

DESIGN NOTES

Two Wires, Many Uses

In this column, we'll discuss an RF transformer building block that can be used in many ways. It is a simple set of two windings on a magnetic core. Using such a core accomplishes two things:

- Increases the mutual coupling to near unity for applications requiring magnetic coupling between windings
- Provides sufficient reactance to effectively isolate the windings from end-to-end, for transmission line transformer type applications

Also, the two wires are closely spaced—either parallel bonded wires or a twisted pair. This enhances the mutual coupling and establishes a low impedance for the pair as a transmission line.

This one component can be used for several functions, as described in the diagrams of Figure 1. Two or more of these can be combined in various forms to make more complex subsystems, such as the 4-way power combiner/divider of Figure 2.

Readers wishing to experiment can build a transformer using 8 turns of a twisted pair comprising two #26 enameled wires, wound on a 0.5-inch diameter ferrite toroid core. Operation in the HF range allows

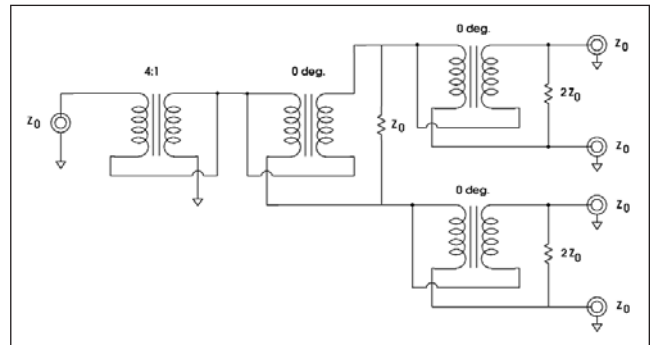


Figure 2 · 4-way 0° combiner/divider.

operation at low enough frequencies that parasitics are small and performance is easily measured with a spectrum analyzer or oscilloscope. The following core materials can be used over the approximate frequency ranges noted. Other manufacturers' equivalent materials are also appropriate (e.g. from TDK, Ceramic Magnetics, Ferroxcube and others):

- ~10-100 MHz: Fair-Rite 61 material ($\mu_i = 125$)
- ~3-50 MHz: Fair Rite 43 material ($\mu_i = 850$)
- ~0.5-15 MHz: Fair-Rite 77 material ($\mu_i = 2000$), or 73 material ($\mu_i = 2500$)

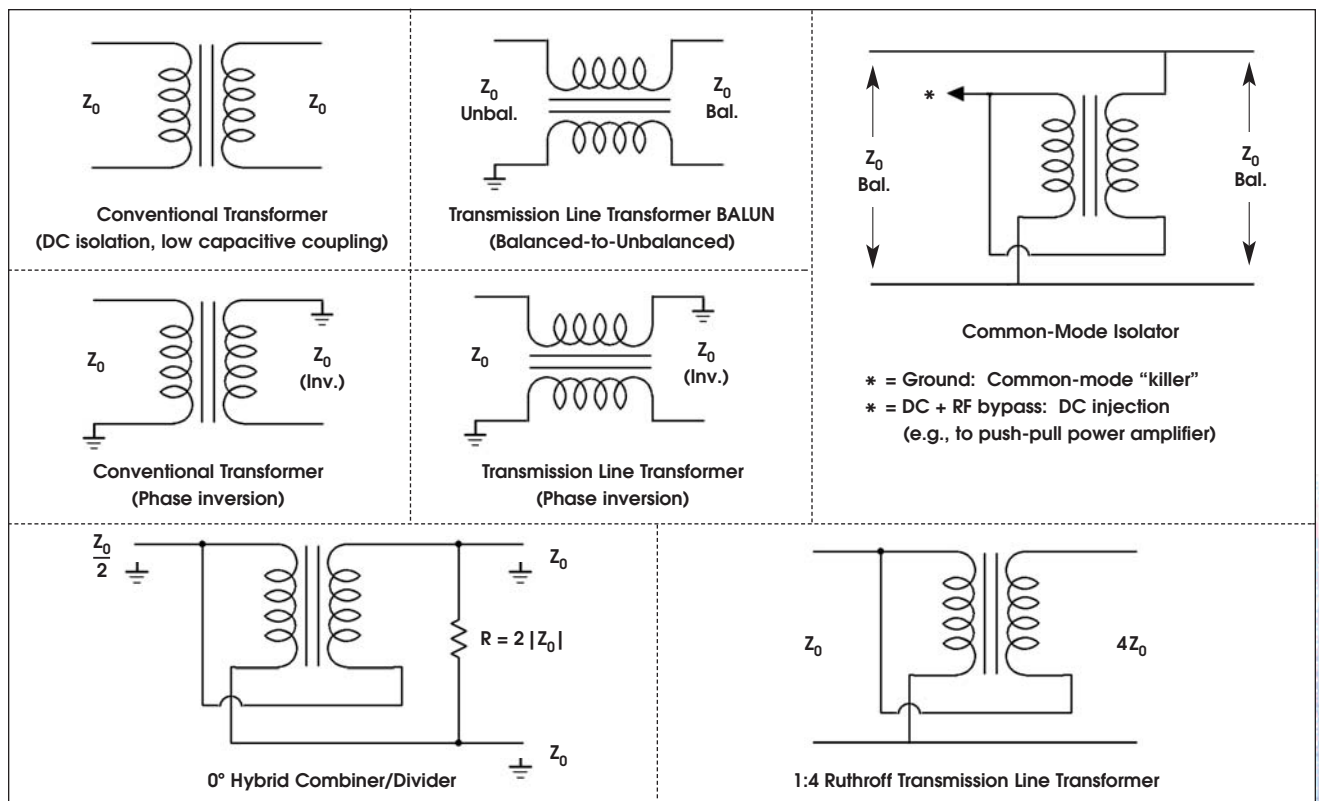


Figure 1 · Various 2-wire transformer configurations.