DEPARTMENT OF ELECTRONIC AND TELECOMMUNICATION ENGINEERING

UNIVERSITY OF MORATUWA

EN2160 - Electronic Design Realization

Report - Preliminary Design

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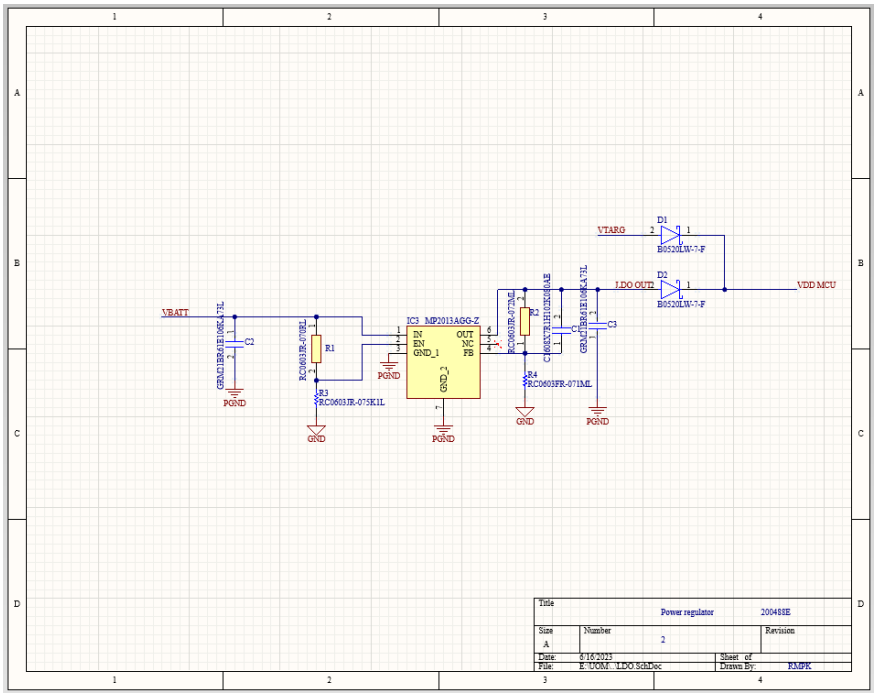
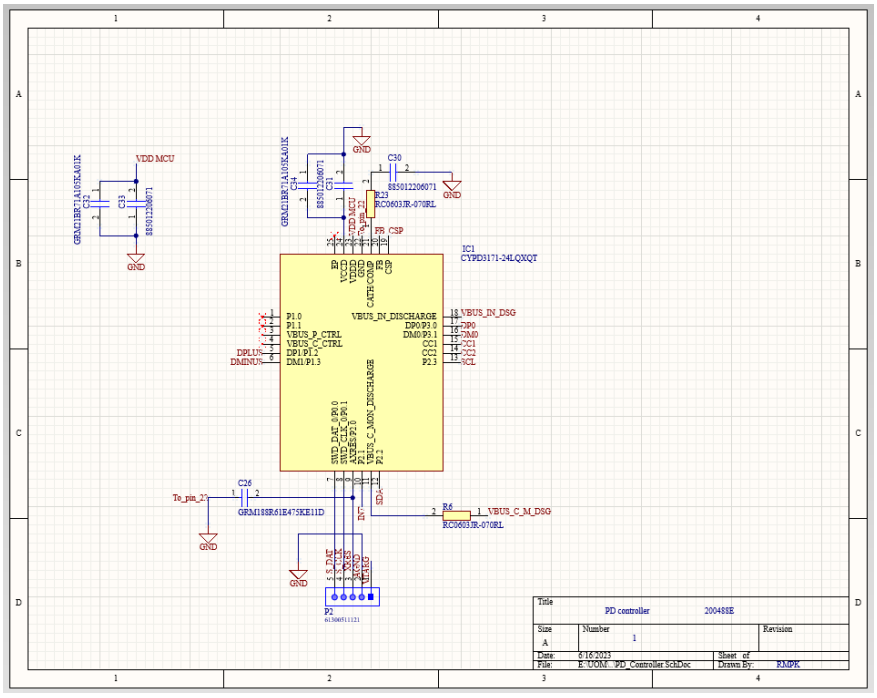
200488E

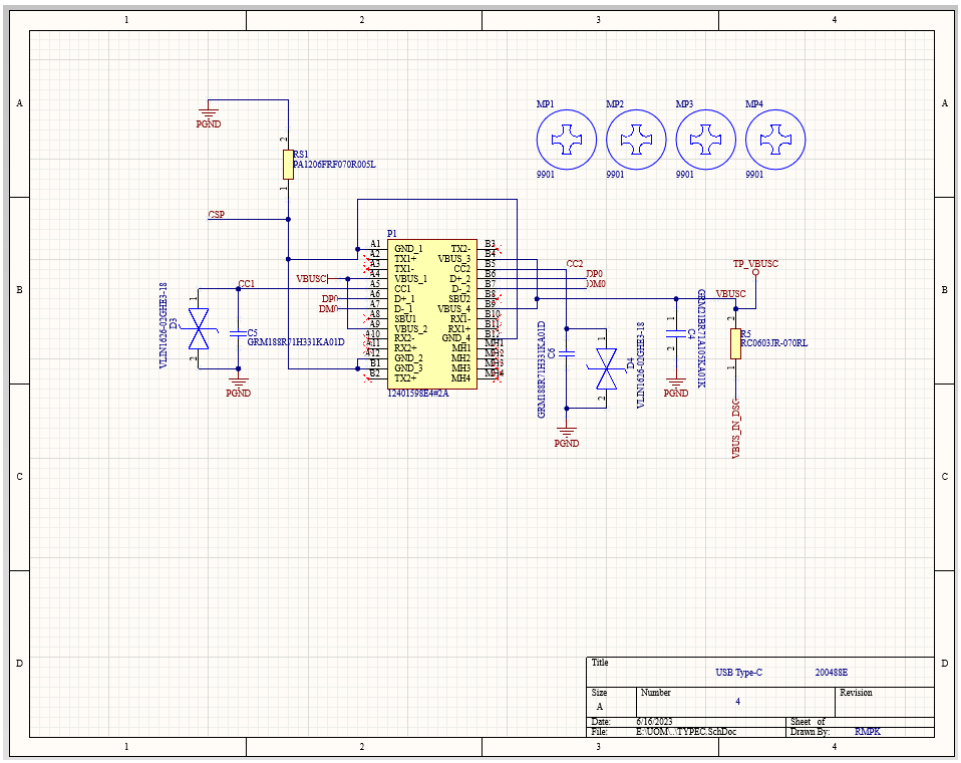
JUNE 16, 2023

Schematic and Solid work design of the implemented design.

Schematic Design







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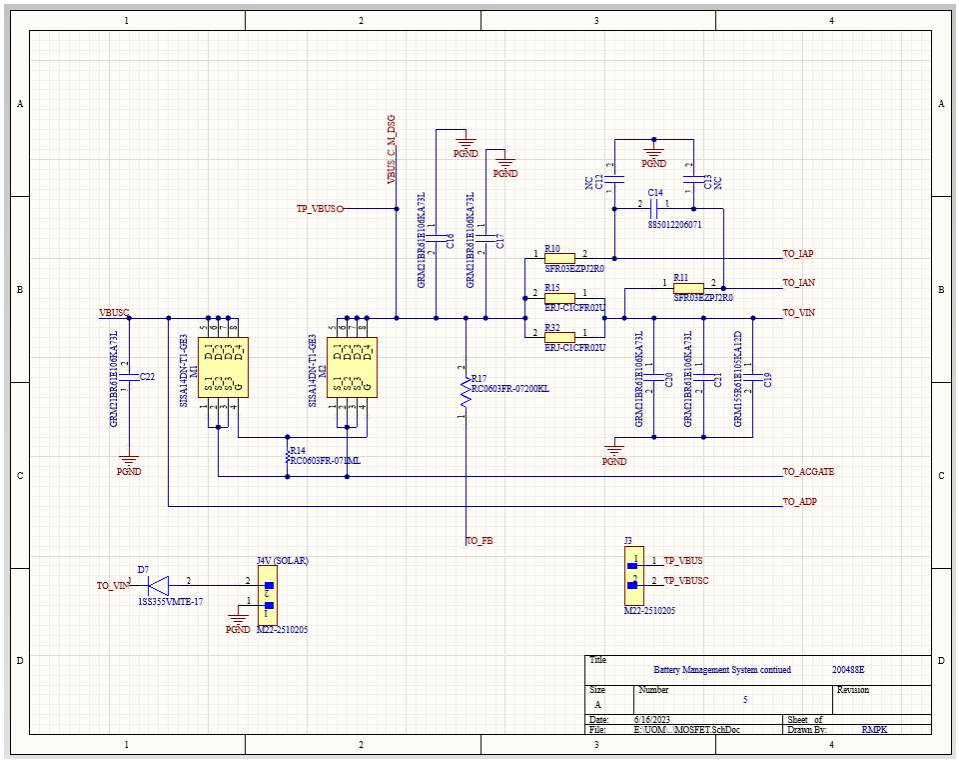

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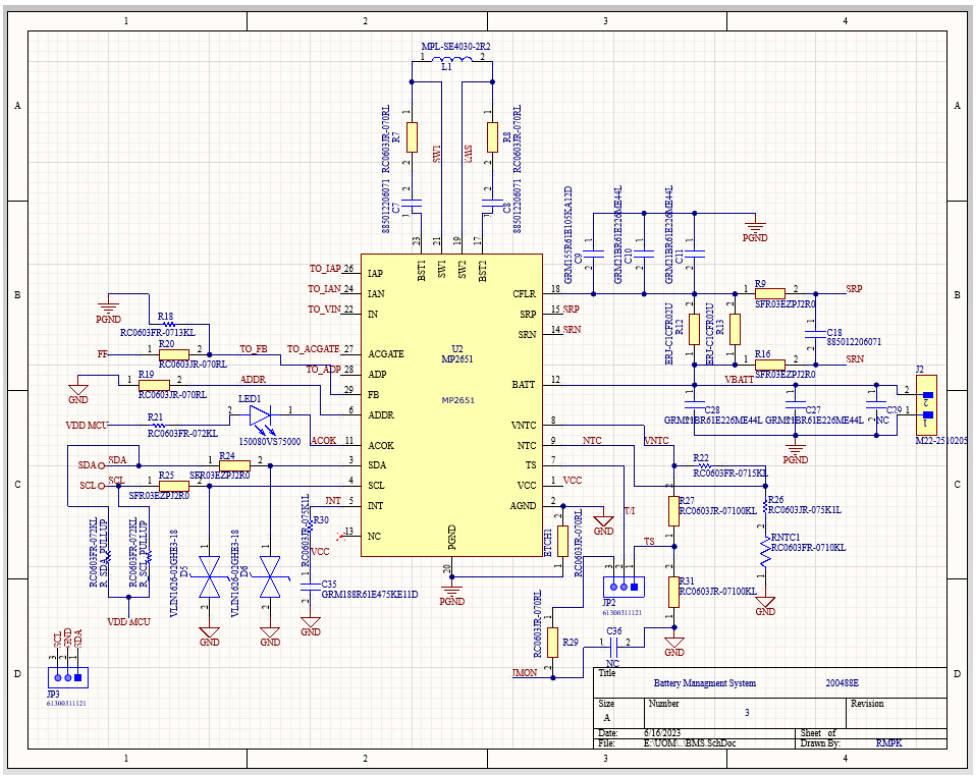
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U2
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Number
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Revision
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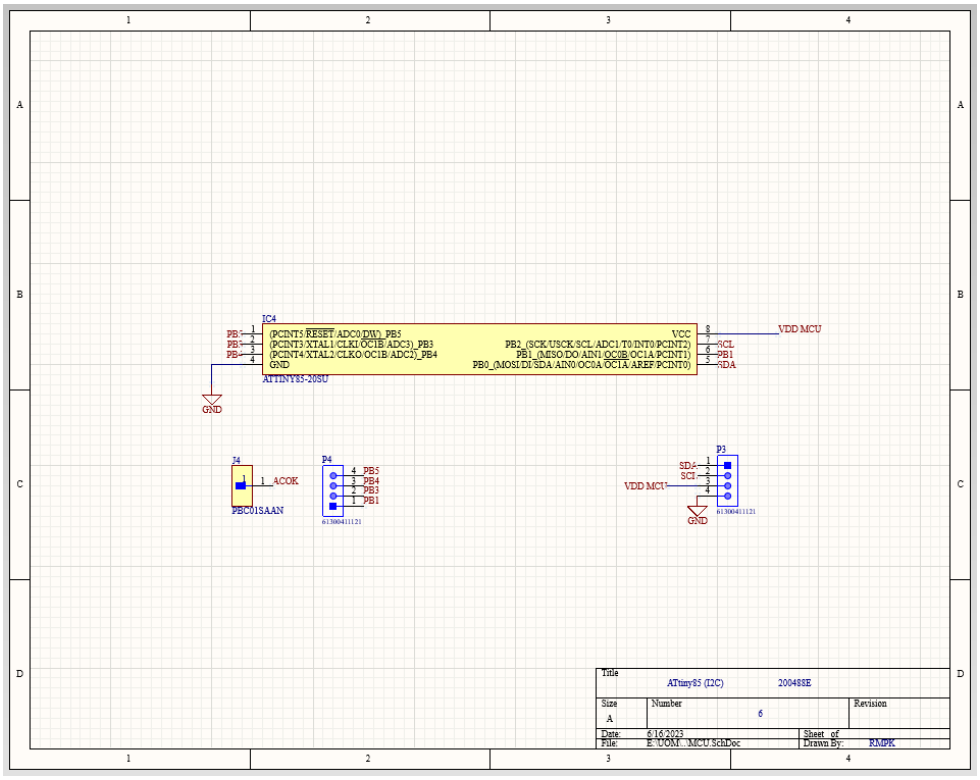
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ATtiny85 (I2C)
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Revision
Date: 6/16/2023
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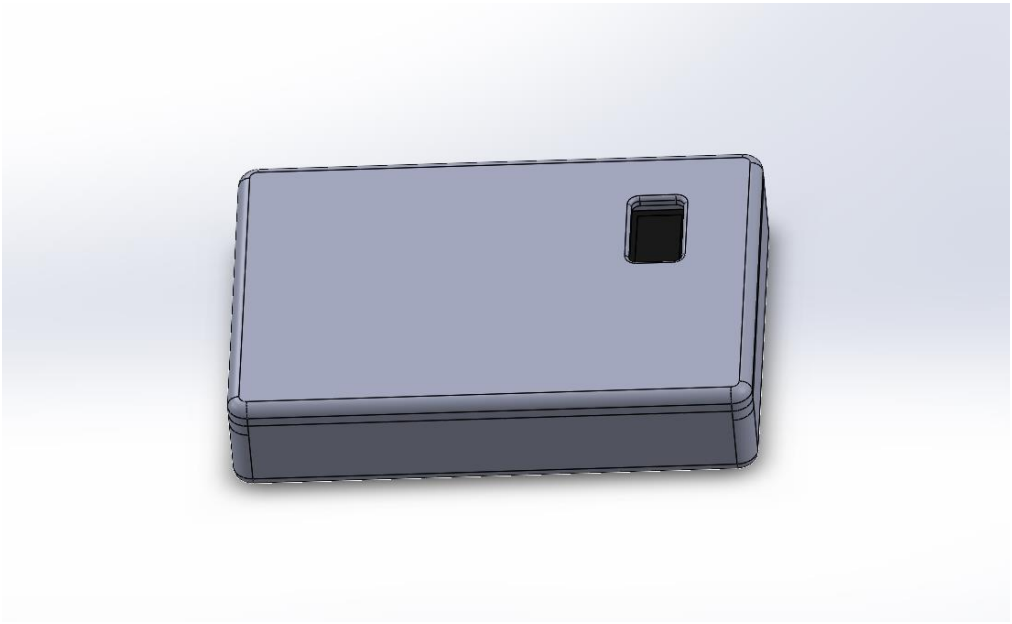
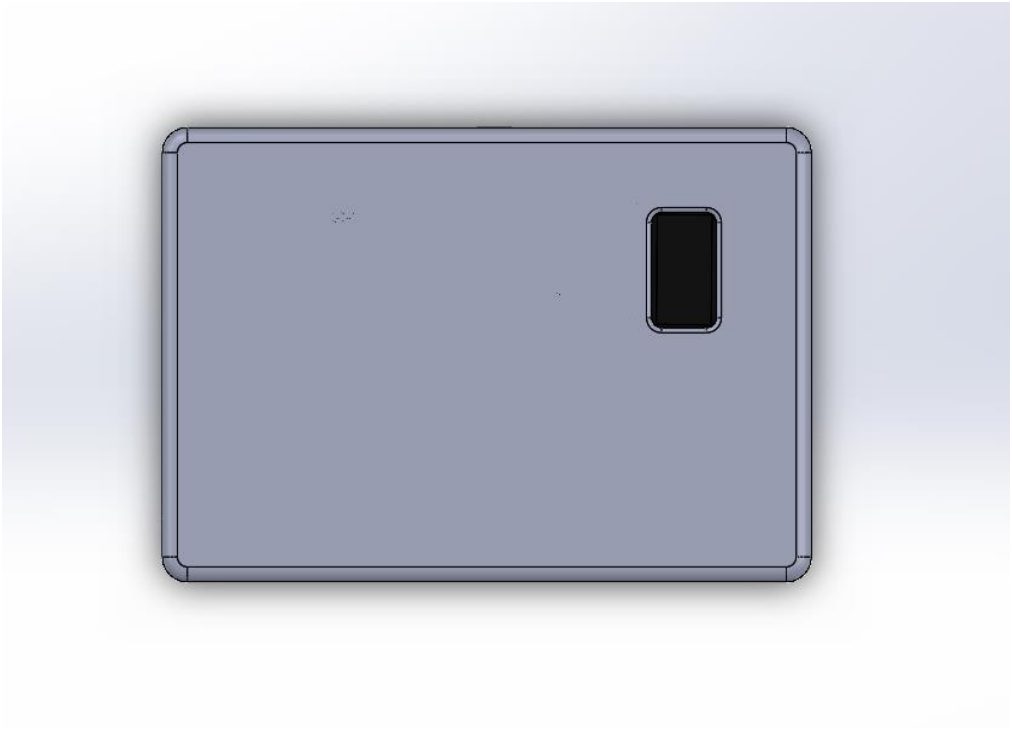
Solidworks Design





Problems identified by considering the course content delivered by Prof. Jayasinghe

1. Schematic Design:

- Utilize net labels and minimize the use of individual cables for improved clarity and simplicity.
- Apply clear and consistent component naming conventions that facilitate easy identification from top to bottom.

2. Enclosure Design:

- Develop an enclosure design that aligns with industry standards and best practices.
- Utilize professional CAD software, such as SolidWorks, to import hand-drawn sketches and create accurate 3D models.
- Pay attention to ergonomic considerations, functional requirements, and aesthetic appeal when designing the product.

3. Enclosure Moldability:

- Perform a thorough draft analysis using appropriate tools to ensure the enclosure parts can be manufactured using standard molding techniques.
- Design the enclosure parts with appropriate draft angles, fillets, and wall thicknesses to facilitate moldability.

4. User Needs Analysis:

- Conduct comprehensive user research to identify and understand the target audience's needs, preferences, and pain points.

- Incorporate user feedback and input throughout the design process to enhance the product's implementation and usability.

5. Design Cycle Implementation:

- Establish a systematic design cycle that includes multiple iterations and feedback loops to refine and improve the product.
- Solicit input from users and group members and use their feedback to inform subsequent design iterations.
- Evaluate and rate designs based on predetermined criteria to select the best one for further refinement.

6. Product Manual and Documentation:

- Create a user manual that provides clear instructions on how to operate and maintain the product effectively.
- Develop a service manual that offers detailed information on troubleshooting, repairs, and maintenance procedures.
- Ensure accurate and thorough record-keeping throughout the design and manufacturing process.

7. Appearance for Marketing:

- Employ thoughtful and strategic use of color and texture in the product's design to attract and engage potential customers.
- Consider market trends and target audience preferences to create an appealing and visually cohesive product.

8. The Value of the Final Look of the Product:

- Recognize the importance of the product's visual appeal in establishing a positive perception among customers.
- Ensure that the final look of the product aligns with the brand identity and conveys a sense of quality and professionalism.

Problems/Improvements identified/proposed by group members.

Problems:

- The enclosure is not attractive.
- Most of the devices have USB Type–A output.
- The design is not moldable.
- The thickness of the design is somewhat higher.

Improvement:

- Design enclosure by using hand-drawn sketches and user-attractive way.
- Add another Type-A USB port.
- Improve the design that includes draft angles.
- Change the dimensions of the design such that users can grip that easily.

Problems/Improvements identified/proposed by users.

To conduct the user need survey, I choose the following questionnaire.

1. How often do you use portable power banks?
2. What devices do you typically charge with a power bank? (e.g., smartphones, tablets, laptops, cameras)

3. How important is it for you to have a power bank that can be charged using solar power?
4. Are you familiar with using solar power to charge electronic devices?
5. What features do you value the most in a power bank? (e.g., battery capacity, fast charging, multiple ports)
6. How long do you usually expect a power bank to last before needing to be recharged?
7. In what outdoor activities or situations would you use a solar-powered power bank?
8. What is your primary reason for considering a solar-powered power bank? (e.g., environmental impact, convenience, emergency backup)
9. Are you willing to pay a premium price for a power bank with solar charging capabilities compared to a regular power bank?
10. What is the ideal size and weight of a power bank for your needs?
11. How important is it for the power bank to have multiple charging ports to simultaneously charge multiple devices?
12. Would you prefer the solar panel to be built-in or detachable?
13. What is the typical duration of sunlight exposure you can expect in your location during a typical day?
14. What is your level of concern about the environmental impact of the products you use?
15. Have you used any solar-powered devices in the past? If so, please describe your experience.
16. Would you be interested in additional features, such as a built-in flashlight or a rugged design for outdoor use?
17. What is your preferred method of connecting the power bank to devices? (e.g., USB-A, USB-C, wireless)

18. Are you interested in monitoring the charging progress and battery level through a mobile app or LED indicators?
19. Do you have any concerns or requirements regarding the compatibility of the power bank with different devices or operating systems?
20. Is there any specific design or functionality requirement you would like to see in a solar-powered power bank?

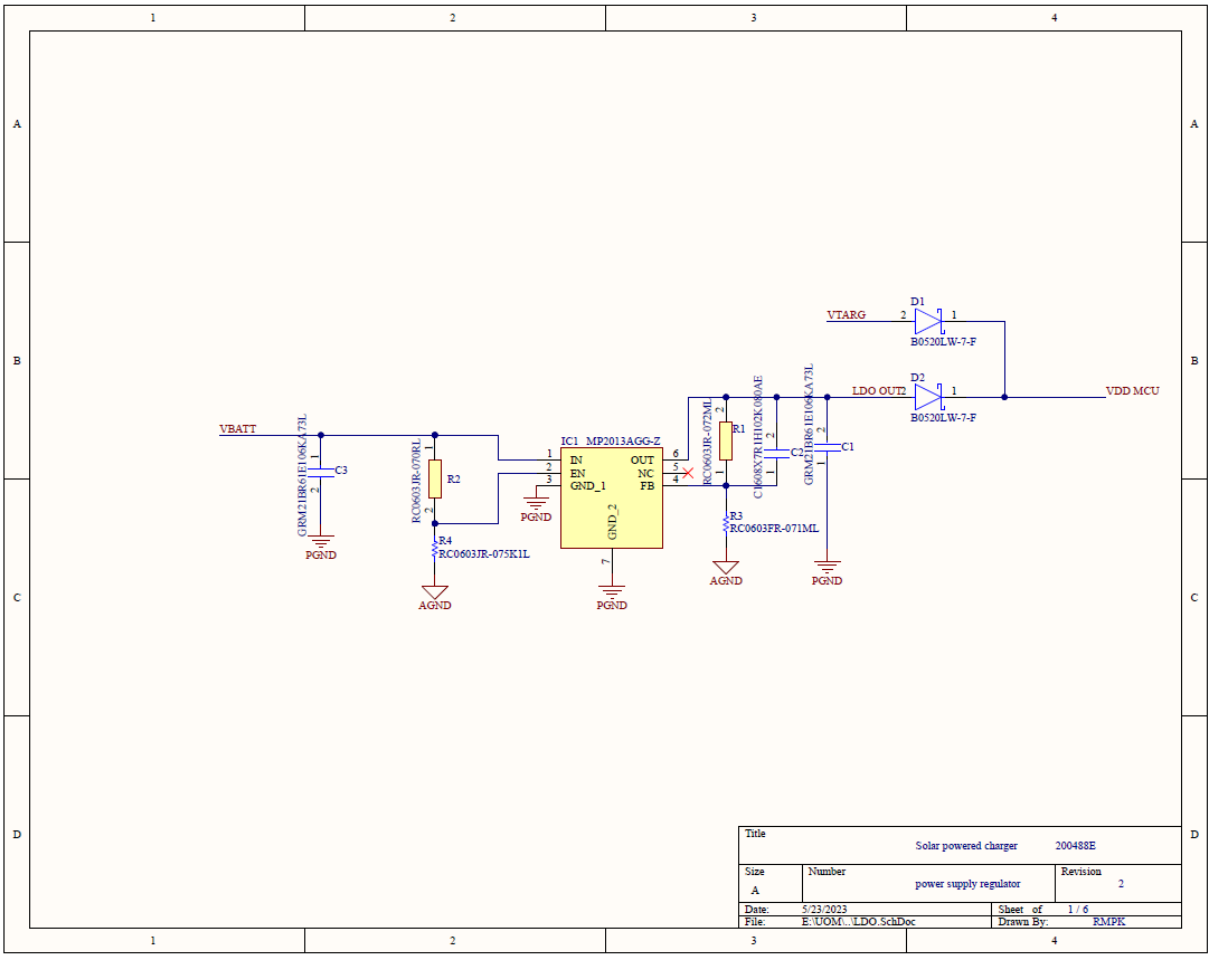
Users proposed things:

1. Sleek and modern designs
2. Clear branding options
3. Options can help attract customers.
4. Durable construction that can withstand occasional rough handling.
5. Smart power management system
6. Advanced safety features

Improved design

Schematic

I added USB-Type A port. Because all other features already had in my design. But I changed my design according to Professor Jayasinghe's lectures such that including net labels, naming components properly and adding other standard features.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LDO OUT2
D2
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R2
RC0603JR-070RL
R4
RC0603JR-075K1L
IC1 MP2013AGG-Z
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EN
GND_1
GND_2
OUT
NC
FB
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RC0603JR-072ML
R3
RC0603FR-071ML
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Size
A
Number
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Revision
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Date:
5/23/2023
Sheet of
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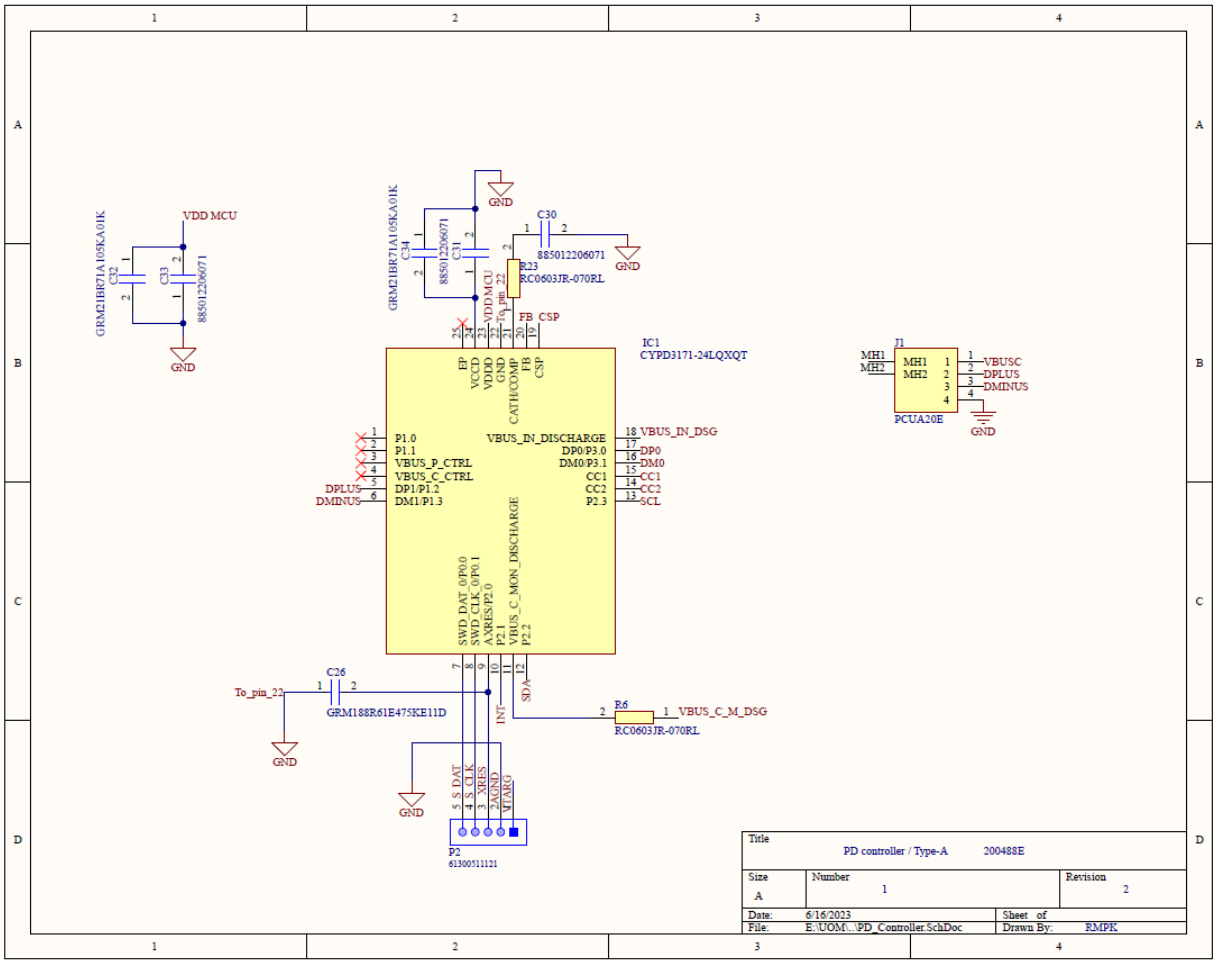
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GND
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GND
R23
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To_pin_22
VDD MCU
FB CSP
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EP
VCCD
VDDD
GND
CATH/COMP
FB
CSP
P1.0
P1.1
VBUS_P_CTRL
VBUS_C_CTRL
DP1/P1.2
DM1/P1.3
DPLUS
DMINUS
VBUS_IN_DISCHARGE
DP0/P3.0
DM0/P3.1
CC1
CC2
P2.3
VBUS_IN_DSG
DP0
DM0
CC1
CC2
SCL
SWD_DAT_0/P0.0
SWD_CLK_0/P0.1
AXRES/P2.0
P2.1
VBUS_C_MON_DISCHARGE
P2.2
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MH2
PCUA20E
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Revision
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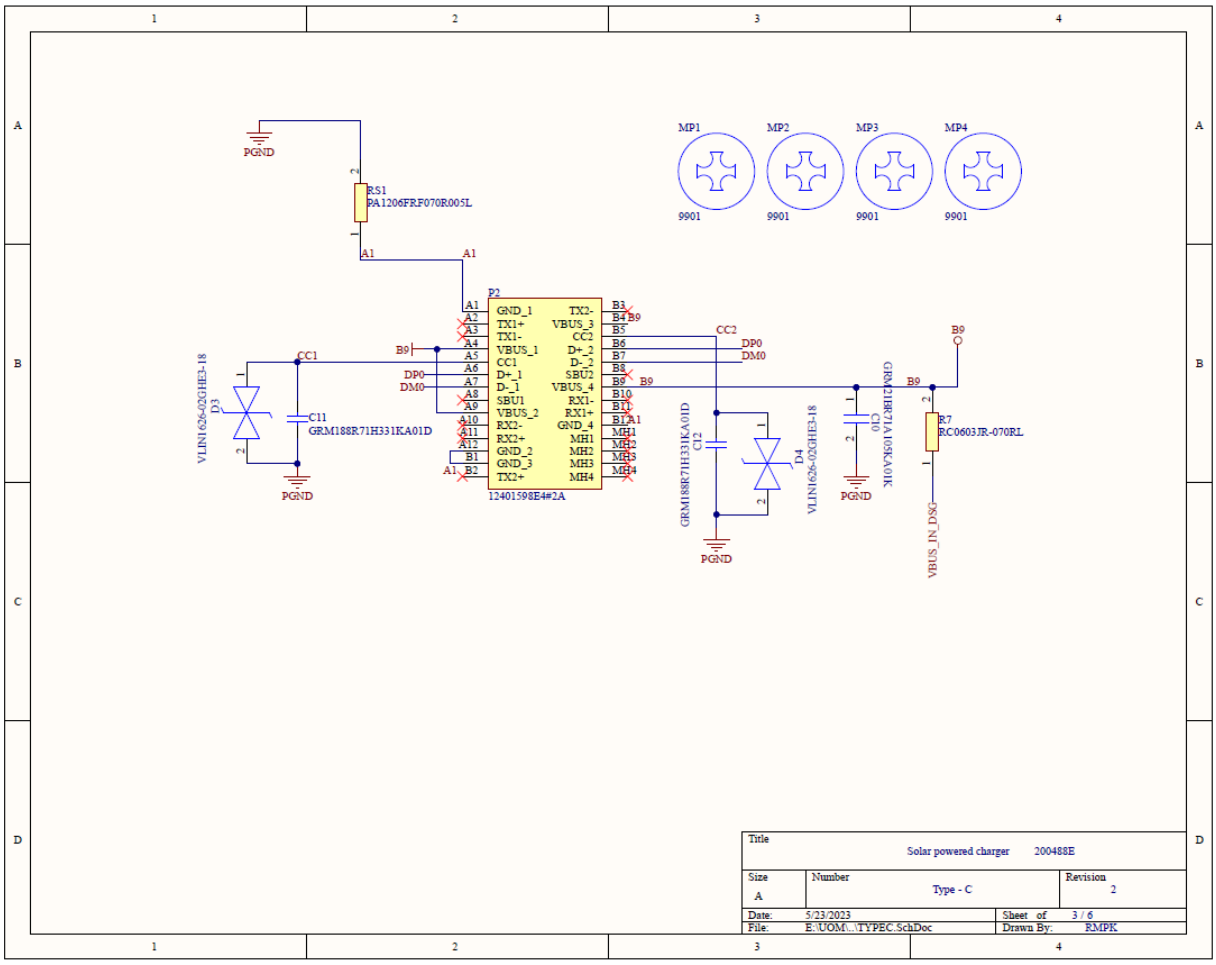
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CC1
D+_1
D-_1
SBU1
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RX2-
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TX2-
VBUS_3
CC2
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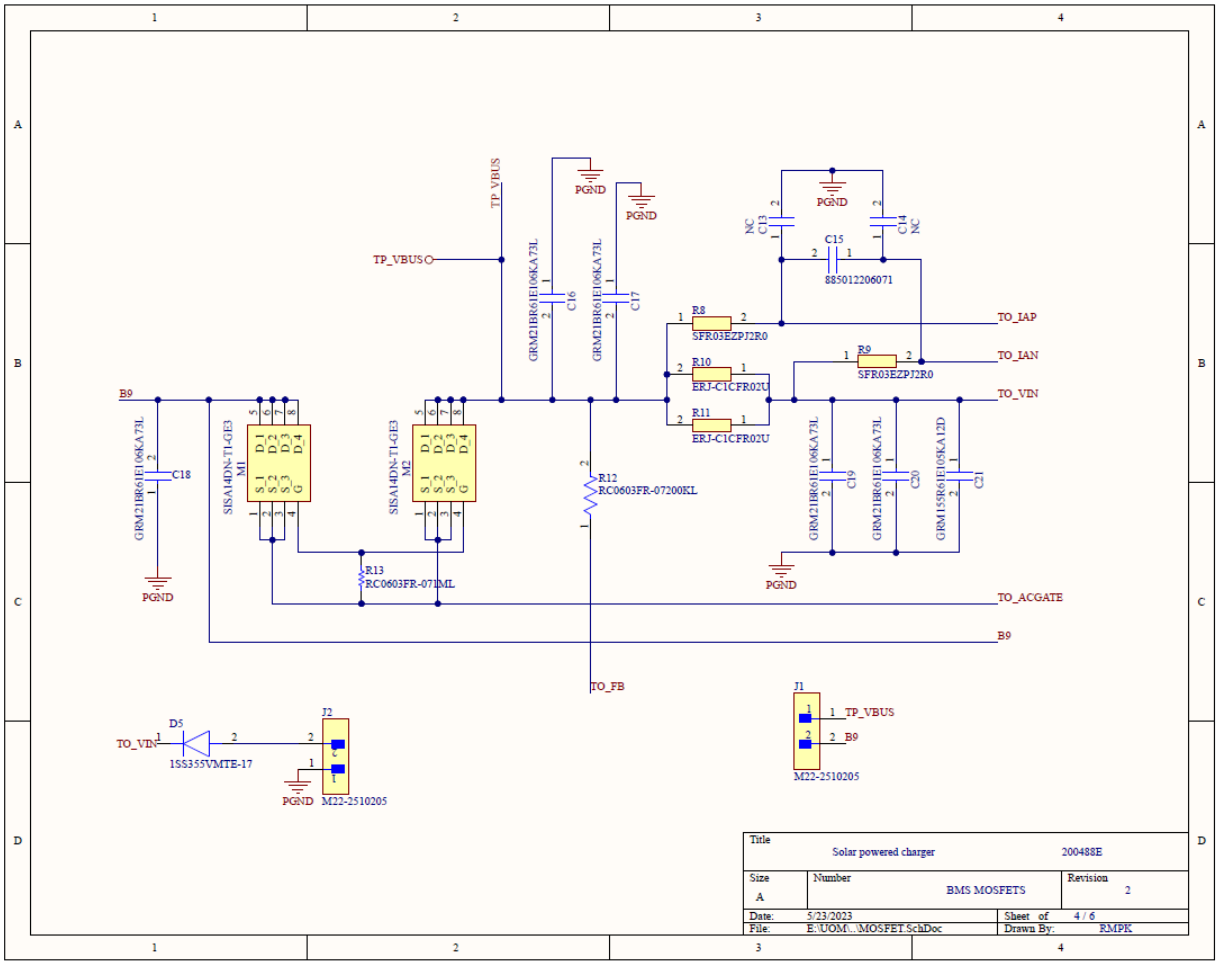
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TO_IAP
R9
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TO_IAN
R10
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ERJ-C1CFR02U
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2 B9
M22-2510205
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Number
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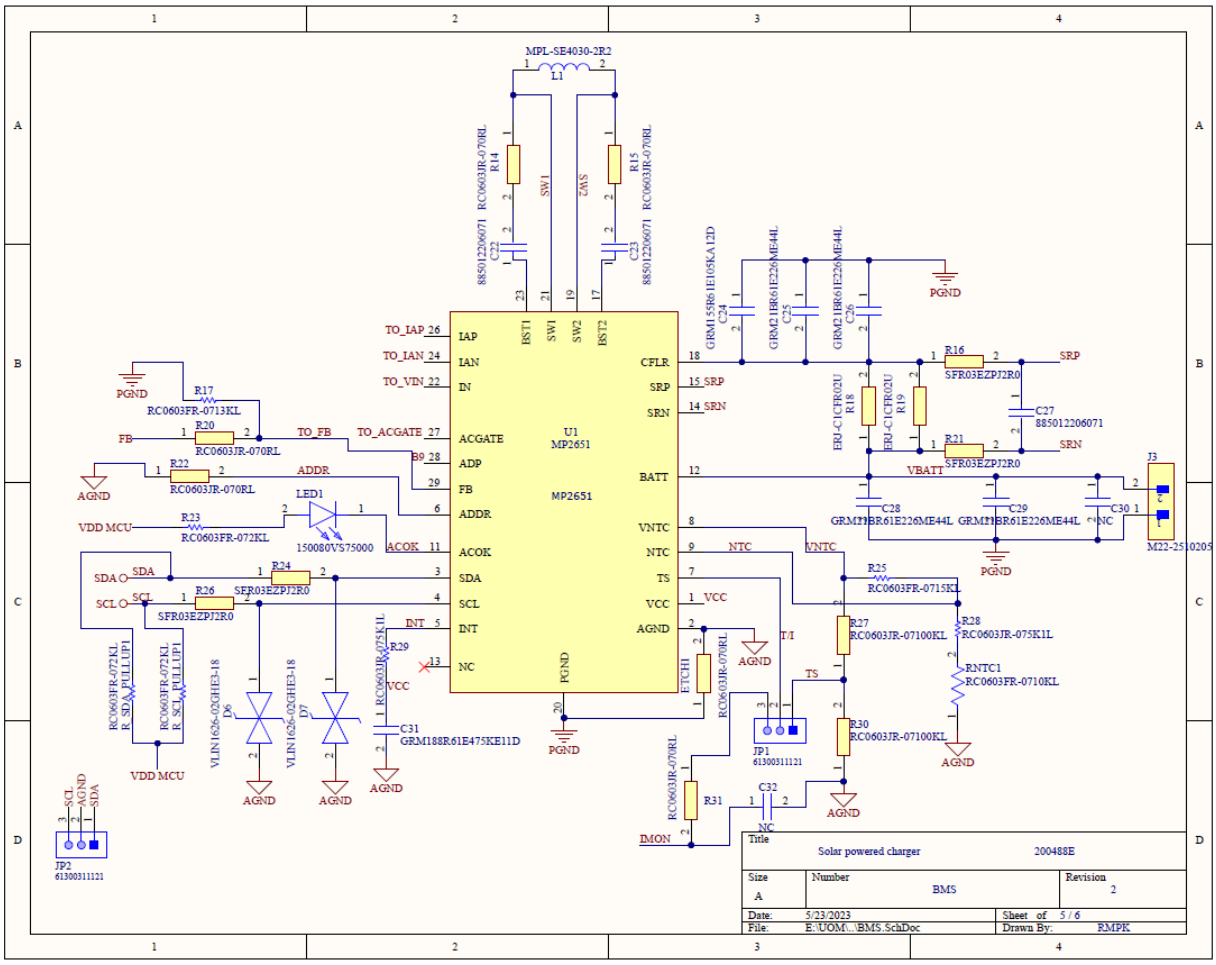
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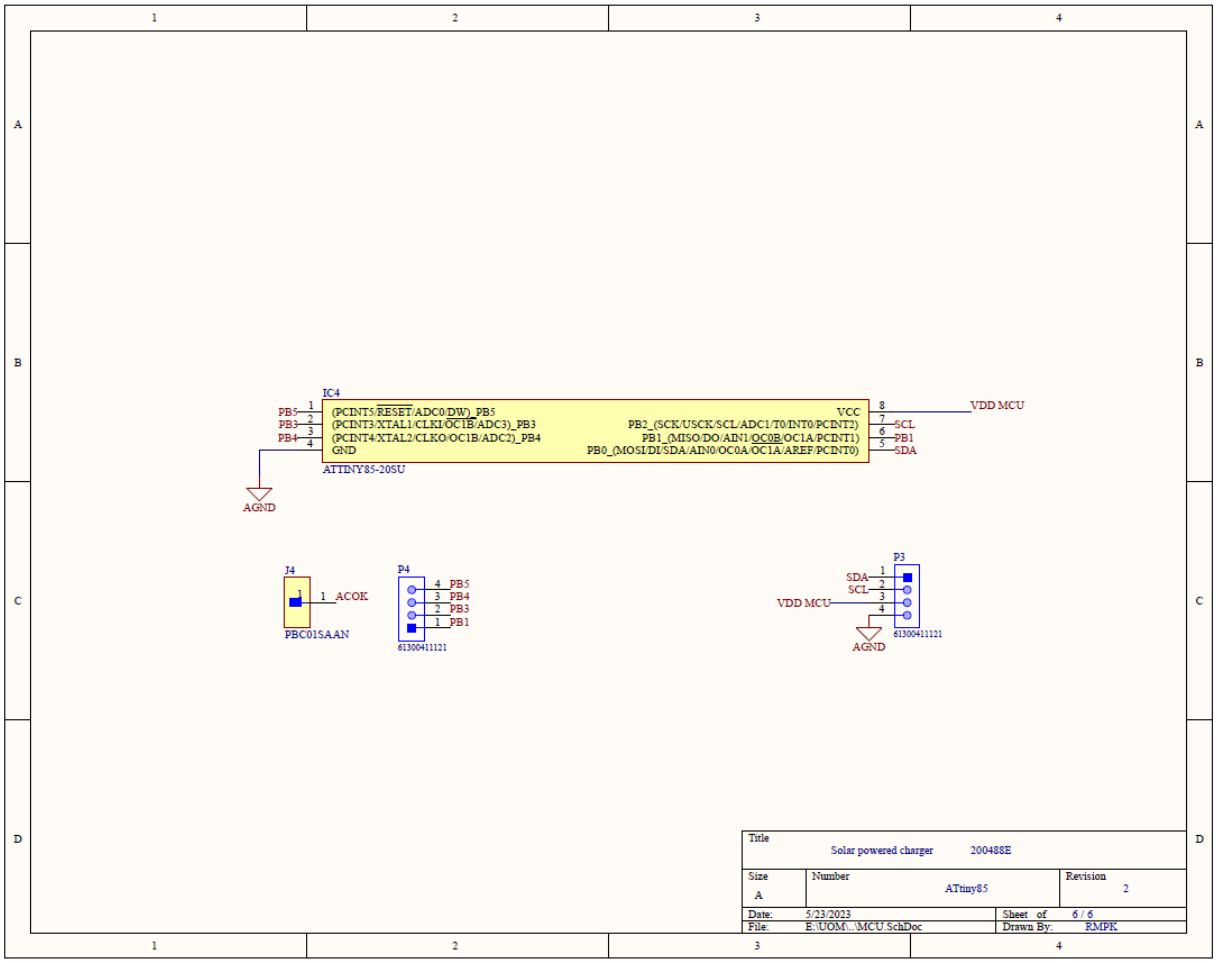
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PB3
PB4
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(PCINT3/XTAL1/CLKI/OC1B/ADC3)_PB3
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GND
VCC
PB2_(SCK/USCK/SCL/ADC1/T0/INT0/PCINT2)
PB1_(MISO/DO/AIN1/OC0B/OC1A/PCINT1)
PB0_(MOSI/DI/SDA/AIN0/OC0A/OC1A/AREF/PCINT0)
VDD MCU
SCL
PB1
SDA
ATTINY85-20SU
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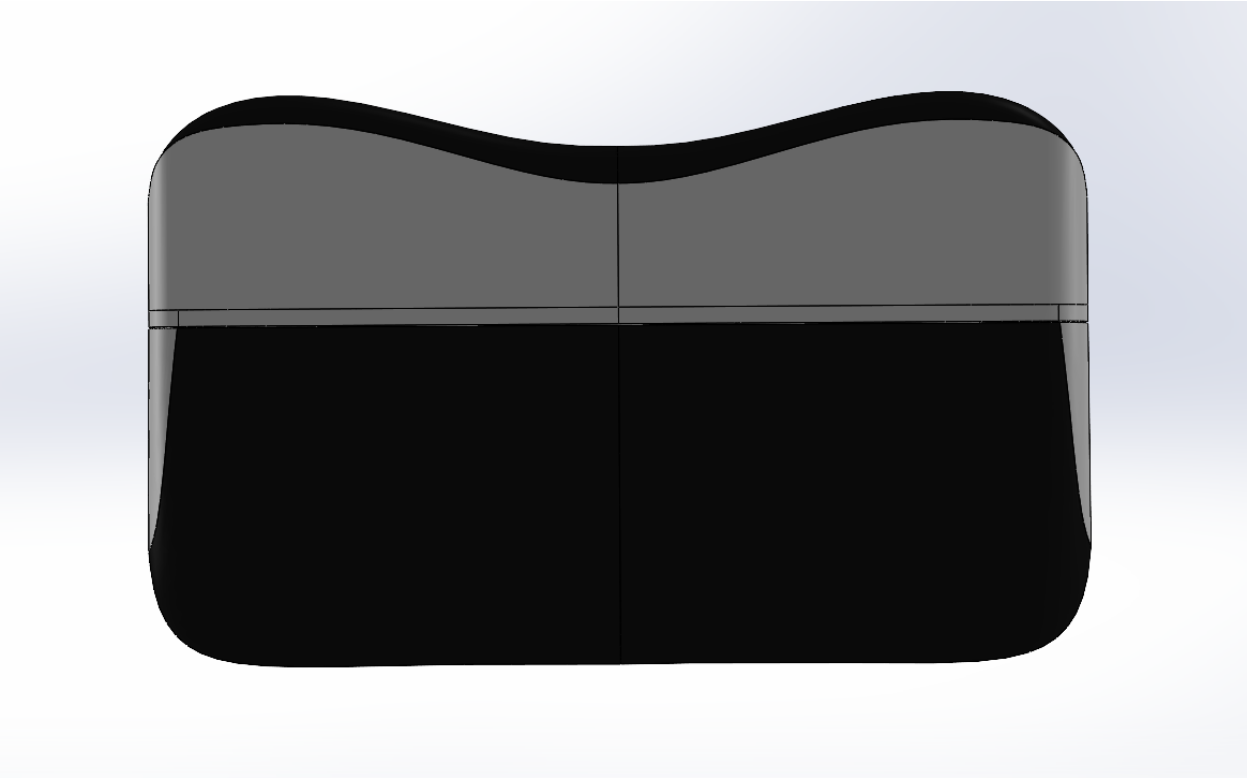
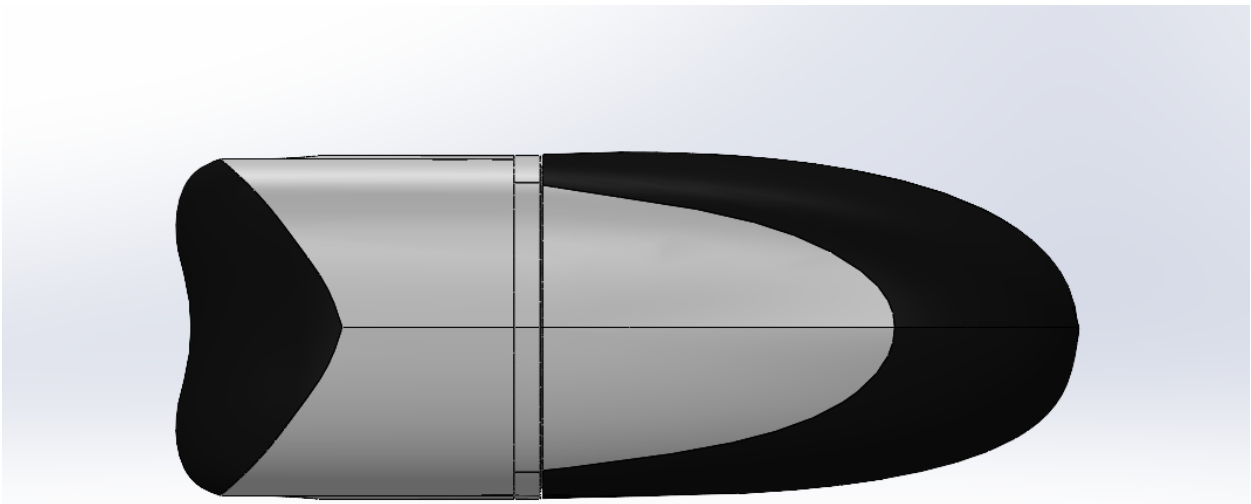
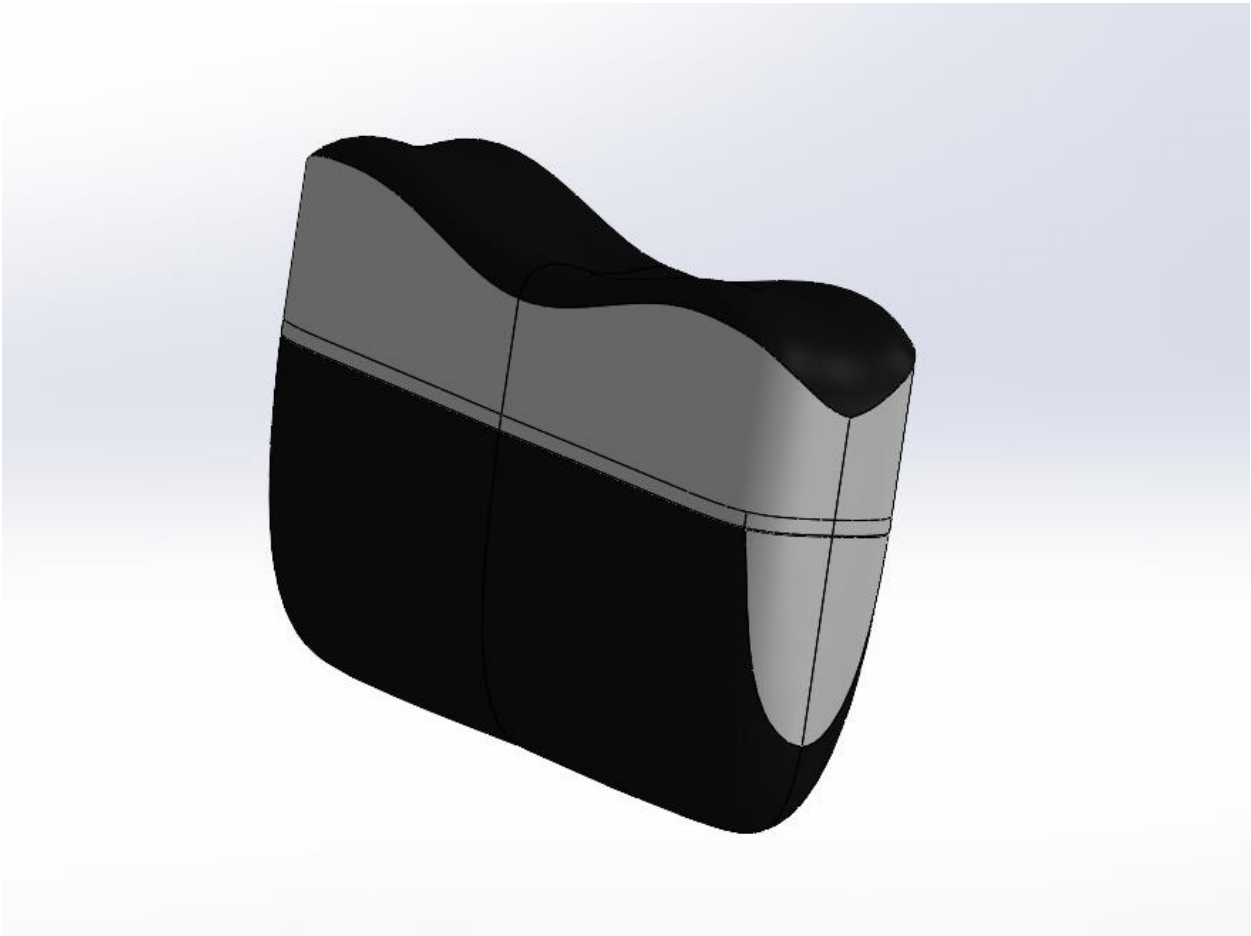
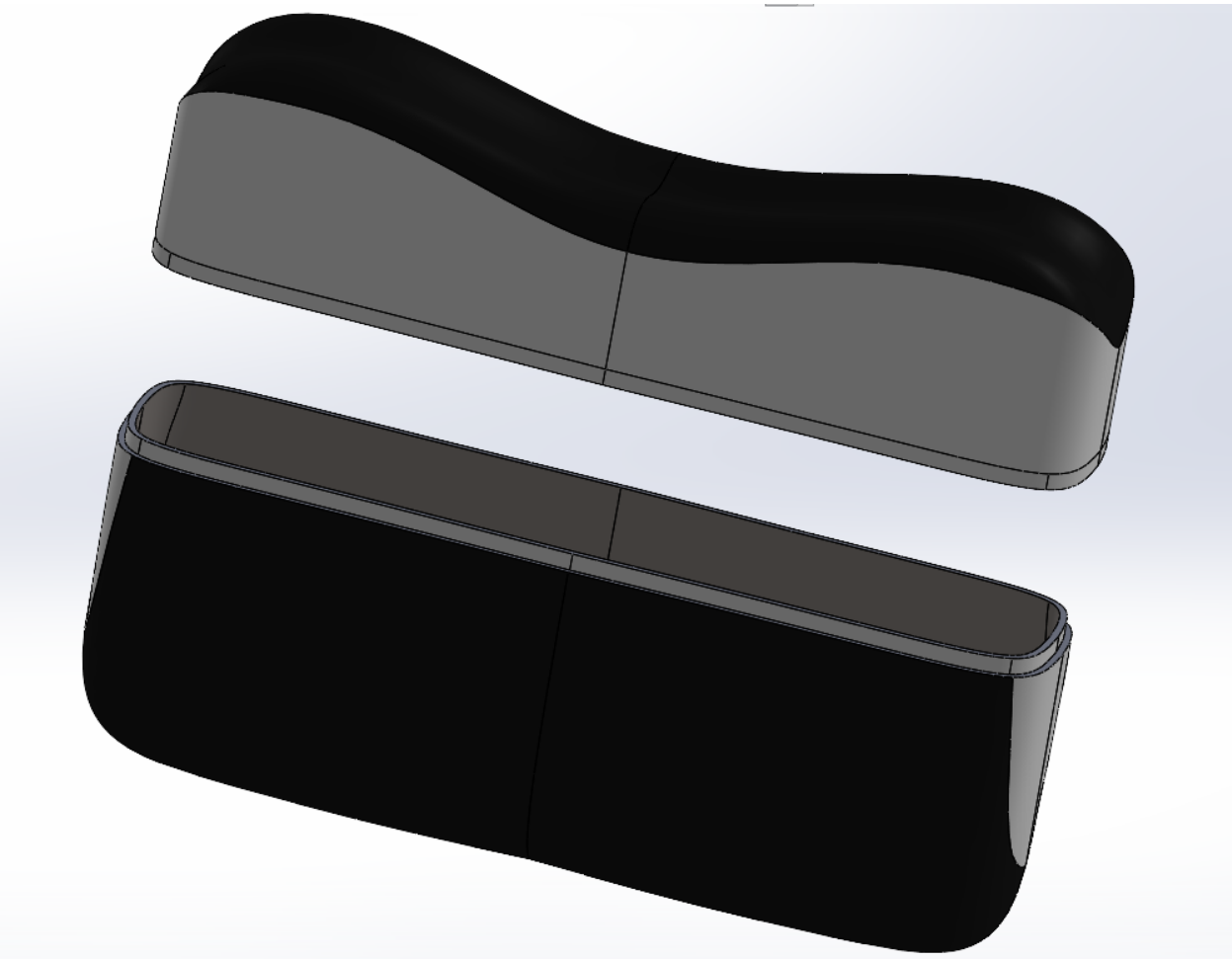
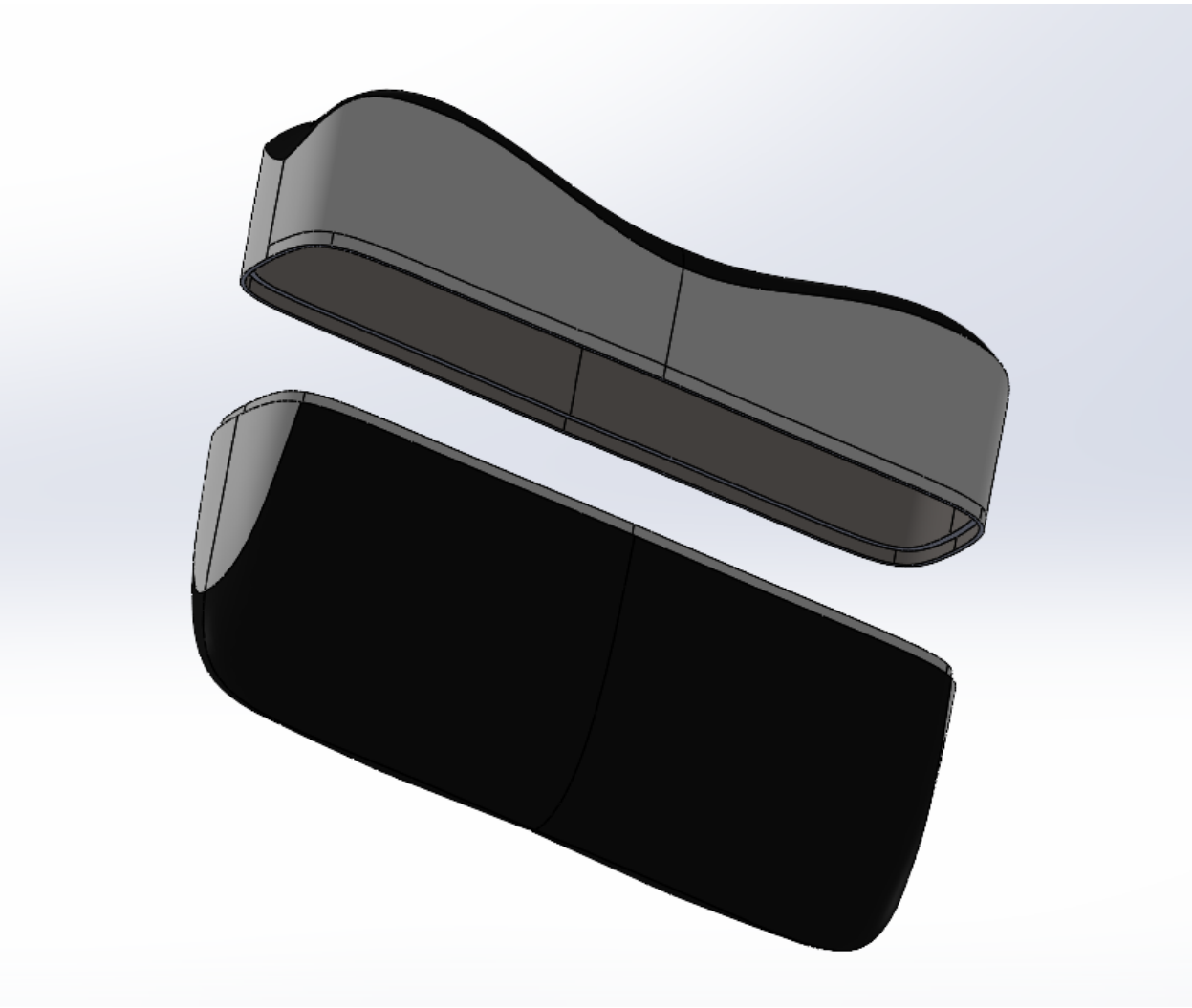
Solidworks Design

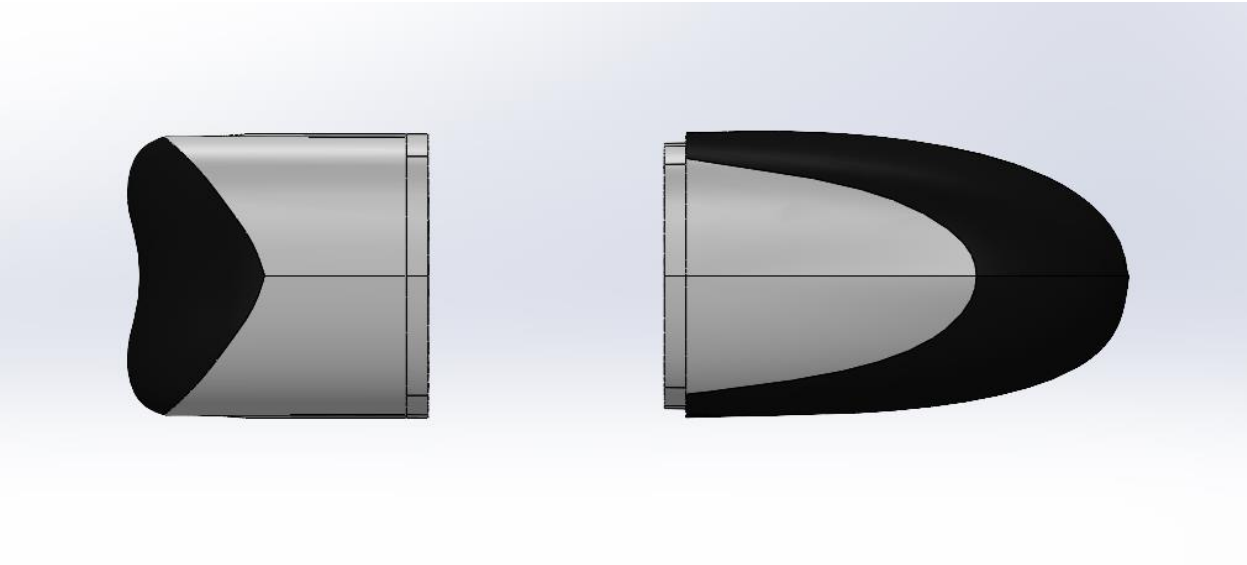


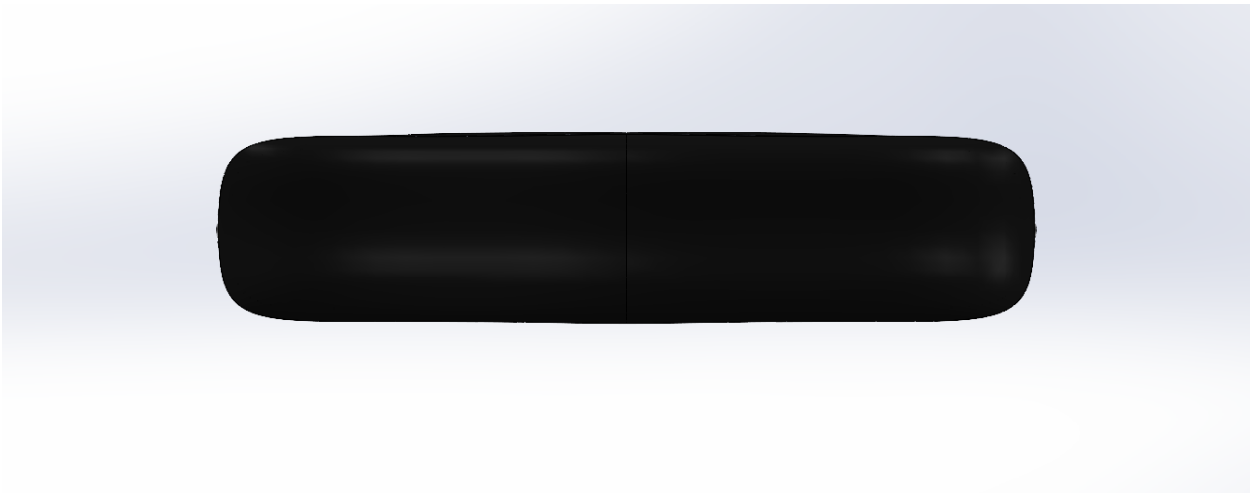




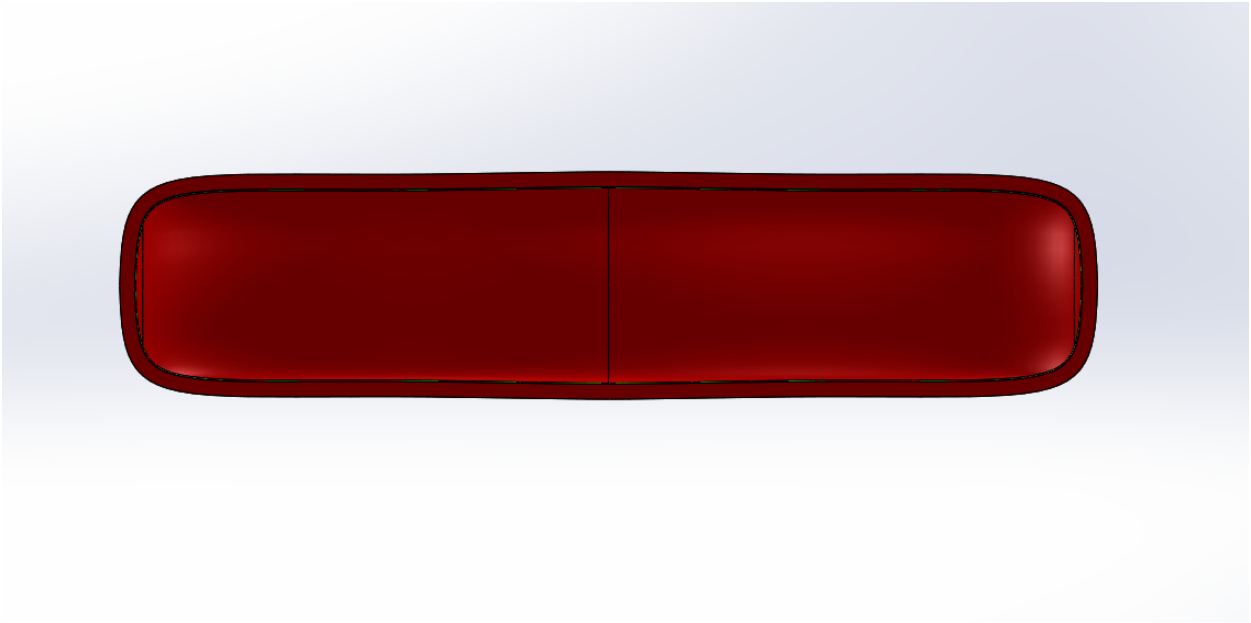


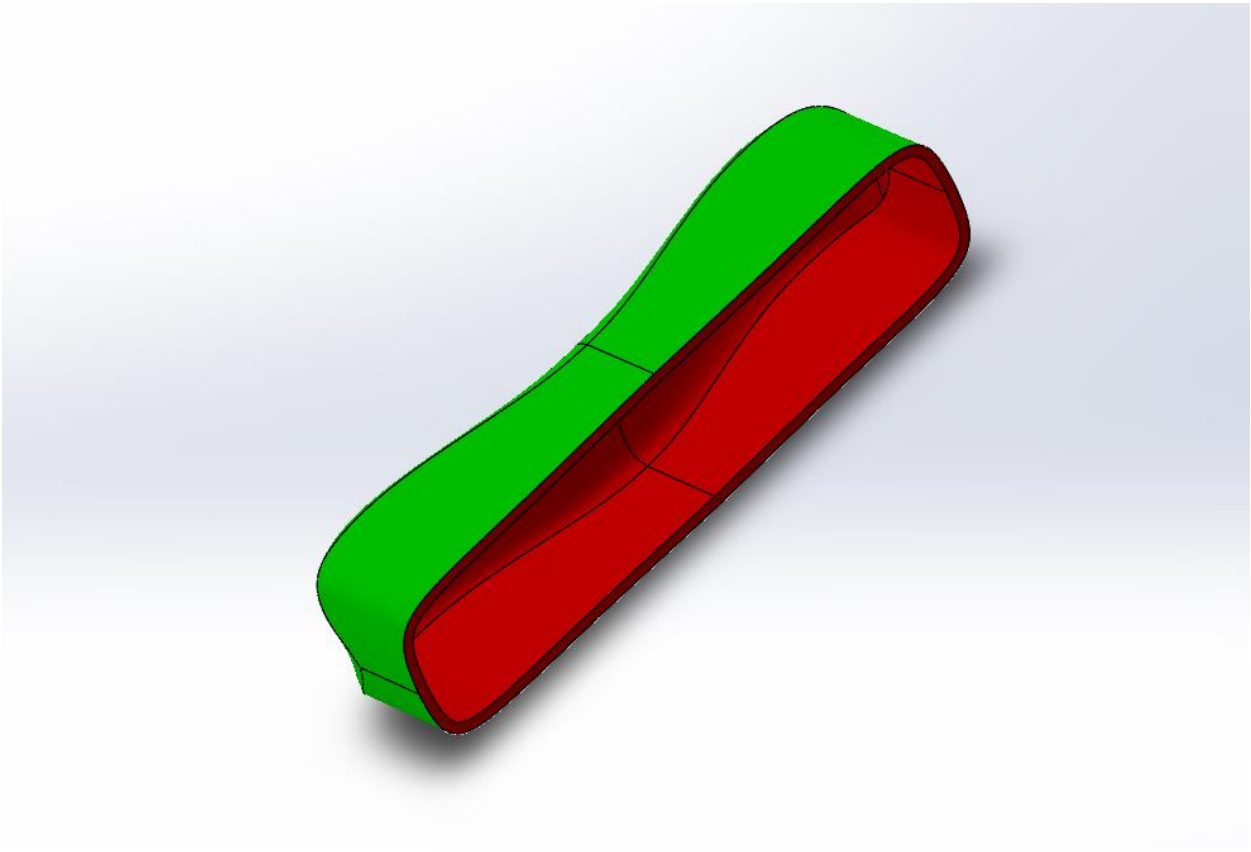


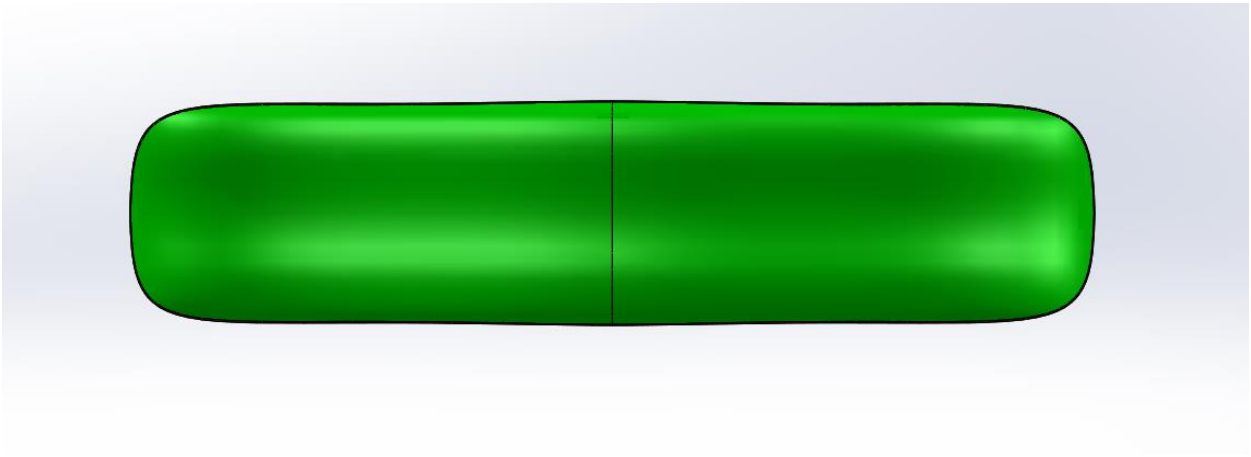


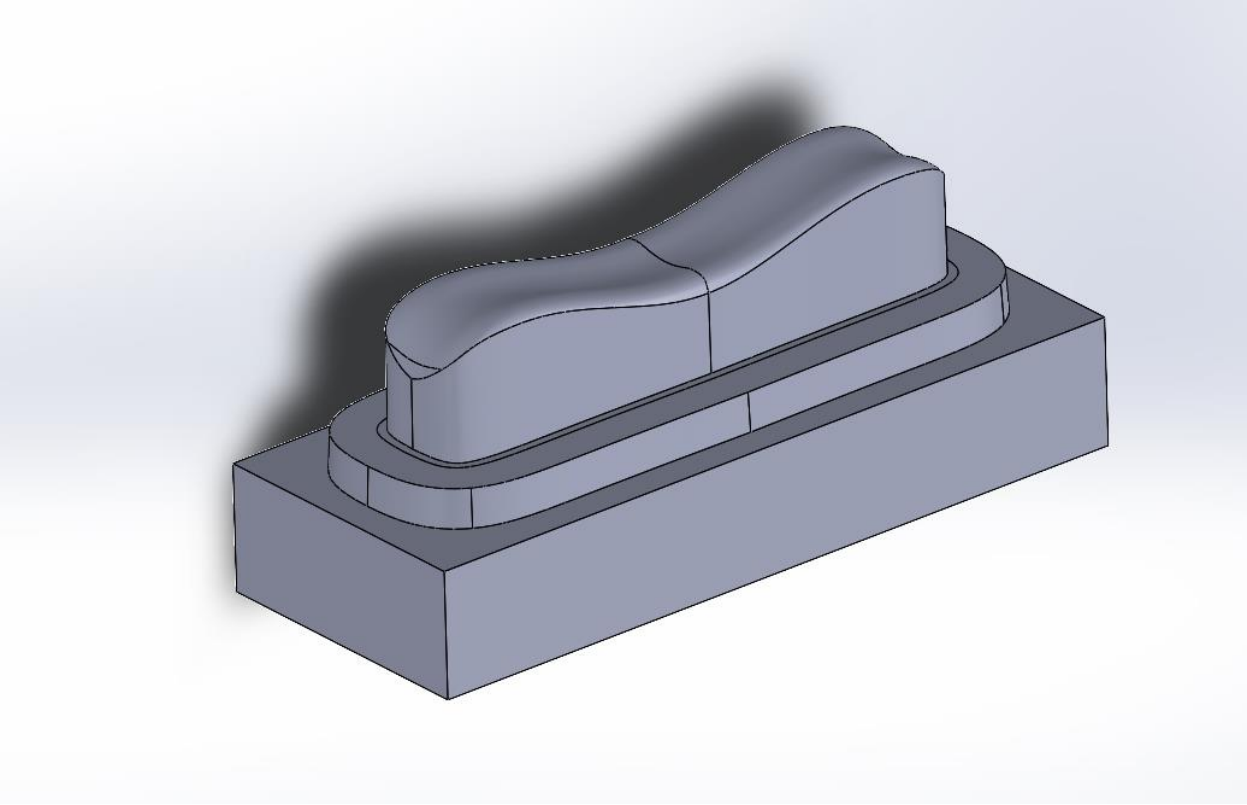


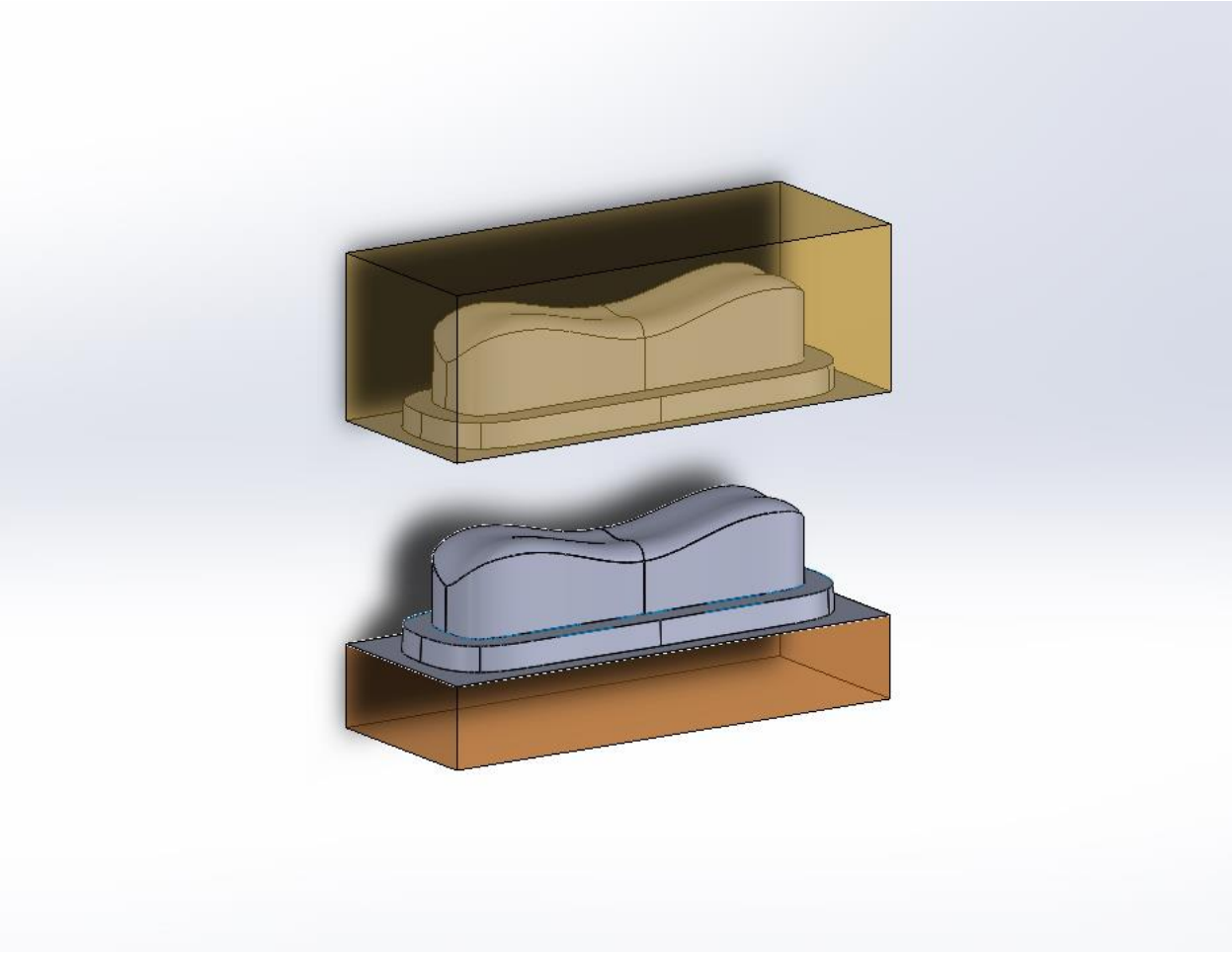
Draft analysis and mold design.

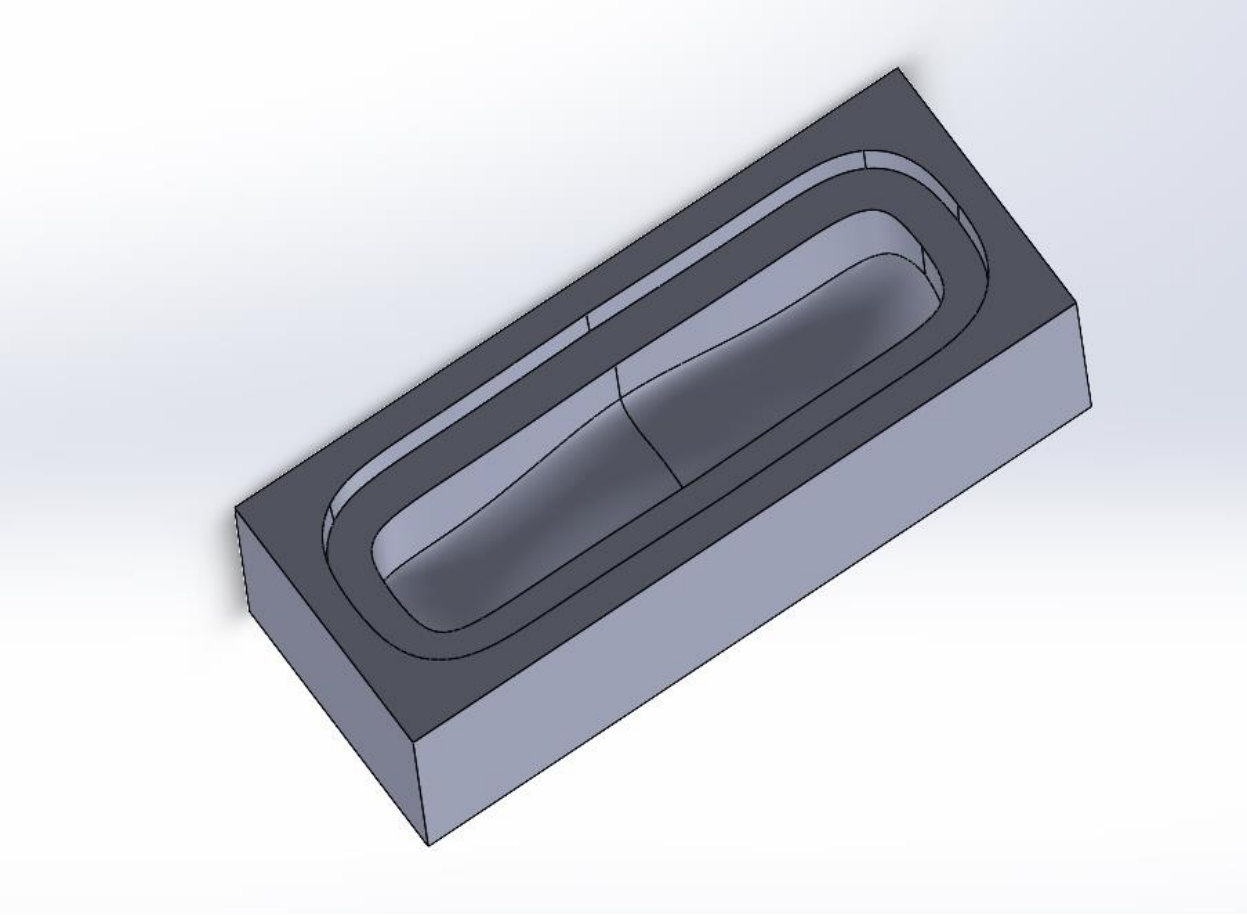




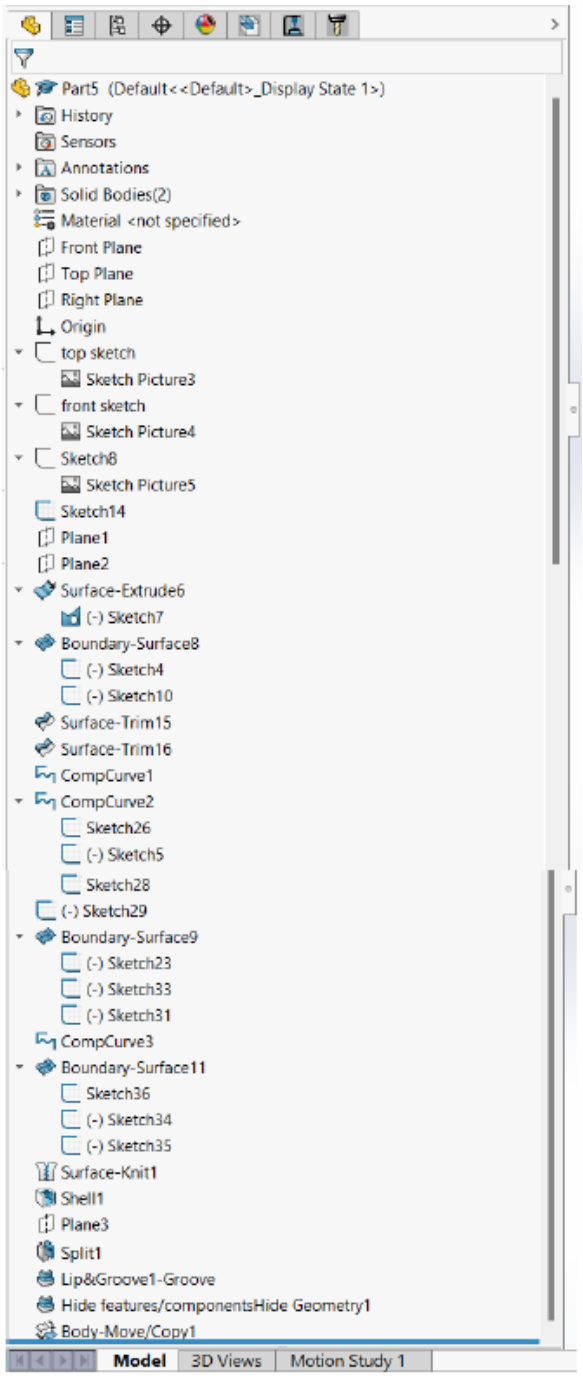


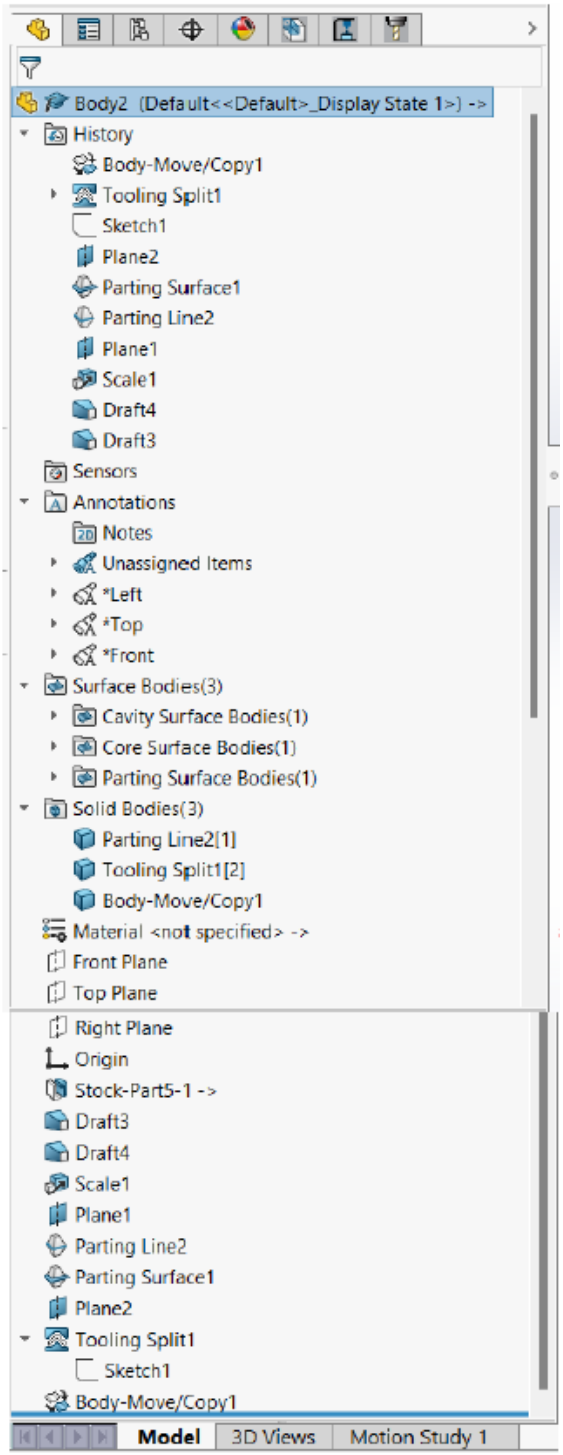






Model trees


Part5 (Default<<Default>_Display State 1>)
History
Sensors
Annotations
Solid Bodies(2)
Material <not specified>
Front Plane
Top Plane
Right Plane
Origin
top sketch
Sketch Picture3
front sketch
Sketch Picture4
Sketch8
Sketch Picture5
Sketch14
Plane1
Plane2
Surface-Extrude6
(-) Sketch7
Boundary-Surface8
(-) Sketch4
(-) Sketch10
Surface-Trim15
Surface-Trim16
CompCurve1
CompCurve2
Sketch26
(-) Sketch5
Sketch28
(-) Sketch29
Boundary-Surface9
(-) Sketch23
(-) Sketch33
(-) Sketch31
CompCurve3
Boundary-Surface11
Sketch36
(-) Sketch34
(-) Sketch35
Surface-Knit1
Shell1
Plane3
Split1
Lip&Groove1-Groove
Hide features/componentsHide Geometry1
Body-Move/Copy1
Model
3D Views
Motion Study 1


Body2 (Default<<Default>_Display State 1>) ->
History
Body-Move/Copy1
Tooling Split1
Sketch1
Plane2
Parting Surface1
Parting Line2
Plane1
Scale1
Draft4
Draft3
Sensors
Annotations
Notes
Unassigned Items
*Left
*Top
*Front
Surface Bodies(3)
Cavity Surface Bodies(1)
Core Surface Bodies(1)
Parting Surface Bodies(1)
Solid Bodies(3)
Parting Line2[1]
Tooling Split1[2]
Body-Move/Copy1
Material <not specified> ->
Front Plane
Top Plane
Right Plane
Origin
Stock-Part5-1 ->
Draft3
Draft4
Scale1
Plane1
Parting Line2
Parting Surface1
Plane2
Tooling Split1
Sketch1
Body-Move/Copy1
Model
3D Views
Motion Study 1