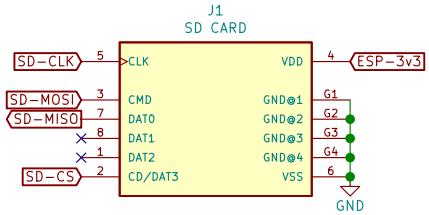
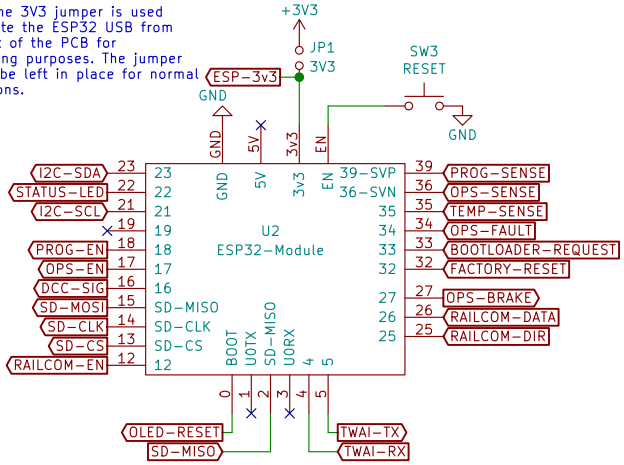
MicroSD Storage

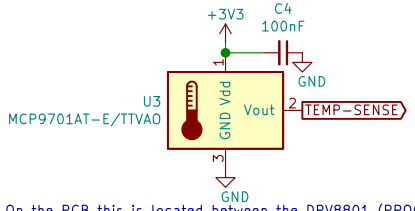


It is highly recommended to use a MicroSD card instead of the built-in flash for persistent configuration data as this will reduce the wear on the flash. The TTGO-T1 board has a built-in MicroSD slot that is wired in parallel to this one.

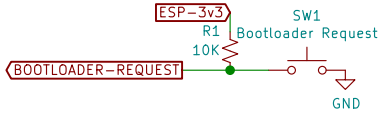
Note: The 3V3 jumper is used to isolate the ESP32 USB from the rest of the PCB for debugging purposes. The jumper should be left in place for normal operations.



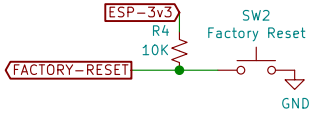
Ambient temperature sensor



On the PCB this is located between the DRV8801 (PROG) and the DRV8873 (OPS). The goal being to alert the user(s) when the PCB temperature is exceeding safe thresholds that are configured by the user.

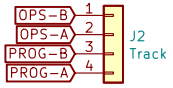


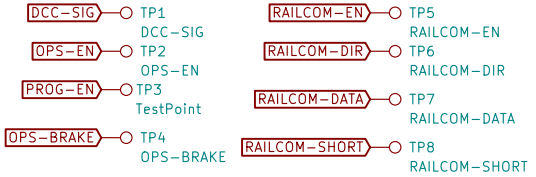
The bootloader button can be pressed on startup to have the node go into the OpenLCB Bootloader.



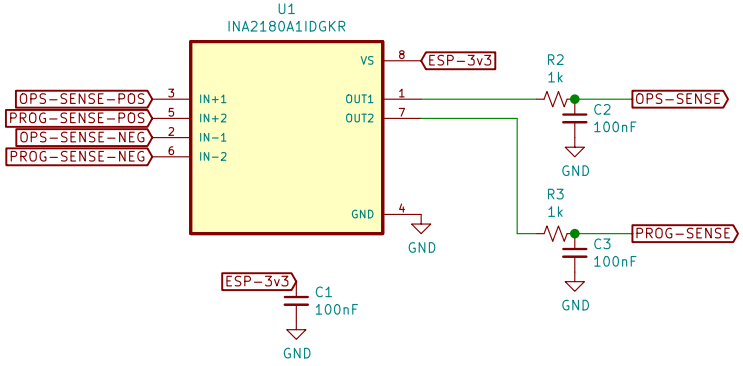
The Factory Reset button be pressed on startup to have the node reset all persistent configuration data.

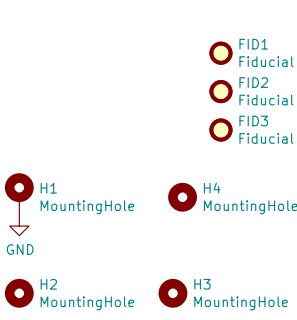
OPS and PROG track connection

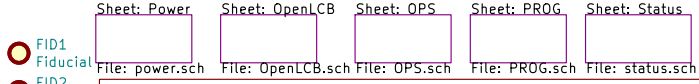




OPS and PROG current sense monitoring





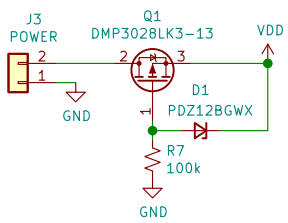


Sheet: /
File: esp32cspcb.sch

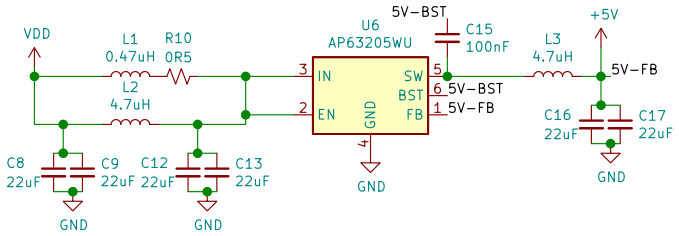
Title: ESP32 Command Station

Size: A4	Date: 2021-10-13	**Rev: v1.5.2**
KiCad E.D.A. kicad 5.1.10		Id: 1/6

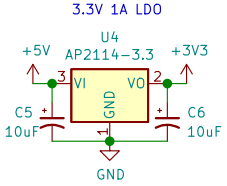
Incoming power with
Reverse Current protection



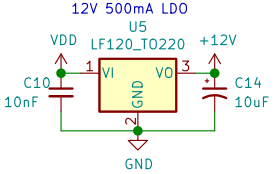
5V 2A buck converter



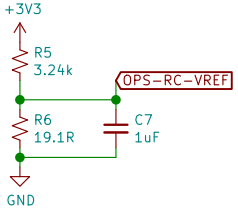
3.3V 1A LDO



12V 500mA LDO

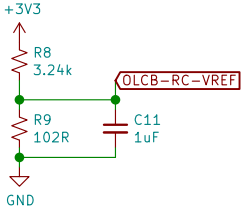


OPS track RailCom
reference voltage



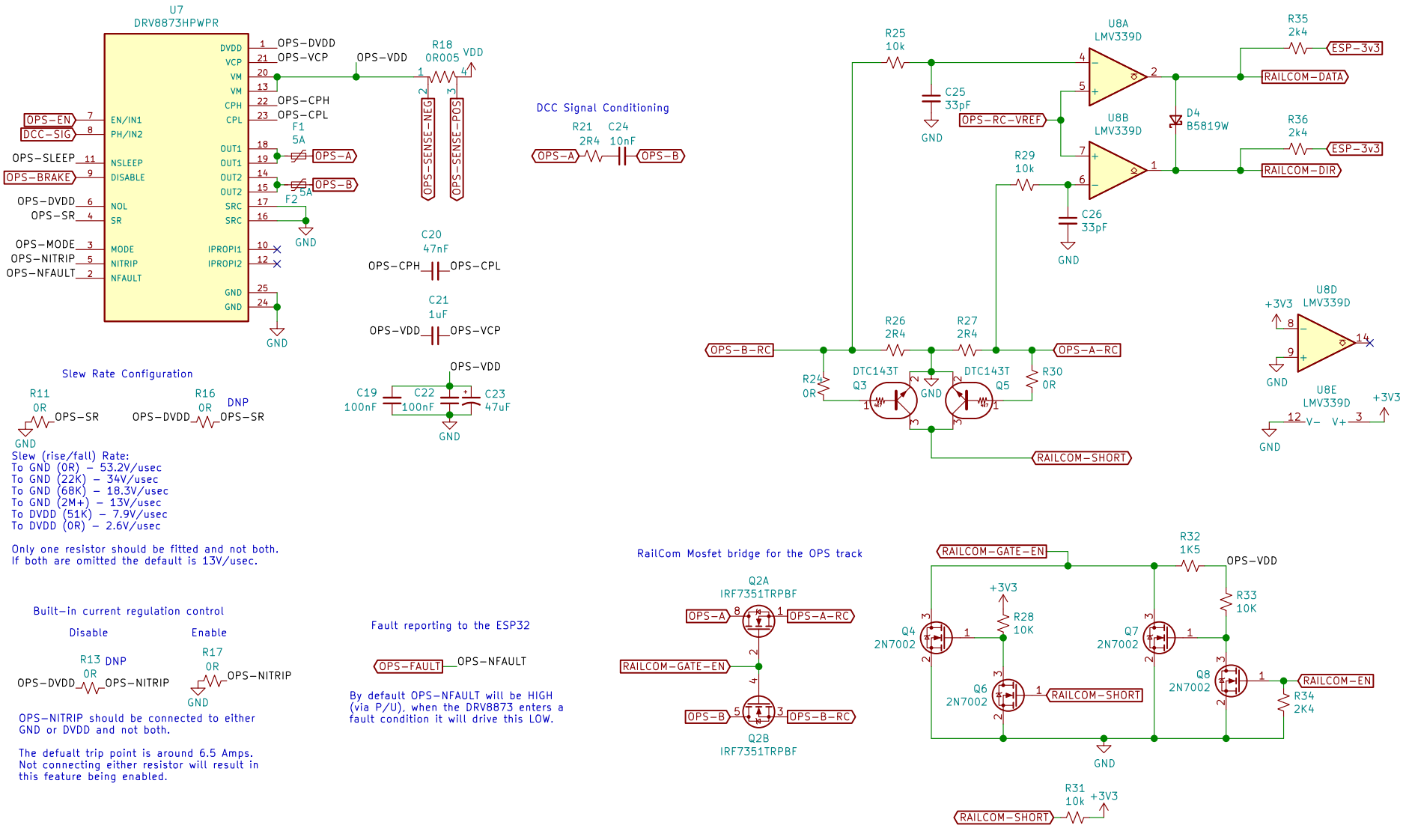
OPS-RC-VREF = (3.3v x R) / (R + R)
OPS-RC-VREF = (3.3 x 19.1) / (3240 + 19.1)
OPS-RC-VREF = 19mV

OpenLCB connection RailCom
reference voltage

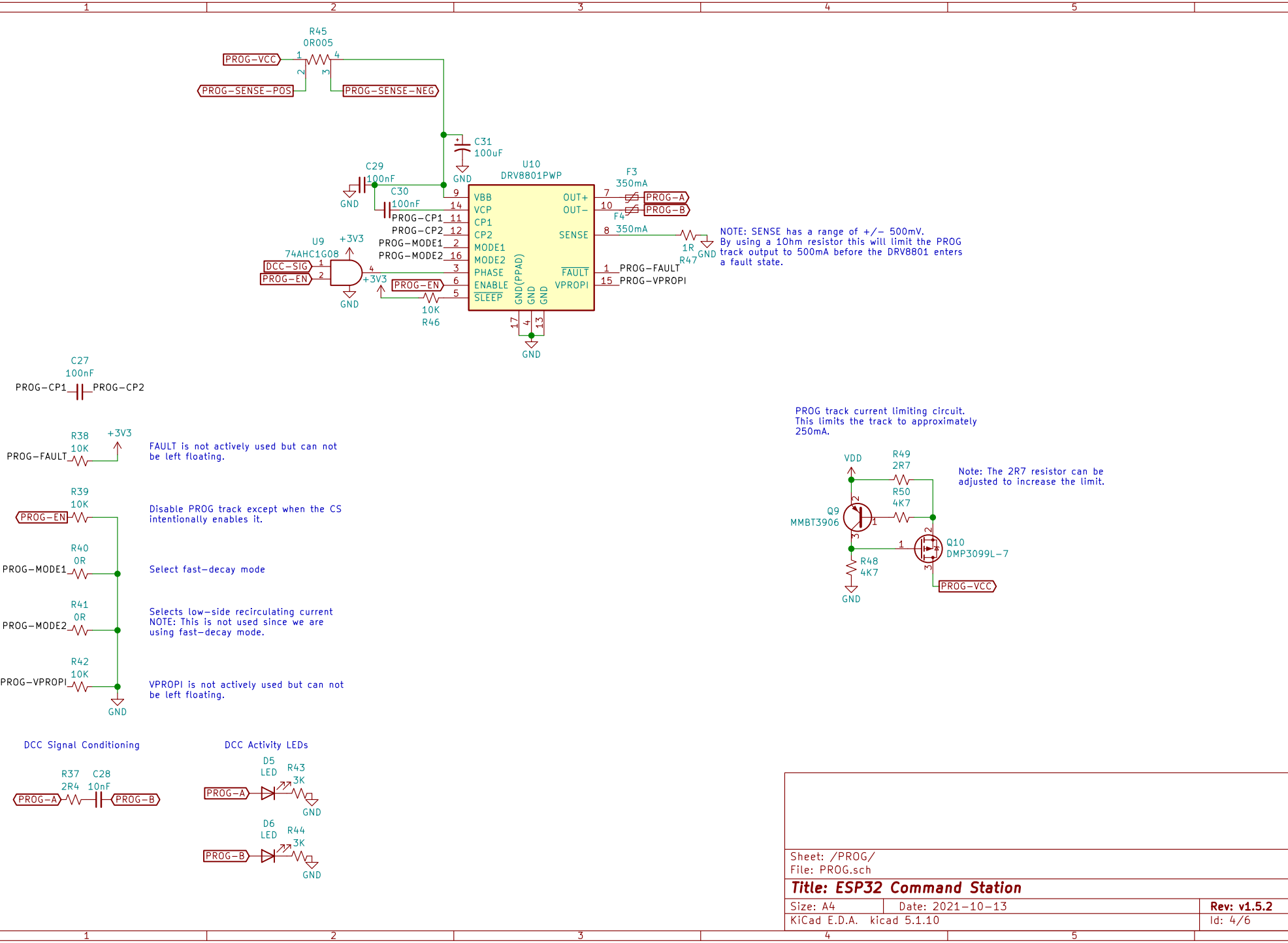


OLCB-RC-VREF = (3.3v x R) / (R + R)
OLCB-RC-VREF = (3.3v x 102) / (3240 + 102)
OLCB-RC-VREF = 101mV

Sheet: /Power/		
File: power.sch		
Title: ESP32 Command Station		
Size: A4	Date: 2021-10-13	**Rev: v1.5.2**
KiCad E.D.A. kicad 5.1.10		Id: 2/6

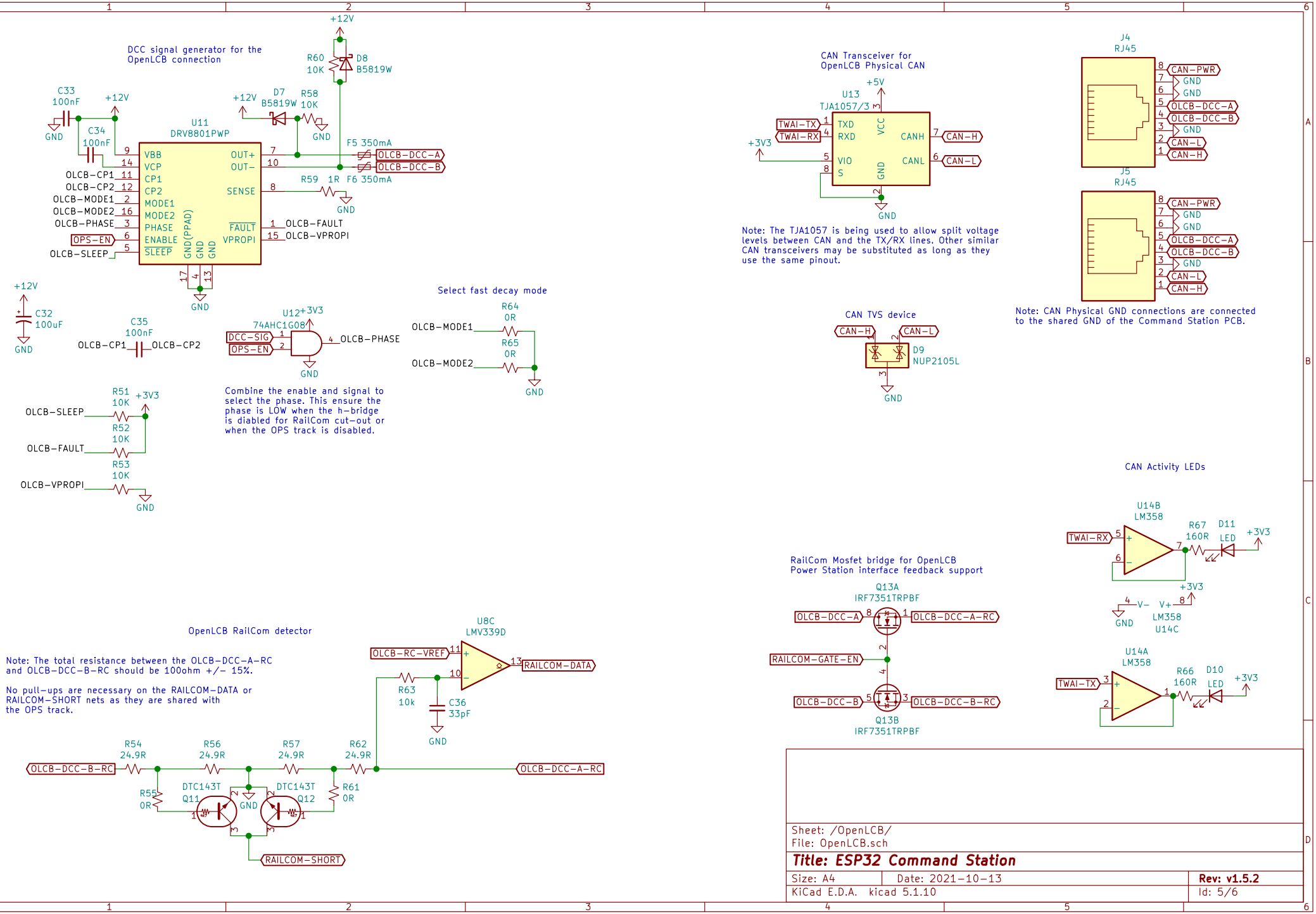


Sheet: /OPS/	
File: OPS.sch	
Title: ESP32 Command Station	
Size: A4	Date: 2021-10-13
KiCad E.D.A. kicad 5.1.10	**Rev: v1.5.2**
	Id: 3/6



Sheet: /PROG/	
File: PROG.sch	
Title: ESP32 Command Station	
Size: A4	Date: 2021-10-13
KiCad E.D.A. kicad 5.1.10	Id: 4/6

Rev: v1.5.2


DCC signal generator for the OpenLCB connection
U11
DRV8801PWP
VBB
VCP
CP1
CP2
MODE1
MODE2
PHASE
ENABLE
SLEEP
GND(PPAD)
OUT+
OUT−
SENSE
FAULT
VPROPI
OLCB-DCC-A
OLCB-DCC-B
OLCB-CP1
OLCB-CP2
OLCB-MODE1
OLCB-MODE2
OLCB-PHASE
OPS-EN
OLCB-SLEEP
OLCB-FAULT
OLCB-VPROPI
F5 350mA
F6 350mA
R59 1R
R60 10K
D8 B5819W
D7 B5819W
R58 10K
C33 100nF
C34 100nF
C32 100uF
C35 100nF
+12V
GND
U12
74AHC1G08
DCC-SIG
OPS-EN
+3V3
Select fast decay mode
R64 0R
R65 0R
Combine the enable and signal to select the phase. This ensure the phase is LOW when the h-bridge is diabled for RailCom cut-out or when the OPS track is disabled.
R51 10K
R52 10K
R53 10K
CAN Transceiver for OpenLCB Physical CAN
U13
TJA1057/3
TXD
RXD
VIO
S
VCC
GND
CANH
CANL
TWAI-TX
TWAI-RX
CAN-H
CAN-L
+5V
Note: The TJA1057 is being used to allow split voltage levels between CAN and the TX/RX lines. Other similar CAN transceivers may be substituted as long as they use the same pinout.
CAN TVS device
D9 NUP2105L
J4 RJ45
J5 RJ45
CAN-PWR
Note: CAN Physical GND connections are connected to the shared GND of the Command Station PCB.
CAN Activity LEDs
U14B LM358
U14A LM358
U14C LM358
R67 160R
R66 160R
D11 LED
D10 LED
RailCom Mosfet bridge for OpenLCB Power Station interface feedback support
Q13A IRF7351TRPBF
Q13B IRF7351TRPBF
RAILCOM-GATE-EN
OLCB-DCC-A-RC
OLCB-DCC-B-RC
OpenLCB RailCom detector
U8C LMV339D
OLCB-RC-VREF
RAILCOM-DATA
R63 10k
C36 33pF
R54 24.9R
R56 24.9R
R57 24.9R
R62 24.9R
R55 0R
R61 0R
DTC143T Q11
DTC143T Q12
RAILCOM-SHORT
Note: The total resistance between the OLCB-DCC-A-RC and OLCB-DCC-B-RC should be 100ohm +/- 15%.
No pull-ups are necessary on the RAILCOM-DATA or RAILCOM-SHORT nets as they are shared with the OPS track.
Sheet: /OpenLCB/
File: OpenLCB.sch
Title: ESP32 Command Station
Size: A4
Date: 2021-10-13
Rev: v1.5.2
KiCad E.D.A. kicad 5.1.10
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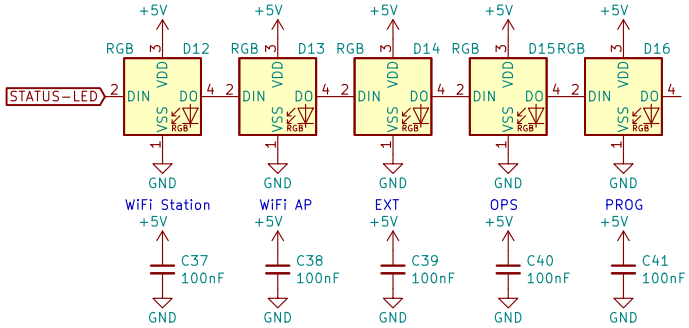
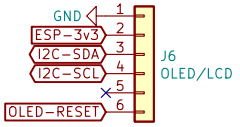
Status LEDs



WiFi:
Green [ON] – Station Connected
Green [Flashing] – Station Connecting
Blue [ON] – SoftAP Active
Blue [Flashing] – SoftAP Starting
Red – Disconnected

OPS / PROG:
Green = On
Off/Black = Off
Yellow = Usage warning (75% of limit)
Red = Fault/Short

Status Display connection



The Status Display connection is for adding an OLED or LCD display to the Command Station. The display shows real-time statistics and status information about the Command Station.

Note: OLED-RESET will be pulsed LOW for approximately 50ms during startup to allow a connected OLED display to reset.

I2C pull-up resistors

Sheet: /Status/		
File: status.sch		
Title:		
Size: A4	Date: 2021-10-13	**Rev: v1.5.2**
KiCad E.D.A. kicad 5.1.10		Id: 6/6