Further testing

Notebook:	Automatic Hen Door Opener		
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Author:	Tim Netherwood		
URL:	imap://tim%40sekel%2Eco%2Euk@mail.uk2.net:143/fetch%3EUID%3E.INBOX%...		

Further testing
Homework from Pablo @TI

- **Pablo:** "I'm very puzzled as to why nFAULT is dropping low right before starting up the motor (like you show in figure 4). **What are you using for the main power supply? A DC battery or a bench power supply?** My main theory for this phenomena is that there might be some part of your circuit drawing some significant amount of current at that point which surpasses the current limit set by you power supply and causing the voltage to drop momentarily. This might cause an under-voltage fault which self-clears when the supply voltage goes back to nominal value. I will research this more because this event is very strange. I'll keep you updated on what I find."
    - ===> Tests are done with a Bench supply and 2x7F Supercap (15Farad) on the PCB, there is also a 100uF tant in the motor Vcc routing plus the 10uF ceramic at the Vcc pin.
        - then tested also without Bench supply , no discernible difference apart from drop in Vcc as the supercaps drain.
    - ===> Circuitry is fairly simple and very low-power, approx 10 microamps on standby (motor not running). Thirteen of the 74LVC series and two micro-power Comparators LMC7215, and of course the DRV8832
    - ===> No sign of any under-voltage before the spurious FAULTn
    - ===> 13 logic gates, 2 comparators, two mag. sensors and DRV8832 draw about 15 microamps in quiescent state at room temp.
    - ===> If IN1 and IN2 are driving the motor and then reverse state simultaneously, then the spurious FAULTn does not occur, it only happens if IN1 or IN2 are set HIGH at different times.
- **Pablo:** "Here is some of my theories as to what could be causing the nFAULT to not de-assert after the stall. I also provided a few tests you can do to verify the validity of my theories:
- OCP could simply be triggered when you stall the motor. But like I said before, I'm not convinced this is what's happening based on the scopes your provided. **Knowing the time delta between the region I asked you to measure in my first bullet point will further solidify this theory.**
    - **===>** Tests with various values of Rsense (0.25, 0.56, 0.71 and 0.91) all have between 800ms and 700ms - as per the data sheet 750ms typ.

- **Pablo:** The high current that occurs when reversing the motors (900mV) could be causing the internal logic of the driver to malfunction. Even though it is not mentioned in the datasheet for this part, TI strongly recommends that the ISENSE pin voltage is less than 800mV to ensure driver operates properly. **One easy way to test this theory is to use a lower Rsense, let's say around a 0.25Ω resistor, and repeat the same experiment**. If the same results are observed, then it will disprove this theory.
    - ===> Test with all the Rsense values produce the same stall result, theory disproven!
- **Pablo:** Your current design using the SN74LVC to force IN1 and IN2 to be HIGH when nFAULT drops low might be clashing with the fault logic of the device. In all fault events, with the exception of current limit, the H-bridge FETs are disabled (high-Z state). When you force the H-bridge into BRAKE mode while the fault logic of the driver is trying to disable the outputs, this might cause some internal coalition and making the internal logic unable to clear the fault (when a non-OCP fault occurs). **One way to test this theory is by repeating the experiment but not changing the states of the INx signals when nFAULT drops low.** If nFAULT clears itself afterwards, the **BINGO!** this will solve your problem.
    - ===> Traces under the heading 'Design 1' do work correctly. In this design the state of IN1 and IN2 were reversed, ie changing motor direction.
    - ===> So Design 2 is the latest, so what you deduce is that IN1 and IN2 cannot be set HIGH by the FAULTn being asserted - *something not alluded to by the data sheet*.
- **Pablo:** The motor you are using, specially if it is an old motor or has some manufacturing defects, could be causing an internal short of some sort. **Have you used more than one motor when you ran the experiment? Try running the experiment again with different motors (either of the same motor or similar motors to the one you used originally in your experiment).**
    - **===>** Motors all new,
    - ===> a smaller motor when stalled produces similar results for the spurious FAULTn but even though stalled for several seconds at 230 mV VILIM there is **no FAULTn** assertion
    - ===> I have ordered others, so will keep an eye on that.