Application Brief

RF Sampling Resource Guide

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Introduction

This resource guide provides links to blog entries related to RF sampling data converters. The document is a handy resource guide to various topics pertinent to high-speed data converter designers, FPGA firmware designers, and communication engineers.

RF Sampling Data Converter Topics

1. RF Sampling: The new architecture on the block
   Introduces a new transceiver architecture with the availability of RF sampling data converters capable of converting digital bits to and from RF signals directly.
2. Why Bother with RF Sampling?
   Investigates one of the primary benefits of RF sampling related to supporting large instantaneous bandwidths and multi-mode signals.
3. Managing Input Data Rates Is a Breeze
   RF sampling converters operate at very high sample rates, but it is not possible to reasonably transfer all of that digital data to the FPGA or processor. Learn how interpolation (TX) and decimation (RX) reduce the data rates to reasonable speeds without impacting the signal.
4. RF Sampling: Aliasing Can Be Your Friend
   Traditional sample theory dictates that your signal must be within the first Nyquist zone (Fs/2) and that aliasing is bad. Not so. See how aliasing is advantageous to operate at higher frequencies in higher Nyquist zones.
5. RF Sampling: How Over-sampling Is Cheating Physics
   Maybe your signal bandwidth or frequency is not that large. You can still take advantage of the high speed sampling. See how over-sampling provides some key performance advantages in your system.
6. RF Sampling: Digital Mixers Make Mixing Fun
   Analog mixers are troublesome with unwanted noise, images, and spurs. Not the digital ones; they make mixing up and down to arbitrary frequency bands easy and fast.
7. RF Sampling: Interleaving Builds Faster ADCs
   When sampling speed requirements exceed the capability of the core ADC sample rate, interleaving multiple devices is a viable approach. Review the limitations and pitfalls of interleaved ADCs.
8. RF Sampling: Frequency Planning Yields a Clean Spectrum
   With so much spectrum at your disposal wiht RF sampling converters, frequency planning is a must to work around Nyquist zone boundaries and troublesome harmonic spurs.
9. RF Sampling: Clocking Is the Key Every Time
   High quality clocking is critical for best RF sampling data converter performance. See how the clocking specifications impact overall data converter performance.
10. How to Select a Power-efficient Narrowband Receiver for Active Antenna-array Systems
    Introduces a narrow band receiver for a phased array system to electronically steer the antenna beam pattern.
11. Push Your Receiver Bandwidths past 1-GHz in High-end Applications
    You need more capacity and more users on your system. RF sampling converters support large instantaneous bandwidth of 1GHz and beyond.
12. Blast past Interference Using Digital-down Converters in RF Sampling Receivers
    Take advantage of the large spectrum capabilities and digital mixing of the RF sampling converters to work around interference signals that can derail your design.

13. What's the Fuss about Noise in RF Sampling Converters?
    Certainly noise performance in data converters is a key metric, but how to characterize it for high speed ADCs. Investigate the parameters of Noise Figure (NF) and Noise Spectral Density (NSD) to properly characterize signal-to-noise ratio of the converter.
14. RF Sampling: Linearity Performance Is Not So Straightforward
    Investigate the linearity of the data converter with large signals or in the presence of large blocking signals.
15. RF Sampling: Analog-to-digital Converter Linearity Sets Sensitivity
    Investigate how device linearity performance impacts system sensitivity.
16. Why Phase Noise Matters in RF Sampling Converters
    Investigate how phase noise performance of the data converter sampling clock impacts real-world system specifications.

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