

低功率互補式金氧半射頻前端接收器

— 使用堆疊式低雜訊放大器及混頻器

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摘要

由於接收器前端電路是高耗電裝置且可攜式通訊設備具有限的電源，因而在射頻段低功率操作的可攜式應用引發了很廣泛的研究。

基於電流再利用的觀點，此論文提出了一個使用堆疊式低雜訊放大器及混頻器的低功率射頻接收器，其中採用了台灣積體電路製造股份有限公司提供的 $0.18\text{-}\mu\text{m}$ 互補式金氧半製程技術。此堆疊式低雜訊放大器及混頻器是設計用來作為一應用於藍芽系統的積體化低中頻映像消除接收器的第一級電路。此電路的模擬和佈局圖已經完成。

模擬結果顯示，所設計的堆疊式低雜訊放大器及混頻器可在 1.8 V 電源下正常工作。此堆疊式低雜訊放大器及混頻器僅消耗 6.3 mW 功率。本地震盪器的功率要求是在 2.38 GHz 頻段要有 -5 dBm 。此全級電路的轉換增益為 24.4 dB ，當中頻為 40 MHz 時，其雜訊指數為 3.8 dB ，輸入 1-dB 增益壓縮點為 -29 dBm ，輸入三階截點為 -20.5 dBm 。整個堆疊式低雜訊放大器及混頻器佔有晶片面積為 $1.5\text{ mm} \times 1.2\text{ mm}$ 。

Low-Power CMOS RF Receiver Front-End

With Stacked LNA-Mixer

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Abstract

Owing to receiver front-end circuits are power-hungry blocks and portable communication devices are usually battery-limited, hence, the demand for low-power operations in portable applications has led to extensive research on RF circuit design.

In this thesis, based on current-reuse concept, we present a low-power RF receiver front-end with stacked LNA-Mixer by TSMC (Taiwan Semiconductors Manufacture Company) 0.18- μ m 1P6M CMOS technology. This stacked LNA-Mixer is designed as the first stage of an integrated low-IF image-reject receiver under development for Bluetooth applications. The circuit simulations and layout of stacked LNA-Mixer are carried out.

Simulation results reveal that the proposed stacked LNA-Mixer can operate well under 1.8 V power supply. The stacked LNA-Mixer circuit only consumes 6.3 mW. LO available power requirement is -5 dBm at 2.38 GHz frequency band. The conversion gain of overall circuit is about 24.4 dB. Noise figure is about 3.8 dB at 40 MHz IF. Input 1-dB gain compression point is -29 dBm while IIP3 point is at -20.5 dBm. The entire stacked LNA-Mixer occupies a die area of 1.5mm \times 1.2mm.

誌 謝

剛進交大校園時，由於對此求學環境不熟悉，再加上母親逝世的傷痛，讓我在生活上及求學上遇到了不小的阻力，幸經過兩年時間的調整與適應，在今年夏天，終於能順利完成碩士學業。要感謝的人很多，不免俗地，首先要感謝生我育我的父母親，雖然他們都已不在世上，不過對於我個人的影響卻是深遠且無法磨滅的。再來要感謝兩位姑姑吳慶梅及吳慶美，在父母親逝世後，將我視同己出，在生活上照顧的無微不至，在艱困時全力的幫我排除困難，憂煩時適時地幫我開導啟發。還要感謝女友陳彥蓉，在我低潮時適時的給予鼓勵，迷惘時陪同我一起思考人生的方向，更在我徬徨時鞭策我走向正確的方向。

在研究工作上，要非常感謝謝太烟老師殷勤地惠予教導並提供良好的研究環境，讓此論文得以順利完成，還有兩位全力幫忙的郭立民及趙靜軒學長，在我對於研究課題遇有疑義時適時地給予建議與指導。在求學伙伴中，要感謝鄒善強、黃賢生、楊宇宙、林伯洋同學在課業及生活上的支持與鼓勵，共同度過充滿挑戰性的研究生生涯，還要感謝龔俊穎學弟為實驗室帶來了歡笑與快樂。

即將步出校園，踏入社會，心中充滿了忐忑不安與熱烈期待交織的心情，在面對即將遭遇的許多困難與挑戰，必將秉持謹慎踏實的態度來面對所有的磨練。最後，謹以此論文獻給有緣人。

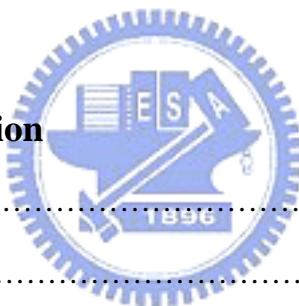
蒼天松”柏”凌雲霄，天降甘”霖”化萬物

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2004. 夏 於新竹

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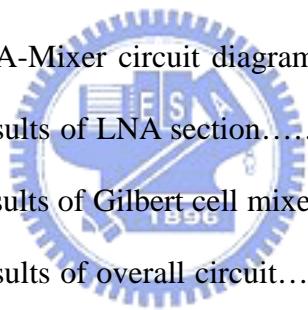
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