

FEATURES

- DC, gain and time skew background calibration
- Digital, analog and hybrid time skew correction modes
- Wideband operation:
 - 100% of Nyquist band in analog mode
 - 90% of Nyquist band in digital and hybrid modes
 - Multiple Nyquist zones

- 10-bit to 18-bit ADC resolution
- Low power and high-speed

APPLICATIONS

- Wideband communication receivers
- High-end test and measurement digitizers

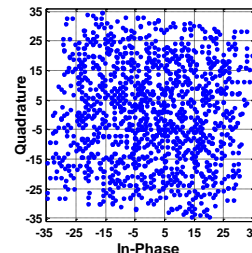
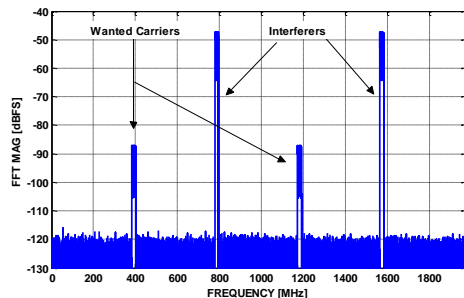
DESCRIPTION

CiP2015 is a proven digital IP for background calibration of mismatch errors in 2-channel, time-interleaved A/D converters. It provides wideband interleaving spurs rejection while maintaining low power and high-speed thanks to Cericic *Zero-Spurs* technology. It has many features that can be enabled through SPI interface and that allow the IP to address most applications. Additional custom features can be added on request.

DC, gain and time skew errors are estimated continuously in the digital domain to track drifts with temperature for instance. They feed a correction engine that supports digital, analog and hybrid operating modes. In digital correction mode, time skew compensation is performed with a low latency digital FIR filter. In analog correction mode, the digital correction filter is disabled and the estimator is still active. The estimated time skew error is used to control a digitally tunable time delay in the clock path and form a closed estimation-correction loop.

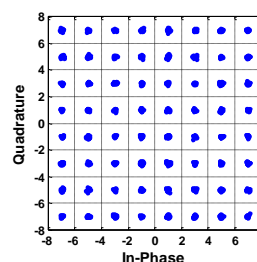
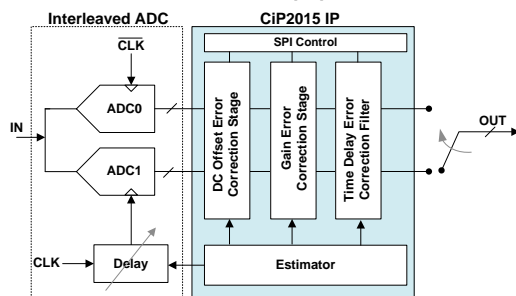
Hybrid time skew correction mode uses the digital filter for fine time skew tuning with a low complexity analog delay for coarse time skew adjustment. This digital-analog approach provides high dynamic range and large correction range while preserving jitter performance of the clock path. The resolution split between analog and digital is programmable through SPI interface.

TYPICAL APPLICATION AND PERFORMANCE



Before Calibration

Constellation of the QAM64 symbols of the wanted LTE carrier before calibration. ADC mismatch errors make the recovery of the symbols impossible.



After Calibration

Constellation of the QAM64 symbols of the wanted LTE carrier after calibration with CiP2015 IP. ADC mismatch errors have been cancelled and only ADC noise floor effect remains.

Test case: two large 20MHz-LTE interferers have been placed away from each other to create a wideband situation. Their interleaving images fall in the frequency location of small 20MHz-LTE carriers. This test signal has been used to test a simulated 14-bit/4Gbps/64dB SNR, time-interleaved ADC with 0.1dB and 7ps gain and time skew errors respectively.

As a digital IP, CiP2015 can be fully characterized with simulation data that has the benefit of reproducing any use case that is beyond the capability of commercially available A/D converters. However, Cericic IPs have been validated also with measured data from actual ADCs. Cericic R&D team has system design and test expertise to design a custom demonstrator on request.

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