Abstracts

A Low-Noise X-Band Parametric Amplifier Using a Silicon Mesa Diode

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This paper summarizes a cooperative effort to develop silicon mesa variable-capacitance diodes and to evaluate their potential for achieving low-noise amplification in the high microwave frequency range. Cutoff frequencies of about 70 kMc at zero-bias voltage (corresponding to 140 kMc at maximum reverse bias voltage) with a total permissible voltage swing in excess of 5 volts have been obtained. A versatile degenerate X-band parametric amplifier was developed which, when used in conjunction with these silicon mesa diodes, achieved a radiometer noise temperature of 130°K at 8.5 kMc with a 50-Mc bandwidth at 17-db gain. The measured performance of the diode (figure of merit) is compared with the first-order theory in an operating radar system. The over-all performance of the amplifier improved the observed system sensitivity by 6 db.

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