

Gesture Controlled Alarm Clock

Seth Gibson
Tyler VanderWerp
4/17/2023





Purpose

- Alarm Clocks are susceptible to power failure
- Also very unintuitive
- Could be infinitely better if you didn't have to touch it as much

Solution: VL53L5

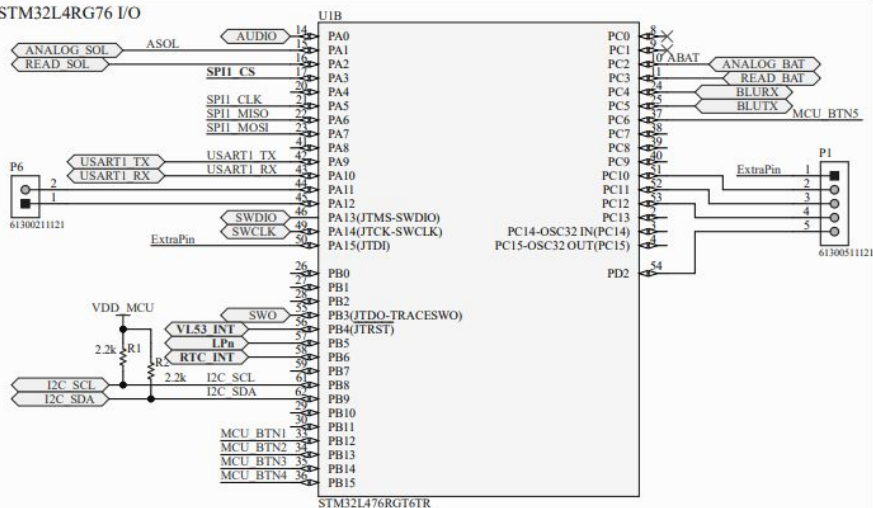




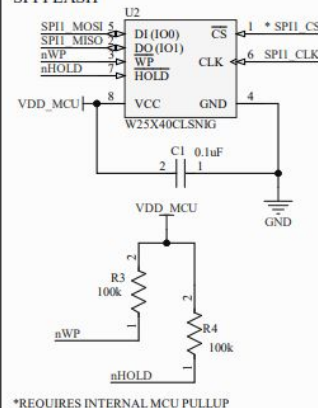
Features to note

- Set alarm via on board buttons, and bluetooth
- Read alarm via bluetooth, terminal, and LCD display
- Turn off alarm via gesture or pushbutton
- Alarms are stored on flash and exist after a total power out event.
 - Main clock still has to be reset during a total power out event.
- Speaker triggers upon alarm
 - Turned off via button or gesture
- LCD Display only powered during USB connection, increasing battery life of the system.
- Voltage on the battery and solar panel can be viewed on the LCD.

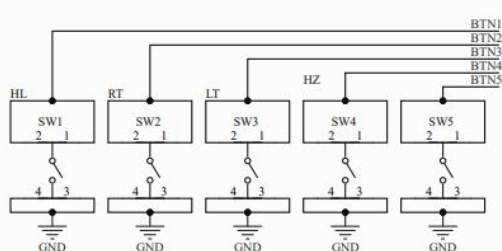
STM32L4RG76 I/O



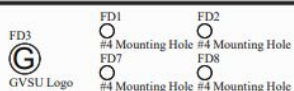
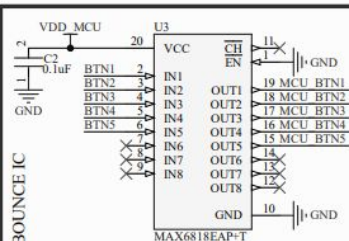
SPI FLASH



BUTTONS



SW DEBOUNCE IC



T. VanderWerp

S. Gibson

Sheet title

MCU and Peripherals

PROJECT

GVSU Student Project

PROJECT

NA
COURSE
EGR436: Gesture Alarm Clock

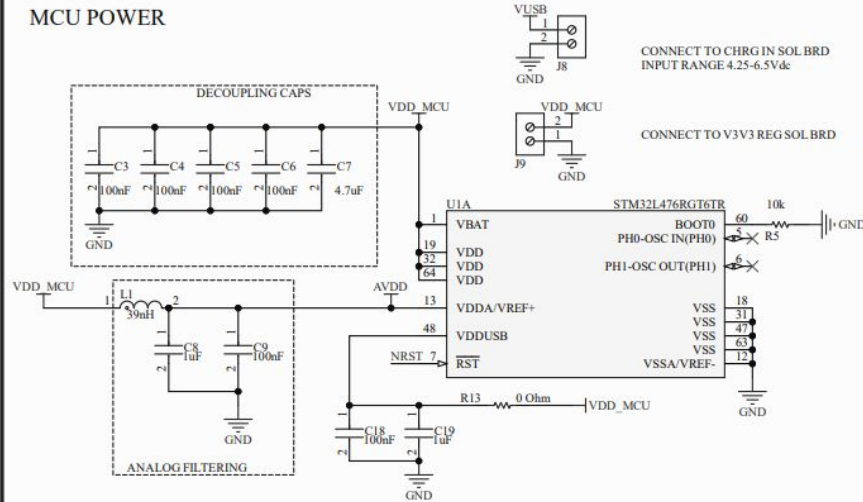
Brakora

SHEET 1 OF 4

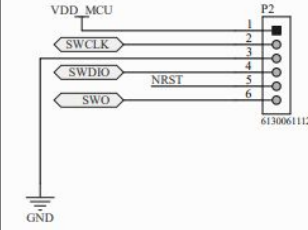


Schematics (2)

MCU POWER



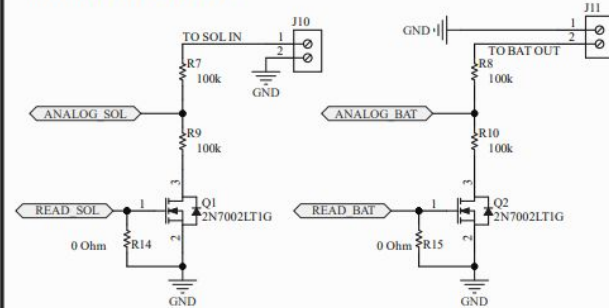
SWD



XTRA PWR CONNECTIONS

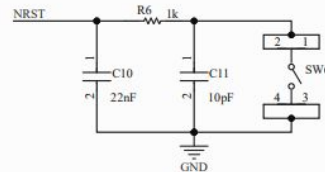


VOLTAGE READING



MOSFET USED SO ONLY CURRENT DRAW DURING READ OPERATIONS
VOLTAGE DIV USED SO WITHIN RANGE OF REF VOLTAGE
REPLACE 0 OHM RES WITH APPROPRIATE VALUE

RESET SWITCH



T. VanderWerp

S. Gibson

SHEET TITLE

MCU Power and Battery/Sol Read

PROJECT

GVSU Student Project

PROJECT ID

NA

COURSE

EGR436: Gesture Alarm Clock

INSTRUCTOR/ADVISOR

Brakora

DESIGN DATE

4/9/2023

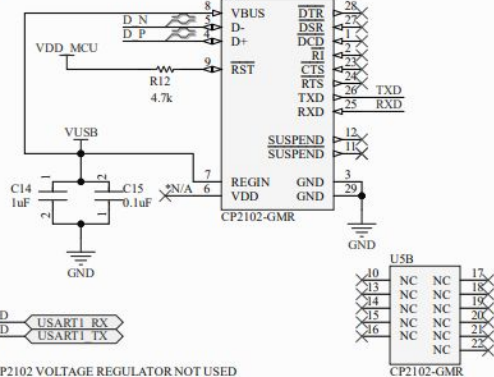
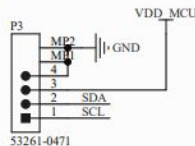
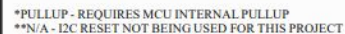
REV

NA

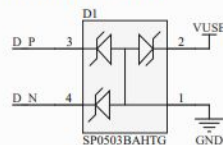
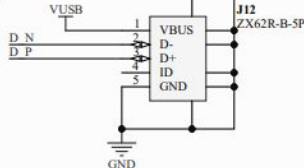
SHEET 2 OF 4




Schematics (3)

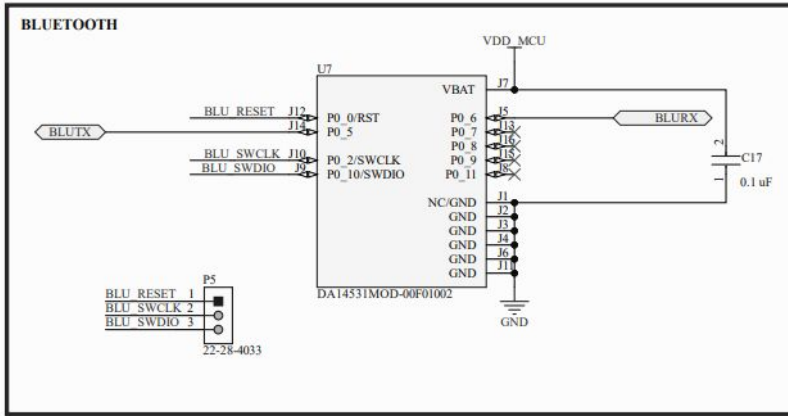
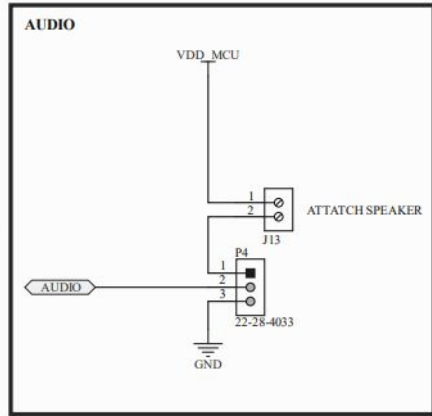


*N/A - CP2102 VOLTAGE REGULATOR NOT USED



T. VanderWerp	SHEET TITLE		
S. Gibson	ToF, LCD, UART Bridge, RTC and USB		
	PROJECT		
	GVSU StudentProject		
	PROJECT ID	REV	
	NA	NA	
	COURSE		
	EGR436: Gesture Alarm Clock		
	INSTRUCTOR/TA/DESK		
	Brakora		
	MODIFIED DATE		
	4/18/2023		
	SHEET 3 OF 4		

Schematics (4)



T. VanderWerp	SHEET TITLE	
S. Gibson	Audio and BT	
	PROJECT	
	GVSU StudentProject	
	PROJECT ID	REV
	NA	NA
	COURSE	
	EGR436: Gesture Alarm Clock	
	INSTRUCTOR/ADVISOR	
	Brakora	
	MODIFIED DATE	
	4/9/2023	

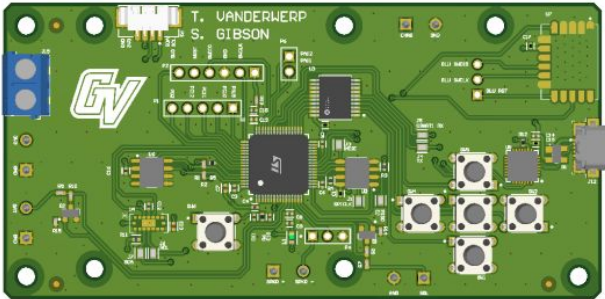




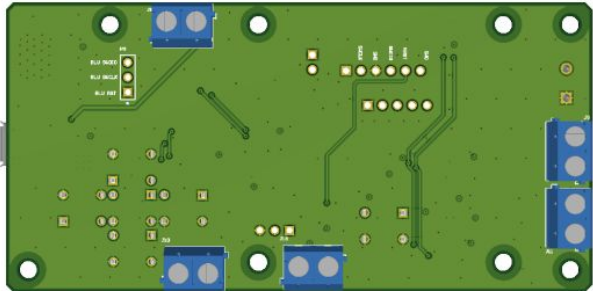
PCB

Layer Stack Legend		Material	Layer	Thickness	Dielectric Material	Type	Gerber
			Top Overlay			Legend	GTO
		Surface Material	Top Solder	0mil	Solder Resist	Solder Mask	GTS
		Copper	M1 Top	1mil		Signal	GTL
		Prepreg		4mil	PP-006	Dielectric	
		CF-004	M2 Plane 1	1mil		Internal Plane	GP1
				44mil	FR-4	Dielectric	
		CF-004	M3 Layer 2	1mil		Internal Plane	GP2
		Prepreg		4mil	PP-006	Dielectric	
		Copper	M4 Bottom	1mil		Signal	GBL
		Surface Material	Bottom Solder	0mil	Solder Resist	Solder Mask	GBS
			Bottom Overlay			Legend	GBO
Total thickness: 59mil							

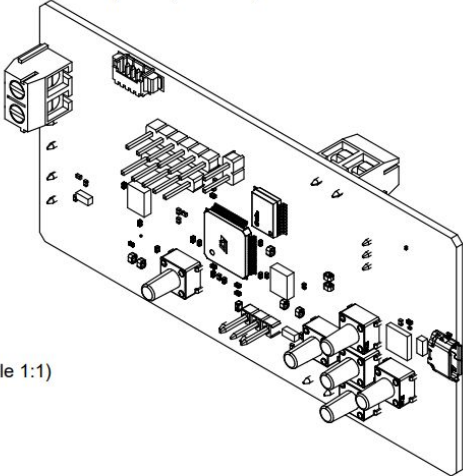
Realistic View



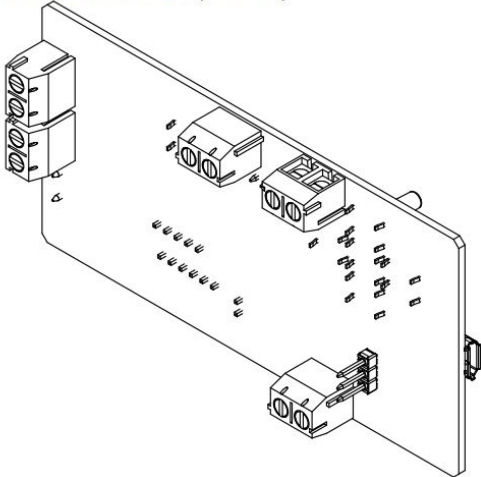
Realistic View



View from Top side (Scale 1:1)

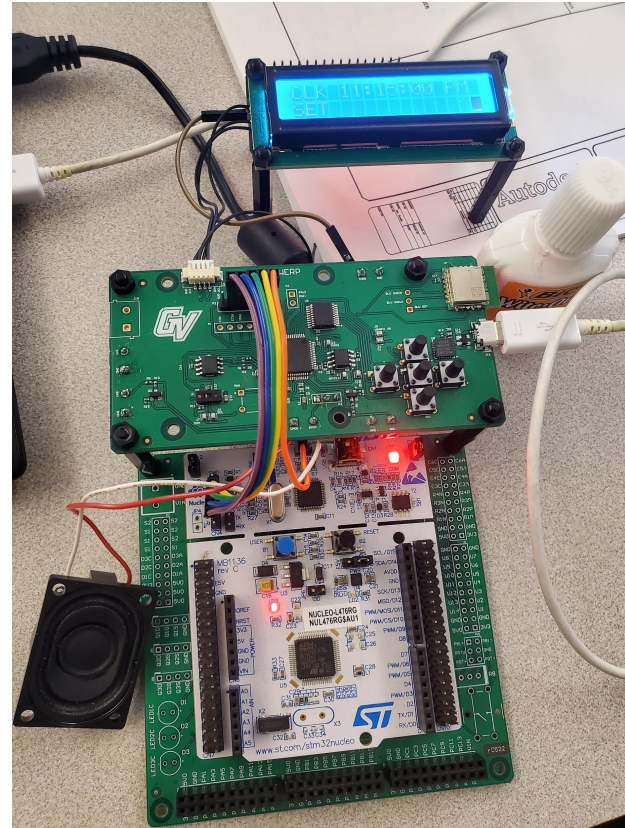


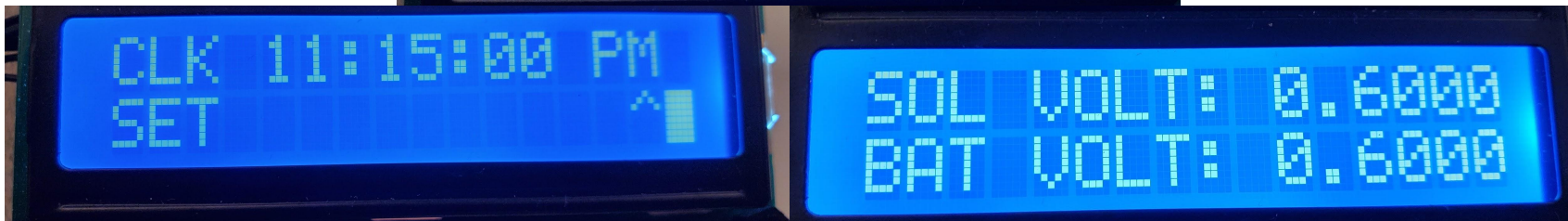
View from Bottom side (Scale 1:1)



Prototype/Demo

It'll look pretty,
we promise.







Bluetooth

6:09 5G 66%

SmartConsole
Console AT+

Receive Console Mode Data

ASCII

HEX

Enter Alarm Min

Enter Alarm Sec

Send Console Mode Data

ASCII

HEX

10034555

III O <

6:09 5G 66%

SmartConsole
Console AT+

Receive Console Mode Data

ASCII

HEX

ALM: 8:00:00

Send Console Mode Data

ASCII

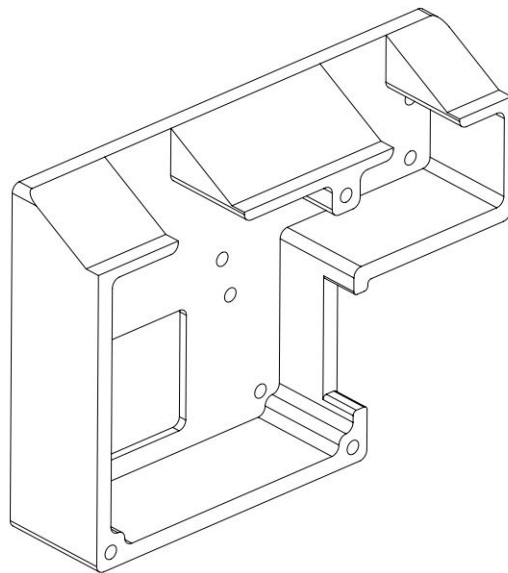
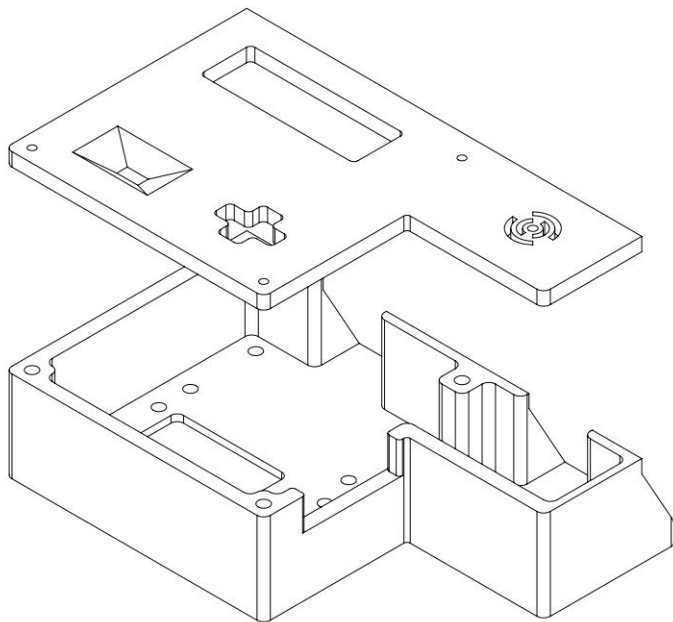
HEX

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III O <



Enclosure





Final Progress (Completed)

- “Legacy” System
 - Solar/Battery/USB Power Capabilities
 - Time and Alarm visible on LCD
 - Alarm visible over UART (Serial & BT)
 - Menu Navigation w/ Buttons
 - Time and Alarm can be set by buttons & hand wave
 - Time and Alarm can be set by UART (Serial & BT)
 - Alarm Time stored to FLASH
 - Voltage ADC Readouts available
 - Alarm Triggers with horrible noise
 - Alarm can be turned off by button & hand wave



Future Improvements (To Do)

- Final System
 - Integrating TOF Time Selection
 - General Debugging
 - Final Assembly
 - **GOAL - Friday, 4/21**
- Cut Features
 - Selecting time values via hand swiping
 - Snooze button functionality

Questions