GLOWSTITCH

One of the easiest ways to add lights to projects, from wearable technology to arts and crafts.

PERFECT FOR:

- Hobbyists
- Artists
- Makers
- Teachers & Schools
- Cosplayers
- Kids and learners

WELCOME!

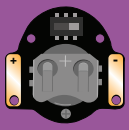
GlowStitch LEDs are designed for the absolute beginner. With the instructions in this booklet, you'll know how to get the most out of these LED strips and add lights to costumes, crafting projects, paintings and much more.

YOUR KIT INCLUDES:

GlowStitch LEDs

Conductive tape

AAA battery holder



Coin cell battery holder (CR2032)

YOU'LL ALSO NEED:

Scissors or craft knife

Paper or Fabric Project Base

Batteries

YOU CAN MAKE:

Wearable Tech Projects

Light up Artworks

All kinds of light up craft

Educators! Visit makerqueen.com.au for PDF printable downloads of these instructions.

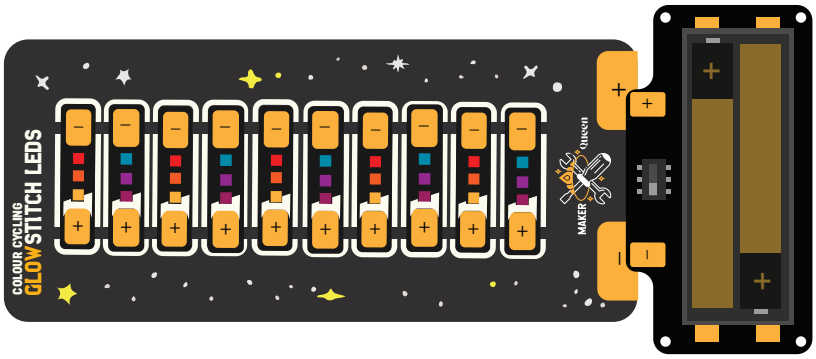
1 Test your circuit by placing your battery pack over the circuit test pads.

Teste deine Schaltung, indem du das Batteriepack an die Testpunkte mit leitendem Band anschließt.

Testa il tuo circuito collegando il pacco batterie ai punti di test con nastro conduttivo.

Prueba tu circuito conectando el paquete de baterías a los puntos de prueba con cinta conductora.

Teste ton circuit en connectant le pack de batteries aux points de test avec du ruban conducteur.



2

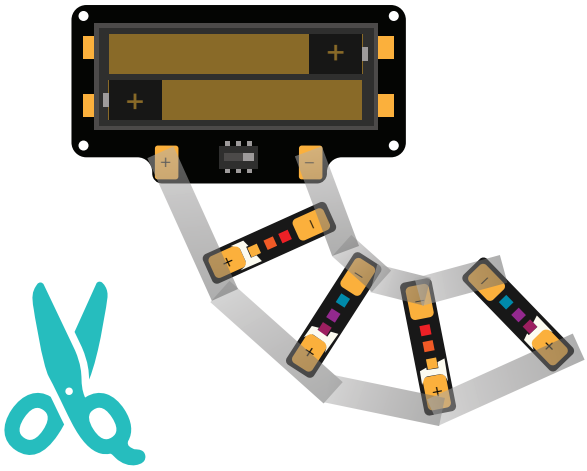
Cut out the LED strips and make your circuit creation. Connect all positives (+) together and all negatives (-) together.

Schneide die LED-Streifen aus und erstelle deine Schaltung. Verbinde alle Positiven (+) miteinander und alle Negativen (-) miteinander.

Ritaglia le strisce LED e crea il tuo circuito. Collega tutti i positivi (+) insieme e tutti i negativi (-) i nsieme.

Corta las tiras LED y crea tu circuito. Conecta todos los positivos (+) juntos y todos los negativos (-) juntos.

Découpe les bandes LED et crée ton circuit. Connecte tous les positifs (+) ensemble et tous les négatifs (-) ensemble.



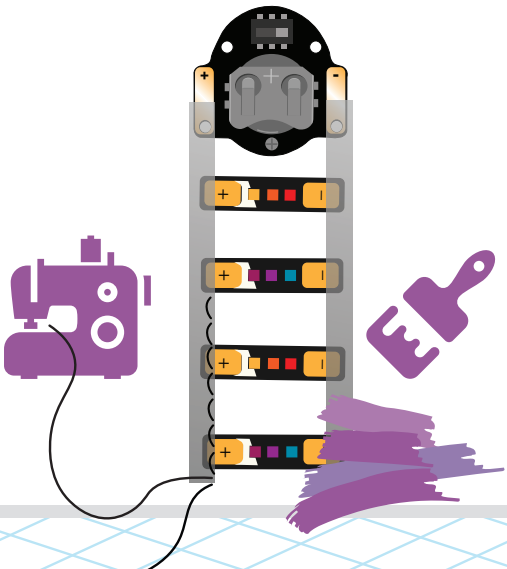
3 Finish your project with optional machine sewing, painting or other crafts.

Vervollständige dein Projekt mit optionaler Maschinennäherei, Malerei oder anderen Handarbeiten.

Completa il tuo progetto con cucitura a macchina opzionale, pittura o altri lavori manuali.

Completa tu proyecto con costura a máquina opcional, pintura u otros trabajos manuales.

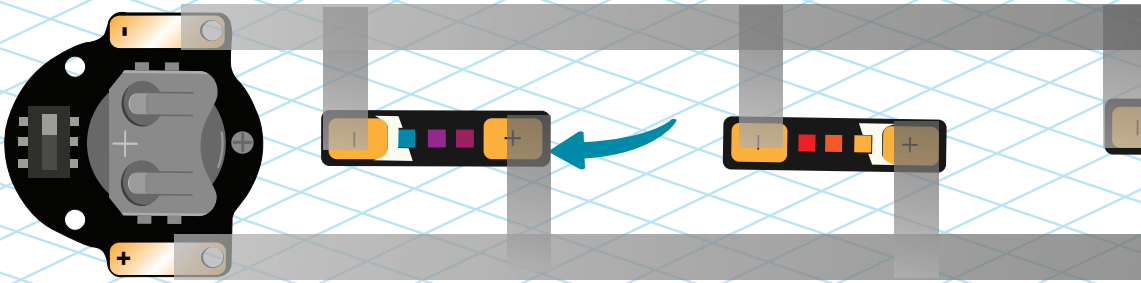
Termine ton projet avec une couture machine en option, de la peinture ou d'autres travaux manuels.



GLOWSTITCH CIRCUITS

COLOUR CYCLING TIPS

Colour cycling LEDs eventually revert to low voltage colours of red, green and yellow as the battery drains. They are a fun way to add a splash of colour to a project and the randomness of colour increases the longer the circuit operates. Add white LEDs to a colour cycling circuit for a twinkling effect.

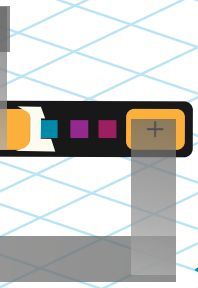


ADDING A SWITCH

You can add a switch in a range of different ways between the battery and LED strips. Two touching pieces of conductive tape can be a switch, or you can use snap fasteners, bulldog clips, bra fasteners, paper clips, safety pins and more to turn your circuit on and off.

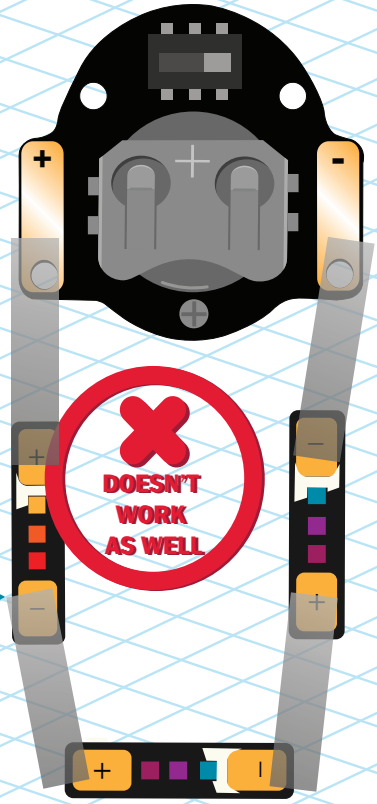
CIRCUIT DESIGN TIP:

To build parallel circuits, as a general rule; connect all the positives (+) then connect all the negatives (-) with separate rails. Don't connect negatives to positives like the circuit on the right, this is called an 'in-series' circuit which does not share power evenly between the LEDs and the lights will not work.



IN SERIES CIRCUIT

PARALLEL CIRCUIT



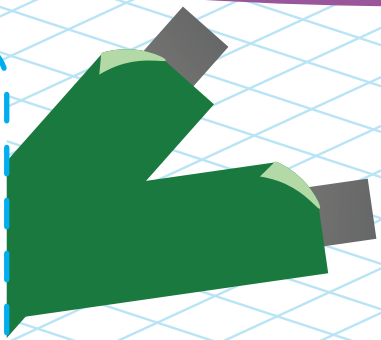
FLEXING

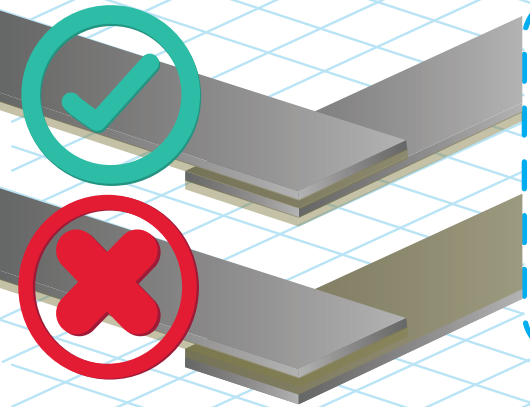
Excessive LED flexing can result in the strips breaking. Position your strips in your project to avoid this, ie. do not position strips inside elbow/knee joints on clothing. Make sure the strips are sitting flat when taped down and/or sewed. You may also add a stiff backing fabric below your circuit to help protect your circuit from extra flexing, especially if you plan to regularly wash your project.

GLOWSTITCH TAPE TIPS

CROSSOVER EPISODE

Protect your circuit from shorts by adding a cover to your conductive tape to stop them touching eachother or rubbing on anything else. You can use paper, fabric, or fabric tape to insulate your circuit. This is a great final step to ensure the longevity of your project.



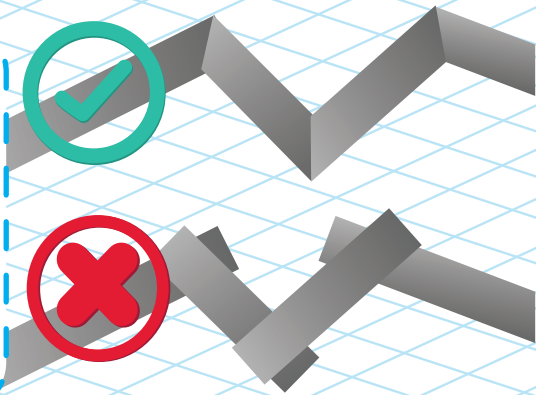


TAPE PARTS

Conductive fabric tape is made up of a sticky adhesive and the conductive top. The adhesive is conductive but not as strongly as the silver fabric. If you join the tape sticky to silver, it will make a good connection, but if you join sticky to sticky, it will make a poor connection.

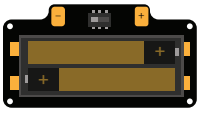
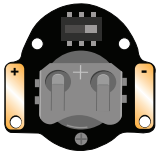
FOLD YOUR TAPE

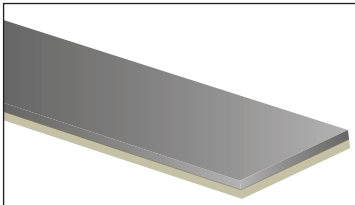
Even when using 'sticky to silver' connections this can introduce more resistance to your circuit when done repetitively. You'll have a stronger connection by bending or folding the tape around corners rather than cutting and sticking. You'll start to see problems when using 5+ cut and stuck pieces.



TECH SPECS

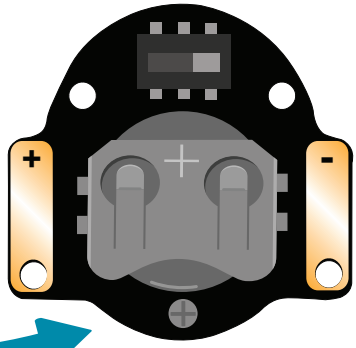
GlowStitch LED	Operating Voltage	Current
 White LED	2.5V - 4.5V	20mA
 Colour Cycling LED Strip	3V - 4.5V	75mA

Battery Holders	Operating Voltage
 	3V

	**Conductive Fabric Tape** Resistance of 0.04 Ω per 25mm. The longer the tape, the more resistance it will have.

BATTERY SAFETY

Coin cell batteries are a swallowing hazard for young children. Install an M3 size screw below the battery to secure it in place. Any child who is thought to have swallowed a coin cell battery should be immediately taken to the nearest emergency department.



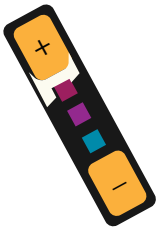
GLOSSARY

Word	Definition
Circuit	Connecting components together to provide an electrical pathway between parts.
LED	Light Emitting Diode: The acronym for the light-up modules.
Rails	Parallel bars or strips, like train tracks on a railway line. In this case, two parallel strips of conductive tape to make up your circuit.
Polarity	Having positive or negative charge. In this case, LEDs have polarity and need to be connected to positives and negatives correctly to work.
Resistance	Opposition to the flow of current and dissapation in the form of heat. Measured in ohms (Ω).
Shorting/Shorts	A short circuit is when the electrical current flows through an unintended, shorter pathway instead of following and/or powering the circuit.
Conductivity	How well a material can conduct electricity. Conductive materials are needed to build circuits.
Current	The flow of electrons through a conductor, measured in amps.
Voltage	The electrical pressure or force that causes current to flow, measured in Volts (V).
Insulated	When a non-conducting material is used to isolate conducting materials from one another.
PCB	Printed circuit board. For example, Glowstitch LEDs are made up of flexible PCBs.

TROUBLESHOOTING

Run through this checklist to find out why your circuit might not be working. Check 'Tape Tips' page for more ideas.

☐ LEDS AROUND THE RIGHT WAY?

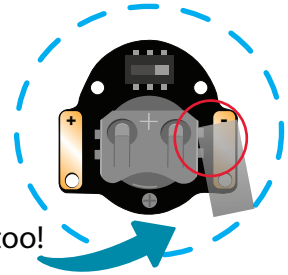


Make sure you only have positives '+' connected on your positive rails and negatives connected on your negative rails. Use the white marking as a guide to find the positive side if tape is covering the ends.

☐ BATTERIES IN CORRECTLY?

Make sure your batteries are in the right way. The coin cell battery goes in with the positive '+' side up.

☐ NO SHORTS IN THE CIRCUIT?



Check to see if your positive and negative rails are overlapping. This means the electrons can 'sneak through' without being forced to do the work of lighting up the LEDs. Sometimes a bit of stray tape on the battery holder can do this too!

☐ EVERYTHING STUCK DOWN WELL?

Make sure the tape is stuck down and well connected to the gold pads in the circuit.

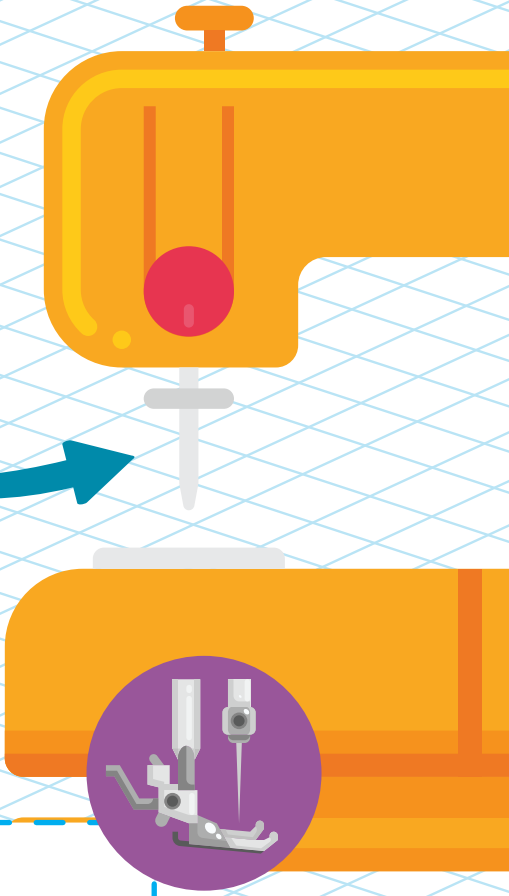
☐ BATTERY HAS CHARGE?

If your circuit is weakly lit or showing mostly reds in a colour cycling circuit, your battery might be low on charge. Swap your battery to find out if you were working with a drained battery.

GLOWSTITCH SEWING

MACHINE SEWING

Secure your LEDs with conductive fabric tape, and run them through the sewing machine to finalise your design. Make sure to only sew the gold pad areas and not beyond it where the LEDs lay. Do not sew into the battery holder, there is a small hole in the battery pads for you to hand stitch this down into place.

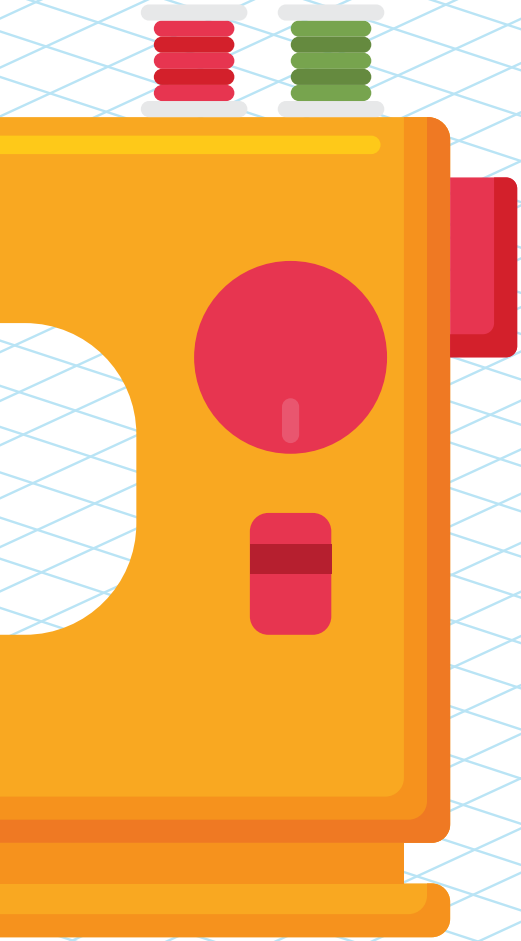


NEEDLE MAINTENANCE

After prolonged sewing with conductive tape, the needle can get gummed up with adhesive. Keep it clean with alcohol wipes or something similar to keep on sewing. Turn the machine off and remove the needle to clean safely.

FOOT TYPE

It's recommended to use a slimline foot like the zipper foot to make sure you can avoid the foot running over the bumpy LEDs. This will put less strain on the LEDs and make it easy to get nice stright rows.



WASHING YOUR CREATION

Before washing, take out the battery and the screw and store in a secure, child proof location.
Hand wash and drip dry your creation. Do not machine wash or machine dry. Avoid excessive flexing of the LED strips while washing. Do not re-insert the battery until completely dry.

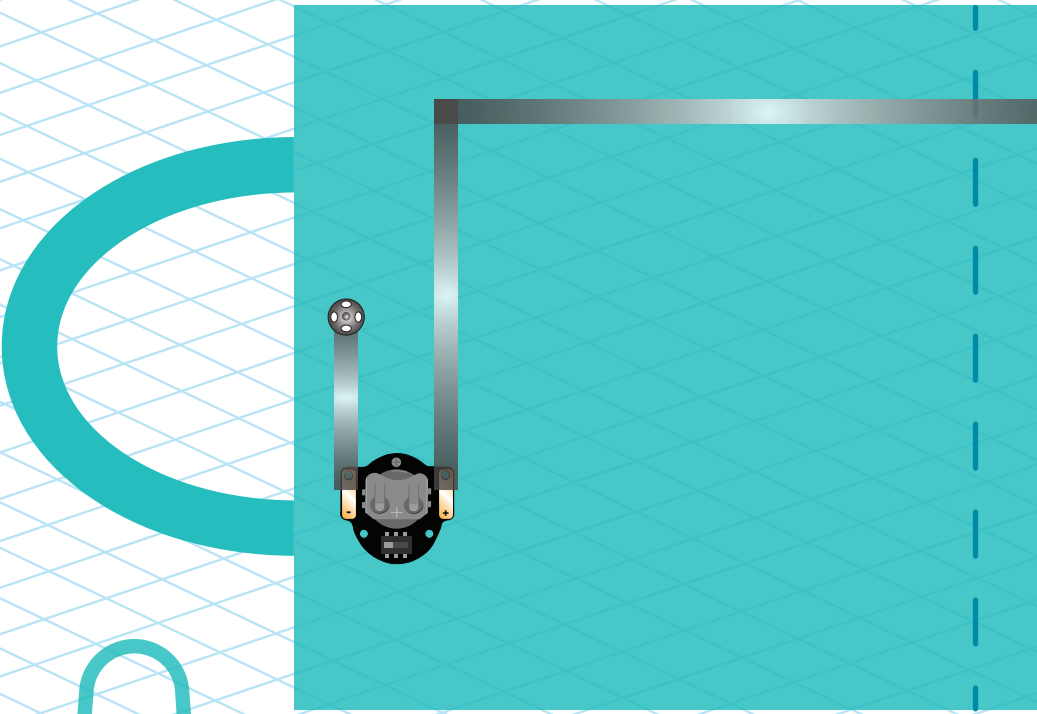
STITCH TYPES

While you can use any stitch type, it's recommended to use straight stitch with the length set at minimum 3 with LED strips. This makes it easier to sew neatly and to unpick and reuse LEDs if the need arises.

GLOW BAG

WEARABLE TECH

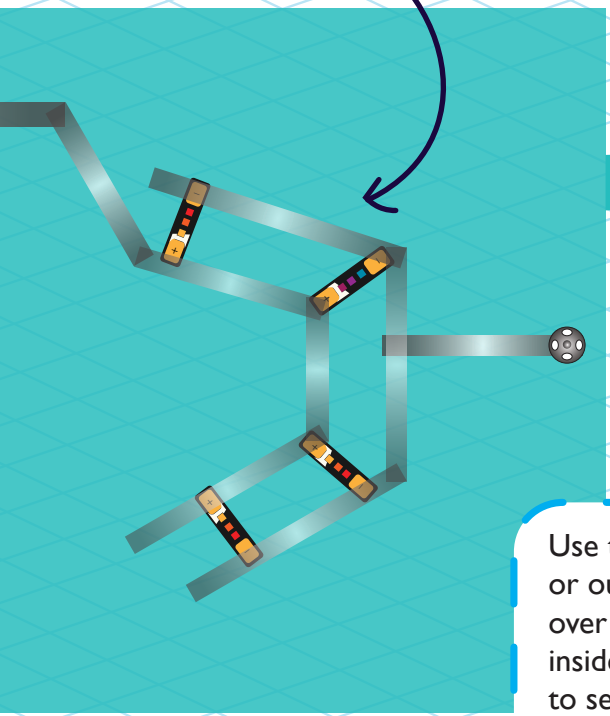
Liven up an old bag or sew a new bag with decorations and light up electronics.
The lights come on when the bag is shut!



Decorate the front with a rainbow, flower or other design of your choice to finish off your project.

PROJECT

Make sure the tape makes a good connection with the gold pads on the LEDs. Sandwich the LED pad between two layers of conductive tape if reversing the LEDs to shine through the fabric from the inside of the bag.



This clip acts as a switch. When connected, it brings power from the battery to the lights!

Use this circuit pattern either on the inside or outside of the bag. Use a layer of fabric over the top to protect the circuit if on the inside of the bag. Consider machine sewing to secure your circuit in place. Conductive tape will still function if painted during decoration.

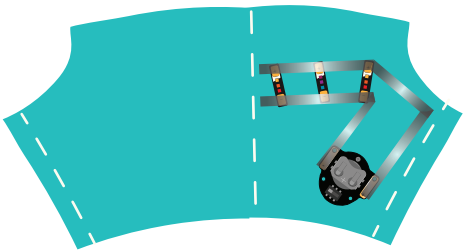
POWER GLOVE
WEARABLE TECH

STEP 1

Trace around your hand to make a glove pattern on a piece of paper. Fold it over to make it double sided. Cut it out of your fabric of choice, allowing a 2cm excess to sew the side up.

STEP 2

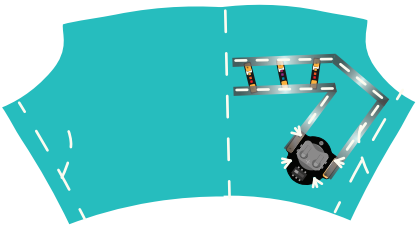
Lay down the LEDs and battery pack, joining the parts together in a circuit with conductive tape.



PROJECT

STEP 3

Optionally, sew the circuit down with a sewing machine along the circuit lines. Hand stitch the battery in place.



STEP 4

Fold the glove together inside-out and sew up the side of the glove, either with hand stitching or a sewing machine. You can also sew down the corner between thumb and forefinger. Turn it back to right side out and enjoy!

OPEN SOURCE

open source hardware

Open source means you can download the blueprints and create your own GlowStitch modules. To do this, you'll need to learn circuit board design software KiCAD.

The designs are given with the following terms:

Attribution - You must give credit to 'GlowStitch', provide a link to the licence and indicate what changes you made.

ShareAlike - If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

The aim of this project is to make electronics easier and strip away the things that make it hard. Releasing the circuit board designs makes it easier for others to get involved and design their own compatible modules, building up a larger variety of GlowStitch parts. This will fast track more innovation in wearable tech and edutech spaces.

I encourage you to download these blueprints and design your own modules for custom projects, interesting applications, and commercial products. By doing this I will be delighted to know that you are inspiring and educating others and learning some circuit board design skills yourself.

Open Source Files on Github:
github.com/sjpiper145/GlowStitch

ABOUT: STEPH PIPER

Steph Piper is a creative technologist and maker located in Queensland, Australia. She is the Community Engagement Coordinator at the University of Southern Queensland, looking after the library Makerspace.
In her free time, she creates beautiful electronics kits with a signature aesthetic that are now sold globally.
For more info, see **makerqueen.com.au**

MAKE SOMETHING?

GlowStitch Project Showcase

Use the tag **#glowstitch** on social media, get your project featured on the Showcase page!

SOCIALS

For updates on GlowStitch, follow Steph:

mastodon.social/@sjpiper145

@maker_queen27

hackaday.io/project/186907-glowstitch-led-strips

HAPPY MAKING!