

Proximity and Registered Distance (MCU Reading)

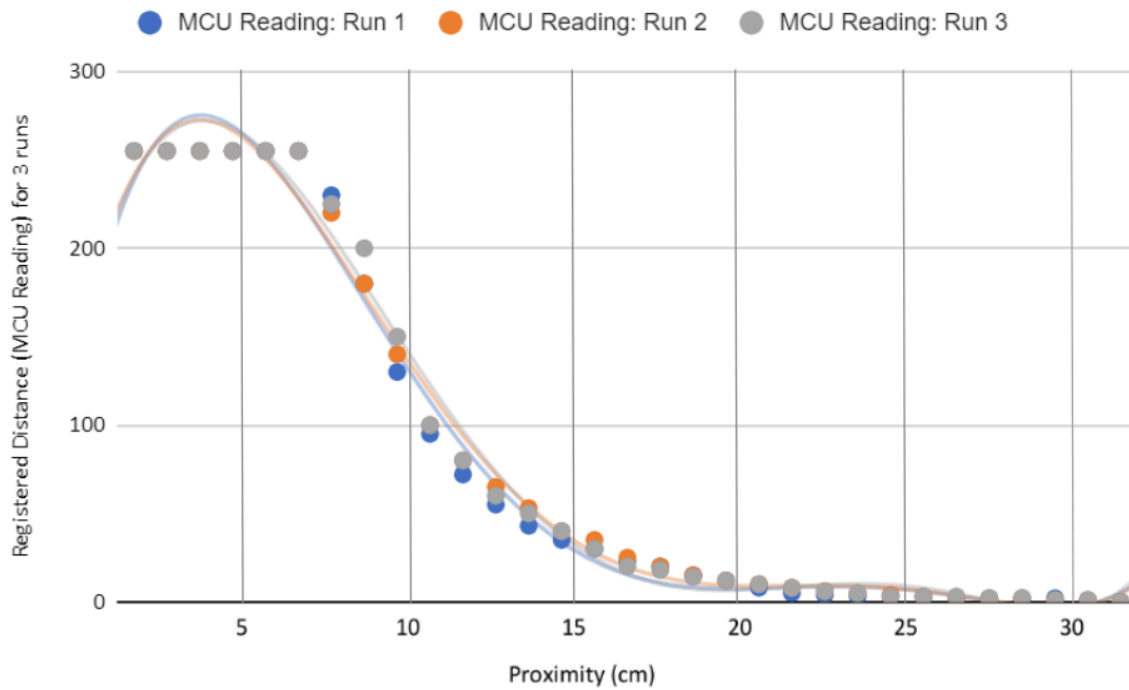


Figure 2: Showing the proximity sensor's MCU-data-reading for 3 runs across increasing object distances (Trendline overlaid to emphasize the sensor's nonlinear behavior).

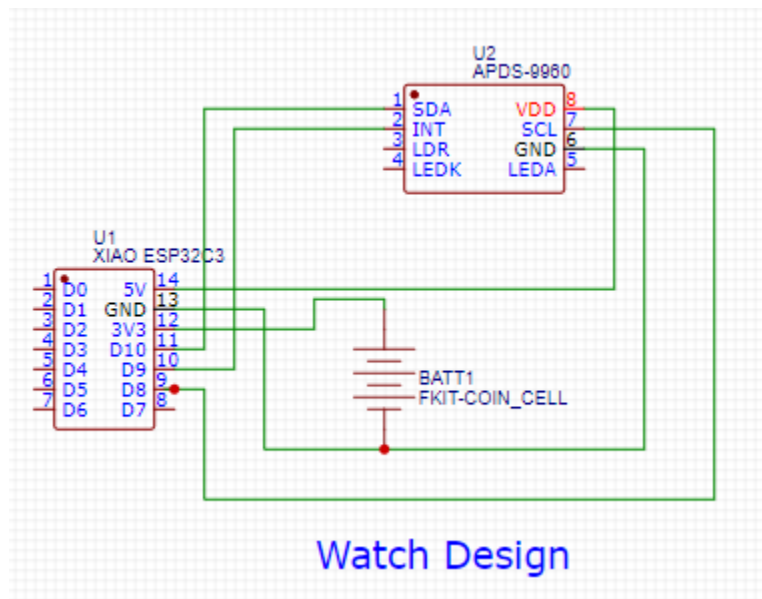
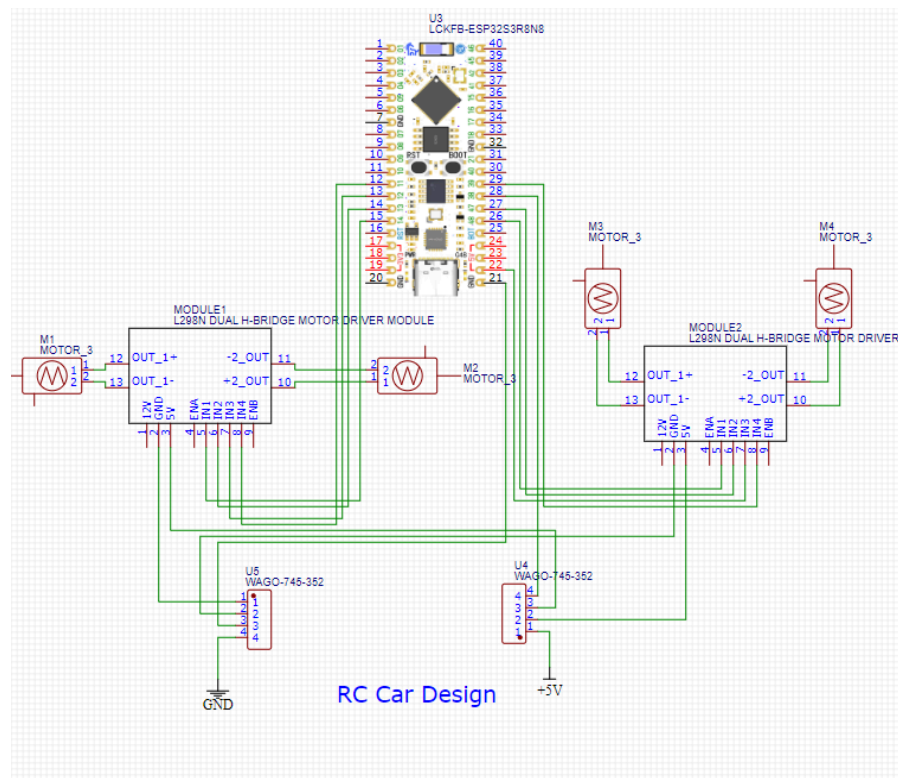


Figure 3: Circuit diagrams for the RC Car and the accompanying APDS-9960 wristwatch.

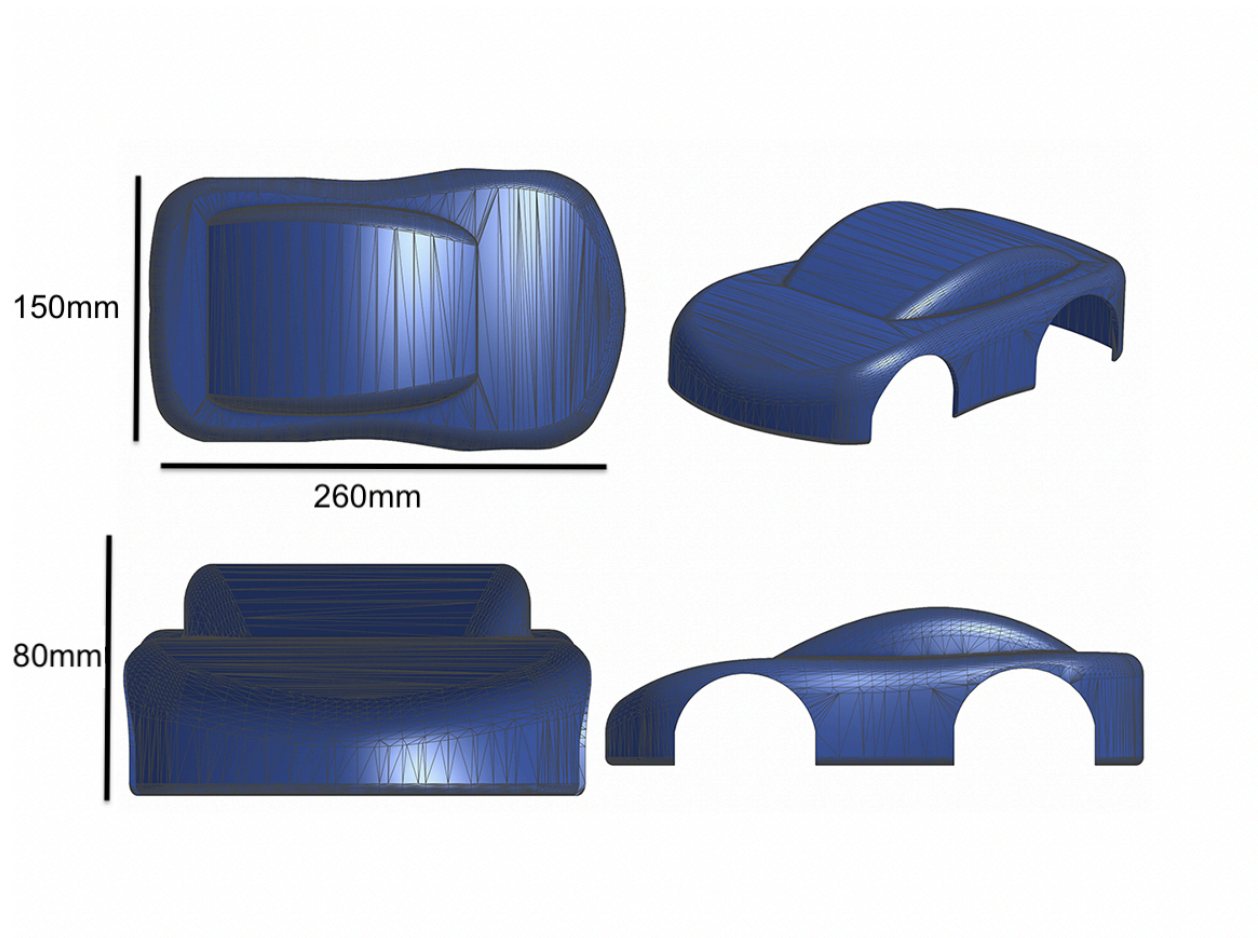


Figure 4: CAD drawing of the RC Car's shell with accompanying LWH measurements.

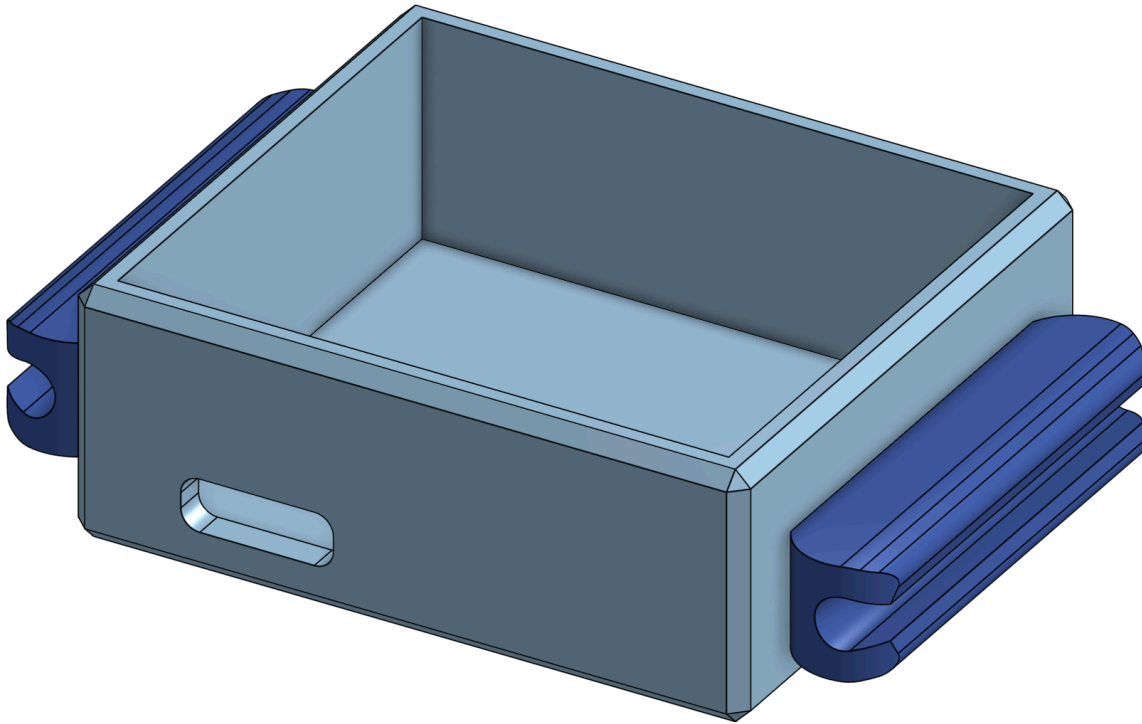


Figure 5: CAD assembly of the APDS-9960 wristwatch and the female wrist strap connectors.

RC Car Body Parts	Supply Current per device	Supply voltage (V)	Peak Power Consumption (W)
ESP32-S3	1000 mA	11.1	11.1a
L298n motor controller x2	1000 mA	11.1	22.2
Wrist Watch Parts	Supply Current per device	Supply voltage (V)	Peak Power Consumption (W)
Xiao seed ESP32-C3	200 mA	11.1	2.22
APDS-9960	200 mA	11.1	2.22

Figure 6: Calculations showing the power consumption of the RC car and wristwatch at peak usage.

Table 2. Morph chart of various functions and means; grayed regions represent selected means.

Function \ Means	1	2	3	4	5
Store or accept external energy	LiPo Battery	Coin cell batteries	Ni-Mh Battery	9V Battery	Lithium Battery
Sense gesture	SEN-13162 Gesture Sensor	APDS-9960 Gesture Sensor	SEN-0315 Gesture Sensor		
Protects components from external elements	Acrylonitrile styrene acrylate (ASA)	Polycarbonate plastic	Polylactic Acid (PLA)	Methyl Methacrylate (Acrylic plastic)	Acrylonitrile Butadiene Styrene (ABS)
Generate mechanical energy from electrical energy	Servo motor	Brushless DC motor	Brushed DC motor	Vibrating motor	
Sending gesture signal to corresponding part	Wireless ESP32 communication	Bluetooth	Wifi		
Able to change direction of movement	Plastic Wheels	Rubber wheels	Foam wheels		

Table 3. Bill of Materials.

List of parts	Cost (\$)	Number of Parts	Total Cost of Parts(\$)		
L298n	6.99	2	13.98		
ESP32-S3	16.99	1	16.99		
ESP32-C3	9.9	1	9.9		Total Cost (\$)
APDS9960	8.99	1	8.99		113.41
Watch Strap	2.89	1	2.89		
ASA filament	9.84	1	9.84		
Rubber Wheels	3.99	4	15.96		
Acrylic	4.99	1	4.99		
LiPo Battery	19.89	1	19.89		
DC Motor	7.15	4	9.98		