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# Analysing and Designing Layout of all current mirrors on Cadence Virtuoso

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**Abstract:** This paper proposes new current mirror layout strategies which are being designed using 180nm technologies using cadence virtuoso layout software. The performances of circuit is also being analysed in L edit window by varying input current and input voltages values or by changing arrangement of N- Type-Mosfet. Simulation results show a significant improvement in matching characteristics of the proposed structures over what is achievable with existing layout techniques in demanding applications.[21]

**Keywords:** Current mirror layout strategies, performance linear grading specifications.

## I. INTRODUCTION

Current mirrors are special circuits which are being used in IC (integrated circuit) technology. The mirrors circuit generally consists of two transistors while third or other one can consist of FETs which can be used in these types of circuits to enhance performance. Current mirror copies or gains the name because it copies the current flowing in the circuit with output current being constant. Actually we can say that current mirrors are types of the current controlled current source circuits. The current mirror is used to provide biasing current and active loads of circuit[22].

## II. DIFFERENT CURRENT MIRRORS AND THEIR LAYOUTS

### A. Simple Current Mirror

Current Mirrors are subject of innovation and low voltage current mirrors are being possible by use of bipolar technology. Simple current mirror is shown in figure which is commonly used and also being well known for its inaccuracy by having similar values of  $\beta$ . The ratio of output current  $I_2$  to input current  $I_1$  of the simple current mirror is given by  $\beta$ , where  $\beta$  is the current gain of the transistors.

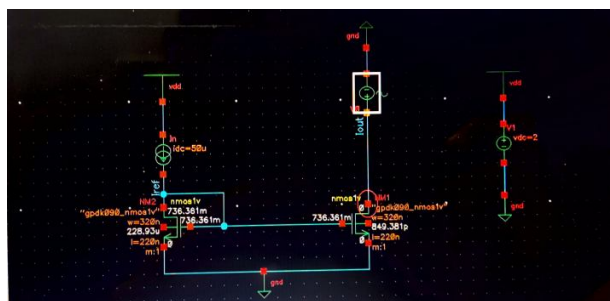


Fig.1 Schematic Diagram of Simple current mirror

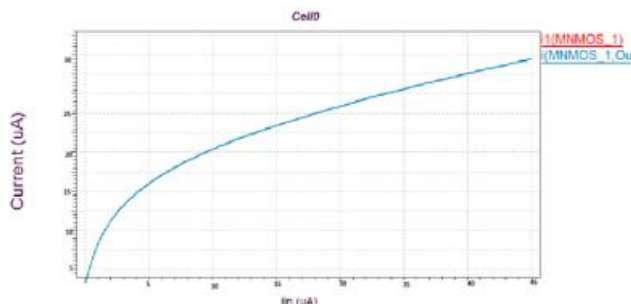


Fig.2 Analysis of Simple current mirror.

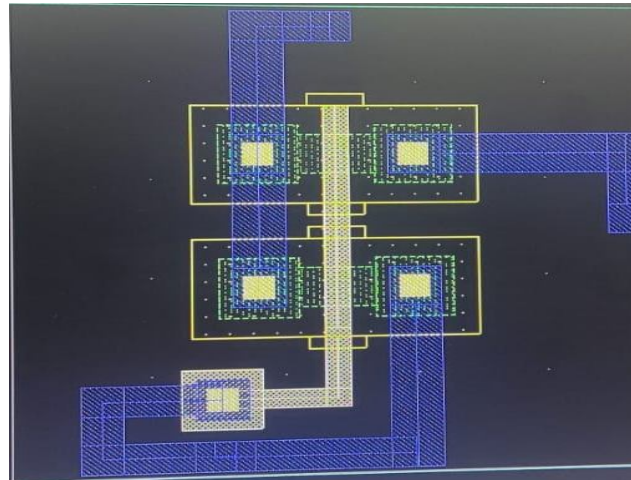


Fig.3 Layout of Simple current mirror.

### B. Cascode Current Mirror

There is a cascode current mirror device that can produce an output current that is a direct function of the input current it receives. At least two parts are connected in a cascode fashion in the cascode current mirror. Additionally, a connection for feedback is built between those components. For instance, a buffering connection might be this feedback connection. This device produces voltage signals that can be utilised to drive and regulate further output stages. Such additional output stages have the ability to provide more output current[2].

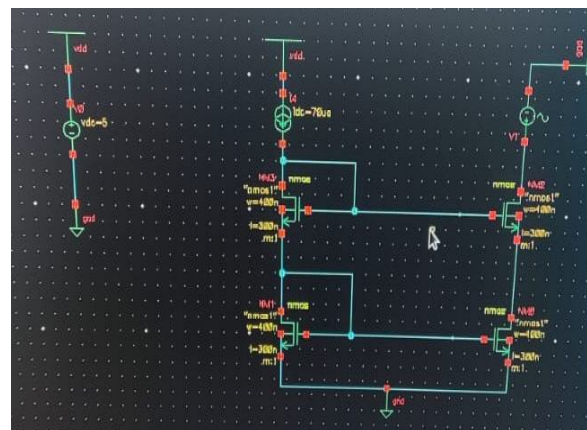


Fig 4. Schematic diagram of cascode current mirror.

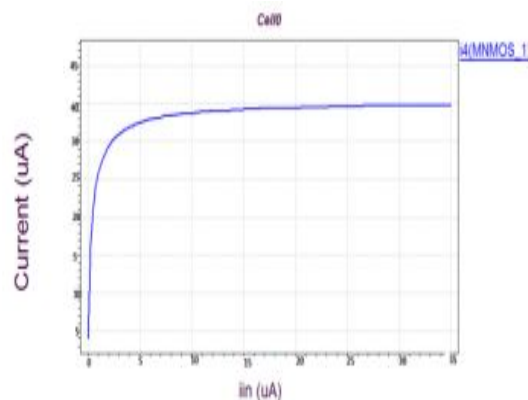


Fig 5. Analysis of cascode current mirror.



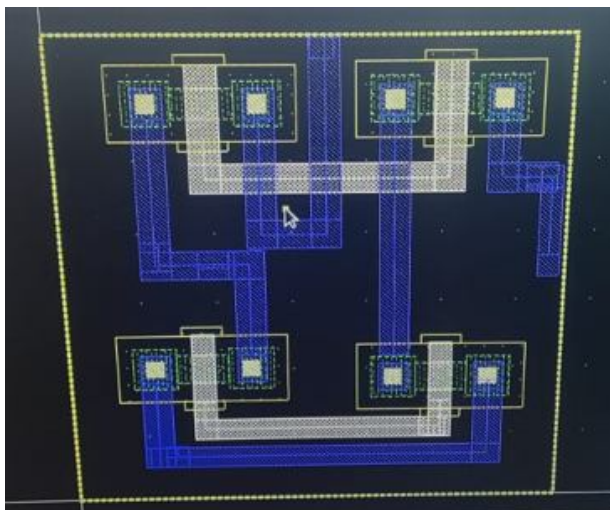


Fig 6. Layout of cascode current mirror.

### C. Widlar Current Mirror

It is a modification of simple 2 transistor current mirror that incorporates the emitter degeneration resistor for output transistor with enhanced output and with the better accuracy being obtained in output with no change in value of  $\beta$ [4].

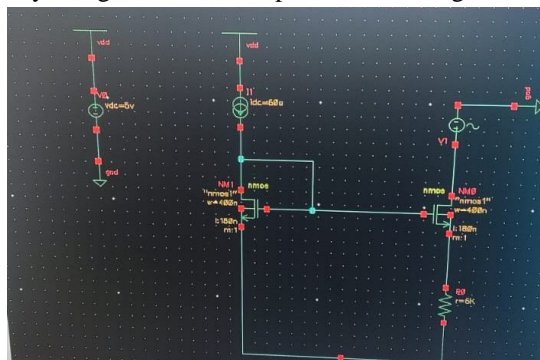


Fig 7. Schematic diagram of widlar current mirror.

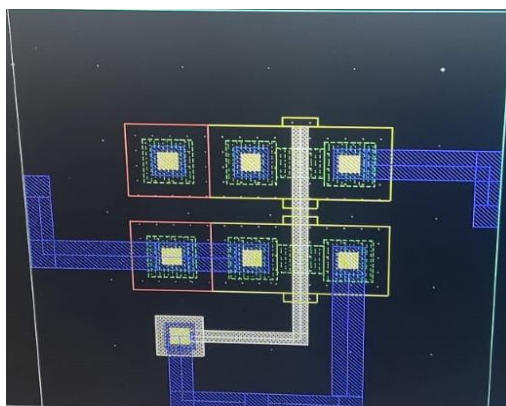


Fig 8. Layout of Widlar Current Mirror.

### D. Wilson Current Mirror

In this type of current mirror shunt series negative feedback circuit is being used to improve the performance of circuit between the output impedance of circuit and output current of the circuit.

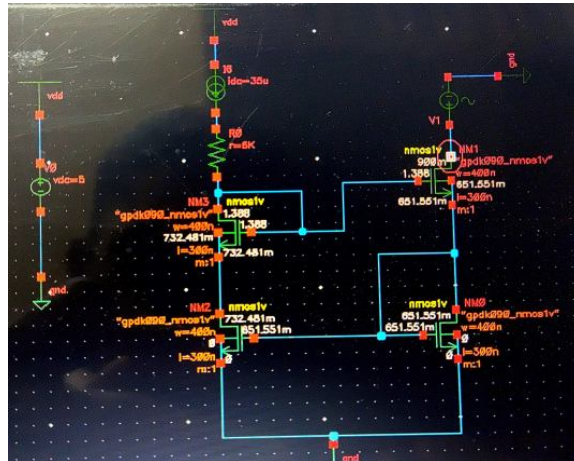


Fig 9. Schematic diagram of wilson current mirror.

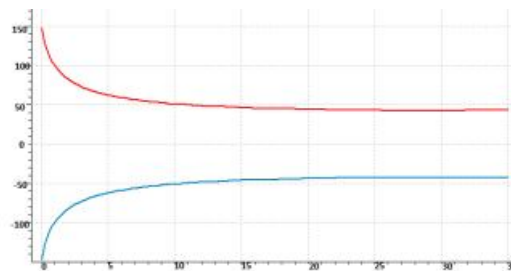


Fig 10. Analysis of Wilson Current Mirror

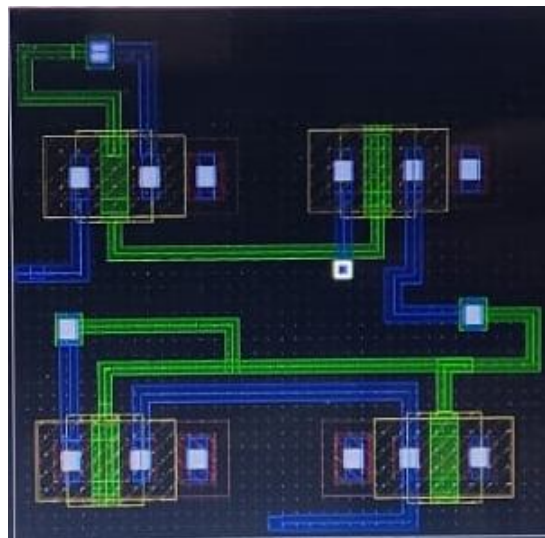


Fig 11. Wilson Current Mirror Layout

### REFERENCES

- [1] Solid-State Electronics Volume 46, Issue 2, February 2002, Pages 307–312
- [2] [www.google.com/search?tbm=pts&hl=en&q=Cascode+current+mirror++US+4983929+A](http://www.google.com/search?tbm=pts&hl=en&q=Cascode+current+mirror++US+4983929+A)
- [3] [www.google.com/search?tbm=pts&hl=en&q=Compound+triple+cascoded+mirror++US+5412348+A](http://www.google.com/search?tbm=pts&hl=en&q=Compound+triple+cascoded+mirror++US+5412348+A)
- [4] IEEE Transactions on Circuits and Systems II: Express Briefs ( Volume: 57, Issue: 9, Sept. 2010 )
- [5] International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 3 Issue: 6
- [6] Paul.R.Gray, Paul.J.Hurst, Stephen.H.Lewis and Robert.G.Meyer, "Analysis and Design of Analog Integrated Circuits", by John Wiley & sons, Inc 1984.
- [7] E. SACKINGER and W. GUGGENBUHL, "A versatile building block: the CMOS differential difference amplifier," IEEE J., 1987, SC-22, (2), pp. 287-294.



- [8] Hassan Faraji Baghtash, Khalil Monfaredi, and Ahmad Ayatollahi, "Very Low Power, Low Voltage, High Accuracy, and High Performance Current Mirror", JOURNAL OF ELECTRONIC SCIENCE AND TECHNOLOGY, VOL. 9, NO. 3, SEPTEMBER 2011
- [9] B. Razavi, "Design of Analog CMOS Integrated Circuits," New York: Tata McGraw-Hill 2002.
- [10] Bajrang Bansal, "Current Mirror Circuits with Improved Performance", International Journal of Electrical & Electronics Engineering, Vol-I, Issue -II, 2011.
- [11] S.S. Rajput and S.S. Jamuar, "A current mirror for low voltage, high performance Analog Circuits." In Proc. Analog integrated Circuits & Signal, Kluwer Academic Publications, 36, pp. 221-233, 2003.
- [12] Cyril Mechkov, "Equalizing the Currents in Wilson Current Mirror", International Scientific Conference Computer Science, 2008
- [13] Mei-Ping Pua, "The Design of A Precision Current Mirror Using A High-Gain Current Amplifier, Published M S Thesis ,The University of Texas at Arington, , December 2008.
- [14] Hitesh, anuj goyal, "Advancement in Current Mirror Techniques", International Journal of Advanced Research in Computer Science and Software Engineering, volume 2, issue 1, January 2012
- [15] S.S. Rajput and S.S. Jamuar, "Low voltage analog circuit design techniques", IEEE circuits systems Magazine 2, pp-24-42, 2002.
- [16] Radwene Laajimi, Mohamed Masmoudi, "HighPerformance CMOS Current Mirrors: Application to Linear Voltage-to-Current Converter Used for TwoStage Operational Amplifier", scientific research, vol-3, page:311-316, year 2012
- [17] B. Minch, "Low-Voltage Wilson Current Mirrors in CMOS," in IEEE ISCAS, New Orleans, LA, USA, 2007, pp. 2220–2223.
- [18] Ajay kumar, arjun singh yadav, C. M roy, "A New CMOS Voltage Divider Based Current Mirror, Compared with the Basic and Cascode Current Mirrors", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 4, April 2013
- [19] Neeraj gupta, nutan, taru tewatia "Characterization & Analysis of Various Current Mirrors using 180Nano Technology", 2009
- [20] <http://class.ece.iastate.edu/vlsi2/docs/papers%20done/2001-07-aicsp-ml.pdf>
- [21] "<http://www.radioelectronics.com/info/circuits/transistor/current-mirror.php>
- [22] <https://www.google.com/patents/US4329639>





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