Abstracts

Three-port 3-dB power divider terminated by different impedances and its application to MMICs

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The three-port 3-dB power divider (T3PD) terminated by different impedances considered in this paper is very useful for a small-sized circuit design. New design equations for T3PDs are derived. They can be applied to T3PDs with both different termination impedances and, especially, a 3-dB power division. If a T3PD is terminated by different impedances, scattering parameters cannot be derived with conventional even- and odd-mode methods. Under these conditions, basis-independent normalized scattering parameters are derived. As these scattering parameters are only dependent on the ratio of R/sub c/ to R/sub b/ (where R/sub c/ and R/sub b/ are two termination impedances that are connected with an isolation resistor), the ratio of R/sub c/ to R/sub b/ "t" is introduced to analyze all load conditions and the derived scattering parameters are proven to be correct by a commercial program. For the frequency-response characteristics, a T3PD terminated by 40, 50, and 60 /spl Omega/ has been simulated using ideal transmission lines. Also, a simple method for determining the exact values of two indispensable elements-coplanar rectangular inductances (C-RINDs) and coplanar metal-insulator-metal capacitors (C-MIMs)-in coplanar monolithic-microwave integrated-circuit (C-MMIC) technology is presented using a resonator technique. As another trial, a new type of lumped-element three-port 3-dB power divider (LET3PD) with low insertion loss and its design equations are presented. Finally, a coplanar T3PD terminated by 30, 53, and 47 /spl Omega/ was fabricated on an Al/sub 2/O/sub 3/ substrate (/spl epsi//sub r/=9.9 and h=635 /spl mu/m) and it shows good agreement between experimental and theoretical results.

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