

基于过零检测的 TIADC 时钟失配校准算法

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摘要: 针对时间交织模数转换器 (Time-Interleaved Analog-to-Digital Converter, TIADC) 的时钟失配设计了一种基于过零检测的后台校准算法. 该算法通过比较通道间采样值过零的个数判断时钟误差的大小, 再利用提取到的误差大小控制可变延时的延时大小对时钟误差进行校正. 通过 MATLAB 建立 8 位五通道 TIADC 为模型对算法进行验证, 当 $f_{in}/f_s=0.461$ 时, 仿真结果表明, 经本算法校准后 ENOB 从 5.16 位提升到 7.88 位, SNR 从 32.8 dB 提高到了 49.4 dB, 从而验证了该校准算法的正确性和有效性. 此外, 该校准算法对输入信号的频率没有严格的要求, 且可以扩展到任意通道数.

关键词: TIADC; 后台校准算法; 过零检测; 时钟失配

Background Timing-Skew Calibration Algorithm for the TIADC

Based on Zero-Crossing Detection

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Abstract: A background calibration technique, which is based on zero-crossing detection method, for clock mismatch in Time-Interleaved Analog-to-Digital Converter (TIADC) is proposed. The error is achieved by comparing the amount of zero-crossing in channels to control the delay for the purpose of timing skew calibration. The algorithm is verified by an 8 bits 5-channels TI ADC MATLAB model. The simulation result shows that the ENOB rises from 5.16 bits to 7.88 bits, and the SNR rises from 32.8 dB to 49.4 dB at the $f_{in}/f_s=0.461$, which means the correctness and effectiveness of the algorithm is validated. The presented calibration in this paper has no restriction on the input signal frequency, and can be extended to arbitrary number of channels.

Key words: TIADC; background calibration algorithm; zero-crossing detection; timing skew

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