

Linearized Low Noise Amplifier with Employing Dual Band Notch Filter

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Abstract: Low Noise Amplifier (LNA) is key building block of analog front end receivers. Its noise performance influences the overall system noise figure; thus, noise performance is an important factor for this module. In this design, as depicted in Fig. 1, combined structure of common source and resistive feedback are used to overcome the limitation of each topology. In this design, inductor is used in the source of the L-CSLNA for input matchin.. Cascoded amplifier is applied to decrease the miller effect of the capacitor C_{dg} of input transistor. The width of the transistor $M1$ influences on the noise performance. However, the transistor $M2$ contributes to the linearity performance as well as the improvement of the reverse isolation due to high output impedance. The Load is consist of resistance in series with inductor in order to have flat gain in regarding bandwidth; also by choosing proper R_f , flat and high gain is achieved. C_f is DC blocking capacitor, which blocks the current coming from the output node.

The proposed UWB LNA in this abstract achieved a low noise figure by using extra common source amplifiers to subtract two correlated but out of phase noise voltages at the drain and source of cascode transistor, at the output node. It reduces channel thermal noise of this transistor and also other elements of the circuits; as a result, it lowers the overall noise figure of the LNA module. An auxiliary PMOS transistor is used to improve IIP3. The PMOS transistor is biased at weak inversion with positive \tilde{g}_m while the NMOS transistor is biased at moderate inversion with negative \tilde{g}_m .

Received power signal in UWB is smaller than narrow band interferences that are located near it; thus, dual band notch filter with low power active inductor is implemented after UWB LNA to improve the out-of-band rejection. The filter stage is placed after the gain stage to avoid the decline in NF due to the loss of this notch filter. Dual band notch filters consist of two series capacitor and inductor combination in parallel. They employed after the LNA core due to suppress the WLAN interferers at 2.4GHz and 5.2GHz without affecting the noise figure (NF) of the LNA.

With combination of dual band notch filter and linearity improvement technique high IIP3 can be achieved while suppressing WLAN signals.

Keywords: LNA, Notch filter, UWB, Noise Figure

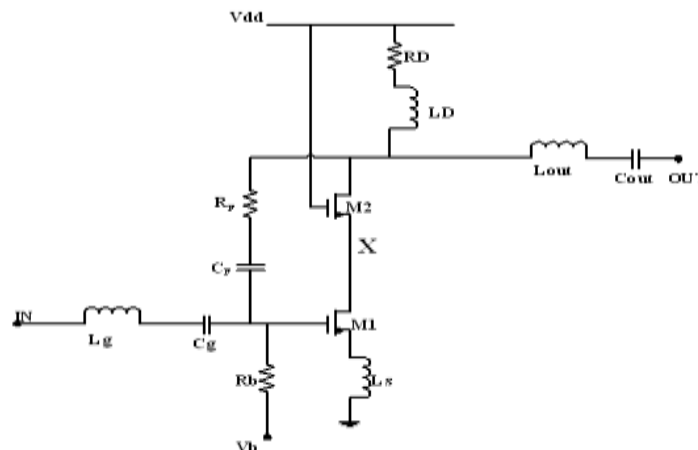


Fig. 1: schematic of simulated LNA