

# 应用于 ETCS 超低功耗唤醒接收机的设计

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**摘要:** 基于 DSRC 标准, 介绍了唤醒接收机在 ETCS 中的应用, 通过采用提出的设计方案, 设计一款低功耗, 高灵敏度唤醒接收机. 基于  $0.13\ \mu\text{m}$  CMOS 工艺, 实现了偏置电路, 放大电路, 比较器, 电流基准源和驱动等电路模块. 采用优化的电路结构, 使得运放有较低功耗和高增益. 为了减小噪声和比较器自身失调对比较器输出的影响, 采用带迟滞功能的比较器. 仿真结果表明, 唤醒接收机可工作在  $2\sim 3.3\text{V}$  电源电压,  $-40\sim 80$  度下, 典型情况下基带的检测灵敏度为  $-68.3\ \text{dBm}$ , 直流电流为  $6.97\ \mu\text{A}$ .

**关键词:** 电子收费系统 (ETCS); 唤醒接收机; 超低功耗; 弱反型区

## The Design of Ultra-Low Power Wake-Up Receivers Applied to ETCS

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**Abstract:** Based on the standard of DSRC, paper introduce the application of wake-up receivers in ETCS. By using the proposed design scheme, wake-up receiver has been achieved, which have low power and high sensitivity. The circuit module, such as bias circuit, amplifier circuit, comparator, current reference source and drive, are implemented based on  $0.13\ \mu\text{m}$  CMOS process. The op amp has lower power consumption and high gain by using optimizing structure of circuit. A comparator with hysteresis is used to reduce the interference of noise and comparator offset on the comparator output. Simulation result shows that the wake-up receiver can work in the  $2\ \text{V}\sim 3.3\ \text{V}$  power supply voltage and  $-40\sim 80^\circ\text{C}$  temperature. The detection sensitivity of the baseband is  $-68.3\ \text{dBm}$  and the DC current is  $6.97\ \mu\text{A}$  typically.

**Key words:** electronic toll collection system (ETCS); wake-up receiver; ultra-low power; weak inversion

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