Abstracts

Monolithic GaAs HBT p-i-n Diode Variable Gain Amplifiers, Attenuators, and Switches

K.W. Kobayashi, A.K. Oki, D.K. Umemoto, S.K.Z. Claxton and D.C. Streit. "Monolithic GaAs HBT p-i-n Diode Variable Gain Amplifiers, Attenuators, and Switches." 1993 Transactions on Microwave Theory and Techniques 41.11 (Dec. 1993 [T-MTT] (1993 Symposium Issue)): 2295-2302.

We report on monolithic circuits integrating HBT's and p-i-n diodes using a common HBT MBE structure. An HBT variable gain amplifier using a p-i-n diode as a variable resistor achieved a gain of 14.6 dB, a bandwidth out to 9 GHz, a gain control range of >15 dB, and an IP3 of 28 dBm. A two-stage HBT p-i-n diode attenuator from 1-10 GHz and an X-band one-pole two-throw HBT p-i-n diode switch were also demonstrated. The two-stage p-i-n attenuator has over 50 dB dynamic range at 2 GHz and a maximum IP3 of 9 dBm. The minimum insertion loss is 1.7 dB per stage and has a flat response to 10 GHz. The X-band switch has an insertion loss of 0.82 dB and an off-isolation of 25 dB. The bandwidth is greater than 35% and the IP3 is greater than 34.5 dBm. These circuits consist of p-i-n diodes constructed from the base-collector MBE layers of a base-line HBT process. This work demonstrates the first monolithic integration of p-i-n diode switch, variable gain control, and attenuation functions in an HBT technology without additional processing steps or MBE material growth.

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