Abstracts

Photoresponse of microwave transistors to high-frequency modulated lightwave carrier signal

L.E.M. de Barros, A. Paolella, M.Y. Frankel, M.J. Romero, P.R. Herczfeld and A. Madjar. "Photoresponse of microwave transistors to high-frequency modulated lightwave carrier signal." 1997 Transactions on Microwave Theory and Techniques 45.8 (Aug. 1997, Part II [T-MTT]): 1368-1374.

Described in this paper are the photoresponse characteristics of microwave transistors, both unipolar [metal-semiconductor FETs (MESFETs) and modulation-doped FETs (MODFETs)] and bipolar [heterojunction bipolar transistors (HBTs)]. Investigation includes time- and frequency-domain measurements. For unipolar device FETs, the two dominant photodetection mechanisms, photoconductive and photovoltaic, are clearly identified within the same device for the first time. It is shown that even high-speed FETs are limited to a photonic bandwidth of a few megahertz, if photodetection and amplification are to be achieved simultaneously. In contrast, bipolar HBTs can provide optical gain up to the millimeter-wave range. It is shown that their bandwidth to a modulated optical input is closely related to the microwave bandwidth, and that parameters such as base-access resistance and base-emitter capacitance are critical to photoresponse optimization.

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