



How do I move from the launchpad to a custom schematic

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By ak96, August 23, 2018 in General

schematic pcb lcd msp430

ak96

Member



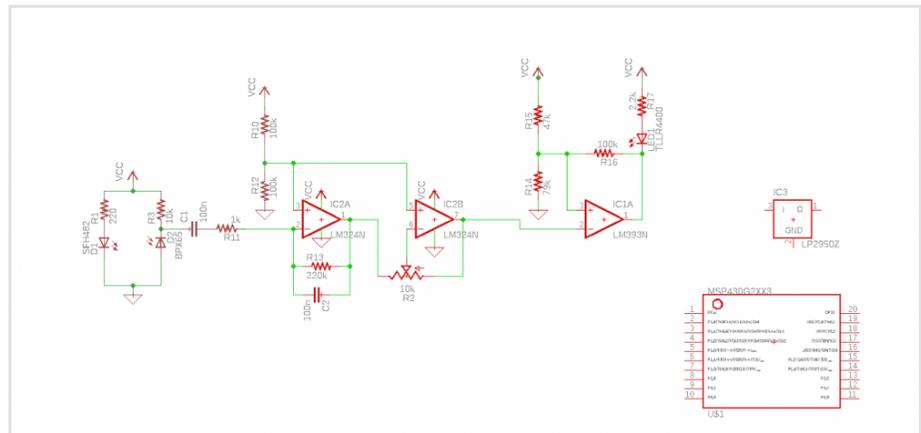
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Posted August 23, 2018

I made a heart rate sensor, and prototyped it with the launchpad. The mcu reads BPM and displays it on an LCD. I now want to create a pcb without the launchpad. I've attached what I have so far. I'm powering everything from a 9V battery, so I have a 3.3V regulator which I will use to power the MSP430G2553. Can I just connect the the output of the regulator to the VCC pin, and connect all the other pins to the circuit as I did with the launchpad, or are there other considerations I need to account for? Also, how do I debug and edit the program while the microcontroller is on my custom pcb?



cubeberg

Level 4



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Posted August 23, 2018



I'd suggest taking a look at the launchpad schematic - there are probably a couple different places you can find it - but here's one - <http://www.ti.com/lit/ug/slau318g/slau318g.pdf> (Page 15)

Pay attention to filter caps on the power lines (10uf and 100nf), as well as the reset pin (I usually just add the the 47k pull-up - although I think the cap is recommended as it prevents problems with power supplies that are slow to start up).

For programming - you just need GND, TST and RST - I usually break out a 4 pin header - VCC/TST/RST/GND - for programming/debugging. Pull all of the jumpers from the Launchpad, pull out the chip, and connect GND/TST/RST from the emulator side of the LP and you can program/debug the board. I've connected jumpers from the boosterpack headers - but the 47k pull-up on the launchpad can cause problems (I've had a few aggravated troubleshooting sessions caused by that). Connecting from the emulator side should avoid that.

FWIW - unless you need 9v for a peripheral - you're going to put off a lot of heat dropping 9v -> 3v, and 9v batteries drain fairly quickly. You could, however, run straight off of 2xAA or 2xAAA batteries for quite some time with an MSP430, depending on what else is in your circuit. I've even run an MSP430 with an LED and wireless transmitter for months off of a CR2032 by staying in sleep mode as much as possible and using the transmitter infrequently.



ak96 reacted to this

ak96

Member



Posted August 23, 2018



🗨️ On 8/23/2018 at 4:48 PM, cubeberg said:



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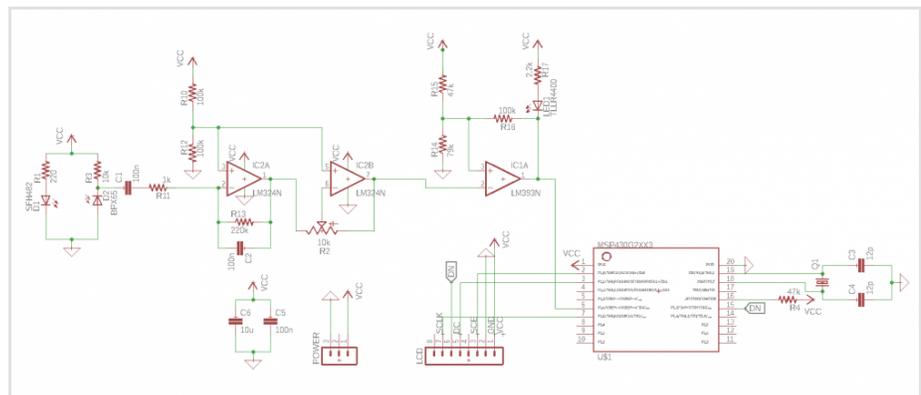
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I added some connections. Should I use another header to connect GND/TST/RST or should I add TST and RST to the power header. I'll take your advice on using 2 aa batteries over the 9 volt battery. I will need to adjust some of my resistor values in the heart rate circuit for 3V instead of 9V. Also, I thought the MSP430 only works with 3.3V. Will 3V be enough?

Do you see any issues with my schematic? I left the pins I'm not using unconnected. Is there a better practice?



cubeberg

Level 4



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Posted August 24, 2018



✓ On 8/23/2018 at 11:13 PM, ak96 said:



Also, I thought the MSP430 only works with 3.3V. Will 3V be enough?

The MSP430G family will run down to 1.8v actually - but the CPU speed you can run at is reduced. Here's a good discussion from E2E - <https://e2e.ti.com/support/microcontrollers/msp430/f/166/t/599159?MSP430G2553-MSP430G2553-Clock-Speed>

✓ On 8/23/2018 at 11:13 PM, ak96 said:



I left the pins I'm not using unconnected

Assuming you've got the space on your board - I'd at least break unused pins out to SMD test points - you never know when you're going to need an extra pin or two.

✓ On 8/23/2018 at 11:13 PM, ak96 said:



Should I use another header to connect GND/TST/RST or should I add TST and RST to the power header.

If there's any chance you may want to debug while connected to an external battery - I'd probably suggest at least adding an extra GND pin so you have VCC/GND for battery and TST/RST/GND for the LP debugger. Otherwise - break it out into a different header. Again, unless you're low on board space.

NurseBob

Level 2



Members

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Posted August 25, 2018



> I left the pins I'm not using unconnected

Generally, you do not want to leave unconnected pins floating; your device can experience problems when pins float. There are numerous references on how to handle unconnected pins for both stability and low power operation. So, either to ground (risk of a short if you accidentally enable output on the pin), or to a defined voltage. You might find some useful tips [here](#), and further [e2e](#) is a very useful resource. And, as @cubeberg said, you may want to add test pads or connections to your unused pins for future experiments/expansion (you

LocationSt. Helena, CA

might be able to add an O2 sensor - there are TI app notes on such for the msp430 line).

As to your schematic, you might consider adding a momentary pushbutton switch as a reset; sometimes handy. As noted by @cubeberg, you could consider a different supply voltage. 3V coin cells are handy, as well as AAA and AA cells. There are a number of regulators out there that can supply 3.0-3.3V from a single 1.5V cell, or cells in series.

Enjoy the step-up in your experiments. There are a lot of circuit examples out there to play with.

ak96

Member



Members

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Posted August 25, 2018



👍 On 8/25/2018 at 11:58 AM, NurseBob said:

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I just realized that the op-amps I'm using have a minimum supply voltage of 3V, so 2xAA batteries will be cutting it close. I'm thinking of using a 3.7V lithium ion battery instead. Will the MSP430 be able to handle this voltage?

NurseBob

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Posted August 25, 2018

👍 On 8/25/2018 at 1:11 PM, ak96 said:

I just realized that the op-amps I'm using have a minimum supply voltage of 3V, so 2xAA batteries will be cutting it close. I'm thinking of using a 3.7V lithium ion battery instead. Will the MSP430 be able to handle this voltage?

Could be risky; you really may want to avoid running at the "maximums" (for the '430). Also, many lithium batteries, when fully charged, may actually put out more than 4V for awhile. You could consider an LDO regulator like an [AAT3221/2](#) (obsolete - but similar specs to what you might want/need). Then

you can be confident that the devices on your board are getting the proper voltages. If you're hand-soldering, these SOT-5 and SOT-6 devices are not too difficult to work with.

Oh, and now you may want to look at battery charging IC circuits....

Also, how will you program the '430? JTAG? or via a second LaunchPad? (see articles on this site for using a LP as a programmer).

NurseBob

Level 2



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Posted August 25, 2018



BTW - I don't know what you're using for your schematics, but many of the launchpad schematics can be downloaded for Eagle. Exploring those will give some hints on power supply management, as well as other useful stuff.

ak96

Member



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Posted August 25, 2018



🗨 On 8/25/2018 at 1:32 PM, NurseBob said:



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Also, how will you program the '430? JTAG? or via a second LaunchPad? (see articles on this site for using a LP as a programmer).

I will go with programming using the launchpad. From what I understand, to do this I just need to connect TST/RST/GND/VCC from my pcb to the launchpad. Will this method only allow me to flash programs onto the chip, or will it also

allow me to debug?

NurseBob

Level 2



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LocationSt. Helena, CA

Posted August 25, 2018



> will it also allow me to debug?

Yes, you can debug with this arrangement. But, you will need to be using CCS, IAR, or another suitable IDE that supports debugging. If you have a pair of Launchpads you can experiment with the arrangement, you don't have to wait for your custom pcb. Are you making your own PCB? Or sending out to someone like OSH, Elecrow?

While it's probably not a concern at this point, you may want to file away a note that whether via a LP or FET programmer, you are limited to a total draw of about 60mA. If you exceed that, you will need to supply an external/alternate power supply (battery, etc.) This limitation is true for virtually all of the LP, FET-driven debugging solutions. People trip across the limitation when they start driving heavier loads (such as battery chargers, or other power-hungry devices). HTH

cubeberg

Level 4



Members

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1,431 posts

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Posted August 29, 2018



Sorry - busy weekend/work week

🗨 On 8/25/2018 at 11:58 AM, NurseBob said:



Generally, you do not want to leave unconnected pins floating; your device can experience problems when pins float

Enabling pull up/down resistors should be sufficient for that problem - it's recommended for low-power optimization anyway.

Looks like @NurseBob has done an excellent job answering everything else 😊

FWIW - I like Elecrow over Seeed, etc. I've always had good luck with them - and they have good customer service for the few times I've had any issues.



NurseBob reacted to this

NurseBob

Level 2



Members

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Location St. Helena, CA

Posted September 5, 2018



> FWIW - I like Elecrow over Seeed, etc.

I started out with Sparkfun's pcb service, which ultimately ran into issues (too long ago to remember what "issues" - price? service? delivery time? So, switched to OSH Park for several years, but price recently became an issue (very limited budget here after retiring) when compared with Elecrow, and given that in my limited experience, both quality & delivery times were equivalent; cost won out (my last order at Elecrow [190mm x 90mm] was \$65 for 5 boards, same boards from OSH would have been \$132 for 3 boards...) I still get my stencils from OSH Stencils and have never had any issues.

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