一种应用于角度传感器的 Sigma Delta ADC 设计

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摘 要：采用 XH018 0.35 μm CMOS 工艺设计了一种应用于磁阻角度传感器的 Sigma Delta 调制器.由于实际运放的增益都是有限的，使得开关电容积分器的信号传输函数的极点发生偏移，进而影响 ADC 精度，本文采用有限增益补偿技术减小运放增益对开关电容积分器的影响.该调制器采用两阶 1 bit 全反馈结构，信号带宽 12 KHz，采样频率 6.25 MHz.后仿结果表明，在 2.5 V 电源电压下，调制器的整体功耗为 4 mW.核心电路版图尺寸为 0.45 mm×0.3 mm. 在-40℃~150℃，各个工艺角的 ENOB ≥ 16.5 bit.FOM=165.

关键词：角度传感器；高精度 ADC；Sigma Delta Modulator；Gain Compensation

Design of Sigma Delta ADC for angle sensor

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Abstract：A Sigma-Delta modulator for magnetoresistive angle sensor is designed using XH018 0.35 μm CMOS process. The finite gain of the actual amplifier results in a pole shift in the transfer function, which will affect the accuracy of ADC. In this paper, the finite gain compensation technique is adopted to reduce the effect of operational amplifier gain on switched capacitor integrator. The structure of the modulator is 2 Order 1 Bit full feedback, with a signal bandwidth of 12 KHz and a sampling frequency of 6.25 MHz. The simulation results show that the overall power consumption of the modulator is 4mW under the 2.5V supply voltage. The layout of the core circuit is 0.45 mm × 0.3 mm. At -40℃~150℃, the ENOB of each corner is greater than 16.5bit. FOM=165.

Key words：Angle sensor; High-presicion ; Sigma Delta Modulator；Gain Compensation

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