Battery Powering Wearable Electronics
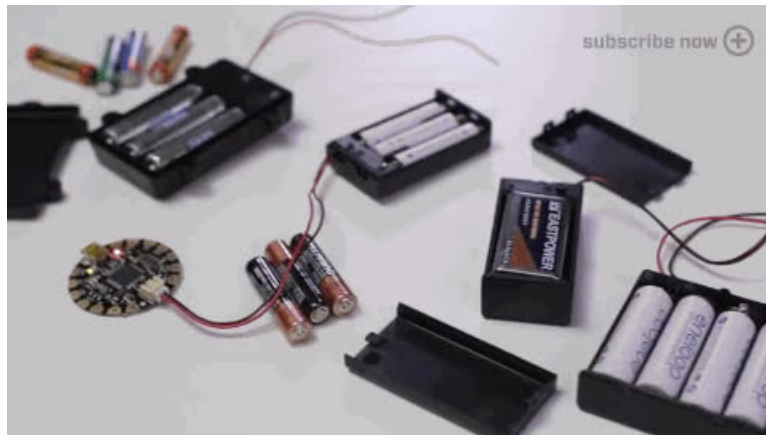
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Last updated on 2018-08-22 03:49:52 PM UTC

# Guide Contents

Overview

So, you want to build something wearable but you're not sure how to power it? You're in luck-- this guide will help you pick the right battery for your wearable electronics project.

Related guides:

- All About Batteries (https://adafru.it/tfL)
- Washing Wearable Electronics (https://adafru.it/tfM)
- Li-Ion & LiPoly Batteries (https://adafru.it/tfN)
- Adafruit MicroLipo and MiniLipo Battery Chargers (https://adafru.it/tfO)
- Multimeters (https://adafru.it/dn4)
- Power Supplies (https://adafru.it/tfP)
- Getting Started with FLORA (https://adafru.it/dwi)
- Introducing GEMMA (https://adafru.it/dwi)
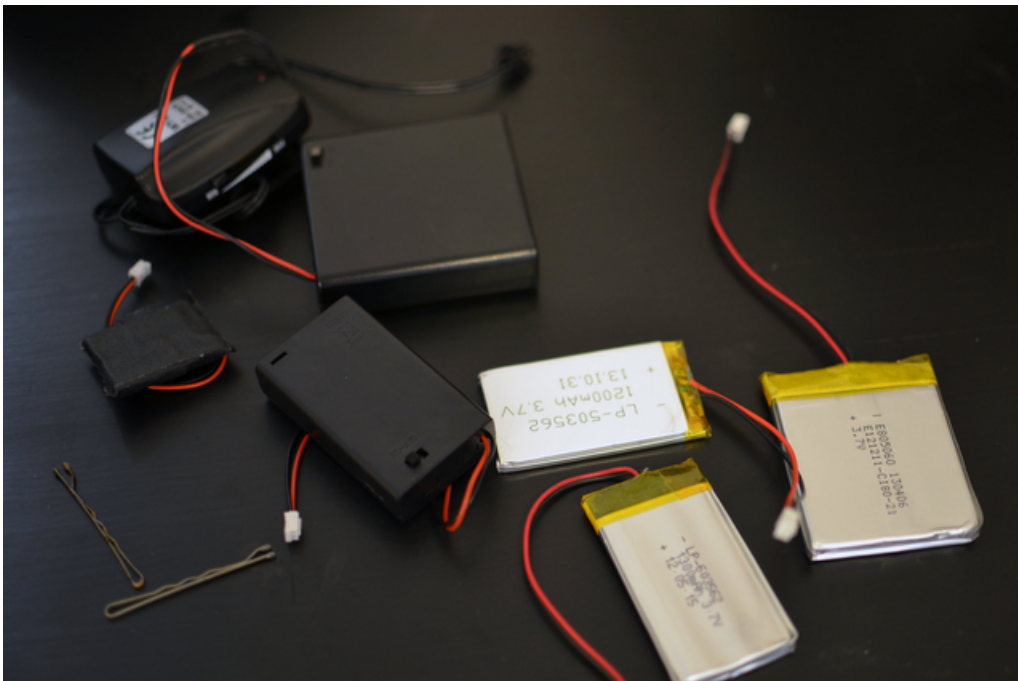
First, it's important to know how much power your circuit uses. For most circuits, just look up the maximum current draw for each component, and add them together. Then pick a battery that matches or exceeds your amperage needs. A 1.5v rechargeable AAA battery that stores 750 milliamp-hours can theoretically output 750 milliamps for an hour, or half as much current for twice as long. If you have three in a battery pack, it can give you three times the voltage, 4.5V, at the same 750milliamp-hours.

A FLORA (30mA), GPS (20mA), and eight NeoPixels (on blue only - 20mA each), total up to 210 milliamps of current draw:

30 + 20 + (20*8) = 210mA

So a three AAA pack (750mA) can easily run the project for about three hours:

750mAh/210mA = 3.57 hours

In reality your pixels are probably not on full brightness all the time, and will therefore draw less current than you calculated. This power supply "overhead" is a good thing and means you're not going to overtax your battery.

However depending on your code your circuit is running, your battery life could vary dramatically! For instance a circuit that randomly pulses one of eight LEDs every minute will use much less power than the same circuit with all eight LEDs on full brightness the whole time.
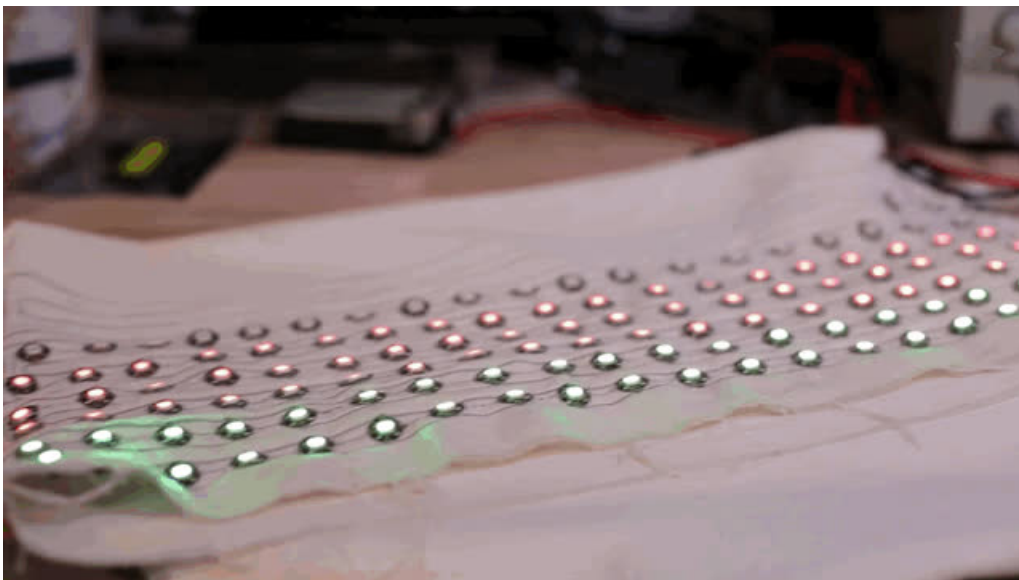
You can also measure the current draw of your circuit using a benchtop power supply or a multimeter. We usually

prototype our projects using a plug-in power option, then switch to battery power later. It's just one fewer thing to troubleshoot.

We hope this helps you pick the perfect battery for your project! Check out the batteries, holders, and chargers in the Adafruit shop (https://adafru.it/fQV).

Alkaline & Ni-MH packs

We have a bunch of different flavors of alkaline battery holders to suit your different needs, including waterproof varieties. Each battery adds another 1.5V to your total voltage. For most wearable projects, stick to 2 to 4 Alkaline or rechargeables for about 3 to 5 volts.

Alkaline packs are great-- the batteries are easily replaceable and the hard plastic keeps everything safe.

For easy charging, nothing beats a pack of Nickel-Metal-Hydride batteries. Three AA's will power most projects, four AA's will alleviate the voltage drop that occurs over long lengths of conductive textiles. However we also recommend avoiding long runs of thread in favor of soldering thin silicone-coated wire.

Projects you can build with a 3xAAA battery pack:

- Really Simple Anamatronic Tail (https://adafru.it/tfQ)
- Pac Man Pixel Suspenders (https://adafru.it/rze)
- Firewalker LED Sneakers (https://adafru.it/jMF)
- NeoPixel Cyber Falls Wig (https://adafru.it/tfR)
- GPS Logging Dog Harness (https://adafru.it/dNj)
- Laugh Track Jacket (https://adafru.it/tfS)
- Textile Potentiometer Hoodie (https://adafru.it/qzA)

Projects you can build with waterproof AA battery packs:

- Bike Wheel POV Display (https://adafru.it/tfT)
- Guggenhat NeoPixel Marquee Hat (https://adafru.it/tfU)
- Brake Light Backpack (https://adafru.it/tfV)

LiPoly rechargeables
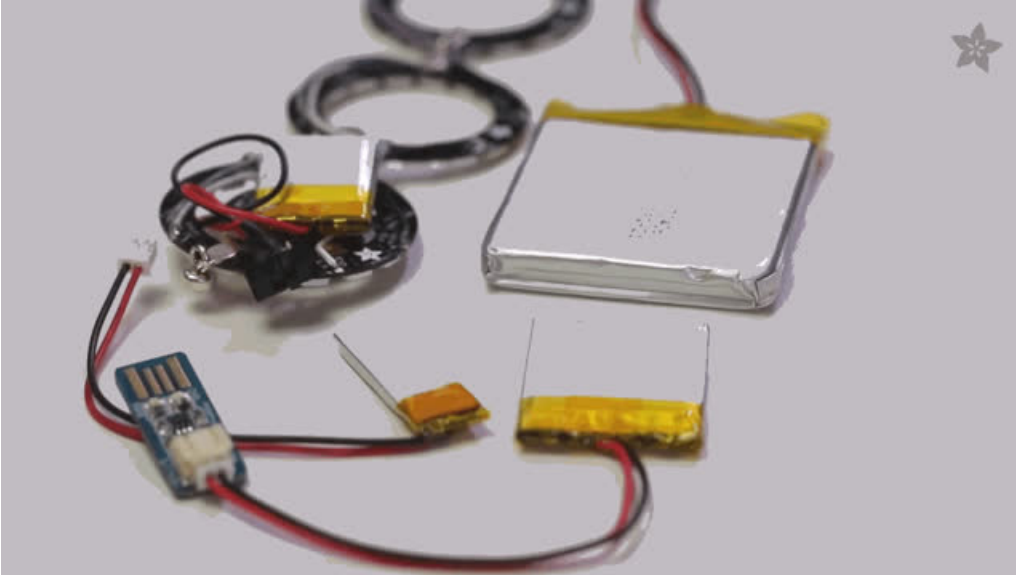
If you're more advanced, you might like these power-dense and lightweight lithium ion polymer rechargeable cells (https://adafru.it/e0v).

These batteries come in many shapes and sizes, and require a special charger to fill them up. Some are small enough to wear on earrings (https://adafru.it/tfW) or other jewelry (https://adafru.it/tfX).
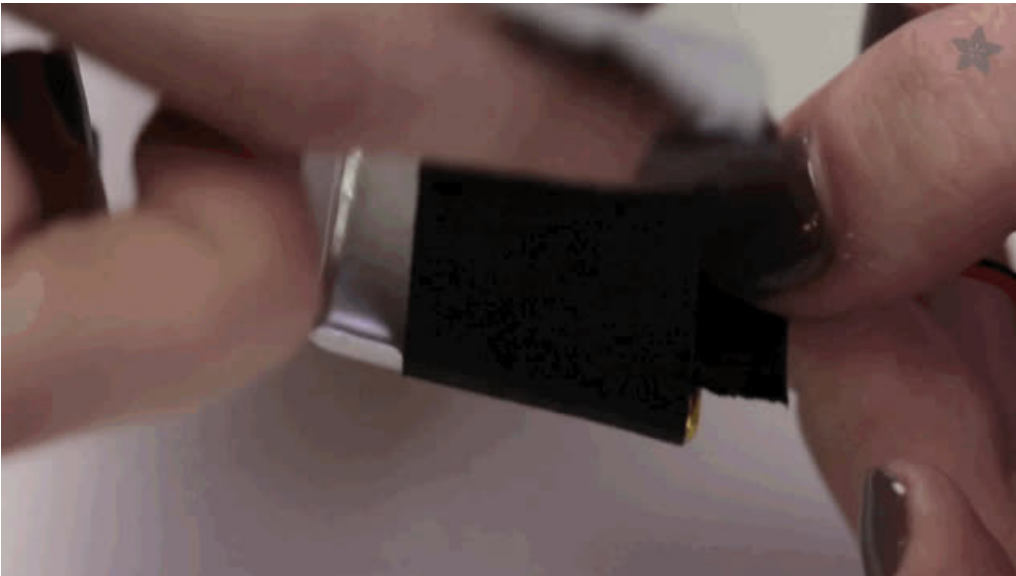
Lithium cells are more delicate than alkaline battery packs and for this reason need more care and attention to prevent from being damaged-- you should never bend, puncture, crush, or otherwise abuse these batteries. We often wrap them in gaffer's tape when embedding in projects, like here on the NeoGeo watch (https://adafru.it/dN4).

Lithium batteries can get hot during charging so they should also be charged off of fabric or the body. For that reason, we have a separate charger board. Unplug the battery from the connector to recharge from any USB port.

Projects you can build with a 110mAh lipoly battery:

- Galaxy Pendant (https://adafru.it/tfY)
- Buzzing Mindfulness Bracelet (https://adafru.it/jDC)
- Crystal Glow Knuckles (https://adafru.it/tfZ)
- Jewel Hair Stick (https://adafru.it/tga)
- Steampunk Cameo OLED Necklace (https://adafru.it/tgb)
- Question Block Sound Jewelry (https://adafru.it/tgc)
- Mario Clouds Pendant (https://adafru.it/tgd)
- Flying Toasters Pendant (https://adafru.it/tge)
- Segment Display Knuckle Jewelry (https://adafru.it/e0I)
- Motion Wristband (https://adafru.it/dN2)
- Light-Activated Pixel Heart (https://adafru.it/rzc)

Projects you can build with a 150mAh lipoly battery:

- Space Invader Pendant (https://adafru.it/tgf)
- Larson Scanner Shades (https://adafru.it/tgA)
- GEMMA Hoop Earrings (https://adafru.it/tfW)
- Heart Rate Badge (https://adafru.it/tgB)
- 3D Printed LED Belt Buckle (https://adafru.it/tgC)
- NeoPixel Ring Bangle Bracelet (https://adafru.it/tfX)
- NeoPixel Punk Collar (https://adafru.it/tgD)
- Laser Dog Goggles (https://adafru.it/doggles)
- Ursula's Seshell Necklace (https://adafru.it/tgE)

Projects you can build with a 500mAh lipoly battery:

- Kaleidoscope Eyes NeoPixel Goggles (https://adafru.it/nYc)
- Cyberpunk Spikes (https://adafru.it/tgF)
- 3D Printed LED Fire Horns (https://adafru.it/e0G)

- Sparkle Skirt (https://adafru.it/dN1)
- VU Meter Baseball Hat (https://adafru.it/tha)
- Sunscreen Reminder Hat (https://adafru.it/dNc)
- Celebration Spectacles (https://adafru.it/thb)
- 3D Printed Unicorn Horn (https://adafru.it/rtb)
- NeoGeo Watch (https://adafru.it/dN4)

Projects you can build with a 1200mAh lipoly battery:

- Citi Bike Helmet (https://adafru.it/dN5)
- Boombox Beach Bag (https://adafru.it/thc)
- LED Ampli-Tie (https://adafru.it/doN)
- 3D Printed Daft Punk Helmet (https://adafru.it/e0C)

Projects you can build with a 2000mAh lipoly batery:

- Solar Boost Bag (https://adafru.it/thd)
- Portable Apple Watch Charger (https://adafru.it/the)

Projects you can build with a 2500mAh lipoly battery:

- FLORAbrella (https://adafru.it/dNe)
- UV Manicure Lamp (https://adafru.it/thf)
- NeoPixel LED Longboard (https://adafru.it/e0F)
- Animated NeoPixel Glow Fur Scarf (https://adafru.it/thA)
- EEG Costume Cap (https://adafru.it/thB)

Many of you ask how to power a large number of pixels on the go, like on a video jacket. Sure, you could wear a huge 6V lead-acid battery in your backpack, but these days there are some lighter-weight options available.


Another way to deliver juice to your power hungry wearable is through these USB battery packs. We sourced them for the Raspberry Pi, but this bigger one can deliver up to two amps, enough to charge your iPad, and has 10,000 milli-amp hours of capacity. FLORA is designed to handle up to 1A through USB port (2A from the battery JST port) so you can just plug in the pack into the USB port and it can drive up to 100 NeoPixel LEDs if not all of them are lit up at once

or on full white

Projects you can build with a USB battery pack:

- LED Stego Flex Spike Hoodie (https://adafru.it/thC)
- Bandolier of Light (https://adafru.it/thD)
- Roll-up Video Light (https://adafru.it/thE)

Coin cells
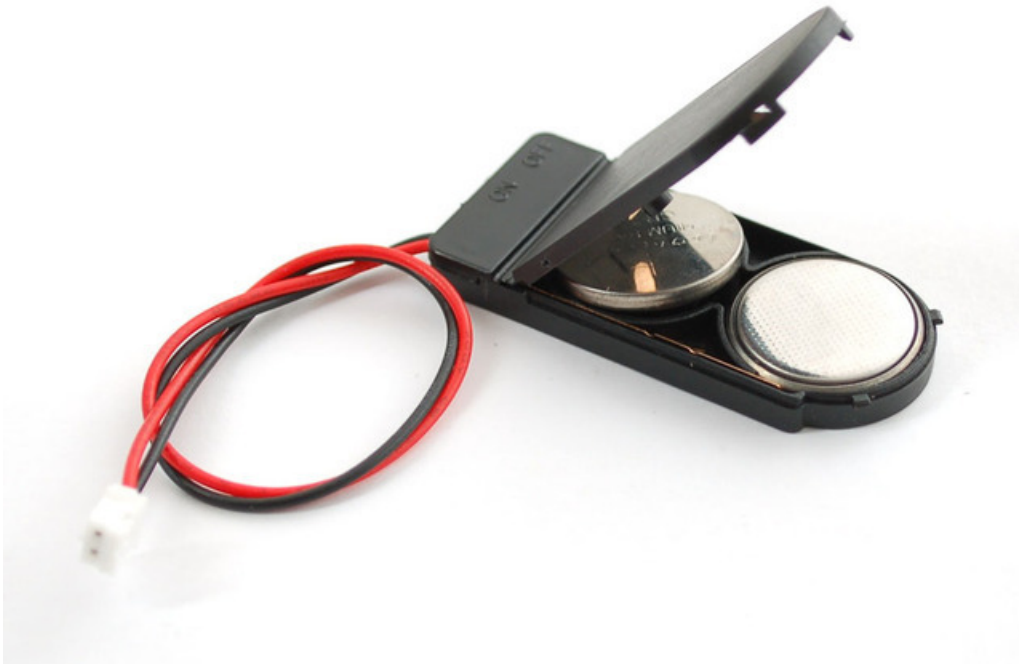
For GEMMA projects in particular, a slim battery holder with a built-in power switch is handy. Coin cells are fairly high capacity for the size; this pack can give you about 6V and 250mAh (https://adafru.it/fQZ). However, it can't provide tons of current for long periods of time, this pack can power a gemma plus three or four neopixels for a couple hours-- pack spares in case the party runs long.
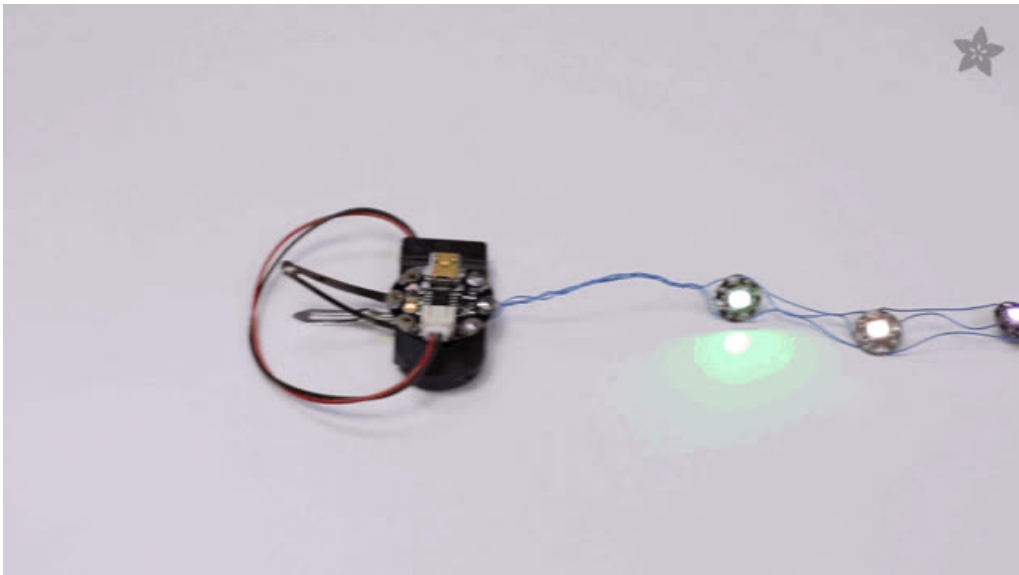
Projects you can make using this battery pack:

- LED sequin hat (https://adafru.it/iSf)
- NeoPixel Tiara (https://adafru.it/rza)

- Interior Light Purse (https://adafru.it/thF)
- Space Face LED Galaxy Makeup (https://adafru.it/rzd)
- Luminous LED Flower Bouquet (https://adafru.it/tia)