Analysis, Design and Optimization of On-Chip Inductors On Sapphire for Gan Based RFICs

Abstract

The on chip spiral inductors are one of the key components in the development of the RFICs as they determine the performance of the circuits such as VCO, LNA, mixers etc. In this paper, the design of an inductor for GaN based RFICs operating in C-band is presented. Sapphire (Al2O3), which is a common substrate for GaN, is used as substrate and silicon nitride (Si3N4), which is a common passivation layer in GaN technology, is used as insulator layer between the metal layers. While the use of Al2O3 alleviates the problem of substrate losses that are common in Si substrate, use of Si3N4 increases the inter-metal layer capacitance. IE3D EM simulation tool was used for the design and optimization of the spiral inductors. An inductor of 5 nH operating at 5 GHz has been designed and optimized to achieve high quality factor (Q) in low foot print. Finally a parallel LC resonant tank circuit was designed to resonate at 5 GHz to demonstrate the operation of the designed inductor.

References

- Hongtao Xu, Doctoral report on "MMICs using GaN HEMTs and Thin-Film BST Capacitors," submitted to University of California, 2005
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**Index Terms**

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**Keywords**

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