HIP4081A H-Bridge PWM design

19th February 2013, 18:20 #1

kimfmx

Newbie level 4

Join Date: Feb 2013
Posts: 5
Helped: 1 / 1
Points: 46
Level: 1

HIP4081A H-Bridge PWM design

Hi,

This is my first post, and value this board as a helpfull area for information and help.

So Im building a PWM controller to controll a pair of electric chair motors, this natually needs to be PWM controlled. I have done alot of research on the net on different designs, and have come up with a first draft design that will suit my needs. So i have made a prototype with controller (ATMega8 @ 4Mhz) and the HIP4081A, and have spend alot of time trying to hurdle out some issues.

As for the ATMega8 everything is set, it has two PWM outputs, from 0 to 99% dutycycle (0=low) around 3KHz frequence, in 256 intervals from a RC receiver signal.

For now I have the following concerns:

- When I drive the HIP4081A, I found that then i get neer 99,99% duty cycle, or close to 0 % i get high spikes on the HIP, its like it does not like the short spikes at those end points that is a few us long. A workaround could be to only alow longer pulses as minimum, but just want to make sure im not making a annoying mistake that is not intentinally. I did find that i had greatly underestimated the HDEL/LDEL resistors, that were 10K, and should now

be above 200K
- The startup.... According to the datasheet, its ok to tie the High controll pins to Vcc, as the low pins overule the high pins, but it does not comply with my head in a startup condition, as when power is applied to the board, the chip needs to start up first, and is tri-stated, resulting in the high side active until processsor is on, which pulls the low side down. Im i wrong in not having a "boot" sequence of the HIP - Maybe a component solution with raising the disable pin for a period during poweron, untill it can be controlled by the atmel.
- Generally there is alot of different suggestions to dimentions to the resistors and fets, and its not rely very well explained in the datasheets in how you get to the correct conclusions on the dimentions. For the FETS, im IRFP2907, which i have seen others use, but as for the resistor in front of the gate etc. there is not rely much more than trial and error to rely on i guess. As for the HDEL and LDEL, i assume that there is nothing wrong with setting worst case values (200K+), as it should set biggest delays, and should only make me not get the best out of the PWM, but nothing should get hot.
- I find it hard for me to use a 7812 to drive down the voltage from the 24V supply, to the HIP4081A, there must be a more energy effecient way... I would prefer to seperate the HIP4081a from the controller board for the sake of noise etc, but the 7805 is driven from the 7812, so its hard..

If anyone have experience, good hints or help, please let me know, its much appriciated, and i will get cracking at the info when the everyday dust settles..

Best Regards
Kim Mortensen - Denmark.

19th February 2013, 18:20

FvM (40889), alexan_e (11889), BradtheRad (11509), betwixt (11139), keith1200rs (10877)

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20th February 2013, 08:55 #2

crutschow

Advanced Member level 5

Join Date: Feb 2012
Location: L.A. USA Zulu -8
Posts: 3,411
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Points: 17,327
Level: 31

Re: HIP4081A H-Bridge PWM design

It's rather hard to follow your long description. Posting a schematic would be a great help.

Zapper
Curmudgeon Elektroniker

20th February 2013, 08:55

24th February 2013, 10:29 #3

kimfmx

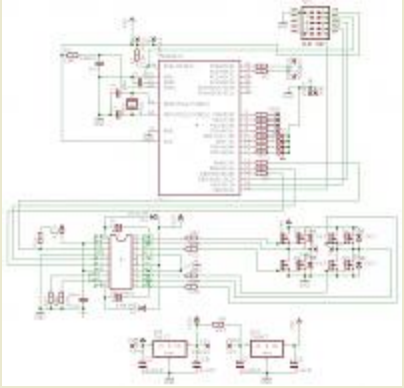
Newbie level 4

Join Date: Feb 2013
Posts: 5
Helped: 1 / 1
Points: 46
Level: 1

Re: HIP4081A H-Bridge PWM design

So this was the first draft - In the mean time i have split the circuit into two boards to seperate the controller from the high power.

But any inputs are welcome.



- - - Updated - - -

but... i would like to add, i have now added a 200K resistor pots on the HDEL and LDEL, I can now controll the AHI and BHI from the mycrocontroller, I have added the DIS bjt controlled circuit from the application note, that ensures that when power is applied, the DIS is immediately turned high.
Im using fast switching diodes instead of the 1N4148 (what i had in my desk), I have orderes transient killers to put over the gate resistors. And then made a stronger PCB which is not beeing manufactures, as test 2. When assempled it should work better than first attempt.

Tested my motor, and its a 24V wheelchair motor, when running free wheel its pulling 2-3 Amps, and when loaded heavily (by hand) its pulling about 5 Amps. So if i say worst case 10A, that is something that should be a walk in the park for the IRFP2907 fets.

Best Regards
Kim Mortensen

1 members found this post helpful.

24th February 2013, 10:29

16th March 2013, 15:09 #4

kimfmx

Newbie level 4

Join Date: Feb 2013
Posts: 5
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Points: 46
Level: 1

Re: HIP4081A H-Bridge PWM design

I have finished the design, and its running like a charm.
Issue was:
- No diodes over the resistors (did not think it mattered during test for proof of concept), but they ensures a fasst kill time for the FETs, and the resistor ensures a somewhat delayed rise time.
- Increased the HDEL and LDEL to variable 500K resistors for finer adjustments on the delay.

Did a test by running full speed on regulator with the wheelchair motor on, and there were no heat registered on the fets at all. even with load of 10A @ 24V. No increase in heat even with 50% dutycycle of the PWM signal.
Im extreamly satisfied with how it runs, it can even kick in the overprotection on the 20A lab supply when doing full speed one direction, and quickly switch to full other direction. I may have to implement a "go-slow" functionality in the controller to ensure I do not bust fuses undeliberately in the finished application. Im switching at around 32 KHZ, so had to go for 16MHz x-tal in the controller.

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