Abstracts

A novel low-loss low-crosstalk interconnect for broad-band mixed-signal silicon MMICs

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A novel RF interconnect configuration for high-density broad-band mixed-signal silicon monolithic microwave integrated circuits (MMICs) is presented. The proposed silicon-metal-polyimide (SIMPOL) structure is based on multilayer polyimide technology with self-packaging features, and is extremely effective in reducing the noise crosstalk as well as overall size of MMIC chips. Moreover, since the SIMPOL interconnect can be built on low-cost silicon substrates using standard CMOS processing techniques, it is very cost-effective and applicable to current products without major cost addition. Measured results of a prototype test wafer demonstrate that the SIMPOL interconnect has reasonably low insertion loss (0.62 dB/mm at 30 GHz), which agrees well with theoretical prediction (0.5 dB/mm). The line loss can be reduced significantly (<0.1 dB/mm) by a using thicker dielectric layer. The measured crosstalk is at the same level as the background noise floor up to 30 GHz (<-60 dB), and limited primarily by imperfect termination of idling ports in the test structure. Full-wave finite-difference time-domain simulations indicate that SIRPOL could achieve an extremely high level of signal isolation, above 100 dB, at frequencies up to 50 GHz or beyond.

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