Abstracts

MMIC Active Bandpass Filters Using Varactor-Tuned Negative Resistance Elements

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This paper describes techniques for realizing microwave active filters using single transistor active resonators in a negative resistance configuration. The negative resistance topologies for both bipolar (AIGaAs/GaAs HBT) and FET (MESFET or HEMT) devices are studied and compared. The essence of the technique is that the input reactance of the transistor circuit resonates with an external capacitor or inductor, whilst the negative resistance is used to compensate for the losses in the resonator. It is shown that the FET device is ideally suited for this application as it can have a varactor-controlled negative resistance component. Three-stage and two-stage monolithic varactor-tuned bandpass filters have been demonstrated using this technique. The measured response of the three-stage filter exhibits a 120 MHz 3 dB-bandwidth centered on 2.3 GHz, 0dB insertion loss with only ±0.1 dB ripple in the pass-band, up to 100 dB of stop-band attenuation at low frequencies, and over 50 dB of rejection up to 6 GHz. The two-stage filter exhibits a 400 MHz 3 dB-bandwidth centered on 4.7 GHz, with tunable insertion gain and only ±0.1 dB ripple in the pass-band.

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