ADE7816 Multichannel Energy Measurement IC Provides Flexibility and Scalability for Monitoring Applications

Overview

The ADE7816 is a single-chip energy measurement analog front end (AFE) that monitors the energy consumption and power quality of up to six electrical circuits. It is designed for data center power distribution units, energy monitoring and management systems, and multi-channel electricity meters. Able to measure one voltage and up to six current channels, the new AFE provides high accuracy energy usage and power quality data for each circuit.

Since it interfaces to standard microcontrollers, the ADE7816 is specifically suited for applications that require more processor flexibility and peripheral options than is offered by fixed-configuration system-on-chip (SoC) devices.

General Description

The device incorporates seven sigma-delta (Σ-Δ) ADCs and a high accuracy energy measurement core. The six current input channels allow multiple loads to be measured simultaneously. The voltage channel and the six current channels each have a complete signal path allowing for a full range of measurements. Each input channel supports a flexible gain stage, making the device suitable for use with different types of current sensors, such as current transformers (CTs) and Rogowski coils. The device includes six on-chip digital integrators to facilitate the use of the Rogowski coil sensors.

The ADE7816 provides access to on-chip meter registers via either the SPI or I²C interface. A dedicated high speed interface, the high speed data capture (HSDC) port, can be used in conjunction with I²C to provide access to real-time ADC output information. A full range of power quality information, such as overcurrent, overvoltage, peak, and sag detection, are accessible via the two external interrupt pins, IRQ0 and IRQ1. The ADE7816 energy metering IC operates from a 3.3 V supply voltage and is available in a 40-lead LFCSP, Pb-free package.

Features

- Measures active and reactive energy, sampled waveforms, current and voltage rms
- 6 current input channels and one voltage input channel
- Less than 0.1% error in active and reactive energy measurement over a dynamic range of 1000:1
- Supports current transformers and Rogowski coil input sensors
- Provides instantaneous current and voltage readings
- Provides angle measurements on all six input channels
- 2 kHz bandwidth operation
- 1.2 V voltage reference with external overdrive capability
- 10 ppm/°C voltage reference drift
- Flexible SPI, I²C, and HSDC serial interfaces

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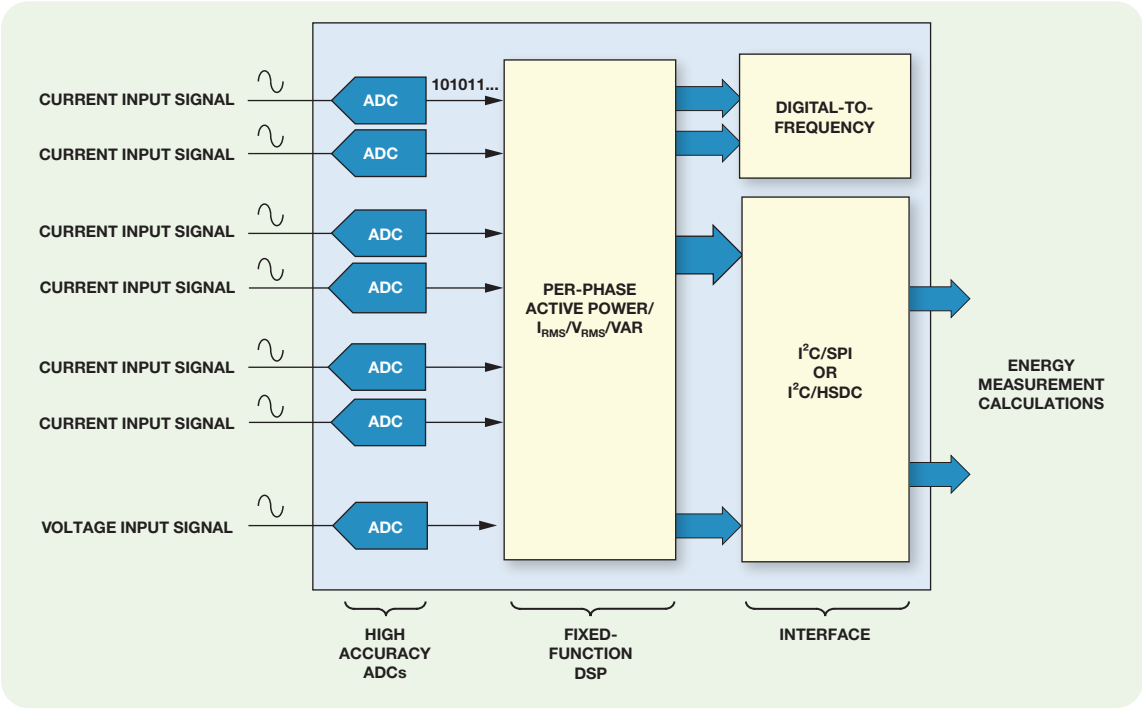
ADE7816 Simplified Block Diagram



Features and Benefits

Feature	Benefit
Analog front-end IC architecture with industry-standard interfaces	Supports flexible system design by interfacing a wide variety of user-selectable microcontroller configurations
Supports current transformers and Rogowski coils	Solution addresses a broad set of applications with different input voltage and current requirements
Scalable system design	Designer can use multiple ADE7816 AFEs with a single application MCU (microcontroller)
I²C, SPI, and HSDC (high speed data capture) interfaces	ADE7816 provides real-time access to raw waveform samples so that user can perform postprocessing
Highly integrated	Saves board space and cost by replacing up to six single-phase energy metering ICs (integrated circuits)
On-chip support for a variety of power quality measurements	Saves development time by integrating power quality information, including overvoltage, overcurrent, peak, and sag detection
Extremely robust measurement solution	Uses ADI's field-proven, revenue-grade measurements that include active and reactive energies and instantaneous rms voltage and currents

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I²C refers to a communications protocol originally developed by Philips Semiconductors (now NXP Semiconductors).

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