Abstracts

A Unilateral Parametric Amplifier

H.E. Brenner. "A Unilateral Parametric Amplifier." 1967 Transactions on Microwave Theory and Techniques 15.5 (May 1967 [T-MTT]): 301-306.

A theoretical investigation of a unilateral parametric amplifier using two varactor diodes indicates an improvement of unilateral stability over already existing types. A circuit is suggested which uses lower sideband idler energy for achieving forward gain and upper side-band energy to obtain substantial reverse loss. The phases of the applied signals and of the pump at the two varactors have to be 90° out of phase to achieve unilateral operation. Numerical evaluation of the theoretical results for a signal frequency at 4.0 GHz and a pump frequency at 12.0 GHz, assuming a diode junction capacitance of C/sub j/ = 0.4 pF and a bulk resistance of R/sub s/ = 2Omega was done for several pump power levels. For 14 dB maximum forward gain, the 3 dB bandwidth of the gain versus frequency characteristic of the unilateral amplifier is about 18 percent smaller than that of the reflection type amplifier. The maximum reverse loss for these conditions is 7.3 dB. For lower forward gain the backward loss increases relatively until for very low gain values (about 1 dB) the amplifier is unconditionally stable, i.e., the backward loss is larger than the forward gain. The theoretical noise figure is about 1.95 dB at signal center frequency for 14 dB forward gain and, for ±80 MHz from the center frequency, only 0.1 dB higher than for the reflection type amplifier.

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