# Power Budget

| | Min Power (W) | Max Power (W) | Average Power (W) |
|---|---|---|---|
| Turtlebot3 | 7.55 (ROSBU) | 9.28 (ROSBU + MAX Speed) | 8.42 |
| Projectile Launcher Motors (Both on) | 4.25 | 4.76 | 4.51 |

Min and Max power already averaged from 3 tests

## Assumptions:

- Duration of boot-up and servo switching are too short compared to the total duration of the mission, hence they are not considered in the power budget.
- Turtlebot will have ROSBU on at all times, power consumption of turtlebot without ROSBU will not be considered.
- Worst case scenario for projectile launcher motors : on at all times.
- Worst case scenario for Turtlebot : ROSBU + Max Speed at all times.
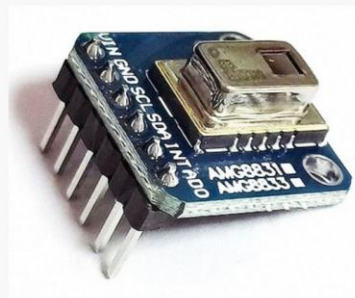
## Calculations:

- Given that the battery capacity is $(11.1\ V) \times (1800\ mAh) = 19.98\ Wh$
- Total Power (Worst case) = 9.28 + 4.76 = 14.04W
- 19.98 / 14.04 = 1.42hrs (long enough to sustain the whole mission)

# Temperature Sensor Choice



MLX90640

VS



AMG8833

# Temperature Sensor Choice

| | MLX90640 | AMG8833 |
|---|---|---|
| Resolution | **32x24 pixels** provide a finer detail in the thermal image. | **8x8 pixels** capture less detailed thermal images. |
| Temperature Range | **-40°C to +300°C** | **-20°C to +80°C** |
| Accuracy | around **±1.5°C** | around **±2.5°C**. |
| Data Refresh Rate | **32Hz** refresh rate | **10Hz** refresh rate |
| Field of View (FOV) | Two different field of view options: standard 55°x35° and 110°x75° wide angle (We use the wider one) | **60° x 60°** field of view, offering a wider area but with less detail |
| Power Consumption | **1.5-3.5 mA** | **0.6-1.2 mA** |
| Interface and Integration | Uses **I2C** communication for integration with other systems | sensor only supports I2C |
| Ease of use | can be a bit more complex for users not familiar with I2C protocols. | generally considered easier to interface with and more straightforward for basic applications |

| | MLX90640 | AMG8833 |
|---|---|---|
| Max distance detected | **5 meters or more** | up to around **1-2 meters** |
| Others: | **safety and convenience applications** that include fire prevention systems, smart buildings, intelligent lighting, IP/surveillance cameras, HVAC equipment and vehicle seat occupancy detection. | has a configurable interrupt pin that can fire when any individual pixel goes above or below a threshold that you set. |
| noise performance | **Better due to higher resolution** | Less good |
| Applications | **robotics, temperature mapping, industrial monitoring, and security systems** | **body temperature detection, simple thermal sensing**, and **low-resolution thermal applications** microcontroller or computer |
| Price | more expensive | more affordable |

*We decided MLX90640 since it is significantly better than AMG8833. It has longer Max detection range of 5 meters plus, and AWG 8833 with only 1-2m may not be enough as map will be larger than 1-2m.*

# Power calculation (Sensors)

## AMG8833

- Operating Voltage: 3.3V
- Operating Current: 4.5mA
- Power consumption: 0.0149W

## MLX90640

- Operating Voltage: 3.6V
- Operating Current: 25mA
- Power consumption: 0.0900W