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RF2

Matching Network Project

This matching network was designed with the specific purpose of matching a non Ideal load (395.2 +17.4j ohms) to 50 ohms and having the highest possible Bandwidth (BW) that I can get. This was realized by utilizing parallel capacitances and series inductive elements. By adding parallel capacitance it causes to move along the smith chart in the negative b values with a constant g, and by adding series inductive elements it allows movement on the smith chart along the constant R circle in the positive x direction. See the Smith chart in figure 1 below.

Once the ideal values had been picked the ideal circuit shown in figure 2 produced the red plot in figure 5. The Bandwidth was wide due to picking 4 elements that were close to the center of the smith chart in order to keep the highest Qn value in the circuit as low as possible to produce the highest bandwidth possible. The smaller the Q of the network the smaller the BW. $BW = f_0/Q$. Once the Ideal was simulated I could move on and simulate with Triquint components to verify that I was still getting the same results. I did an optimization and adjusted some of the Inductor lengths and it the result was that the S11 looked closer to the ideal circuit as shown in the blue of figure 5.

I then laid out the circuit using Triquint components as well as interconnecting vias and T lines and the end schematic is shown in figure 4. The S11 was bound to change due to adding some many new parasitics into the circuit. By doing an optimization and adjusting the transmission line width I was capable of adjusting the S11 so that it was close to the ideal circuit with Triquint components. The S11 plot is shown in violet in figure 5. The end resulting BW of the matching circuit was 70%

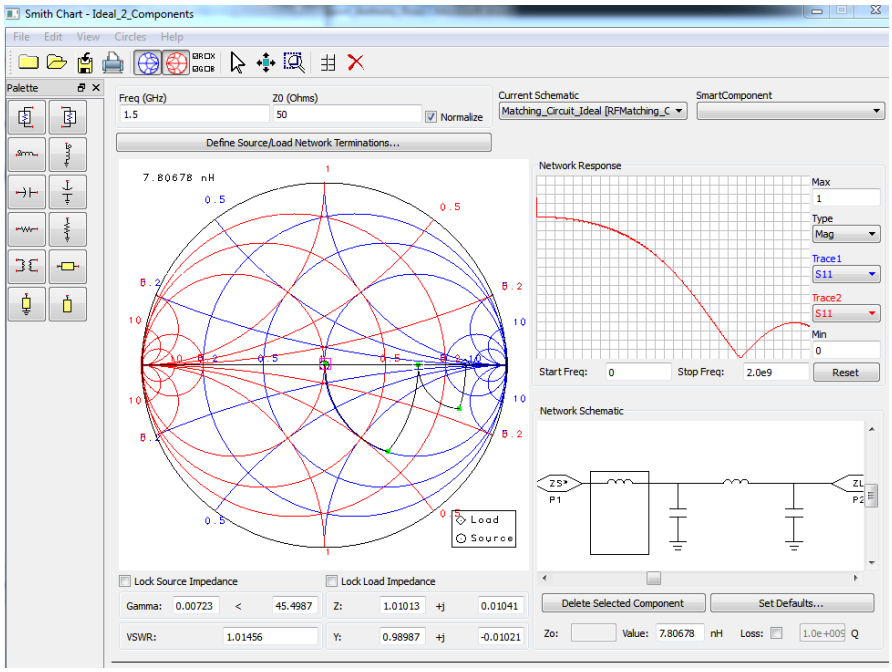

Figure 1: Smith chart matching

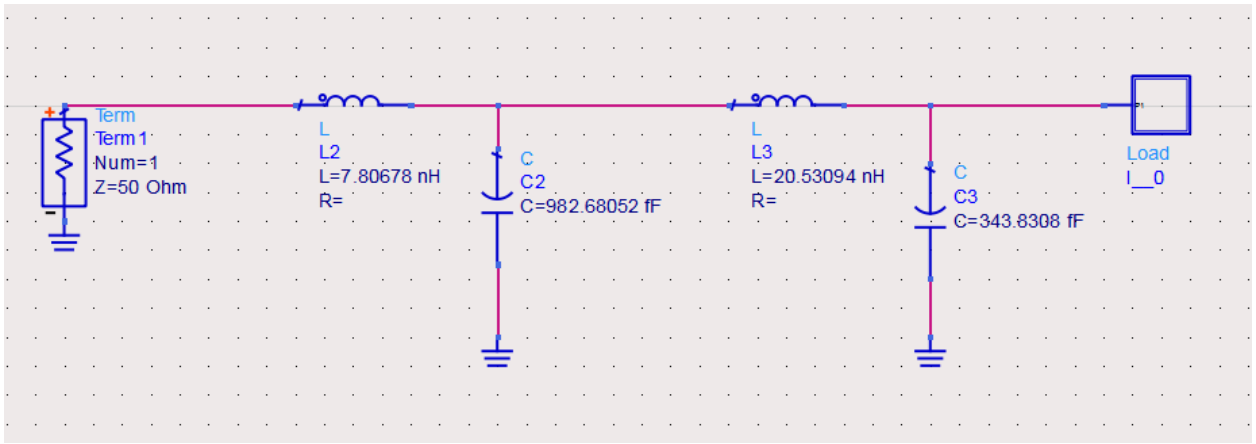

Figure 2: The Ideal Matching network

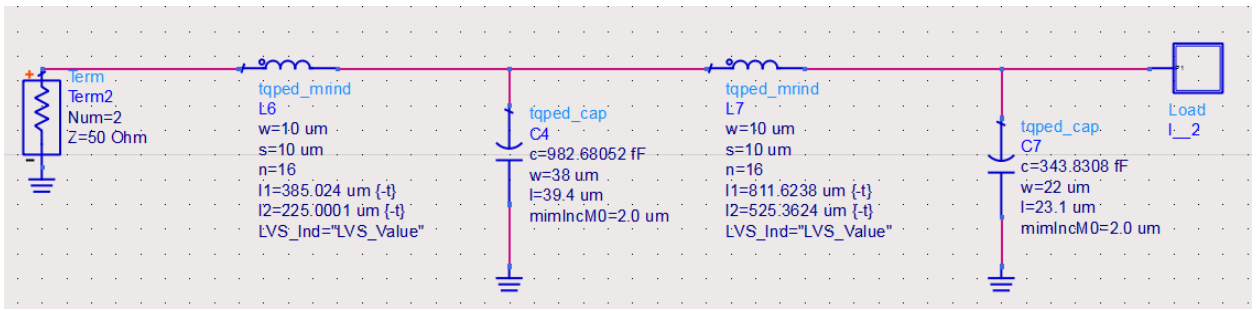

Figure 3: The Ideal Matching Network with Triquint components

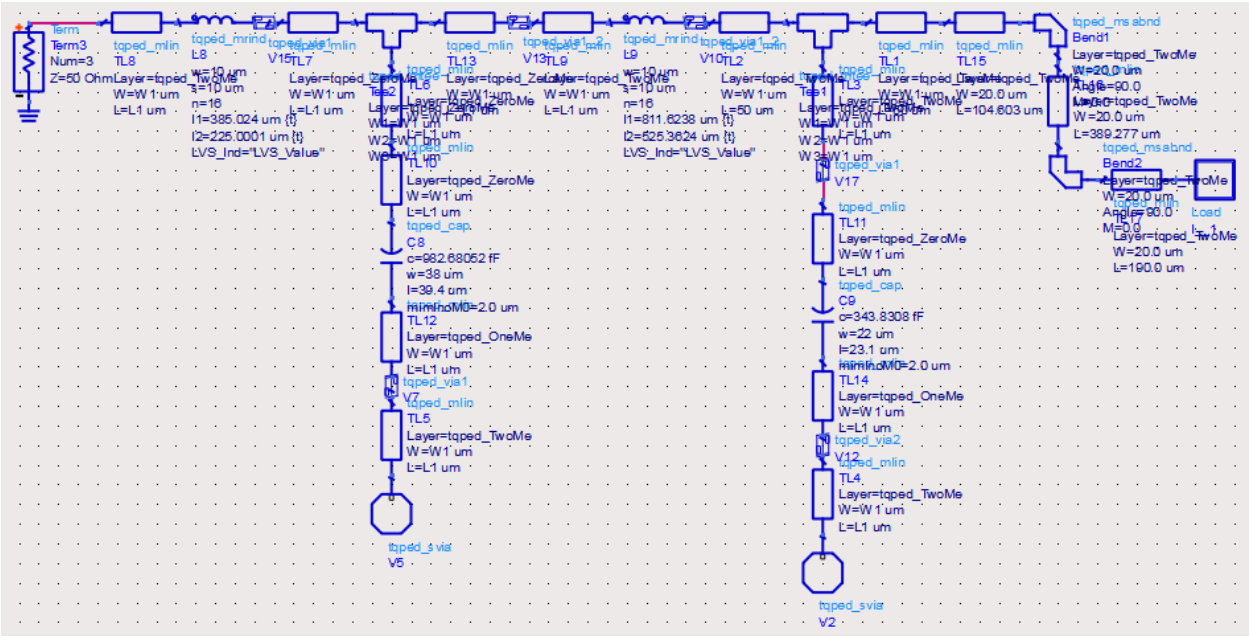

Figure 4: The Real Matching Network with Triquint components and lines and vias

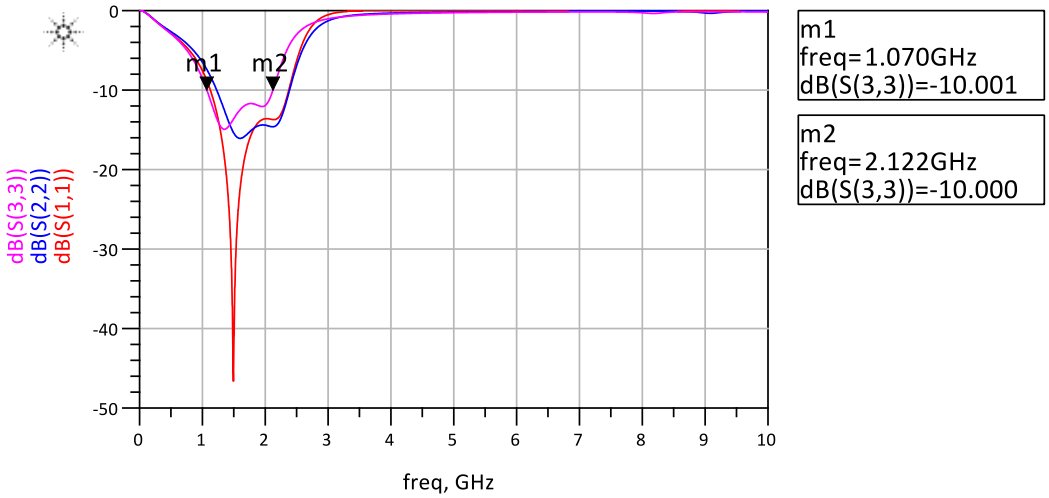

Figure 5: Red is Ideal, Blue is ideal with Triquint components, Violet is Real with Vias and Tlines (**70% BW**)

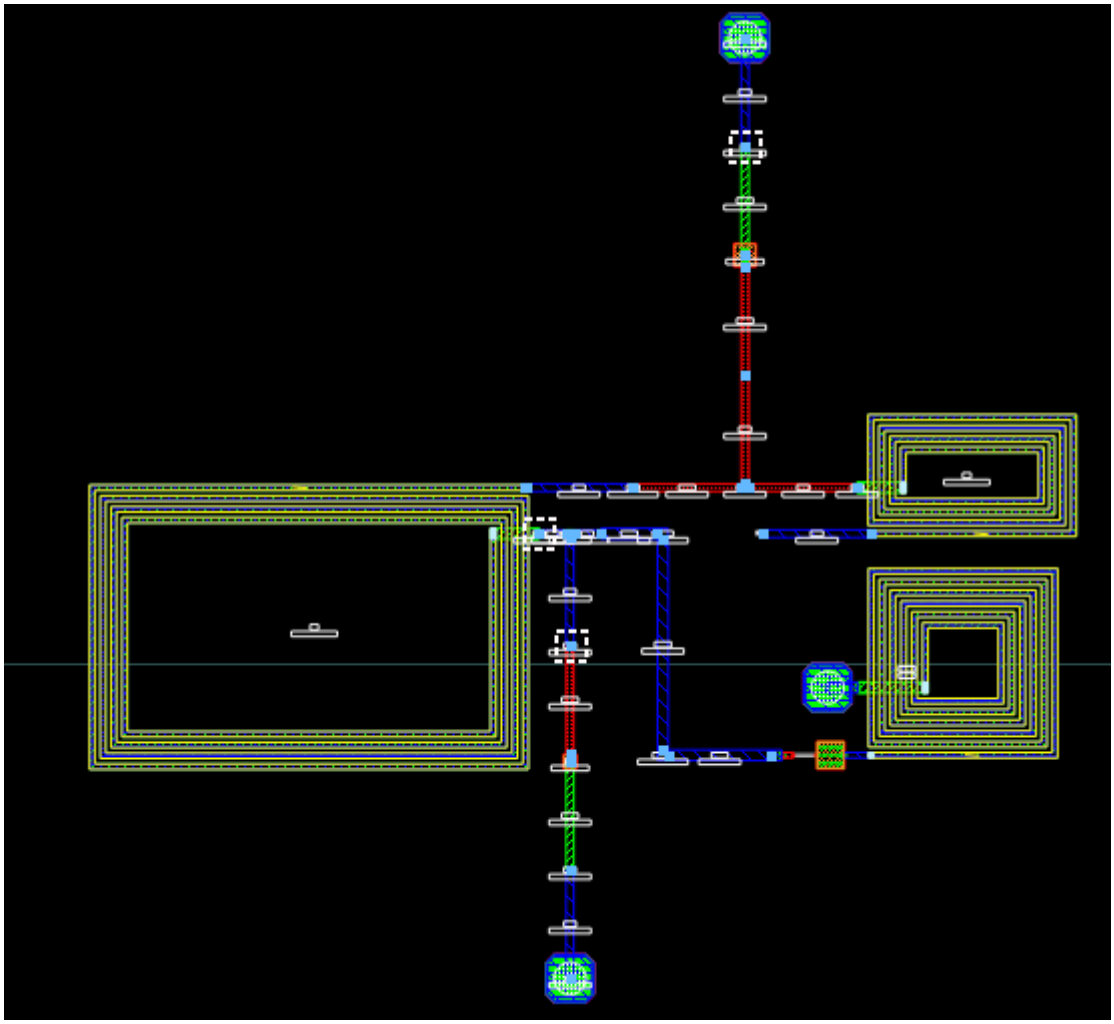

Figure 6: Matching Network Layout configuration