Abstracts

A miniaturized MMIC analog phase shifter using two quarter-wave-length transmission lines

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This paper describes a miniaturized monolithic-microwave integrated-circuit (MMIC) analog phase shifter using two quarter-wave-length transmission lines. A conventional analog phase shifter employs an analog phase-shifter topology using a 3-dB 90/spl deg/ branch-line hybrid requiring four quarter-wave-length transmission lines. Thus, in the first stage of our study, we present a new analog phase-shifter topology using only two quarter-wave-length transmission lines. The phase shifter here has only one-half as many transmission tines as a conventional analog phase shifter using a 3-dB 90/spl deg/ branch-line hybrid, and the circuit can be miniaturized to less than one-fourth as compared to the conventional analog phase shifter. Furthermore, we show that the operating frequency range of the phase shifter is very wide and can obtain large phase variation with small capacitance variation. Next, an experimental Ku-band MMIC analog phase shifter is presented. A phase shift of more than 180/spl deg/ and an insertion loss of 3.6/spl plusmn/1.1 dB are obtained at the frequency range from 12 to 14 GHz. The chip size of the experimental MMIC phase shifter is less than 3.0 mm/sup 2/.

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