



# ISPLC 2010

## Texas Instruments Smart Metering Solution Overview

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28 a 31 de março de 2010

Rio Othon Palace

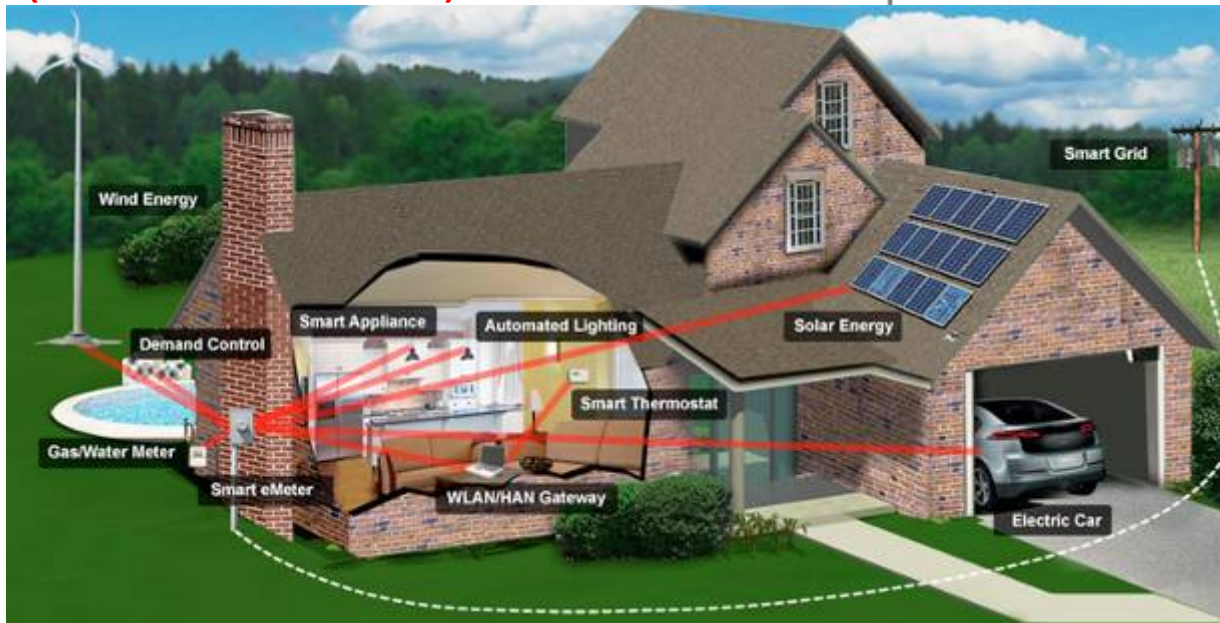
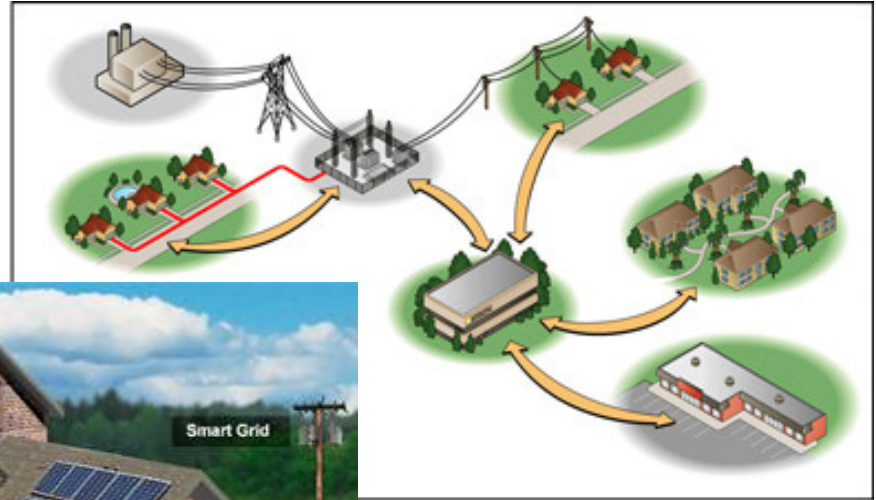
Rio de Janeiro

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# What is Metering, the “Smart Grid”?

Outside the Home  
(Wide Area Network)

Inside the Home  
(Home Area Network)

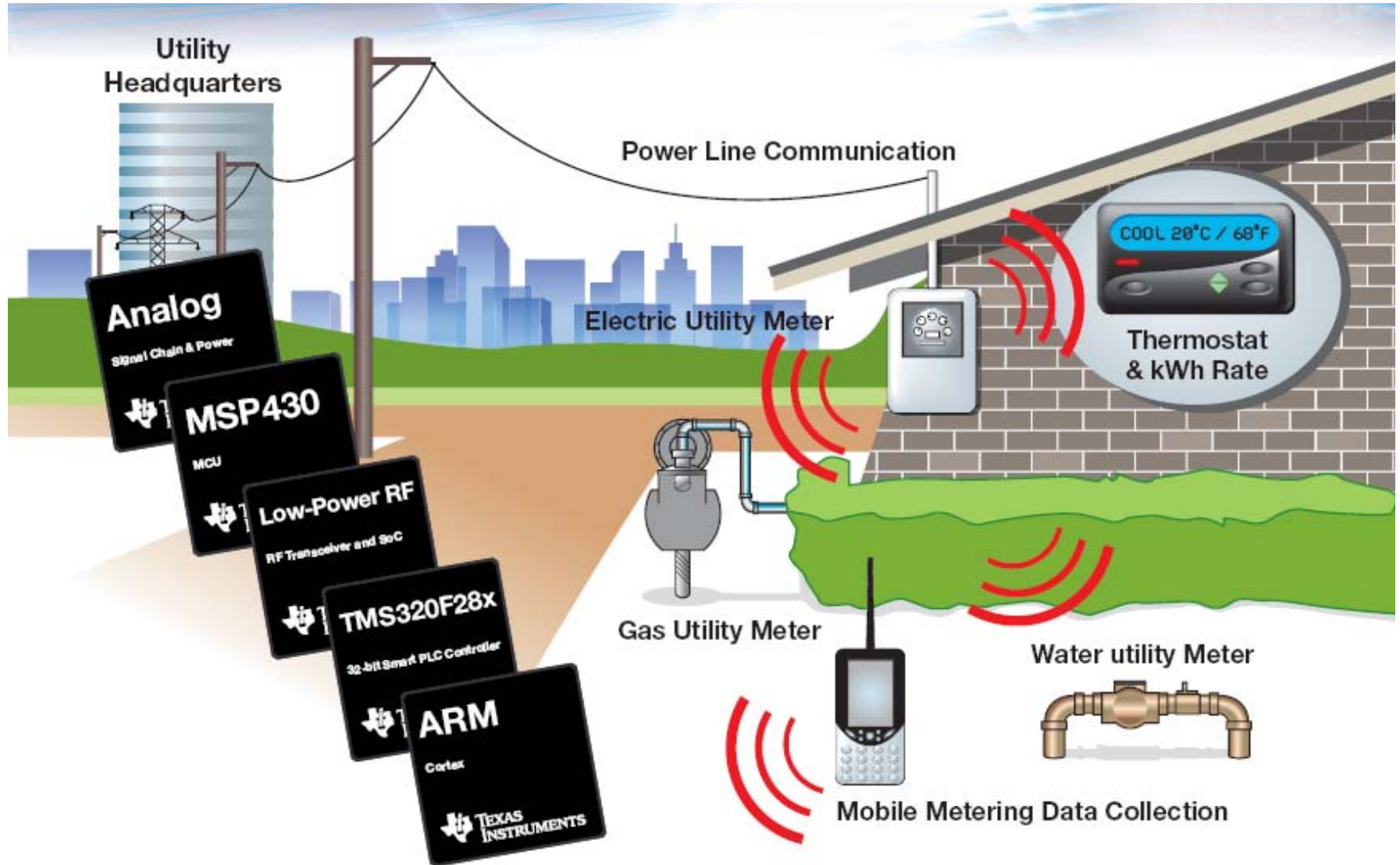


## Smart Grid:

- Consumer participation
- Distributed generation
- Resilient, self-healing
- Future proof PHEV, broadband ...

Metering, “Smart Grid” includes **Electrical, Water, Gas Meters** and adjacent segments in the home – **thermostats, smart appliances**, in **home display, demand response unit**

# TI Offer contains all ingredients for Optimized Metering System solutions



# TI Technologies for Metering Solutions

## Microcontrollers

### 16-bit

#### MSP430

Ultra-low Power

Up to 25MHz

Flash  
1KB to 256KB

RTC, ADC,  
MPY, USART

Measurement  
Metrology MCU



Water meters

### ARM 32-bit

#### Cortex

Industry Std  
Low Power

< 100 MHz

Flash  
64KB to 1MB

USB, ENET,  
ADC, PWM

Electricity CPU  
Communication



### 32-bit Real-time

#### C2000

Power Line  
Communication

Protocol  
Stack & Modem

Embedded  
Flash f. upgrade

Appropriate  
peripherals

Multi- Modulation  
SFSK-OFDM, etc

+ Application



Electricity meters

## Memory

### FeRAM

#### FR

Replace  
Flash & SRAM

Ultra Low  
Power

Faster writes  
than Flash

Smaller size  
than SRAM

Good fit  
with MSP430

## Complementary Analog

### Low-Power RF

#### CC

RF SoC  
Transceiver

433 to  
2500 MHz

Flash for SoC

Appropriate  
peripherals

Mesh-RF  
Zigbee, WM-Bus



### Analog

#### OPA, THS, ADC

Amp, LD, PGA  
ADC, DAC

Full range

Various  
Technologies

Measurement  
PLC



Electricity meters

### Saving Power

#### TPS, UCC

AC/DC,  
DC/DC, LDO

Full range

Ultra Low-Power  
High Efficiency

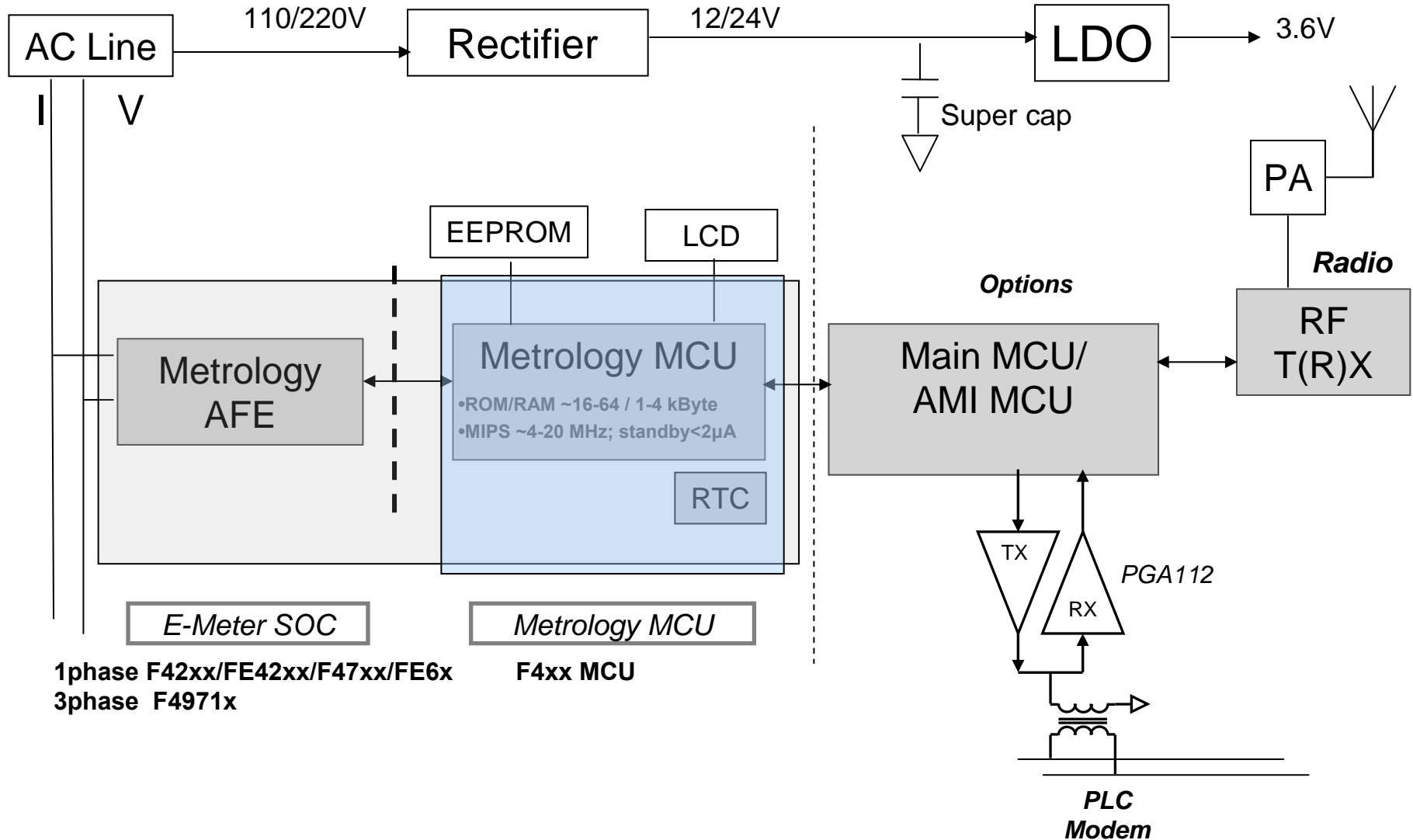
Metering Saving  
Power



Electricity meters



# Typical E-meter Block diagram and terminology

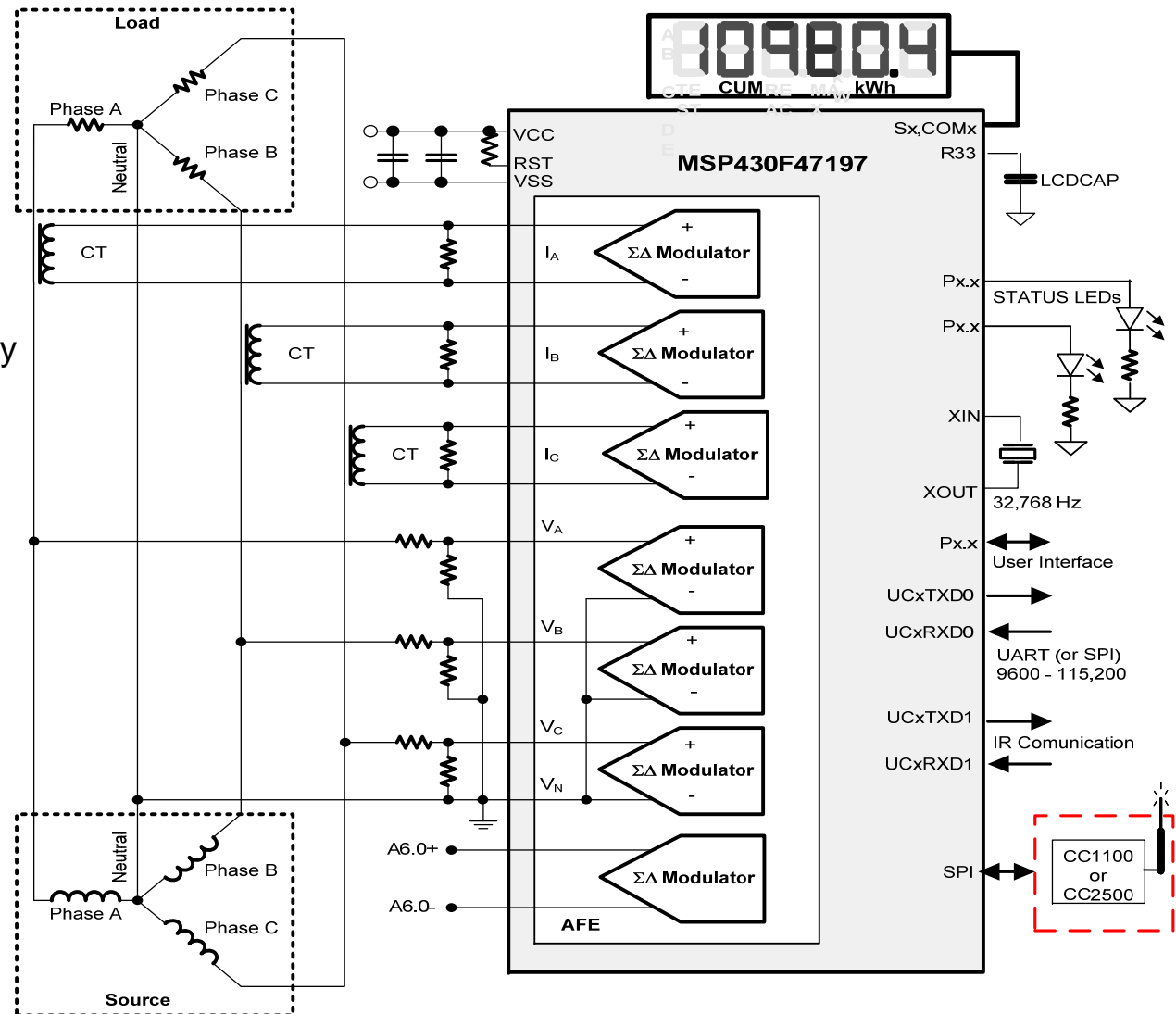


*Whatever the system partitioning, TI has a solution*

# MSP430F47197 3-phase E-Meter

## Key features & benefits

- Simultaneous V<sub>1,2,3</sub> and I<sub>1,2,3</sub> Measurements
- Differential Analog Inputs
- 7th A/D Converter for Anti-Tamper or Temperature/ Humidity Measurement
- Up to 120KB flash & 8KB RAM
- 160-seg LCD with Contrast Control
- HW Real Time Clock
- Signal-Chain-on-Chip
- 16-bit RISC CPU



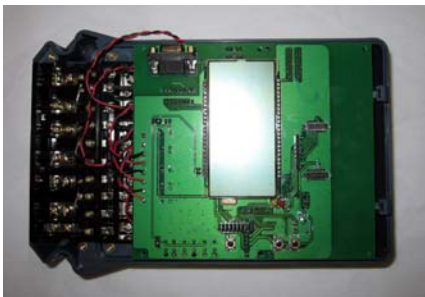
# Hardware and SW ready for E-meter SOC



- **Class 1 Single-phase E-meter**
- Support for FE427, FE427(A) and FE42x2 devices
- Demo-S/W “ready to use” is included in the FE427(A) 1-Phase application report (**SLAA203B**)



- **Single Phase 2 or 3 wires E-meter**
- MSP430F4794 EVM
- LPRF socket available
- Availability: End of July

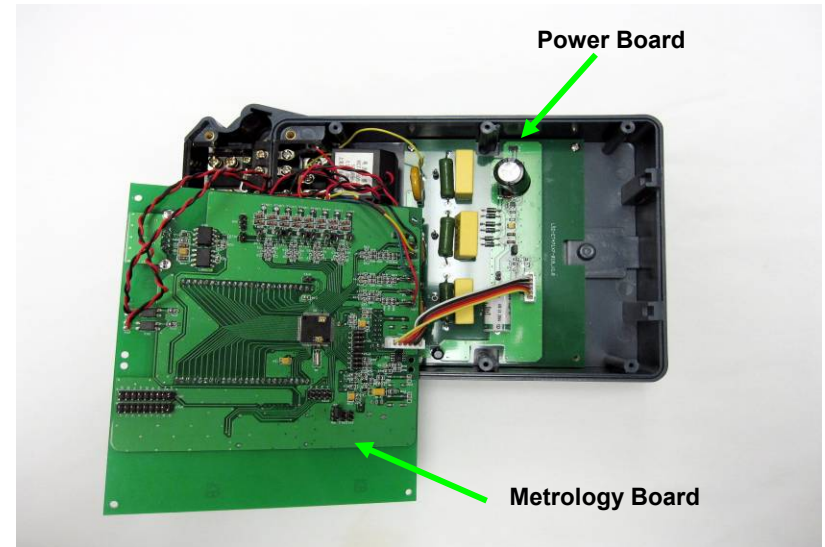


- **3-phase meters**
- MSP430F47197 EVM
- Availability: Mid-May

# 3-phase Electricity meter MSP430F49197 EVM board



Top view closed system

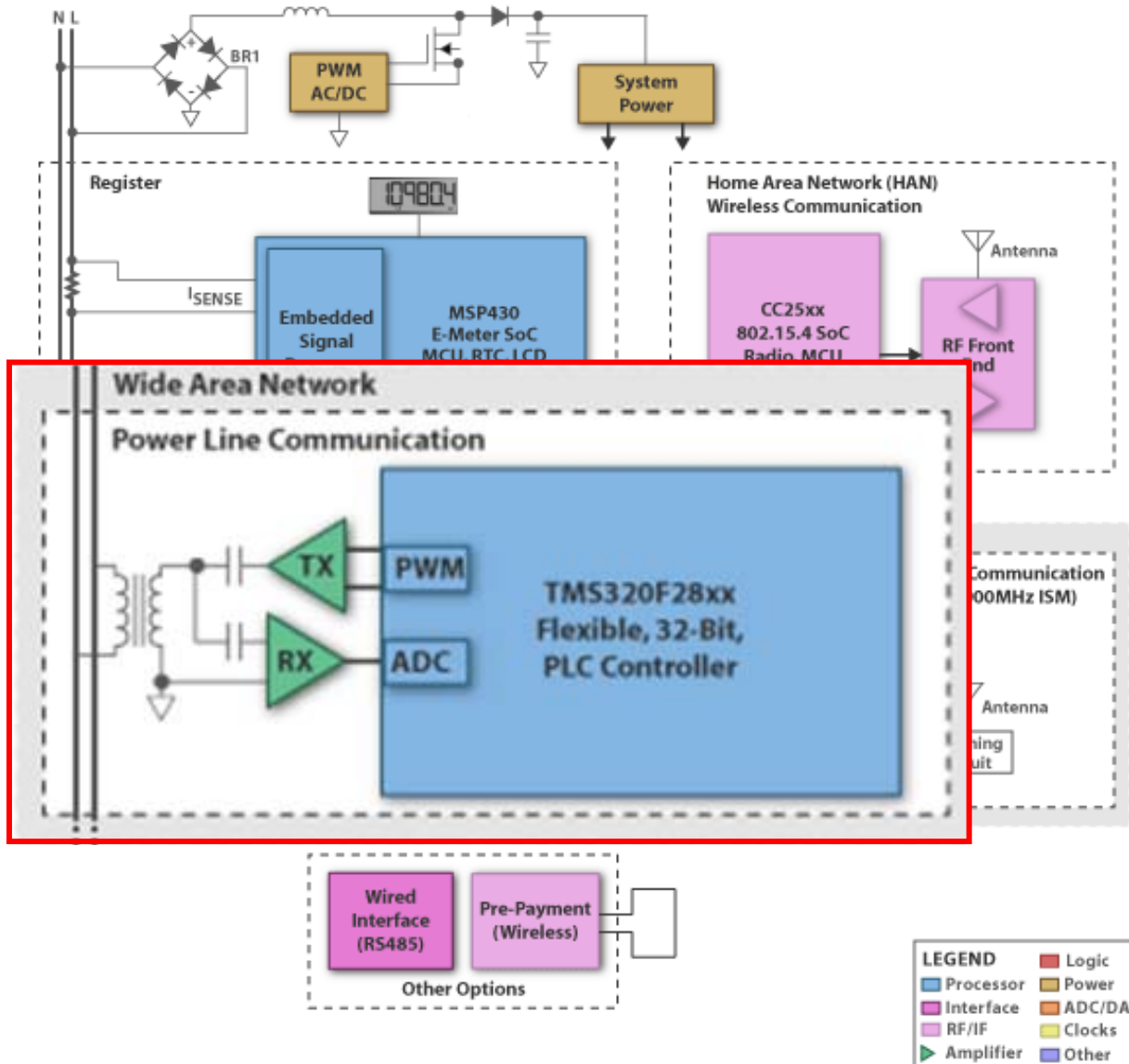


Top view open system

- Availability – 12<sup>th</sup> of June
- Comes with test results, software and documentation



# TI's Power Line Communication Solutions



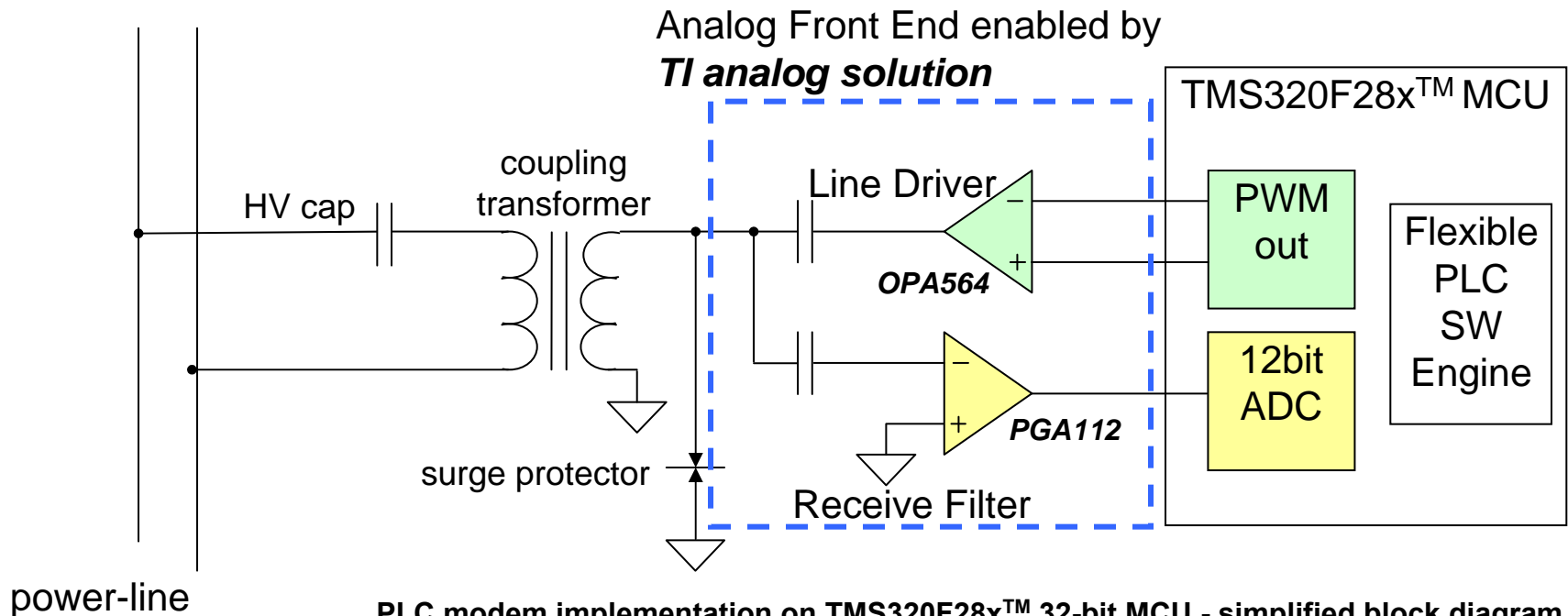
- **Register measures energy**
  - Metrology and control
  - MSP430FE-based
- **Wide Area Network**
  - Two-way utility-to-meter
  - CC11xx ISM + C28xx PLC
- **Home Area Network**
  - Two-way meter-to-home
  - CC25xx 802.15.4 + C28xx PLC
- **Efficient Power Supply**

More information on  
[www.ti.com/metering](http://www.ti.com/metering)



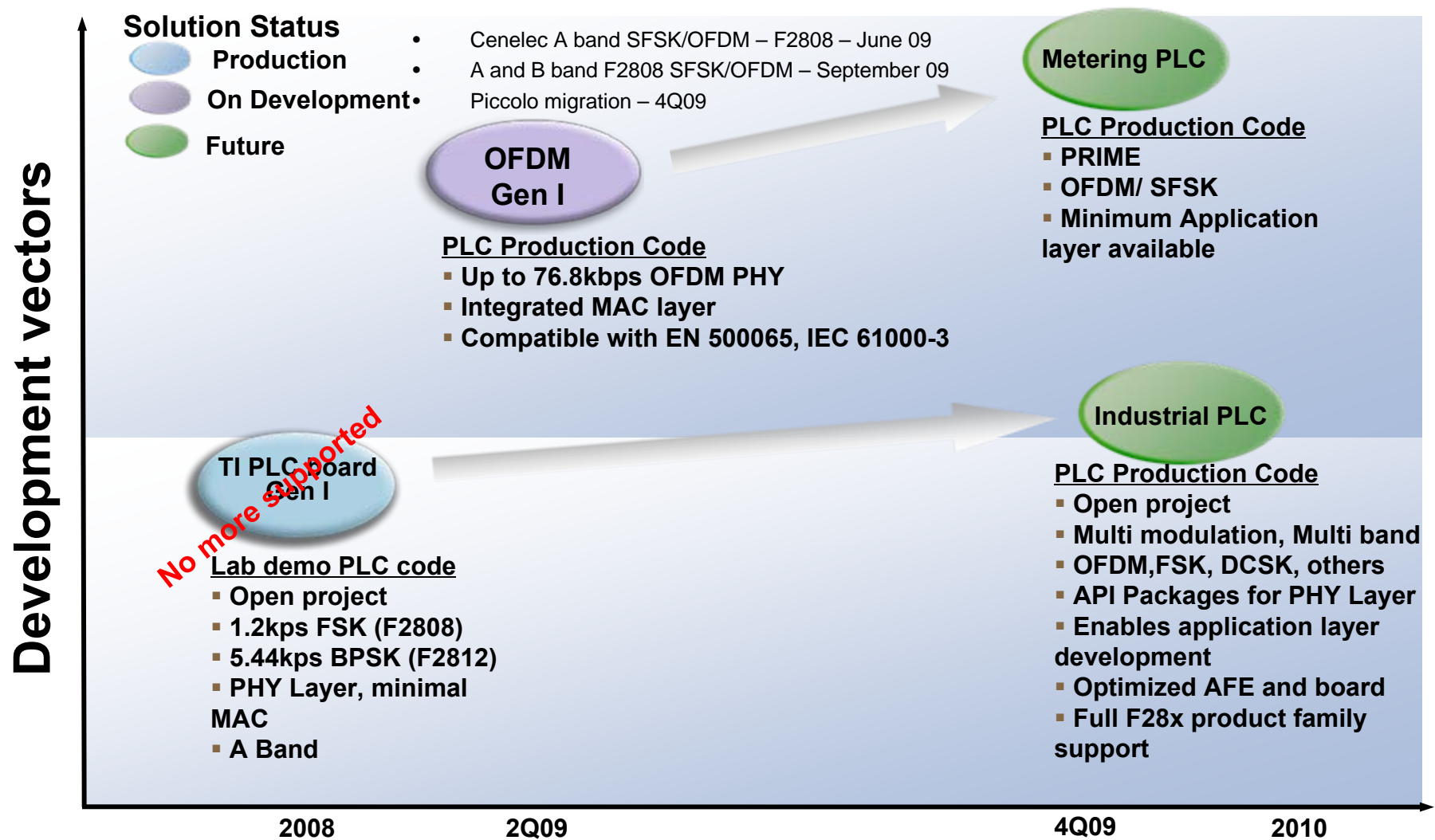
# F28x™ 32-bit MCU PLC Modem solution

## *SW flexible implementation - application integration*

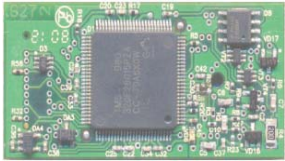


- Ready and flexible for future standards:
  - **Resources left for evolving, more demanding modulation schemes.**
  - **New code = new standard with the same hardware!**
- Additional functions can be implemented in same processor:
  - **PFC, solar, lighting, power monitoring, inverters, motor control,...**

# TI Power Line Communication Solution Roadmap

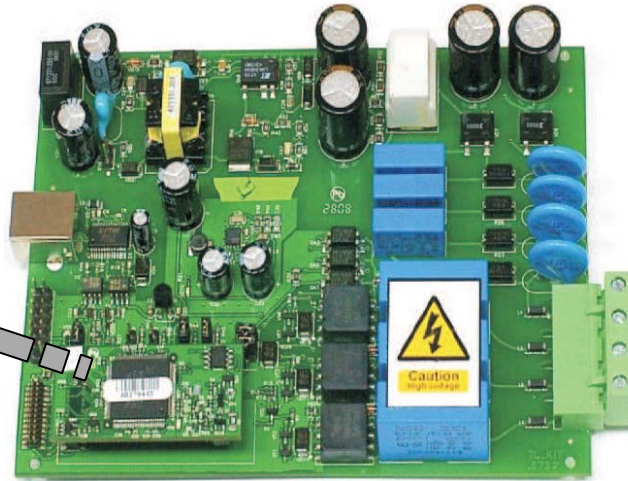


# TI PLC modem development kit (PLC-DK)



## PLC System On Module (SoM)

- TMS320F280x 32-bit Micro-controller based
- I2C , SPI, SCI ports available for Host controller
- Gerber and Schematics available

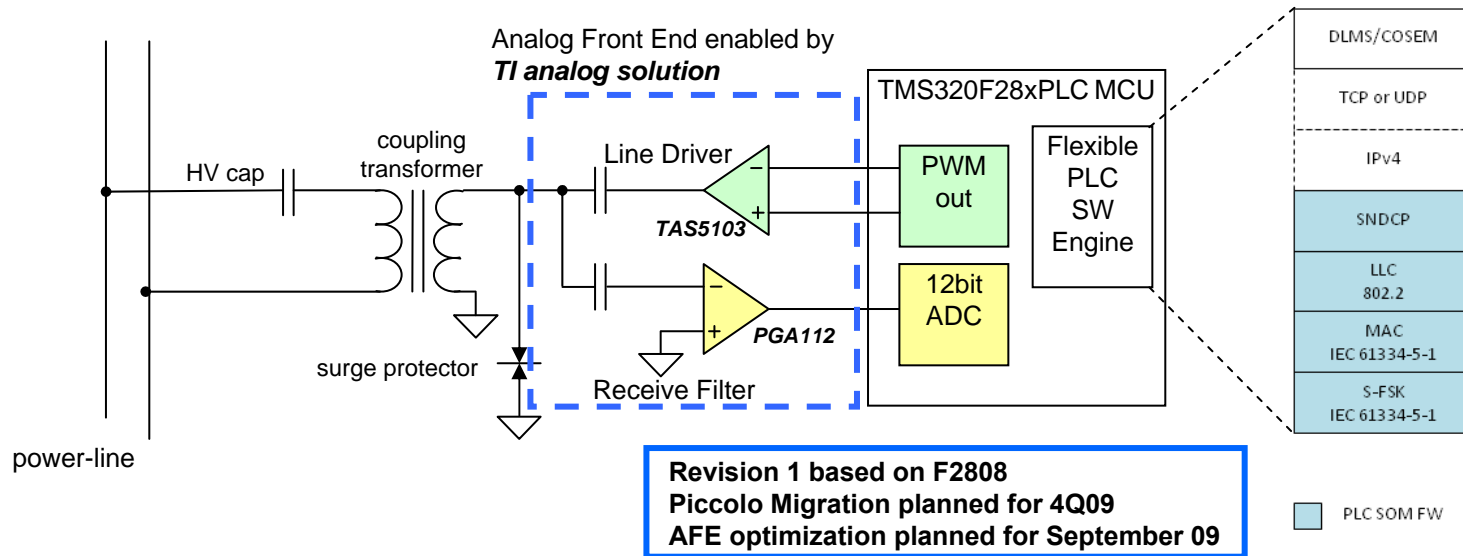


## PLC Modem development Kit (PLC- DK) – comes with

- 2 Modem s
- 2 PLC System On Module
- Cables (USB and power)
- GUI and documentations
- Plastic cover box
- **Part # TMDSPCLKITV1**
- **SRP \$450**
- **Available end of June**

- Robust Narrowband communication over low-voltage power line
- OFDM and S-FSK
- Data rates up to 76.8 kbps for one phase
- Phase selection provided
- Encapsulated libraries solution with interface to host controller (I2C, SPI, SCI)
- Compatible to standards EN50065 (Cenelec), IEC 61000-3
- Operating frequency range 24-94.5kHz (**Cenelec A band**)
- B band support under development
- Easy integration into end-point or network devices of AMR/AMI systems
- Easy integration in industrial application (lighting, solar..)
- NRE and Royalties FREE

# PLC Modem development path



## Prototype Phase

- **Experience** and demo on the PLC-DK
- **Interface** with application
  - Interfaces available for host controller using serial port (I2C, SPI, SCI)
- **Integrate** into the final application
  - Option 1: Plug PLC SoM in application (interface definition provided)
  - Option 2: Merge SoM in application (schematic and Gerber File Available)

## Production Phase

- **Order specific** TMS320F28xPLC device from Texas Instruments



# Conclusion

- For more details or further information, please contact:

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