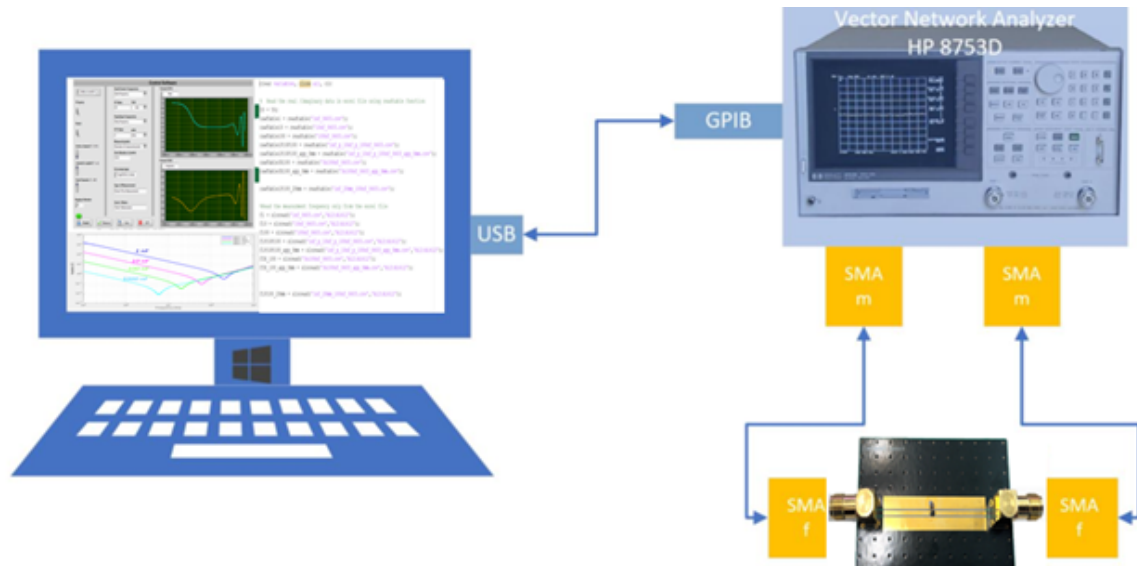


Impedance Curves of Real Components

Nowadays real components can be found in every electronic circuit. But due to the parasitic effect they have, they may cause problems in the functionality of the electronic devices. This project focuses on measuring and visualising the impedance curves of real components as well as examining the influence of the PCB layout on the impedance curves.



High-frequency Impedance measurement setup

Basics

In practice, there are no ideal components – real components behave like combinations of ideal components. All components are neither purely resistive nor purely reactive. These parasitic effects may have adverse effects on the circuit or cause electromagnetic compatibility problems. Using a previously developed impedance measurement setup, a high-frequency impedance measurement is performed and the influence of PCB layouts on the measurement results are investigated.

Implementation

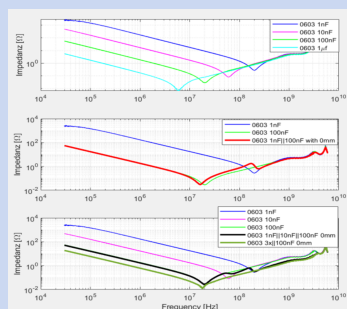
As shown in the figure above, the component is placed on the developed PCB board. The LabVIEW-based control software, which automates the impedance measurement process in the network analyzer, measures and saves the real/imaginary pairs of the real component. After that, the MATLAB-based developed evaluating software reads, further calculates and visualizes the impedance curves of the real components from the measured real/imaginary pairs.

Results

Impedance curves of different ceramic capacitors are measured, calculated and visualised by the developed hardware and software. The influence of the PCB layout on the arrangement of the components is examined and documented. Some of the measured impedance curves influenced by the PCB layout are illustrated in the infobox below.

PCB layout influences on the Impedance curves

In the first plot, the impedance curves of measured individual ceramic capacitor, that have different values, are shown. In the second plot, the measured impedance curve (red curve) of a parallel connected 1 nF (blue curve) and 100 nF (light green curve) capacitors is illustrated. In the third plot, the two impedance curve of three parallel connected capacitors 1 nF, 10 nF and 100 nF as well as three times the 100 nF is illustrated.



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