

Uniplanar hybrid couplers using asymmetrical coplanar striplines

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This paper presents four new uniplanar 3-dB hybrid couplers using asymmetrical coplanar strips (ACPSs) for microwave integrated circuit (MIC) and monolithic MIC (MMIC) applications. Experimental results show that the standard ($1.5 \lambda_g$ circumference) uniplanar 180° hybrid-ring coupler has 3.5 ± 0.4 dB coupling, greater than 21-dB isolation, and greater than 23.4-dB return loss over a 25% bandwidth centered at 3 GHz. The 180° reverse-phase hybrid-ring coupler ($1.0 \lambda_g$ circumference) provides better performance as compared to conventional microstrip hybrid couplers. This circuit has a bandwidth of more than one octave from 2 to 4 GHz with 0.4 -dB power dividing imbalance and 4° phase imbalance. The 180° reduced-size reverse-phase hybrid-ring coupler ($0.8 \lambda_g$ circumference) maintains the performance of the 180° reverse-phase hybrid coupler with the advantage of smaller size. This circuit also has a bandwidth of more than one octave from 2 to 4 GHz with 0.3 -dB power dividing imbalance and 3.1° phase imbalance. A new 90° 3-dB branch-line hybrid coupler is also introduced. Experimental results show the insertion loss of this component to be 0.5 dB at 3 GHz, and also greater than 15.3-dB isolation and 17.1-dB return loss over a 10% bandwidth centered at 3 GHz. The circuits were designed and simulated with Sonnet electromagnetic-circuit solver software. The measured results agree well with the simulations.

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