

A Low-Power and High-Precision Spread Spectrum Clock Generator for Serial Advanced Technology Attachment Application Using Two-Point Modulation

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Abstract

A new technique utilizing the two-point modulation (TP) for a spread-spectrum clock generator (SSCG) for Serial ATA is presented in which the divider ratio is varied by a $\Sigma \Delta$ modulator, and the voltage-controlled oscillator is modulated. With this technique, the modulation bandwidth is enhanced in order that the modulation profile accuracy and jitter performance caused by the $\Sigma \Delta$ modulator can be improved at the same time. The order of the $\Sigma \Delta$ modulator and the loop filter can be reduced to save power and area, while the EMI suppression still satisfies specifications. The dual-path loop-filter (DL) reduces the size of the loop capacitor and enables full integration. The proposed TPD-SSCG has been fabricated in a $0.18 \mu\text{m}$ CMOS process. The size of chip area is $0.44 \times 0.48 \text{mm}^2$. The circuit produces a clock of 1.5GHz with a down spread ratio of 0.5%, 10.14dB EMI of reduction, 5.485ps rms jitter and 35ps peak-to-peak jitter. The power consumption, excluding an output buffer, is only 15.3mW.

Keyword : Phase-locked loops, spread spectrum clock generator