

## **TPS74501 AC Model Correlation**

### **Overview**

This document details the correlation of the TPS74501 voltage regulator AC model. The model has an external feedback resistor network to adjust the output voltage. The model is correlated to the measured data of TPS74525, and TPS74510.

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#### 1.0) TPS74525 Model

1.1) Measured Data

1.2) Model & Correlation

#### 2.0) TPS74510 Model

1.1) Measured Data

1.2) Model & Correlation

## 1.0 Correlation with TPS74525

### 1.1 Measured Data

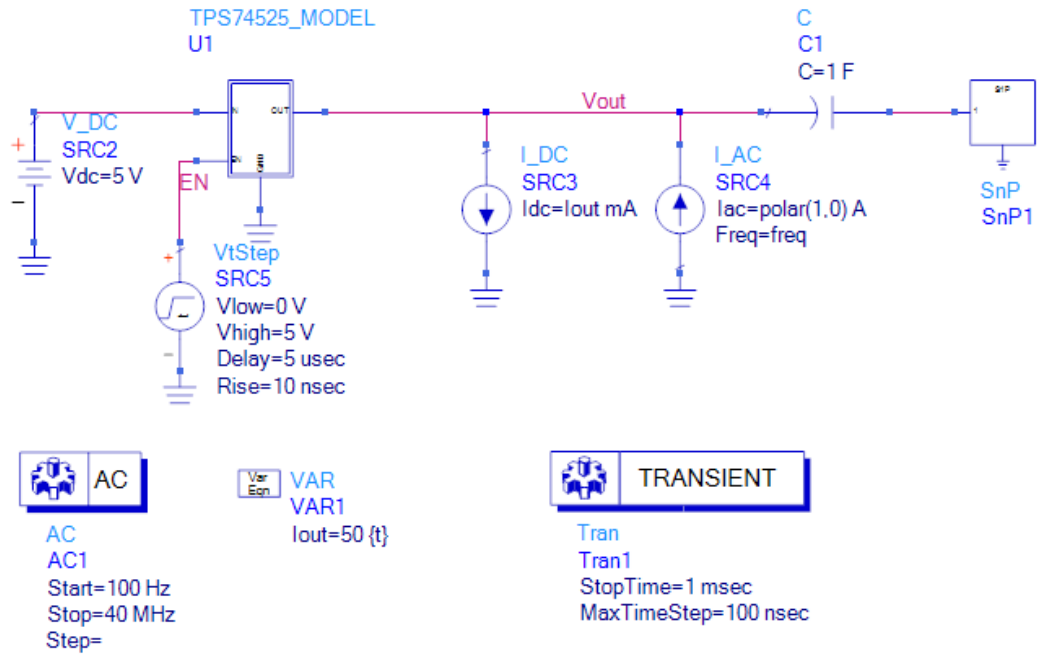


Figure 1.1-1: Schematic of the +2.5V TPS74525 regulator for transient and AC analysis used to create a SPICE model.

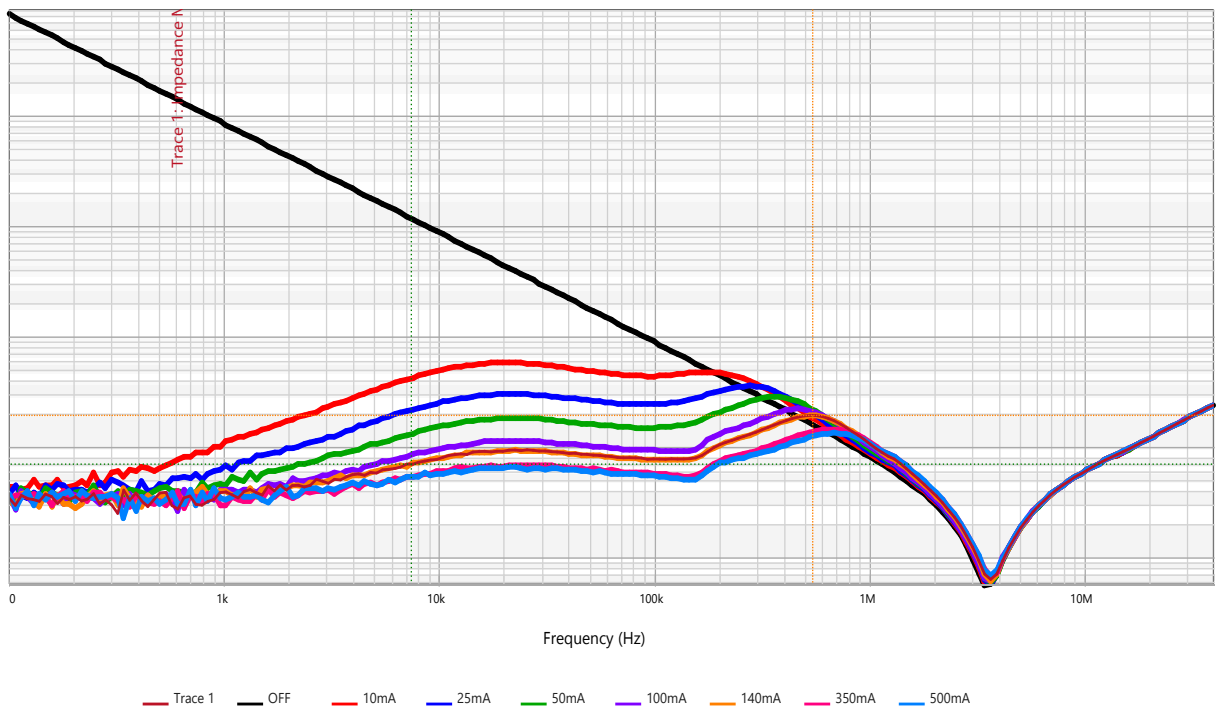


Figure 1.1-2: Measured impedance vs frequency plot of the +2.5V TPS74525 across several values of load currents using the EVAL board.

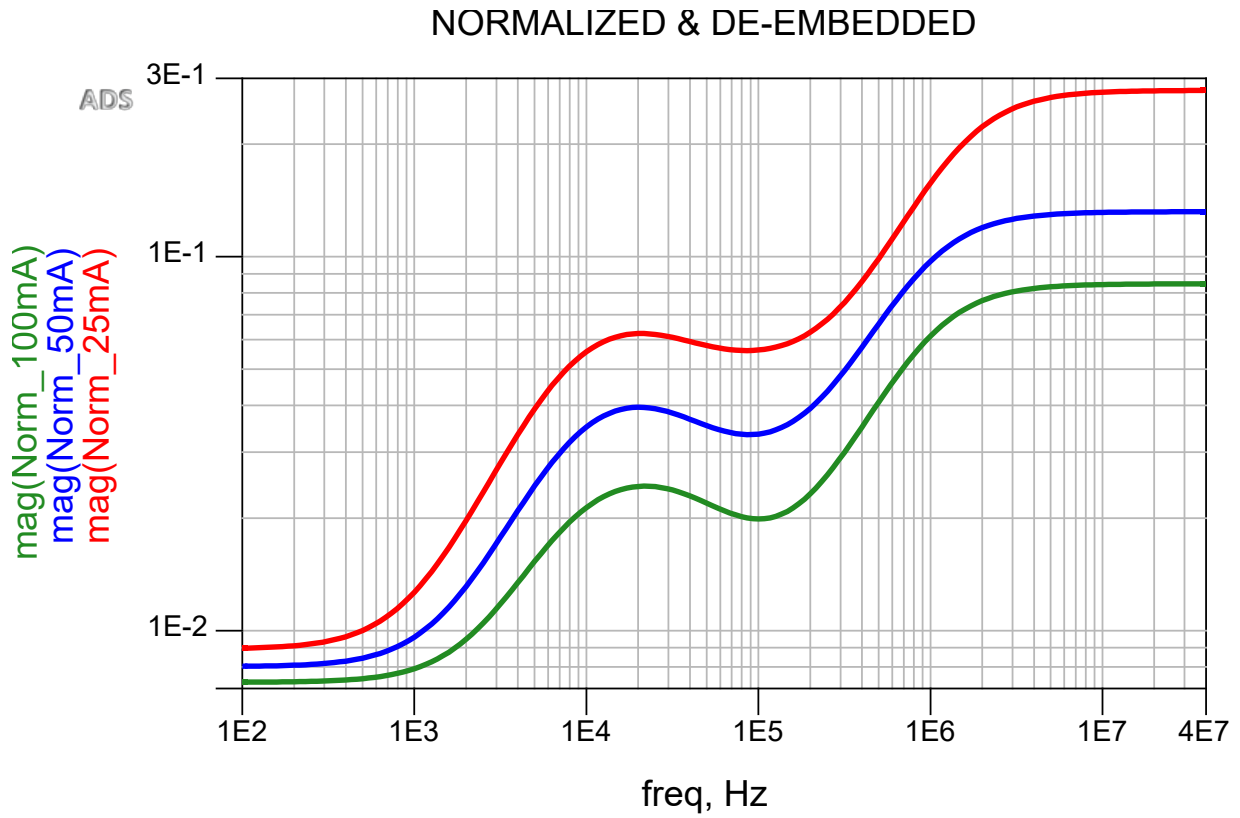


Figure 1.1-3: Measured normalized output impedance of the +2.5V TPS74525.

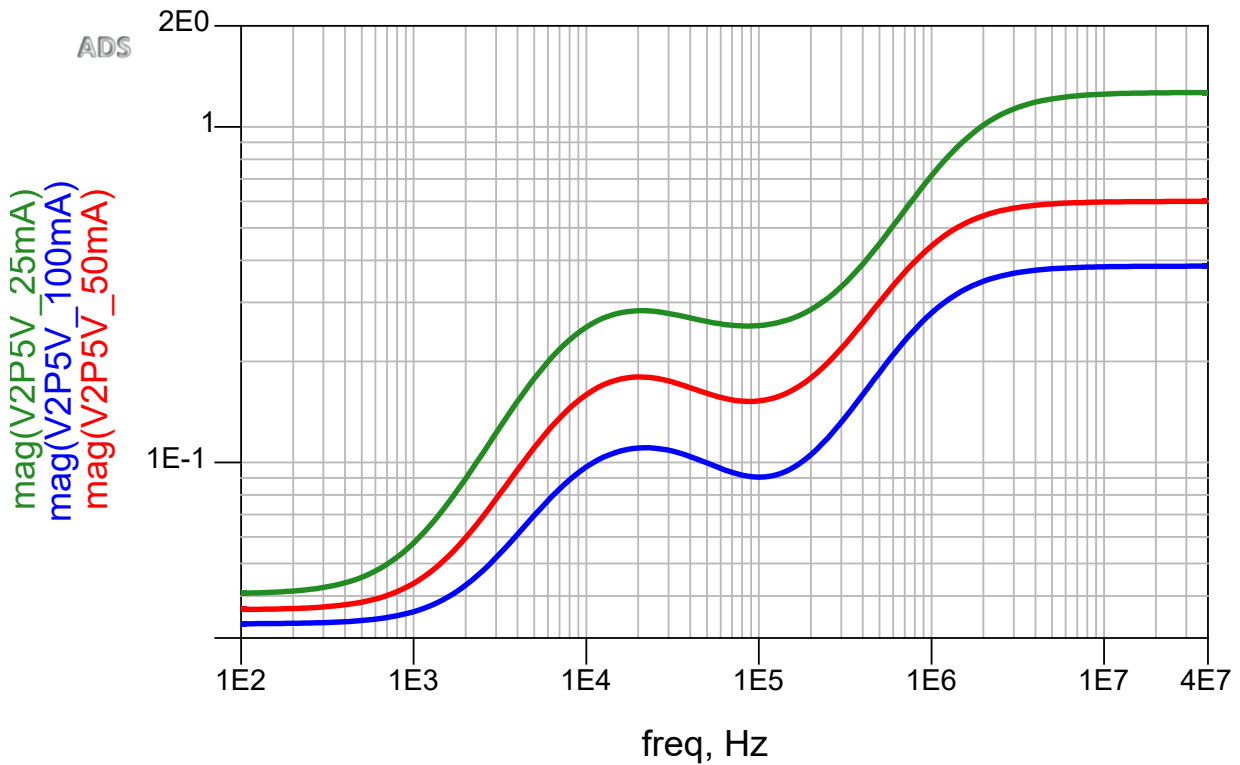


Figure 1.1-4: Measured de-embedded output impedance of the +2.5V TPS74525.

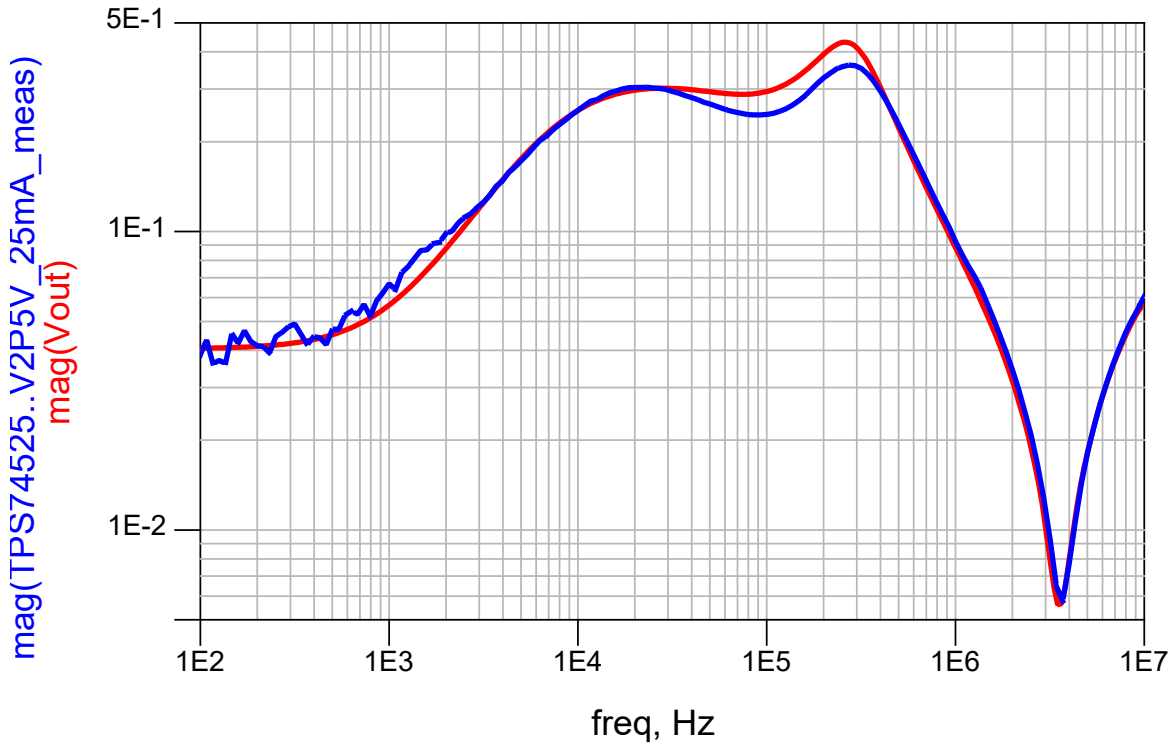


Figure 1.1-5: Measured impedance plot (blue) and ADS model plot (red) of the +2.5V TPS74525 EVAL board with a 25mA current load.

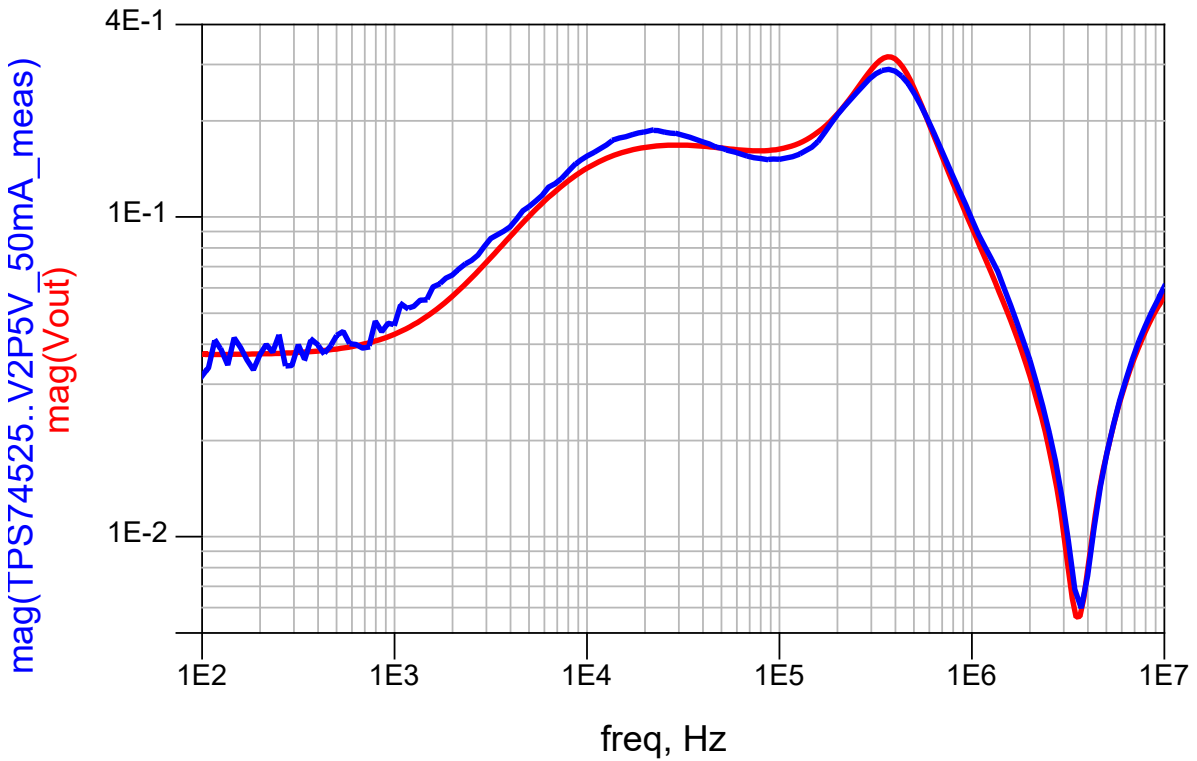


Figure 1.1-6: Measured impedance plot (blue) and ADS model plot (red) of the +2.5V TPS74525 EVAL board with a 50mA current load.

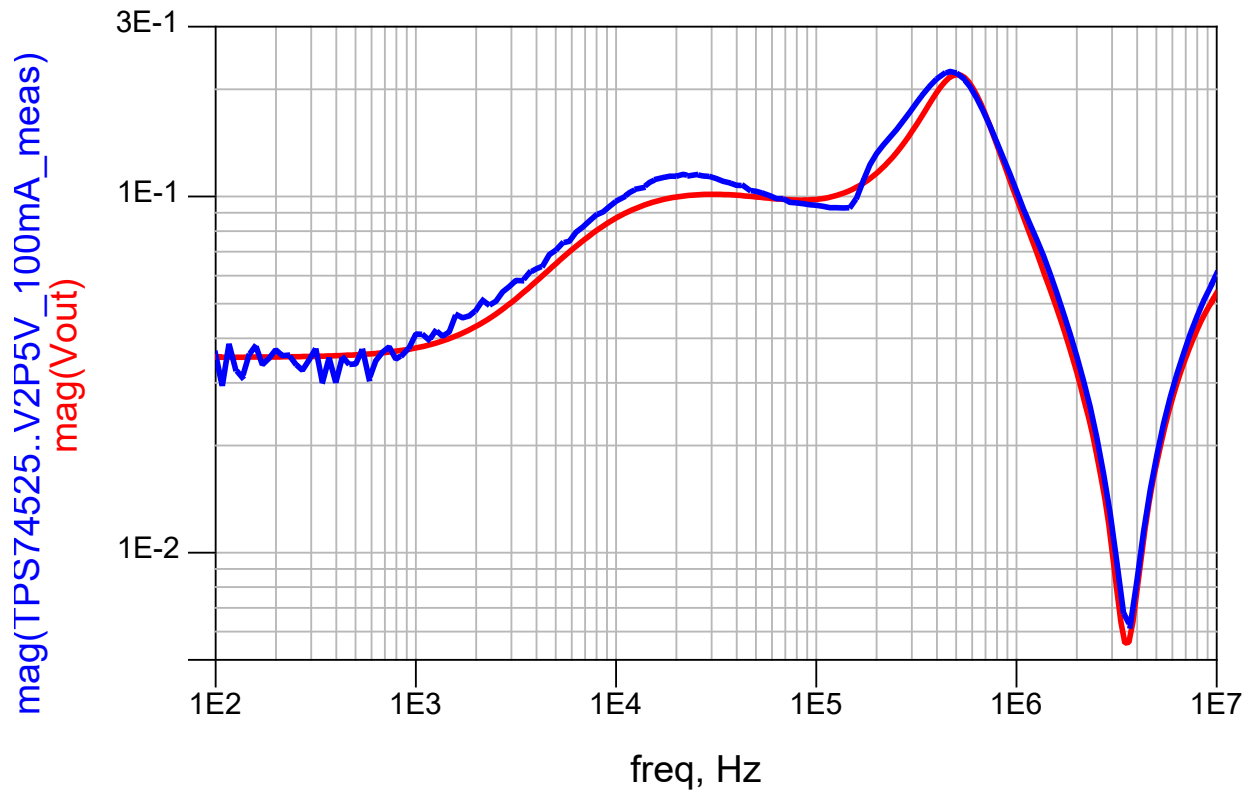


Figure 1.1-7: Measured impedance plot (blue) and ADS model plot (red) of the +2.5V TPS74525 EVAL board with a 100mA current load.

## 1.2 Model & Correlation

### AC Model

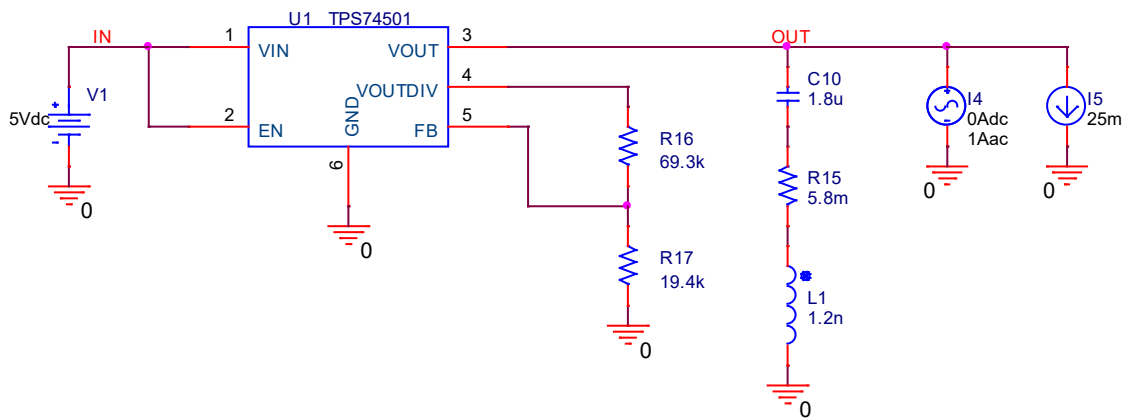


Figure 1.2-1: Schematic of the modeled +2.5V TPS74501 based on measured data.

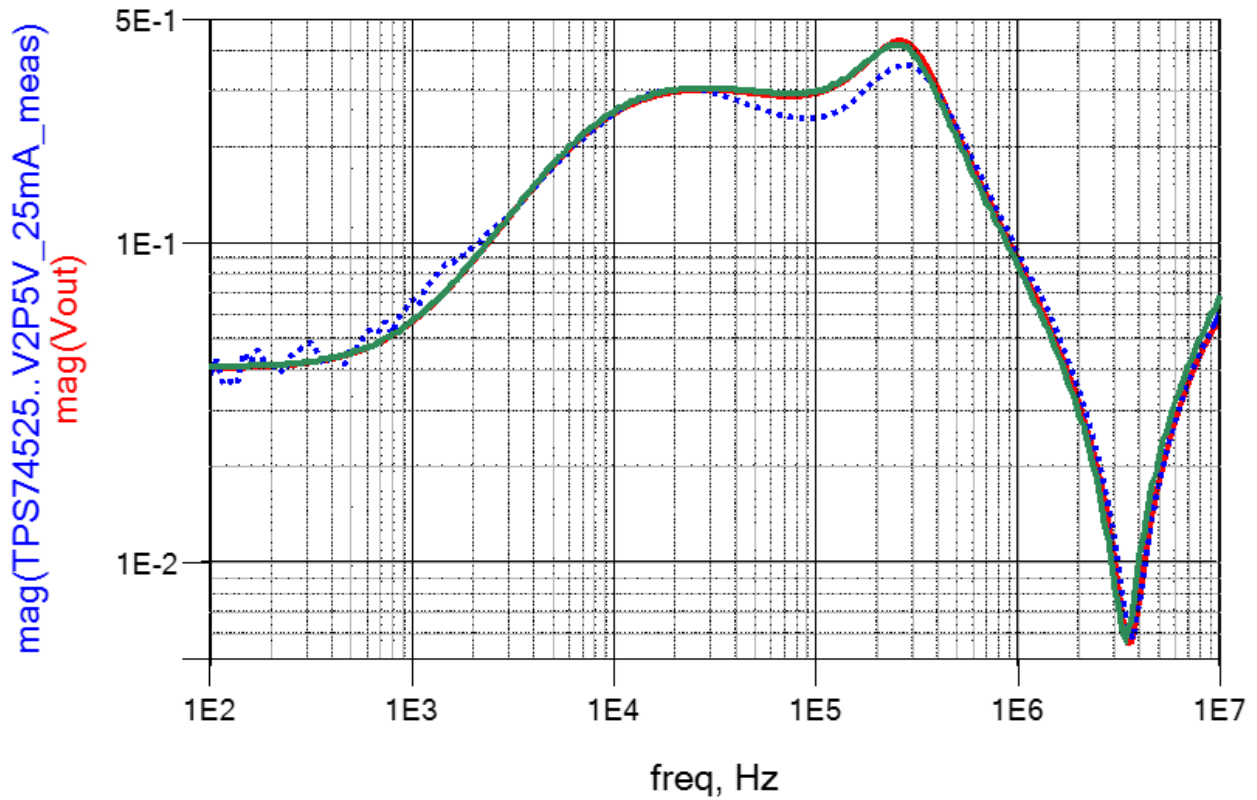


Figure 1.2-2: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) with a load current value of 25mA.

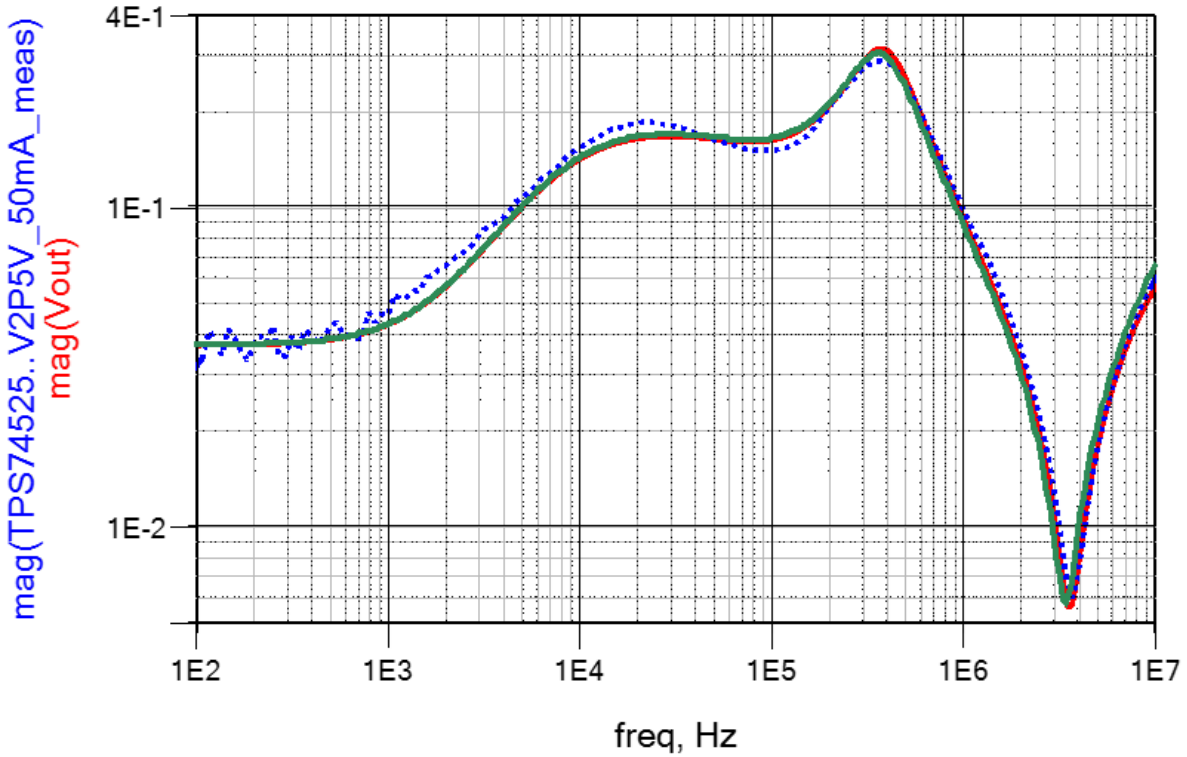


Figure 1.2-3: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) with a load current value of 50mA.

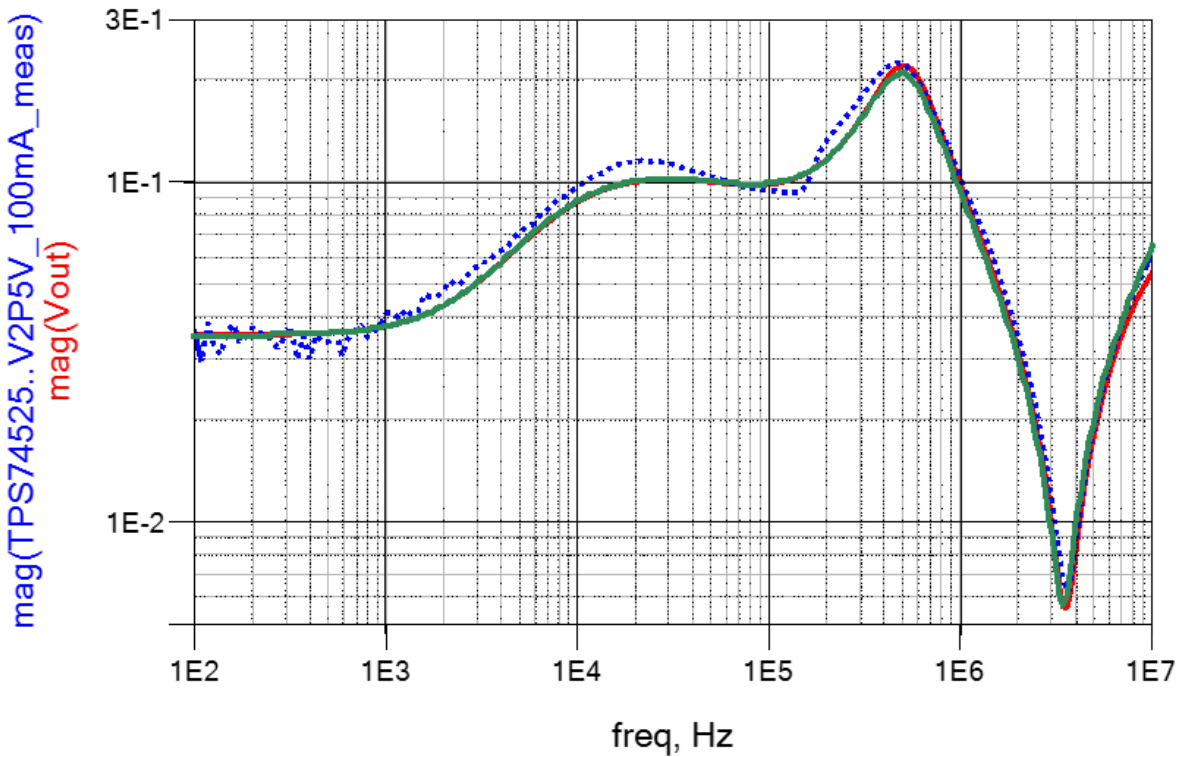


Figure 1.2-4: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) with a load current value of 100mA.

## 2.0 Correlation with TPS74510

### 2.1 Measured Data

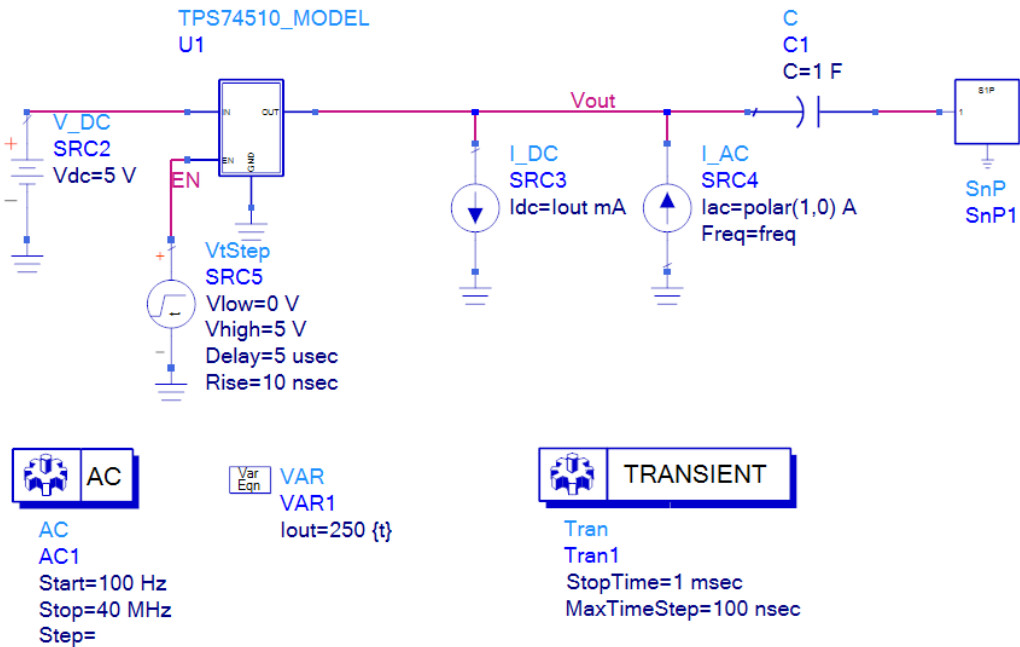


Figure 2.1-1: Schematic of the +1.0V TPS74510 regulator for transient and AC analysis used to create a SPICE model.

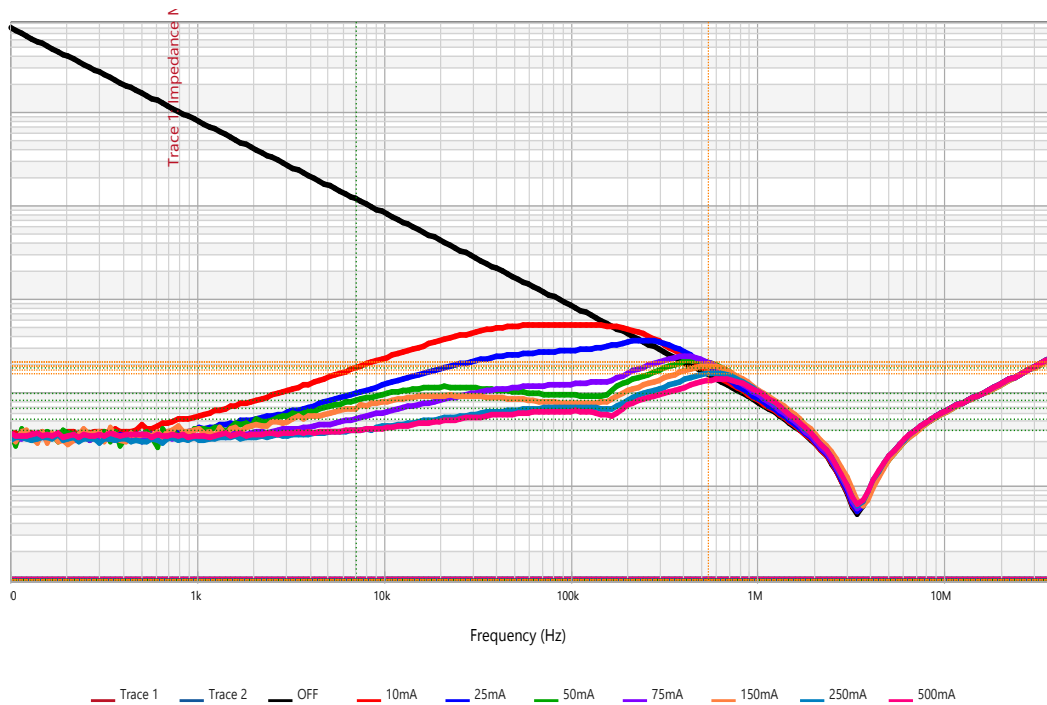


Figure 2.1-2: Measured impedance vs frequency plot of the +1.0V TPS74510 across several values of load currents using the EVAL board.



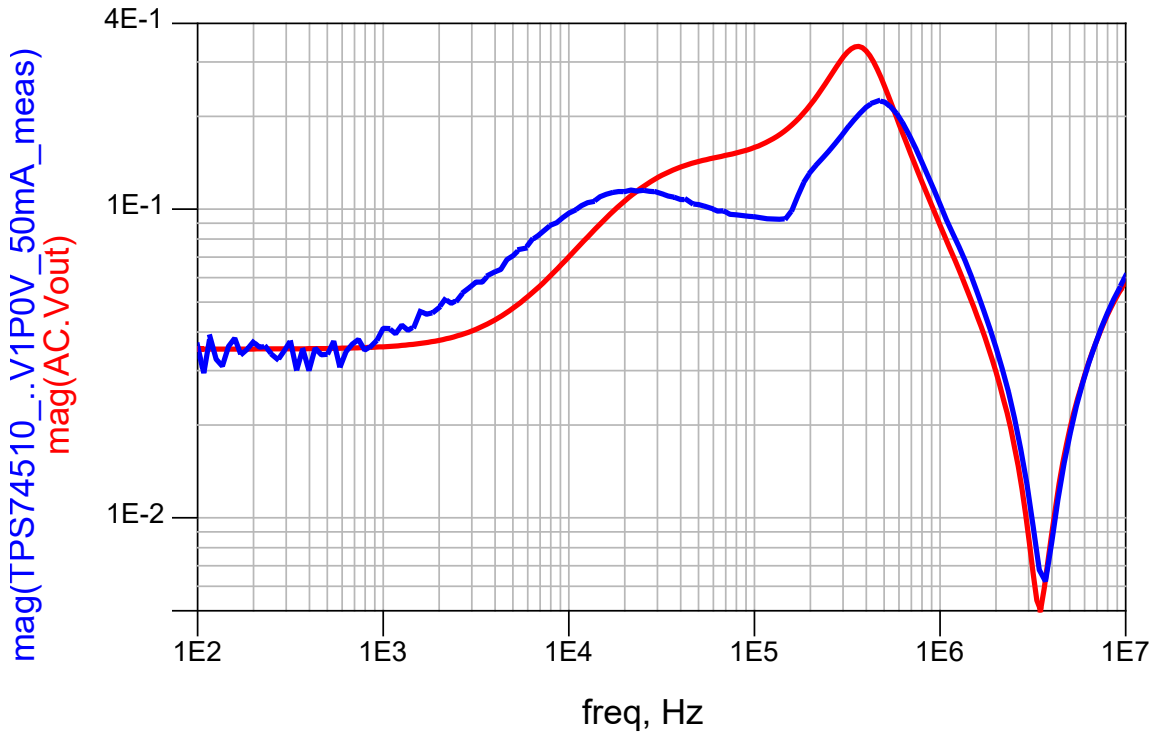


Figure 2.1-3: Measured impedance plot (blue) and ADS model plot (red) of the +1.0V TPS74510 EVAL board with a 50mA load current.

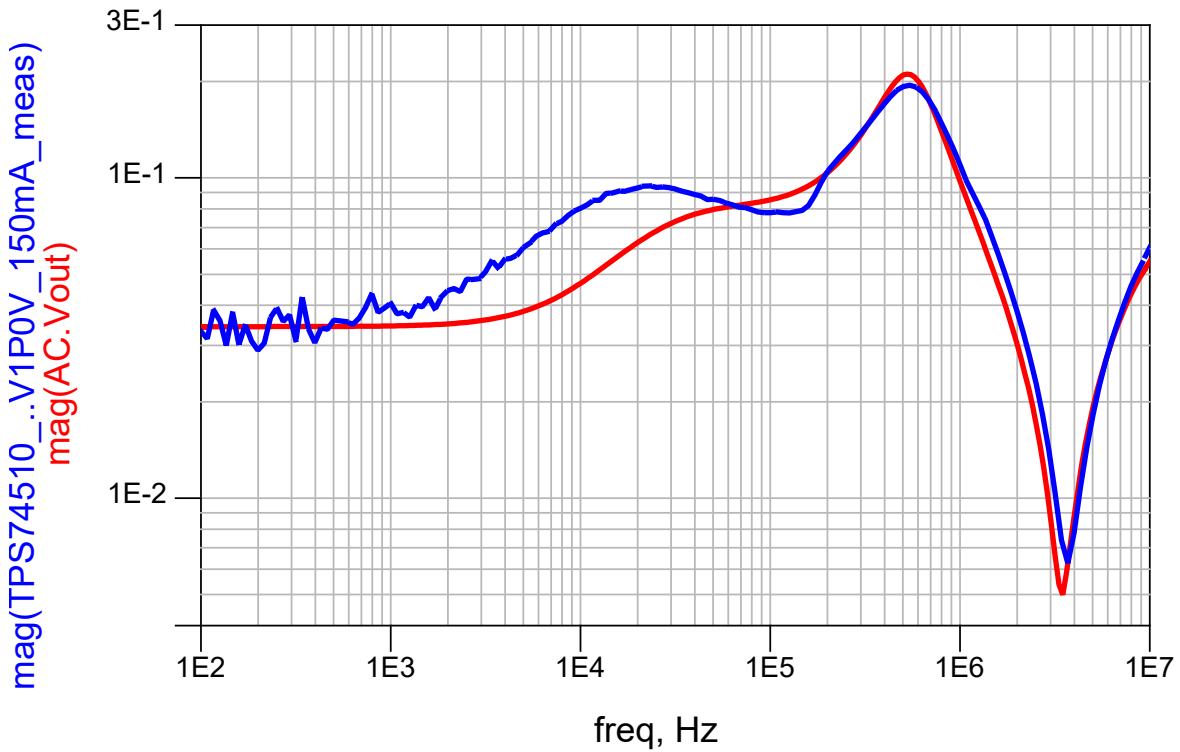


Figure 2.1-4: Measured impedance plot (blue) and ADS model plot (red) of the +1.0V TPS74510 EVAL board with a 150mA load current.

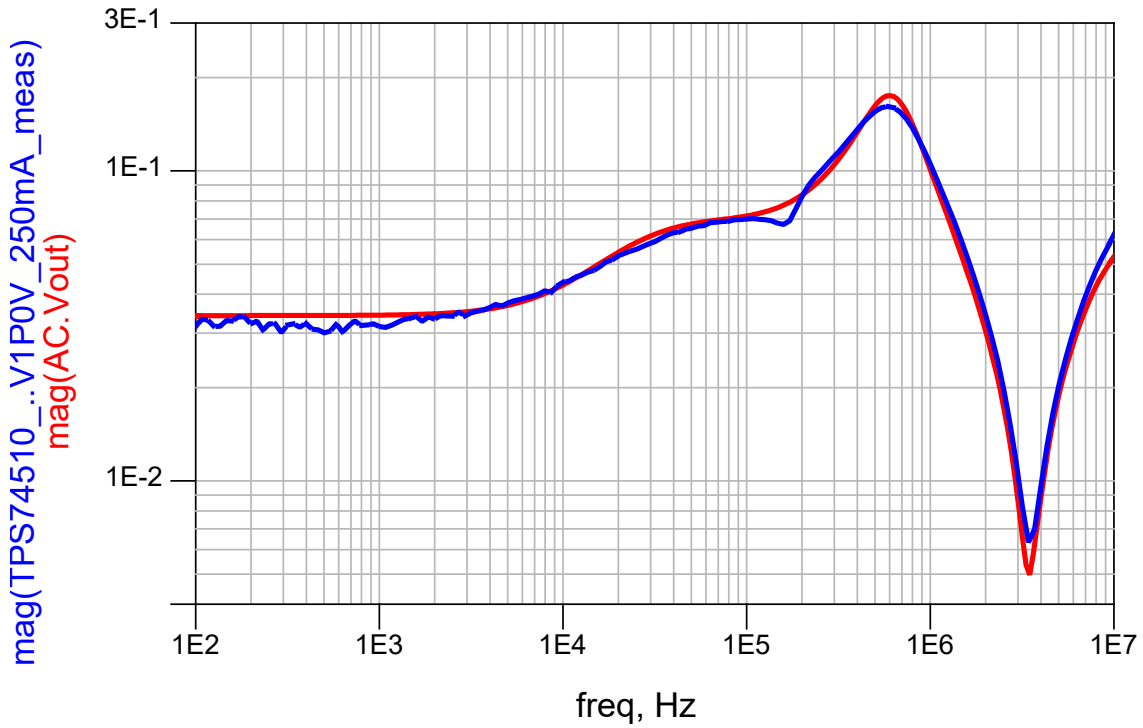


Figure 2.1-5: Measured impedance plot (blue) and ADS model plot (red) of the +1.0V TPS74510 EVAL board with a 250mA load current.

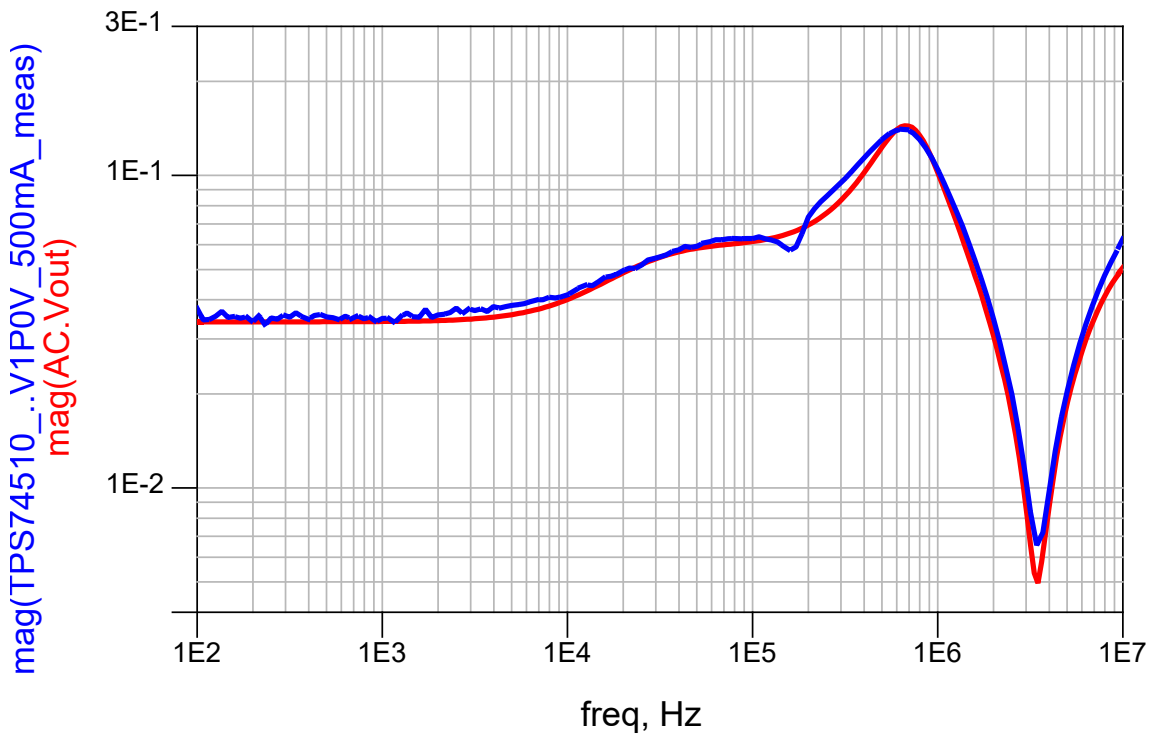


Figure 2.1-6: Measured impedance plot (blue) and ADS model plot (red) of the +1.0V TPS74510 EVAL board with a 500mA load current.

The ADS model impedance plot matches the measured plot with an acceptable accuracy at low load currents. However, it correlates well at higher load currents.

## 2.2 Model & Correlation

### AC Model

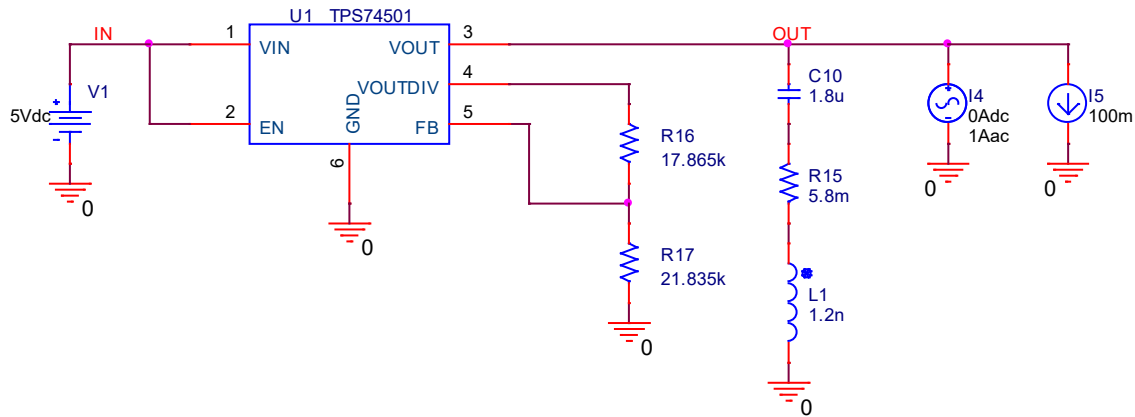


Figure 2.2-1: Schematic of the modeled +1.0V TPS74501 regulator based on measured data for AC analysis.

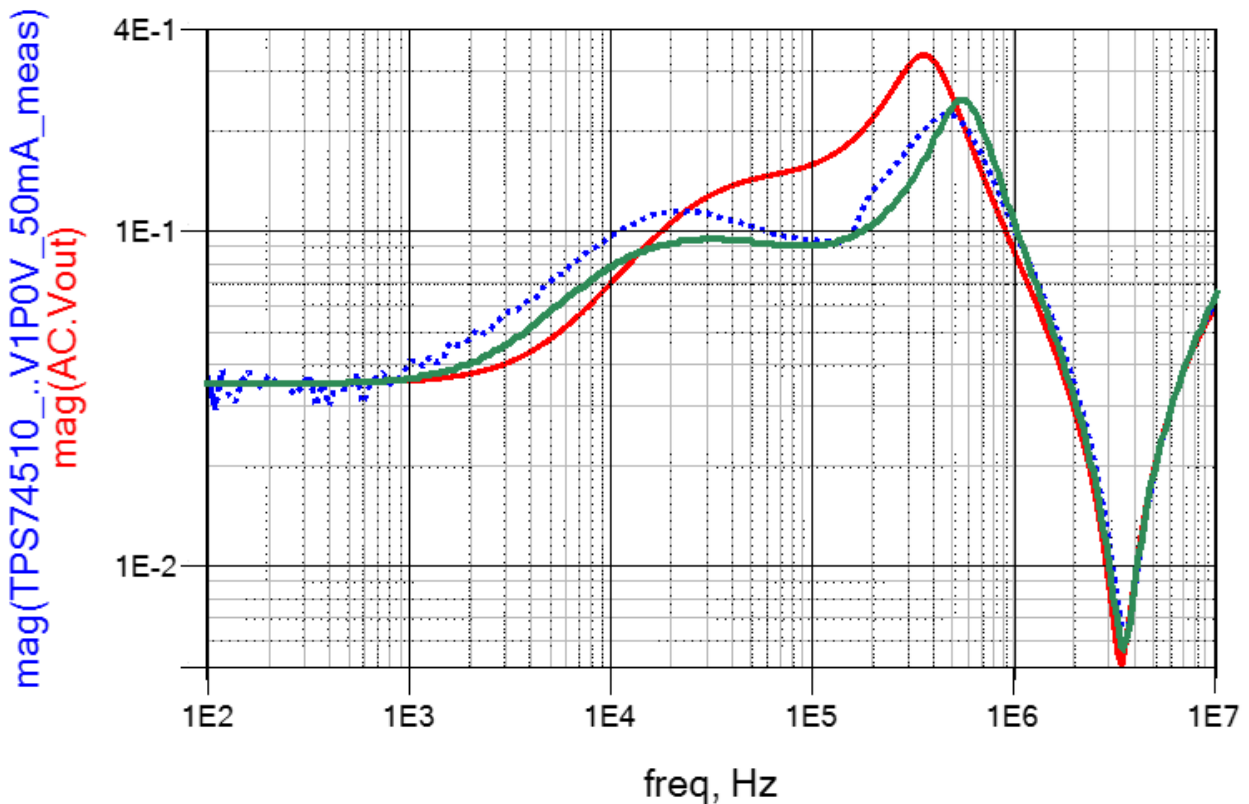


Figure 2.2-2: Overlaid results of the impedance curves between the measured model (red) and the simulated model (green) with a 50mA load current.

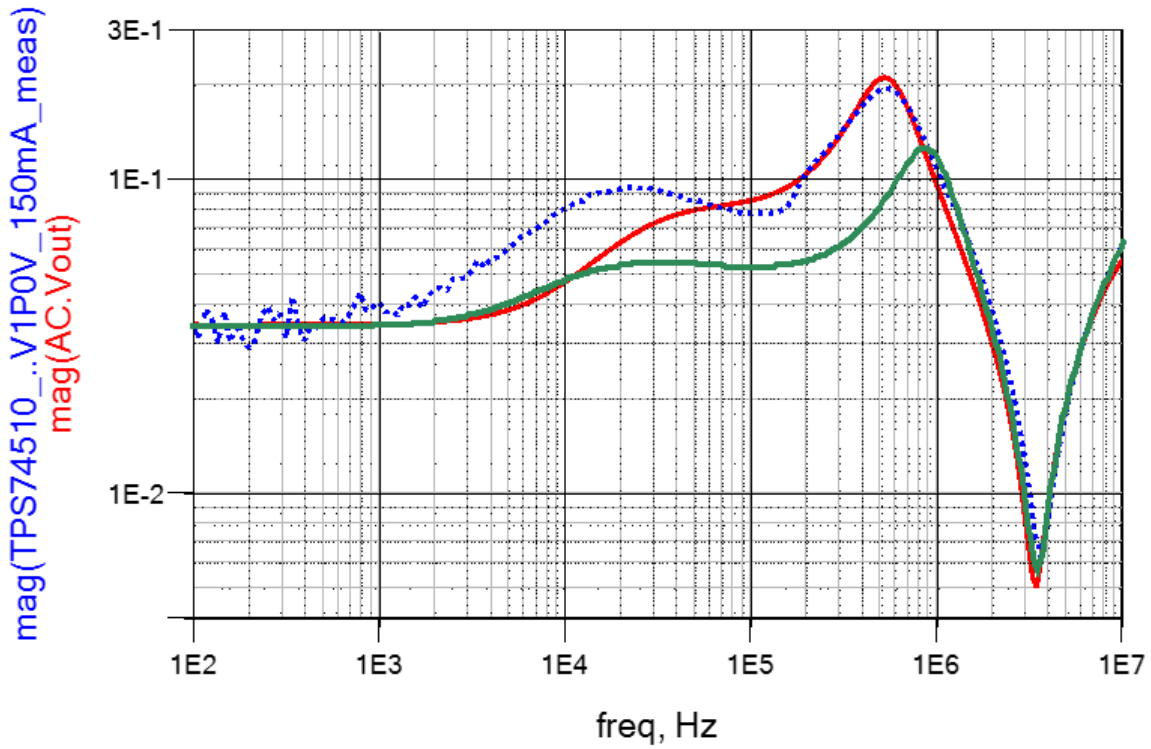


Figure 2.2-3: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) at 1V with a 150mA load current.

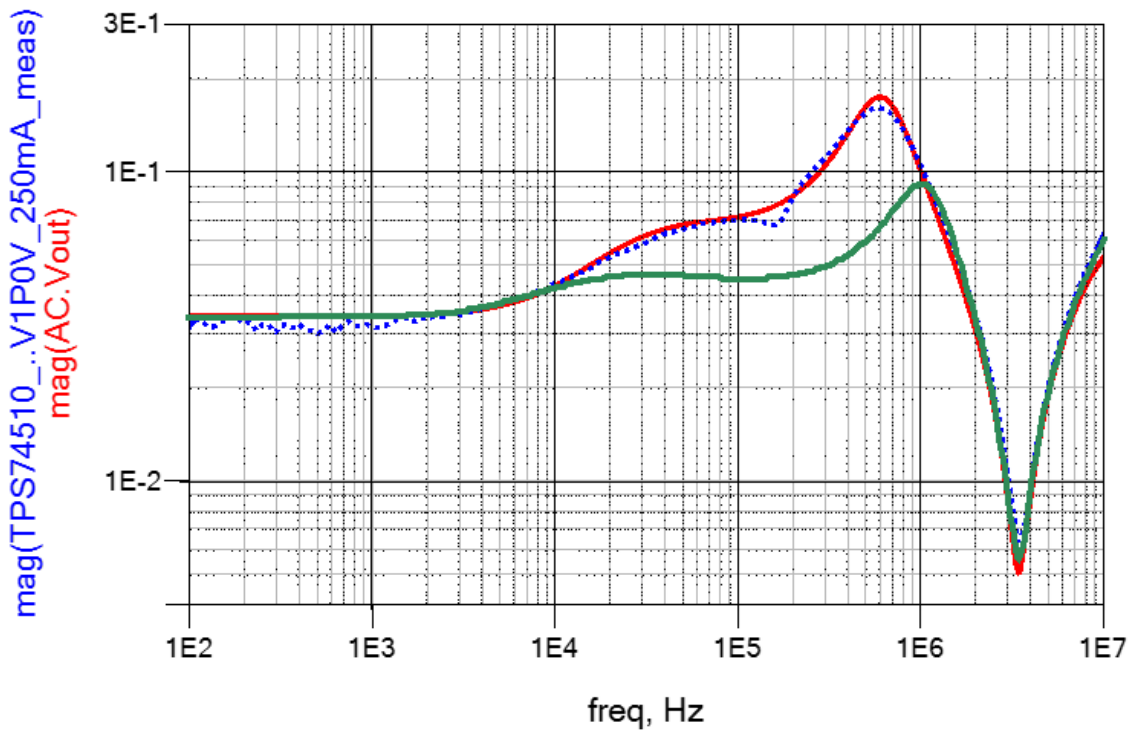


Figure 2.2-4: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) at 1V with a 250mA load current.

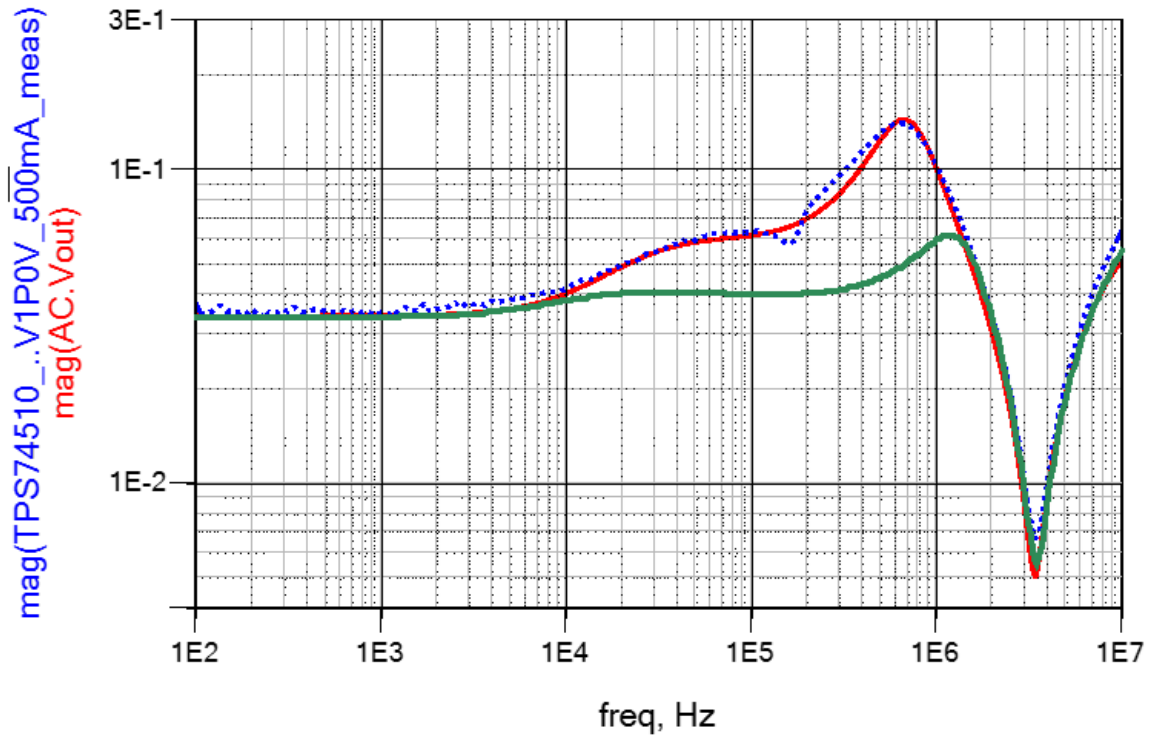


Figure 2.2-5: Overlaid results of the impedance curves between the measured model (blue), ADS model (red), and the simulated model (green) at 1V with a 500mA load current.