

Display Device

System Parameters (defined by hardware) from the datasheets

Processor

XIAO ESP32-C3

[om/IrisYzh/Sm](#)

Active	154 mW
Idle	3 mW
Sleep	1 mW

LED

NeoPixel - SK6812R

[om/IrisYzh/Sm](#)

Full bright	195 mW
Dark(10%)	20 mW

Display

SSD1306

[om/IrisYzh/Sm](#)

On (full information)	66 mW
Idle (only nember)	33 mW
Off	0 mW

Stepper Motor X27

Moving	155 mW
Standby	86 mW
Off	0 mW

Radio: BLE

Data Rate	300 bps
Standby Power	7 mW
TX Power	240 mW

Profiles (usage of each component mode - defined by software and usage)

Sleep Displaying Adjusting

0%	3%	40%
0%	97%	60%
100%	0%	0%

0%	3%	100%
0%	97%	0%

0%	3%	100%
0%	97%	0%
100%	0%	0%

0%	3%	10%
0%	97%	90%
100%	0%	0%

0%	0%	0%
100%	80%	50%
0%	5%	30%

RX Power	210 mW	0%	15%	20%
		16	7.5	0.5 hours/day typical usage
Battery				
Capacity	600 mAh			
Nominal Voltage	4 V			
Regulator Efficiency	99%			

Reflection

How did you determine your "days of use" metric?

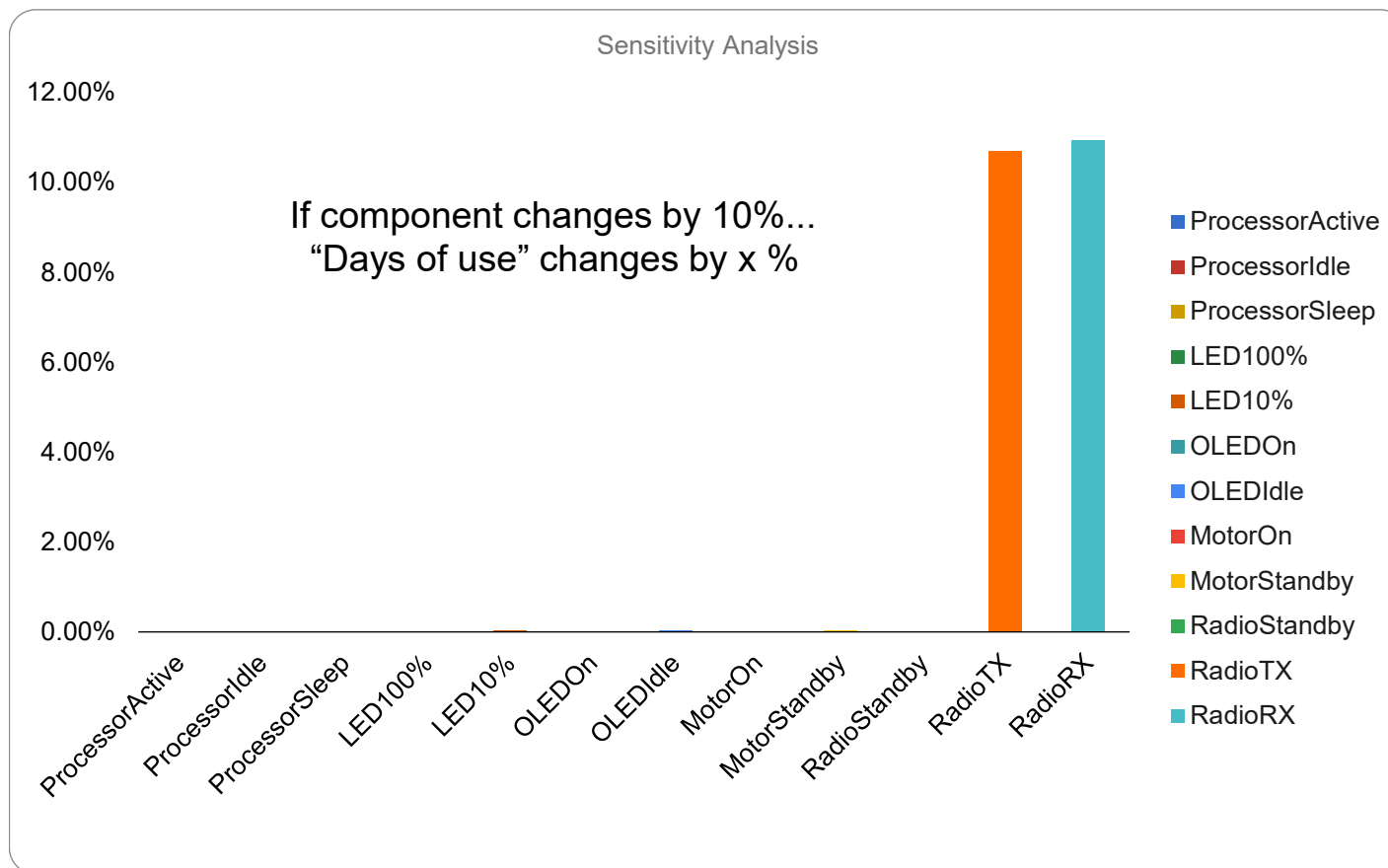
I measured power consumption in three modes: sleep at 7.8 mW for 16 hours, displaying at 203 mW for 7.5 hours, and adjusting at 534 mW for 0.5 hours. Total daily energy consumption is 1912 mW·h. Dividing the battery capacity of 2198 mW·h by daily consumption gives 1.15 days of use.

What do you think is the optimum size for the battery in your device?

A 600 mAh battery at 3.7V provides about 27 hours of runtime, which is ideal for a desktop device. Smaller batteries wouldn't last a full day, while larger ones would add bulk without practical benefit. Since it should be placed on a desk that usually have a charger, daily charging is acceptable.

What hardware/software/cost/effort tradeoffs could you make to improve the user experience?

The stepper motor uses 43% of power just holding position. I could turn it off periodically and reset it when needed, which would save a lot of energy but might cause the needle to drift slightly. Another thing I could do is to add a screen timeout that turns off the display after 30 seconds. This would cut screen power in half with just a small code change. The software changes are easiest to implement since they don't require new hardware, while fixing the motor issue would save the most power but is more complex.



Total power in profile (mw)		Maximum Time
Sleep	7.82 mW	281.0 hours
Displaying	202.60345 mW	10.8 hours

Adjusting	534.361 mW	4.1 hours
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Effective Battery Capacity
2197.8 mW*h

Days of Use	1.15 days
Hours of Use	27.59 hours