

Design of Enclosure for Power Supply (SMPS) Module

Scope : Enclosure Design (Sheet Metal)

Application : Efficient and stable power supply for electronics

Switched-Mode Power Supplies (SMPS) are efficient, compact power converters ideal for modern electronics. They use high-frequency switching to minimize energy loss and heat dissipation, making them suitable for computing, telecommunications, and industrial applications. SMPS provide stable, reliable power with reduced electromagnetic interference, supporting the development of energy-efficient and compact electronic systems.



Designing a durable enclosure for the power supply module, as requested by the client, proved to be a considerable challenge for us.

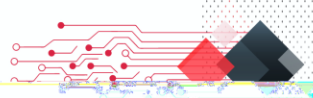
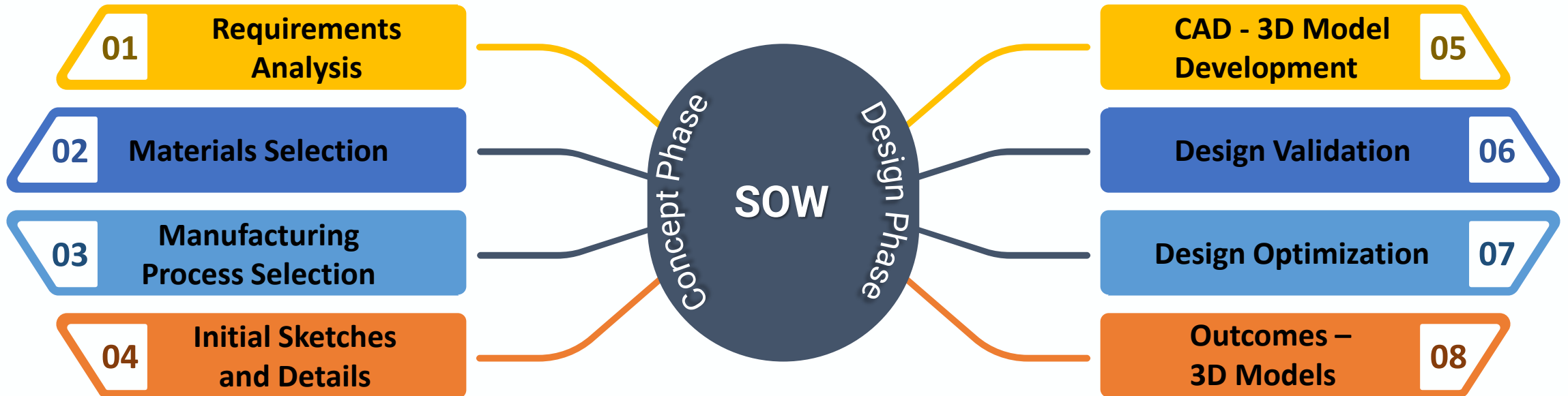
Challenges

- * Provision for Accessory Parts – Fan, Connector and Switch
- * Optimization of Mounting and Installation
- * Thermal Management - Adequate heat dissipation
- * EMI considerations
- * Size and Form factor constraints
- * Material Selection for Durability
- * Environmental Protection/Resistance
- * Aesthetically Pleasing Design
- * Accessibility for Maintenance and Portability
- * Adherence to Regulatory Compliances
- * Cost-Effective Solutions



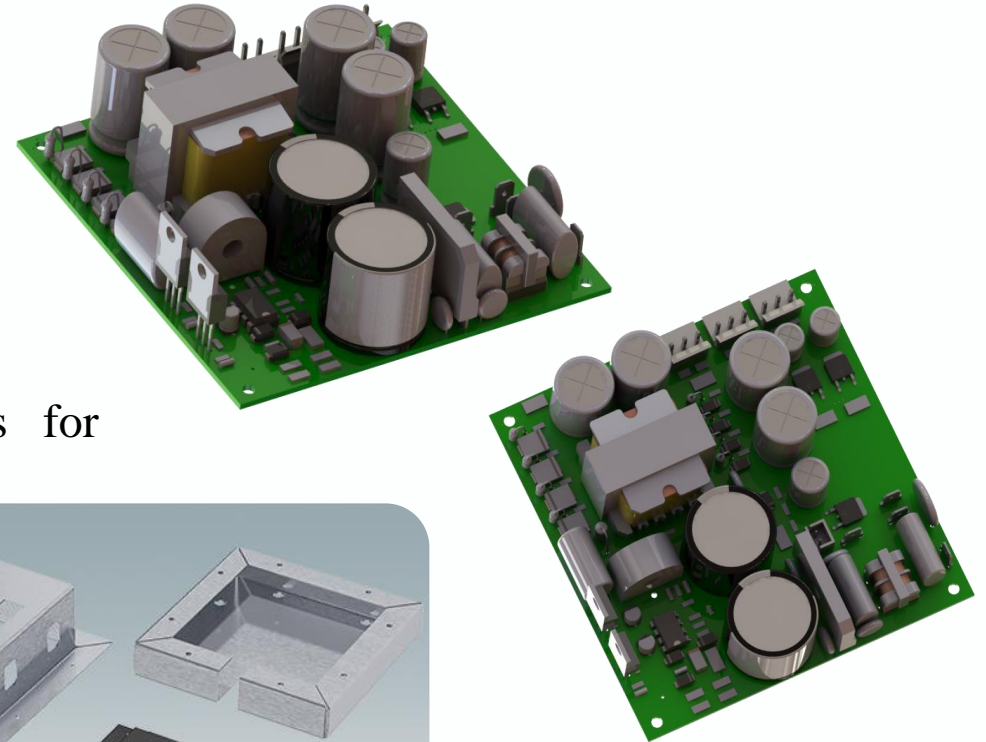
Conceptualization Phase

Design Development Phase



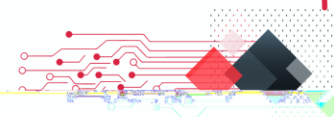
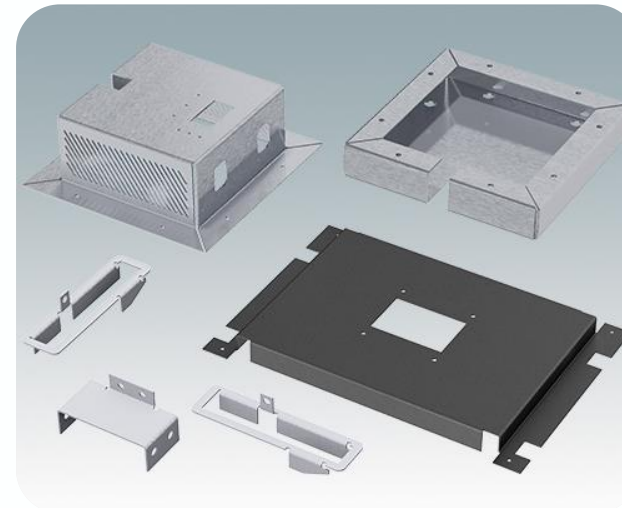
Requirements - Analysis

- PCB Board in “STEP” file for Dimensional accuracy and fit
- Height restriction constraints
- Keep-out area information
- Fan and connector location details
- Ventilation requirement details – Efficient heat transfer
- Additional document contains any other relevant details for enclosure design.



Materials Selection

Sheet metal (Aluminum) can be a very suitable choice for this enclosures, especially when considering factors like durability, ease of fabrication, and cost-effectiveness.

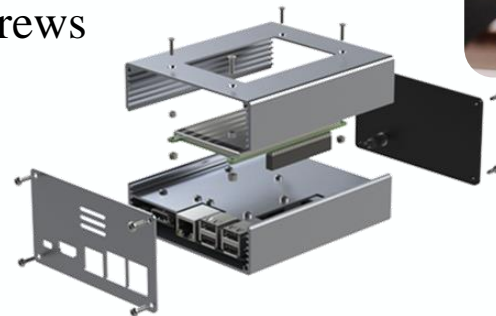


Manufacturing Process

Sheet metal enclosures are manufactured through a series of well-defined steps that involve cutting, forming, and assembling metal sheets into the desired shapes and structures.

For manufacturing sheet metal enclosures in a cost-effective way, the manufacturing process for this enclosure design are listed below.

- Cutting – Laser Cutting
- Punching – CNC Punching
- Forming – Sheet Metal Bending
- Assembly – Fastening – using screws



Sketching & Details: Initial Sketches

Enclosure Shape & Size Plan

Rough initial sketches are drawn with the details related to cutout for Power connector, Toggle Switch and sufficient air ventilation and Area for other accessory parts.

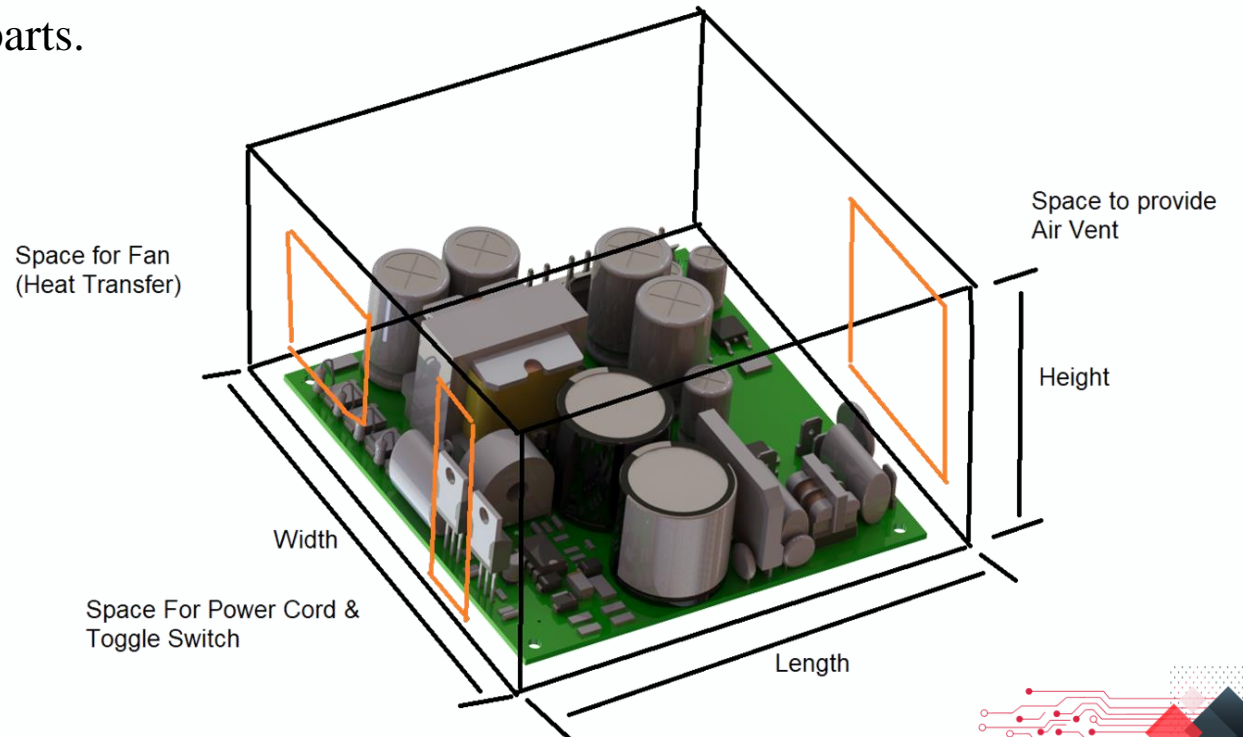
- Enclosure Size (Length x Width x Height)
- Air Ventilation for Heat dissipation
- Space for Fan
- Cutouts requirements – Switch & Connectors
- PCB Mounting techniques

Considerations:

Thickness of Enclosure

Bending Radius

Assembling Ideas – Fastening using screws



CAD Model Development

Based on the sketch details, 3D modeling is initiated, and design optimizations are performed after discussions with the client to meet their requirements.

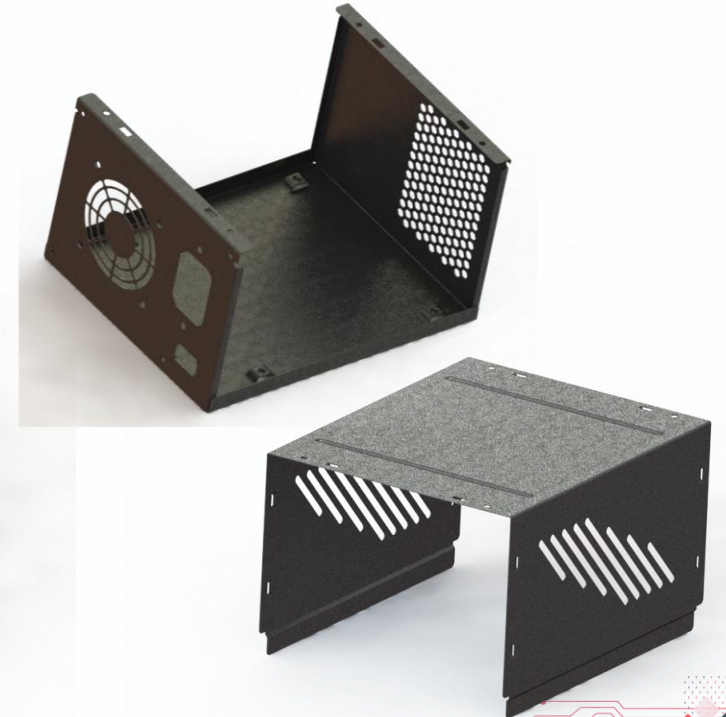
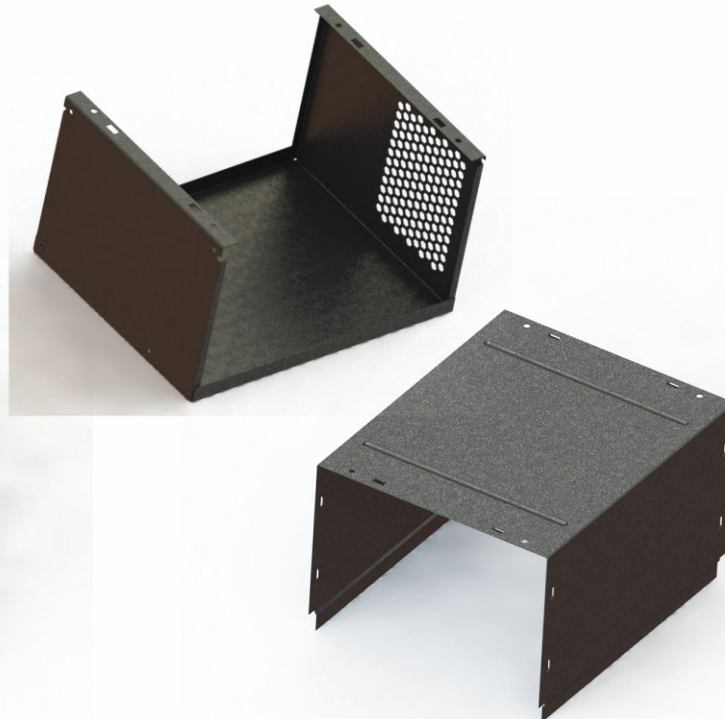
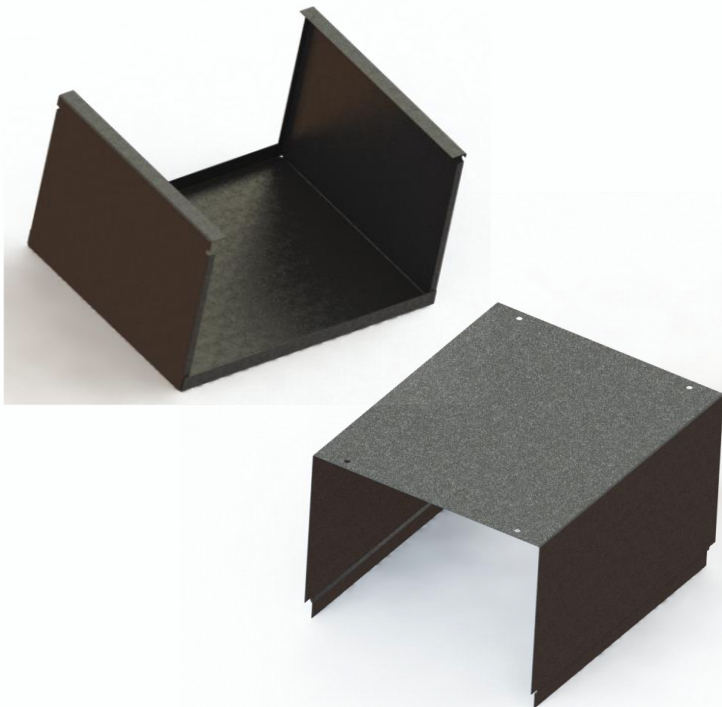
Flow: Outline Design



Design Optimization



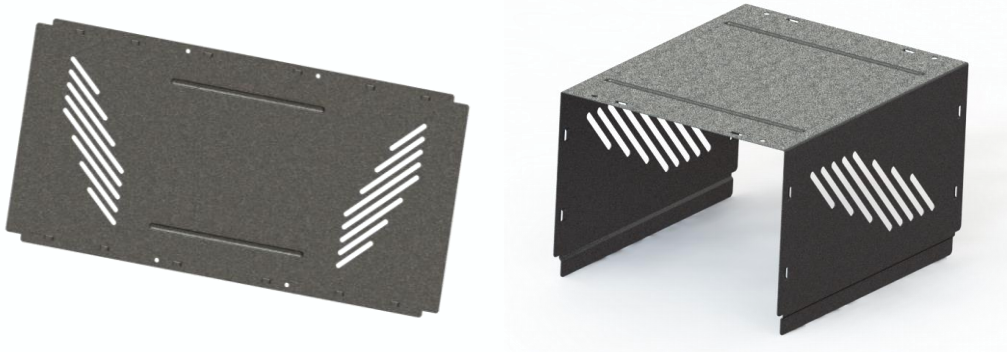
Aesthetic Improvements



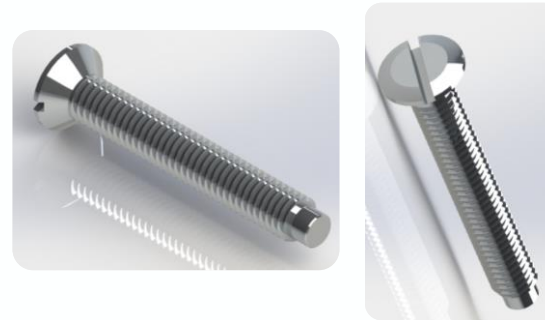


Individual CAD Models

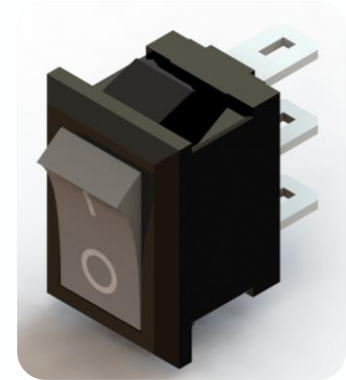
Top Enclosure



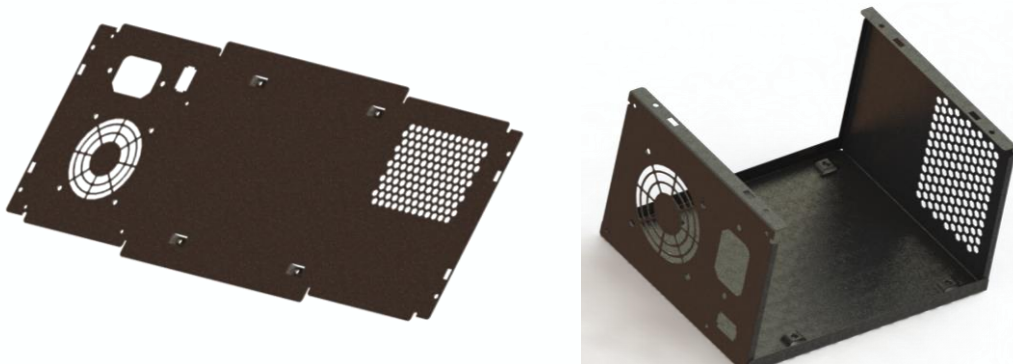
Screws



Toggle Switch



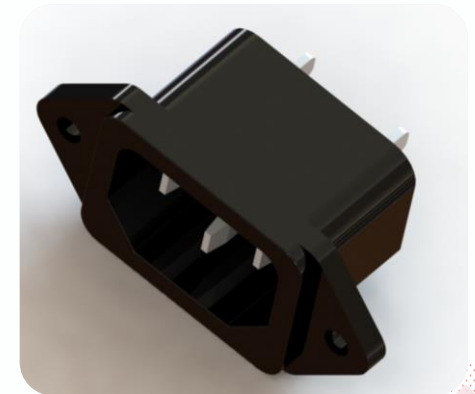
Bottom Enclosure



Fan



Power Connector

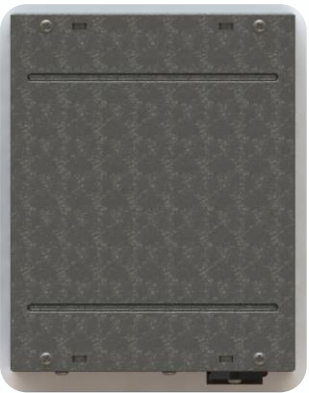


Final Enclosure CAD Model

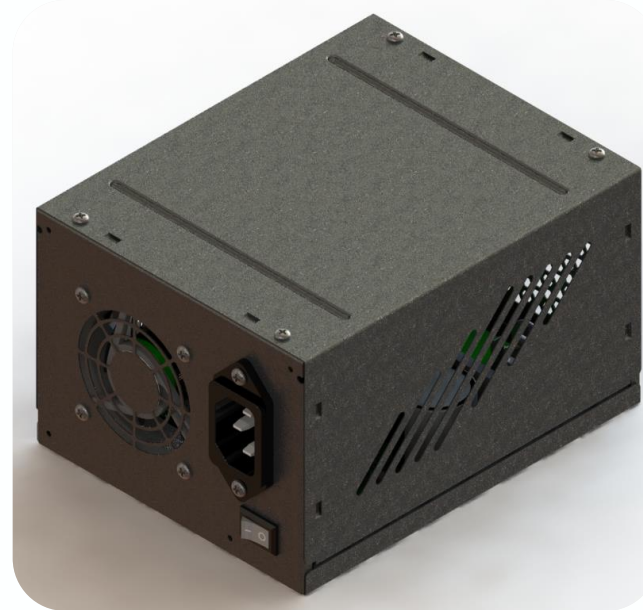
The final CAD model of the enclosure is presented in both orthographic and exploded perspective views.

Enclosure Dimension – 140mm (L) x 111.4mm (W) x 84.4mm (H)

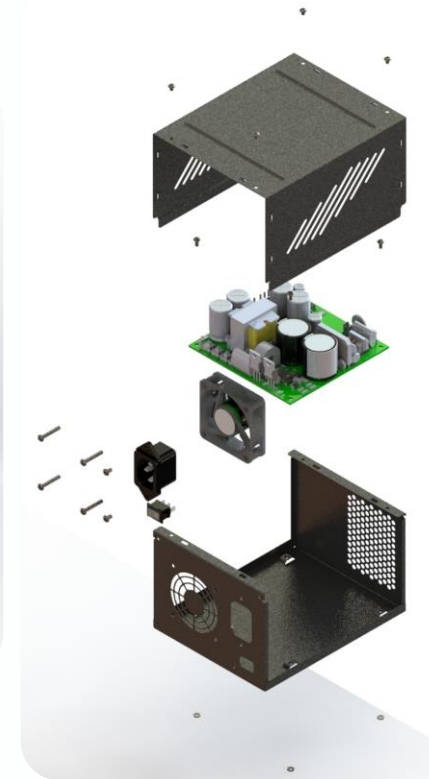
Top View



Isometric View



Exploded View



Front View



Side View



We are excited to present a testimonial from one of our satisfied clients.

“We are thrilled with the 3D enclosure design services provided. The final design surpassed our expectations, precisely meeting our specifications and demonstrating remarkable expertise and attention to detail. The project was completed within the agreed timeline, showcasing their efficiency and reliability. Additionally, they optimized the design cost without sacrificing quality, underscoring their commitment to customer satisfaction. We highly recommend their services to any organization in need of top-quality design solutions. Their exceptional work greatly contributed to our project's success, and we eagerly anticipate future collaborations with this skilled team”



In summary, our team successfully tackled challenges to deliver a finely crafted enclosure, utilizing thorough brainstorming sessions and our expertise in MCAD Engineering Services.

Through meticulous analysis and precise execution, we produced a design that surpassed client expectations, optimizing every detail for superior performance.

Our collaborative approach extended beyond technical considerations to refine the design according to specific client needs, emphasizing cost-effectiveness and timely delivery.

We remain committed to delivering unparalleled MCAD services, showcasing our dedication to excellence and reliability in achieving exceptional outcomes.

