IOSR Journal of Electronics and Communication Engineering (IOSR-JECE)
e-ISSN: 2278-2834,p- ISSN: 2278-8735.Volume 10, Issue 1, Ver. II (Jan - Feb. 2015), PP 87-90
www.iosrjournals.org

Comparison of 60GHz CSRRs Ground Shield and Patterned Ground Shield On-chip Bandpass Filters Designed for 0.18µm CMOS Technology

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Abstract: *This paper present on-chip open loop resonators 60GHz bandpass filters fabricated with the complementary metal-oxide semiconductor (CMOS) 0.18µm technology. Both filters have different ground shield placed at the lowest metal, M1. The first filter is designed with patterned ground shield below while the other filter with complementary split ring resonators (CSRR) as ground shield. The purpose of this research is to examine the best ground shield that can be used and employed to enhance the performance of the filter. Design simulation is conducted with electromagnetic simulator tools. It shows that, filter with CSRR as ground shield produce better results with S21= -2.682dB, 3-dB bandwidth = 10.8GHz compare to patterned ground shield with S21= -2.77dB, 3-dB bandwidth = 14GHz with both have good return loss.*

Keywords: *bandpass filter, CMOS, CSRRs, open loop resonators*

I. Introduction

In modern RF wireless communication systems, filters constructed with CMOS technology process become great importance for enabling the integration of the millimeter-wave system on a single chip (SoC). Compactness and lightweight are required in the realization of the BPF. Besides that, maximal loss inside the pass region, minimal attenuation in the reject/stop regions and the transition region are also necessary to be considered in design of respective filters. Although many researches have been conducted for the development of on-chip passive filters in the unlicensed frequency band, these filters suffered from high insertion loss, occupy larger chip area and more bandwidth [1-3] makes it difficult to be used in real implementation. BPF is an indispensable cascade component in the transmission system, thus decreasing the insertion loss and bandwidth allocated are of great importance.

II. CSRRs and Patterned Ground shield

Both filters designed employed the open loop resonators structure placed at the top metallization layer, M6 of the CMOS 0.18µm technology. To achieve high selectivity and low insertion loss in this filter design, cross coupling topology with quasi-elliptic response indicated by 4th order cross-coupled filter with a pair of transmission zeros at finite frequencies is applied. The length of the resonator was estimated to be 1250µm with line width of 10µm which gives 50Ω impedance on the substrate. Fig. 1 shows the filter design with employed folded structure.

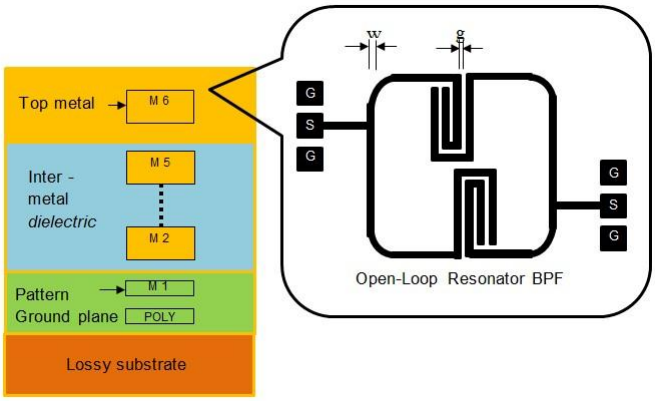

Fig. 1 0.18µm CMOS metal layers and filter structure with folded structure