

MIT PRESENTATION

BOSE

FEBRUARY 2023

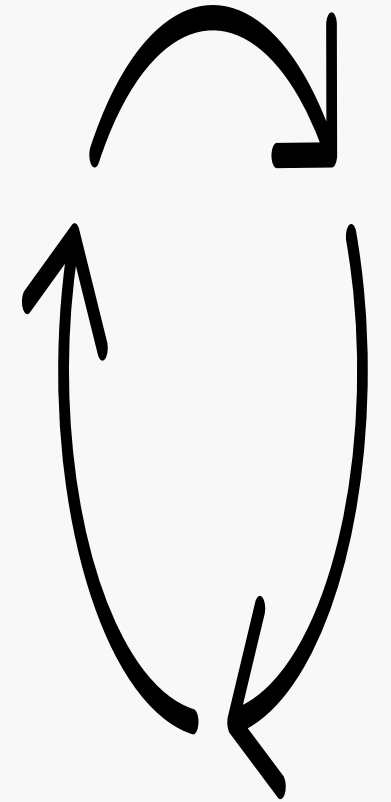
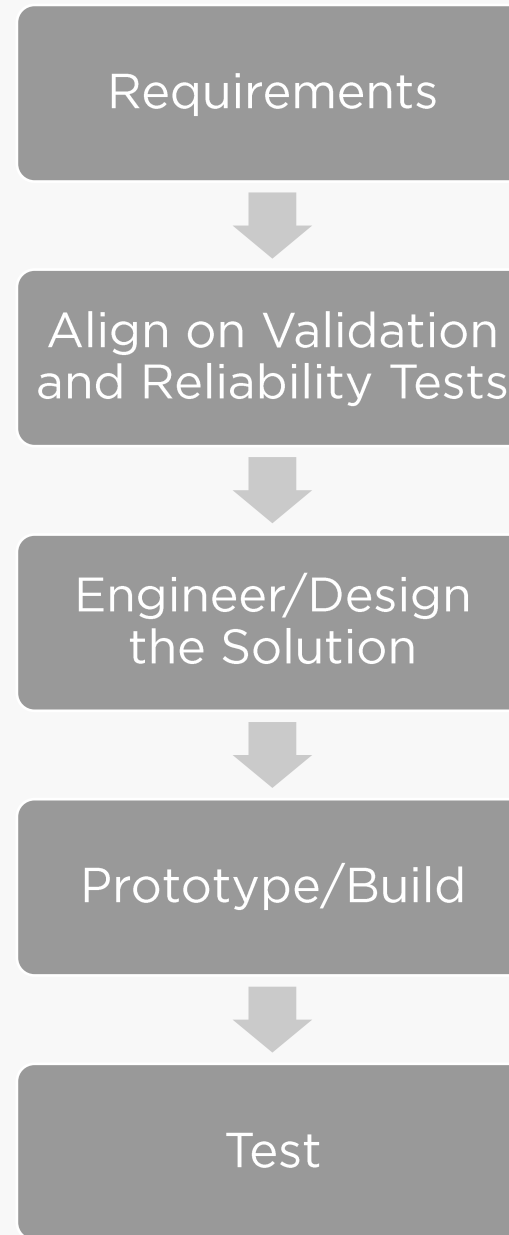
Introductions

Dan Gonsalves

Colin Stievater

Sohan Abraham

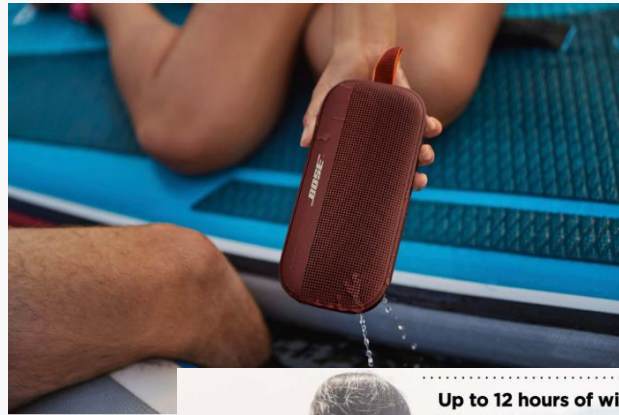
Development Philosophy



**What is a
rugged product**



Starts with Requirements



Up to 12 hours of wireless listening for music that lasts all day long.



Testing Requirements

Ipx testing - Rain & Dust in Miami

Thermal Operating Conditions - Out in the sun on a hot day

Liquid Spill Test

Drop Test

Reliability Tests

Test to failure or accelerated testing.

Mechanical Design 101 – Create a Sealed Box

Off the Shelf Sealed Box

The screenshot shows the Polycase website's product page for waterproof enclosures. The navigation bar includes 'PRODUCTS', 'SHOP BY SIZE', 'SHOP BY SERIES', 'SERVICES CUSTOMIZED ENCLOSURES', and an 'INSTANT QUOTE' button. The main heading is 'Waterproof Enclosures & Boxes'. Below it, a paragraph explains that these enclosures protect internal electrical and electronic components in any environment, meeting various NEMA and IP requirements. A second paragraph notes that they are dust-tight and resistant to environmental hazards like corrosion and submersion. An image of a white rectangular enclosure is shown on the right.

HOLE PLUG As low as \$1.29 per unit

0.53 x 0.84 x 0.84 in.
13.46 x 21.34 x 21.34 mm.

Fits Hole Size: M12, M16, M20, M32
IP Rating: IP67, IP68
NEMA Rating: 3R, 4, 4X
Material: Nylon

VENT PLUG As low as \$2.31 per unit

0.62 x 1.06 x 1.06 in.
15.75 x 26.92 x 26.92 mm.

Fits Hole Size: M20
IP Rating: IP67, IP68
NEMA Rating: 3R, 4, 4X
Material: Nylon

YETLEBOX Waterproof Electrical Box with Mounting Plate 130x80x70mm, IP67 Junction Box Dustproof Clear...

★★★★☆ ~ 22

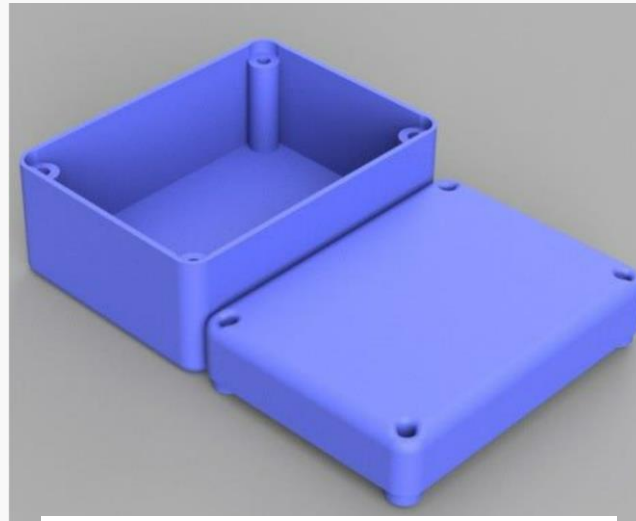
\$9⁹⁹ - \$52⁹⁹

Save 6% with coupon

prime

Mechanical Design 101 – Create a Sealed Box

Create Rapid Prototype Box



MG Chemicals 419D Acrylic Conformal Coating, Clear Finish, 12 oz. Aerosol

Brand: MG Chemicals
★★★★★ 4.7 (140 ratings | 6 answered questions)

\$41⁷⁸ (\$3.01 / Fl Oz)

Brand	MG Chemicals
Color	Clear
Finish Type	Matte
Size	12 Ounce (Pack of 1)
Item Volume	12 Fluid Ounces
Unit Count	13.86 Fl Oz
Paint Type	Acrylic

See more



Frost King 3/4 in. x 7/16 in. x 10 ft. Black High-Density Rubber Foam Weatherstrip...

★★★★★ (311)

\$5⁴⁷

MG Chemicals 419D Acrylic Conformal Coating, Clear Finish, 12 oz. Aerosol

Brand: MG Chemicals
★★★★★ 4.7 (140 ratings | 6 answered questions)

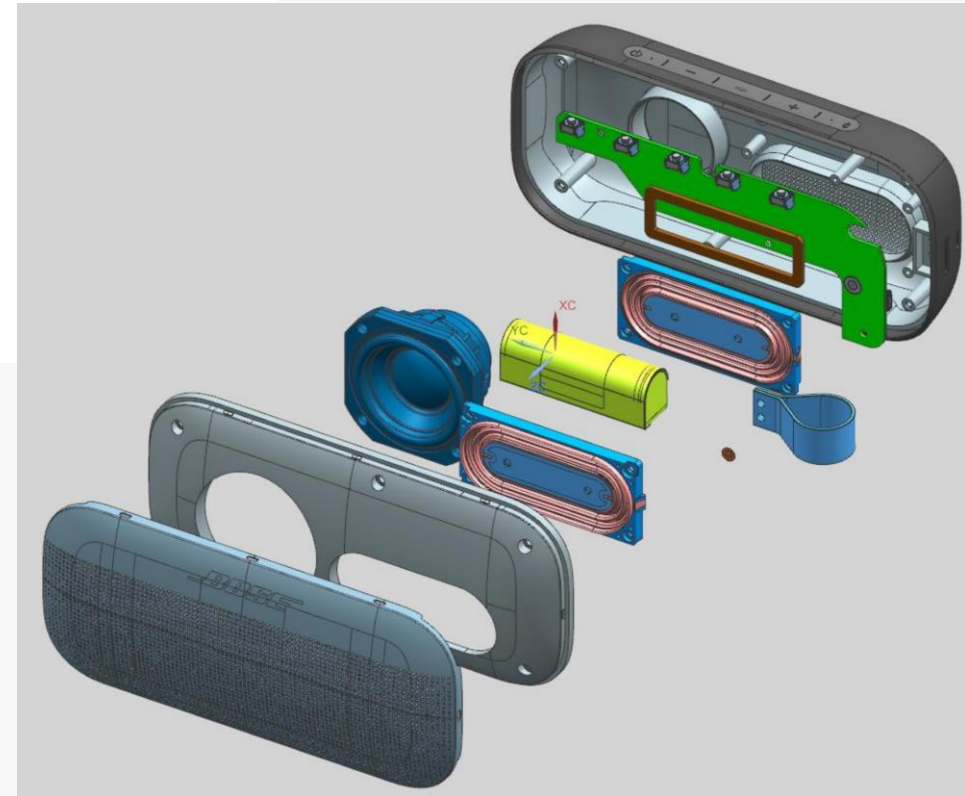
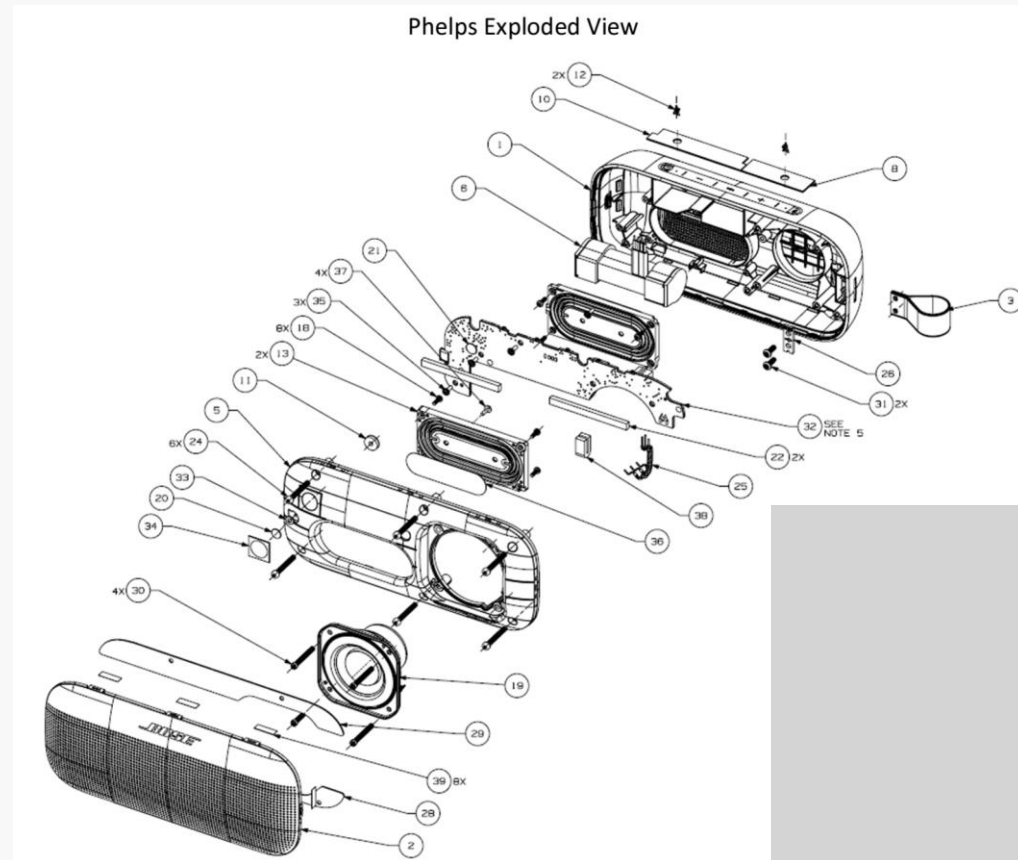
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Mechanical Design 101 – Create a Sealed Box

For Mass Production



Mechanical Design 101 – Design Considerations

Openings- Sealed or bottom of product

Moisture is your enemy- condensation, rain, etc.

Conformal coat

Glue or gasket out gassing

Repairability and tamper proof

Thermal performance (where will the heat go)

Material degradation (UV, abrasion, etc)

Useful Links

Online store for all hardware and anything need to build prototypes:

<https://www.mcmaster.com/>

IPX Ratings

<https://headphonesaddict.com/ip-rating-explained/>

Design Tips

<https://www.protolabs.com/resources/design-tips/>

Rugged design guidelines

<https://sgwdesignworks.com/rugged-product-design-how-to-get-it-right/>

