

MIRROR WITH MULTIPLE OUTPUTS

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July 26, 2021

Abstract

Although large electronic systems can be constructed almost entirely with digital techniques many systems still have analog components and current mirror is the core structure for almost all analog and mixed mode circuits. It determines the performance of analog structures which largely depends on their characteristics. In simple words, current mirror is an analog circuit which is used to mirror given current, not only mirroring but also we can amplify it and also we can scale it, so here I have made an attempt to scale the currents. In this paper, we will see how we can obtain the multiple currents just by extending the current mirrors and by changing the W to L ratio of the MOSFETs as per our current requirements.

1 Circuit Details

The current mirror circuits are simple current sources which give constant current. In other words, we can define it as a two-terminal circuit whose output current is independent of the output terminal voltage and depends only on the input current. Generally, it is used to generate a replica of given reference current. The current mirror circuits are based on the principle: if the gate-to-source voltage of two identical MOSFETs are equal, then the drain current flowing through them is equal. A current mirror can be thought of as a current-controlled current source. Ideally, the output impedance of a current source should be infinite and capable of generating or drawing a constant current over a wide range of voltages. A current flows through M_1 corresponding to V_{GS1} . Since V_{GS} of all the MOSFETs are shorted, ideally the same current has to flow through all other MOSFETs, but by adjusting the W to L ratio, we can get a different current as per our requirement, a multiple of the current in M_1 or the fraction of the current flows through M_2 , M_3 , M_4 , M_5 . If the MOSFETs are of the same size, the same drain current flows in each MOSFET provided M_2 , M_3 , M_4 , M_5 stays in the saturation region. The circuit diagram for the basic current mirror with multiple output currents has been uploaded in the reference circuit file. This circuit is obtained by extending the basic current mirror to give multiple outputs; here I have used all n type MOSFETs.

2 Implemented Circuit

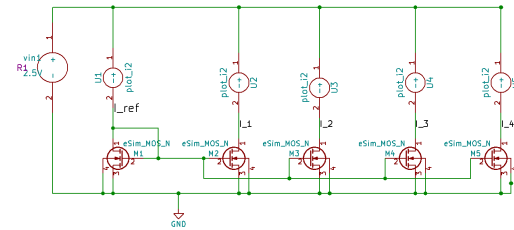


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

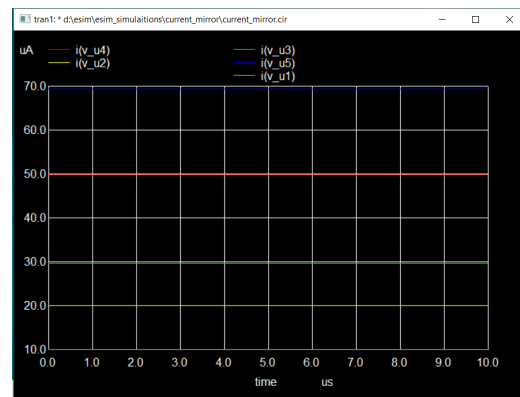


Figure 2: Implemented waveform.

References

- [1] M. H. S. M. R. M. M. N. H. M. S. H. T. M. H. M. Hasan. Design simulation study of a current mirror act as a current regulator by enhancement type mosfet. <http://ajaseb-dweeblycomuploads134513455174ajase78pdf>.