Design of a suitable high power low-cost buck convertor

NEED

Our bot has 4 motors each of which draws a high starting current of about 4A which then drops to about 0.15A. However, due to the high starting current drawn the power supply from the buck convertor we currently use is not sufficient to supply enough current to the circuit. As a result, the ESP gets reset and

Design goals

* Must be able to handle currents upto 20A
* Must output constant voltage of around 12V
* Must be small in size to fit in bot easily

Based on these design objectives we ended up with 4 viable options

1. Use pre-built buck convertor rated at 20A. Link to the seller website : <https://www.banggood.in/DC-6-40V-To-1_2-36V-300W-20A-Constant-Current-Adjustable-Buck-Converter-Step-Down-Module-Board-p-1203369.html?gmcCountry=IN&currency=INR&createTmp=1&utm_source=googleshopping&utm_medium=cpc_bgcs&utm_content=garman&utm_campaign=pla-ing-ele-pc&ad_id=356287887298&gclid=Cj0KCQjw6cHoBRDdARIsADiTTzZaWtpND105dV-5tQmtsgrLHA1cMyeqgLP_4Vplg8v_3ikzyjJRHGAaAkIaEALw_wcB&cur_warehouse=CN>
2. Use 2 10A rated buck converters and adding the current outputs.
3. Using microcontroller like Atmega-8A or AT-Tiny85 to take feedback from the output and supply constant voltage using design of the generic buck convertor
4. Use a buck convertor or feedback IC with other auxiliary components – the tradeoff here being whether to go for integrated inductor or integrated switch
5. Designing circuit from scratch – the buck convertor along with the feedback mechanism

Out of the 5 options we thought that the 1st two were just standby options we would resort to only if the others didn`t work out. Option 4 was found useful however not at all economically feasible as the readymade buck convertors were much cheaper than the cost of the ICs. Option 3 is simple yet effective and seems to be the way forward. However, as an attempt to understanding the working of the buck convertor from scratch we decided to try out the last option. We first made the generic buck converter and then added voltage feedback. First we gathered the necessary components the most significant of which were 2200 uF capacitor , a 24 mH inductor and a schottky diode SRC-360 with an interrupt current of 50A.

This part was easy and was successfully implemented as well. The problem came with feedback. The first problem was generation of a triangular wave signal of correct amplitude and frequency. By calculating values effectively we were able to tune the frequency but the amplitude just could not be adjusted. We were using a 555 timer IC. We tried adjusting input voltage to the IC but it kept blowing up. No matter what we did even though it was rated for 16V. Due to this reason we could not complete our summer project. Hence, we will now try to make the triangular wave with op-amps and also implement the 3rd option.