

# 一种低温度灵敏度片上张弛振荡器

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**摘要:** 本文介绍了一种用 CMOS 工艺实现的对温度和电源电压变化不敏感的片上张弛振荡器.文中提出了一种降低张弛振荡器频率波动的补偿技术, 该技术克服了传统补偿方法受到片上电阻温度特性制约的缺点, 极大地提高了振荡器输出频率的稳定性.测试结果表明, 当电源电压从 1.62 V 变化到 1.98 V 时, 振荡器输出频率变化 $\pm 0.11\%$ ; 当温度从 40°C 变化到 125°C 时, 输出频率变化 $\pm 0.24\%$ .相比于传统方法, 频率波动降低了大约 2/3.该振荡器采用 TSMC 180 nm 1P5M 工艺实现, 电源电压为 1.8 V.当工作在 25 MHz 时, 功耗为 50  $\mu$  W.

**关键词:** 片上张弛振荡器; 带隙基准; 电压、工艺以及温度变化; 物联网

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## A Low Temperature Sensitivity On-Chip

Relaxation Oscillator

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**Abstract:** A temperature and supply independent on-chip relaxation oscillator is introduced. This paper proposed a technique to reduce frequency variation of relaxation oscillator. This technique overcomes the disadvantages of traditional compensation methods, which are restricted by on-chip resistance temperature characteristics. Experimental results show that the oscillator exhibits frequency variation of  $\pm 0.11\%$  for supply ranging from 1.62 V to 1.98 V and  $\pm 0.24\%$  for temperature ranging from 40°C to 125°C. Compared to conventional methods, frequency variation of this oscillator is reduced by 2/3. This oscillator is designed in TSMC 180-nm 1P5M CMOS process with a supply voltage of 1.8 V and consumes 50  $\mu$  W when operating at 25 MHz.

**Key words:** on-chip relaxation oscillator; bandgap reference; process voltage temperature variation; internet of things

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