

Power Requirements

↳ runs @ 3V

↳ LCD

↳ 1Hz update $50\mu W \rightarrow 0.017\text{mA}$

↳ ATmega 328P

↳ Active @ 1MHz $\rightarrow 0.55\text{mA}$

w/ Modules
 $\rightarrow 0.582\text{mA}$
 $\rightarrow 0.225\text{mA}$

↳ Idle @ 1MHz $\rightarrow 0.17\text{mA}$

↳ Power-Down w/ WDT disabled $\rightarrow 0.0004\text{mA}$

↳ Percentage additions for each Module (Active / Idle)

↳ UART - 1.4% / 7.8% * we're only using UART while charging, so we won't count its consumption

↳ TWI - 3.0% / 16.6%

↳ SPI - 2.9% / 15.7%

↳ DS3231

↳ VCC = 0V, VBAT = 2.3-5.5V

↳ Active (I²C) $\rightarrow 0.07\text{mA}$

↳ Timekeeping $\rightarrow 0.003\text{mA}$

↳ Active vs Sleep

↳ Updating LCD

↳ sec $\rightarrow 2\text{ms}$

↳ min $\rightarrow 4\text{ms}$

↳ hour $\rightarrow 6\text{ms}$

↳ RTC Reading Time - 7 Bytes

↳ 1 ms

↳ Total Active time $\approx 20\text{ms} / 1\text{sec}$

↳ 2% duty cycle

↳ LED - 20mA

↳ 10s/day? $\rightarrow 0.0116\%$

↳ 0.0023mA/sec.

Batteries

↳ LIR2450

↳ 120mAh (24mA discharge) - $I_{\text{REG}} < 60\text{mA}$

↳ 24.5 x 5 mm

↳ LIR2032

↳ 40mAh (8mA discharge) - $I_{\text{REG}} < 17\text{mA}$

↳ 20 x 3.2 mm

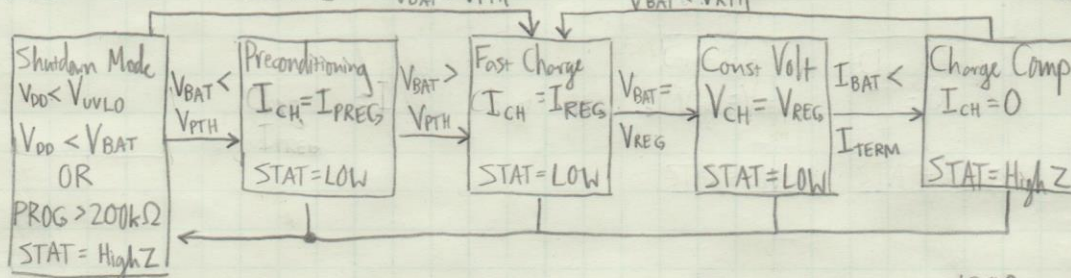
Charger

↳ MCP73831 - 2ACI

$V_{\text{BAT}} > V_{\text{PTH}}$

$V_{\text{BAT}} < V_{\text{RTH}}$

$V_{\text{REG}} = 4.2\text{V}$



UVLO - Undervoltage Lockout = $0.15\text{V} + V_{\text{BAT}}$

V PTH - Preconditioning Threshold

V RTH - Recharge Threshold

I PREG - Preconditioning Regulation

I TERM - Terminating

CH = Charge

$$[k\Omega] R_{\text{REG}} = \frac{1000}{I_{\text{REG}} [\text{mA}]} = 69k\Omega$$

$$I_{\text{REG}} = 14.5\text{mA}$$

$$= 2.793$$

$$= 4.053$$

$$= 0.1 * I_{\text{REG}}$$

$$= 0.075 * I_{\text{REG}}$$

Total Current Usage

- LCD - 0.017mA

- ATmega 328P - 0.012mA

- DS3231 - 0.00434mA

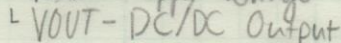
- TOTAL - 0.03334mA

safety $\rightarrow 0.04\text{mA}$ (1000hrs)
w/ 40mAh

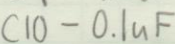
0.12mW

12/19/17

(open-drain)



BĀSĒ



Base Li-Ion
Charger
STAT

$$V_{USB} = 5.0V$$