Abstracts

A study of parasitic effects of ESD protection on RF ICs

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This paper presents a comprehensive study on influences of on-chip electro-static discharge (ESD) protection structures on performance of the circuits being protected. Two novel compact low-parasitic ESD structures were designed for RF and mixed-signal (MS) integrated circuits. Parasitic models of the ESD structures are extracted. RF building-block circuits, including a low-power high-speed op amp and a fully integrated 2.4-GHz low-noise amplifier were designed in 0.18/0.35-/spl mu/m technologies. Investigation of performance of these circuits under influences of the two new ESD protection structures and traditional MOS ESD protection device, in both copper and aluminum interconnects, demonstrated that significant circuit performance degradation (/spl sim/30%) occur when using NMOS ESD protection in Al technology, which recovered substantially (/spl sim/80%) when using low-parasitic ESD protection in Cu technology. This work indicates that the ESD-to-circuit influence is inevitable and substantial. Therefore, novel low-parasitic ESD protection solution is essential to maintaining both circuit functionality and ESD robustness in RF and MS applications.

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