Instructables - The Definitive Guide to LED Accent Lighting

ATL Link

Key
Green = Useful
Blue = Not Useful

This source shows research skills in finding a source that will answer my inquiry. Additionally this source shows self management as I am finding sources to address my success criteria

Link to Criteria

"To incorporate outdoor lighting into the design."

Global Context

Light has always been important and changing the light of an environment during the night allows for humans to function outside of what biology allows them to. In my case lighting my feature will allow for it to be viewed and appreciated after dark.

Learner Profile Link

Risk-Takers
Inquirers

Why did I select this resource

This information was written with all kinds of LED lighting uses in mind and I needed to learn the basics of LED lighting so I selected this resource

How I can apply this information

This information will help in selecting the type of lights to use and the other components. Additionally it will help me understand how to wire the lighting and what type of power source to use. Understanding the basics will allow me to build upon that and add more complex parts like solar power, timers and light sensors

Bibliography

RedWagon, ~ . 2016, 'The Definitive Guide To LED Accent Lighting', Instructables [Online] Available http://www.instructables.com/id/The-Definitive-Guide-to-LED-Accent-Lighting/step9/Enjoy/, Accessed 21 November 2016.

The Definitive Guide to LED Accent Lighting

This guide goes over some info and techniques for using LED strips as accent lighting. LED strips are relatively cheap, the RGB strips can make any color, and they're small and easy to hide. They also run off 12v which makes them easy to install in cars or boats as well.

We will cover picking out lights, controlling, powering, and different techniques for hanging them.

Step 1: Ordering your LEDs

If you search for RGB LED strips you'll see there are a TON of options. Luckily there's a very specific thing you want; just search for 5050 RGB 5M 300. Here's a breakdown of the individual parts:
5050 - This is the type of LED. This is a standard part, it's big and bright but still runs cool. It's common to see 3528's in LED strips, avoid these, they're a lot smaller and dimmer. To go bigger than 5050 you're going to get a lot more expensive and a lot hotter.
RGB - Red Green Blue. This means it's a tri color strip. By mixing the different colors tri-color strips can do any color in the rainbow.
5M - 5 meters. This is the longest length I've found. You can use it pretty fast, go any shorter and you'll pay extra.
300 - The count of LEDs. The most common setups are a 5M strip with 150 LEDs or 5M with 300 LEDs. I recommend the 300 count ones because the price difference isn't that much and they're a lot brighter.

If you don't want to search around this set should get you started, it comes with a power supply and controller.
http://www.amazon.com/TaoTronics-TT-SL001-Waterproof-Changing-Controller/dp/B004T0BM0O/

So, to recap:
Search Amazon or eBay for 5050 RGB 5M 300 and pick one. I've never ordered from the same place twice (I always forget) but I haven't had any issues with any of them. All of them have been about the same. The only thing I would recommend is if you're doing a large room, order all the LEDs at once because the whites can be slightly off. In my living room one set of strips has a warm, pinkish white and the other set is a light cool blue and it drives me crazy because I'm picky about those things. Order your LEDs all at once and they'll all match.

Type of LED
Must consider outdoor use

Only Need Green But simplity of RGB kits could be an advantage

Can get 3 1.6m strips

Check this when purchasing

Kits seem like a good idea

Remember the seller and model

Other options:
For large areas like a porch it might make more financial sense to order a single color. White is a good for general lighting. Red and blue are very dull, don't count on them to provide more than an accent lighting.

Waterproof for outdoor use

Waterproof?
I like the waterproof LEDs simply because it makes the strands easier to work with. They have a nice weight and flex more easily, plus the coating helps prevent shorts when mounting the strips with staples or other metal fasteners. The weight can be a problem if you're hanging them off the bottom of something and you want to rely on the built in tape, but other than that I don't see any downside to the waterproof strips.

Step 2: Powering your LEDs

Kits win again

The easiest way is to just get the little controller that comes with the LEDs. They are dirt cheap when you get them with a 5M strip of LEDs like the link posted in the last step. If you ordered a set that came with a power supply and controller you can skip to step 5.

Using a kit this issue wont matter as much

Power:
Here's the guide to power bricks that they never told you:
There are two things to look at, volts and amps. You can fudge the voltage a little bit, but messing with it can be dangerous. Going too high will stress components and can lead to fires. Go too low, and whatever you're powering may not work. The only thing that gives you some play is the fact that a lot of devices will take a certain voltage input and step it down using a voltage regulator but there's really no way of knowing this without taking the device apart and poking around. Long story short: play it safe and use the recommended voltage.

Amps: you have more wiggle room here. Too little amps and the device won't have enough power, too many amps and the device will only use what it needs. So, feel free to overshoot a little on amps.

For a 5M strip I recommend a 12v power supply with at least 4 amps. Your standard 12v 1A power brick won't cut it, if you don't have one just order one with the LED strips.

For larger installations I like to use old computer power supplies. They have 12v, lots of power and are fused so I sleep safer with them running at night.

My installation is not as many lights and computer PSU are not waterproof and are bulky

However I do have some that are not in use

Step 3: Using a computer power supply

If you're not using a computer power supply you can skip this step.

Quick and dirty:
Get a small piece of wire and short the green (should be only one) and black (any of them) lines. This tells the power supply to turn on. Plug the lights into a yellow and black wire.

Yellow = 12v+
Red = 5v+
Black = Ground (all -)

For a cleaner installation, take apart the case. Cut all the wires off leaving a couple black wires, the green wire and some yellow wires. Unplug the fan if you want. Strip the green and black, twist them together and hide them somewhere in the case. You can also solider the green wire to ground if you feel comfortable reading the circuit boards. Run the yellow and black wires outside of the case, put back together.

Step 4: Controlling your LEDs

Using a kit will allow me to use a remote as a controller and have full control of my LEDS

If you are not experienced with electronics I recommend just getting the controller that comes with the RGB strips. They're simple and they work, the only downside to them is if you have multiple 5M strips you'll end up with multiple remotes to control the lights. I haven't had good luck with one remote working with multiple controllers.

For more advanced setups you can control the lights with a microcontroller. This is the method I use, but my shield is not ready for documentation. I can, however, post the power ICs I use and a basic circuit diagram in case anyone wants to make their own controller.

Building my own circuits will not be used if I use a kit

These power IC's are my favorite for switching 12v with 5v. They're designed for automotive use, support PWM, can handle a lot of amps at 12v and they have built in fuses to prevent anything bad from happeneing. If you cross some wires and short them out they'll simply stop conducting until the problem is removed.

http://www.mouser.com/Search/ProductDetail.aspx?R=BSP75NTAvirtualkey52230000virtualkey522-BSP75NTA

These power ICs have three pins: Source, Drain and In. Mosfets have a Source, Drain and Gate. Just pretend In is Gate and you can use these like mosfets but with less math. T

All of the LED strips I have purchased have been common anode. This means there's one positive line and three grounds, one for each LED. So, if you design your own circuit be sure you're switching grounds.

The attached schematic is a basic circuit that can be used to switch one channel of an LED strip with a 5v logic line. If you want to do an RGB strip you'll need to repeat this three times, one for each channel.

Step 5: Ordering your wires

Will have to have a look at wires but joiners included in the kit might work

Monoprice.com is the one stop shop for cheap cabling, I order all my stuff from there for my light projects. The 4 strand 16AWG is what I currently use. The wires are a decent thickness and they have nice, easy to identify colors. The only downside is the entire package is a little stiff. If anyone finds a looser 4 strand wire with a comparable gauge be sure to let me know in the comments.

http://www.monoprice.com/products/subdepartment.asp?c_id=102&cp_id=10239

For single color runs (only two wires needed) speaker cable or lamp cord will work just fine. My deck lights (white only) are hooked up using a cheap spool of lamp cord I got from the local hardware store.

Step 6: Wiring your lights

There will be 3 1.6m strips if the wire allows that

You can only cut LED strips at certain points, otherwise you can't solider onto the ends. Look copper pads spaced every 3 LEDs and cut across the middle of the pads. You can also find them by the labels; typically you'll see + R G B or in the case of these pictures, just a marking on the common power line. To wire up the LED strips there's nothing special, just match up like pins (+ to +, R to R, etc).

waterproof strips will be used

If you have a waterproof strip you'll need to trim off some of the plastic to get to the solider pads. Strip the wires and then tin them and the pads on the LED strip. Touch the wires to the pad and heat them up to solder them together. Be sure to mind the gap between them. Once the wires are soldered use hot glue to seal the end and be sure to get some glue between the wires. will need a hot glue gun to keep the wires from shorting

For smaller bends pull off the outer sheeting for cleaner wiring.

Step 7: Methods for hanging lights

Built in double sided tape:
For the first use the built in tape on the back usually works on smooth surfaces. My lights stuck nicely to the Power Wheels and the bottom of my first cabinets. Once I moved they didn't stick as well and I had to move on to hot glue. Just try the tape, if it doesn't work move on to some other techniques.

Hot Glue:
Hot glue works well but I've had problems with the hot glue sticking to the back of the LED strips. The double sided tape can fail and separate from the LED strip. To remedy this wrap a small wire around the LED strip wherever you're going to apply hot glue. This gives something for the hot glue to grip on and hold the light.

Nails:
Small nails are my favorite way to hang lights when I have a good solid surface to attach to. Just hammer it straight in, then bend it over the light.

Staple Gun:
Staples from a staple gun hold very well but it's easy to accidentally clip the LED strip and damage it. A standard staple gun staple will barely clear an RGB LED strip, plus the way the staples are forcefully shot makes it easy to miss.

Stapler:
If you're attaching to a soft enough material like pine you can use a regular stapler. They're much wider and you can insert them slowly which makes them the safer bet.

Step 8: Placement tips and tricks

As a general rule of thumb I never place LED strips where they are directly visible. They're too bright to look directly at and I like having nice glows coming from seemingly nowhere. If you don't have a good way to hide the LEDs quarter round is good way to create an extra lip. The shelf above my liquor has no lip to hide the LEDs behind so I bought a piece of quarter round for $2, stained it dark to blend in with the rest of the mantle and nailed it in front of the LEDs. The piece is barely noticeable and the LEDs are hid nicely from sight.

At my office I wanted to put LED lights in my cube but there wasn't a lot of options. I mounted the LEDs directly to some pieces of quarter round and mounted those around the perimeter of my cube.

When you have more flexibility try to mount LEDs slightly off from the wall. If they're too close you can see the shadows in between the individual LEDs but if you space the strip slightly away from the wall you'll get a nice, even glow. 300 count strips vs 150 count strips help with this also.