# Water Level Sensor Design Notes

## Voltage regulator efficiency experiments

Pololu 3.3V 500mA step down regulator

* No load

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 117uA |
| 6.5V | 107uA |

* With 27.5uA load (120K resistor)

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 134uA |
| 6.5V | 123uA |

* with 10.0mA load (330ohm resistor)

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 7.6mA |
| 6.5V | 5.7mA |

Pololu 5V step up/down regulator

* no load

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 61.5uA |
| 6.7V | 58.6uA |

* with 2.7mA load (MB7389 ultrasonic sensor)

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 3mA |
| 6.7V | 2.55mA |

* with 15.7mA load (330ohm resistor)

|  |  |
| --- | --- |
| Input voltage | Input current |
| 5V | 20mA |
| 6.5V | 15.4mA |

Pololu 3.3V step up/down regulator – need to get one

Power-down mode current looks like it’s less than 10uA.

## Hardware Design

There will be an attempt to design a general-purpose cellular data system. Load program through RJ45 jack? No. Debug console via sw serial with RJ11 jack (only need 4 pins)?

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | I2C | SPI | HW UART | 3.3V | 4.1V | 5V |
| Water level sensor | TMP102 |  | MB7389 | uC | SIM800 | MB7389 |
| Water pressure sensor | TMP102 | SSP… |  | uC |  | SSP… |
| LED lighting ups remote monitor | TMP102? |  |  | uC | SIM800 | Comes from UPS |
| Remote GPS tracker | TMP102? |  | SkyTraq | uC | SIM800 | no |

### Power source

A 4.5V battery pack of 12 Alkaline D cells will supply at least 48Ah.

### AtMega328P

* run directly off 4.5V battery pack – no regulator needed. This means the power-down current will be only that which the AtMega328P uses (about 7uAh?)
* run with 8MHz crystal
* 8-bit Timer0 – Software serial rx for debug console (4800 baud)
* 16-bit Timer1 - system clock and sotware serial tx for SIM800 and debug console (4800 baud)
* 8-bit Timer2 – software serial rx for SIM800
* Hardware UART Rx for ultrasonic sensor (9600 baud)
* Use power-down mode for sleep

### I/O Pin usage

PD0 – hardware UART Rx for ultrasonic sensor

PD2,PD3 – Software serial Rx/Tx for SIM800 (4800 baud)

PD4 – onkey for SIM800

PD5 – power status (not using)

PC4,PC5 - I2C for optional MCP9808 temperature sensor

PB0,PB1 – Software serial Rx/Tx for debug console (4800 baud)

PB2 – SS for SPI

PB3-PB5 SPI for pressure sensor

## Control flow

Water Level monitor task returns status that reports when it is done processing (reading sensors, posting data to server). When it is done we enter a sleep loop until the next scheduled processing time.

Initialize

Loop {

Tasks

If monitor task is done {

Finalize

Sleep until next interval

Initialize

}

}

## SparkFun SSOP to DIP Adapter - 8-Pin

BOB-00497

Eagle SOT-223 pkg: linear-technology-2:LT1129CST5

Use 1N4148 diode to level-shift 3V3 Rx pin of microcontroller to USB-to-serial adapter (assumes pull-up on Rx pin).