5.4 TL431 ADJUSTABLE SHUNT REGULATOR

5.4.1 Scope

The purpose of this analysis is to model the TL431 Adjustable Shunt Regulator

Description:	TL431 Regulator
Performed by:	AEi Systems, LLC, Info@AENG.com, www.AENG.com
Last Rev Date:	3/17/2005
Publication Number:	TL431/D
Revision	Rev. 1
SPICE File	TL431.cir

5.4.2 Functional Description

The TL431 is a three-terminal programmable shunt regulator. One of the terminals is a 2.495V reference, as long as sufficient voltage is present at the cathode. The unit is in regulation with the output signal scaled down through two resistors and feedback to the reference voltage input.

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5.4.3 Assumptions

1. The temperature for this model is 25 degrees centigrade.

5.4.4 Methods of modeling

The dynamic open-loop voltage gain of the model was simulated and the result was correlated to the published data points. The SPICE test fixture is shown in figure 5.4.1. The simulation waveform result is shown in figure 5.4.2 with the data sheet response in 5.4.3.

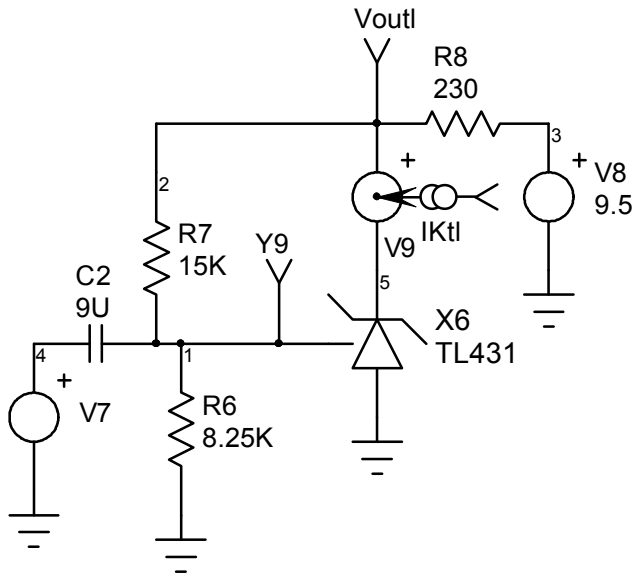

Figure 5.4.1. SPICE test fixture for Open loop Dynamic Gain.

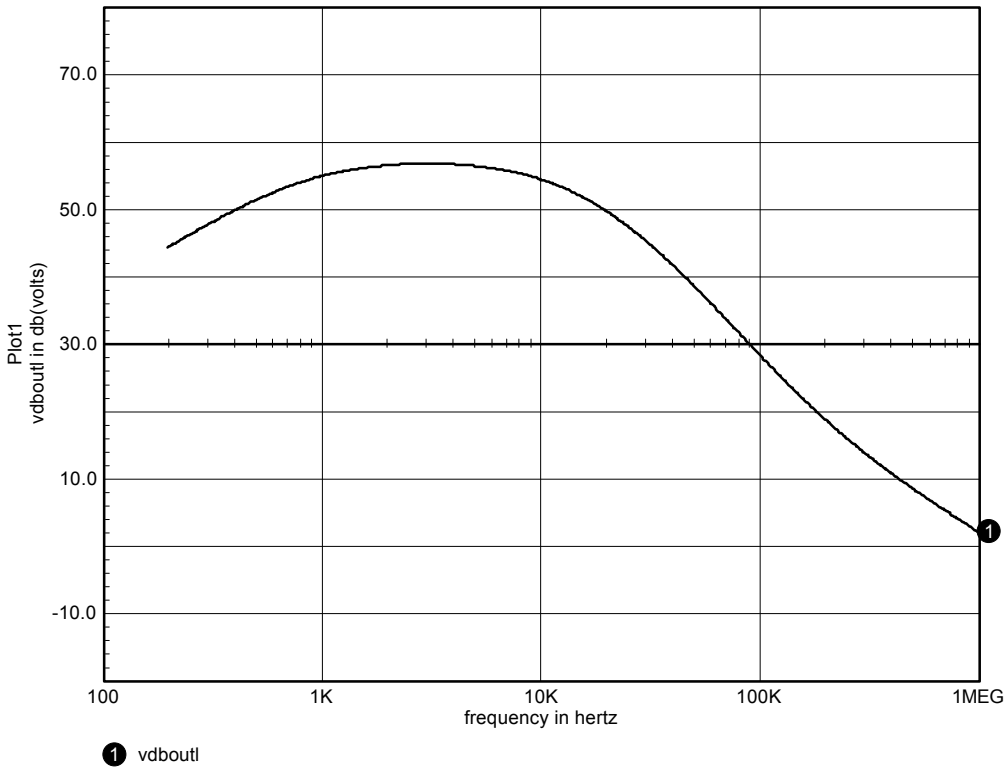

Figure 5.4.2: SPICE waveform of Open-Loop Voltage Gain Vs Frequency

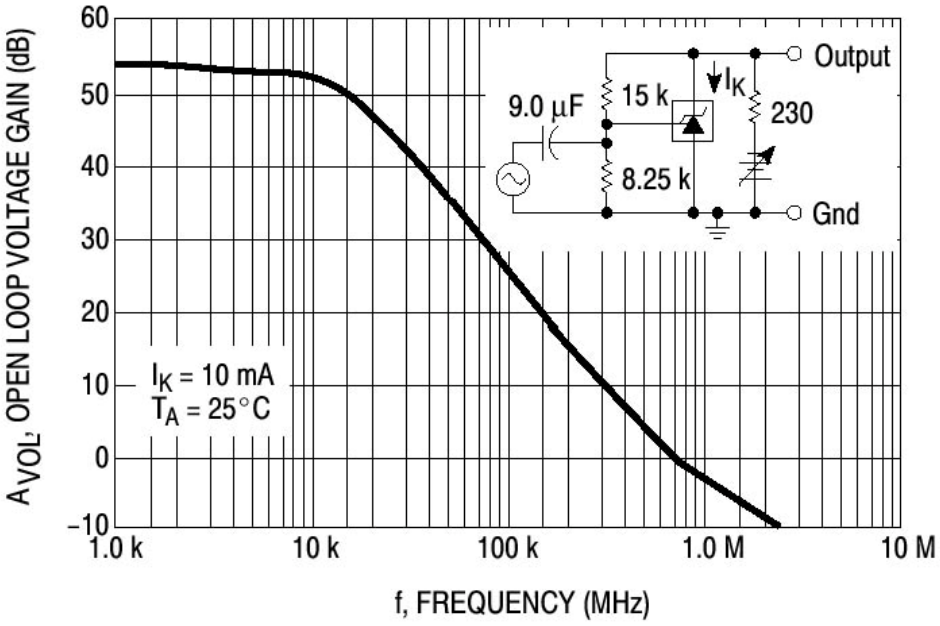

Figure 12. Open–Loop Voltage Gain versus Frequency

Figure 5.4.3. Open loop Dynamic Gain as shown in the data sheet.

The pulse response of the model was also simulated with the test circuit and results in figure 5.4.4.

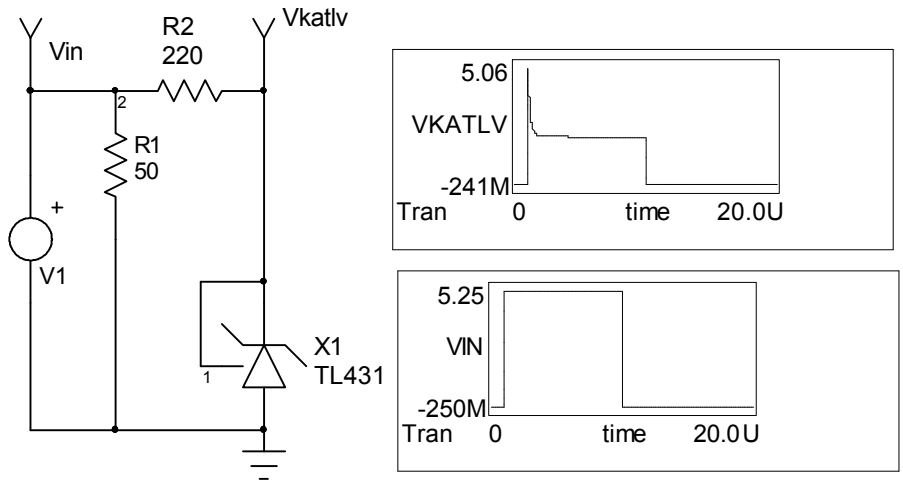

Figure 5.4.4. Pulse response.

5.4.5 Conclusions and Recommendations

The SPICE simulation result of the reference output voltage was 2.495Vdc, and the Open-Loop Voltage Gain and pulse response simulation results are in agreement with the published data sheet.