Micromachined Microstrip Forms Bandstop Filters

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Abstract :

Millimeter-wave frequency bands have long held the appeal of enormous bandwidths for high-data-rate, line-of-sight communications. The main limitation on the increased use of millimeter-wave components and systems has been the cost of manufacturing hardware with such small dimensions (as a function of wavelength) and with the corresponding tight tolerances. But silicon (Si) micromachining has been applied to microwave and millimeter-wave circuits in many ways since its introduction in the late 1980s and offers great potential for realizing cost-effective millimeter-wave products. Micromachining, or sculpting crystal Si, can be made using either orientation-dependent (anisotropic) or orientation-independent (isotropic) etchants. Silicon micromachined, dielectric membrane supported structures, such as antennas, transmission lines, and filters, have shown improved performance and have extended the operating range of planar circuits to W-band frequencies and beyond.[superscript]1-3 In addition, silicon micromachined-based packaging provides a high-isolation self-package without the need for external carriers or external hermetic shielding. This method of circuit integration provides a comprehensive technique to integrate a very large degree of functionality with extremely high density and at a relatively low cost.

The vertically layered structure of a micromachined circuit presents an excellent opportunity for three-dimensional integration, resulting in the potential for substantial reductions in size. Micromachined circuits are an ideal way to integrate microelectromechanical-systems (MEMS) devices and provide components with performance and size advantages from 1 GHz to terahertz frequencies. They demonstrate their greatest promise at K-band and above. Micromachining is truly an excellent integration technology with the opportunity for an order

of magnitude or more reduction in the size, weight, and cost of planar circuits, which can have a major impact on radar and communications …

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