USER MANUAL

STM32 UART +ADC +Timer PCB Design

JULY 19, 2020

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STM32 UART + ADC + Timer PCB Project – User Manual

1. Introduction

This project is a beginner-friendly STM32 development board implementing UART (serial), ADC (analog), and Timer functions.
It uses the STM32F103C6T6 microcontroller and is designed entirely in KiCad. The board can be fabricated using the provided Gerber files and explored using the schematic and PCB layout files.

2. Project Structure and Required Tools

- KiCad: Required to open and view `.kicad_sch` and `.kicad_pcb` files.
- Folder `uart`: Contains the schematic and PCB layout.
- Folder `GerberFile`: Contains production-ready files for PCB fabrication.

3. Opening Files in KiCad

1. Launch KiCad.
2. Open the `uart.kicad_pro` project file.
3. Open the schematic using the Schematic Editor.
4. Open the PCB layout using the PCB Editor.
5. Optionally, use the 3D Viewer to view the board visually.

4. Schematic Overview

Key components in the schematic include:
- STM32F103C6T6 microcontroller
- Power regulation circuitry (3.3V)
- UART TX/RX connections
- ADC input using a light-dependent resistor (LDR)
- Timer-based LED output
- Reset and Boot configuration buttons

5. PCB Layout Overview

The PCB is a 2-layer design with the following features:
- Central placement of the STM32 MCU
- USB input and 3.3V regulator circuit
- GPIO, UART, ADC exposed via headers
- LEDs and switches for user interaction
- Clean routing and silkscreen labels for easy assembly

6. Gerber Files for Fabrication

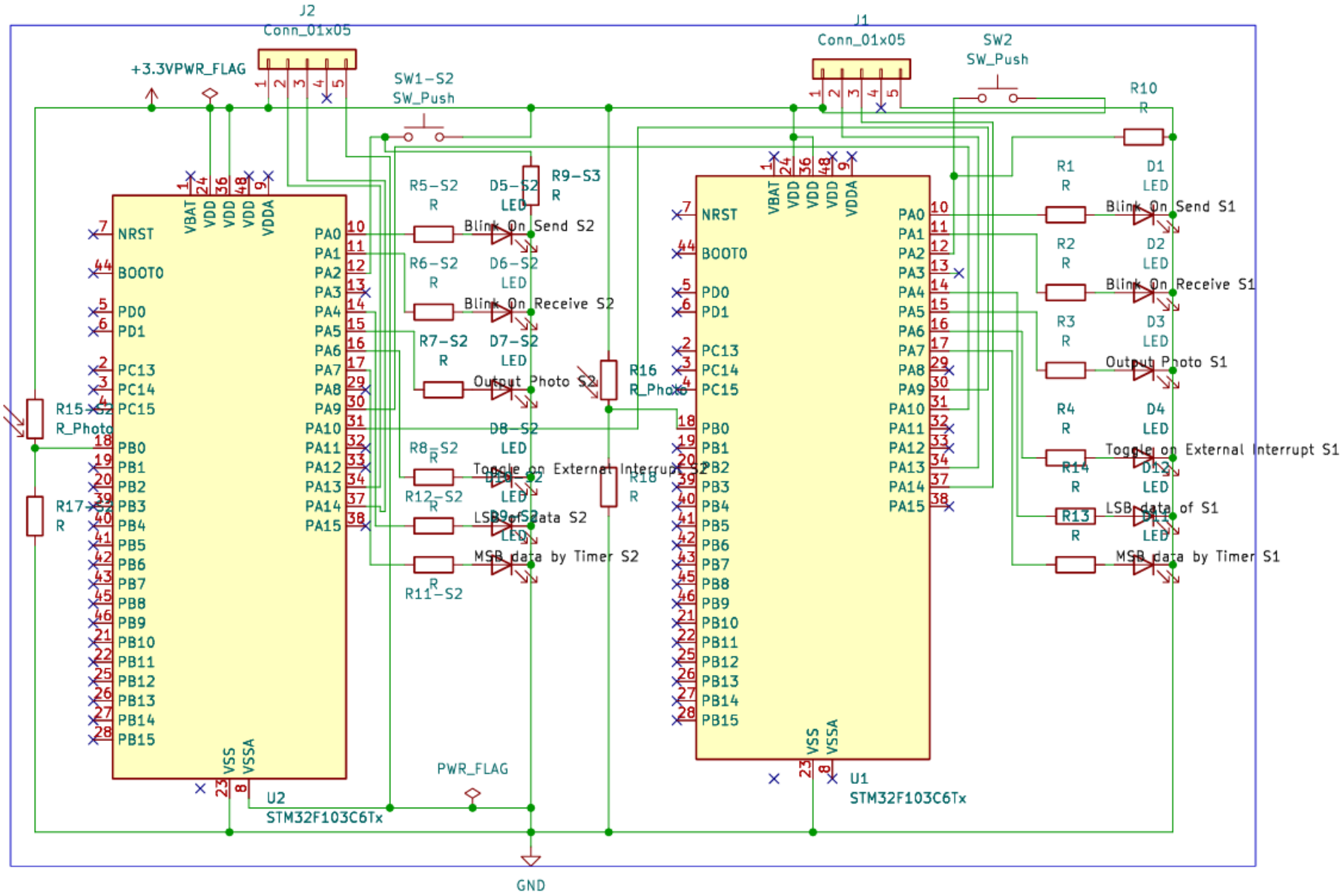
The `GerberFile` folder contains all necessary files for PCB manufacturing.
To fabricate the board:
1. Zip the contents of the `GerberFile` folder.
2. Upload to a PCB manufacturer (e.g., PCBWay, JLCPCB).
3. Confirm preview and proceed with order.

7. Using the Board (Beginner Tips)

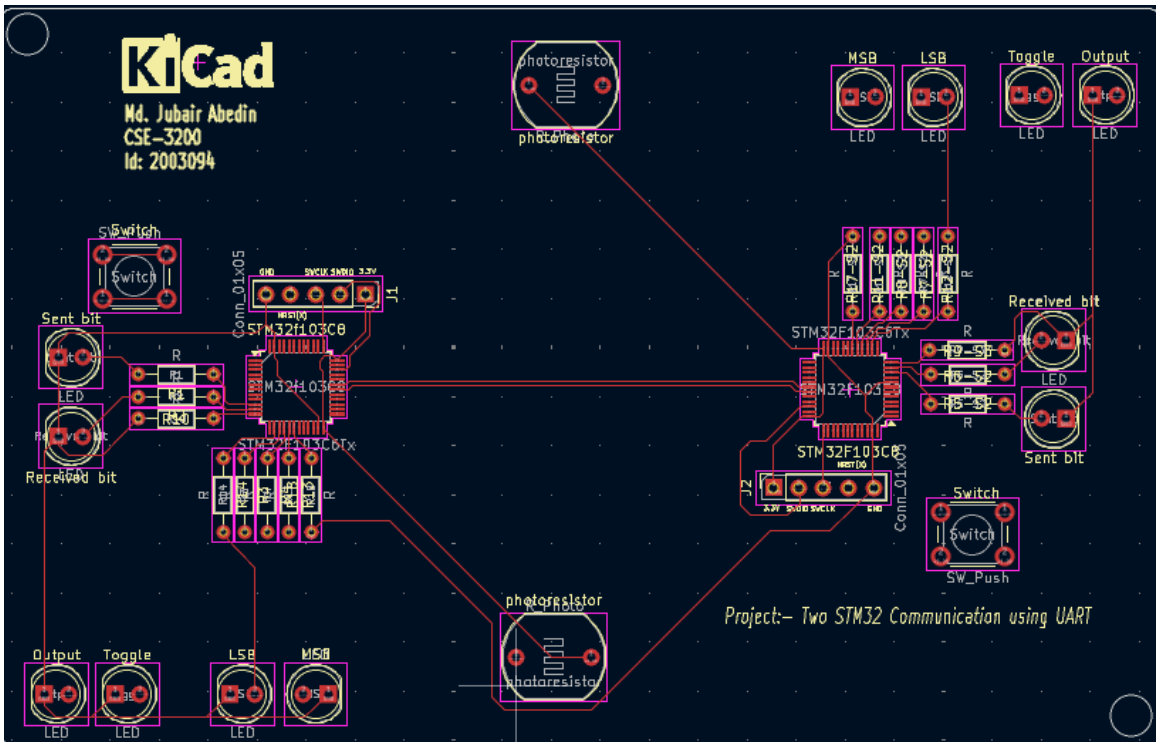
- Power the board using 3.3V via USB or external header.
- UART TX/RX can be connected to a USB-to-TTL adapter for communication.
- The light sensor provides analog input to the ADC pin.
- The LED can be toggled using a timer interrupt.
- No firmware is included, but STM32CubeIDE or PlatformIO can be used to program the MCU.

8. Diagrams:

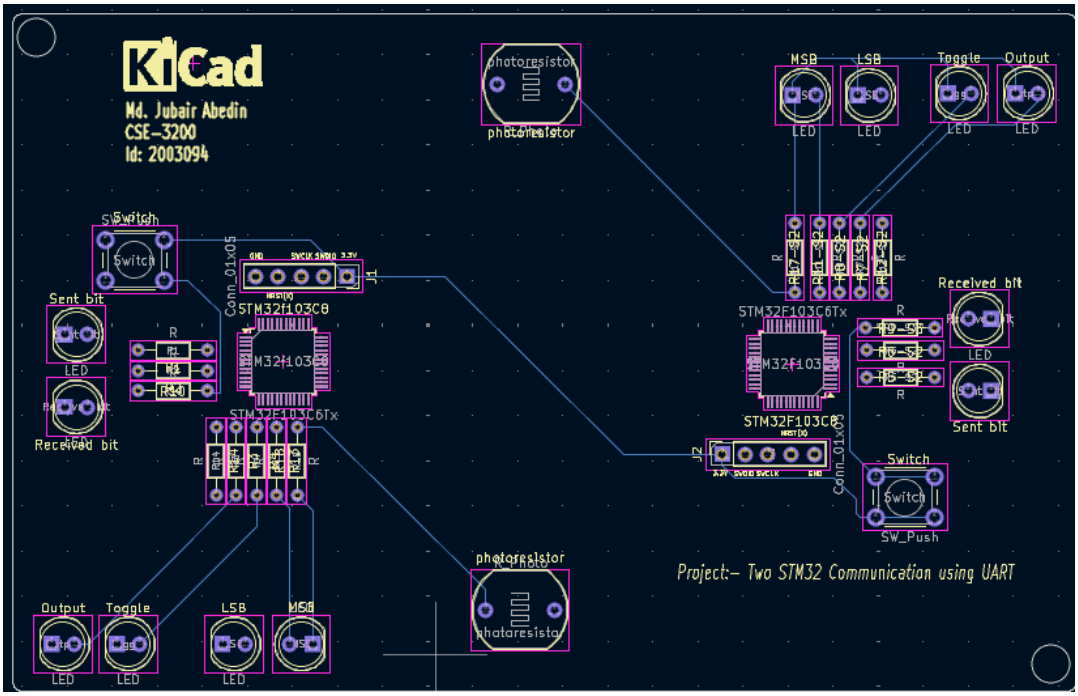
a) The diagram is the schematic editor diagram of the UART implementation. This shows the connection between components.


J2
Conn_01x05
+3.3VPWR_FLAG
SW1-S2
SW_Push
J1
Conn_01x05
SW2
SW_Push
R10
R
R1
R
D1
LED
Blink On Send S1
R2
R
D2
LED
Blink On Receive S1
R3
R
D3
LED
Output Photo S1
R4
R
D4
LED
Toggle on External Interrupt S1
R14
R
D12
LED
LSB data of S1
R13
R
D11
LED
MSB data by Timer S1
R5-S2
R
D5-S2
LED
R9-S3
R
Blink On Send S2
R6-S2
R
D6-S2
LED
Blink On Receive S2
R7-S2
R
D7-S2
LED
Output Photo S2
R16
R_Photo
D8-S2
LED
R8-S2
R
D10-S2
LED
Toggle on External Interrupt S2
R18
R
R12-S2
R
D9-S2
LED
LSB data of S2
R11-S2
R
MSB data by Timer S2
R15
R_Photo
R17
R
VBAT
VDD
VDD
VDD
VDDA
NRST
BOOT0
PD0
PD1
PC13
PC14
PC15
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PB8
PB9
PB10
PB11
PB12
PB13
PB14
PB15
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PA8
PA9
PA10
PA11
PA12
PA13
PA14
PA15
VSS
VSSA
U2
STM32F103C6Tx
PWR_FLAG
U1
STM32F103C6Tx
GND

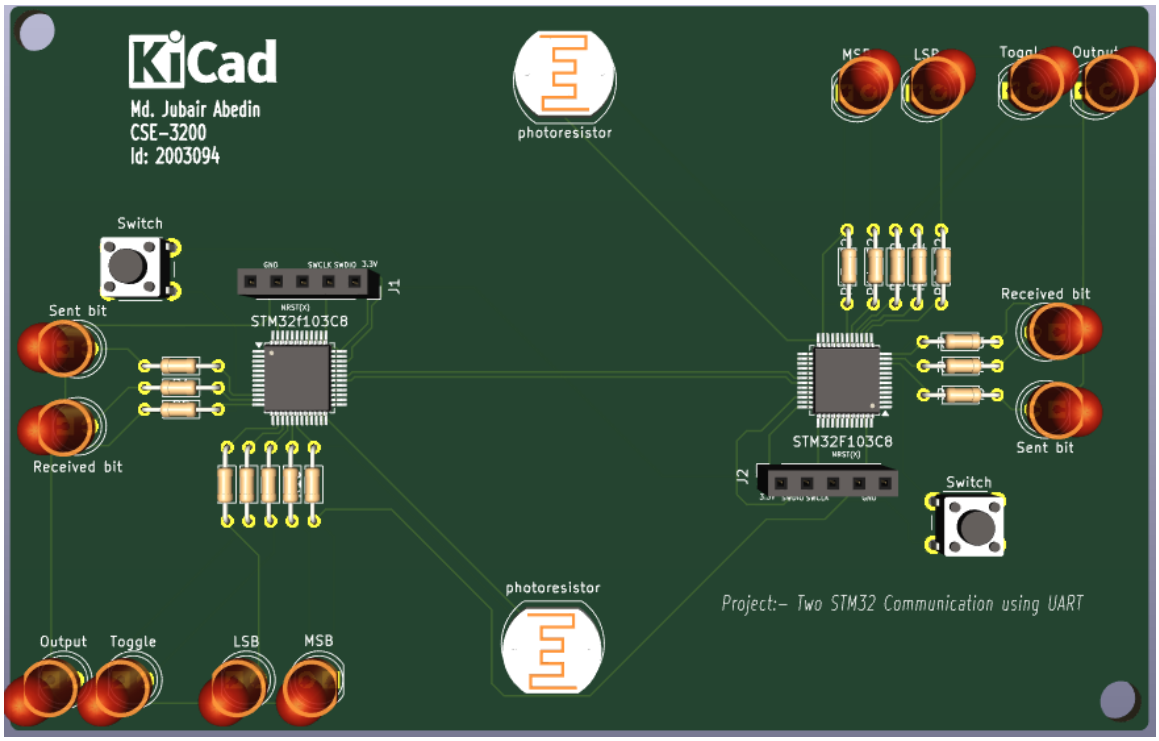
b) Font-Cu:



c) Back-Cu:



c) 3-d view:



9. Summary

This project is designed for beginners to learn STM32 hardware development with KiCad. It offers a complete hardware platform to explore UART communication, analog signal measurement, and timer-driven output control.