

# Design Your Circuit

## The Rules:

You will be using conductive traces made of thread to connect the sewable tabs on your components.

The battery pack needs to connect to the LilyTiny: a positive tab to a positive tab, and a negative to a negative tab. Note: there are two positives and two negatives on the battery pack. You only need to use one of each. This is a short trace, which terminates after connecting the battery pack and the Tiny.

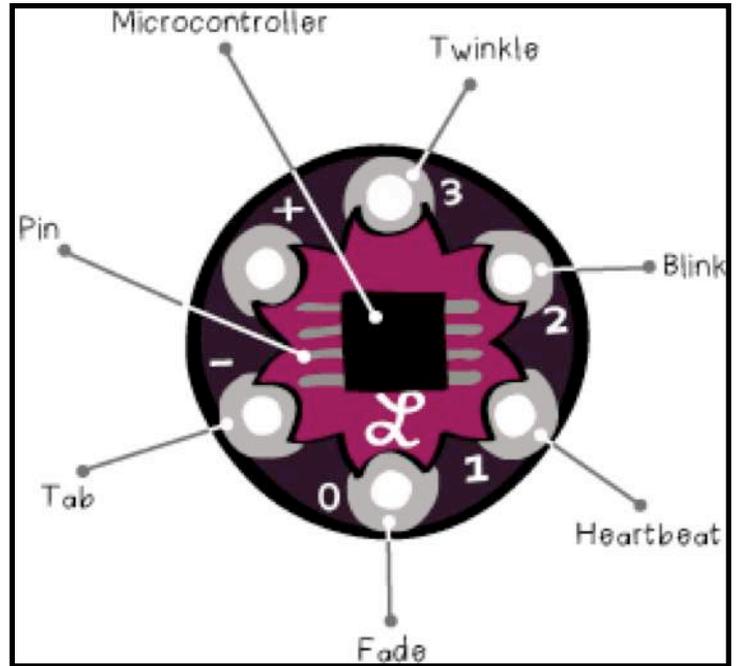
The positive tab of each one of your LEDs needs to connect to ONE of the numeric tabs (0-3) on the LilyTiny. These are short traces, which go from numbered point to LED, then terminate.

All the negative points on the LEDs need to connect and link back to the negative on the LilyTiny. This can be a long trace and you can simply sew through the negative points on the components three times then keep on sewing.

A single 3v battery can run 1-5 LEDs. The more LEDs the shorter the battery life.

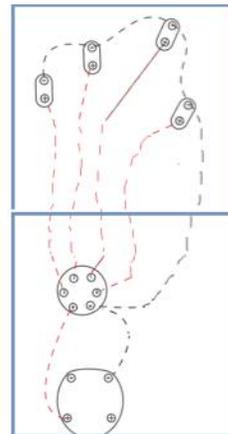
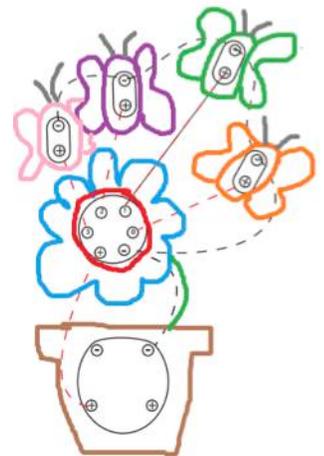
Positive and negative traces must not cross or touch. Thread is fibrous and tends to cross small gaps between traces.

The shorter the trace, the better the conductivity.



## Creative decisions:

Once you have a working circuit, how will you decorate it? Some people plan the whole thing out first, others make the circuit then decorate away!



Front

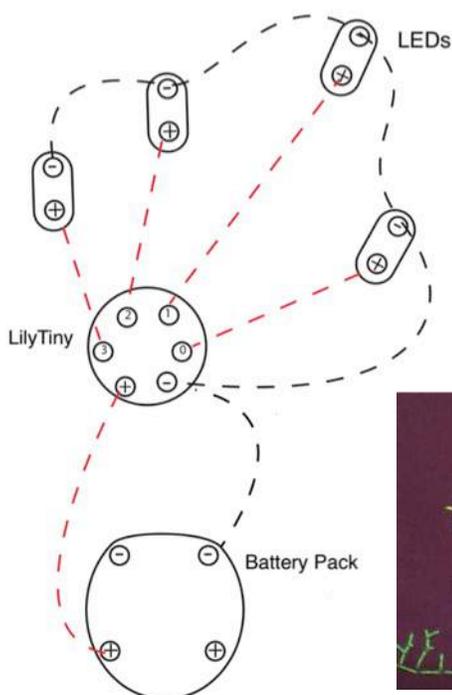
Back

If you want to, you can hide the battery and LilyTiny on the back of your project. Just extend your traces and plan where you will fold the fabric. Make sure to insulate the layers with felt.

How do you want to finish your panel? You can leave it in the hoop as a wall hanging, You can turn it into a patch for clothing, you can attach it to a bag or pillow or whatever you wish!

NOTE: e-Textile projects can be gently laundered. Just remove the battery before you wash, then air dry. Check the threads for fuzzies after laundering-- the thread sheds a bit and the fuzzies can create crossed traces.

This is the basic plan but you can get all kinds of creative...



# Assembly Instructions!!

## Preparing to sew

Use one strand of thread.  
Use short strands-- conductive thread tangles easily!  
Beeswax conditioning can help with tangling.  
Do not double thread.  
Tie a knot in one end.  
Thread the other end through the needle.

## Sewing

Sew using tight, small stitches.  
Either running or back stitch will work-- back stitching is more conductive.  
Do not allow positive and negative traces to cross or touch. Be careful of where you make knots.  
Only sew traces with conductive thread. Use sewing thread for other attachments. (Especially important on the battery pack!)  
Sew at least three tight loops through each hole of your components.  
More is fine. Make sure that the loops sit side by side to maximize contact with the metal legs.

### Recommended order:

Positive battery pack to positive Tiny.

0 to LED positive.

1 to LED positive.

2 to LED positive.

3 to LED positive.

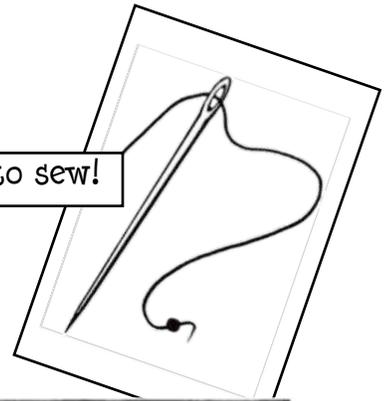
Long trace that connects battery pack negative to Tiny negative to each LED negative.

If (when) a thread breaks or knots, thread your needle with new thread. Knot it to the old thread as close to the last stitch as you can. Cut the threads close to the knot and continue sewing.

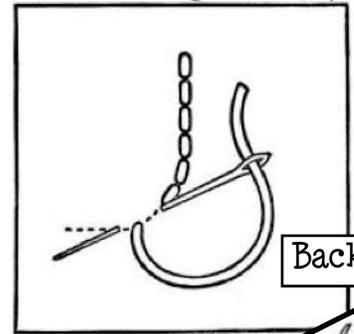
## Troubleshooting

- If you are making a patch with the battery on the back, add a layer of felt between the front and back to act as an insulator.
- You can use duct tape to make "bridges" over traces when crossing is inevitable.
- Test component polarity with a multimeter (if you have one) or by using alligator clamps.
- Ripping out sewing hurts, but is often the only way to fix a problem.
- If you want to add LEDs to other fabric items, make sure the items are not metallic.

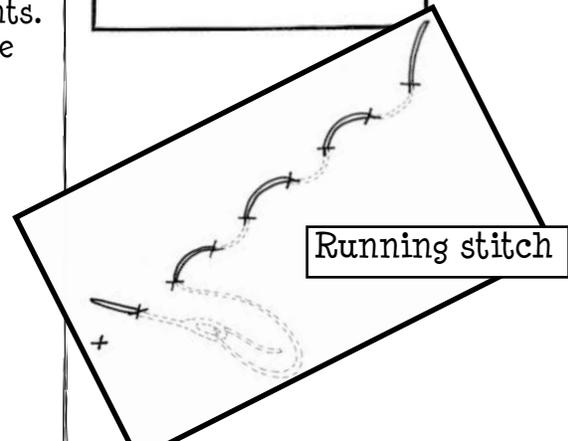
Ready to sew!



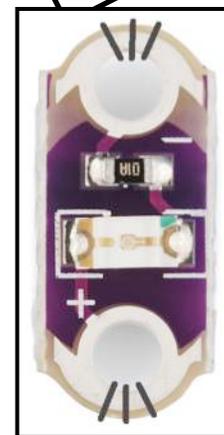
Back stitch



Running stitch



3+ tight stitches on all component connections



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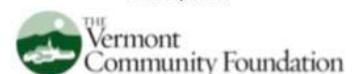
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