INTEGRATED INDUCTORS

Integrated inductors also called as spiral inductors, on-chip inductors or planar inductors are inseparable part in radio frequency integrated circuits (RFICs). Increasing growth in RFICs from the past few decades has forced study of these components in greater detail. Apart from IC inductors there are several components mounted on a chip - namely capacitors, resistors, MOSFETs, diodes etc. It is extremely important to understand the electrical and magnetic behavior of all these components. Electrical behavior of these components is easy to understand. However, the real challenge is in realizing and predicting the magnetic behavior of components namely, inductors and capacitors. Capacitors have their own physical model developed for accurate modeling, but for inductors there are many factors to be considered. As the frequencies in RFICs are in the GHz range, factors such as self resonant frequency (SRF), quality factor (Q), self and mutual inductance are critical to design due to the very small size of inductor. Electromagnetic simulators and lumped circuit model assist greatly in designing of IC inductors. Lumped circuit models developed in the past help to model parasitic elements most accurately. A MATLAB based spiral and π network calculators have been developed which compares different equations and solves for parasitic components depending on substrate material, dielectric layer thickness, and metal oxide thickness. The main aim of this research was to design a theoretical design procedure for designing inductor internal dimensions. It has been described briefly with the design example. The proposed method makes it easy to design internal dimension such as the inner diameter \( d \), width \( w \), spacing \( s \), height \( h \), and number of turns \( N \).

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