

# Ultra-low-power 12-bit SAR ADC IP

A 0.5V ultra-low-power 12-bit 1 MS/s general purpose SAR ADC which is fully characterized on silicon for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

This ultra-low-power 12-bit ADC IP is a general purpose Analog to Digital Converter (ADC) for low-power applications based on successive approximation register architecture with a core sampling frequency ranging from 100 KS/s up to 1 MS/s. The ultra-low power is achieved by employing an advanced comparator based on the bulk biasing principle. Therefore, only dynamic current is consumed and the power consumption is fully proportional to the sampling rate.

This ADC IP features an outstanding dynamic performance that includes 66 dB SNR, -72 dB THD, and 10.5-bit ENOBs. The obtained figure of merit is only 16 fJ/Sampling rate/Conv-step for a sampling frequency of 1 MS/s excluding references. The functional block diagram is shown below.

## Applications

- Low-power data acquisition
- Sensor applications
- Portable medical equipment
- Radio baseband processing
- Hard drives

## Features

- Mie Fujitsu 55 nm low-power process
- Silicon proven
- Standard process (no analog option)
- 0.9 V analog input voltage & 0.5 V supply
- 12-bit SAR-based
- Differential input signal range:  $1.8 V_{\text{diffpp}}$
- Sampling rate from 100 KS/s up to 1 MS/s
- Power consumption scaling with frequency
- Internal biasing system
  - DNL  $< \pm 0.9$  LSB
  - INL  $< \pm 1.5$  LSB
- Dynamic performance @ 1 MS/s
  - 66dB SNR at  $f_{\text{in}} = 100$  KHz
  - -72dB THD at  $f_{\text{in}} = 100$  KHz
- Ultra-low-power dissipation
  - Only 25  $\mu\text{W}$  excluding references
- Compact die area
  - Only 0.15  $\text{mm}^2$  excluding references
- Operating temperature range
  - $-40^{\circ}\text{C} - 85^{\circ}\text{C}$
- Power down current
  - $< 10$  nA typ

