Portable Qi Charger
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https://learn.adafruit.com/portable-qi-charger

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Overview

In this project, we'll take a look at building a portable Qi charger. This universal standard works with many devices and can still charge non Qi enabled devices via the USB port on the side.

In a previous project we built a 3d printed stand to hold our charging transmitter but in this project we'll make it portable with a PowerBoost 1000C and a beefy 6600mAh battery!
Maximum output is around 5W which is good for most smart phones, basically 1000mA charge at 5V on the other side of the wireless connection. It has a charging distance of 2-8mm!

We've built smaller portable wireless Qi chargers for wearables like the Apple Watch and have found it useful enough to leave behind one less cable while traveling.

You can also just connect to a 5v power supply - through a micro USB port. If you want to 'share' the microUSB power connection, you can also connect directly to the USB-A port.

Prerequisite Guides

Check out the following guide below to get a better understanding of the Powerboost 1000C pin outs.

[PowerBoost 1000C](https://www.adafruit.com)
Parts, Tool & Supplies

If you don't have access to a 3D printer, you can send the files to a service or check with your local hackerspace/library.

Universal Qi Wireless Charging Transmitter
If you have a modern smart phone you may have noticed that it comes with built in wireless charging capability called ‘Qi charging.’
https://www.adafruit.com/product/2162

PowerBoost 1000 Charger - Rechargeable 5V Lipo USB Boost @ 1A
PowerBoost 1000C is the perfect power supply for your portable project! With a built-in load-sharing battery charger circuit, you'll be able to keep your power-hungry...
https://www.adafruit.com/product/2465

Lithium Ion Battery Pack - 3.7V 6600mAh
Need a massive battery for your project? This lithium-ion pack is made of 3 balanced 2200mAh cells for a total of 6600mA capacity! The cells are connected in parallel and spot-welded...
USB DIY Connector Shell - Type Micro-B Plug
Make your own USB connections without slicing apart a USB cable and soldering those thin wires inside. These DIY "USB shells" are available in https://www.adafruit.com/product/1390

5V 2.5A Switching Power Supply with 20AWG MicroUSB Cable
Our all-in-one 5V 2.5 Amp + MicroUSB cable power adapter is the perfect choice for powering single-board computers like Raspberry Pi, BeagleBone, or anything else that's... https://www.adafruit.com/product/1995

Ultimaker 3 - 3D Printer
The Ultimaker 3 is one of our favorite 3D printers on the market. It's a well-built open-source compact machine with an excellent UX. Every inch of the... https://www.adafruit.com/product/3300

Filament for 3D Printers in Various Colors and Types
Having a 3D printer without filament is sort of like having a regular printer without paper or ink. And while a lot of printers come with some filament there's a good chance... https://www.adafruit.com/product/2080
3D Printing

The 3D printed parts are fairly easy to make with most common home desktop 3D printers that are on the market.

And if you don't have access a 3D printer, you can order our parts by visiting our Thingiverse page and have someone local 3D print the parts and ship them to you.

Slice Settings

Download the STL file and import it into your 3D printing slicing software. You'll need to adjust your settings accordingly if you're using material different than PLA.

- 230C Extruder Temp
- No heated bed (65C for heated)
- 1.0 Extrusion Multiplier
- .4mm Nozzle
- 0.48 Extrusion Width
- .2mm Layer Height
• 30% infill
• No Supports
• 90mm/s | 120mm travel speed

NinjaFlex flexible lid:

• 30mm/s | 120mm/s travel
• 240C Extrusion Temp
• 1.2 Extrusion Multiplier
• No Retraction

Print without supports

The enclosure features mounts on both sides with a cutout through the model for mounting the battery. To avoid adding supports, we can orient the model to print on its side. This worked out really well as the overhangs start to catch themselves after a couple of layers!

Add about 6 skirts (brims) the help adhere the enclosure to the build plate
Make flexible filaments grippy with glass

Printing with flexible material will slipping on flat surfaces. To maximize the gripping characteristics of NinjaFlex, we can print the lid parts flat on a glass bed with the temperature set to 40-60c.

You can also add rubber feet to help the enclosure grip to surfaces better.
Dual Colors

To print in multiple colors, we can use the lid parts found inside the dual lid.zip file.

In Simplify3D, select all of the lid files and then under the edit menu, select Align Selected Model Origins. Then select Group Selection under the edit menu. Lay the lid flat with the fillet side on the bed. To ensure the parts fuse together, set the Horizontal size compensation to .3mm.

In Cura, select all of the lid parts and then select merge models. Now we can rotate the merged model and lay the lid flat with the fillet side on the bed.
Clean up

We used a flush diagonal cutter to clean up any stringing and overhangs around the port openings and around the standoffs inside the enclosure.

Make sure the openings for the slide switch and USB ports are cleaned before mounting components. Use a hobby knife to help cut away stringing that could block components from mounting.

Circuit Diagram
Take a moment to review the components in the circuit diagram. This illustration is meant for referencing wired connections - The length of wire, position and size of components are not exact.

A Micro-B USB connects to 5V and G on the PowerBoost1000C via 50mm long wires. The Micro-B USB connects to the Micro USB port on the Qi board.

The pre assembled USB jack on the PowerBoost is extended with 27mm long wires to reach the port opening on the enclosure. Take note, in order to easily fit inside the enclosure, the USB jack will need to be flipped. This means the wiring will need to be flipped to match the correct pins on the PowerBoost.

The slide switch will need to connect to GND and EN via 16mm long wires.

Battery connects to the JST port next to the USB port on the PowerBoost.

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Assembly

Remove USB A jack

The PowerBoost comes with a USB A jack pre assembled. To fit with in our design, we'll need to extend the USB jack with wires so the jack can protrude outside of the enclosure.

Remove the USB jack by lifting it out of the through holes. We will need to flip the USB jack when mounting to the enclosure, so take note that the wiring will need to be flipped when soldering.
Modifying USB jack

The enclosure has a port opening for the USB jack to pass-through but first, we'll need to modify the edges on the metal case so it can fit through.

We can use a pair of flat pliers to carefully bend all four edges straight to allow the component to fit through the USB port opening.

For the wide edges, use the entire length of the pliers to grip. This will make it easier to bend back once we push it through the 3d printed enclosure.

Be careful not to over bend the edges. The metal is pretty thin and will break off after half a dozen times bending back and forth.
Mount USB jack

Insert the USB jack from the inside of the enclosure as shown in the picture. Use both thumbs and evenly push the component through the opening. If the jack doesn't fit, double check that the edges are all straighten.

Next, the two larger pins on the sides will need to be bend flat to shorten to height of the component.

Now we can gently bend all of the edges back to keep the component from getting pushed back into the enclosure.

The middle four pins will need to be trimmed to shorten the height of the component. Cut about 2mm off each of the four pins. Don't bend the pins back as it can short the circuit.
USB stopper

To keep the USB component flush against the enclosure, we'll need to insert the small printed stopper in front of the plastic clip around the metal shell.

Push the edges on the USB jack into the enclosure while pressing the clip onto the metal shell.

Test the stopper clip by inserting a USB cable into the jack and then remove it to see if all of the parts stay.
Slide switch

To power the circuit on and off, we'll first need to wire up our slide switch. Cut two 16mm long wires and then tin and solder them on two of the pins on the slide switch like shown in the picture.

Now we can solder those wires to the EN pin and the other wire to the GND pin on the PowerBoost1000C.
USB Jack wires

Next we can go ahead start tinning the middle four pads on the opposite side of the micro USB.

The wires for the USB jack will need to be at least 27mm long to reach the port opening.

Tin each pad and then lay each wire on top to solder in place.
Male Micro USB

The PowerBoost will connect to the Qi transmitter through a male micro USB. We used the Micro-B plug and removed it from the shell.

Cut and solder two wires 50mm long as shown in the circuit diagram. We'll connect the +5v pin on the micro USB to the 5v pad on the PowerBoost and the GND on the micro USB to the G pad on the PowerBoost.
Mount PowerBoost

Once all of our connections are wired up and soldered, we can move on to mounting the PowerBoost into the enclosure.

We'll use M2.5 x 5mm long screws to secure the PowerBoost to the standoffs on the enclosure.

Slide Switch

Make sure the opening for the slide switch is cleaned from any stringing left over from printing and then press the slide switch in at an angle. Use tweezers to help it snap into the three walls that will secure the slide switch in place.

Position the micro USB wires above the wires for the USB jack as shown in the picture.
Solder USB jack wires

Solder the remaining four wires from PowerBoost to the four pins on the USB jack.

Remember that all of the pins are flipped upside down!
Mount the Coil

Now we can mount the coil base to the outline on opposite side of the enclosure.

Flip the enclosure and apply two very small pieces of mounting tac to the two corner outline as shown in the picture. Position the coil over the outline with the transmitter PCB inside of the cutout.

Press down on the coil base to adhere it to the enclosure. Make sure to use a small amount of mounting tac or the coil will be too thick for the lid to close.
Mount transmitter PCB

Pass the transmitter PCB through the cutout and rest it on the standoffs on the opposite side of the enclosure.

Use M3x6mm long screws to secure the transmitter PCB to the standoffs.

Connect micro USB to Transmitter

Next we'll plug in the micro USB into the Transmitter PCB. Align the ports and use a tweezer to help guide the usb connections.
Coil lid

Before we attach the battery, we'll first need to attach the lid to the side of the enclosure were the coil is mounted.

Use four M2x5mm long screws to secure the lid to the enclosure.

If you are using the NinjaFlex lid part, first add the "lid support" and then the flexible lid over. The same screws will secure both lids.

Mount battery

Position the 6600mAh battery inside the cutout with the wires angled as shown in the picture. Use tweezers to help maneuver excess wire under the transmitter pcb.

Plug the battery into the JST port on the PowerBoost. You can use flat pliers to help align and plug the battery in.

Verify the circuit powers on and then add the lid over this side of the enclosure.
Now we can flip on the slide switch and test the circuit!

Align the coil to the middle of your Qi enabled device to begin charging!

Note the coil isn't centered in the middle of the enclosure, so you'll need to be aware of the coil position to align your device.