國立陽明交通大學 電機工程學系

Department of Electronics and Electrical Engineering

Power Supply Design & Device Measurement

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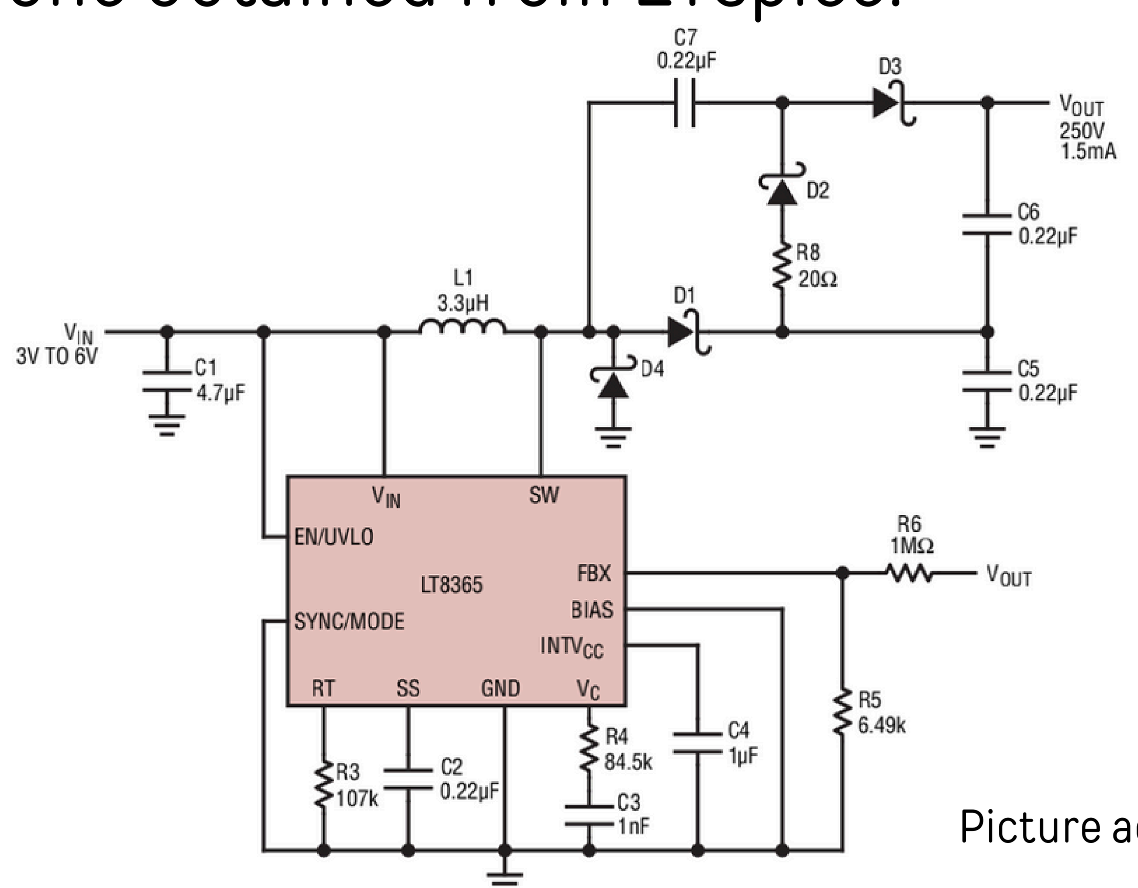
Introduction

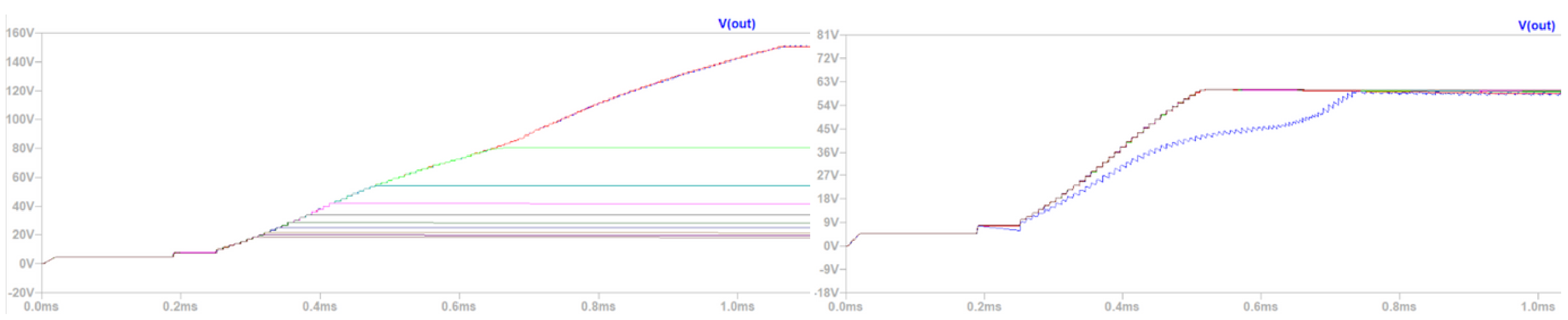
At the beginning of the semester, our goal was to design and implement a 60V power supply using a Raspberry Pi and the IC. The reason for conducting research on this project was to miniaturize the device and make it portable. However, when we searched for relevant information on the Internet or reviewed some research papers , we discovered that most of them convert 5V to 60V with coils which are too large for our device. Therefore, we tried to figure out how to achieve our goal with boost converters.

Stimulation & Implementation

We chose LT8365 to boost 5V that supplied by a Raspberry Pi to 60V. The circuit below is the one I adapted. In the stimulation process, we were able to achieve the results close to the expected value by adjusting R5 and R6. However, as we implemented the circuit on the breadboard, there was significant discrepancy between the measured value and the one obtained from LTspice.

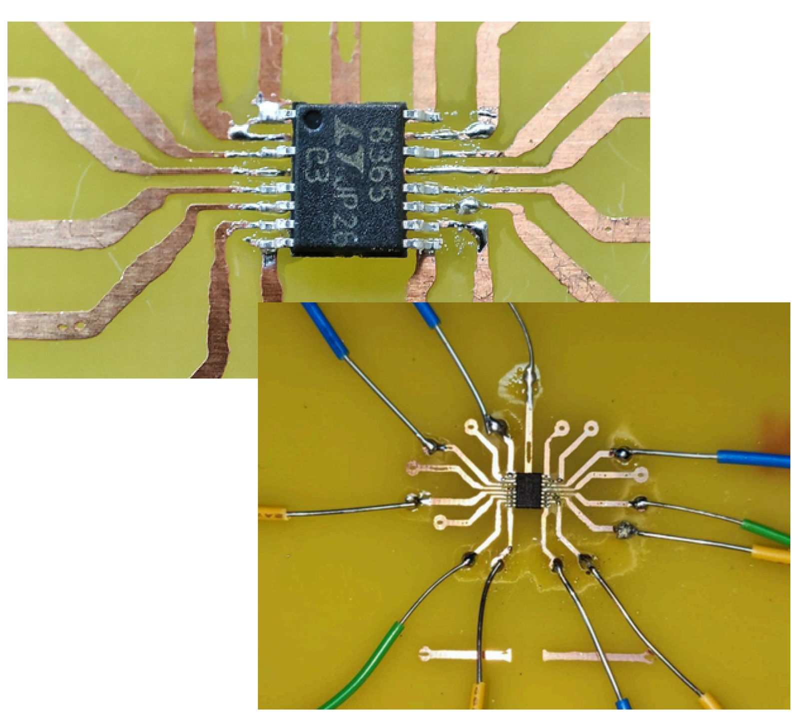


Picture adapted from LT8365 datasheet.



LTspice stimulation result. The figure on the left side shows that Vout is closely correlated with the ratio of R5 to R6. The one on the right side shows that as we increase the value of Rout, the voltage will be more stable.

Before testing the results in practice, we encountered a challenge. LT8365 is too small to be placed on the breadboard, so we had to attach it to a PCB board, as shown in the right figures.

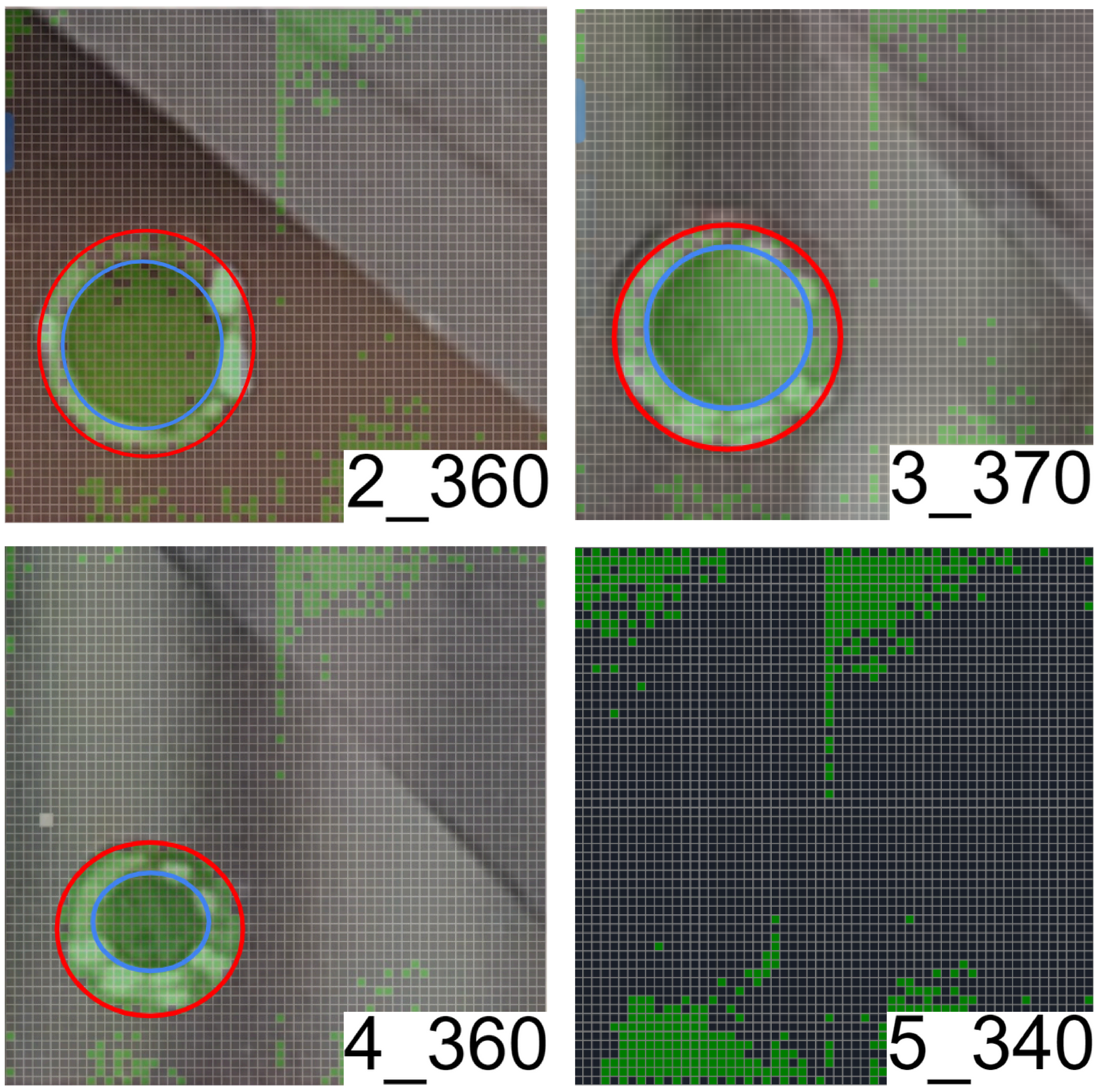


In the actual measurement, the result deviated significantly from the theoretical prediction performed on LTspice. There was only 10V on Vout.

The reason why the results from LTspice and from actual measurement had huge different included inaccurate models on LTspice, component tolerance in practice, and non-ideal component behavior. It was a tough task to figure out the problem and address it.

Sensing measurment

In addition to the circuit measurement, we also measured the accuracy of the droplet sensing device.



In the four figures above, "x_abc" provides some information. 'x' indicates that the distance between the ITO glass and microelectrode (coated with passivation and Teflon) is 'x' layers of iron shims. Besides, 'abc' stands for the DPDG value.

When x was 5, the device could not identify the location of the droplet, which might be caused by the possibility that the ITO glass didn't make contact with the droplet to deliver the signal.

Reference

1. M.-F. Shiu and C.-Y. Lee "System Integration of Field-Programmable Lab-on-a-Chip (FPLOC) for Biomedical Detection," Oct. 2015.
2. Y.- S. Chan and C.-Y. Lee "A Programmable Bio-Chip with Adaptive Pattern-Control Micro-Electrode-Dot-Array," Nov. 2022.