flexible**

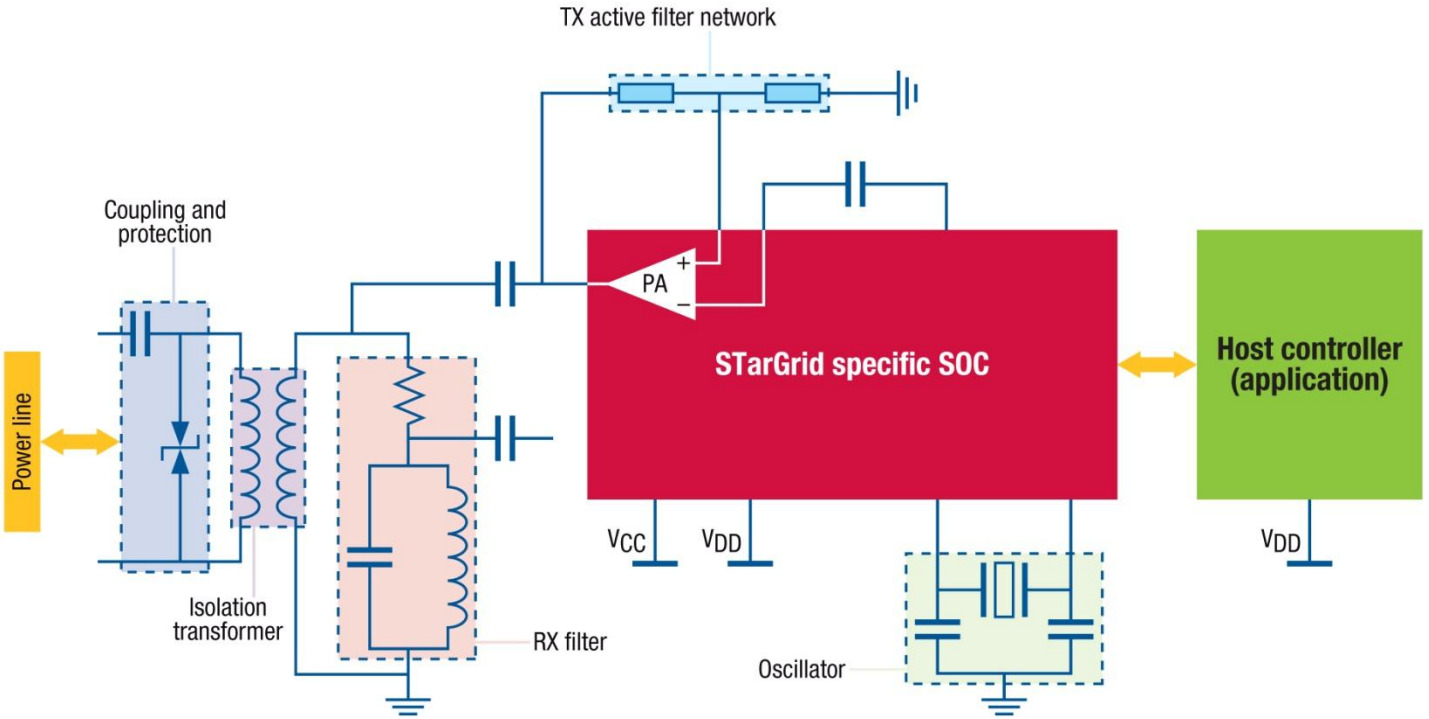
Towards full SoC Evolution



….towards full system integration

STarGRID

based PLC application diagram



Most compact, lowest BOM PLC node on the market

Suggested ST PLM versus CENELEC PLC Frequency Bands & Use

ST7580 (meters&more), ST7590 (PRIME)
ST7570 (IEC 61334-5-1)

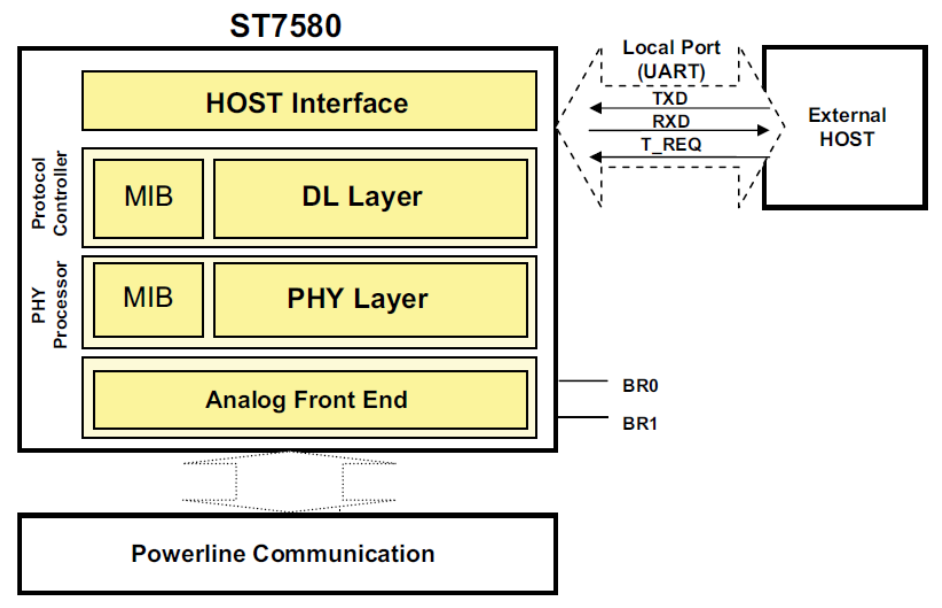
ST7580

ST7540

Electricity Suppliers	Band A	Band B	Band C	Consumer Use D
	Electricity Suppliers and their Licensees	Consumer Use	Consumer Use ***Access Protocol Mandatory***	

3 9 95 125 140 148.6 f (kHz)

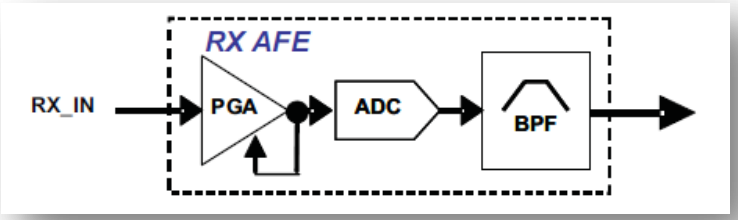
ST7580: Functional Overview



- Complete physical layer (PHY): a BFSK and a multi-mode PSK modulation with channel quality estimation and dual channel receiving mode
- Basic Data link layer (DL) services
- AES-128 based authentication
- A UART host interface is available for communication with an external host

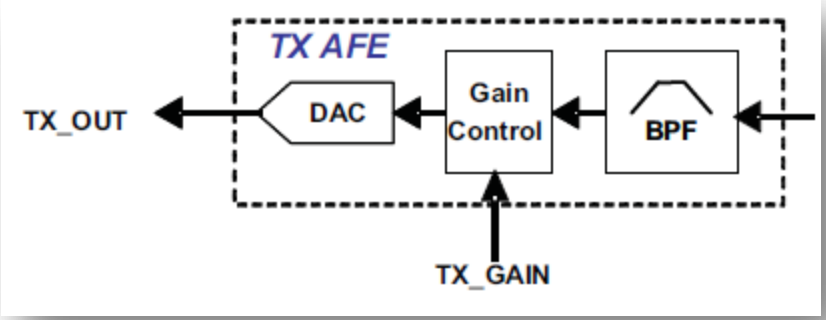
ST7580: AFE – Reception path

The PGA is controlled by an embedded loop algorithm, adapting the PGA gain to amplify or attenuate the input signal according to the input voltage range for the ADC.



PGA code	PGA gain (typ.) [dB]	RX_IN max. range [V p-p]
0	-18	V(RX_IN) MAX
1	-12	8
2	-6	4
3	0	2
4	6	1
5	12	0.500
6	18	0.250
7	24	0.125
8	30	0.0625

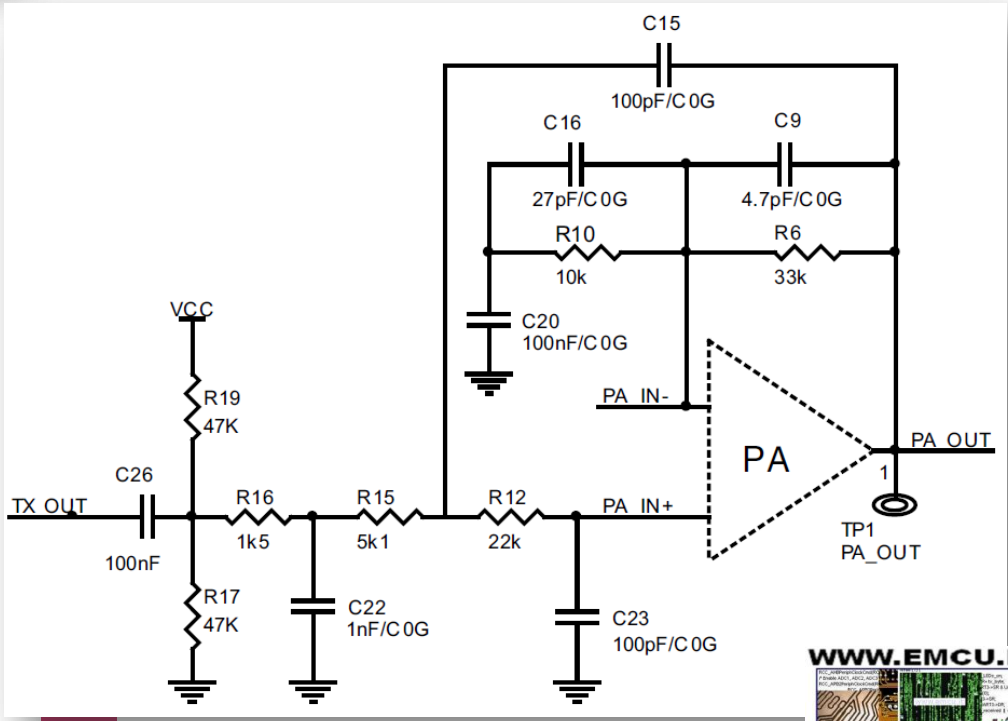
ST7580: AFE – Trasmission path



A gain control block before the DAC gives the possibility to scale down the output signal to match the desired transmission level.

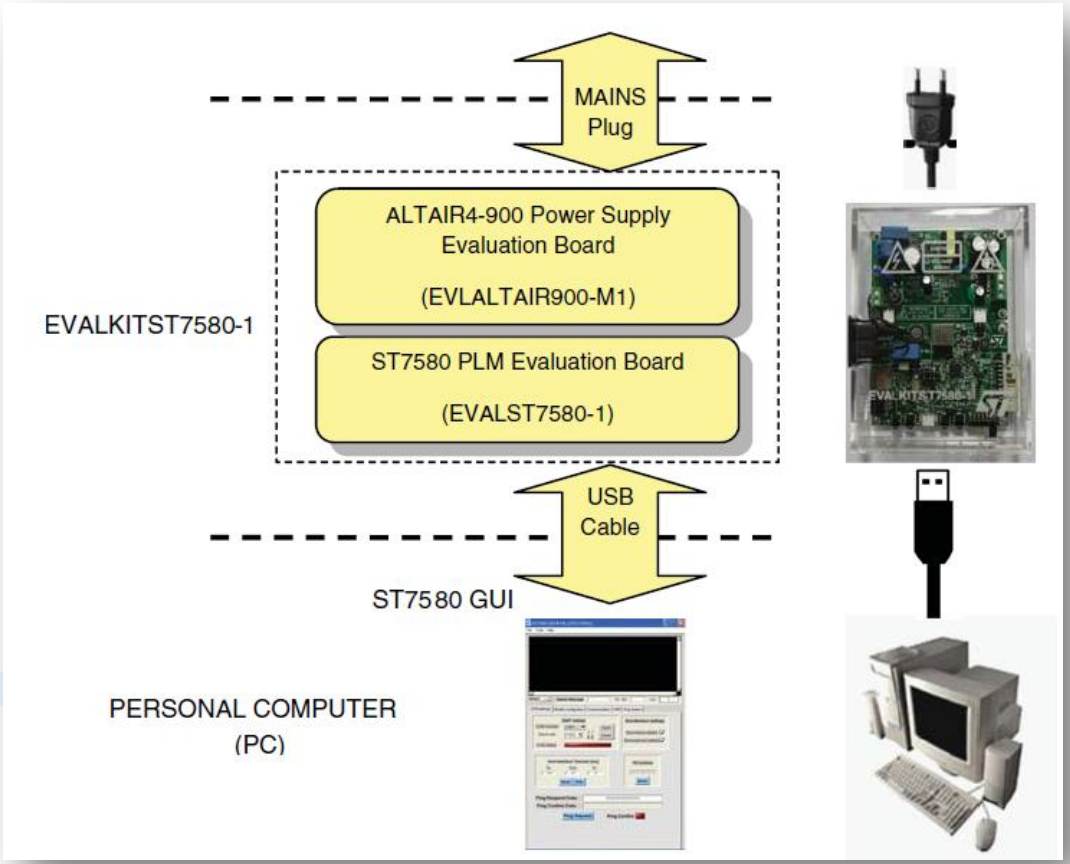
Current capability power amplifier allows to drive even very low impedance points of the network

All pins of the power amplifier are accessible, making it possible to build an active filter
network to increase the linearity of the output signal.

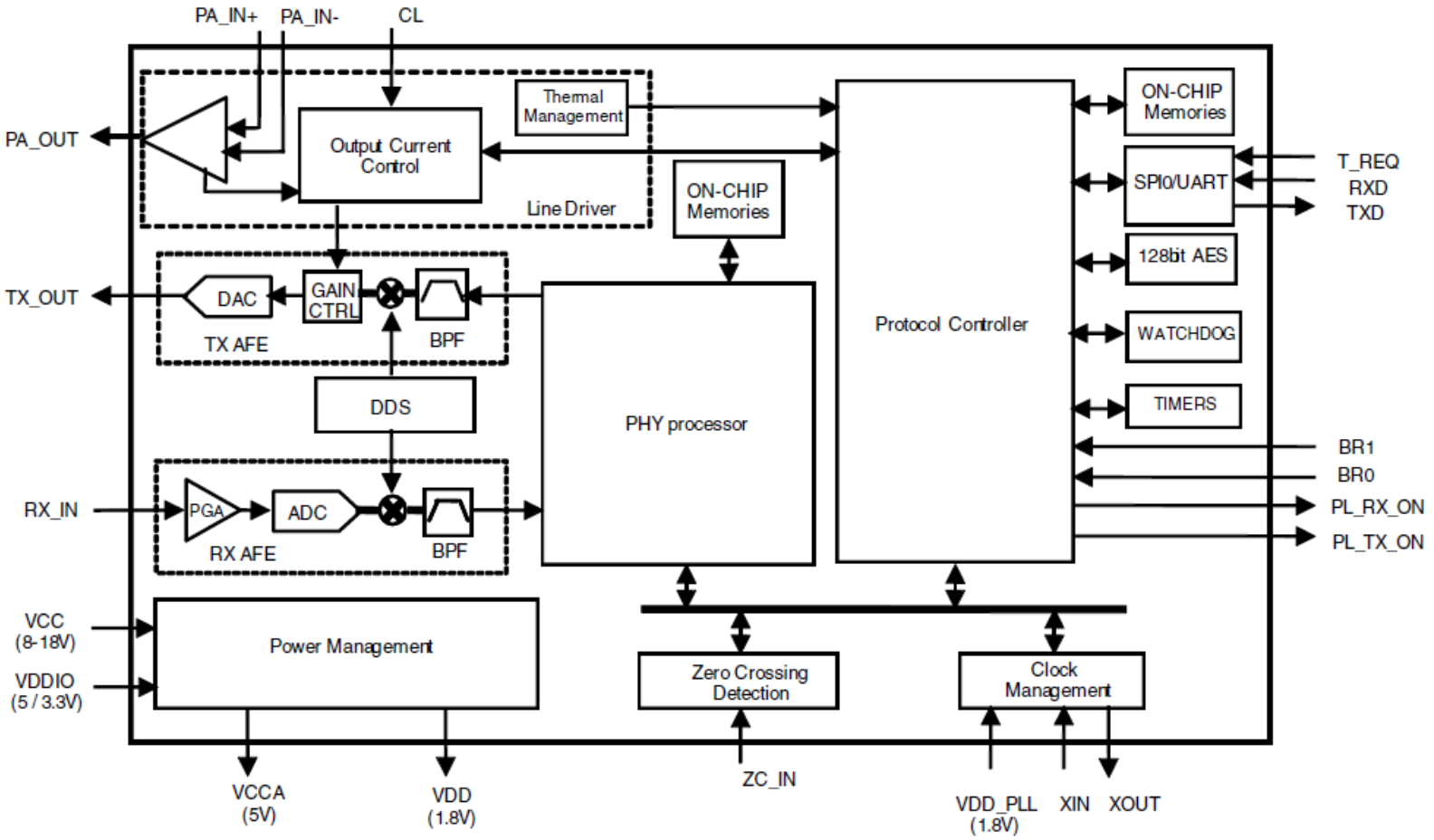


PLC Evaluation Boards

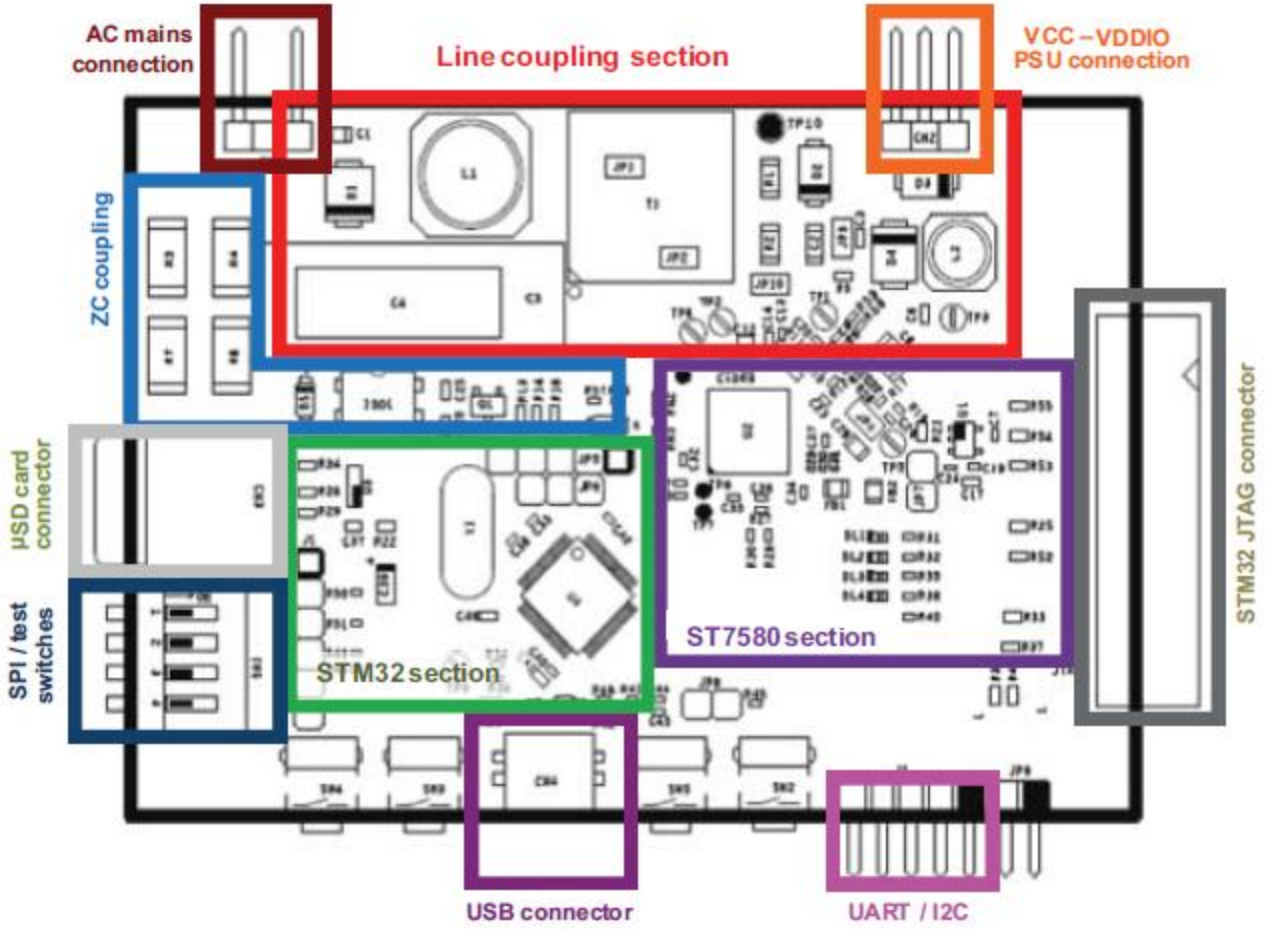
- Turn key evaluation boards available for ST7540 (EVALST7540-2) and STarGRID SoC ICs (EVALST7570KIT-1,EVALKITST7580-1,EVALST7590-1)
- Example for ST7580: PLC Evaluation Node with Power Supply Board and embedded STM32 MCU for application prototyping



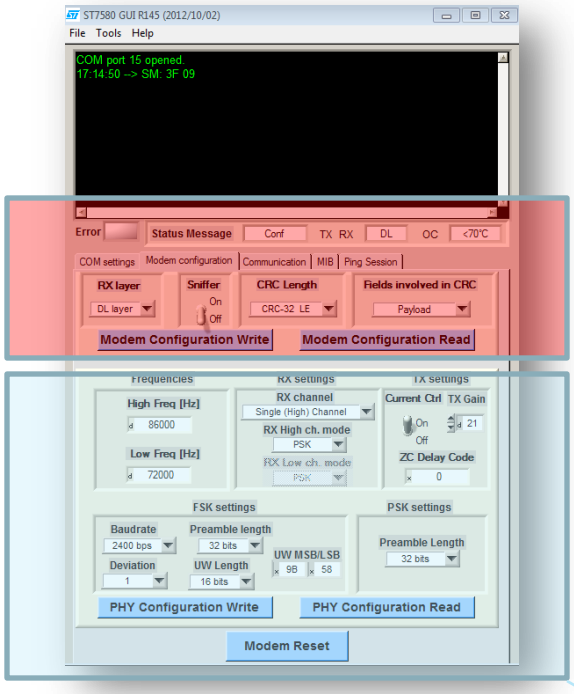
ST7580: Evalboard (schematic)



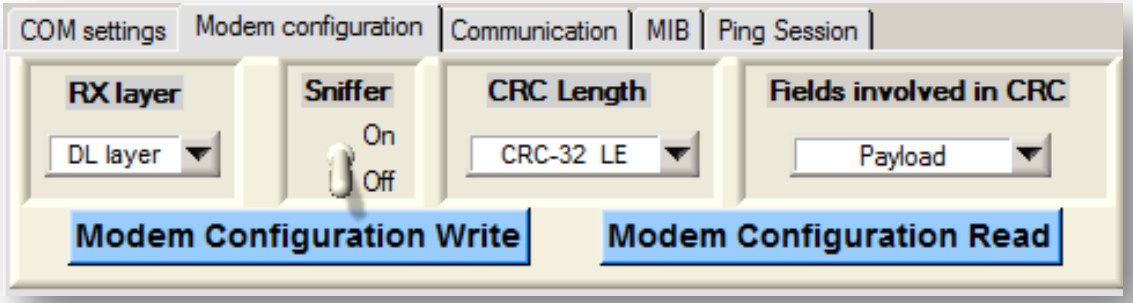
ST7580:Evalboard (functional blocks)



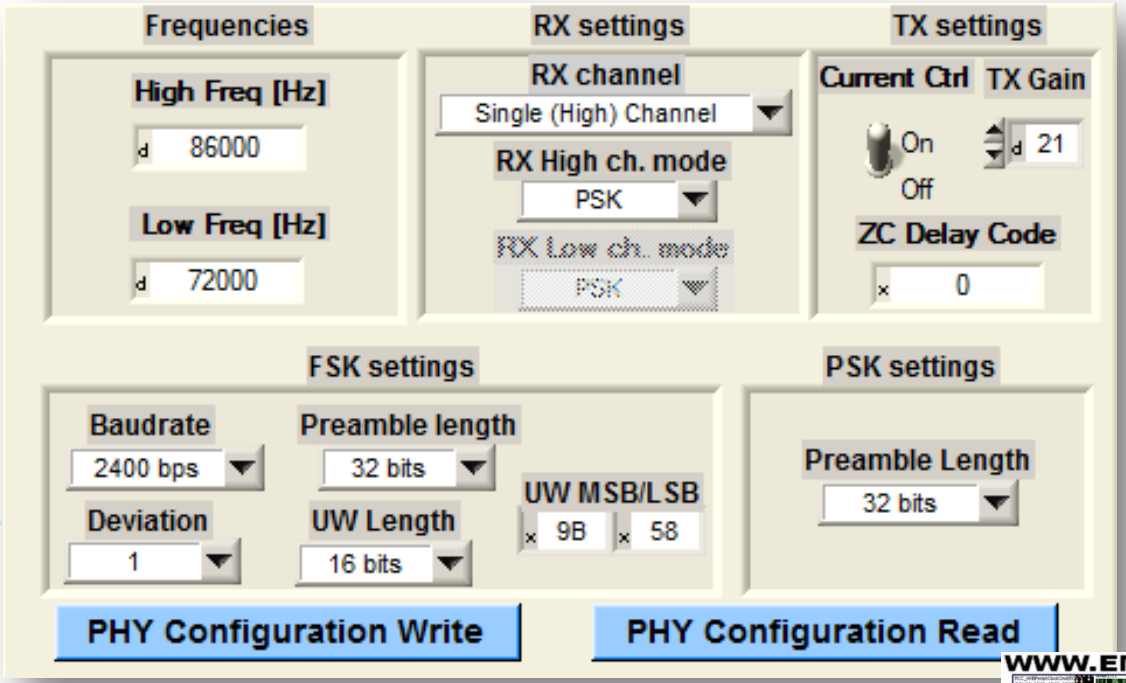
ST7580 GUI: Modem Configuration



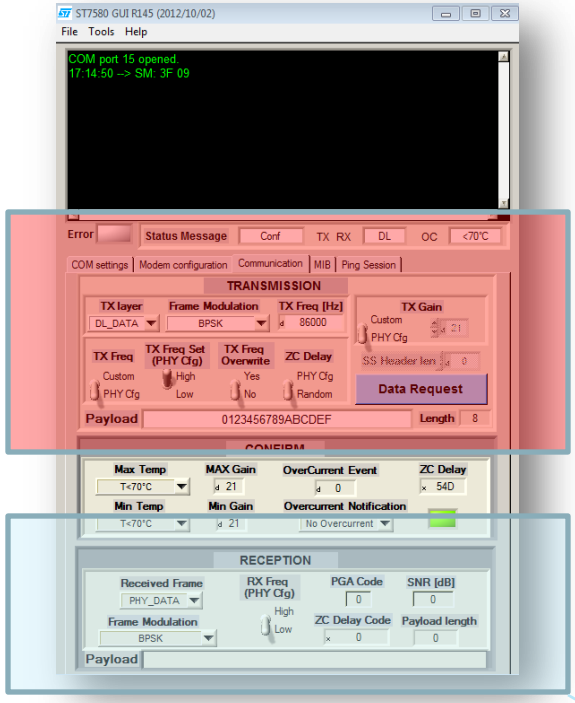
MODEM CONFIGURATION



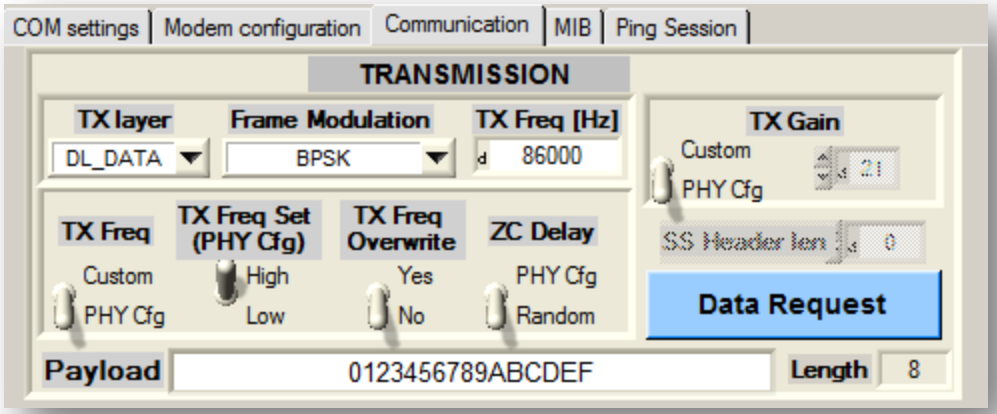
PHY CONFIGURATION



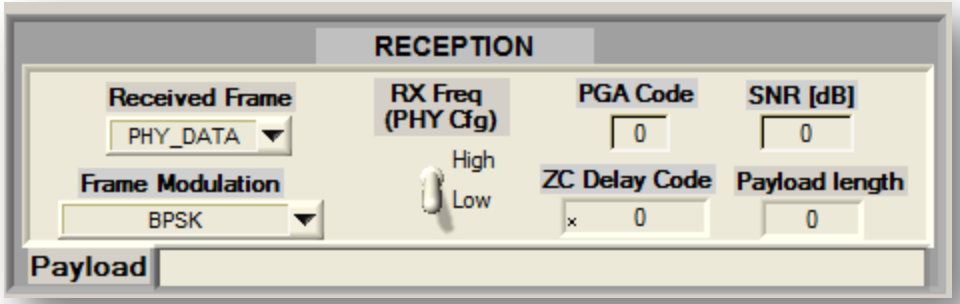
ST7580 GUI: Comunication



TRASMISSION BOX



RECEPTION BOX

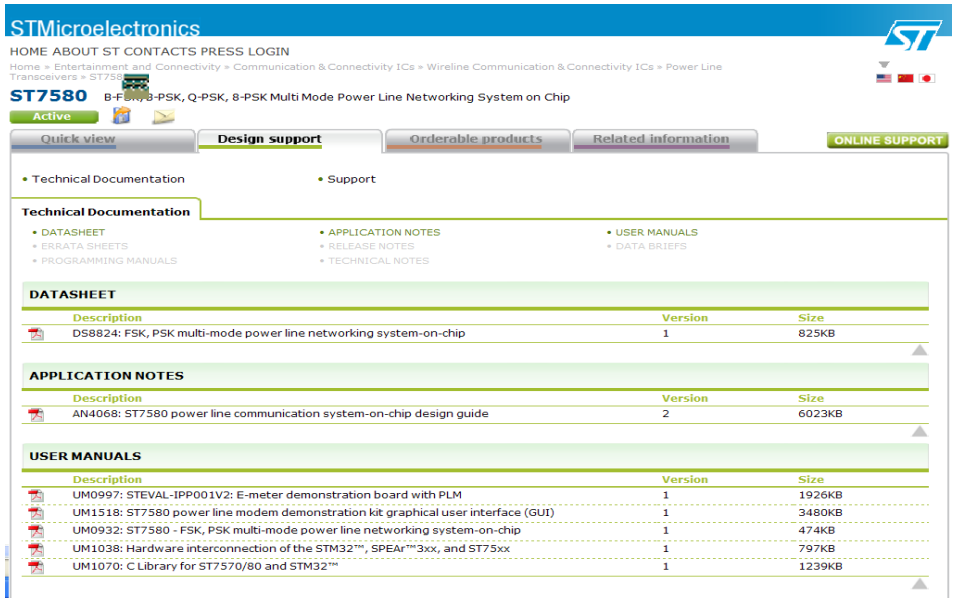


ST PLC support on www.st.com

- **Click here** for ST PLC Information, Documentation, Support
  - Data Sheet
  - Application Note
  - User Manuals

www.st.com/powerline

- **Click here** for EVALKITS support
  - Data Brief
  - User Manual
  - Evaluation boards Bill of Material
  - PCB Layout
  - Schematics
  - SW GUI



Thanks for your attention

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simone.franceschin@silica.com