11/06/2022

Previews day Controller only transmits a String through LORA in 5 sec it continuously drawing 0.08Amp

When the controller is active then it draws 80 to 100 m Amps, when it is in sleep it draws 0.04 Amp

Today’s test controller is Sleep every 290 sec in 4 sec it reads the Sensor value and transfers it to GU through LORA.

Average current of controller in 5 Min = ((0.04x296) + (0.09x4))/300 = 0.0407 A

The controller work with 3.3 Volt logic, Sensor and Lora needs 3.3 Volt

i.e

Power when Controller is wakeup = 3.3 x 0.09 = 2.97 W

Power when Controller is Sleep = 3.3 x 0.04 = 0.132 W

Average power = 3.3 x 0.0407 = 0.1342W

Theoretically Battery duration calculation

4.5Ah Battery the controller average current is 0.0407 Amp, Duration (Hr) = 4.5/0.0407 = 110.565Hr = 4.607 days ≈ **4 days 14 hours**

In the test

The two 3.7 volt 4.5Ah batteries are connected in series

And charged for a charging duration of 2 hr 30 min (Up to V = 7.5 v and I charging = 0.01 Amp)

batteries are connected to the controller (TU) with an I average of 51.2 mAmp. Batteries are a complete drain in 3 hr 30 min (12:38 to 16:10)

Next test the two Sealed lead-acid batteries been tested

Used two Sealed lead-acid batteries (SoC) B1 is 5.93 v B2 is 5.99v I circulating 0.06amp when they connected in parallel and combine Parallel voltage is 5.96v combined Serial voltage is 11.93v

By using BPS-305 (Controlled power supply), the battery is charged with a V battery terminal of 12.4 volts and I charge450 mAmp (10% of rated Ah). Gradually the I charging is decreasing. Put battery charging until I charging is 200 mAmp.

Present over Average current of controller in 5 Min = ((0.04x296) + (0.09x4))/300 = 40.7 m A

In deep sleep mode, the esp32 takes around 10uAmp

LARO and Sensor are continuously connected to the power supply

During the test, it is observed that the sensor is consuming power only when TRIGGERING pulses are given but LARO is continuously drawing current from the source

So, in our case when esp32 is in Deep-sleep mode it takes around 40 m Amp based on the datasheet esp32 draws 10uAmp so the remaining current (39m Amp) is drowned by LORA

If LORA is energized only when esp32 is Active then the battery backup theoretically calculation

Average current of controller in 5 Min = ((10 x (10^-6) x296) + (0.09 x 4))/300 = **1.2 mAmp**

Amp-hour for a **day** with a minimum voltage of 3.3 = 1.2 \* 24 = **28.8 m Ah**

Amp-hour for a **month** with a minimum voltage of 3.3 = 28.8\*30= **864 m Ah**

Amp-hour for a **year** with a minimum voltage of 3.3 = 864 \* 12 = **10368 m Ah**

Note: - for over-application **LiFePo4** battery is suitable (this has a typical cell voltage of 3.4 volts). But it needs to connect directly to the esp32 without any regulator

4.5Ah Battery the controller average current is 1.2 mAmp, Duration (Hr) = 4.5/1.2m = 3750Hr = 156.25 days ≈ **156 days 6 hours**

0.5Ah Battery the controller average current is 1.2 mAmp, Duration (Hr) = 0.5/1.2m = 416.67Hr = 17.361 days ≈ **17 days 8 hours 40 min**

**Five years of back up the current consumption in active mode should reduce to 16.6 m Amp**

**To reduce further current consumption**

1. Replace delay with **Light Sleep Mode** (0.8 mA)
2. In active mode we can disable WiFi, Bluetooth, and radio. Only peripherals, core, memory, ULP, and RTC will online
3. Reduce the clock speed
4. Only Energizing the GPIO pins which we are using
5. Instead of deep sleep (10uA) mode can use **Hibernation Mode** (2.5uA)

With this modification, the thermotical average current

Average current of controller in 5 Min = ((2.5 x (10^-6) x296) + ((65+ 0.8) x (10^-3) x 4))/300 = **0.88 mAmp**

Amp-hour for a **day** with a minimum voltage of 3.3 = 0.88 \* 24 = **21.12 m Ah**

Amp-hour for a **month** with a minimum voltage of 3.3 = 28.8\*30=**633.6 m Ah**

Amp-hour for a **year** with a minimum voltage of 3.3 = 864 \* 12 = **7603.2 m Ah**

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setCpuFrequencyMhz(80);

| **Frequency** | **Power consumption** |
| --- | --- |
| 240Mhz | 66.8mA |
| 160Mhz | 45.9mA |
| 80Mhz | 33.2mA |
| 40Mhz | 19.88mA |
| 20Mhz | 15.43mA |
| 10Mhz | 13.19mA |