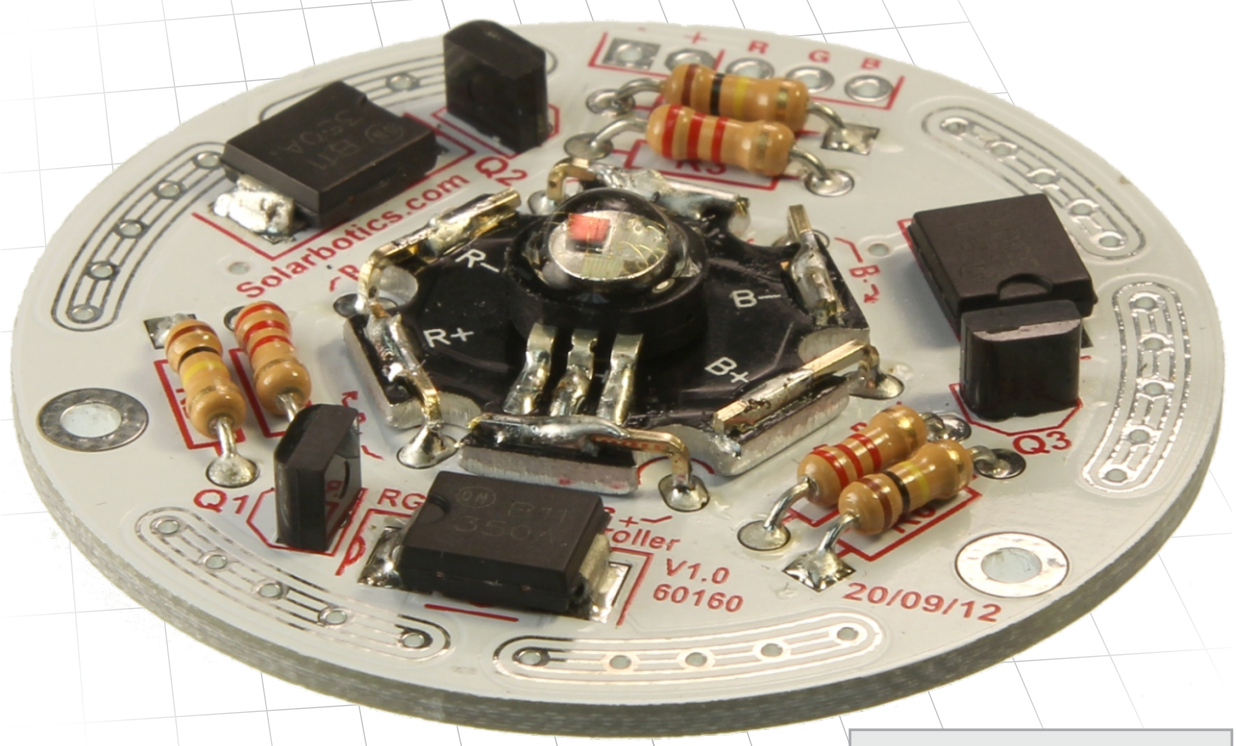
Star Controller

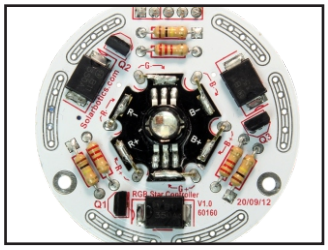
3-Watt Red/Green/Blue Star LED Controller kit

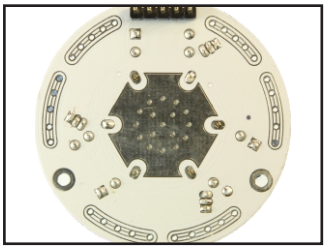
Making it easy to say:
"OUCH - that colorful LED sure is bright!"



Build Time: 15mins
Skill Level: Beginner (2/5)

- Complete with 43,000 mcd RGB star LED (comparable to 135 lumen lamp!)
- Uses Advanced "Constant-Current Regulator" technology
- Logic-level PWM compatible inputs
- 3.7 to 13VDC supply compatible
- Optional diffuser available for LARGE LED effects





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Introduction

WOW are RGB star LEDs ever bright! And HOT! And, well, not that nice to interface to... Trouble with them is that these 3 watt LEDs need to be fed power properly, or you risk burning out a channel, and who wants a R_B LED?

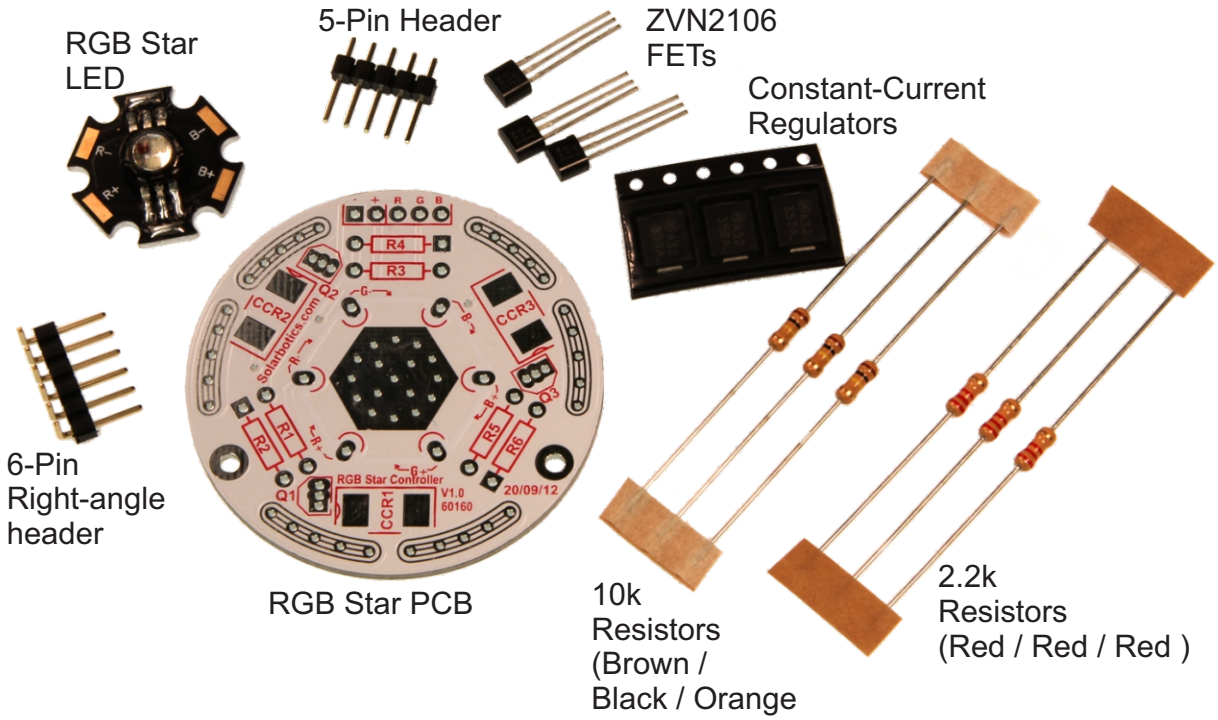
At Solarbotics, we were playing with our super-bright 3W Star LEDs (LED-RGB-Star43CD). Connecting them to our microcontroller projects was a real pain, where we had to find and properly bias transistors before we could get the blinky to work. Then we recalled reading about a new “Constant Current Regulator” (”CCR”) by ON Semiconductor that locked the current output to a preset value over a wide input voltage range. Feed it power, and away it goes, making sure that exactly the right amount of current flows to your device. Add a FET, and it becomes pulse-width modulation friendly, meaning you can dim it or switch it off entirely.

Fascinating... a problem that was begging for a solution had once presented itself! So now we present to you, the Solarbotics RGB Star Controller kit, featuring:

- A 3-watt 43,000 millicandela, 120° viewable RGB LED (135 lumen equiv.)
- 350mA constant-current regulation per color channel
- 5~12VDC nominal operation; 4~13VDC maximum range
- FET PWM switching tested up to 80kHz PWM control
- 5V logic level compatible (3.3V inputs = reduced illumination)
- Large 1.9" PCB with heat-dissipation strips
- #2 hardware compatible mounting holes
- We even found a convenient diffuser container to make it appear HUGE!

Parts List

- 1 x RGB Star Controller printed circuit board (PCB)
- 1 x 3 watt RGB "Star" LED
- 3 x 2.2k resistor (red / red / red) input resistors
- 3 x 10k resistor (brown / black / orange) pull-down resistors
- 3 x ZVN2106 N-channel FETs
- 3 x 17195 350mA constant-current regulators
- 1 x MPin5 5-pin male interface header
- 1 x MPin6RA 6-pin 90 degree header (for star LED mounting)



We strongly suggest you count the parts in your kit to make sure you have all the parts listed (c'mon - there's barely a handful of parts, so count them!). If anything is missing, contact Solarbotics Ltd. for replacement parts information.

Tools & Materials Needed (The 4 'S's):
- Soldering iron
- Solder
- Safety glasses
- Side/flush cutters

Construction!

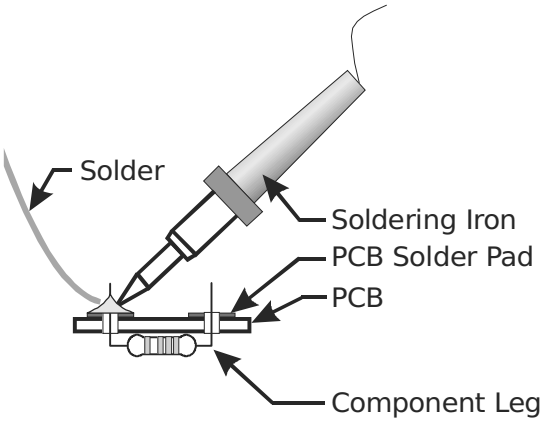
Soldering - The Essentials:

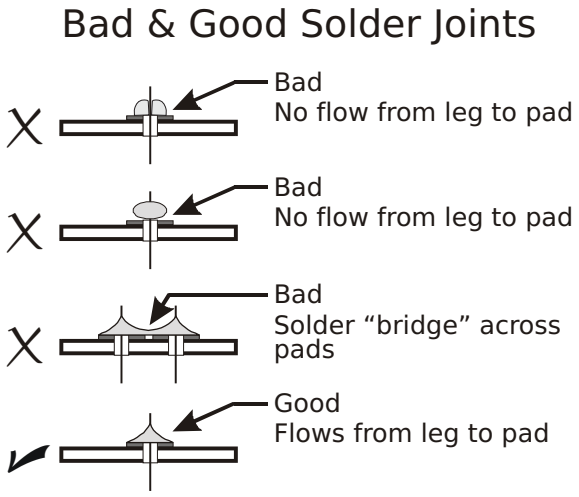
The most important skill needed to successfully construct your device is soldering. Soldering is melting a special metal (called, um..., “solder”) between two components to make an electrical connection. We can also use solder like glue, to build things out of metals. Please note: You must make sure to use electrical solder, and not plumbers solder, which is used for piping and really isn’t good for electronics.

Much like you, solder likes to go where it’s the warmest (this is why Florida is so popular). The trick to successful soldering is to make the parts hot, and the melting solder will run there. If you don’t heat up the parts first, the solder will find the hottest thing around - your soldering iron, and not your parts! Do not melt solder to the tip of your iron and try to smear it onto the parts, as it just won’t work. You’re an electronics hobbyist, not a painter!

Successful soldering is a 4 step process:

1) Wipe the hot tip of the soldering iron on a sponge so the tip is clean and shiny.
2) Jam the soldering iron into the hole where the component leg comes through the soldering pad.
3) Count to 5 (which lets the soldering iron make the pad and component leg nice and hot).
4) From opposite the iron, push solder into the corner between the leg and pad, melting the solder until there’s enough to make the solder joint look like a tiny volcano.

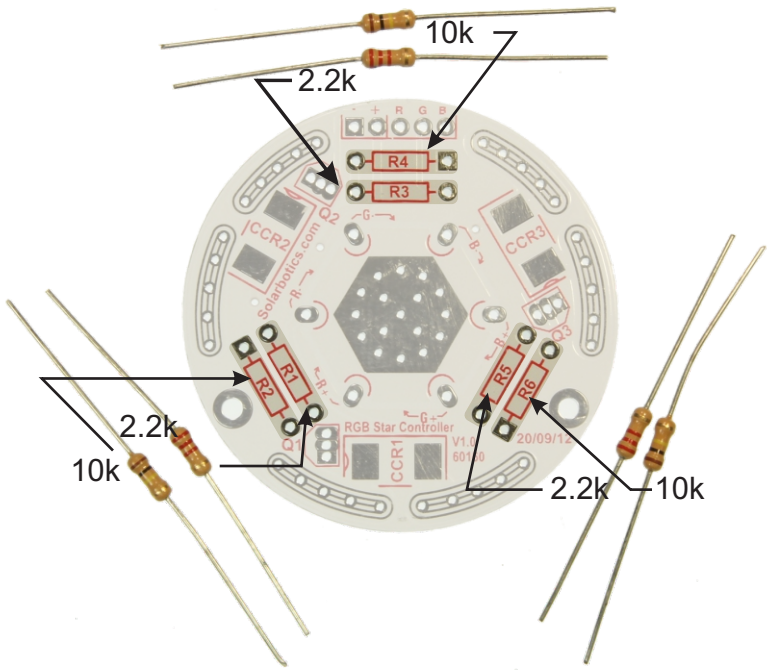




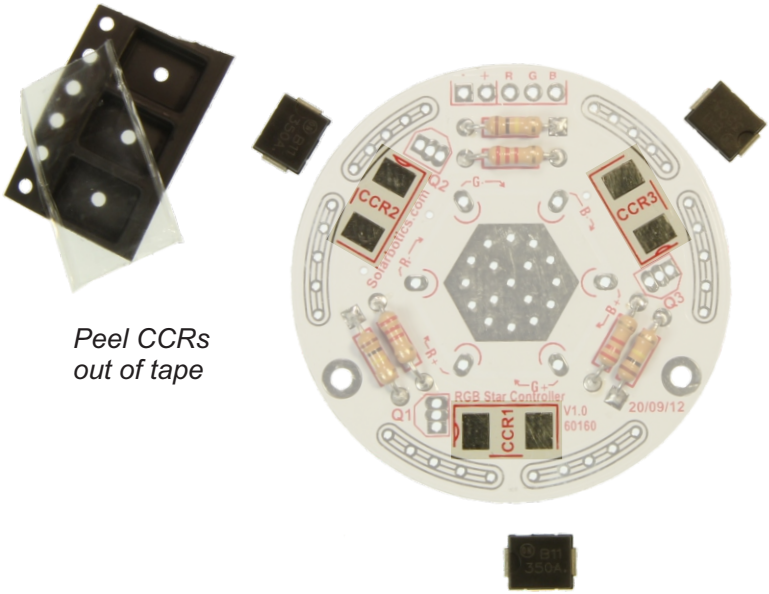
Construction!

Skipped the soldering page and ready to assemble? Gotcha - let's get to it:

Step 1 - Resistors: The 2.2k resistors go in spots R1, R3, & R5 (the inner set), and the 10k resistors go to R2, R4, & R6 (outer set).

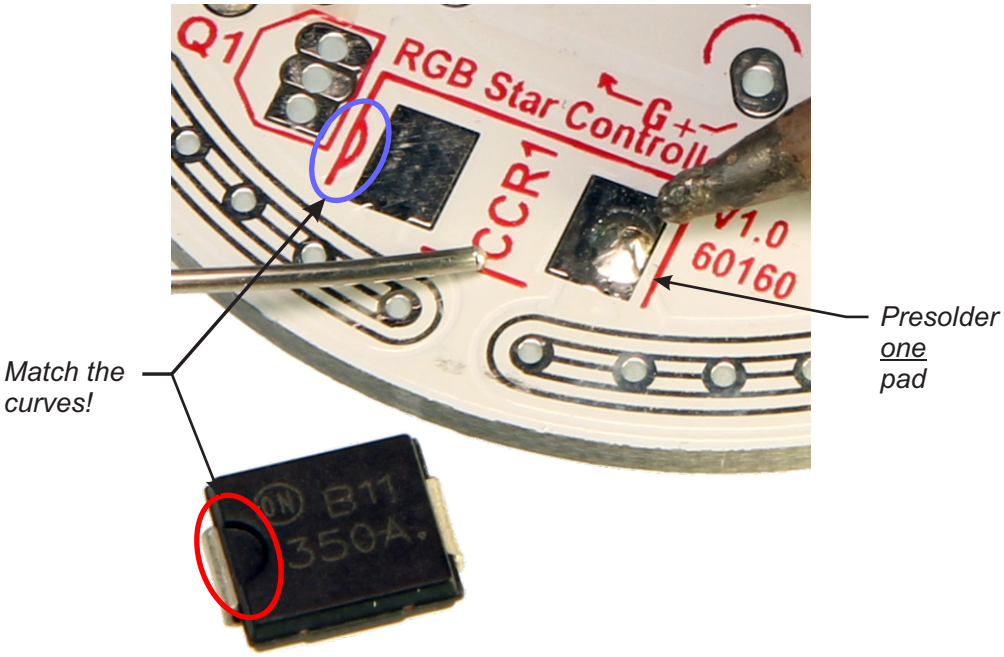


Step 2 - Locate the Constant Current Regulators: Peel the constant-current regulators (CCR) out of the tape pockets. These are surface mount components, and also polarity sensitive - DON'T solder these in quite yet!



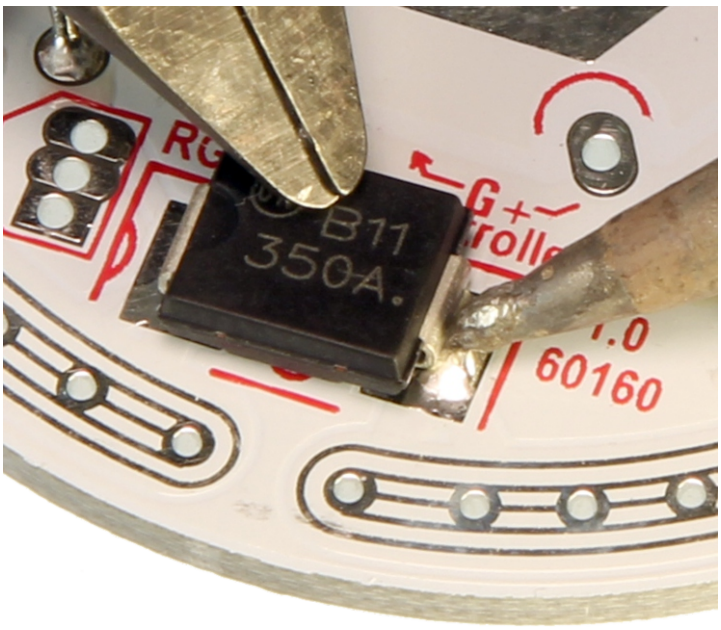
Construction!

Step 3 - Presoldering the Pads: Prepare one of the pads by pre-soldering it. Note the cut-out on one end of the CCR - this is the anode, and matches up with the same curve drawn on the PCB.



Step 4 - Soldering the CCRs: Align the CCR onto the pads, and remelt the solder (add a bit more). It is important to press down on the CCR as you do this, so the CCR sits very flat across both pads. DO NOT use your finger - the CCR will get quite hot during the solder remelt!

Sure it's soldered? Great - solder the other side, and repeat for the other CCRs.

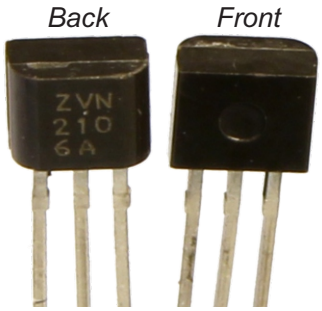


Remelt the solder while pressing the CCR into place

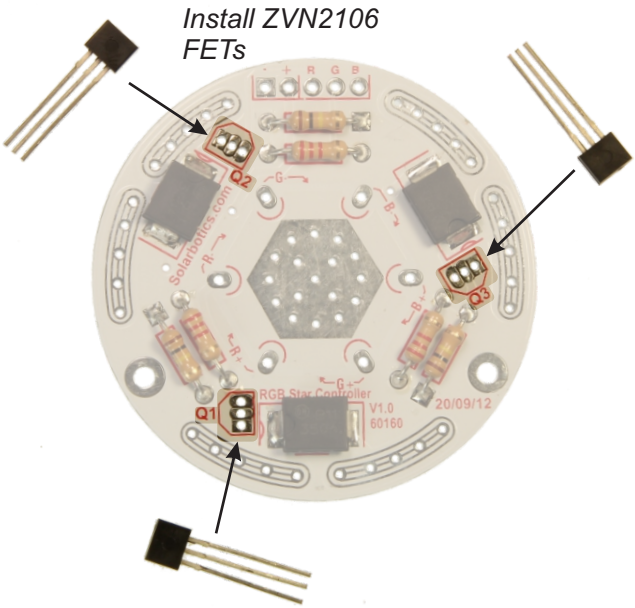
Then solder the other pad, and repeat for the other 2 CCRs.

Construction!

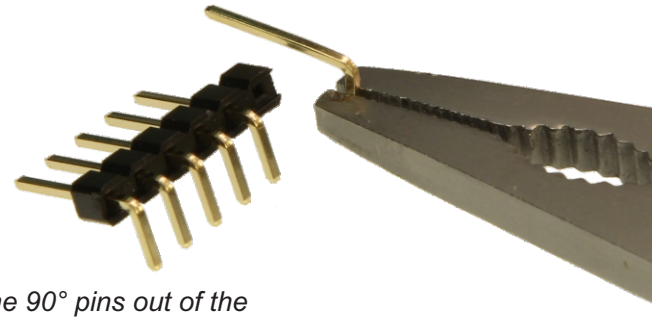
Step 5 - Install the FETs: Be careful here - these FETs are a bit funky in that they have printing on the backside of the package, which may trick you into installing these backwards. Pay attention to the profile shape, with the FET flat side facing toward the CCR.



FET detail - don't let the text on the backside trick you. Install flat-side towards the CCR!



Step 6 - Prepare the LED star hold-downs (Pin yanking): We are robbing the 6 pins from a 90° pin connector to act as the hold-downs for the Star LED. Either use pliers to pull the pins out of their plastic spacer, or use snips to clip them free.



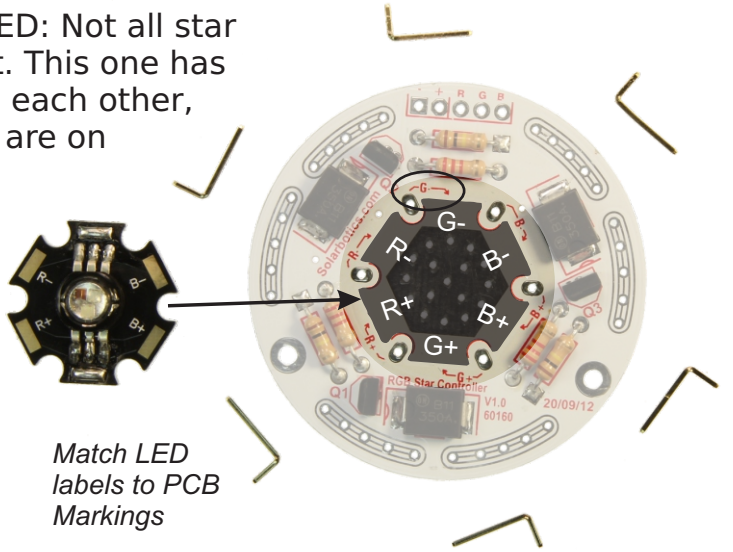
Pull the 90° pins out of the header plastic, or...

...use snips to clip them free. Watch out for flying bits!

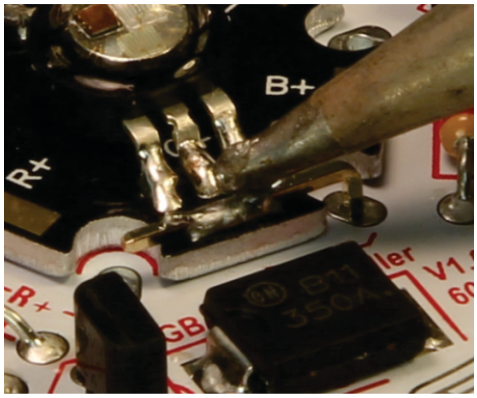
Construction!

Step 7a - Installing the Star LED: Not all star LEDs use the same pad layout. This one has the red and blue leads next to each other, but the unmarked green pads are on opposite ends.

Pay attention to the pads labels, and place your star LED into place.



Match LED labels to PCB Markings



7b: Solder long leg to LED pad

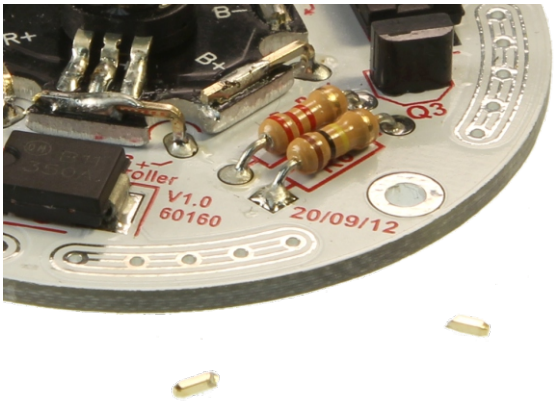
Step 7b - Long Pin End: Lay the long end of the pin on either the G+ or G- (presoldered) pads, and melt it in with your iron, keeping the short leg in the associated hole (see the little markings on the PCB?).

Do the same for the LED pad on the opposite side. Make sure the LED stays aligned while doing step 7c.

Step 7c - Short Pin End: With 2 pin ends soldered to the LED, check that the LED is still aligned, and it **sits flat**. This is important for heat-dissipation.

Solder the 2 short pin ends to the PCB, then **finish soldering the remaining 4 pins to LED/PCB pads.** Don't forget!

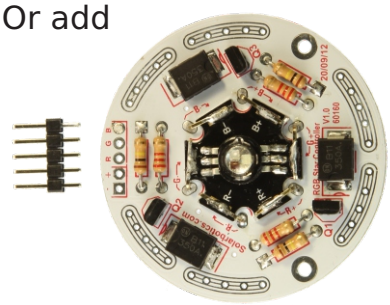
7c: Solder short leg into PCB



Step 7c - Snip Leads: The long ends are a bit too long. Snip them off so they don't accidentally short against their neighbour.

Construction!

Step 8 - Install the 5-Pin Header: Install it or don't. Or add a female socket. Or a ribbon cable - whatever suits your application!

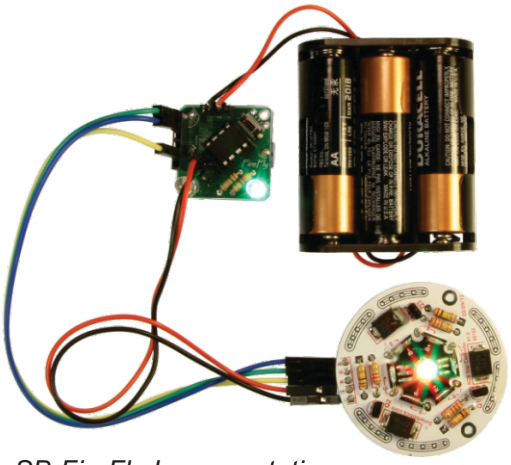


Now you're ready to use it!

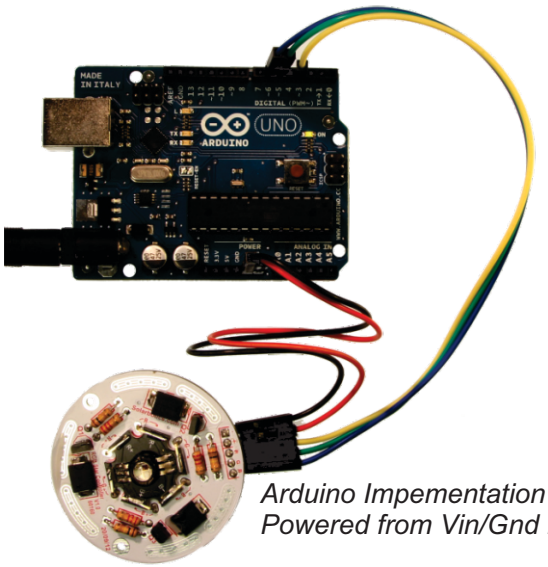
Using it:

Apply 5~12V to the power input lines, and use standard 5V logic level inputs to each of the RGB lines. On a positive signal, the appropriate channel lights up! 3.3V signals will work, but the FETs work at reduced capacity, and it will appear ~ 30% dimmer.

Don't stare at the lens. We've blind ourselves with this LED! Use our diffusion container, which houses it beautifully.



SB-FireFly Impementation
Powered through ICSP V/Gnd Pins

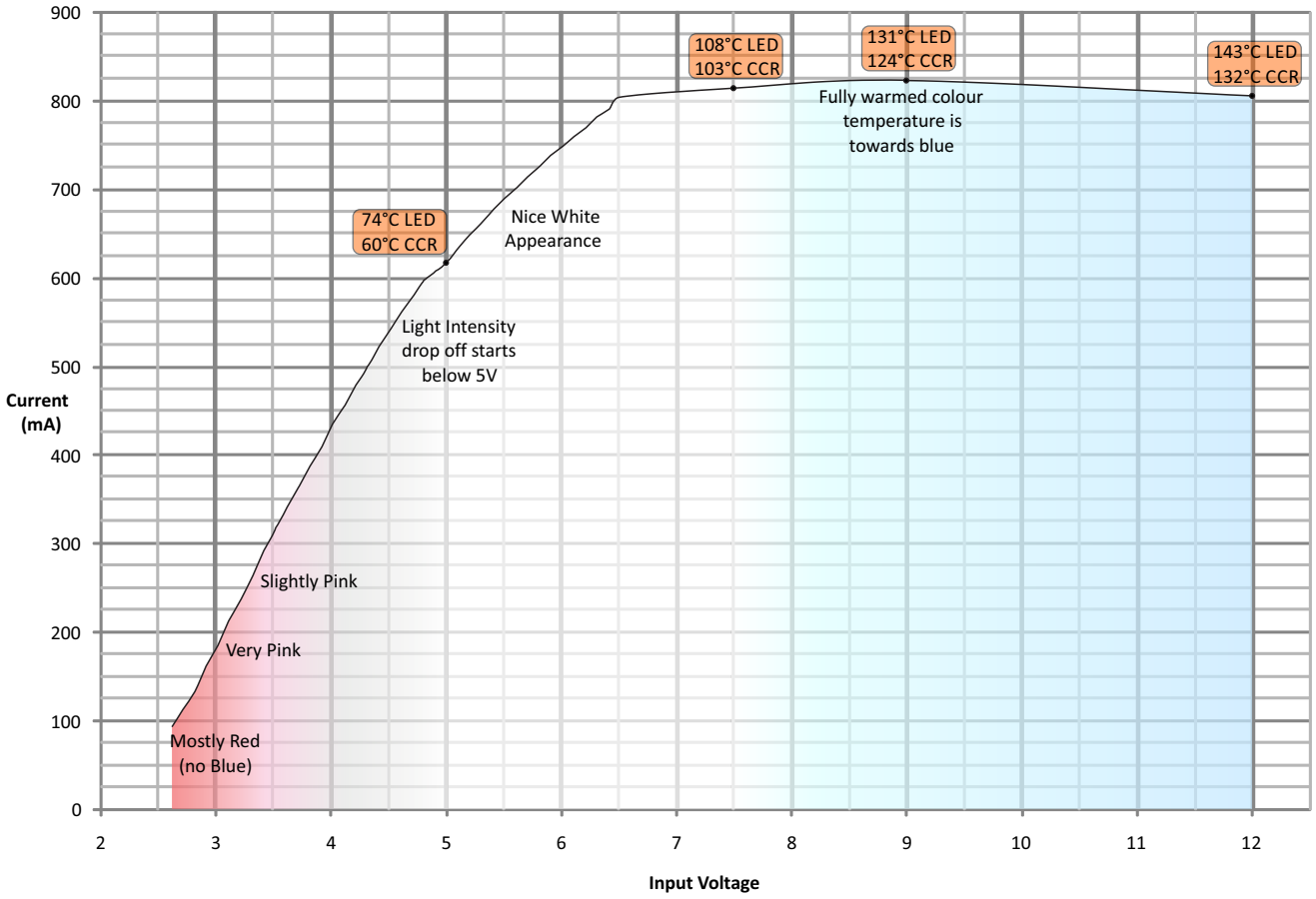


Arduino Impementation
Powered from Vin/Gnd Pins

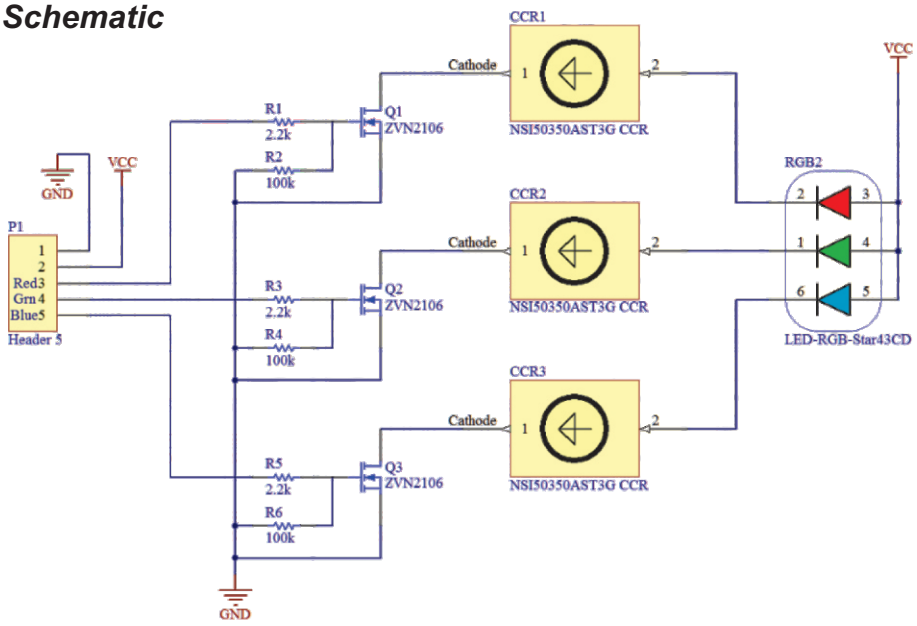
Diffuser container containing FireFly and RGB Star controller seen above

RGB Star mounted solo in Diffuser

RGB Star Controller- Current vs Input Voltage Color Profile



Schematic



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