The Design of a Low Noise Amplifier for Blue Tooth Receiver Design

白欣松、陳勛祥 ; 許崇宜

E-mail: 9314903@mail.dyu.edu.tw

ABSTRACT

A 1.8V LNA (low noise amplifier) is designed for RF (radio frequency) system using TSMC 0.18 μ m process in this thesis. The operating frequency of the low noise amplifier is located at Blue Tooth (2.4GHz). The LNA has a single cascade structure with on-chip spiral inductors to save die area and integrated all devices in an IC. The simulation results emphasis on input/output impedance matching、isolation、power gain、linear、and power dissipation. From tuning parameters of each device, we can get the optimal value in this LNA circuit. The performance of LNA from simulation results were : noise figure 2.894dB, power gain 14.571 dB, power dissipation 4.65 mW, 1-dB compression -24 dBm.

Keywords : LNA ; spiral inductors ; RF

Table of Contents

REFERENCES

[1] Razavi B,[2000],RF MICRO ELECTRONICS, McGraw-Hill, New York.

[2] 謝俊南,“ 設計5.7GHz低雜訊放大器應用於802.11a之研究 ”,國立雲林科技大學電子與資訊工程研究所碩士論文“ ,民國92年 [3] 李建鋒,“ 應用於無線區域網路之5.25GHz CMOS差動式低雜訊放大器 ”,中華大學電機工程研究所碩士論文,民國92年 [4] Yao-Huang Kao; Chao-Hsi Chuang; Tser-YU Lin,“ The effects of gate resistance on the performances of CMOS RF circuits ”, Microwave Conference, 2000 Asia-Pacific , 3-6 Dec. 2000,Pages:169 — 172.

[5] Razavi B.

[2000],Design of Analog CMOS Integrated Circuits, McGraw-Hill,New York.

[6] Chih-Lung Hsiao; Ro-Min Weng; Kun-Yi Lin,“ A 1V fully differential CMOS LNA for 2.4GHz application ”,Circuits and Systems, 2003. ISCAS '03. Proceedings of the 2003 International Symposium on , Volume: 1 , 25-28 May 2003 ,Pages:I-245 - I-248 vol.1.
[7] Huang, J.C.; Ro-Min Weng; Cheng-Chih Chang; Kang Hsu; Kun-Yi Lin,“ A 2 V 2.4 GHz fully integrated CMOS LNA ” ,Circuits and Systems, 2001. ISCAS 2001. The 2001 IEEE International Symposium on , Volume: 4 , 6-9 May 2001 ,Pages:466 - 469 vol. 4.
[8] Shaeffer, D.K.; Lee, T.H.,“ A 1.5-V, 1.5-GHz CMOS low noise amplifier ”,Solid-State Circuits, IEEE Journal of , Volume: 32 , Issue: 5 , May 1997 ,Pages:745 - 759 [9] Yongmin Ge; Mayaram, K.,“ A comparative analysis of CMOS low noise amplifiers for RF applications ”, Circuits and Systems, 1998. ISCAS '98. Proceedings of the 1998 IEEE International Symposium on , Volume: 4 , 31 May-3 June 1998,Pages:349 - 352 vol.4 [10] 林哲煜,“ Design of RF CMOS IC ”, CIC訓練課程 ”,A602 [11] 洪瑞源,“ 高頻被動元件之研究與製作 ”,私立中原大學電子工程研究所碩士論文“ ,民國90年 [12] Jie Long; Badr, N.; Weber, R.,“ A 2.4GHz sub-1 dB CMOS low noise amplifier with on-chip interstage inductor and parallel intrinsic capacito ”, Radio and Wireless Conference, 2002. RAWCON 2002. IEEE , 11-14 Aug. 2002, Pages:165 — 168.
[13] Agilent Technologies,“ ADS Circuit Fundamentals Training Manual ” ,CIC訓練課程,A508 [14] Choong-Yul Cha; Sang-Gug Lee,“ A low power, high gain LNA topology ”,Microwave and Millimeter Wave Technology, 2000, 2nd International Conference on. ICMMT 2000 , 14-16 Sept. 2000,Pages:420 — 423.
[15] Wu, Y.; Chunlei Shi; Ismail, M.; Olsson, H.,“ Temperature compensation design for a 2.4 GHz CMOS low noise amplifier ”,Circuits and Systems, 2000. Proceedings. ISCAS 2000 Geneva. The 2000 IEEE International Symposium on , Volume: 1 , 28-31 May 2000 ,Pages:323 - 326 vol.1.
[16] El-Gamal, M.N.; Rafla, R.A.,“ 2.4-5.8 GHz CMOS LNA's using integrated inductors ”, Circuits and Systems, 2000. Proceedings of the 43rd IEEE Midwest Symposium on , Volume: 1 , 2000 , Page(s): 302 -304 vol.1 [17] Debono, C.J.; Maloberti, F.; Micallef, J.,“ A 1.8 GHz CMOS low-noise amplifier ” , Electronics, Circuits and Systems, 2001. ICECS 2001. The 8th IEEE International Conference on , Volume: 3 , 2001 , Page(s): 1111 -1114 vol.3 [18] J. C. Huang, Ro-Min Weng, Cheng-Chin Chang, Kang Hsu, and Kun-Yi. Lin,“ A 2V 2.4GHz Fully Integrated CMOS LNA ”, Circuits and Systems, 2001. ISCAS 2001. The 2001 IEEE International Symposium on , Volume: 4 , 6-9 May 2001 [19] El-Diwany, E.; El-Hennawy, H.; Fouad, H.; Sharaf, K. ,“ An RF CMOS modified-cascode LNA with inductive source degeneration ”, Radio Science Nineteenth National Conference of the Proceedings NRSC 2002 , 2002 ,Page(s): 450 —457 [20] Wei Hu; Yawei Guo; Zujiang Qiu; Lianxing Yang, ” A 1.2-v 2.4-GHz 0. 18 /spl mu/m CMOS low noise amplifier ”, Communications, Circuits and Systems and West Sino Expositions, IEEE 2002 International Conference on , Volume: 1 , 29 June-1 July 2002 ,Pages:470 - 473 vol.1.