Abstracts

Negative-Impedance Converters (NIC) for VHF Through Microwave Circuit Applications

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The negative impedance converter (NIC) is an active circuit element which has been increasingly useful in low frequency applications. It is a 2 port device which converts any load impedance at one port to an input impedance -Z as seen at the other port. The NIC can be used to synthesize negative impedances and admittances which are then used to generate transfer functions or impedance functions which are not physically realizable without active circuits. We have developed two types of NIC circuits suitable for VHF and microwave applications. The first type of NIC is based upon the idealized circuit shown in Fig. 1. Particular care has been taken in the design and layout of this circuit to minimize stray reactance which might reduce the frequency response of this NIC realization. The transistors used in this circuit are NEC 2SC 989's which are relatively inexpensive and have an f/sub T/ of 3 GHz. Figure 2 is a sketch of the layout of a practical realization of the RF portion of this NIC. Figure 3 demonstrates that the NIC can indeed neutralize a 22 pf capacitor up to 120 MHz. Figure 4 shows the effect of temperature variations on a lossless single-pole L-C filter which used an NIC to generate a -R which cancelled the loss in the inductor. The loaded Q of the tuned circuit is 100. Without the NIC, the loss of the tuned circuit was 8 dB. The noise figure of the filter and NIC was 17 dB and the in-band third order intercept was -12 dBm.

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