User manual

Fastbit 32F407DISC IoT LCD Shield

Introduction

The Fastbit 32F407DISC IoT LCD shield is a compact development board designed to work with the STM32F407 discovery boards. It combines essential IoT features like wireless connectivity, sensors, display, storage, and user controls in one shield.

With a built-in ESP32-C6 (AT firmware) and other onboard components, it helps developers quickly build and test IoT, sensor-based, and interactive embedded applications.

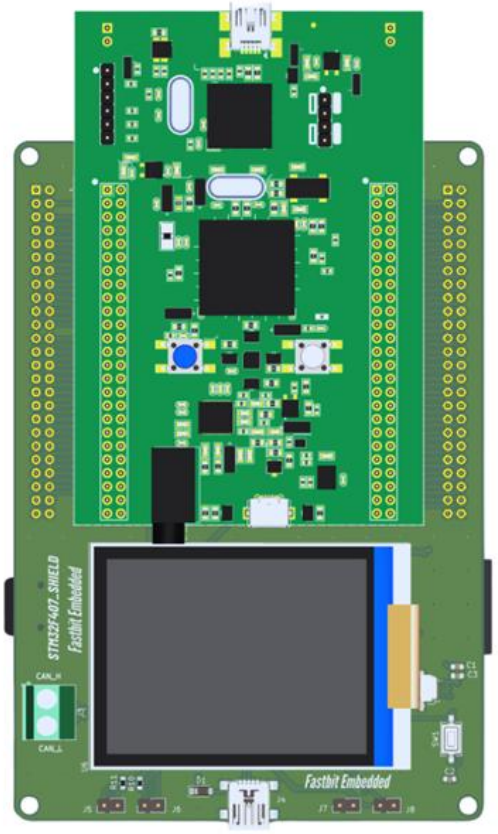

Figure 1. Fastbit 32F407DISC IoT-LCD shield

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Features:

Wireless Module

- ESP32-C6 with:
  - Wi-Fi 6 (802.11ax)
  - Bluetooth 5 (BLE)
  - Zigbee and Thread protocol support
- Preloaded with AT firmware for UART communication
- Can be re-flashed with custom firmware via USB

Compatibility

- STM32F407 disc board

Sensors

- HDC1080 (I2C): Temperature and humidity sensor

Display

- 2.4inch TFT LCD, 240×320 resolution
- Capacitive touch panel with FT6336 touch controller
- SPI interface, driven by ILI9341 display controller

Storage

- microSD card slot (SPI interface)
- 16 MB SPI NOR Flash memory (W25Q128JVSIQ)

User Interface

- 1 Boot button

CAN Module

- CAN transceiver **(SN65HVD230)** onboard for Controller Area Network communication.
- Enables reliable communication in industrial or automotive applications.

USB to UART Converter

- Onboard USB to UART bridge for serial communication and debugging
- Provides easy connection to a PC for monitoring or flashing data

Hardware and layout

The Fastbit 32F407DISC IoT LCD shield, designed with a compact layout for STM32F407 boards, integrates essential components such as the ESP32-C6 wireless module, HDC1080 sensor, 2.4-inch TFT LCD display with capacitive touch, CAN transceiver, microSD card slot, and NOR Flash. It provides flexible connectivity options through USB, SPI, I2C, and UART interfaces. The figures below illustrate the top and bottom views of the shield with all major components clearly labeled.

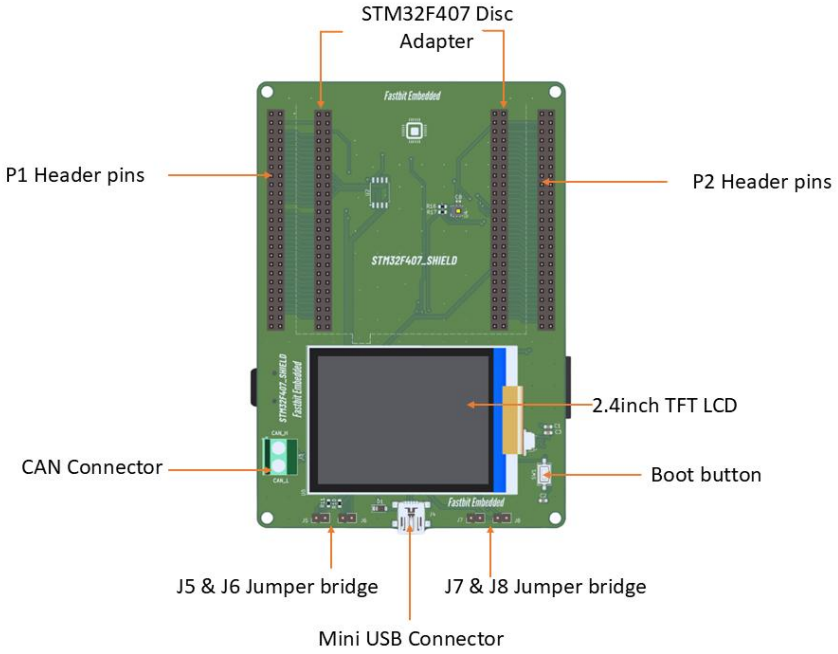


Figure 2: Fastbit 32F407DISC IoT LCD shield - Top layout

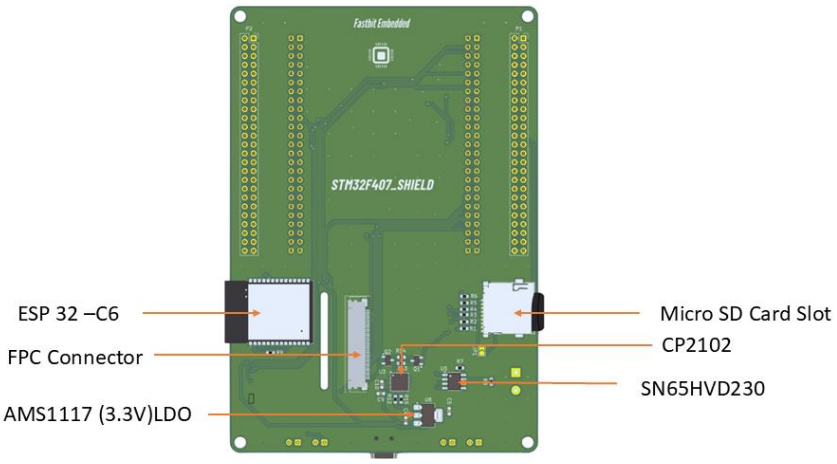


Figure 3: Fastbit 32F407DISC IoT LCD shield – Bottom layout

Power supply and power selection

- The Fastbit 32F407DISC IoT LCD shield is typically powered through the 3.3V rail from the STM32F407 development board via header connections.
- Alternatively, the shield can be powered using the mini-USB connector available on the board.
- In this case, 5V from the mini-USB is routed to the VIN pin, which can also be used to power the STM32F407 board if supported.

Mini USB connector

- The shield features a mini USB connector (J2) used primarily for ESP32-C6 firmware upgrades.
- It can also serve as a power input, supplying 5V to both the shield and the connected host board via the VIN pin.
- Supports auto boot mode for flashing, eliminating the need for manual BOOT/RESET button sequences in most cases.

CP2102 – USB to UART Bridge

- Enables USB to Serial communication between the PC and microcontrollers like STM32F407 or ESP32-C6.
- Plug-and-play, supported on Windows, Linux, and macOS without extra drivers.
- Supports baud rates up to 1 Mbps for fast and reliable data transfer.
- Integrated on the shield to connect the UART (PA2/PA3) or ESP32-C6 to the PC
- Works at 3.3V logic and accepts 5V USB input.
- Allows easy firmware flashing and debugging without any external programmer.

Jumper Configuration Modes

Figure 4: Firmware Update Mode (J5 & J6 Open, J7 & J8 Closed)

Figure 5: UART TTY Mode (J5 & J6 Closed, J7 & J8 Open)

Mode	J5 & J6	J7 & J8	USB Status
UART Communication Mode	Open	Close	UART connector for PA2 (TX) and PA3 (RX) pins.
Firmware Update Mode	Close	Open	Firmware upgrade for ESP32-C6

CAN Module (SN65HVD230)

- PD1 is used as CAN_TX (transmit).
- PD0 is used as CAN_RX (receive).
- Allows the STM32F407 to communicate over the CAN bus.
- Connect external CAN devices using the CAN connector on the shield.

Temperature and humidity sensor

- The HDC1080DMBR is a high-accuracy, low-power digital humidity and temperature sensor with a compact footprint.
- It provides 14-bit temperature and humidity measurements with factory calibration.
- The Host communicates with the HDC1080 sensor via the I2C interface.

MicroSD card slot

- The shield includes a microSD card slot (J1) connected via the SPI interface.
- It allows for data logging, such as saving sensor values, configuration files, or system logs.
- Ensure the card is inserted properly before powering the board to avoid read/write errors.

Push buttons

- SW1 BOOT: Push button connected to the BOOT pin of the ESP32-C6, used to enter firmware download (bootloader) mode.

NOR flash memory

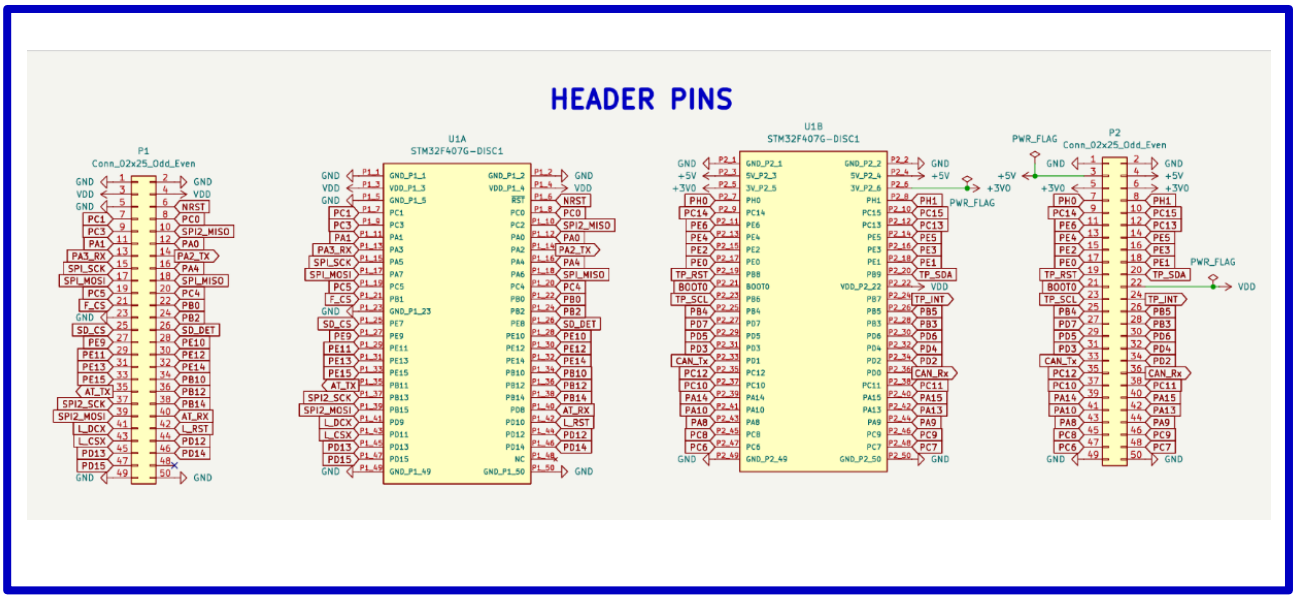
- The shield includes onboard SPI NOR Flash memory (W25Q128JVSIQ) with 16 MB
- (128 Mbit) capacity for non-volatile data storage.
- Useful for storing firmware, configuration files, sensor logs, or lookup tables.
- Communicates over the SPI interface with support for high read/write speeds.
- Offers reliable long-term data retention and supports use cases where data must persist across power cycles or reboots.

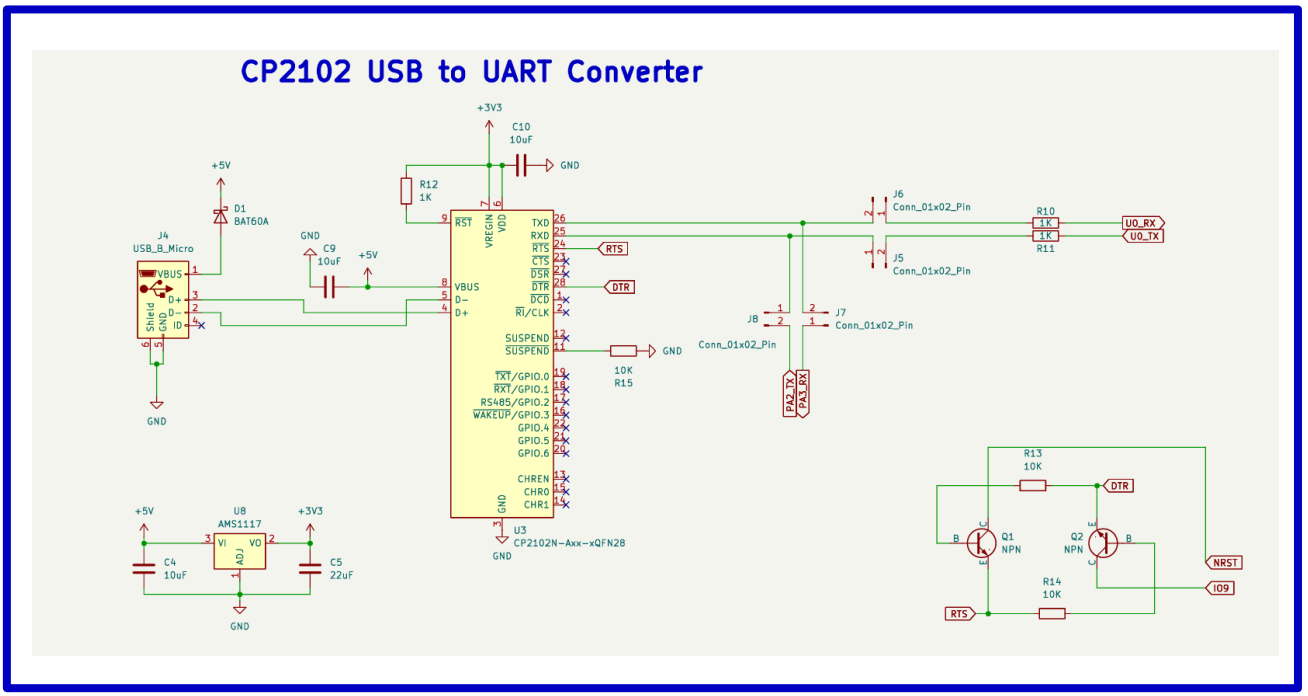
AT firmware upgrade modes

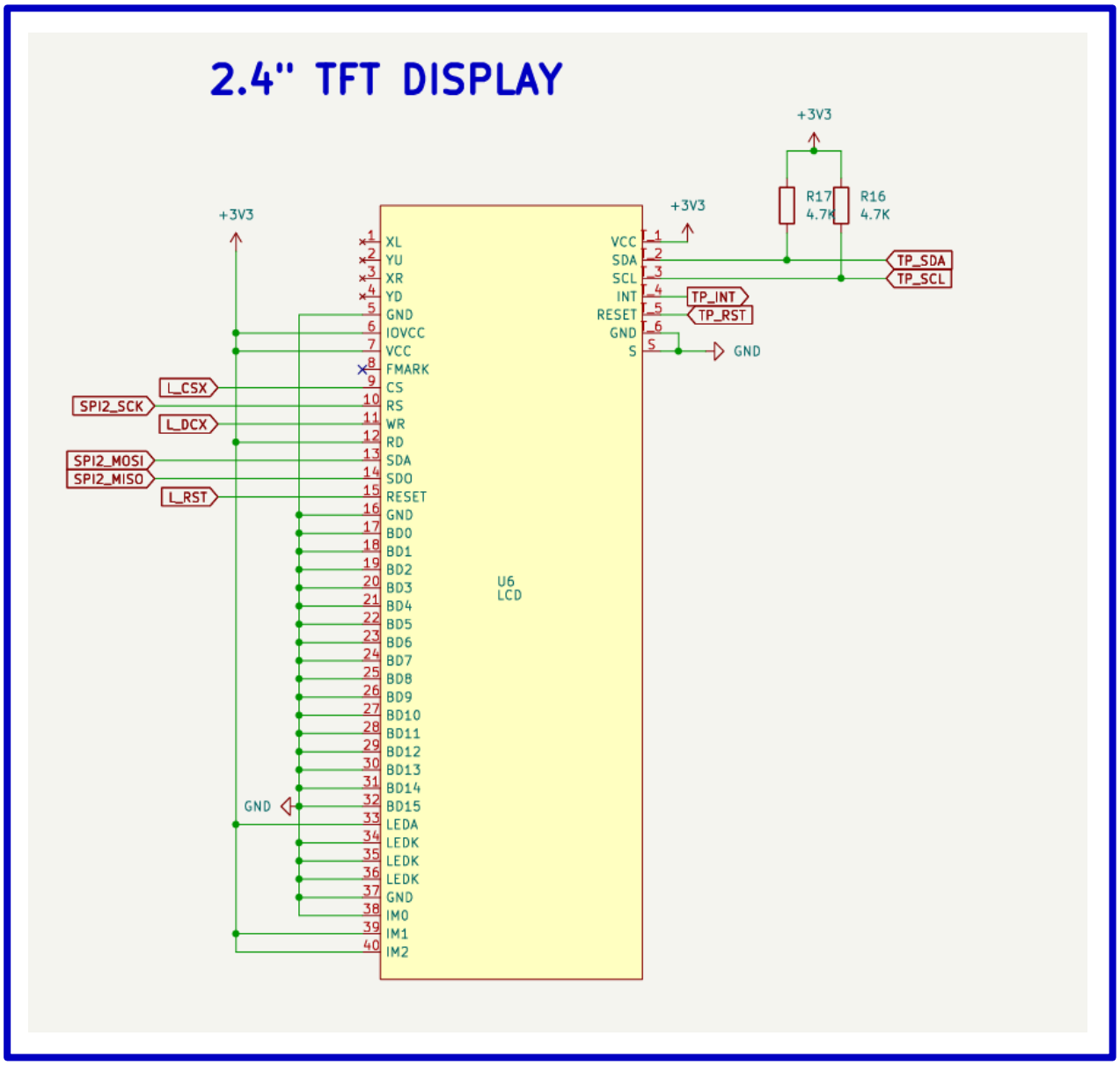
1. **Auto Boot Mode**
   - Simply connect a USB cable to the mini-USB connector (J2) on the IoT Shield.
   - The onboard circuitry will automatically set the ESP32-C6 into bootloader mode.
   - No manual button press is required.

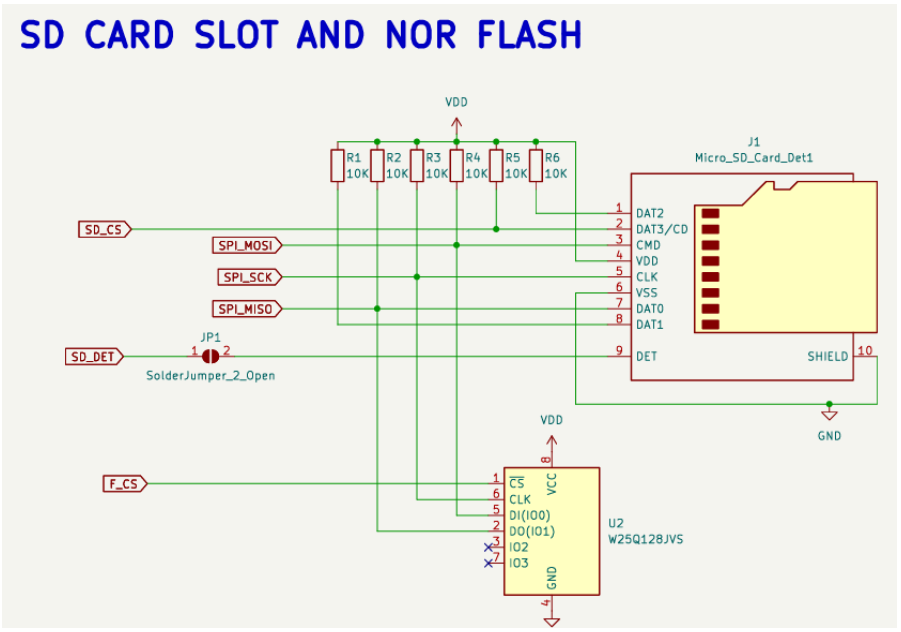
2. **Manual Boot Mode (Using BOOT and RESET Buttons)**
   - Press and hold the BOOT button, then
   - Press and release the RESET button Disc board.
   - This sequence puts the ESP32-C6 into firmware download (bootloader) mode manually.

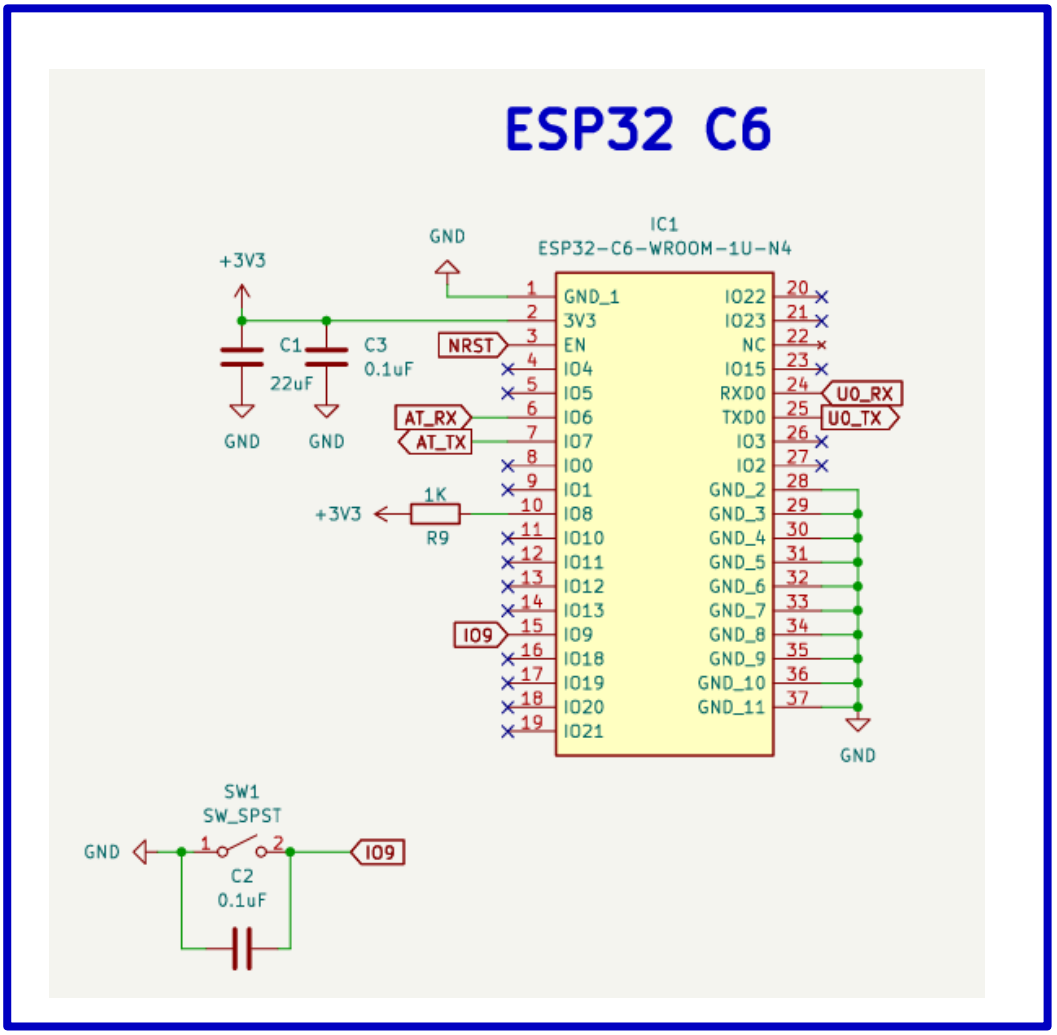
Schematic Overview

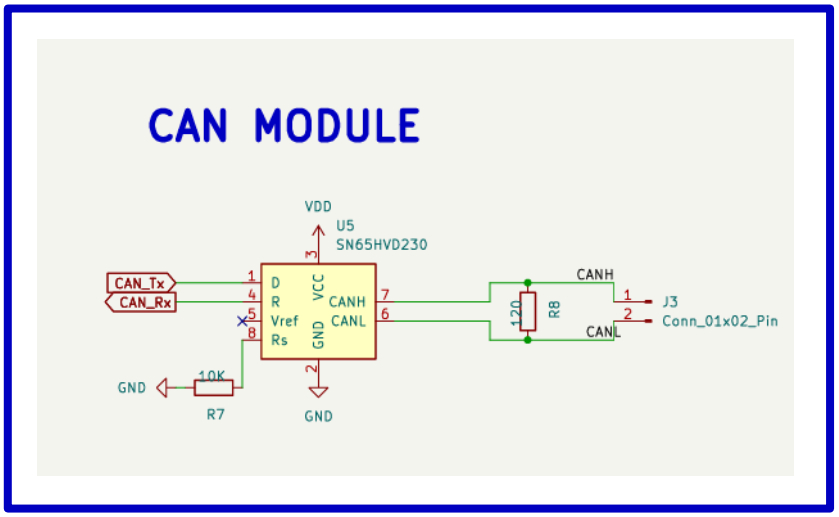


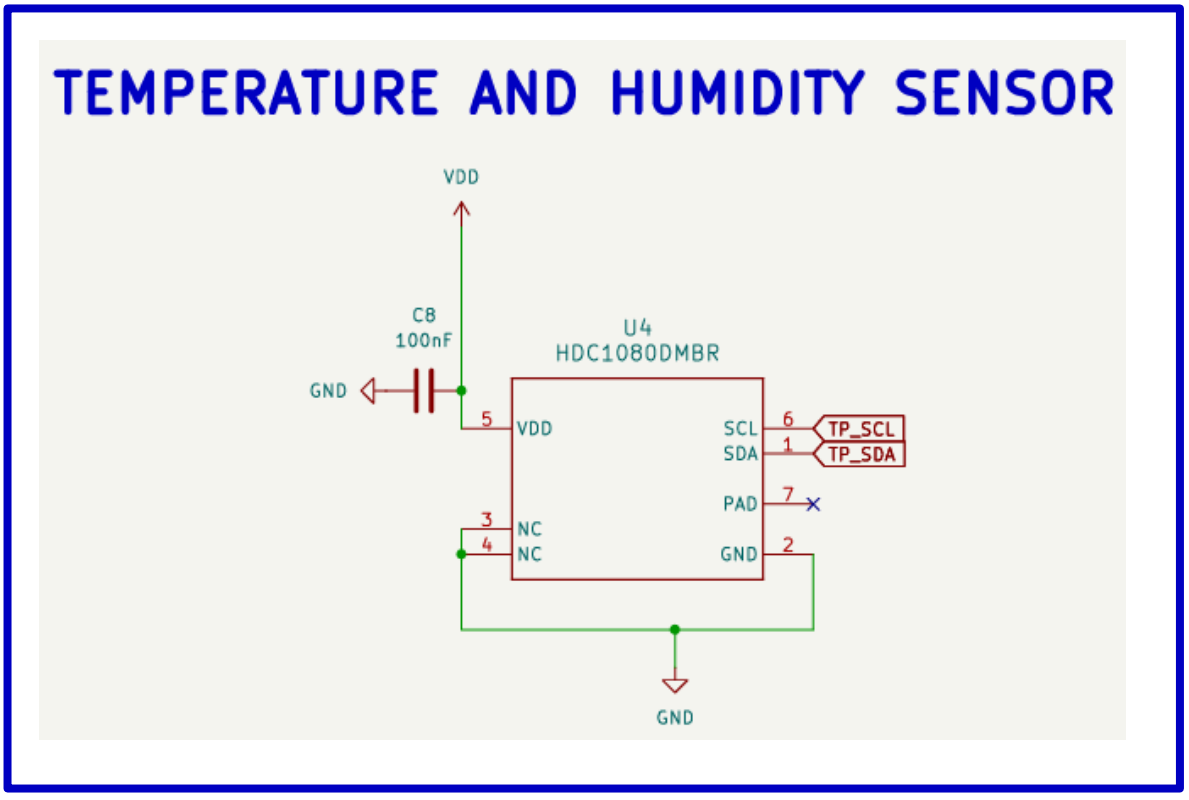



2.4" TFT DISPLAY
+3V3
R17
4.7K
R16
4.7K
+3V3
+3V3
VCC
SDA
SCL
INT
RESET
GND
S
TP_SDA
TP_SCL
TP_INT
TP_RST
GND
L_CSX
SPI2_SCK
L_DCX
SPI2_MOSI
SPI2_MISO
L_RST
GND
XL
YU
XR
YD
GND
IOVCC
VCC
FMARK
CS
RS
WR
RD
SDA
SDO
RESET
GND
BD0
BD1
BD2
BD3
BD4
BD5
BD6
BD7
BD8
BD9
BD10
BD11
BD12
BD13
BD14
BD15
LEDA
LEDK
LEDK
LEDK
GND
IM0
IM1
IM2
U6
LCD


SD CARD SLOT AND NOR FLASH
VDD
R1 10K
R2 10K
R3 10K
R4 10K
R5 10K
R6 10K
J1
Micro_SD_Card_Det1
SD_CS
SPI_MOSI
SPI_SCK
SPI_MISO
SD_DET
JP1
SolderJumper_2_Open
DAT2
DAT3/CD
CMD
VDD
CLK
VSS
DAT0
DAT1
DET
SHIELD
GND
F_CS
CS
CLK
DI(IO0)
DO(IO1)
IO2
IO3
VCC
GND
U2
W25Q128JVS


ESP32 C6
IC1
ESP32-C6-WROOM-1U-N4
GND
+3V3
C1
22uF
C3
0.1uF
GND
GND
NRST
AT_RX
AT_TX
+3V3
1K
R9
I09
SW1
SW_SPST
GND
C2
0.1uF
I09
GND_1
3V3
EN
IO4
IO5
IO6
IO7
IO0
IO1
IO8
IO10
IO11
IO12
IO13
IO9
IO18
IO19
IO20
IO21
IO22
IO23
NC
IO15
RXD0
TXD0
IO3
IO2
GND_2
GND_3
GND_4
GND_5
GND_6
GND_7
GND_8
GND_9
GND_10
GND_11
U0_RX
U0_TX
GND


CAN MODULE
VDD
U5
SN65HVD230
CAN_Tx
CAN_Rx
D
R
Vref
Rs
VCC
CANH
CANL
GND
10K
R7
GND
CANH
CANL
120
R8
J3
Conn_01x02_Pin


TEMPERATURE AND HUMIDITY SENSOR
VDD
C8
100nF
GND
U4
HDC1080DMBR
VDD
NC
NC
SCL
SDA
PAD
GND
TP_SCL
TP_SDA
GND

Product Link

https://fastbitembedded.com/products/fastbit-32f407disc_iot_lcd_shield