Abstracts

High Temperature Superconducting Resonators and Switches: Design, Fabrication, and Characterization

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We report our recent efforts in designs of several RF and microwave devices using high temperature superconducting (HTS) thin film technology. Devices considered include transmission lines, resonators, switches, and phase shifters in microstrip, stripline and coplanar waveguide. The circuit design, modeling, simulation, fabrication, packaging, and testing are discussed. Using a two-dimensional (2-D) EM simulator, we have optimized the geometry of the RF microstrip and stripline resonators for frequencies near 900 MHz. An unloaded Q is obtained as high as 80,000, three orders of magnitude greater than the traditional 2-D gold or copper resonators with identical structures. On-wafer probe and bit-error rate measurements show that the HTS transmission lines have an extremely small insertion loss and dispersion; thus they are ideal candidates for applications in multichip module interconnects and delay lines. A sharp switching characteristic and an unusually strong RF power hysteresis loop have been observed in the HTS lines. This interesting behavior has been utilized for designs of new HTS microwave phase shifters. The use of HTS lines can substantially reduce the losses suffered by conventional PIN diode switches.

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