

interstage 50-ohm terminator for vhf converters

Many mixers and preamplifiers require a 50-ohm load — here's a circuit for providing a wideband resistive termination with minimum insertion loss

When cascading modules for receiving systems, it is often necessary to make sure that a particular stage is presented with a reasonably precise 50-ohm termination, over a relatively broad range of frequencies. One such requirement involves terminating a low-noise preamplifier which, although unconditionally stable at the operating frequency, is potentially unstable out-of-band. The highly reactive termination presented by a bandpass filter, operated off resonance, may cause the amplifier to oscillate at some undefined frequency, significantly degrading system noise figure and intermodulation performance. Another problem involves the image-frequency termination of double-balanced mixers. It has been shown that, to maximize a mixer's dynamic range, the i-f port must be properly matched — not only at the signal frequency, but also at any multiple-response frequencies appearing at the i-f.¹

One method for obtaining a broadband interstage impedance match is based on the use of resistive attenuators between various stages.² Unfortunately, this

approach introduces additional system losses which tend to degrade overall sensitivity. Another solution uses interstage duplexers which shunt the undesired frequency into a 50-ohm load.³ This practice, however, is applicable only when the frequency of the undesired response is known and is well removed from the signal frequency. The circuit in fig. 1 overcomes these shortcomings: It appears virtually lossless at the signal frequency and provides a wideband 50-ohm termination to any other frequency components which are present (limited only by the reactive nature of the load resistors at microwave frequencies). Additionally, this network provides the desired degree of interstage selectivity, as a function of the component values chosen.

The circuit of fig. 1 is by no means original; it was brought to my attention by Gary Frey, W6KJD, who first encountered it in a commercial receiver design. Gary and I have both used the circuit extensively in vhf and uhf transmit and receive converters with considerable success.

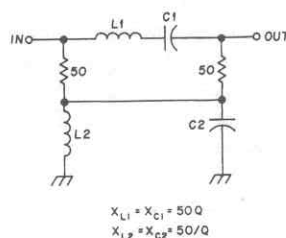


fig. 1. Vhf terminator which provides a wideband 50-ohm termination with minimum insertion loss. Component values are based on desired circuit Q , as discussed in the text. Equivalent circuits at resonance, and above and below resonance, are shown in fig. 2.

circuit operation

In the circuit of fig. 1 capacitor C1 and inductor L1 form a series-resonant circuit at the operating frequency, while C2 and L2 are parallel resonant. At resonance the impedance of L1-C1 is at a minimum, the impedance of L2-C2 is maximum, and the signal path from input to output appears as a short circuit across the two 50-ohm

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