Abstracts

High-Frequency Limitations of IMPATT, MITATT, and TUNNETT Mode Devices

M.E. Elta and G.I. Haddad. "High-Frequency Limitations of IMPATT, MITATT, and TUNNETT Mode Devices." 1979 Transactions on Microwave Theory and Techniques 27.5 (May 1979 [T-MTT] (Special Issue on Solid-State Microwave/Millimeter-Wave Power Generation, Amplification, and Control)): 442-449.

High-frequency limitations of IMPATT and other mode devices are explored by concentrating on the details of the Iarge-signal injected current pulse formation. Simple waveform models are given for injected current pulses of large widths, and various scaling relations are also included. The large-signal injected current pulse is calculated by use of a modified Read equation where attention is given to the effect of the intrinsic response time and the tunneling current. The poor high-frequency performance of GaAs devices is explained by postulating that the intrinsic response time is larger than expected. Tunneling current is shown to increase the high-frequency performance of GaAs diodes. Device efficiencies are calculated for specific diode structures by using a computer simulation which includes mixed avalanche-tunnel breakdown. The results for GaAs and Si devices are given, and the results are discussed and compared.

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