

应用于无源RFID标签的CMOS温度传感器

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摘要:

针对无源RFID标签功耗受限、芯片面积小的特点, 采用SMIC 0.18 μm RF CMOS工艺设计了一种温度传感器。采用了带有偏置电流源的延迟单元, 利用MOS管沟道电流的温度特性使该单元的延迟时间与温度相关, 基于此提取温度信息。并设计了后续电路将提取的温度信息转换成数字信号供RFID标签数字控制模块使用。结果表明, 当温度范围为-20 $^{\circ}\text{C}$ ~80 $^{\circ}\text{C}$ 时, 温度传感器精度为1 $^{\circ}\text{C}$; 标签芯片供电电压为1.8V时, 传感器芯片的总工作电流为440nA, 标签芯片模拟前端电路的总工作电流为6 μA 。

关键词: 无源RFID标签; 温度传感器; 阈值电压; 迁移率

A CMOS Temperature Sensor Used in Passive RFID Tag

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Abstract:

A temperature sensor used in passive RFID tag is fabricated with SMIC 0.18 μm RF CMOS technology. A delay element is designed based on the current temperature effects of MOS transistor. And the delay time is related to temperature. On the basis of that, a pulse with the width related to temperature is generated. Then a counter is utilized to convert the pulse to digital codes for RFID digital and control system. The simulation results show that the sensor can provide a resolution of 1 $^{\circ}\text{C}$ in the range from -20 $^{\circ}\text{C}$ to 80 $^{\circ}\text{C}$. The working currents of the temperature sensor and the analog circuit in RFID tag are 440nA and 6 μA respectively under 1.8-V supply voltage.

Keywords: Passive RFID tag; Temperature sensor; Threshold voltage; Mobility

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