Abstracts

The Fabrication and Performance of Planar Doped Barrier Diodes as 200 GHz Subharmonically Pumped Mixers

T.-H. Lee, J.R. East, C.-Y. Chi, G.M. Rebeiz, R.J. Dengler, I. Mehdi, P.H. Siegel and G.I. Haddad. "The Fabrication and Performance of Planar Doped Barrier Diodes as 200 GHz Subharmonically Pumped Mixers." 1994 Transactions on Microwave Theory and Techniques 42.4 (Apr. 1994, Part II [T-MTT]): 742-749.

The PDB (planar doped barrier) diode consists of a p+ doping spike between two intrinsic layers and n+ ohmic contacts. Such devices can have an anti-symmetric current vs. voltage characteristic. The capacitance is approximately constant with the applied voltage, and the barrier height and device capacitance are easily adjustable. These characteristics make the PDB a candidate for millimeter- and submillimeter-wave subharmonic mixers. We have fabricated 2 and 4 µm diameter diodes with different barrier designs using GaAs epi-layers. The devices are planarized using an air-bridge and a surface channel etch. After completely removing the substrate, the devices are mounted on a quartz substrate to reduce parasitic effects. Diced diodes were tested as subharmonic mixers around 200 GHz in both a quasi-optical planar wideband subharmonic receiver and a planar-diode waveguide-mixer. The quasi-optical measurements show that a 0.23 V (and 0.4 V) barrier height GaAs diode with 2.0 µA (and 5 nA) of saturation current gives a DSB conversion loss of 10.8 dB (and 9.5 dB) and a DSB noise temperature of 3795° K (and 2450° K). The waveguide mixer measurements were made with a similar 0.23 V barrierheight PDB. Such a mixer has a minimum conversion loss of 10.2 dB and noise temperature of 3570° K, and requires only 1.2 milliwatts of available LO power.

❑ Return to main document.