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 (ΣΔ) 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 ΣΔ 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/°C
- 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
**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

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