

TRANSMISSION LINE APPLICATIONS

TRANSPORT OF RF ENERGY

Transmission lines are widely used to transport RF between various pieces of communications equipment and to connect antennas to transmitters and receivers. At low frequencies (<300 MHz) coaxial cables or parallel conductor lines are most often used. At higher frequencies, waveguides and [stripline](#) are more common. (Stripline is a transmission line that is etched directly into a PC board. The two conductors of the transmission line are the ground plane covering the back side of the board, and the etched conductor on the front side.)

REACTIVE CIRCUIT ELEMENTS

We learned in an earlier section that half and quarter wavelength lines can mimic either a parallel or series RLC circuit. In general, an electrically short (less than a quarter wavelength) piece of open circuited transmission line looks like a capacitor. As the length of the open circuited line approaches a quarter wavelength, the capacitive reactance measured at the input becomes less and less, which is equivalent to making the capacitance larger and larger. In a similar way, and a piece of shorted transmission line less than a quarter wavelength long looks like an inductor. As its length increases towards a quarter wavelength, the inductive reactance and equivalent inductance increase. Capacitors and inductors made from transmission line segments are very useful at high frequencies (> 500 MHz) because it is difficult to construct standard capacitors and inductors of the proper values. The transmission line segments can be put directly on the PC board using [stripline](#) techniques or even etched directly into a microwave device using IC fabrication techniques.

IMPEDANCE TRANSFORMATION

Transmission lines can also be used as impedance transformers. They are simpler to design than pi, T, or L networks using capacitors and inductors and they generally have lower losses than conventional RF transformers made with ferromagnetic materials. The most widely used transmission line transformer is the quarter-wave transformer, although other lengths are used for special purposes.

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