Lab 1 – Measuring "Parasitics" of Passive Components with a VNA

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Abstract

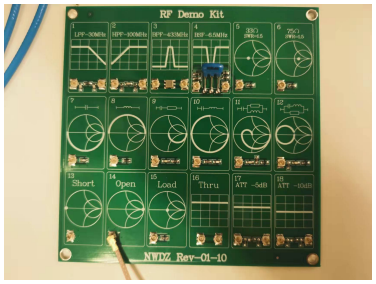
S-Parameters of passive components are measured using a Vector Network Analyzer (VNA), and more realistic circuit models containing parasitics are proposed. The proposed circuit models are simulated in LTSPice, and compared against the experimentally obtained results.

1 Introduction

Real life passive components are far from ideal. All capacitors, inductors, and resistors have some parasitic capacitance, inductance, and resistance. But how can we measure these parasitics? How can we build good electric models of these real-world componenets? To this end, we use Vector Network Analyzers (VNA) to measure the frequency response of these passive components, use our understanding of circuit elements to conjecture about good circuit models, and use LTSpice to verify that the circuit models match what we observe.

2 Experimental Setup

The passive componenets of interest are all surface mount components on the *RF Demo Kit NWDZ Rev-01-10* (Figure 1a), and we use the NanoVNA (Figure 1b) to perform the measurements. Care is taken to calibrate the NanoVNA each



(a) Picture of RF Demo Kit NWDZ

(b) Picture of NanoVNA

time before use.

3 Measurements and Results

3.1 Capacitor

3.2 Inductor