Abstracts

A High-Q Broad-Band Active Inductor and its Application to a Low-Loss Analog Phase Shifter

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This paper demonstrates a high-Q broad-band active inductor and its application to a low-loss analog phase shifter. The proposed high-Q broad-band active inductor utilizes frequency-insensitive negative resistance to compensate constant internal losses caused by the drain-to-source conductance of the field-effect transistors (FET's), the dc bias circuit and several other factors. The measured frequency range of the fabricated In-AIAs, lnGaAs/InP HEMT active inductor is 6 to 20 GHz for Q values greater than 100, and 7 to 15 GHz for Q values greater than 1000. A low-loss analog phase shifter is also fabricated at C-band. This is constructed with the active inductors, the varactor diodes and the low-loss multilayer broad-side coupler in a MIC structure. Since the constant negative resistance of the active inductors also compensates the line loss of the coupler and the varactor diodes' series resistance, the measured results show a good insertion loss performance with a large phase shift. A phase shift of more than 225° within a 0.8 dB insertion loss from 4.7 to 6.7 GHz, another of more than 180° within 1.3 dB insertion loss from 3.7 to 8.5 GHz, and one more of more than 90° within 1.4 dB insertion loss from 3.5 to 10.6 GHz were obtained.

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