This board's job is to provide climate control for plants.
It has three main functions:
- lights: dimmable
- fans: move air throughout the enclosure
- mist: water the plants

Main microcontroller: esp32-c3

Info on auto-programming circuitry / strapping pins
https://dl.espressif.com/dl/schematics/esp32_devkitc_v4-sch-20180607a.pdf

strapping pins:
* io2, io8 should be pulled high
* io9 low = programming mode, high = normal boot
  * io9 has a weak internal pull-up

18v -> 3.3v for microcontroller

voltage converter circuit based on:
https://webench.ti.com/appinfo/webench/scripts/SDP.cgi?ID=A3B25FF3CB499236

datasheet page 27 shows layout

18v Power Input

J1 Conn_01x02
+18V
Cin1 1uF
Cin2 1uF
Cin3 1uF
Cinx1 100nF
U6 LMR54406DBVR
VIN, EN, SW, CB, FB, GND
L3 10uH
Cboot1 100nF
Rfbt1 69.8k
Rfbb1 22.1k
Cout1 10uF
Cout2 10uF
+3.3V

note: barrel jack for power input is offboard,
connected to the board by through-hole wires soldered in.

Humidity+Temperature Sensor

U4 SHT30-DIS
ADDR, RESET, R, VDD, VSS, SDA, SCL, ALERT
C4 .1uF
i2c pullup resistors
R4 4.7k
R15 4.7k
+3.3V

U1 ESP32-C3-WROOM-02-N4

R9 10k
R13 1k
en1
SW_Push
R12 10k
C5 10uF
C6 .1uF
R11 10k
EN, IO0, IO1, IO2, IO3, IO4, IO5, IO6, TXD, RXD, 3V3, IO7, IO8, IO9, IO10, IO18, IO19, GND
fan1_ctl
mist_ctl
led_ctl
boot1
SW_Push
R10 10k
LED status_led1
R1 470

USB for programming

J2 USB_B_Micro
VBUS, D+, D-, ID, Shield, GND
usb_dplus
usb_dminus
Conn_01x06 J3

this is a prototype,
so I'm making unused pins accessible
for experimentation

notes:
- this board design leaves the input voltage line from USB *disconnected*
- power input from the usb is not used for anything on the board
- to program the esp32, you must plug in usb to the computer *and* 18v wall power

LED Driver

powers 5 Cree XT-E LEDs and allows dimming
note: led driver contains internal caps to filter power input

PS1 LDD-700LS
+18V
C3 .1uF
+VIN, N.C_1, N.C_2, N.C_3, N.C_4, N.C_5, +VOUT_1, +VOUT_2, -VIN, N.C_9, PWM_DIM, N.C_8, N.C_7, N.C_6, -VOUT_2, -VOUT_1
led_ctl
R8 10k
D1 LED_Pad
D2 LED_Pad
D3 LED_Pad
D4 LED_Pad
D5 LED_Pad

FET gate driver (2 channel)

U5 IX4427N
VCC, INA, INB, OUTA, OUTB, GND
C2 .1uF
+18V
R3 10k
R7 10k

Fans

+18V
Conn_01x02 fan1
Conn_01x02 fan2
connector polarity:
pin 1 is Vcc
NOTE: fans are brushless,
so no freewheeling diode needed in parallel with FETs
Q1 Q_NMOS_GDS
R2 10k

Ultrasonic mister

+18V
Q3 Q_NMOS_GDS
L1 330uH
R6 10
R5 10k
C1 .1uF
mister1 Conn_01x02

mister1 connects to a
108kHz piezo water atomizer/mister

based on https://www.instructables.com/Make-Your-Own-Super-Simple-Ultrasonic-Mist-Maker/

Mounting Holes

H1 MountingHole_Pad
H2 MountingHole_Pad
H3 MountingHole_Pad
H4 MountingHole_Pad
H5 MountingHole_Pad

Sheet: /
File: pcb.kicad_sch

Title: Terrarium Control Board

Size: A4 | Date: 2024-07-18 | **Rev: v0.2**
KiCad E.D.A. 9.0.0 | Id: 1/1