# MSP430AFE2x3
# single-phase energy meter IC

The Texas Instruments MSP430AFE2xx is a highly integrated, low-power, low-cost, high-accuracy 1-phase energy measurement metrology analog front end (AFE). The MSP430AFE2xx is particularly well suited for a wide range of metering applications such as electricity meters, home automation, energy measurement, energy saving and sub-metering systems.

Supporting up to three independent 24-bit sigma-delta (∑Δ) Analog to Digital Converters (ADC), the MSP430AFE2xx achieves less than 0.1 % error in energy accuracy over wide dynamic range of 2400:1. A comprehensive development tool set including hardware reference design and Energy libraries in software enables quick development, time to market and certification.

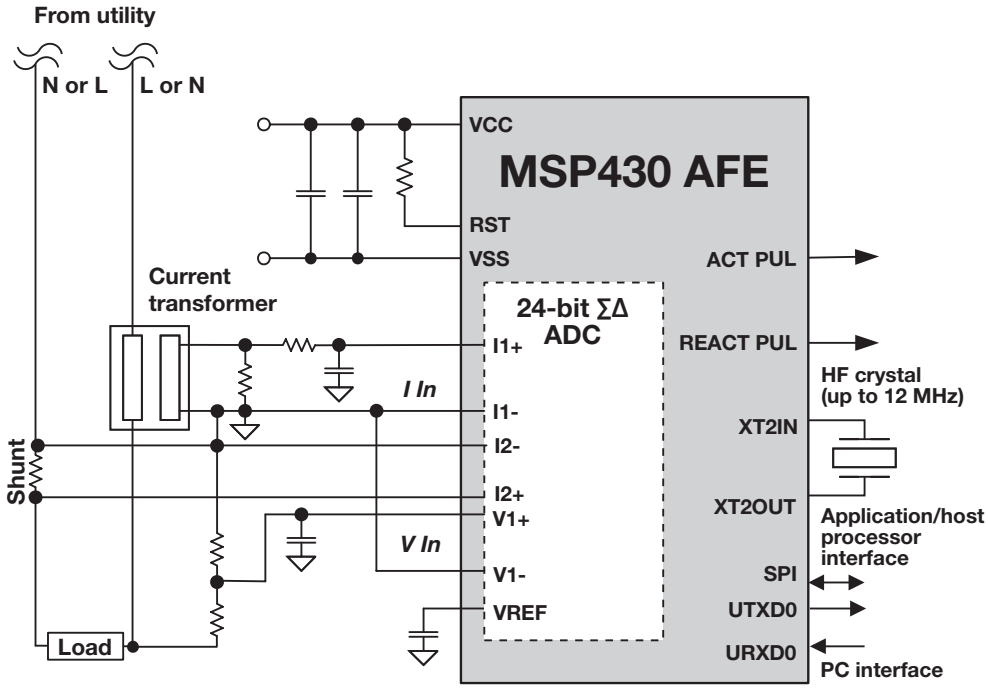
***Energy library features***

- Single-phase energy measurement with support for anti-tamper
- Class 0.1% accuracy over a 2400:1 dynamic range
- Exceeds IEC62053/ANSIC 12.20
- Energy libraries include calibration and provide key metrology parameters that include:
  - RMS current and voltage
  - Active, reactive and apparent power
  - Active, reactive and apparent energies
  - Independent pulse output for active and reactive energies
  - Power factor
  - SW Phase compensation
  - Frequency
  - Temperature
  - Tamper Detection

***Device features***

The MSP430AFE provides maximum design flexibility featuring:

- 12MHz 16-bit RISC architecture featuring an MSP430 core
- Up to three 24-bit second-order ∑Δ ADC
  - Differential inputs o Simultaneous sampling
  - Oversampling of up to 1024
  - Integrated Programmable Gain amplifier of gains up to 32
  - Integrated temperature and voltage sensor
  - Integrated accurate 1.2V ADC reference with 18ppm/ ºC
- UART and SPI communication interfaces
- Up to 16kB programmable on-chip flash and 512 bytes of RAM
- Hardware watchdog timer
- 16-bit general purpose timer with three capture/compare
- 16-bit hardware multiplier
- User configurable supply voltage supervisor (SVS) for sag detection
- 11 General Purpose I/Os with interrupt capability



▲ *MSP430 Evaluation Module (EVM430-AFE253)*

## *Key features*

- Supports shunts/current transformers for current sensors
- Less than 0.1% error in accuracy for 2400: 1 dynamic range
- Metrology parameters provided by the MSP430AFE253
- MSP430F6638 assumes the role of the application/host processor
- Support for anti-tamper detection on the MSP430AFE253
- PC communication to the MSP430AFE via RS-232
- Two-way PC communication to MSP430F6638 via on-chip USB controller
- Segment-based LCD via the MSP430F6638
- Individual JTAG connections for the 430AFE and F6638 for simultaneous debug
- Standard daughter card headers for connection to wireless modules from Texas Instruments
- Flexible and isolated power sources for MSP430AFE and MSP430F6638
  - 3.3V power rails from the AC mains
  - JTAG
- USB for MSP430F6638
  - External power supply
- Software installed for measuring metering parameters
- PC based GUI for calibration/results via MSP430AFE (UART) or MSP430F6638 (USB)
- Two LEDs and two headers for active energy and reactive energy pulses
- Supports shunts/current transformers for current sensors

### *Relevant documents*

For device specifications and recommended operating conditions, please refer to the following documents:

- Single Phase Energy Measurement using the MSP430AFE2xx Application Note
  ***http://www.ti.com/litv/pdf/slaa494***
- MSP430AFE2xx Energy Library
  ***http://www.ti.com/litv/zip/slaa494***
- MSP430AFE2xx Datasheet
  ***http://www.ti.com/product/msp430afe221***
- MSP430F663x Datasheet
  ***http://www.ti.com/product/msp430fe6638***
- MSP430x2xx Family User's Guide
  ***http://www.ti.com/litv/pdf/slau144h***
- MSP430x6xx Family User's Guide
  ***http://www.ti.com/litv/pdf/slau208h***

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