Single Level Inverter Implementation #2

Hey guys! I have an update for you guys on my 7-level inverter project. As I said in my previous post, I was deciding on what parts I wanted to use for the project. Well, I finally finished selecting the parts that I want to use.

Before I talk about the parts, let me tell you guys the design parameters that I wanted to work with. The first parameter is the peak voltage of the AC waveform. I don't want to work with dangerously high voltages, so I chose the peak voltage to be at least 12 volts. As for the operating current, 1A seems like a reasonable number. Since each level is connected in series with each other, the current will not increase (KCL equations). Finally, I don't want the inverter to operate at a high speed, so I'm going with a 60 Hz operating frequency, which is the "ideal" frequency of most grid tied applications. With the parameters listed, let me tell you the major parts I will use for the project.

Figure 1: FQP27P06 and FQP30N06L representation

As shown in figure 1, I will use the FQP27P06 P Channel Mosfet, and the FQP30N06L N Channel Mosfet. Both of these transistors are rated to handle a maximum of 60V between the drain and source. This is much more than the expected peak voltage I will be working with. Although FQP30N06L is rated to handle 32A while the FQP27P06 is able to handle -27A, this is much more than the 1A requirement. The only thing I'm kind of concern about for these transistors are the ratings for the rise and fall times. The FQP30N06L max rise time is 430ns (.43 us) while the FQP27P06 max rise time is 380ns (.38us). However, since the operating frequency of the inverter will be 60 Hz, I doubt this will hurt the output waveform. In fact, the gate driver will reduce the rise and fall times of the Mosfets.

Figure 2: HCPL-3120 representation

For the gate driver, I will go with the HCPL-3120, which can be seen in figure 2. There are two reasons why I'm going with this gate driver. One of the reasons why I'm using this chip is because I've use this chip before. Back at my power electronics research, I built the application circuit listed on the HCPL-3120 datasheet due to sheer boredorm. Another reason is the 2A output current, which is needed to reduce the rise/fall time of the Mosfets. Since the gate of a Mosfet functions like a capacitor, the more current you put into the gate, the shorter the time it takes to charge and discharge the capacitor.

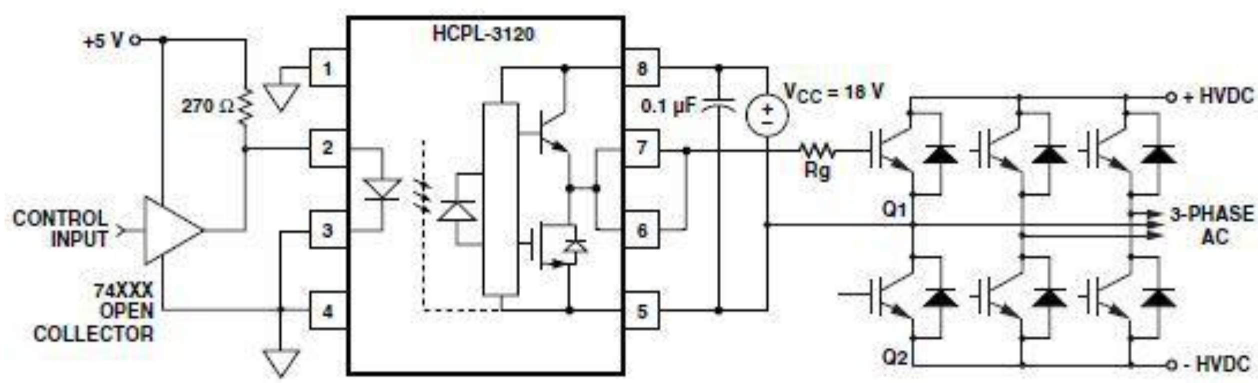

Figure 3: HCPL-3120 example circuit

The rest of the parts I'll go into brief detail. I'll just following the example circuit shown on the datasheet (figure 3). The parts I need to get from the datasheet are the 270 ohm resistor and a .1uF capacitor. The final part I wanted to include in the project is an 8 pin dip, which will make it easier to swap defective gate drivers. Another thing to keep in mind is that I need to get every part I listed in multiplies of three.

What about the PCB? I'll most likely go with dorkbot for the PCB manufacturer. I've been using Dorkbot for two years now, and I trust them with my project requiring a

PCB. Although professional engineers will cringe at this service, this is a really good service for small projects like mine.

Now, when I am ordering all of these goodies? Ideally,I want to say as soon as possible, but realistically I'm going to have to say two-three weeks from now. The reason why is due to Dorkbot. The last time I ordered from Dorkbot, it took 4 weeks for my PCB to arrive home, even though it usually takes 2 weeks for PCB orders to ship out. Since I'm going back to college two weeks from now, I thought it would be better to order the parts when I go back. Not to mention, I can use the lab equipment at my college to properly test the single level of the inverter.

Assuming $10 of shipping and buying the parts in multiples of three, the cost for the project's parts should come to approximately $64. The worst part is that it does not include the cost of the PCBs which should be between $15-$25.

Source: http://coolcapengineer.wordpress.com/2012/08/10/projects-single-level-inverter-implementation-2/