

Enhanced Poly-Phase High-Performance Wide-Span Energy Metering IC

DATASHEET

FEATURES

Metering Features

- Metering features fully in compliance with the requirements of IEC62052-11, IEC62053-22 and IEC62053-23, ANSI C12.1 and ANSI C12.20; applicable in class 0.2S, 0.5S or class 1 poly-phase watt-hour meter or class 2 poly-phase var-hour meter.
- Accuracy of $\pm 0.1\%$ for active energy and $\pm 0.2\%$ for reactive energy over the dynamic range of 6000:1.
- Temperature coefficient is 6 ppm/ $^{\circ}\text{C}$ (typical) for on-chip reference voltage.
- Single-point calibration on each phase over the whole dynamic range for active energy; no calibration needed for reactive/apparent energy.
- $\pm 1^{\circ}\text{C}$ (typical) temperature sensor accuracy.
- Electrical parameters measurement: less than $\pm 0.5\%$ fiducial error for V_{rms} , I_{rms} , mean active/ reactive/ apparent power, frequency, power factor and phase angle.
- Active (forward/reverse), reactive (forward/reverse), apparent energy with independent energy registers. Active/ reactive/ apparent energy can be output by pulse or read through energy registers to adapt to different applications.
- Programmable startup and no-load power threshold, special designed of startup and no-load circuits to eliminate crosstalk among phases achieving better accuracy especially at low power conditions.
- Dedicated ADC and different gains for phase A/B/C and Neutral line current sampling circuits. Current sampled over current transformer (CT) or Rogowski coil (di/dt coil); phase A/B/C voltage sampled over resistor divider network or potential transformer (PT).
- Programmable power modes: Normal mode (N mode), Idle mode (I mode), Detection mode (D mode) and Partial Measurement mode (M mode).
- Fundamental (CF3, 0.2%) and harmonic (CF4, 1%) active energy with dedicated energy and power registers.
- Total Harmonic Distortion (THD) and Discrete Fourier Transform (DFT) functions for 2 ~ 32 order harmonic component. THD and DFT results available in SPI accessible registers. Both voltage and current of all phases processed within the same time period.
- Event detection: sag, phase loss, reverse voltage/ current phase sequence, reverse flow, calculated neutral line current I_{NC} overcurrent sampled neutral line current I_{NS} overcurrent and THD+N over-threshold.

Other Features

- 3.3V single power supply. Operating voltage range: 2.8V~3.6V. Metering accuracy guaranteed within 3.0V~3.6V.
- Four-wire SPI interface with Direct Memory Access (DMA) mode to stream out 7-channel ADC raw data.
- Parameter diagnosis function and programmable interrupt output of the IRQ inter-

- rupt signals and the WarnOut signal.
- Programmable voltage sag detection and zero-crossing output.
- CF1/CF2/CF3/CF4 output active/ reactive/ apparent energy pulses and fundamental/ harmonic energy pulses respectively.
- Crystal oscillator frequency: 16.384 MHz. On-chip two capacitors and no need of external capacitors.
- TQFP48 package.
- Operating temperature: -40 °C ~ +85 °C .

APPLICATION

- Poly-phase energy meters of class 0.2S, 0.5S and class 1 which are used in three-phase four-wire (3P4W, Y0) or three-phase three-wire (3P3W, Y or Δ) systems.
- Data Acquisition Terminal.
- Power monitoring instruments which need to measure voltage, current, THD, DFT, mean power, etc.

GENERAL DESCRIPTION

The M90E36A is a poly-phase high performance wide-dynamic range metering IC. The M90E36A incorporates 7 independent 2nd order sigma-delta ADCs, which could be employed in three voltage channels (phase A, B and C) and four current channels (phase A, B, C and neutral line) in a typical three-phase four-wire system.

The M90E36A has an embedded DSP which executes calculation of active energy, reactive energy, apparent energy, fundamental and harmonic active energy over ADC signal and on-chip reference voltage. The DSP also calculates measurement parameters such as voltage and current RMS value as well as mean active/reactive/apparent power.

A four-wire SPI interface is provided between the M90E36A and the external microcontroller. In addition, DMA mode can be used for 7-channel ADC raw data access, offering more flexibility in system application.

The M90E36A is suitable for poly-phase multi-function meters which could measure active/reactive/apparent energy and fundamental/harmonic energy either through four independent energy pulse outputs CF1/CF2/CF3/CF4 or through the corresponding registers.

With the on-chip THD and DFT engine, all phases' THD and DFT results can be directly accessed through related registers, thus simplifying hardware design in Data Acquisition Terminals.

The proprietary ADC and auto-temperature compensation technology for reference voltage ensure the M90E36A's long-term stability over variations in grid and ambient environment conditions.