December 11 2017

LTM 8045 - Inverting or SEPIC µModule (Power Module)
DC/DC Converter with Up to 700mA Output Current
(Datasheet)

IC Features:

- Wide Input Voltage Range: 2.8V to 18V
- Up to 700 mA Output Current at V_{in} = 12V,V_{out} = 2.5V or -2.5V
- Up to 375 mA Output Current at V_{in} = 12V,V_{out} = 15V or -15V
- Storage Temperature : –55°C to 125°C

Schematic:

Note: The following schematic is a -5V DC/DC converter design.

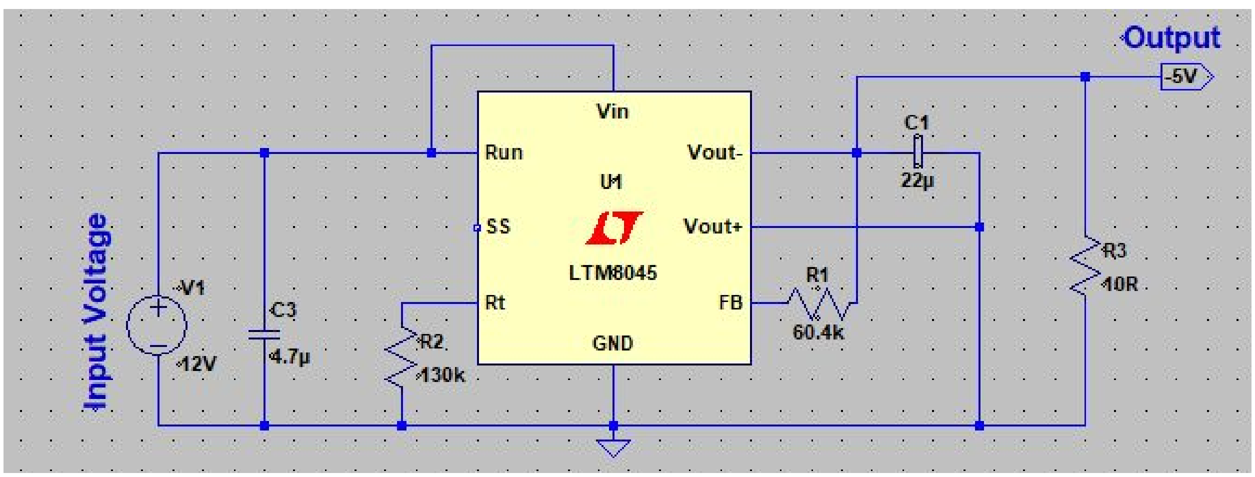

Figure 1 : LTM8045 - DC/DC Converter design from its datasheet

Bill of Materials:

- Capacitors : 4.7µF/16V,22µF/16V
- R_1:60.4kΩ,R_2:130kΩ,R_{Load}:10Ω,5Ω,3Ω
- DC/DC Converter : LTM8045

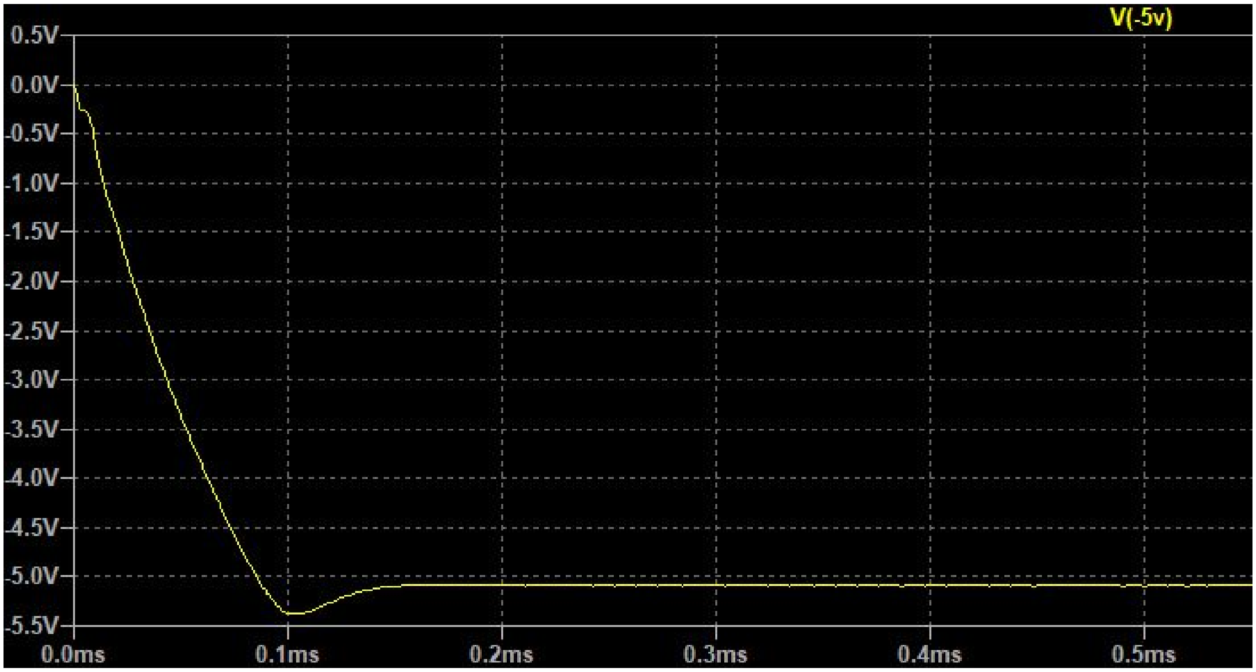

Figure 2 : LTM8045 - Converter Output Voltage when R_{Load} = 10 Ω

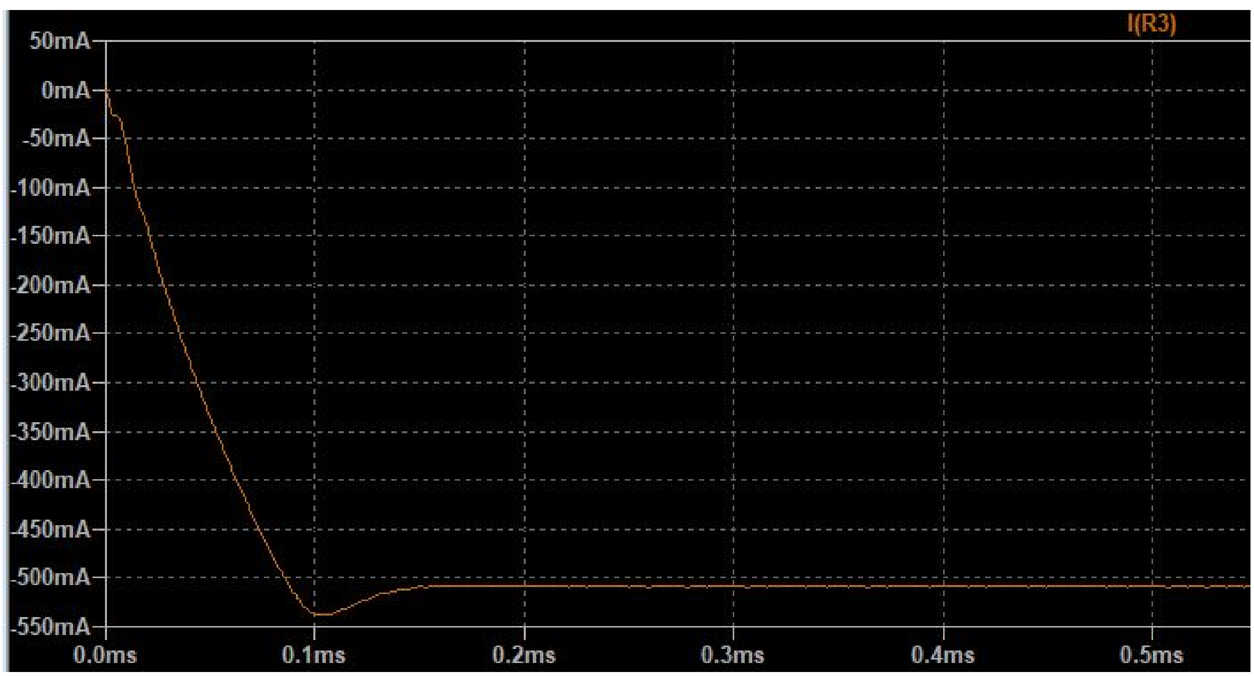

Figure 3: LTM8045 - Converter output current through R_{Load} when R_{Load} = 10 Ω

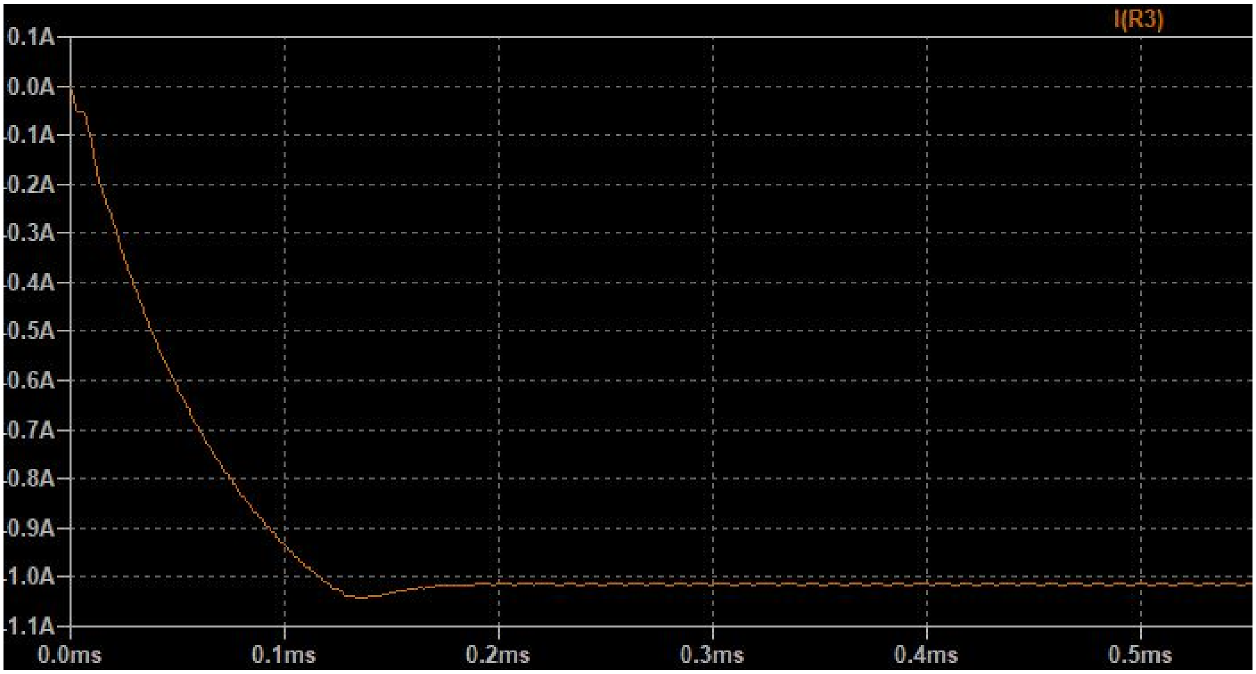

Figure 4 : LTM8045 - Converter Output Voltage when R_{Load} = 5 Ω

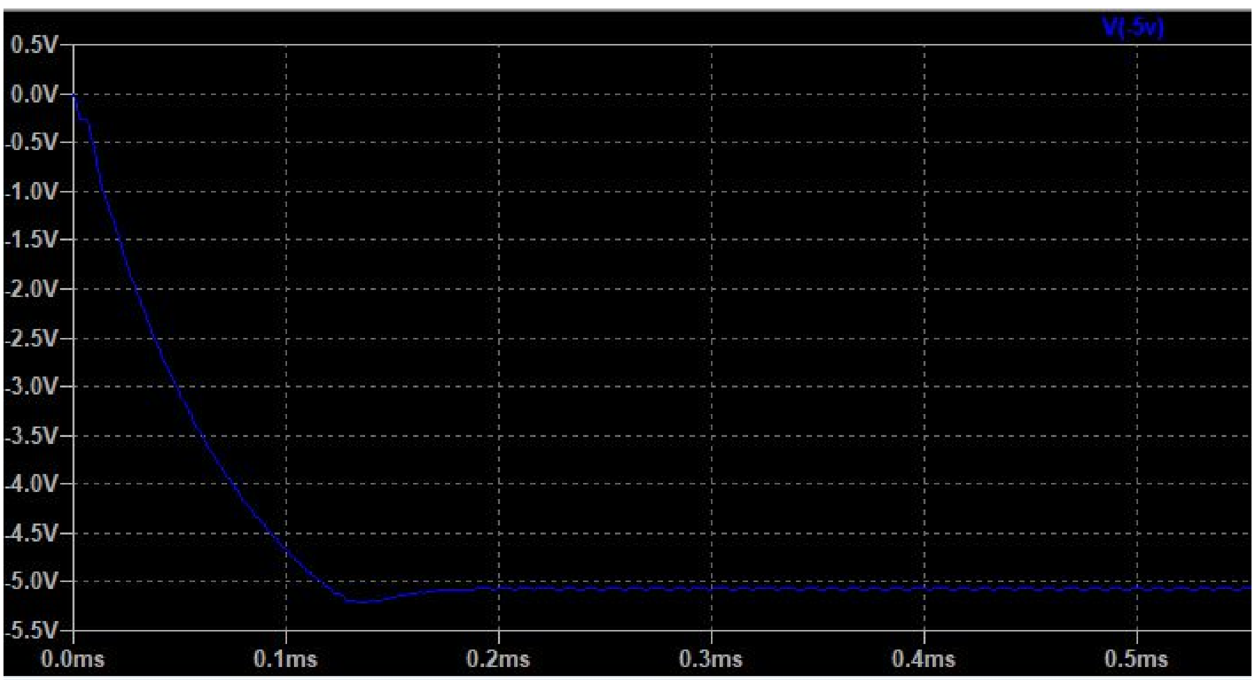

Figure 5 : LTM8045 - Converter Output Voltage when R_{Load} = 5 Ω

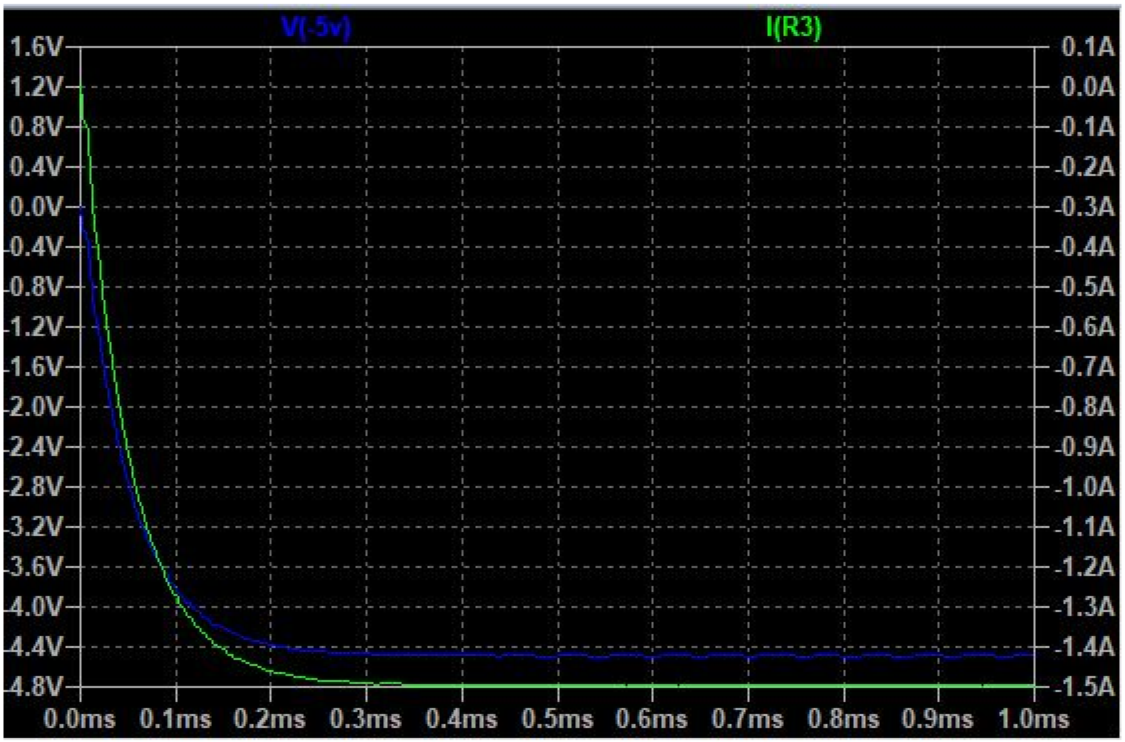

Figure 6 : LTM8045 - converter output voltage and current when R_{Load} = 3Ω

Results:

LTM8045 was randomly picked to design a μModule DC/DC converter.First step in the design was of course to make the schematic of the DC/DC converter.Exactly the same components were picked in the given -5V DC/DC converter schematic,as shown in Figure 1,in the datasheet of the IC.In order to draw about 0.5A from the converter a 10Ω was placed as a load.In Figure 3,it can be seen that the peak output current at 0.1 ms was actually more than -0.5A,nearly -0.55A.This is significant and should be taken into consideration when used with actual loads other than just resistors.After 0.1 ms,the output current of the converter went to nearly -0.5A and became stable.In Figure 1,the output voltage is shown.Figure 1 and Figure 2 are actually very similar.Current and Voltage response of the converter look very alike.The converter's output voltage climbed to nearly -5.25V after 0.1 ms its powered.This is pretty much the same response as in Figure 2 since there is a relationship between voltage and current.After 0.1 ms,the output voltage went to nearly -5V as expected.In order to test the converter,the load resistor was changed to 5Ω to draw more current from it.The current and voltage response of the converter is similar but this time the peak shown in Figure 1 and Figure 2 is shifted about 0.05 ms to the right as shown in Figure 4 and Figure 5.From the converter,the nominal current drawn was 1A but at about 0.15 ms it was 1.05A.Similarly the voltage output was about -5.25V. In order to test the converter's limits,it was pushed to draw -1.66A (nominally).Expectedly,the output voltage dropped to -4.4V instead of -5V.This is unwanted.So one should be aware of how much can be drawn from the DC/DC converter.

Let's look at the performance of the converter from another point.The peak efficiency of the IC can be obtained when the output current is beyond 0.4A (with V_{in} : 12V) as shown in the efficiency plot below.When the output current is let's say 10 mA,the expected efficiency is about 7%.This is very low for efficiency.Wasted power can cause significant problems especially in battery-powered systems.Also the minimum required voltage required to be able to draw 0.6A is about 12V.Heat sink would be needed in the converter design because as the output current is increased,the internal temperature of the IC increases (about 20°C @ 0.4A)

Appendix A :

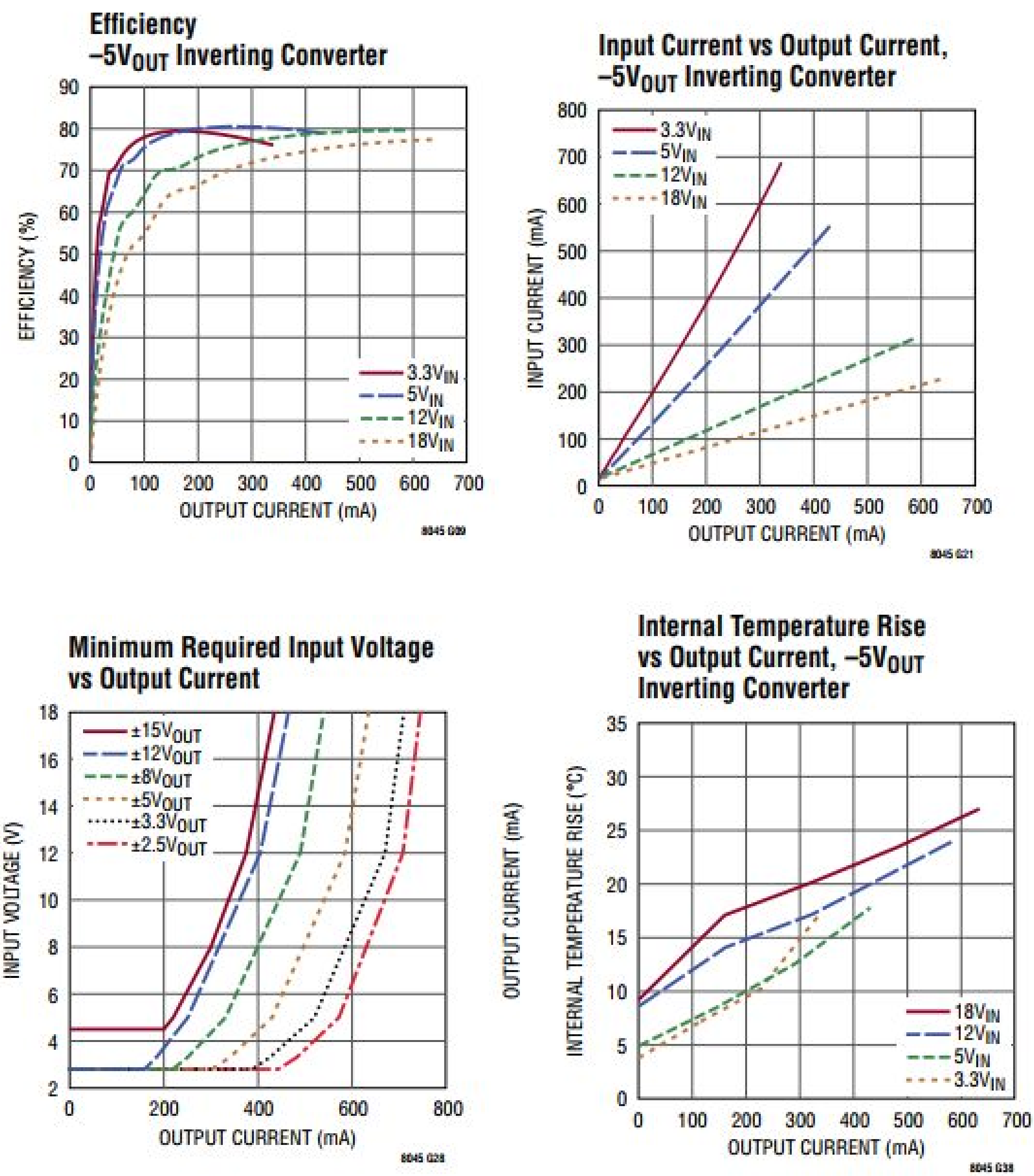

Figure A.1: LTM8045 Performance Characteristics