LT3991 55V, 1.2A Step-Down Regulator with 2.8µA Quiescent Current (Datasheet)

December 4th 2017

Parameter	Range
Input Voltage (V)	4.3 to 55
Output Voltage Range (V)	1.19V to 30V
Quiescent Current (µA)	2.8
Output Current (A)	Max 1.2
Operating Temp (°C)	–40°C to 125

Table 1 : LT3991 Specifications [1]

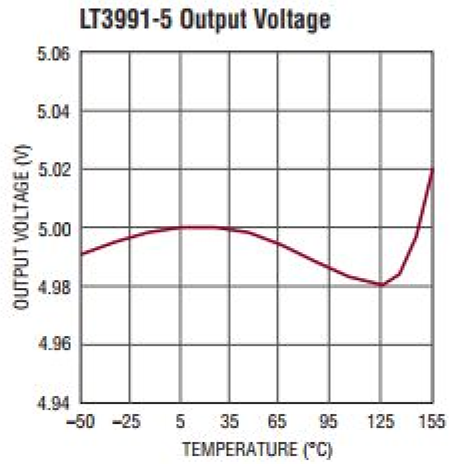

Figure 1 : Temperature v.s. Output Voltage [1]

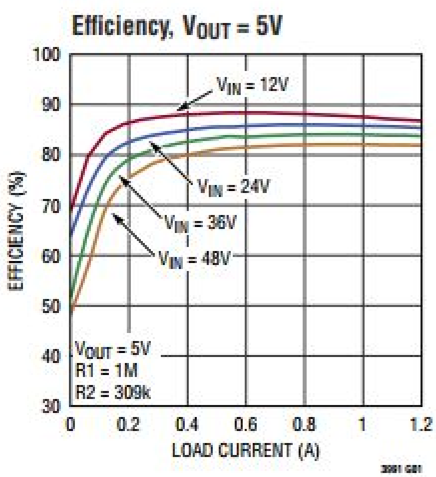

Figure 2 : Load current v.s. Efficiency [1]

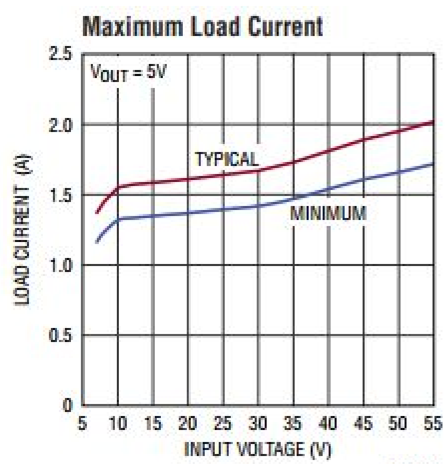

Figure 3 : Load Current v.s. Input Voltage[1]

Simulation:

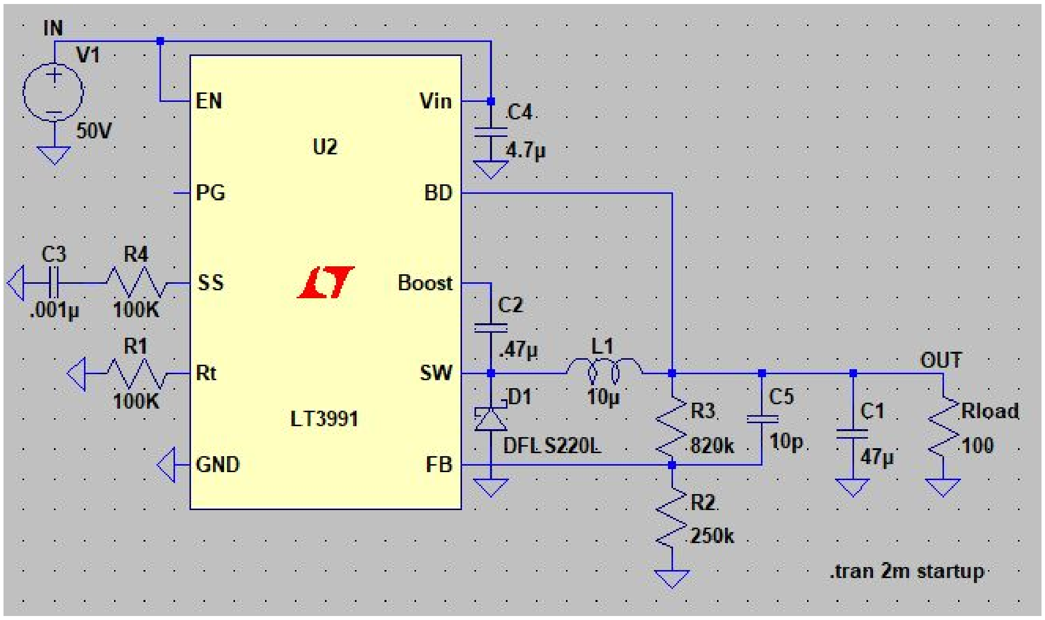

Figure 4: Voltage regulator schematic [1]

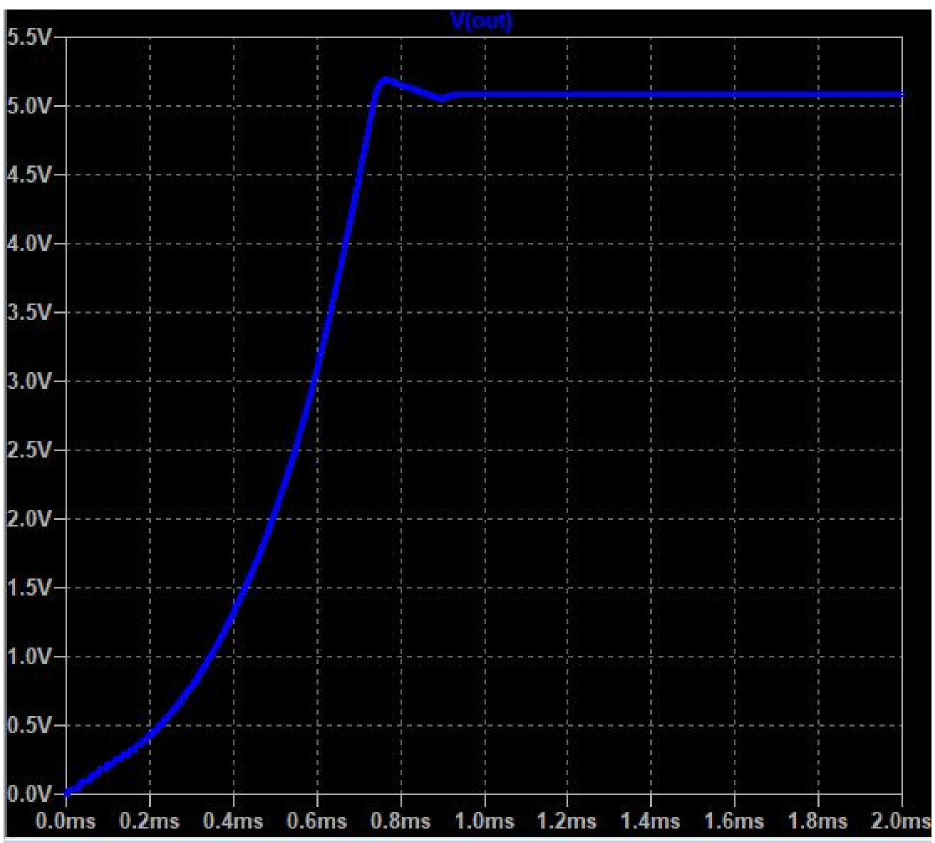

Figure 5 : V_{out} when V_{in} = 50 V

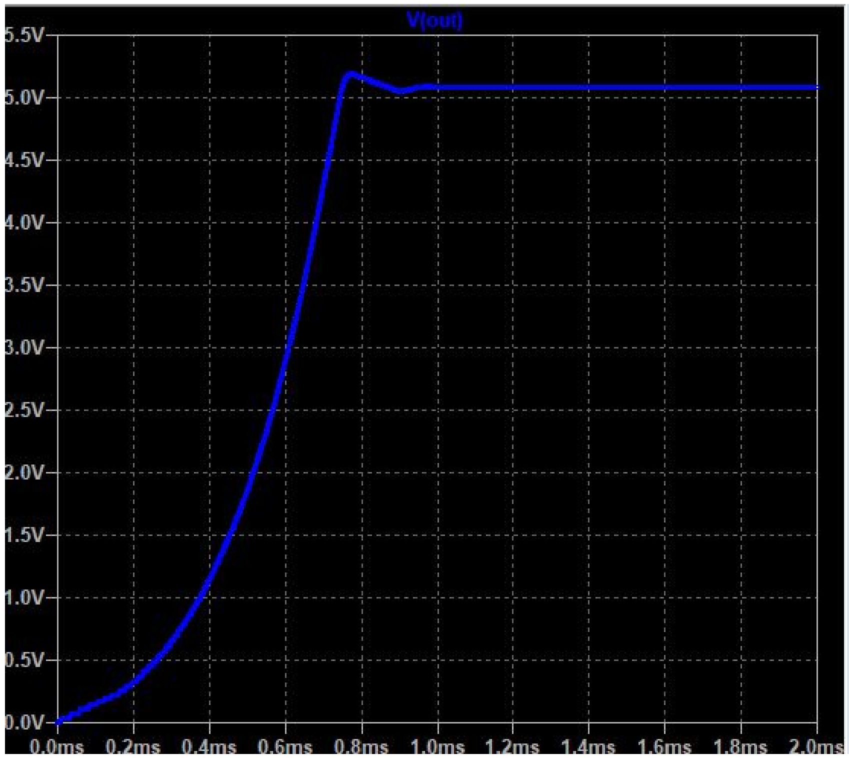

Figure 6 : V_{out} when V_{in} = 24 V

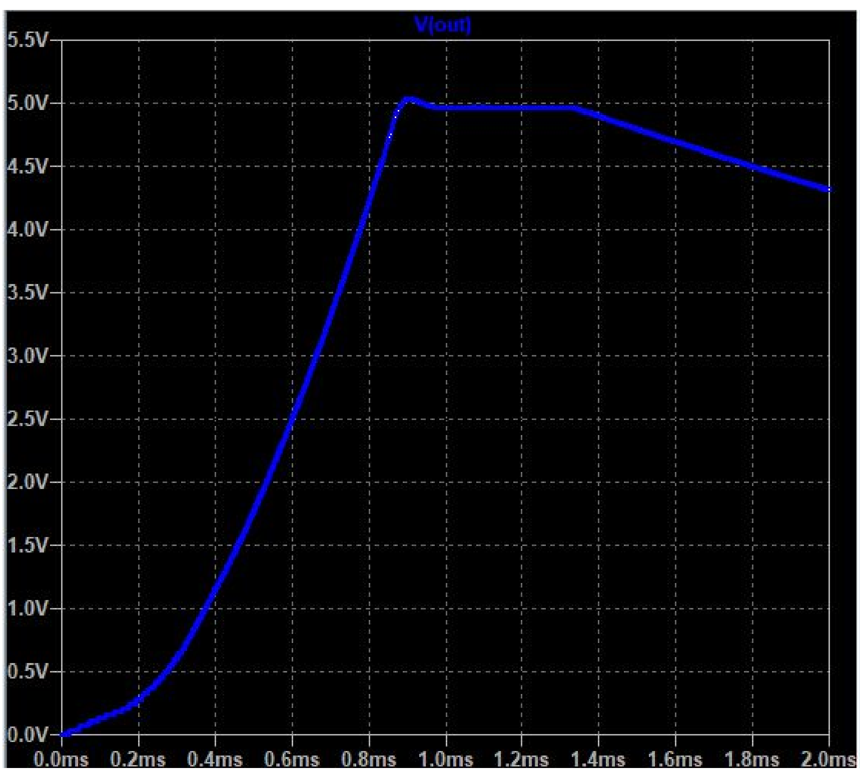

Figure 7 : V_{out} when V_{in} = 5V

Justification:

One of the main goals of our project is to design a system that has minimum power loss when its working.So linear voltage regulators would not be an option due to their high power dissipation.Therefore,LT 3991 step-down (buck) converter is chosen.The output voltage of LT 3991 seems to be steady between 5℃ and 40℃ and expected to be about 5.00V when set up as shown in Figure 4.Let's look at the extreme cases.When the IC is exposed to -50℃ the output voltage of the regulator is nearly 4.99V.The percentage difference between 5.00V and 5.00V is 0.2%,so this decrease in the output voltage of the regulator is acceptable for our project.The expected output voltage swing from PV Panels would be between 4V to 55V.Using this information we can say that efficiency of LT 3991 expected to be between 70% and 85% depending on the input voltage fed into it and when the load current is between 0A and 0.8A as shown in Figure 2.In Figure 3,maximum load current v.s. input voltage plot of LT3991 is shown.According to our calculations in the document XXXXX, we don't expect to draw more than 1A from the voltage regulator LT 3991,so our need from the regulator is in the range of the limits,from 1A to 1.5A, given in this plot.We are planning to use the design shown in Figure 4.When this schematic is simulated in LTSpice,with Vin = 40V from PV Panels,the output voltage of LT 3991 reaches to 5.00V in about 1 ms.When the input voltage of LT 3991 is changed to 24V the output voltage reaches to 5.00V in about 0.6 ms again.Let's say,as an extreme case,the input voltage of LT 3991 is 5V,the output reaches to 5.00V in 0.9 ms but falls below 4.5V after 1.4 ms.This means that the input voltage of the buck converter **should not be less than** 5V in order to get 5V regulated V_{out} from it.The quiescent current of LT 3991 is expected to be 2.8μA when no regulation at all.Overall performance of LT 3991 meets our engineering requirements for the project and meets our expectations.

Reference:

[1] Linear Technology LT 3991 Component Datasheet, 2009. [Online]. Available: http://cds.linear.com/docs/en/datasheet/3991fa.pdf. [Accessed: Dec-2017].