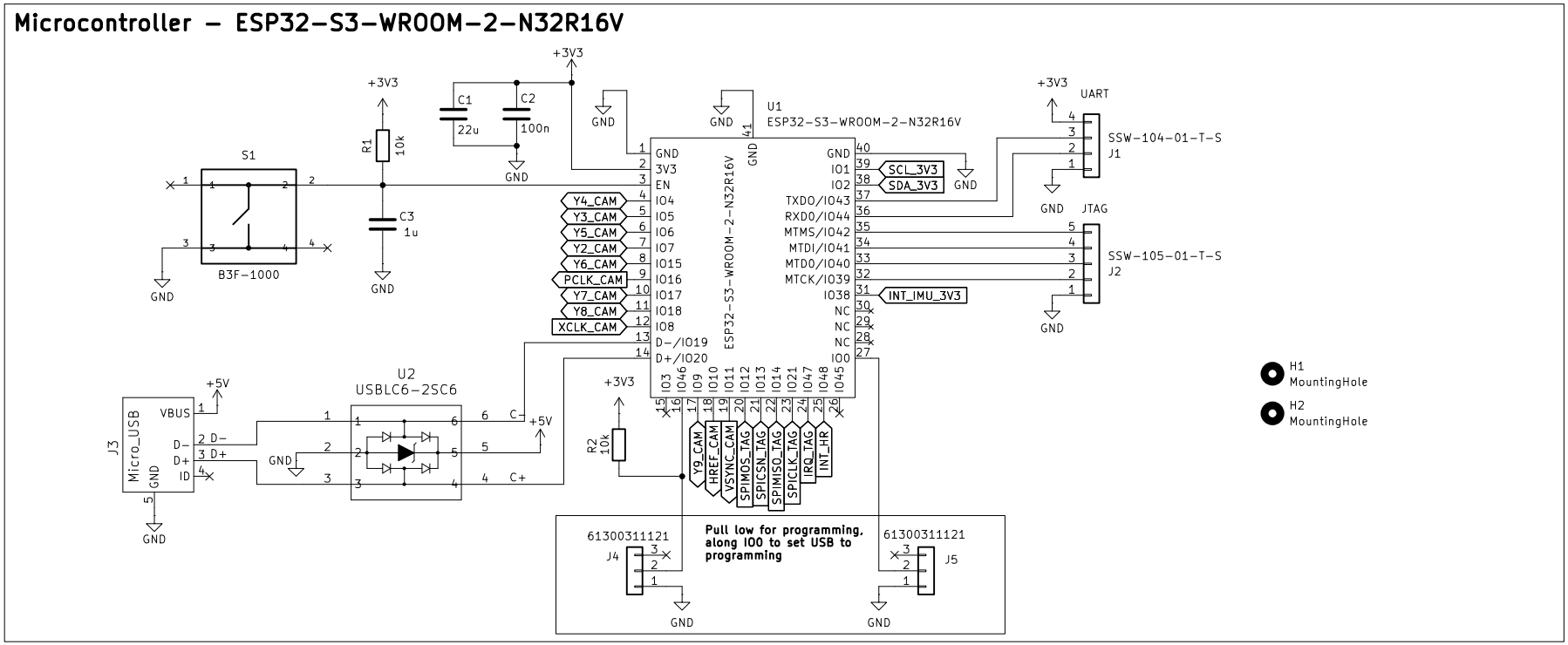
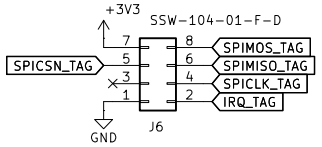
Microcontroller – ESP32-S3-WROOM-2-N32R16V

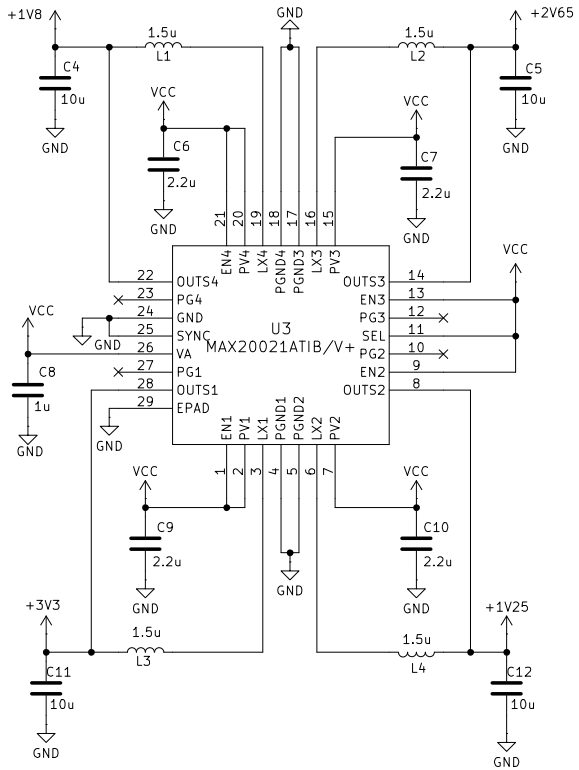


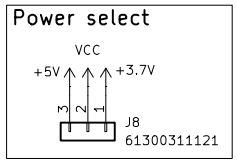
DC-DC Regulators	File: DC-DC Regulators.kicad_sch
Heart Rate Sensor	File: Heart Rate Sensor.kicad_sch
IMU	File: IMU.kicad_sch
Camera (OV2640)	File: Camera_2.kicad_sch
Tag	File: Tag.kicad_sch

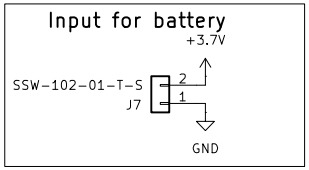
Ultra-WideBand Module (Tag) - DWM1000



Buck Converter – MAX20021 (3V7 to 1V3, 1V8, 2V8, and 3V3)







Application: https://www.allelcoelec.com/datasheets.14/MAX20021ATIA-V-T.pdf

Voltage Regulators can provide the following:
(The absolute maximum RMS)
LX1 -> 3V3 @ 1.0 A @ 3.300W
LX2 -> 1V25 @ 0.5 A @ 0.625W
LX3 -> 2V65 @ 0.5 A @ 1.325W
LX4 -> 1V8 @ 1.0 A @ 1.800W

Components Draw the Following Amount of Current:

HR Sensor (3v3)	:	0.7 mA
IMU (1V8 & 3V3)	:	0.1589mA & 4.34mA
Camera (1V3, 2V8, and 3V3)	:	60mA, 30mA, & 15mA
Tag (3V3)	:	31 mA

I_3V3 = MCU (3V3) + HR (3V3) + IMU (3V3) + Cam (3V3) + TAG (3V3)
I_3V3 = (500m to 1000m) + 0.7m + 4.34m + 15m + 31m

I_3V3 = 551.05mA to 1051mA
I_2V8 = 30 mA
I_1V8 = 0.1589 mA
I_1V3 = 60 mA

Total Power Loss:
3.3v Rail --> (1.0602) * 3.3 = 3498.66 mW
2.8v Rail --> (30m) * 2.8 = 84 mW
1.8v Rail --> (0.1589m) * 1.8 = 0.286 mW
1.3v Rail --> (60m) * 1.3 = 78 mW

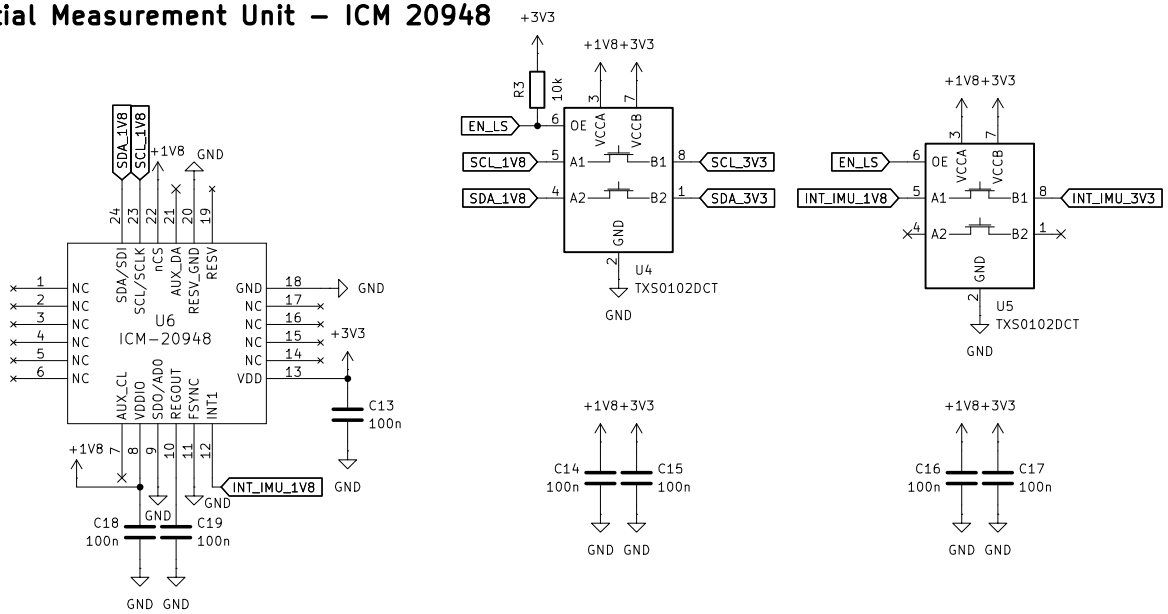
Efficiency 3.3v --> at 1.0602 A, 10% loss of efficiency
==> 3499.00 mW * 0.1 = 350.00 mW loss

Efficiency 2.8v --> at 30 mA, 50% loss of efficiency
==> 84.00 mW * 0.50 = 42.00 mW loss

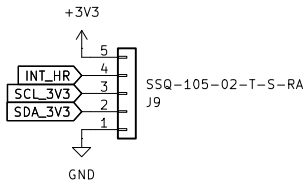
Efficiency 1.8v --> at 0.1589 mA, 100% loss of efficiency
==> 0.1589 mW * 1.0 = 0.1589 mW loss

Efficiency 1.3v --> at 60 mA, 60% loss of efficiency
==> 78.00 mW * 0.6 = 46.80 mW loss

Inertial Measurement Unit – ICM 20948

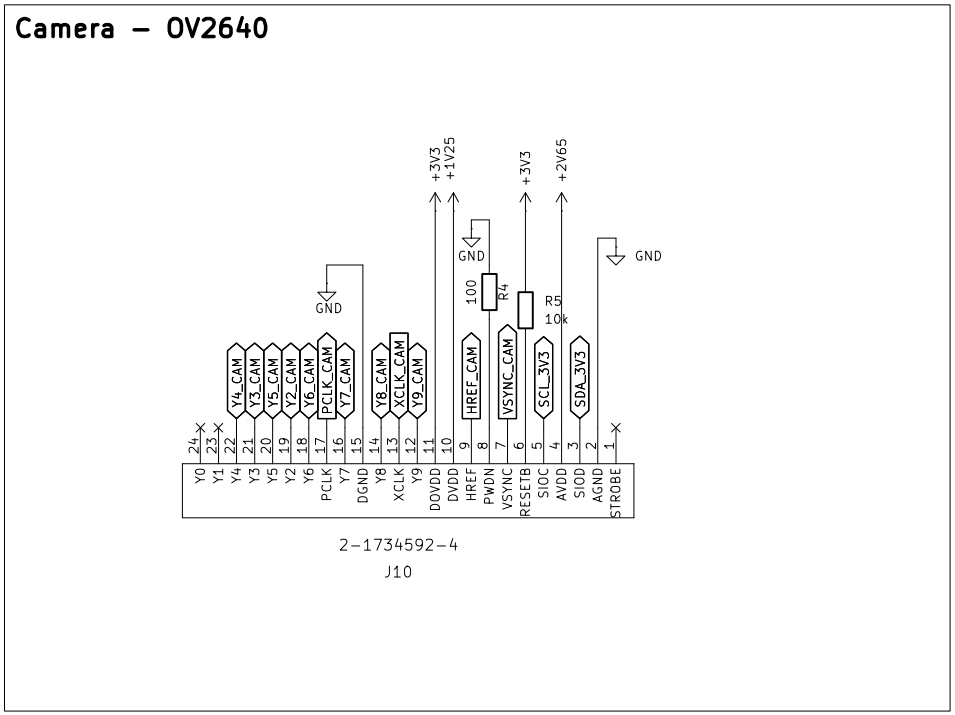


Heart Rate Sensor – MAX30102



Datasheet: https://www.analog.com/media/en/technical-documentation/data-sheets/MAX30102.pdf

Application: https://www.analog.com/en/products/max30102.html#:~:text=The%20MAX30102%20is%20an%20integrated,electronics%20with%20ambient%20light%20rejection.



Datasheet: https://www.uctronics.com/download/OV2640_DS.pdf

Schematics: https://www.waveshare.com/wiki/File:OV2640-Camera-Board-Schematic.pdf

Application: https://hobbylad.wordpress.com/wp-content/uploads/2020/02/ov2640-camera-module-harware-application-notes.pdf