



FORMLABS TUTORIAL:

# 3D Print & Build Your Own Speaker

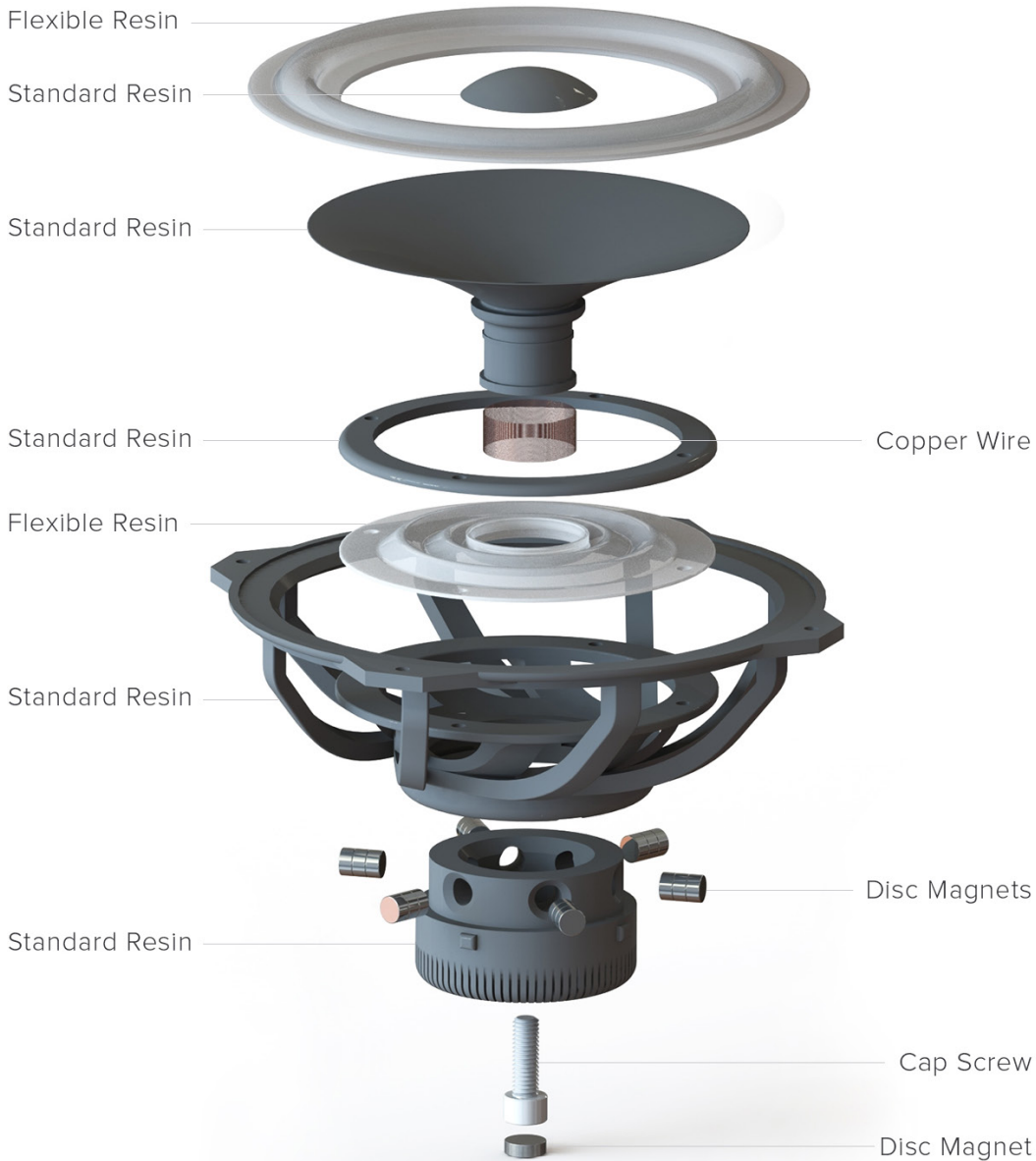
With the exception of wire, magnets and a few nuts and bolts, this speaker driver is designed to be fully printable on the Form 1+ with Formlabs Standard and Flexible Resins. Once wired, the speaker should be between 6 – 8 ohms, safely handle 10 watts and work with most [audio amplifiers](#). Download the [.stl](#) or [.form](#) files to get started on this project.

# Print Files

There are 7 files that need to be printed for the speaker assembly.

## PRINTED COMPONENTS

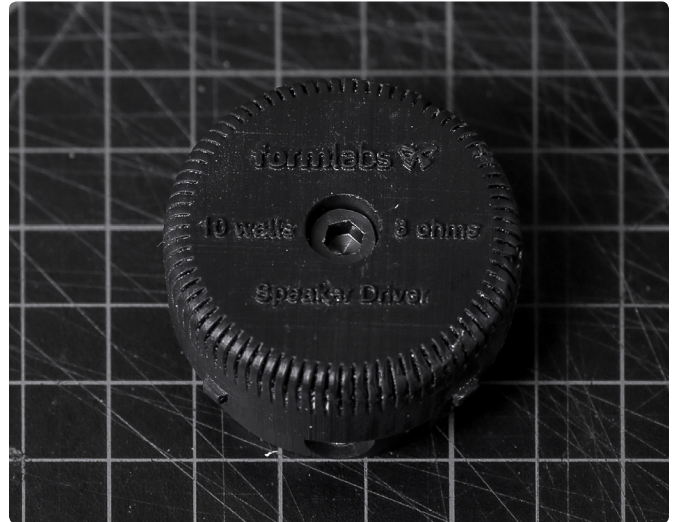
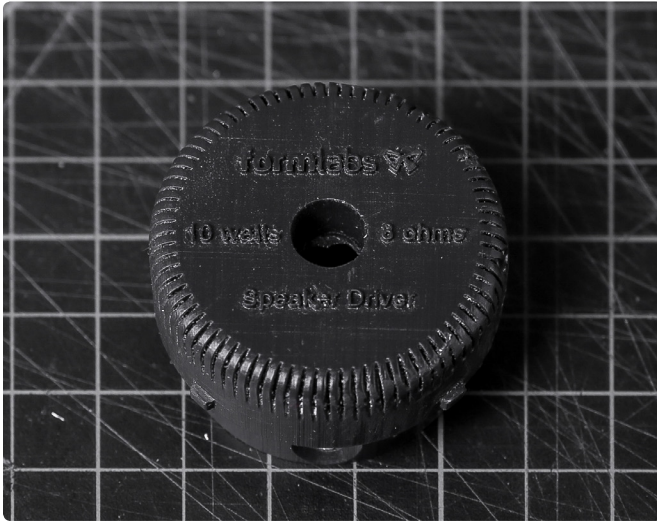
## NON-PRINTED COMPONENTS



## Wash Prints and Remove Supports

After printing, remove parts from the build platform for rinsing in isopropyl alcohol. A short rinse of 3 – 5 minutes is recommended prior to support removal for the cone and dustcap. Because the cone is so thin, the edges may warp if left in alcohol too long. The speaker cone, dustcap, and flexible parts are extremely thin and require very delicate support removal. Post-curing these parts after support removal is also recommended.

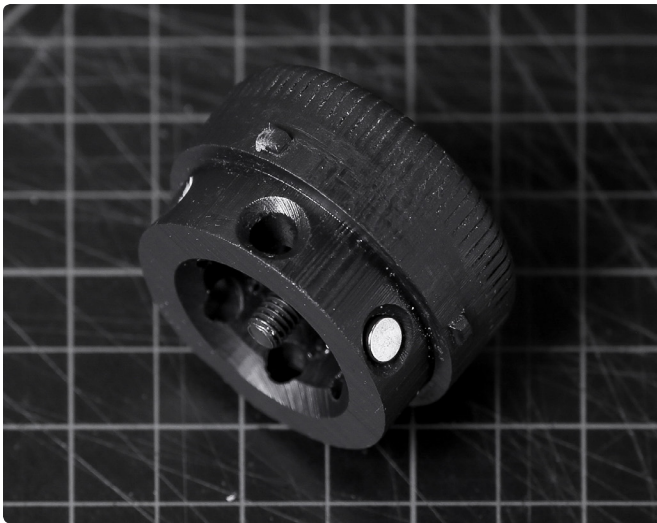
# Magnet Assembly



The magnet assembly is designed to use easily-available cylindrical magnets instead of custom ring magnets used in production speakers.

Tap the center hole with an M6x1 tap. Thread an M6x18 socket head cap screw all the way into the hole. This screw will act as a magnetic pole piece.

**The center hole is sized according to a typical metric drill and tap chart.**



Insert a stack of 3 - 1/4" x 1/8" magnets into each magnet hole ensuring the poles are all facing the same direction (i.e. North facing inward). Either pole can face in, as long as the direction remains consistent.

**The magnet holes are undersized by 0.05 mm diameter for an easy press fit. If the magnets do not stay in place, resin-glue them in place.**

Finally, insert a 3/8" by 1/8" magnet capping the M6 screw in the proper orientation. If North is facing inward on the 6 radial magnets, North should be facing outward (the text side) of the magnet assembly. Feel for attraction or repulsion between the magnets to determine the correct polarity.

## Basket Assembly

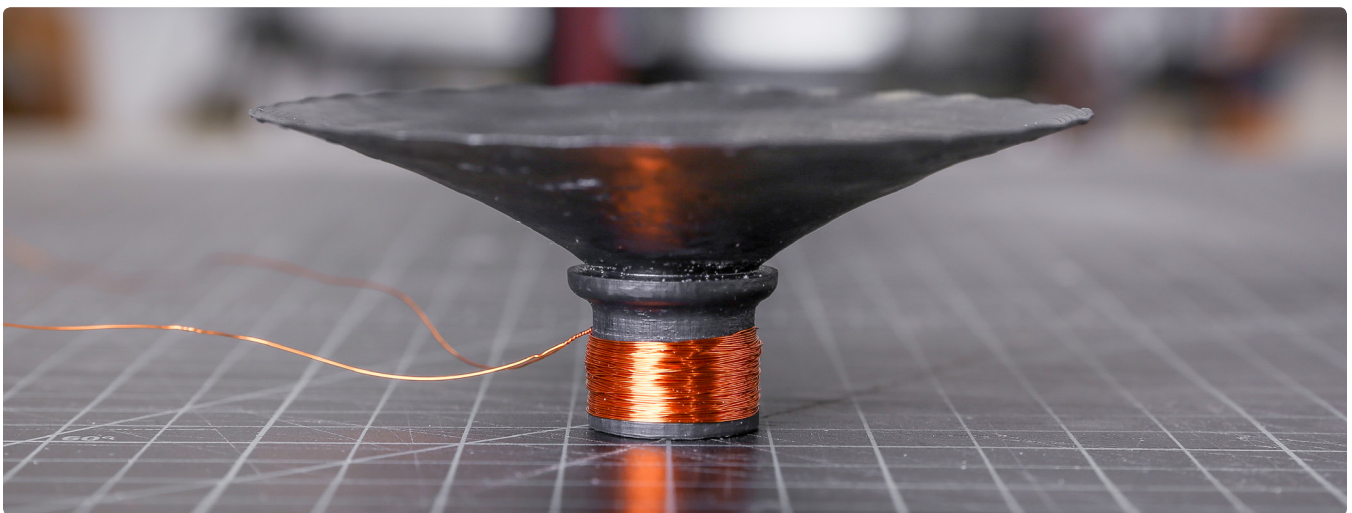
The basket has pockets for **captive M3 nuts** to allow you to mount the speaker in an enclosure. Insert 1 M3 nut into each of the 4 press-fit pockets around the rim of the basket. Going through the hole, tighten an M3 screw onto the nut to squeeze the nut into the press-fit pocket. **These press-fit pockets were created with a 0.1 mm negative offset.**

Insert 4 more M3 nuts into the suspension rim. These nuts will be used to secure a retaining ring holding the suspension in place.



## Cone and Voice Coil

Carefully wind the voice coil between the bottom rim and the ridged line, approximately  $\frac{2}{3}$  of the way up the tube. Wind the coil until the wire stacks approximately to the edge of the bottom rim. You will likely want the resistance of the coil of wire to be 6 – 8 ohms. You can experiment with different gauge wire and number of windings. Check your amplifier to ensure your speaker resistance matches the specified range so your amplifier isn't damaged.



The wire used in this project is 32 gauge magnet wire wound to just under 8 ohms. Twist the wire to hold the coil tightly or place a piece of electrical tape around the coil. Be sure to measure the resistance of the coil before hooking up the speaker.

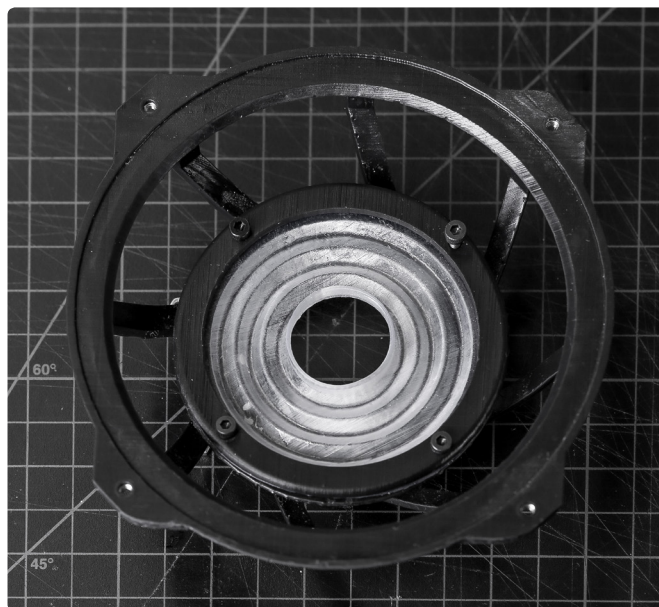
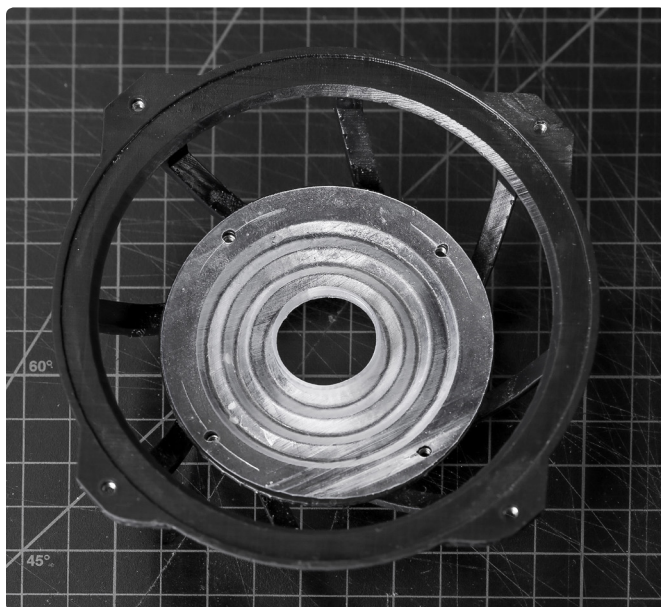
**Resin-glu**e the dustcap in place over the hole in the center of the speaker cone.



The cone is designed to be extremely thin, making it as light as possible while staying rigid. The cone's thickness is tapered down to 0.3 mm at the edge.

## Flexible Lower Suspension

Place the lower suspension in the basket and align the screw holes. Place the ring on top of the suspension and screw it down with 4 M3x8 screws.

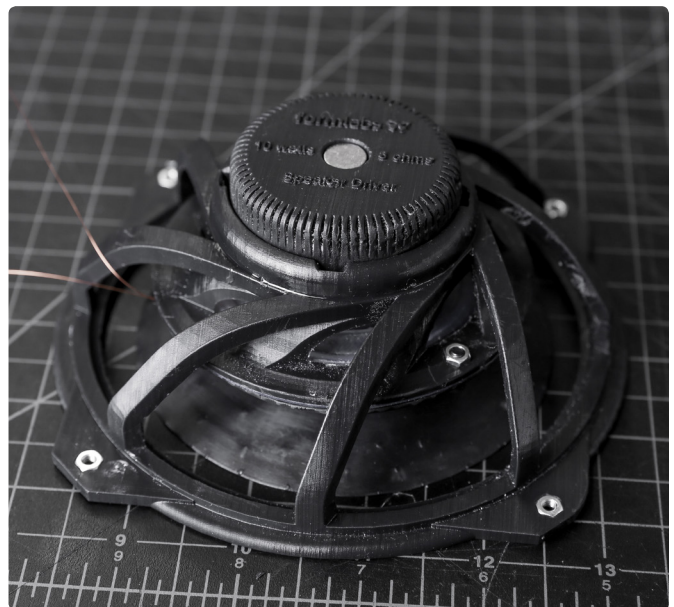
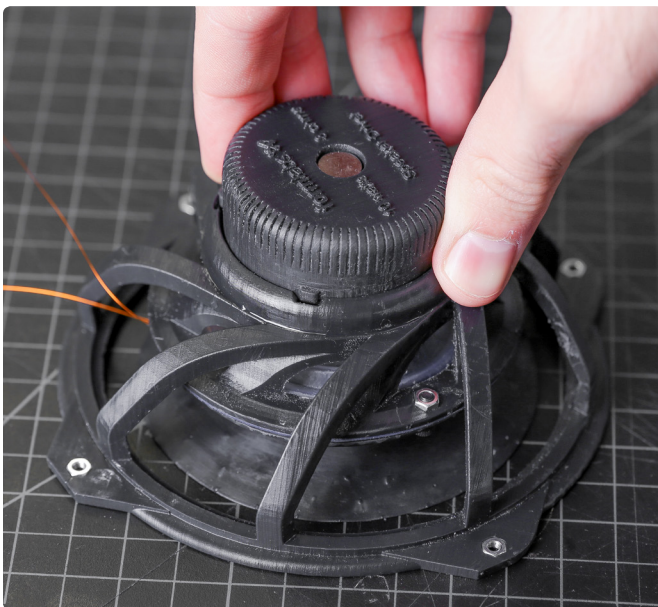


Insert the cone and carefully press the voice coil tube into the lower suspension. A rib in the hole of the lower suspension allows the voice coil tube to 'soft-snap' into the suspension.



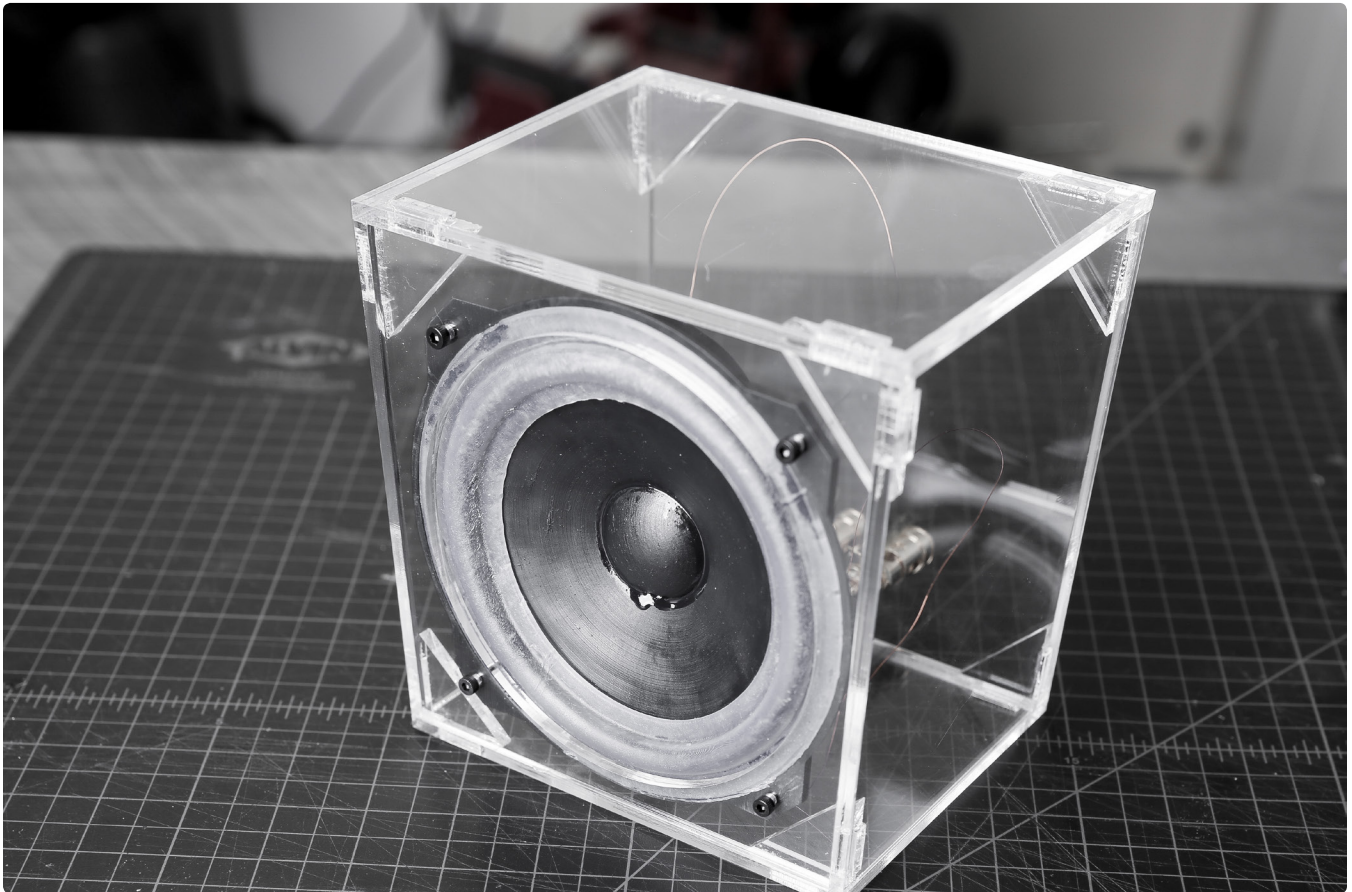
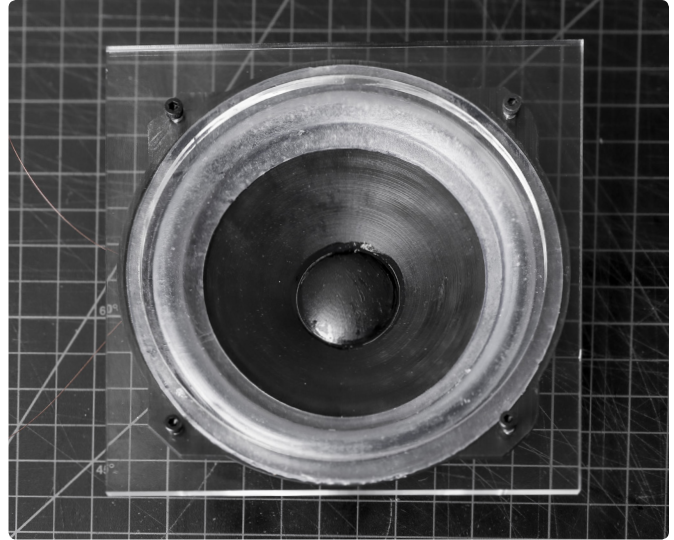
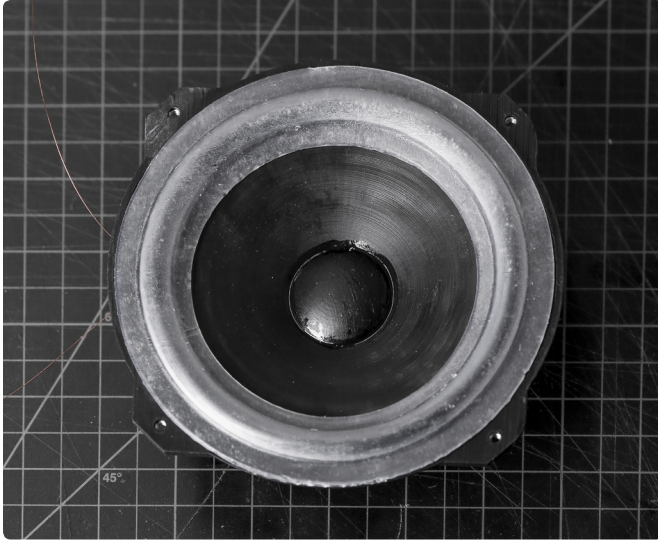
## Insert Magnet Assembly

Insert the magnet assembly into the rear of the basket. Align the 4 keys with the keyways in the basket and insert the magnet assembly further. Rotate the magnet assembly ( $\frac{1}{4}$  turn) until it is snug in the basket. If it does not fit or is too tight, some filing or sanding will do the trick.



# Flexible Surround Suspension

Lay the flexible surround suspension on top of the speaker cone and basket. The flexible surround should fit inside a recess in the basket. Resin-glue the seam between the speaker cone and the surround. If you are building an enclosure, the front of the enclosure will hold the outer edge of the surround to the basket. Otherwise, the flexible surround can be epoxied to the basket with a [fast-setting epoxy](#).



# Bill of Materials

| Name                                    | Qty |
|-----------------------------------------|-----|
| <a href="#">Formlabs Flexible Resin</a> | 1   |
| <a href="#">Formlabs Standard Resin</a> | 1   |
| <a href="#">1/4" x 1/8" Magnets</a>     | 18  |
| <a href="#">3/8" x 1/8" Disc Magnet</a> | 1   |
| <a href="#">32 gauge Magnet Wire</a>    | 1   |
| <a href="#">M6x1 SHCS</a>               | 1   |
| <a href="#">M3x8 SHCS</a>               | 8   |
| <a href="#">M3 Hex Nut</a>              | 8   |

## Other Supplies:

[Hi-Fi Audio Amplifier](#)

[UV Laser Pointer](#)

[5-Min Epoxy](#)

## Appendix

