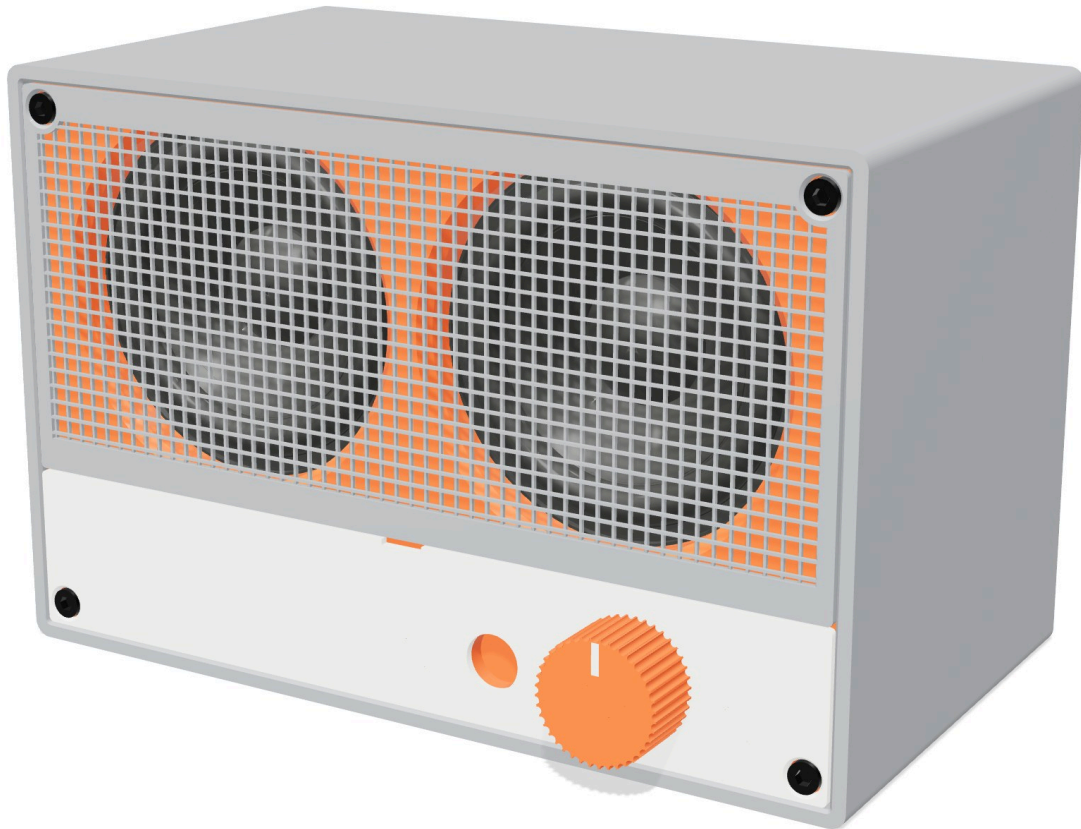


Bluespeaker Mini

This report gives the data that a manufacturer needs to print, finish, and assemble the Bluespeaker Mini. It contains the parts, the print settings, the joint sections, the fastener schedule, the fits, and the inspection steps.



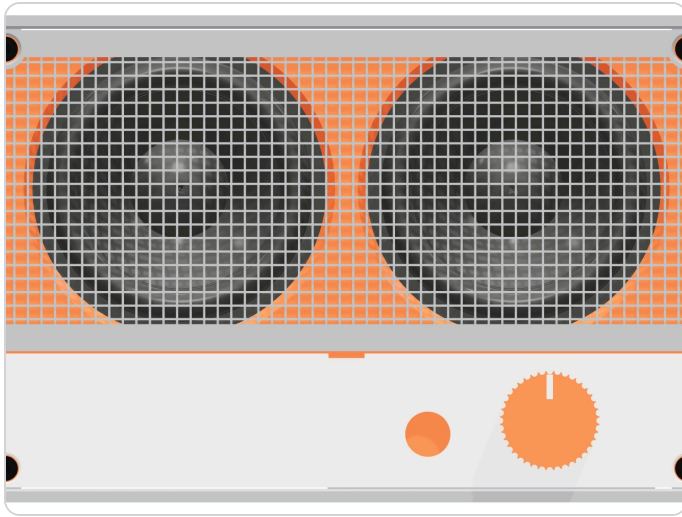
Revision	0.3
Date	11 October 2026
Source model	cad/bluespeaker_mini.py (build123d)
Print files	cad/stl-mini/: STL in print orientation, 3MF for Cura
Process	FDM, PLA 2.85 mm, 0.5 mm nozzle (LulzBot TAZ Workhorse SE, Klipper)
Units	Millimetres. Angles in degrees. Ø is a diameter.
General tolerance	±0.2 mm on printed parts unless a fit is given in section 8

In this report

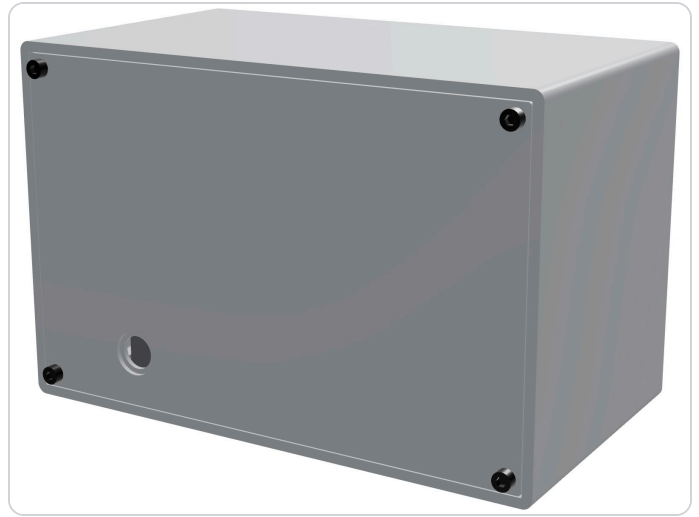
- 1 Product overview
- 2 Bill of materials
- 3 Print instructions for each part
- 4 Process settings (Cura)
- 5 Engineering drawings (A3 sheets at the end)
- 6 Fastener and insert schedule
- 7 Snap-fit covers
- 8 Fits and clearances
- 9 Post-processing
- 10 Assembly
- 11 Inspection and acceptance
- 12 Open items

Coordinates. X is the width (+X to the right, seen from the front). Y is the depth (-Y is the front face, at $Y = -47$). Z is the height ($Z = 0$ is the bottom of the sleeve). The drawing sheets give their cut planes.

Overall views



Front. Overall 166 W × 108 H × 94 D. Drawing BSM-00.



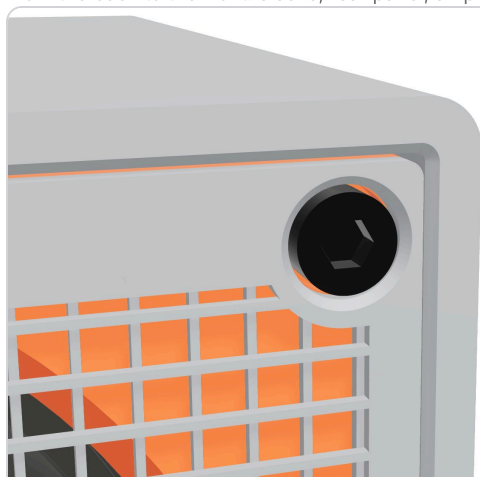
Rear. DC socket hole and four M3 × 6 screws.

Outside size	166 W × 108 H × 94 D, corner radius 3, wall 3
Drivers	2 × Dayton Audio PC68-4 (2.5 in, 4 Ω), rear-mounted on 3 mm spacer frames, 74 mm apart
Amplifier	ZK-502C Bluetooth board on a printed tray, 12–24 V DC
Enclosure	Sealed, about 1.1 L
Front	Grille (grey) and control strip (white), both snap onto the orange baffle. Four cap heads show in the corners.
Printed mass	About 354 g if solid. The real mass is lower: the panels have 40 % infill.

Exploded view



From the back to the front: sleeve, rear panel, amplifier and tray, drivers, baffle, strip, grille, knob.



Top-left corner: the cap head in its grille port.



Bottom-right corner: the cap head in its strip port.

Printed parts

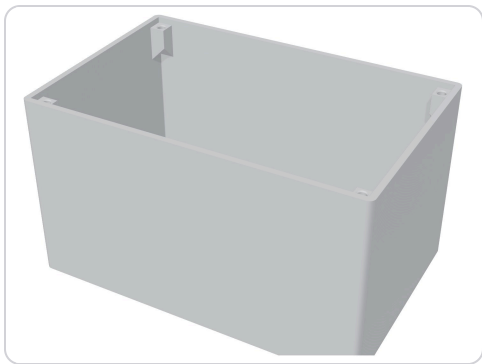
ID	PART	COLOUR	QTY	PRINT SIZE X × Y × Z	VOLUME CM ³	MASS SOLID G	PROFILE
P01	Sleeve	● grey	1	166 × 108 × 94	156.1	193.5	Shell
P02	Feet	● grey (or stick-on rubber feet)	4	142 × 76 × 3.9	1.2	1.5	Parts
P03	Front baffle	● orange (shows through the grille)	1	159.4 × 101.4 × 7	42.8	53.1	Parts
P04	Amplifier tray	● grey	1	72.5 × 81 × 15.5	16.7	20.8	Parts
P05	Rear panel	● grey	1	159.4 × 101.4 × 3	48.1	59.6	Parts
P06	Control strip	● white	1	159.4 × 29.7 × 4	6.8	8.5	Parts
P07	Front grille (lattice)	● grey	1	159.4 × 71.2 × 4	5.8	7.2	Grille (or Grille Infill for the 3MF)
P08	Knob	● orange	1	22 × 22 × 12	3.9	4.8	Parts
P09	Knob mark	● white	1	1.4 × 5.5 × 1.2	0	0	Parts

Print size is in the print orientation, on the bed. The mass is for a solid part in PLA (1.24 g/cm³). The real mass depends on the infill.

Bought parts

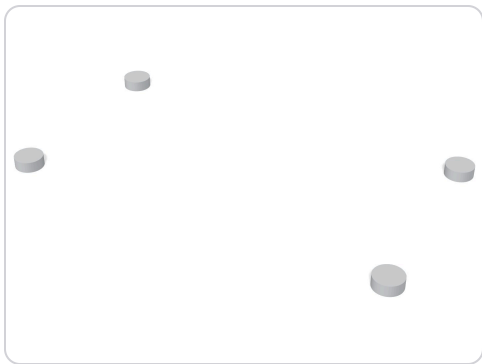
ID	PART	SPECIFICATION	QTY
B01	PC68-4 left	Dayton Audio PC68-4	1
B02	PC68-4 right	Dayton Audio PC68-4	1
B03	ZK-502C board	ZK-502C Bluetooth amplifier	1
B04	ZK-502C parts	Part of the ZK-502C	1
B05	Volume control nut	Supplied with the ZK-502C	1
B06	Screws: baffle to sleeve	M3 × 8 socket head cap screw	4
B07	Inserts: baffle to sleeve	M3 heat-set insert, short (3 mm)	4
B08	Screws: tray to baffle	M3 × 8 socket head cap screw	2
B09	Inserts: tray to baffle	M3 heat-set insert, short (3 mm)	2
B10	Screws: rear panel to sleeve	M3 × 6 socket head cap screw	4
B11	Inserts: rear panel to sleeve	M3 heat-set insert, short (3 mm)	4
B12	Screws: speakers	M3 × 5 pan head	8
B13	Inserts: speakers	M3 heat-set insert, short (3 mm)	8
B14	Screws: board to tray	Self-tapping screw, 1.9 × 7, pan head 3.28 (your board screws)	2
B15	DC adapter	12–24 V, 2 A or more. Check the plug size of the ZK-502C socket.	1
B16	Speaker wire	2 × 0.5 mm ² , 150 mm	2
B17	Closed-cell foam tape	3 × 6 mm, for the driver flanges and the panel seams	0.6 m

Each part on the bed



Sleeve 1 ×

Orientation	Front opening down
Cura profile	Bluespeaker Mini - PLA Shell 0.25
Supports	From the build plate, below the four front posts only
Size on the bed	166 × 108 × 94 mm
Visible faces	Front rim (first layer) is the visible front edge. Outside faces are visible.
After the print	Remove the supports below the front posts. Drill the four front pilot holes Ø4.0 × 7. Install 8 inserts.



Feet 4 ×

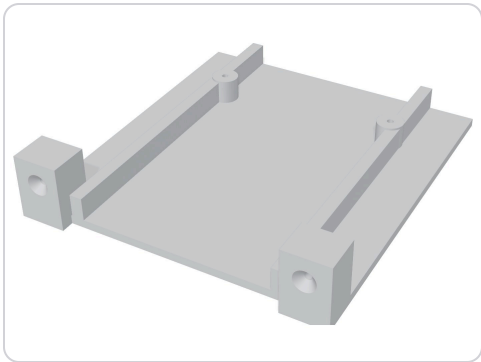
Orientation	Flat
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	142 × 76 × 3.9 mm
Visible faces	None visible.
After the print	Glue into the four recesses. Stick-on rubber feet are an option.



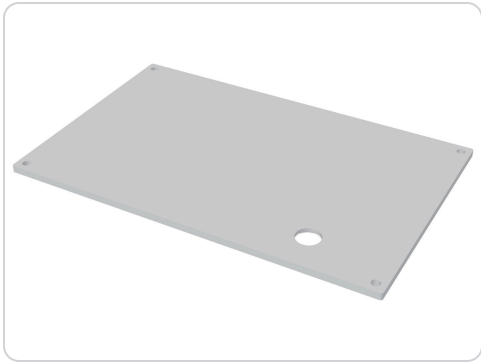
Front baffle 1 ×

Orientation	Front face down
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None. All roofs are bridges of 14 mm or less.
Size on the bed	159.4 × 101.4 × 7 mm
Visible faces	Front face (first layer) shows through the grille.
After the print	Drill the six counterbore membranes Ø3.4 from the back. Cut the pot and AUX membranes. Install 8 inserts in the spacer frames.

Each part on the bed (continued)



Amplifier tray 1 ×	
Orientation	Flat
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	72.5 × 81 × 15.5 mm
Visible faces	None visible.
After the print	Drill the two tab pilot holes Ø4.0 through the tab. Install 2 inserts. Do not drill the two post tap holes.

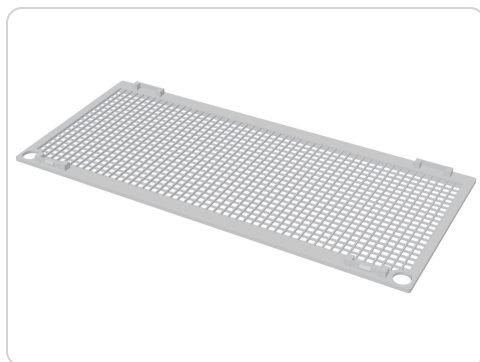


Rear panel 1 ×	
Orientation	Outer face down
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	159.4 × 101.4 × 3 mm
Visible faces	Outer face.
After the print	None



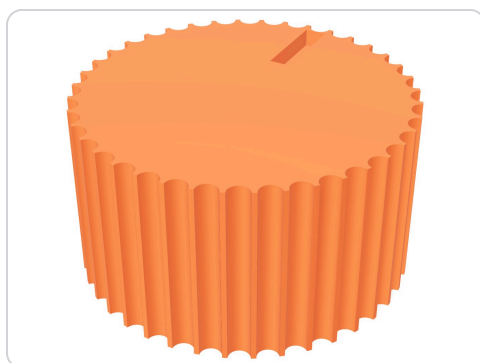
Control strip 1 ×	
Orientation	Front face down, snap catches up
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	159.4 × 29.7 × 4 mm
Visible faces	Front face (first layer) is the visible face.
After the print	Check that the four catch beams are free.

Each part on the bed (continued)



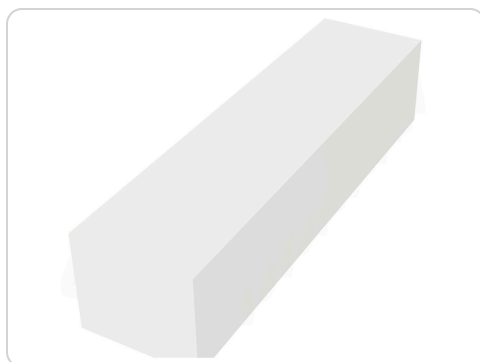
Front grille (lattice) 1 ×

Orientation	Front face down, snap catches up
Cura profile	Bluespeaker Mini - PLA Grille 0.25
Supports	None
Size on the bed	159.4 × 71.2 × 4 mm
Visible faces	Front face (first layer) is the visible face.
After the print	None. Check that the four catch beams are free of the plate below them.



Knob 1 ×

Orientation	Front face up
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	22 × 22 × 12 mm
Visible faces	Front face and the knurl.
After the print	Glue the knob mark into the groove.



Knob mark 1 ×

Orientation	Flat
Cura profile	Bluespeaker Mini - PLA Parts 0.25
Supports	None
Size on the bed	1.4 × 5.5 × 1.2 mm
Visible faces	Top face.
After the print	Glue into the knob groove.

Cura profiles

Cura 5.13, printer "LulzBot TAZ Workhorse | SE | 0.5 mm", PLA 2.85 mm, bed 60 °C. The profiles are in cura/. A dash means the printer default.

SETTING	SHELL	PARTS	GRILLE	GRILLE INFILL
Layer height	0.25 mm	0.25 mm	0.25 mm	0.25 mm
First layer height	0.425 mm	0.25 mm	0.25 mm	0.25 mm
Line width	—	—	0.5 mm	0.5 mm
Wall thickness	3.0 mm	2.0 mm	—	—
Wall line count	—	—	1	1
Top/bottom thickness	1.25 mm	1.25 mm	0 mm	0 mm
Infill	100 %	40 %	100 %	16.67 %
Infill pattern	lines	gyroid	lines	lines
Printing temperature	220 °C	220 °C	220 °C	220 °C
First layer temperature	220 °C	220 °C	220 °C	220 °C
Print speed	40 mm/s	40 mm/s	30 mm/s	30 mm/s
Outer wall speed	30 mm/s	30 mm/s	30 mm/s	30 mm/s
Infill speed	50 mm/s	45 mm/s	35 mm/s	35 mm/s
First layer speed	18 mm/s	18 mm/s	15 mm/s	15 mm/s
Travel speed	150 mm/s	150 mm/s	250 mm/s	250 mm/s
Retraction	1.5 mm	1.5 mm	2.0 mm	2.0 mm
Retraction speed	15 mm/s	15 mm/s	30 mm/s	30 mm/s
Fan	40 %	100 %	100 %	100 %
Fan full at layer	5	4	1	1
Bridge fan	100 %	100 %	100 %	100 %
Minimum layer time	12 s	12 s	12 s	12 s
Adhesion	brim	brim	skirt	skirt
Brim lines	12	6	—	—
Supports	True	False	False	False
Support type	buildplate	—	—	—
Horizontal expansion	0.095 mm	0.095 mm	—	—
Hole horizontal expansion	0.17 mm	0.17 mm	—	—
Shrinkage XY	100.21 %	100.21 %	100.21 %	100.21 %
Shrinkage Z	100 %	100 %	100 %	100 %
Bridge settings	True	True	True	True
Outer wall wipe	0.4 mm	0.4 mm	0 mm	0 mm
Seam	back	back	back	back
Extra skin wall count	0	0	0	0
Skin line directions	[45]	[45]	[45]	[45]
Monotonic top/bottom	True	True	True	True
Combing	—	—	no_outer_surfaces	no_outer_surfaces

Calibration and alignment

SETTING	VALUE	PROFILES
Shrinkage compensation XY	100.21 %	All
Shrinkage compensation Z	100 %	All
Printing temperature	220 °C	All
Horizontal expansion	0.095 mm	Shell, Parts
Hole horizontal expansion	0.17 mm	Shell, Parts

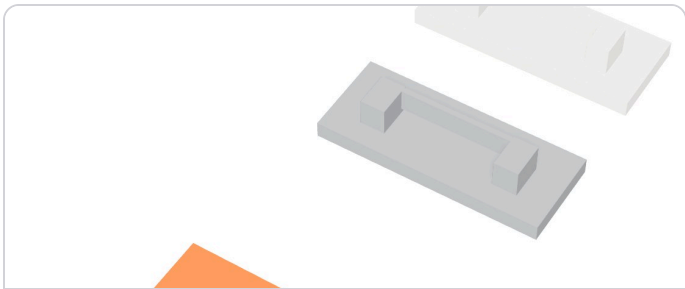
Grille compensation. The Grille profiles have no horizontal expansion: it would change the width of each 0.5 mm rib. The model therefore adds 0.095 mm to the grille snap posts and bumps, and 0.075 mm to the radius of the grille head ports. The strip prints with the Parts profile, so its snap beam is modelled 0.31 mm wide: the 0.095 mm expansion on each side makes one 0.5 mm line.

Layer and line alignment

FEATURE	SIZE	LAYERS OR LINES
Grille and strip	1.5 mm	6 layers
Baffle	4.0 mm	16 layers
Front counterbore	1.5 mm	6 layers
Tray counterbore	2.25 mm	9 layers
Membrane	0.25 mm	1 layer
Snap catch height	2.5 mm	10 layers
Gap below the snap beam	0.5 mm	2 layers
Snap beam	0.5 mm	1 line
Ring around a head port	1.5 mm	3 lines
Head clearance	0.25 mm	½ line
Grille rib	0.5 mm	1 line
Grille rib pitch	3.0 mm	6 lines

The grille, strip, and baffle print with a 0.25 mm first layer, so each height is on the layer grid. The sleeve keeps a 0.425 mm first layer for adhesion.

Test coupons



FILE	PROFILE	TEST
fit_test_snap_baffle.stl	Parts	Two pockets
fit_test_snap_grille.stl	Grille	Grille catch
fit_test_snap_strip.stl	Parts	Strip catch
grille_infill_presets.3mf	Grille Infill	Six grille mesh presets

Press each catch into a pocket until it clicks. Pull it out by hand. 11
Accept: a clear click, the coupon sits flat, it comes out with no crack.
Too tight: set snap_bump to 0.3. Too loose: set it to 0.5.

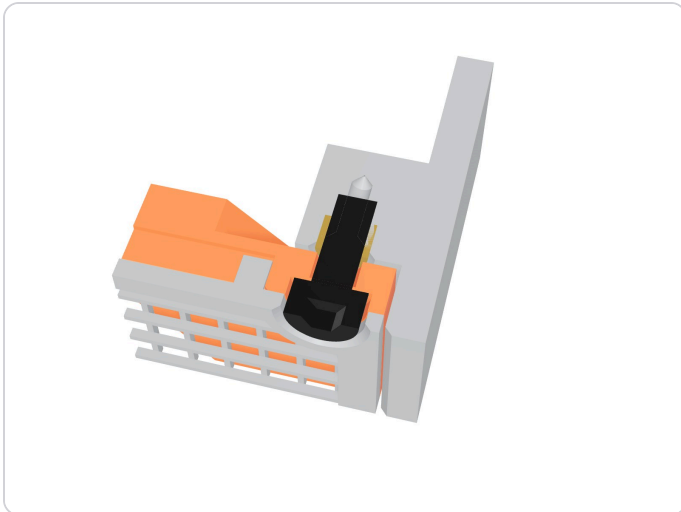
Drawing sheets

The A3 drawing sheets follow at the end of this report. They give the dimensions, the sections through each joint, and the notes for each part. Third-angle projection, millimetres, ± 0.2 unless shown.

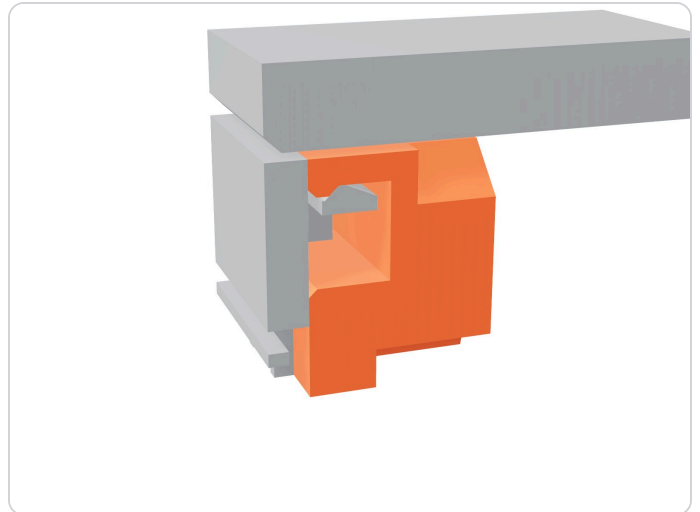
SHEET	SUBJECT	SCALE
BSM-00	General arrangement	1:1
BSM-01	Sleeve	1:1
BSM-02	Front baffle	1:1
BSM-03	Front grille (lattice)	1:1
BSM-04	Control strip	1:1
BSM-05	Rear panel	1:1
BSM-06	Amplifier tray	1:1
BSM-07	Knob	1:1
BSM-08	Joint details: front corner and tray screws	6:1, 5:1
BSM-09	Joint details: snap catches	9:1
BSM-10	Joint details: rear post and driver mount	4.5:1
BSM-11	Joint details: volume control and AUX socket	4:1, 5:1

Files. STEP of each part in its assembly position: `cad/step-mini/`. FreeCAD document with the parts and a TechDraw page for each printed part: `cad/bluespeaker_mini.FCStd`. The sheets come from `cad/mini_drawings.py` (OpenCascade hidden-line views, the same algorithm as FreeCAD TechDraw).

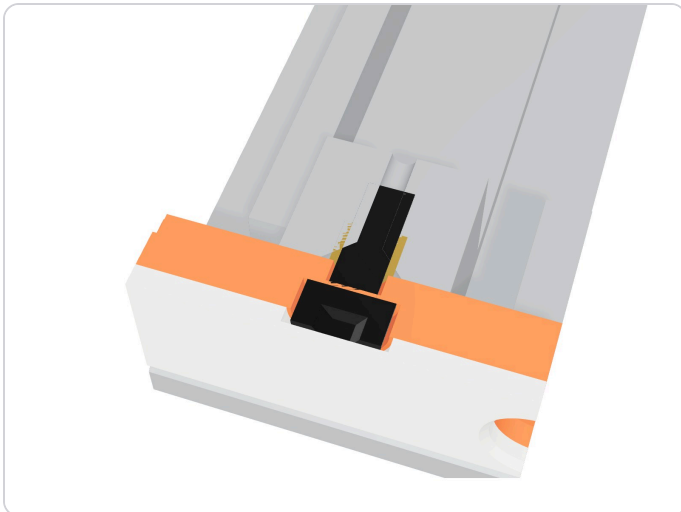
Joints in 3D



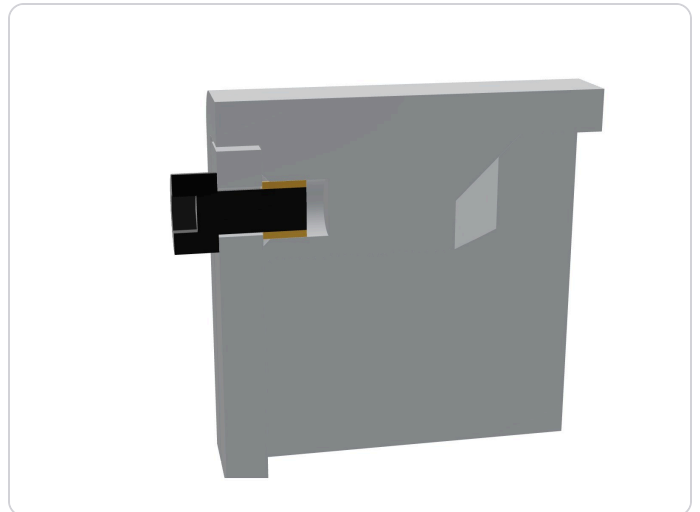
Front corner screw, cut at the screw axis (sheet BSM-08, section A-A).



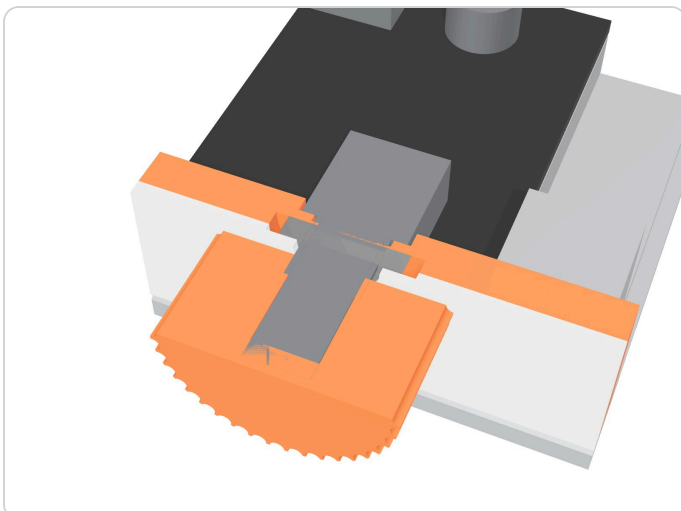
Grille snap catch, cut at the beam centre (BSM-09, section B-B).



Tray screw, cut at the screw axis (BSM-08, section E-E).



Rear post with the 45° gussets (BSM-10, section G-G).



Volume control: nut recess, membrane, strip, knob (BSM-11, section J-J).

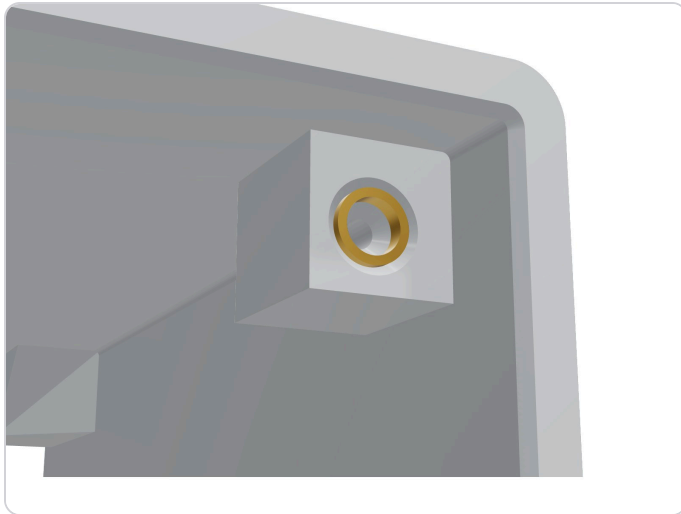


Lower corner: cap head in its strip port.

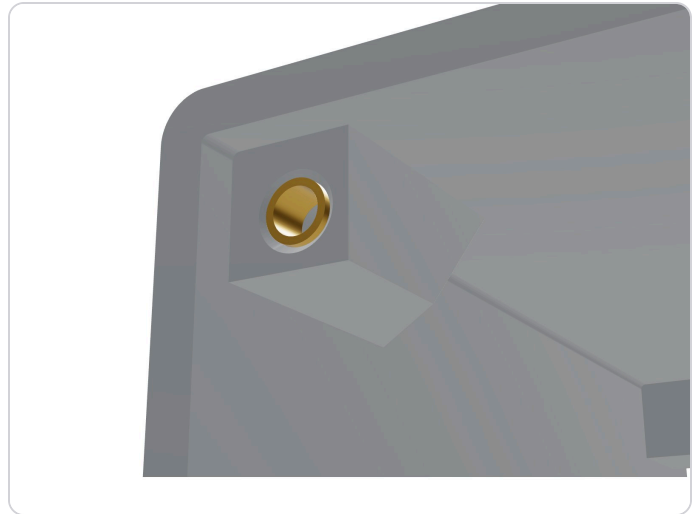
Screws and inserts

JOINT	QTY	SCREW	INSERT	HOLE IN THE FIRST PART	INSERT HOLE
Baffle to sleeve (front corners)	4	M3 × 8 socket head cap, ISO 4762	Short M3 insert in the sleeve front post	Counterbore Ø6.0 × 1.5, membrane 0.25, clearance Ø3.4	Pilot Ø1.6 → drill Ø4.0 × 7
Rear panel to sleeve	4	M3 × 6 socket head cap, ISO 4762	Short M3 insert in the sleeve rear post	Clearance Ø3.4, no counterbore	Printed Ø4.0, 0.5 relief chamfer
Tray to baffle	2	M3 × 8 socket head cap, ISO 4762	Short M3 insert in the tray tab	Counterbore Ø6.0 × 2.25, membrane 0.25, clearance Ø3.4	Pilot Ø1.6 → drill Ø4.0 through
Drivers to the spacer frames	8	M3 × 5 pan head	Short M3 insert in the spacer frame	Driver flange hole	Printed Ø4.0
ZK-502C rear edge to the tray posts	2	Self-tapping, Ø1.9 × 7, pan head Ø3.28	None: the screw cuts its thread	Board mounting hole	Printed tap hole Ø1.5 × 6.5

Inserts: M3 heat-set, short (3 mm long, 4.0 mm hole), for example CNC Kitchen M3 Short. 18 in total. Install them with a soldering iron and an insert tip at the temperature that the insert supplier gives for PLA. Push the insert flush with the face. Do not push it below the face.



Sleeve front post: insert at the post face, 0.4 below the baffle back.



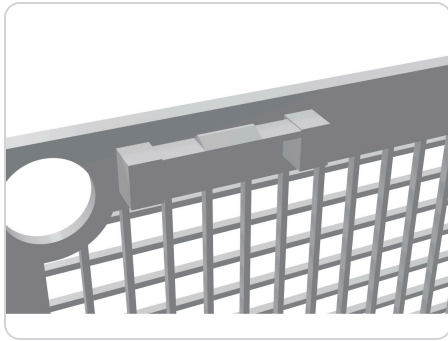
Sleeve rear post: 45° gussets to both walls, insert with relief chamfer.

Screw positions

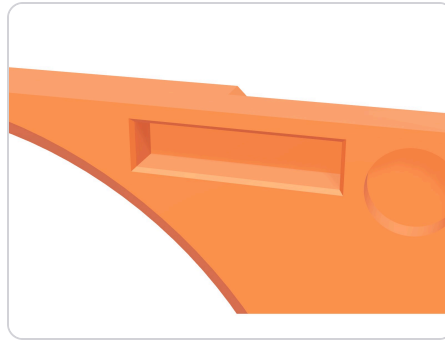
The entry point is where the screw enters the first part. The direction points into the material. Coordinates as in the contents page.

JOINT	ENTRY POINT X, Y, Z	DIRECTION	SCREW
front	-75.5, -45.5, 7.5	0, 1, 0	M3 × 8
rear	-75.5, 47, 7.5	0, -1, 0	M3 × 6
front	-75.5, -45.5, 100.5	0, 1, 0	M3 × 8
rear	-75.5, 47, 100.5	0, -1, 0	M3 × 6
front	75.5, -45.5, 7.5	0, 1, 0	M3 × 8
rear	75.5, 47, 7.5	0, -1, 0	M3 × 6
front	75.5, -45.5, 100.5	0, 1, 0	M3 × 8
rear	75.5, 47, 100.5	0, -1, 0	M3 × 6
tray	1.3, -45.5, 13	0, 1, 0	M3 × 8
tray	62.8, -45.5, 13	0, 1, 0	M3 × 8
speaker	-63.09, -37.9, 43.41	0, -1, 0	M3 × 5
speaker	-63.09, -37.9, 95.59	0, -1, 0	M3 × 5
speaker	-10.91, -37.9, 43.41	0, -1, 0	M3 × 5
speaker	-10.91, -37.9, 95.59	0, -1, 0	M3 × 5
speaker	10.91, -37.9, 43.41	0, -1, 0	M3 × 5
speaker	10.91, -37.9, 95.59	0, -1, 0	M3 × 5
speaker	63.09, -37.9, 43.41	0, -1, 0	M3 × 5
speaker	63.09, -37.9, 95.59	0, -1, 0	M3 × 5
board	9.8, 19.77, 12.6	0, 0, -1	Ø1.9 × 7 self-tapping
board	54.3, 19.77, 12.6	0, 0, -1	Ø1.9 × 7 self-tapping

How the catches work



Grille catch: two posts and one bridged beam with a bump.



Baffle pocket: narrow mouth (lip), wider inside, 1 mm floor.



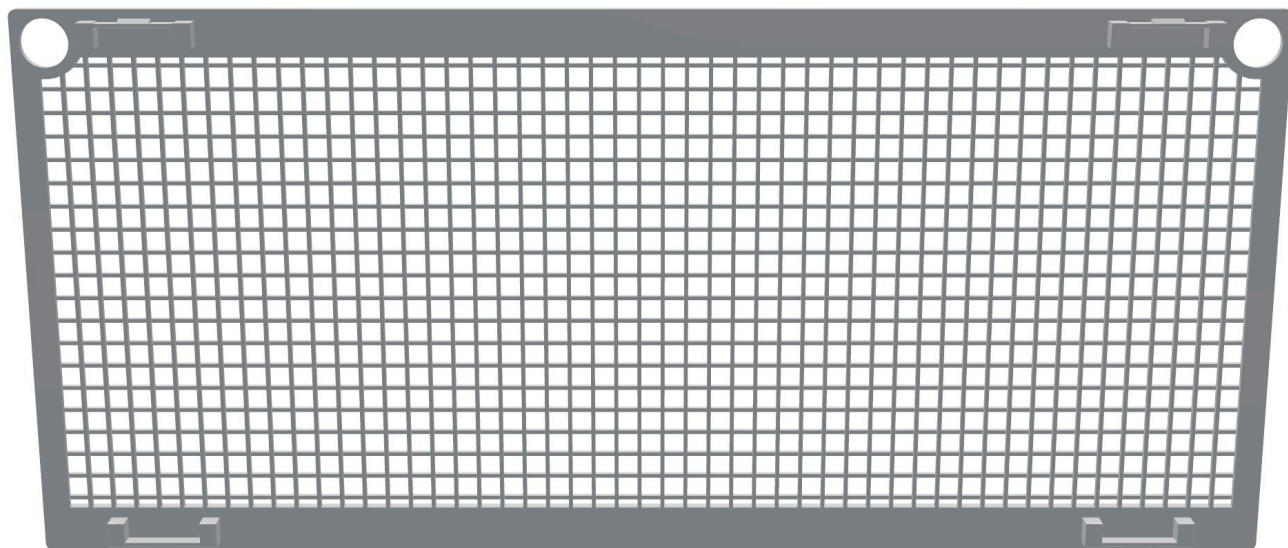
Strip catch.

- **Print direction.** The beam bridges 0.5 mm above the cover back, so the slicer prints it as straight lines along its length. It flexes in the cover plane. The bending load goes along the lines, not across the layers. An upright pin or hook would bend across the layers and crack.
- **Lock.** The 0.4 mm bump clicks behind a 45° lip at the pocket mouth. The bump presses 0.05 mm on the lip, which pulls the cover flat and flush.
- **Release.** A pull on the cover makes the 45° lip push the bump back. The catch releases and does not break.
- **Location.** The posts fit their pockets with 0.15 mm clearance on each side. They locate the cover in X and Z.
- **No support.** The baffle prints front face down. The pocket is narrow at the mouth and wider inside, so its walls only step back. The floor is a 3.3 mm bridge.

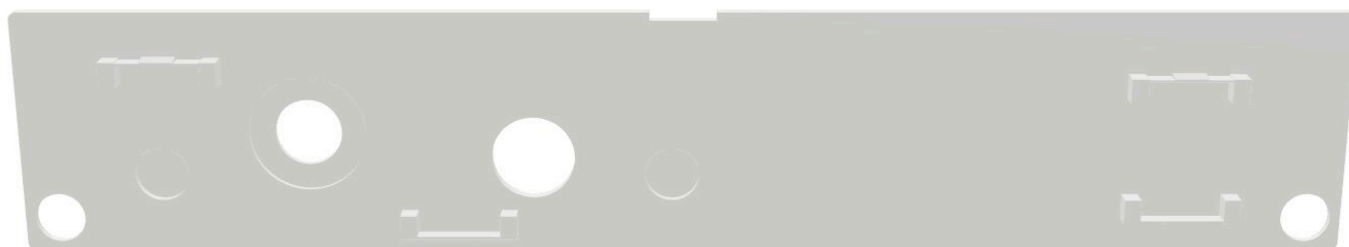
Beam: length × width × height	10 × 0.5 × 2 mm	COVER	X	Z	BUMP
Deflection at the mouth	0.25 mm	grille	-63.75	36.5	-Z
Bending strain (fixed-fixed beam, centre load)	1.5 %	grille	-63.75	101.7	+Z
Spring force at full deflection	3.5 N	grille	63.75	36.5	-Z
Push-on force (18° lead-in, μ 0.3)	2.4 N	grille	63.75	101.7	+Z
Pull-off force (45° lip, μ 0.3)	6.5 N	strip	-60	24	+Z
Grille: four catches, pull-off	26 N	strip	-60	9	-Z
		strip	62	26	+Z
		strip	27	7	-Z

PLA strain at yield along the lines is about 3 to 4 %. The estimate uses $E = 3.5$ GPa. Confirm with the test coupons (section 4).

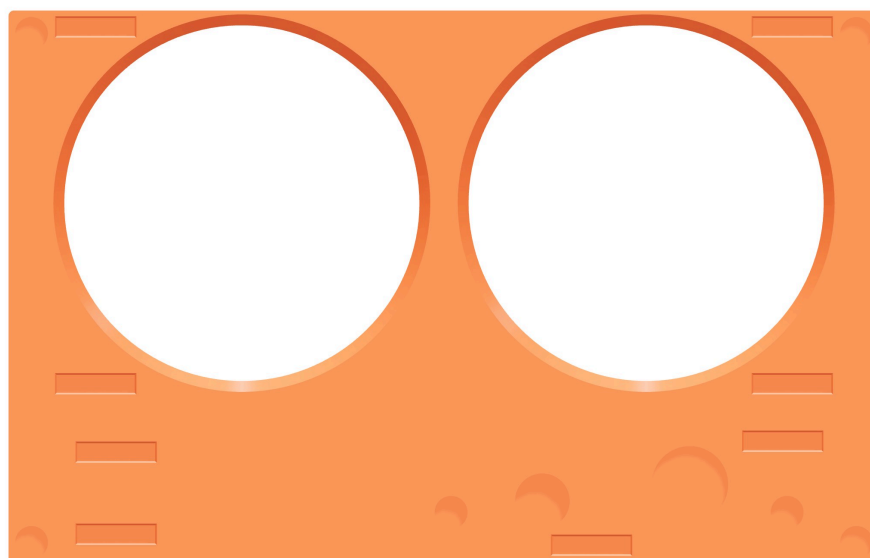
Cover backs



Grille back: four catches in the top and bottom bands, solid rings around the two head ports.



Strip back: four catches, two pockets for the tray screw heads, the volume control and AUX holes, and the pry slot at the top edge.



Baffle front: eight snap pockets, six counterbores, the nut recess ($\varnothing 14 \times 1.5$), the AUX counterbore, and the two $\varnothing 65$ cut-outs.

Fits

FIT	VALUE (MM)	NOTE
Panels in the sleeve opening	0.3 per side	Baffle, grille, strip, rear panel
Sleeve front lead-in chamfer	$0.6 \times 45^\circ$	Takes the elephant foot of the first layers
Front post face setback	0.4	Insert rings and support marks cannot push the baffle forward
Insert relief chamfer	$0.5 \times 45^\circ$	Takes the plastic that the hot insert pushes up
Cap head in port and counterbore	0.25 radial	Ø6.0 for a Ø5.5 head. Grille ports +0.075 comp.
Head top to cover face	0 (flush)	Counterbore 1.5 + cover 1.5 = head 3.0
Tray head pocket in the strip	0.25 radial, 0.25 axial	Head stands 0.75 in front of the baffle, pocket 1.0 deep
Snap post in pocket	0.15 per side	Locates the covers
Snap bump on the lip	0.05 interference	Preload
Snap bump top to pocket wall	0.1	Groove clearance
Knob to strip	0.8	Axial gap
Strip to grille seam	0.5	Horizontal seam on the front
Clearance holes	Ø3.4	M3 screws
Insert holes	Ø4.0	Short M3 inserts

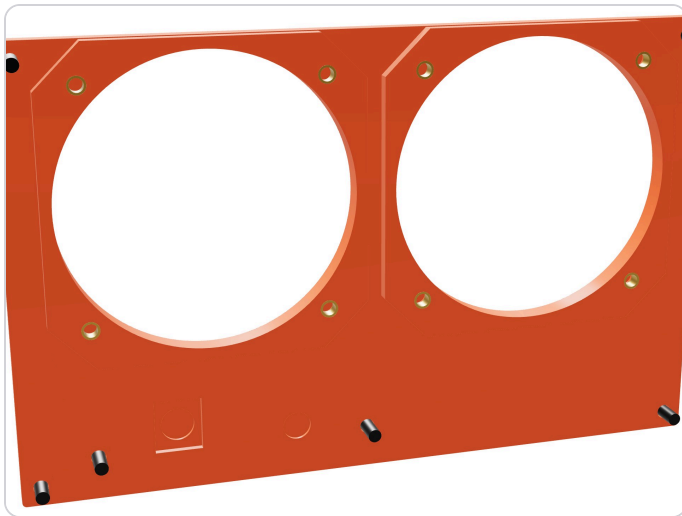
All values are nominal model values. The Cura profiles compensate the calibrated shrink and expansion, so the printed parts follow the model.

Drill, cut, and insert

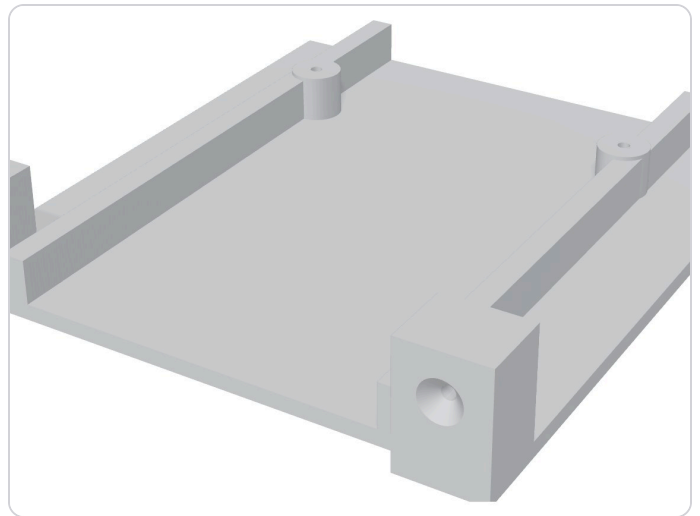
PART	OPERATION	TOOL	DEPTH	NOTE
Sleeve	4 front post holes	Drill Ø4.0	7 mm	The Ø1.6 pilot guides the drill
Sleeve	Remove the supports	Pliers, scraper	—	Below the four front posts. Make the post faces flat.
Sleeve	8 inserts	Soldering iron, M3 insert tip	Flush	4 front, 4 rear
Baffle	6 counterbore membranes	Drill Ø3.4	Through	From the back. The printed hole guides the drill.
Baffle	Volume control membrane	Knife	—	Cut out to the Ø7.5 hole, from the back
Baffle	AUX membrane	Knife	—	Cut out to the Ø6.4 hole, from the back
Baffle	8 inserts	Soldering iron	Flush	In the two spacer frames
Tray	2 tab holes	Drill Ø4.0	Through the tab	Then 2 inserts
Knob	Knob mark	Glue	—	White mark into the groove
Grille, strip	Check the catch beams	Eye, fine blade	—	The 0.5 gap below each beam must be open. Cut any strings.

Membranes and pilot holes

A hole that opens to the bed fills with support, and a horizontal hole sags. The model therefore prints small holes as Ø1.6 pilot holes with a 45° tip, and it closes each counterbore with a 0.25 mm membrane. The slicer prints each membrane as one straight bridge. Drill or cut each one after the print.



Baffle back with the speaker inserts and the screws.

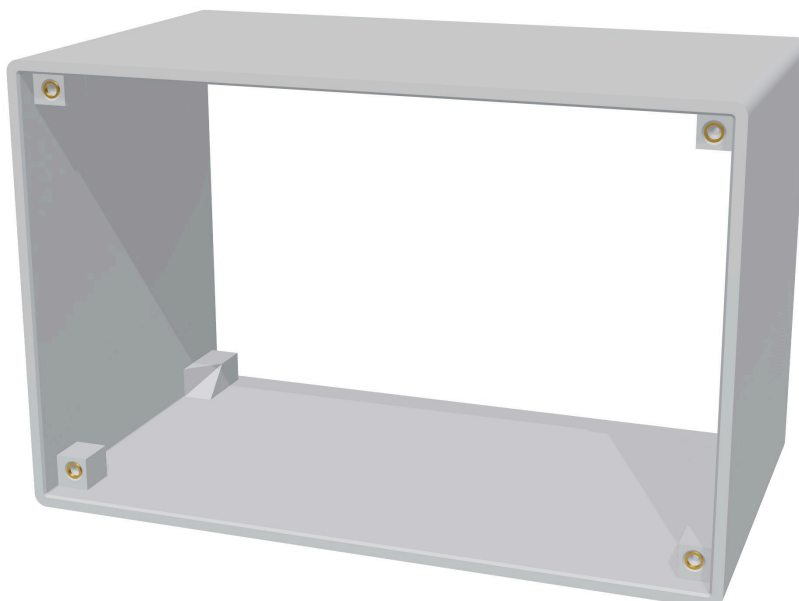


Tray: rails, two tabs with inserts, and two posts for the board screws.

Six steps

- 1 Prepare the sleeve.** Remove the supports below the four front posts. Drill the four front post holes $\varnothing 4.0 \times 7$. Install 8 inserts (4 front, 4 rear). Glue the four feet into the recesses on the bottom.
- 2 Mount the speakers on the baffle.** Drill the membranes. Install 8 inserts in the spacer frames. Put foam tape on the driver flanges. Put each driver on its frame from the back, terminals down. Install four M3 $\times$ 5 pan head screws in each driver.
- 3 Fit the tray and the amplifier.** Drill the tray tabs and install 2 inserts. Hold the tray against the baffle back. Install two M3 $\times$ 8 cap screws from the front. Remove the knob and the nut from the ZK-502C. Put the board on the rails, with the volume control and the AUX socket through the baffle. Install the nut in its recess. Install two self-tapping screws ($\varnothing 1.9 \times 7$) through the rear mounting holes into the posts. Stop when the head touches the board. Connect the speaker wires.
- 4 Install the front module.** Push it into the sleeve front. Install four M3 $\times$ 8 cap screws through the baffle corners into the posts.
- 5 Install the rear panel.** Align the DC socket with its hole. Install four M3 $\times$ 6 cap screws.
- 6 Fit the covers and the knob.** Push the strip on until its four catches click. Push the grille on until its four catches click: the two upper heads go through the grille ports. Push the knob onto the shaft.

To remove the covers. Pull off the knob. Put a flat blade in the slot at the top edge of the strip, below the grille centre. Lift the bottom edge of the grille, then pull the grille off. Then lift the top edge of the strip and pull the strip off.



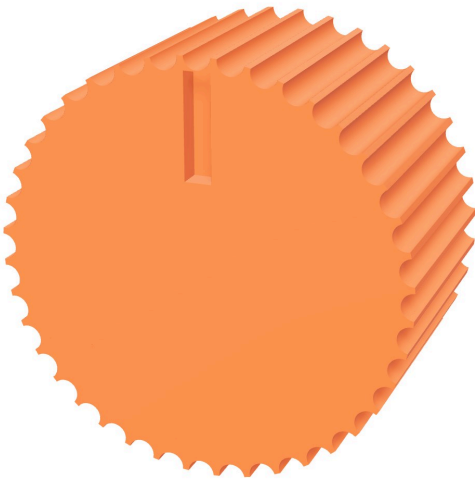
Sleeve from the front, with the eight inserts.

Checks

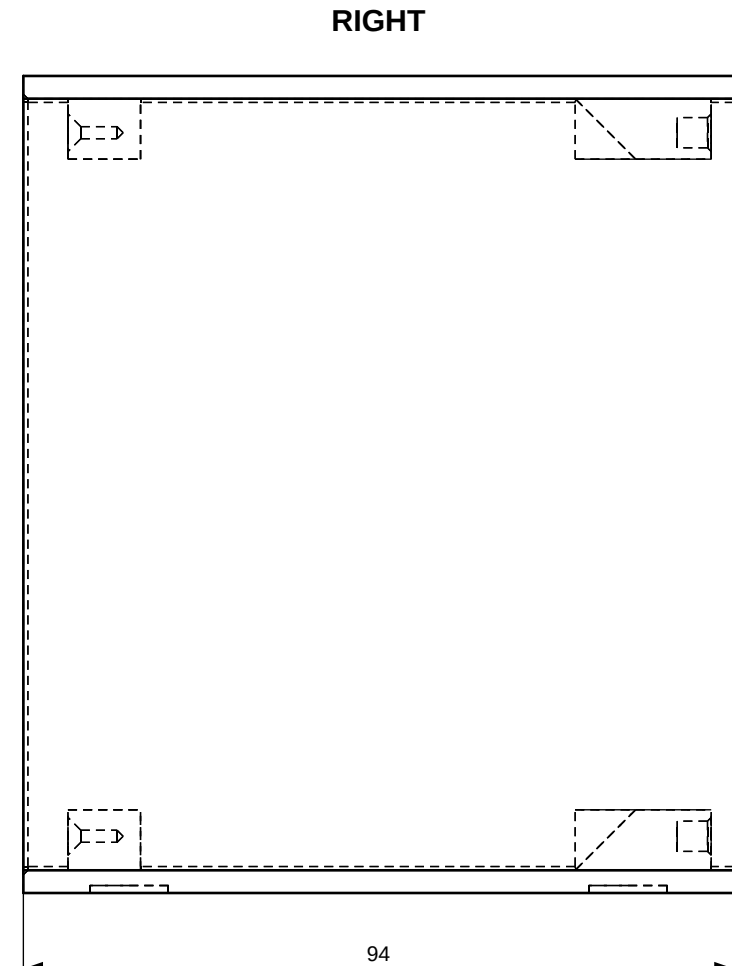
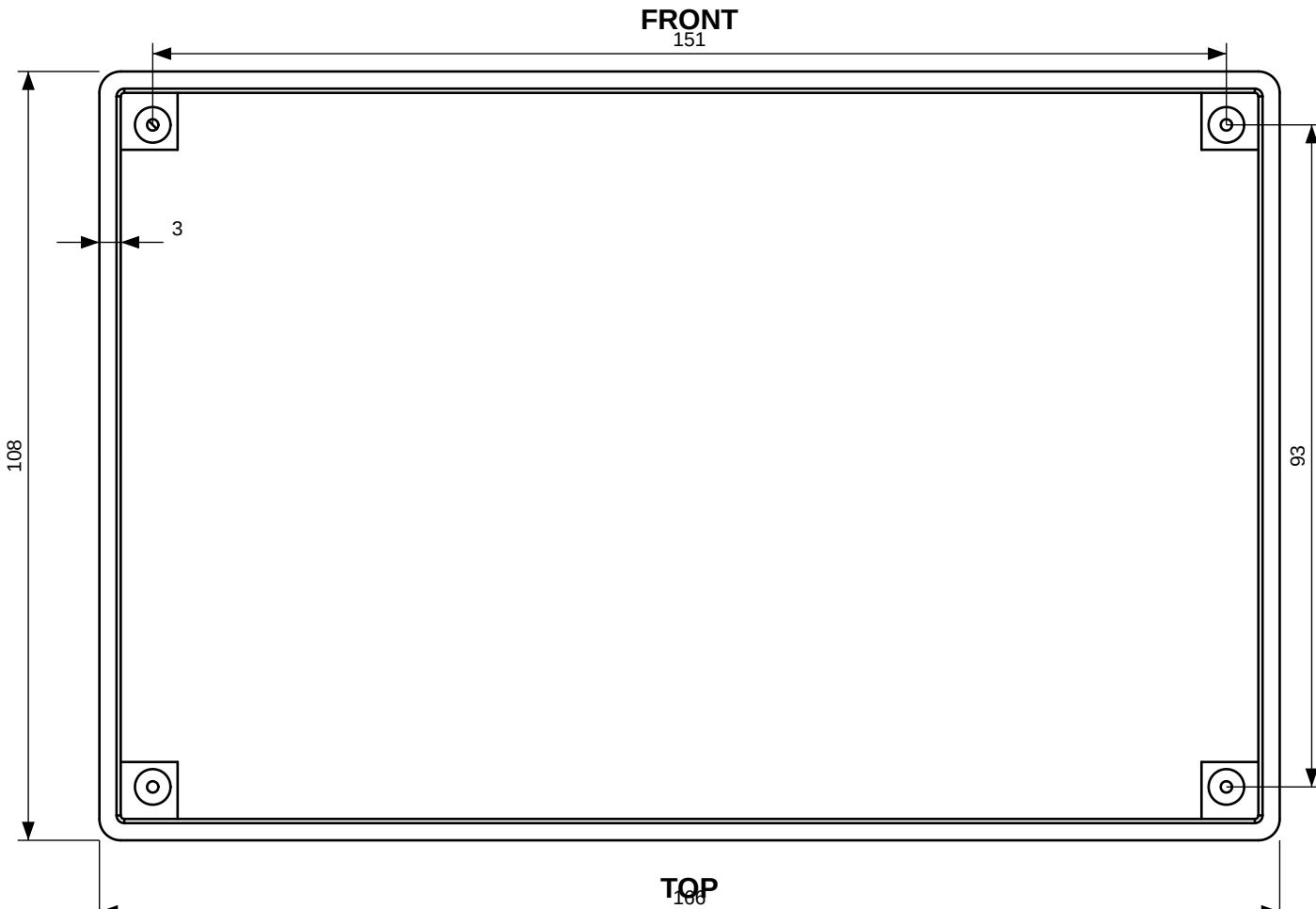
CHECK	METHOD	ACCEPT
Sleeve outside size	Calliper	166.0 × 108.0 × 94.0 ±0.3
Sleeve front rim flat	Put the rim on a flat plate	No corner lifts more than 0.3
Panel fit	Push each panel into the sleeve opening	Slides in by hand, no gap above 0.5 on a side
Grille rib layers	Cura layer view, then the part	Layers 1–3: one line for each horizontal rib. Layers 4–6: one line for each vertical rib.
Head flush	Straight edge across the port	Head top within ±0.2 of the cover face
Snap catches	Coupons, then the covers	Each catch clicks. The cover sits flat. Pull-off by hand with no crack.
Membranes	Eye	Each membrane is a closed flat bridge before you drill it
Inserts	Eye, then a screw	Flush with the face, square, the screw turns in by hand
Volume control	Assemble	The body sits on its pocket floor. The nut sits in its recess. The knob turns with 0.8 gap to the strip.
Air seal	Play an 80–300 Hz sweep	No rattle, no air noise at the seams
Function	Pair a phone, test AUX	Sound from both drivers, AUX works

Before production

- The ZK-502C part positions in the model come from photos. Measure the real board and change `amp_parts()` and the port values in `MParams`.
- The volume control shaft is drawn round. Check whether the board has a knurled or a D-shaft, and change the knob bore to match.
- The snap forces in section 7 are estimates. Confirm them with the test coupons.
- The Orca profiles do not have the calibrated values yet. Use the Cura profiles.
- The drawing sheets give the main dimensions. For a size that a sheet does not show, measure the STEP file.
- The fit of a 3 mm short insert in a printed $\varnothing 4.0$ hole depends on the insert brand. Test one insert in a coupon.



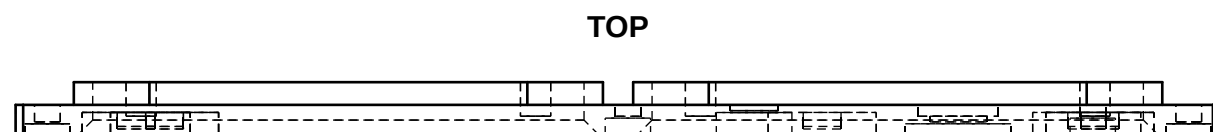
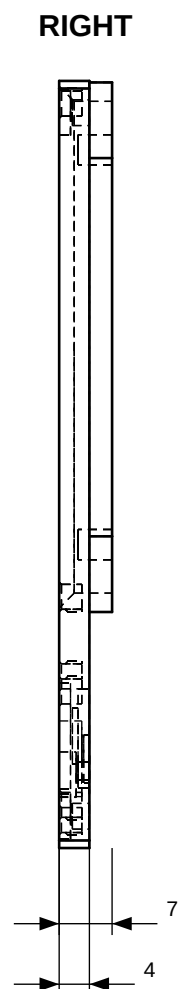
Knob: $\varnothing 22 \times 12$, 40 grip flutes, white mark.



Print front opening down. Profile: PLA Shell 0.25.
Supports from the build plate below the four front posts only.
Front posts: pilot Ø1.6, drill Ø4.0 x 7 after the print, insert M3 x 3.
Rear posts: printed Ø4.0, 0.5 x 45° relief, 45° gussets.
Lead-in chamfer 0.6 x 45° inside the front opening.
Panel opening 160.0 x 102.0 (panels 159.4 x 101.4).

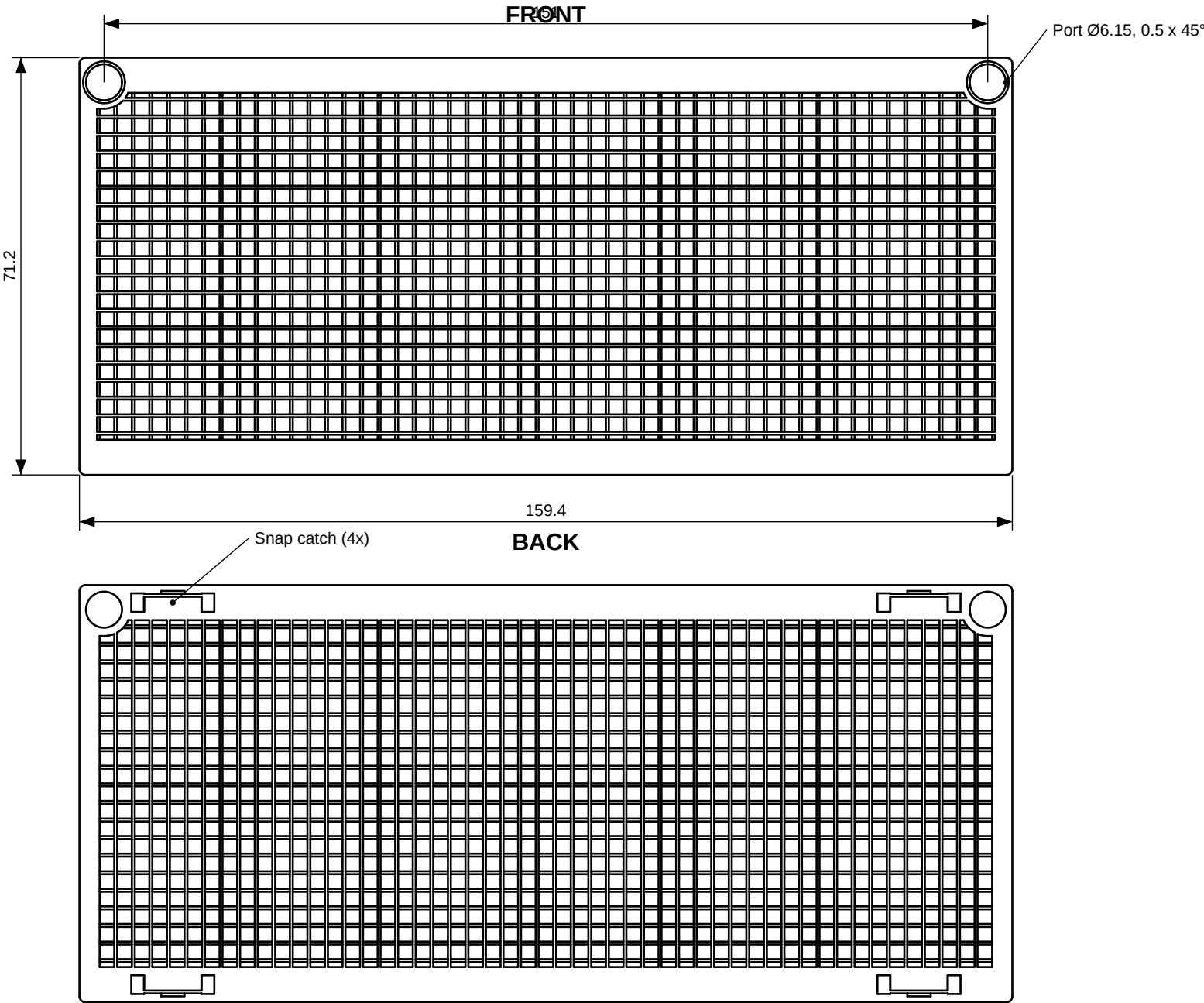
Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title				
Bluespeaker Mini				
Subject				
Sleeve				
Drawing no.	Revision	Date	Scale	Sheet
BSM-01	0.3	2026-10-11	1:1	2 / 12
Material			Tolerance unless shown · units	
PLA, grey			±0.2 · mm · third angle	

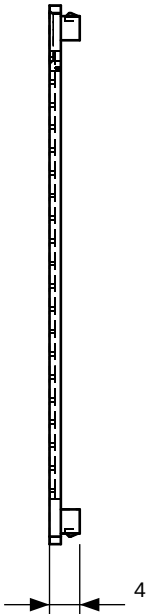


Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title Bluespeaker Mini				
Subject Front baffle				
Drawing no. BSM-02	Revision 0.3	Date 2026-10-11	Scale 1:1	Sheet 3 / 12
Material PLA, orange (shows through the grille)			Tolerance unless shown · units ±0.2 · mm · third angle	



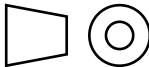
RIGHT

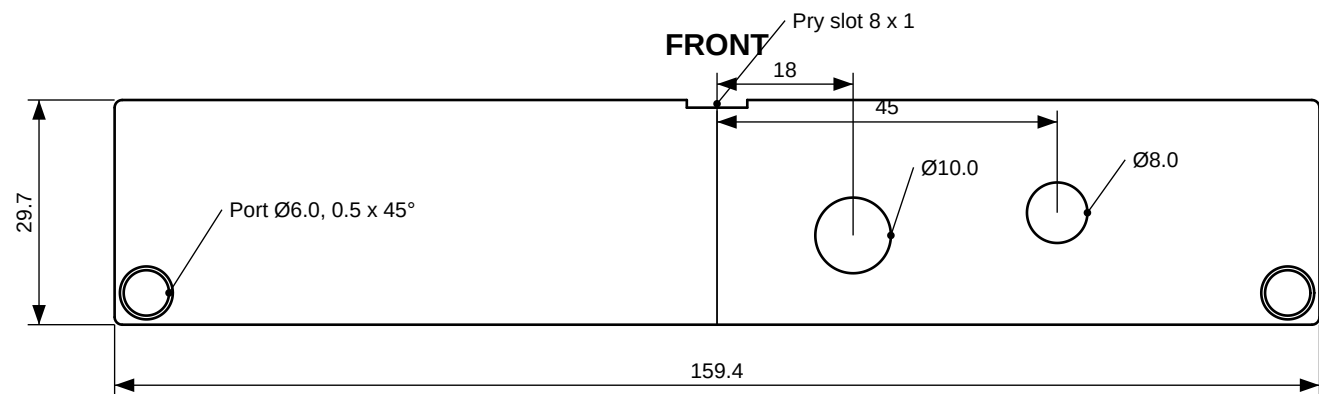


Print front face down. Profile: PLA Grille 0.25 (no expansion).
Ribs: one 0.5 line, 3.0 pitch, horizontal on layers 1-3, vertical on layers 4-6. About 69 % open.
Ports and catches carry the expansion in the model:
ports +0.075 per side, catch posts and bumps +0.095.
Snap catches: see BSM-09.

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title				
Bluespeaker Mini				
Subject				
Front grille (lattice)				
Drawing no.	Revision	Date	Scale	Sheet
BSM-03	0.3	2026-10-11	1:1	4 / 12
Material			Tolerance unless shown · units	
PLA, grey			±0.2 · mm · third angle	



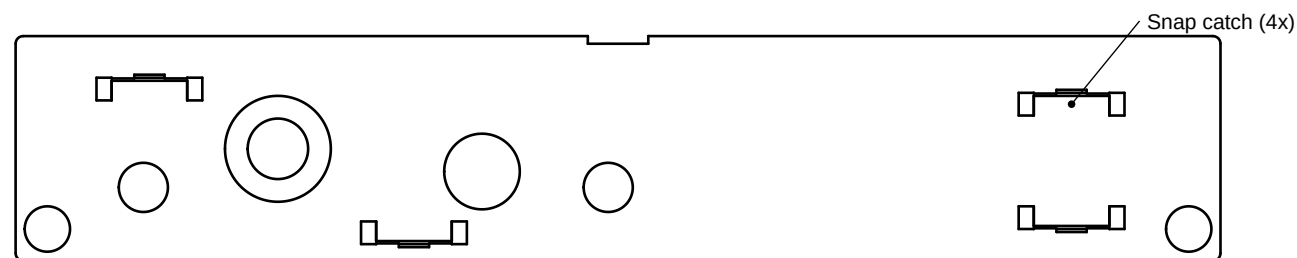
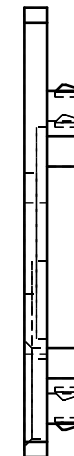


FRONT

BACK

TOP

RIGHT (2:1)

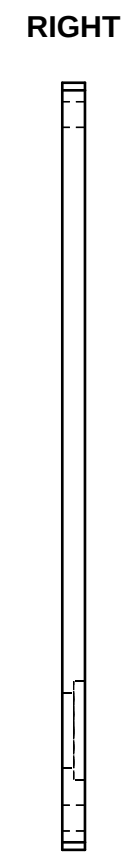
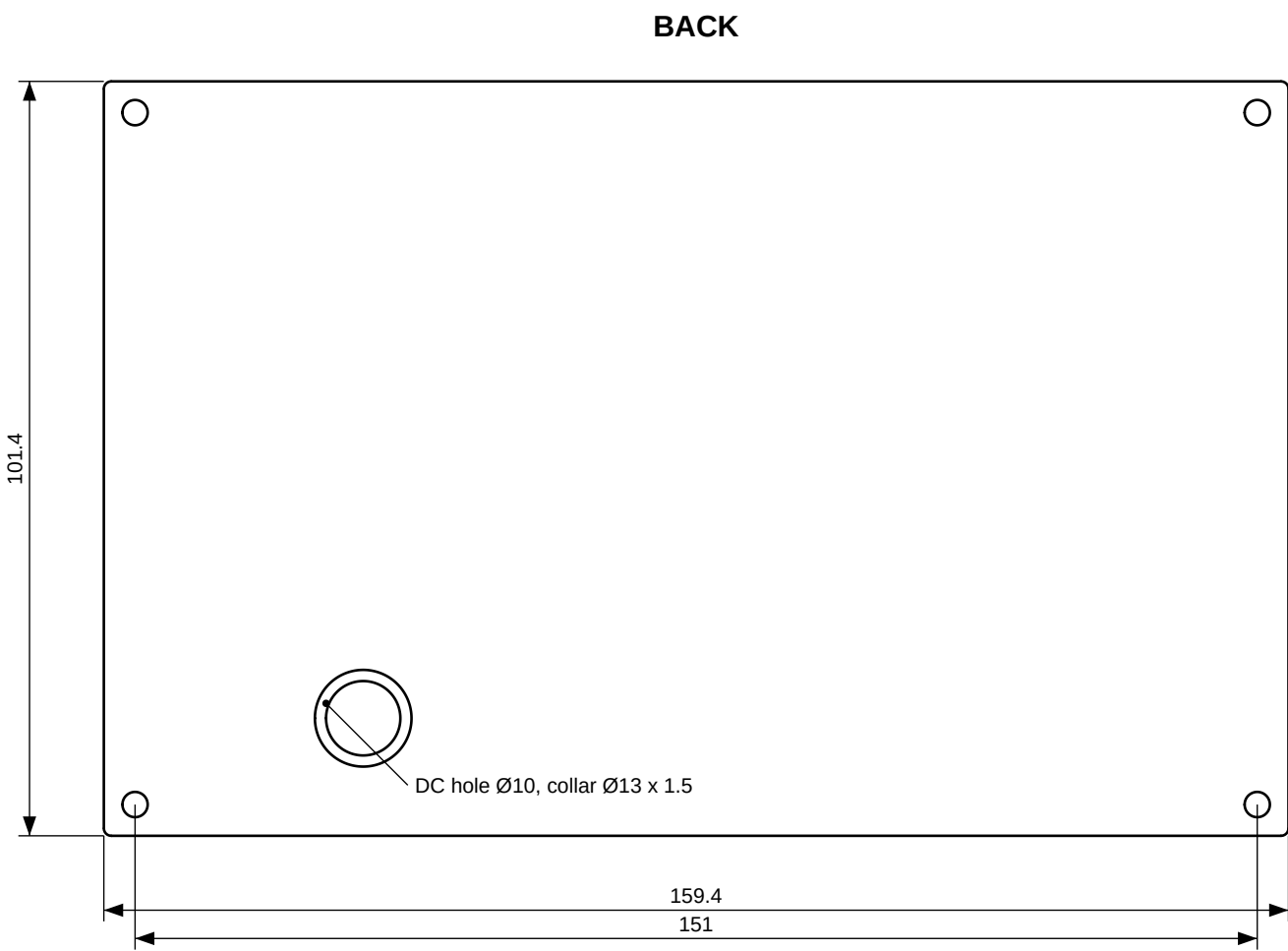


Print front face down. Profile: PLA Parts 0.25. Colour white.
Snap beam modelled 0.31: with 0.095 expansion it prints one 0.5 line.
Back: two pockets Ø6.5 x 1.0 for the tray screw heads.
Snap catches: see BSM-09.

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

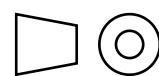
Title				
Bluespeaker Mini				
Subject				
Control strip				
Drawing no.	Revision	Date	Scale	Sheet
BSM-04	0.3	2026-10-11	1:1	5 / 12
Material			Tolerance unless shown · units	
PLA, white			±0.2 · mm · third angle	



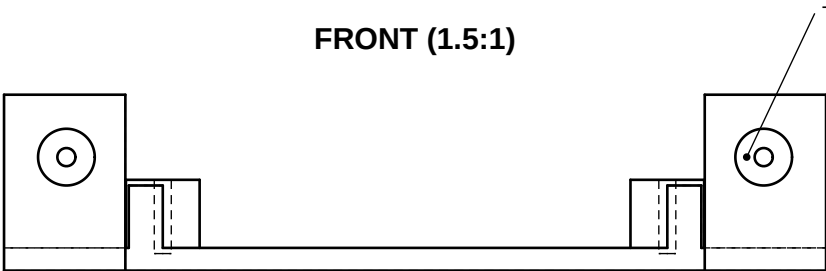
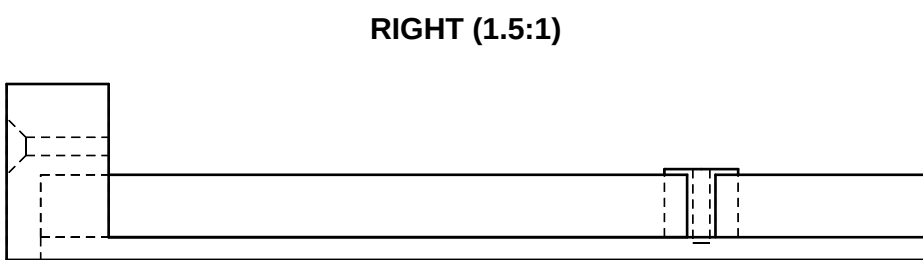
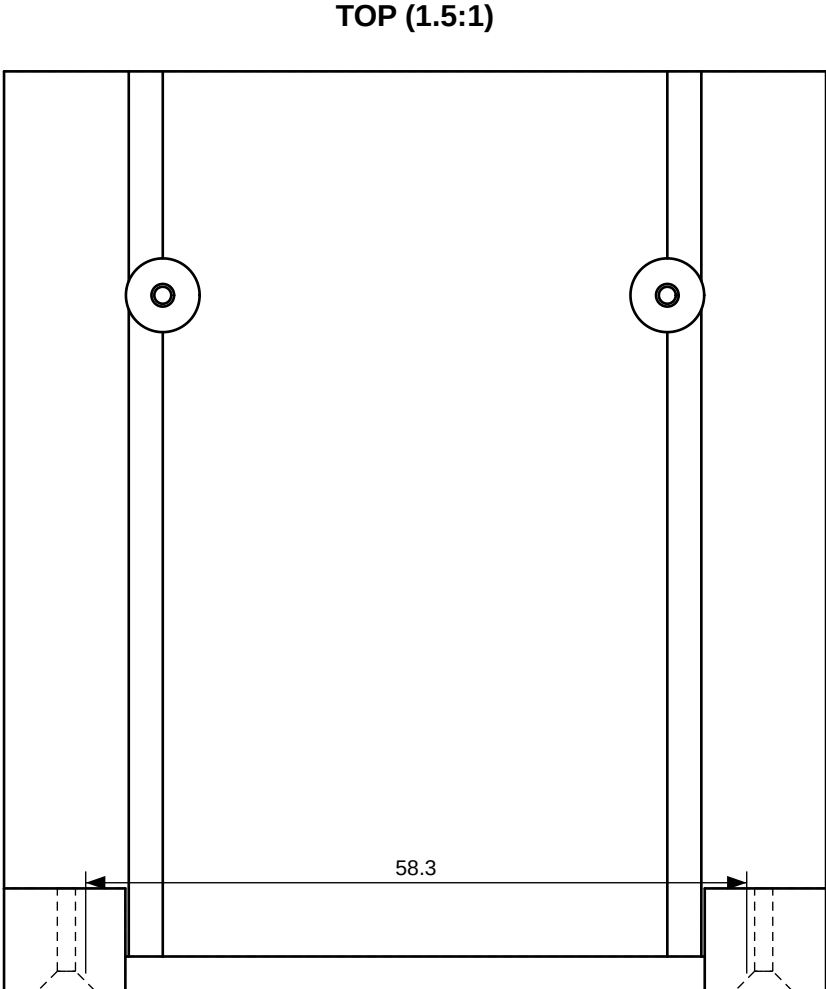


Print outer face down. Profile: PLA Parts 0.25.
Four Ø3.4 clearance holes for M3 x 6 socket head cap screws.
No counterbore: the heads sit on the panel.

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py



Title				
Bluespeaker Mini				
Subject				
Rear panel				
Drawing no.	Revision	Date	Scale	Sheet
BSM-05	0.3	2026-10-11	1:1	6 / 12
Material			Tolerance unless shown · units	
PLA, grey			±0.2 · mm · third angle	

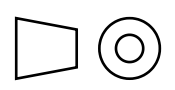


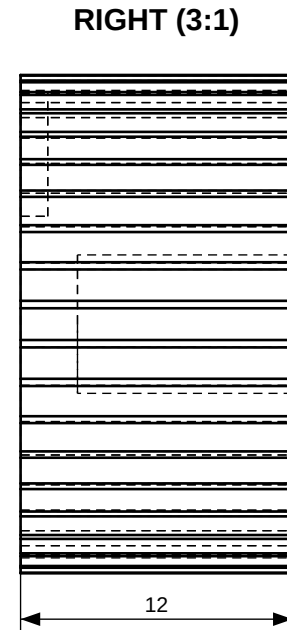
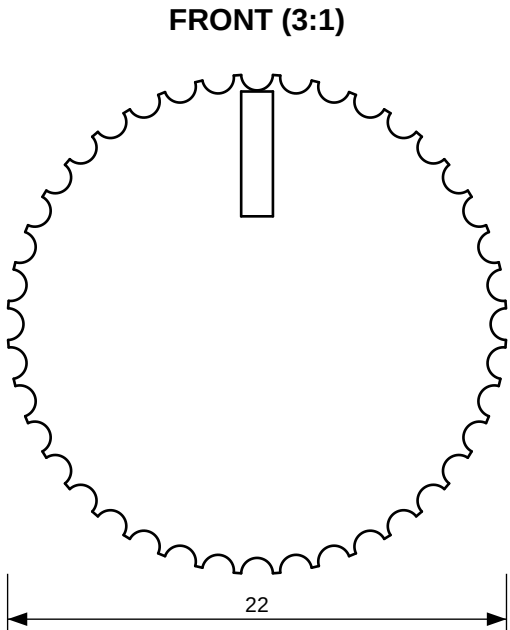
Tab hole: pilot Ø1.6, drill Ø4.0, insert M3 x 3

Print flat. Profile: PLA Parts 0.25.
Rails carry the ZK-502C board 8.0 above the sleeve floor.
The two tabs screw to the baffle back (M3 x 8).

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

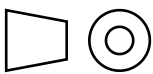
Title				
Bluespeaker Mini				
Subject				
Amplifier tray				
Drawing no.	Revision	Date	Scale	Sheet
BSM-06	0.3	2026-10-11	1:1	7 / 12
Material			Tolerance unless shown · units	
PLA, grey			±0.2 · mm · third angle	





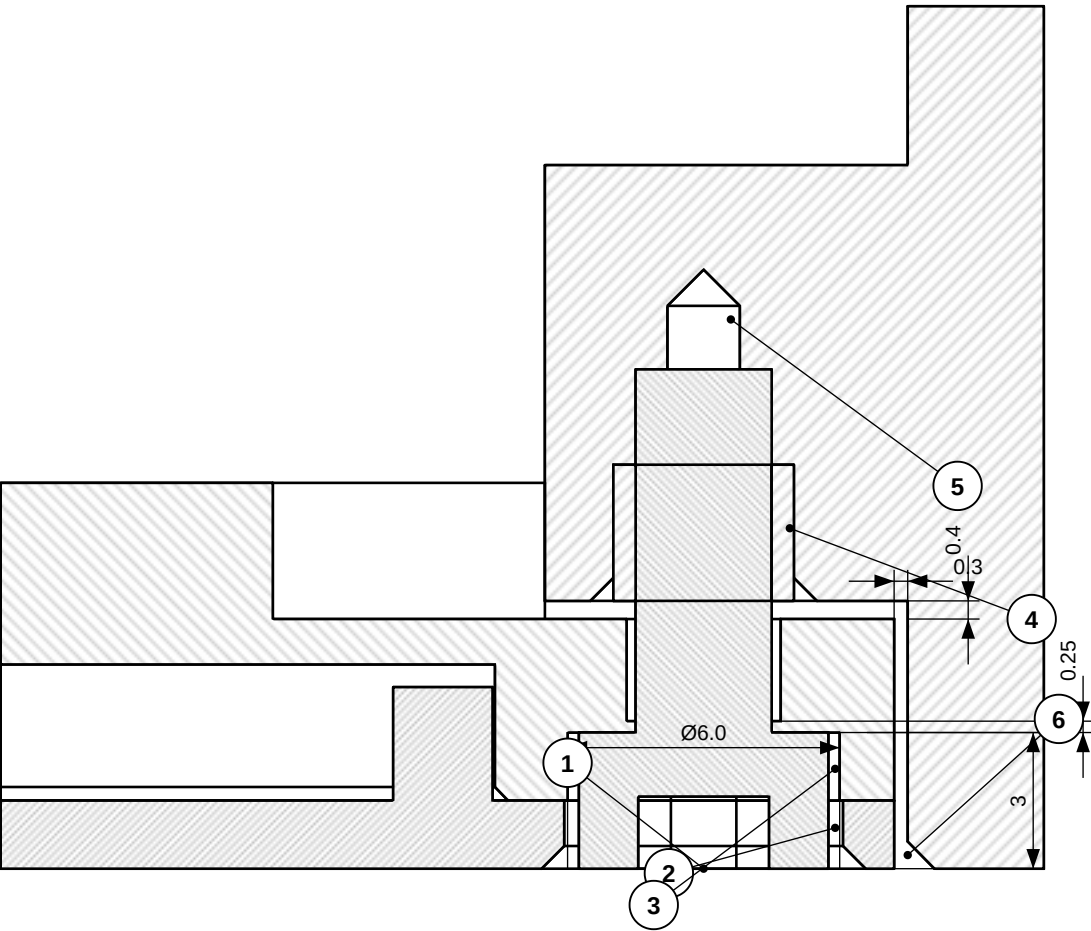
Print front face up. Profile: PLA Parts 0.25. Colour orange.
Bore Ø6.1 x 9.5 for the volume control shaft (check the shaft type).
Glue the white knob mark (1.4 x 1.2 x 5.5) into the groove.

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py



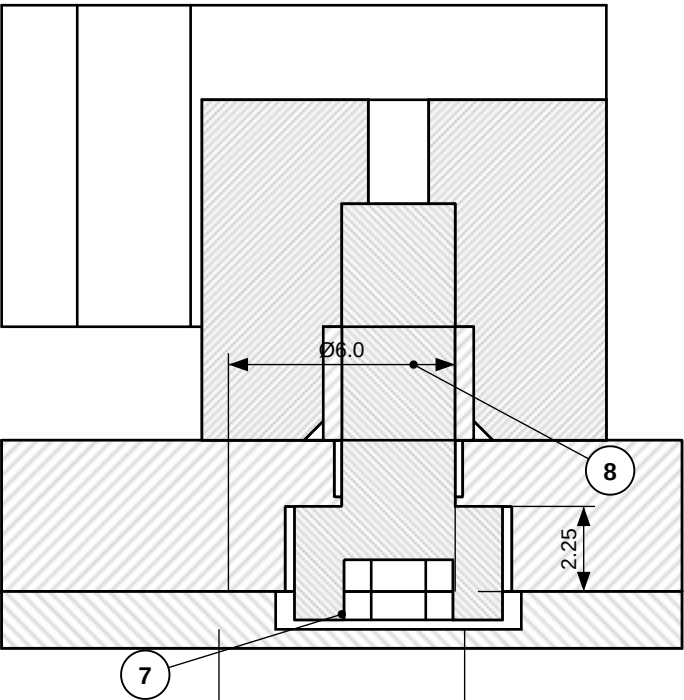
Title				
Bluespeaker Mini				
Subject Knob				
Drawing no. BSM-07	Revision 0.3	Date 2026-10-11	Scale 1:1	Sheet 8 / 12
Material PLA, orange			Tolerance unless shown · units ±0.2 · mm · third angle	

SECTION A-A (Z = 100.5, seen from above) 6:1



- 1 M3 x 8 socket head cap screw, head flush with the grille face
2 Grille port Ø6.15 (Ø6.0 + 0.075 per side), 0.5 x 45° chamfer
3 Baffle counterbore Ø6.0 x 1.5, membrane 0.25: drill Ø3.4
4 Insert M3 x 3 (short), in the sleeve front post
5 Pilot Ø1.6 with 45° tip: drill Ø4.0 x 7
6 Sleeve lead-in chamfer 0.6 x 45°; panel fit gap 0.3

SECTION E-E (Z = 13.0) 5:1

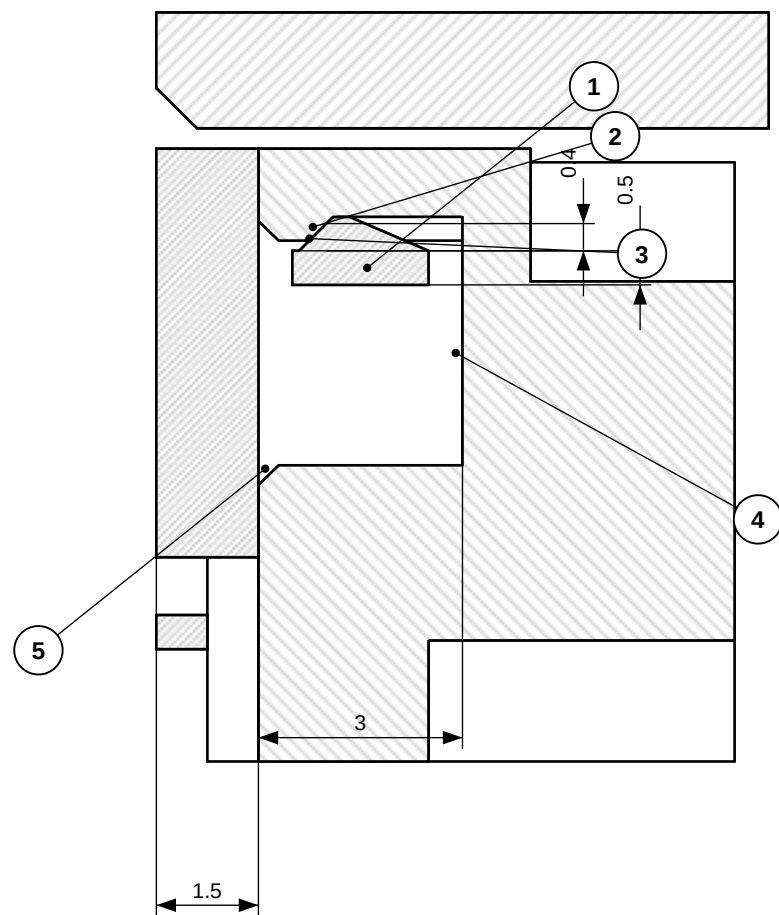


- 7 Strip pocket Ø6.5 x 1.0 covers the tray screw head
(head 0.75 in front of the baffle, 0.25 clear)
8 Tray tab: pilot Ø1.6, drill Ø4.0 through, insert M3 x 3
Counterbore Ø6.0 x 2.25, membrane 0.25

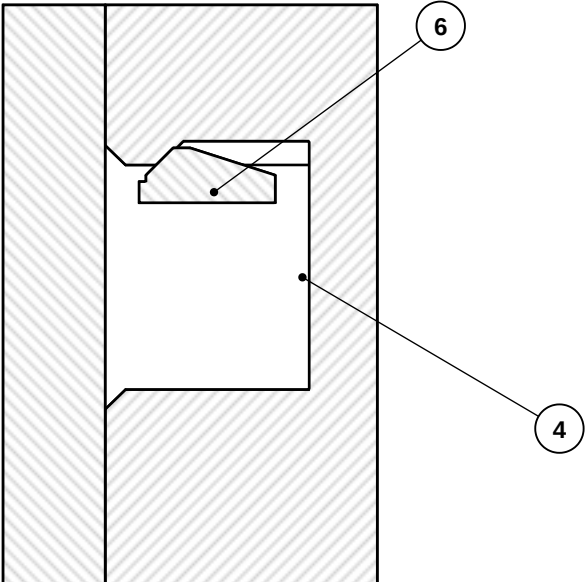
Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title				
Bluespeaker Mini				
Subject				
Joint details: front corner and tray screws				
Drawing no.	Revision	Date	Scale	Sheet
BSM-08	0.3	2026-10-11	6:1, 5:1	9 / 12
Material			Tolerance unless shown · units	
PLA			±0.2 · mm · third angle	

SECTION B-B grille catch (X = 63.75) 9:1



SECTION F-F strip catch (X = 62.0) 9:1



- 1 Beam: one 0.5 line, 10 long, 2.0 high; bridges 0.5 above the cover back. Flexes in the cover plane.
2 Bump 0.4 (grille +0.095 comp): 45° catch face, flat 0.25, 18° lead-in
3 Lip at the pocket mouth: 45°, 0.05 preload on the bump (pulls the cover flat)
4 Pocket 3.0 deep, 3.3 wide, floor is a bridge. Posts 0.15 clear per side (locate the cover)
5 Mouth lead-in 0.3 x 45° (takes the elephant foot)
6 Strip beam modelled 0.31: the Parts profile expansion (0.095) prints one 0.5 line

Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title

Bluespeaker Mini

Subject

Joint details: snap catches

Drawing no.

BSM-09

Revision

0.3

Date

2026-10-11

Scale

9:1

Sheet

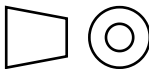
10 / 12

Material

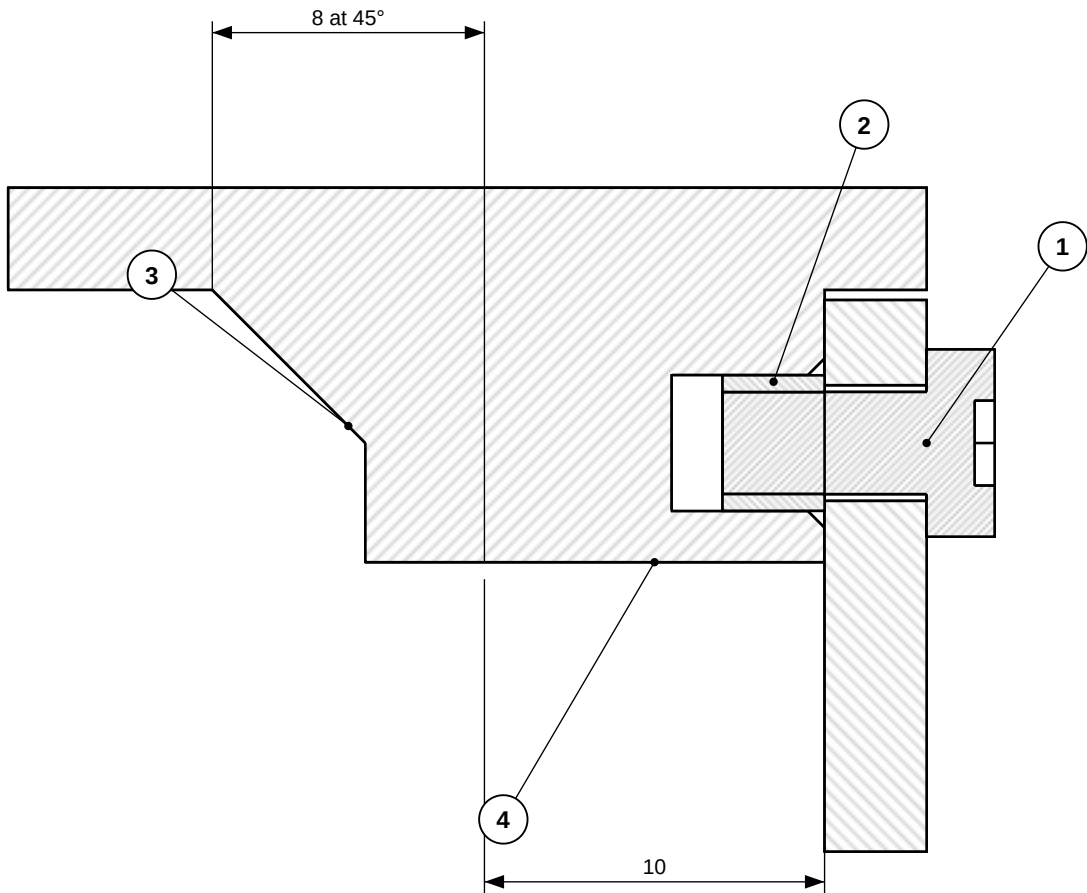
PLA

Tolerance unless shown · units

±0.2 · mm · third angle

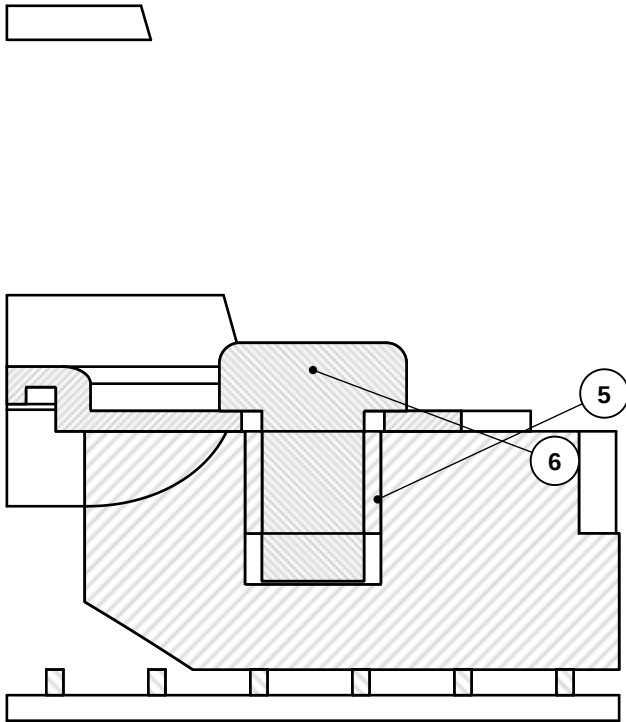


SECTION G-G rear post (X = 75.5) 4.5:1



- 1 M3 x 6 socket head cap screw; head on the rear panel, Ø3.4 clearance
- 2 Insert M3 x 3, printed Ø4.0 hole, 0.5 x 45° relief chamfer
- 3 Gussets at 45° to both walls: the post prints with no support
- 4 Post 8 x 8, 10 deep
- 5 Insert M3 x 3 in the 3 mm spacer frame
- 6 M3 x 5 pan head through the driver flange

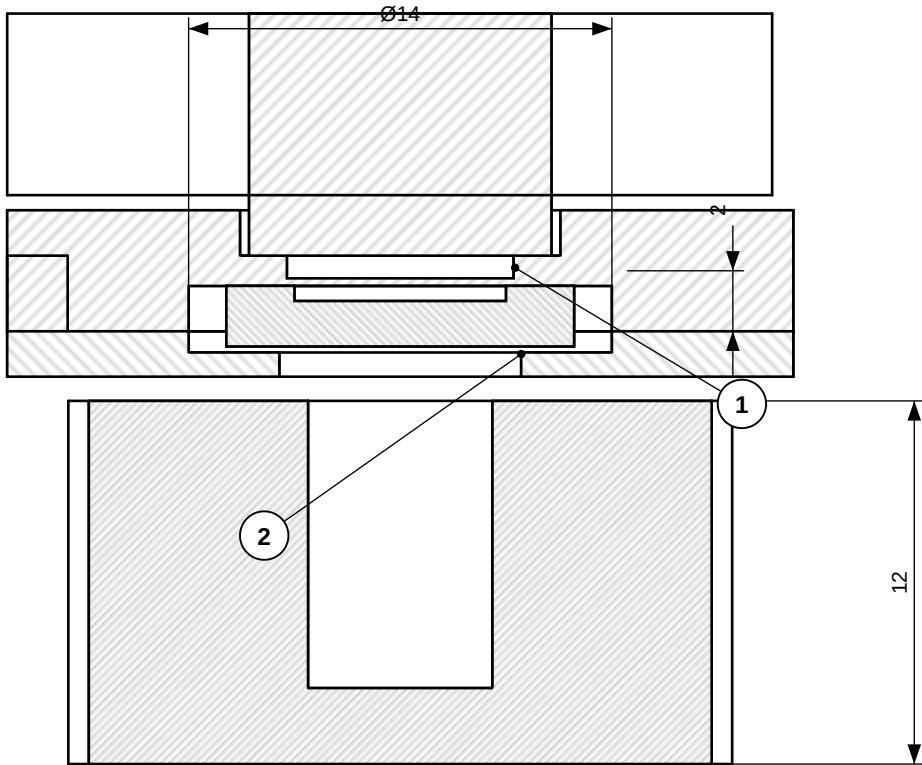
SECTION H-H driver mount (Z = 95.59) 4.5:1



Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

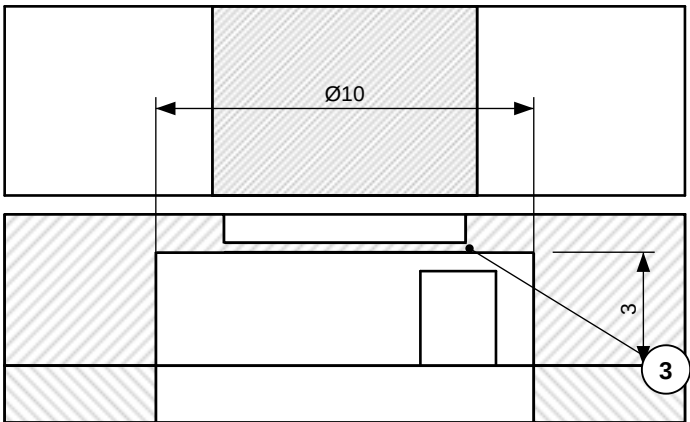
Title				
Bluespeaker Mini				
Subject				
Joint details: rear post and driver mount				
Drawing no.	Revision	Date	Scale	Sheet
BSM-10	0.3	2026-10-11	4.5:1	11 / 12
Material			Tolerance unless shown · units	
PLA			±0.2 · mm · third angle	

SECTION J-J volume control (Z = 18.1) 4:1



- 1 Membrane 0.25 at the floor of the Ø14 x 1.5 nut recess: cut out to Ø7.5
2 Strip hole Ø8.0; knob Ø22 x 12 with 0.8 gap to the strip
3 Membrane 0.25 at the floor of the Ø10 x 3 collar counterbore: cut out to Ø6.4
The ZK-502C positions come from photos. Measure the board before production.

SECTION K-K AUX socket (Z = 15.1) 5:1



Bluespeaker Mini · build123d model cad/bluespeaker_mini.py

Title				
Bluespeaker Mini				
Subject				
Joint details: volume control and AUX socket				
Drawing no.	Revision	Date	Scale	Sheet
BSM-11	0.3	2026-10-11	4:1, 5:1	12 / 12
Material			Tolerance unless shown · units	
PLA			±0.2 · mm · third angle	