Abstracts

Low-Noise Diodes and Mixers for the 1--2-mm Wavelength Region

G.T. Wrixon. "Low-Noise Diodes and Mixers for the 1--2-mm Wavelength Region." 1974 Transactions on Microwave Theory and Techniques 22.12 (Dec. 1974, Part II [T-MTT] (1974 Symposium Issue)): 1159-1165.

Ultralow capacitance low-noise Schottky-barrier diodes have been developed for use in the 1--2-mm-wavelength region. The diodes have been fabricated using both photolithographic and electron-beam lithographic techniques. Use of the latter technique to make diodes shaped as crossed stripes of width 0.25 µm and 0.4 µm on epitaxial GaAs resulted in a 30-percent reduction in spreading resistance over that of photolithographically formed circular diodes with approximately the same junction area and capacitance. Because of this reduction, it is suggested that in order to minimize receiver noise figure at frequencies greater than about 200 GHz, it will prove advantageous to use such shaped diodes rather than the conventional circular ones. The diodes were used in mixers operating at 140, 175, and 230 GHz. At 140 and 175 GHz the diodes were mounted in conventional Sharpless wafers. At 230 GHz, in addition to Sharpless wafers, a mixer of unique design was used which incorporated an RF matching element, low-pass filter, and IF output transmission line, all on stripline, whose performance was optimized using low-frequency scaling techniques. Mixer double side-band (DSB) noise figures of 3.8, 8.1, and 12.6 dB were measured at the three frequencies, respectively. At 175 and 230 GHz, however, mixer performance is degraded due to a lack of sufficient local oscillator (LO) power and this is currently the principal limitation to their performance.

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