Miller compensated Two stage operational amplifier

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Abstract

An operational amplifier is a DC coupled high gain electronic voltage amplifier with a differential input and usually a single ended output.The two stage architecture has been the most popular approach to opamp design. Since it can provide high gain and high output swing. It is a detailed design of Miller compensated two stage operational amplifier for data converter applications. Miller capacitance is used for operational amplifier frequency compensation.The opamp is designed with a cost of moderate power consumption.The technique is presented with a view to increase the gm of the second stage without increasing the power dissipation hence improving the phase margin while maintaining the unity gain bandwidth.

1 Circuit Details

The circuit will have open loop gain of greater than 70dB phase margin greater than or equal to 60 degrees load capacitance of 10 pico farad and a minimum total power consumption.The load is assumed capacitive. compensationcapacitorCccanbetreatedopenat low frequency.There are varieties of applications that opamp is applied on due to its linear device characteristic. In order to produce a good product differential inputs are applied to the amplifier to obtain a higher gain. The input differential amplifier block is designed to provide high inputimpedance large CMRR and PSRR low noise high gain and low offset voltage. The second stage of the opamp performs level shifting which added gain as well as the conversion of differential to single ended The circuit has a current mirror at the top differential pair in the middle and a tail current mirror.It also has a bias circuit at the left which is used to stabalize the transistor transconductance of opamp. The bias circuit supplies bias current to the circuit. Biasing circuit is independent of power supply voltage variations.The tail current mirror acts as a current source to the opamp.The input is given to the differential pair.The first stage of opamp is a differential pair with current mirrors and the second stage is a common source amplifier.The gain does not seem to be affected much to first order. The miller capacitance Cf is connected in negative feedback fashion across one of the internal gain stages typically the second stage.

2 Implemented Circuit

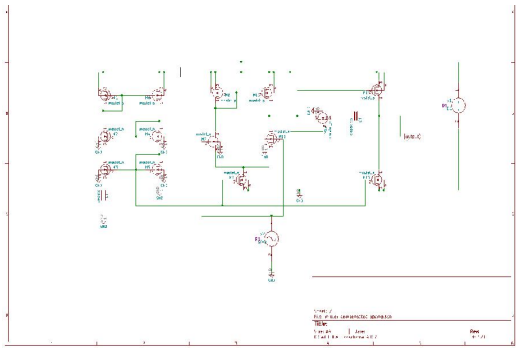

Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

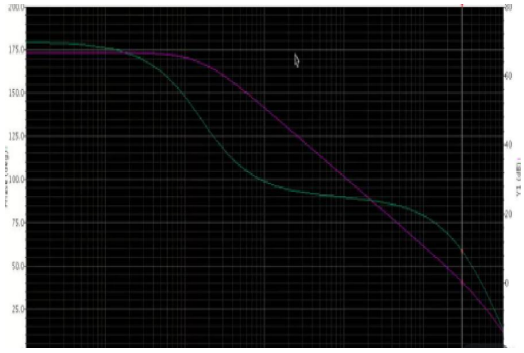

Figure 2: Implemented waveform.

References

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