ABSTRACT

The 3.7V 2600mAh Li-Ion battery by Tenergy Corporation requires a charging DC voltage of 4.2 V. In this application, the supplied power voltage to the circuit will be 5 V, provided by the Micro USB port. The LMR10515 Buck Converter is to be used to step-down this input voltage of 5 V to an output voltage of 4.2 V so that it can be used to charge the battery. The LMR10515 should output a desired voltage with an input voltage between 3.0 V and 5.5 V. 5 Vis applied to the input node of the LMR10515 evaluation board. LMR10515 output voltage is analyzed for verification of desired operation.

THEORY

The output voltage of the LMR10515 is determined by the following equation:

$$V_{out} = 0.6(1 + R1/R2) \quad (1)$$

Where R1 and R2 are the two resistors making up the feedback voltage divider circuit, as shown in the schematic below:

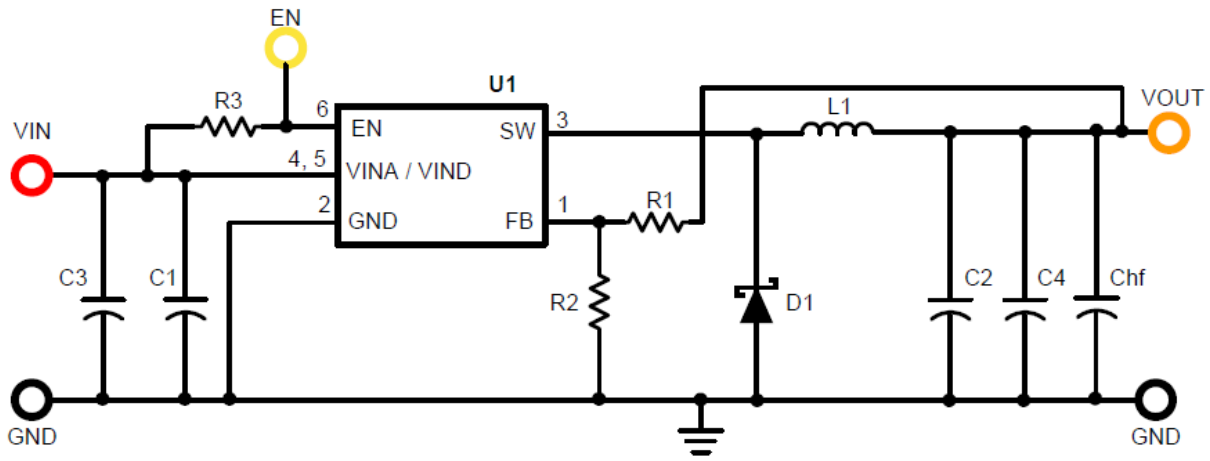

Figure 1. LMR10515 Demo Board Schematic

The values for R1 and R2 in the dev board used for testing are R1 = 20 kΩ and R2 = 10 kΩ. Consequently, the output voltage of the DevBoard test is expected to be 1.8 V.

RESULTS

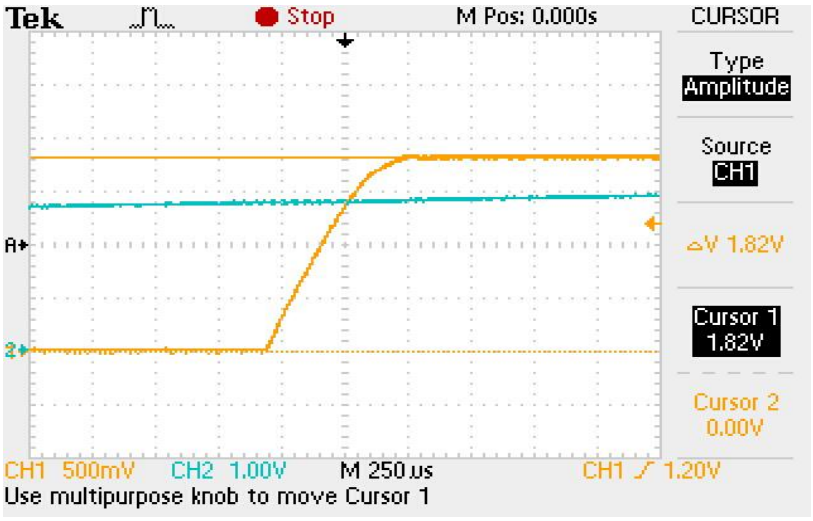

Figure 2. Input and Output Voltages of LMR10515 Dev Board when input reaches 3.0 V

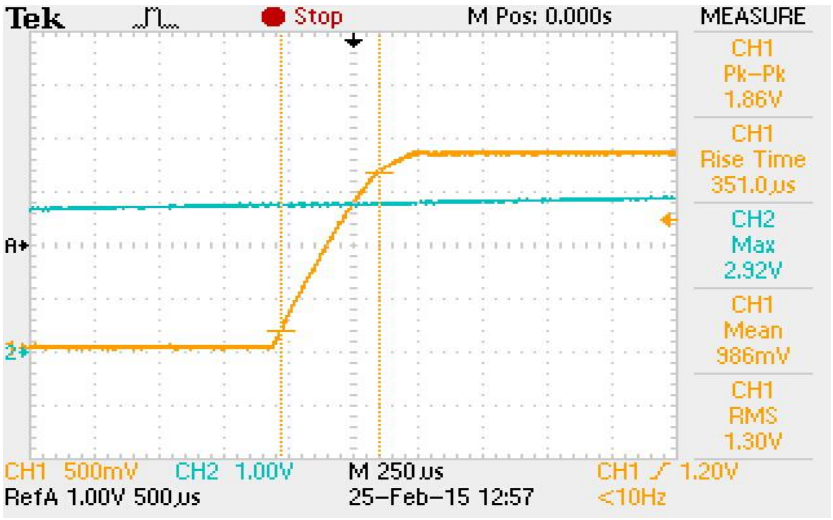

Figure 3. Timing Diagram of Figure 2; depicting output voltage rise time

Figure 2 shows the LMR10515's output voltage (orange) when its input (blue) reaches about 3.0 V. Input voltage increased 1.82 V, giving a percent error of 1.11%. Rise time of the output voltage came out to be about 351 µs.

CONCLUSION

Applying Equation 1 to our desired application, $V_{out} = 4.2\,V = 0.6(1 + R1/R2)$, $(R1/R2) = 6$. Keeping R1 at a resistance about six times that of R2 should provide the desired results. Application of these feedback resistors (R15 and R12) is shown in the figure below:

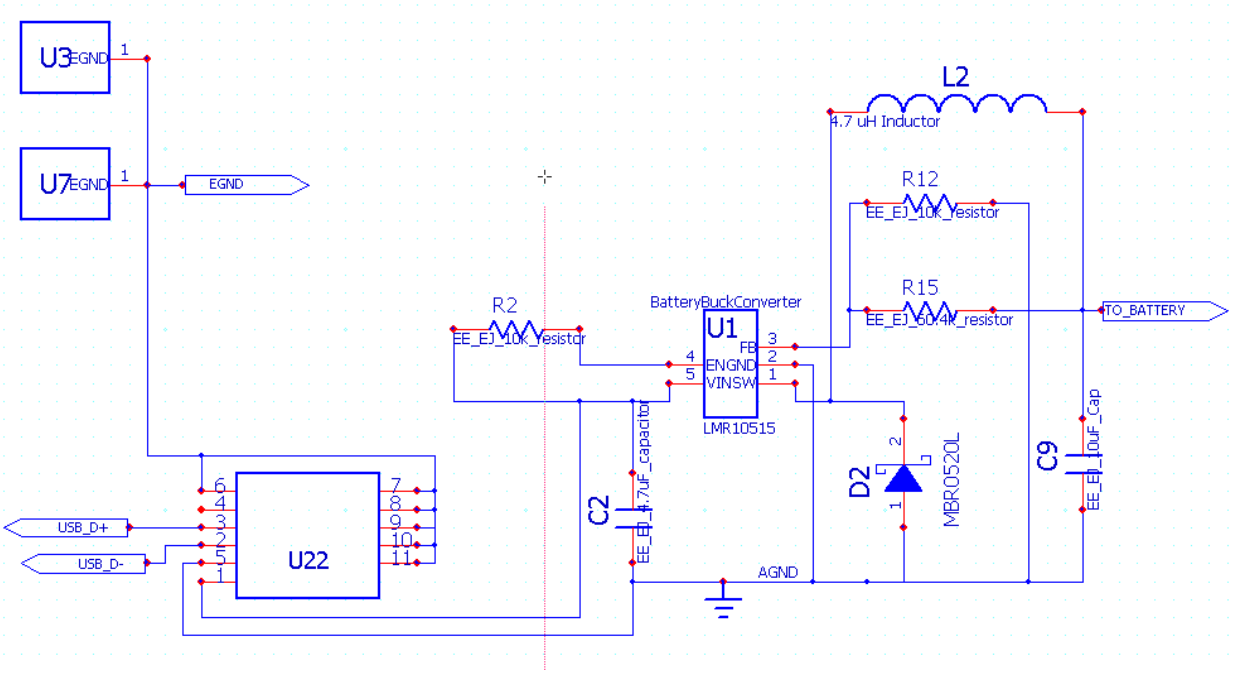

Figure 4. Schematic Drawing of LMR10515 circuit used in PCB design

Key Hardware Used:

LMR10515 Buck Regulator Demo Board: http://www.ti.com/tool/LMR10515YSDDEMO