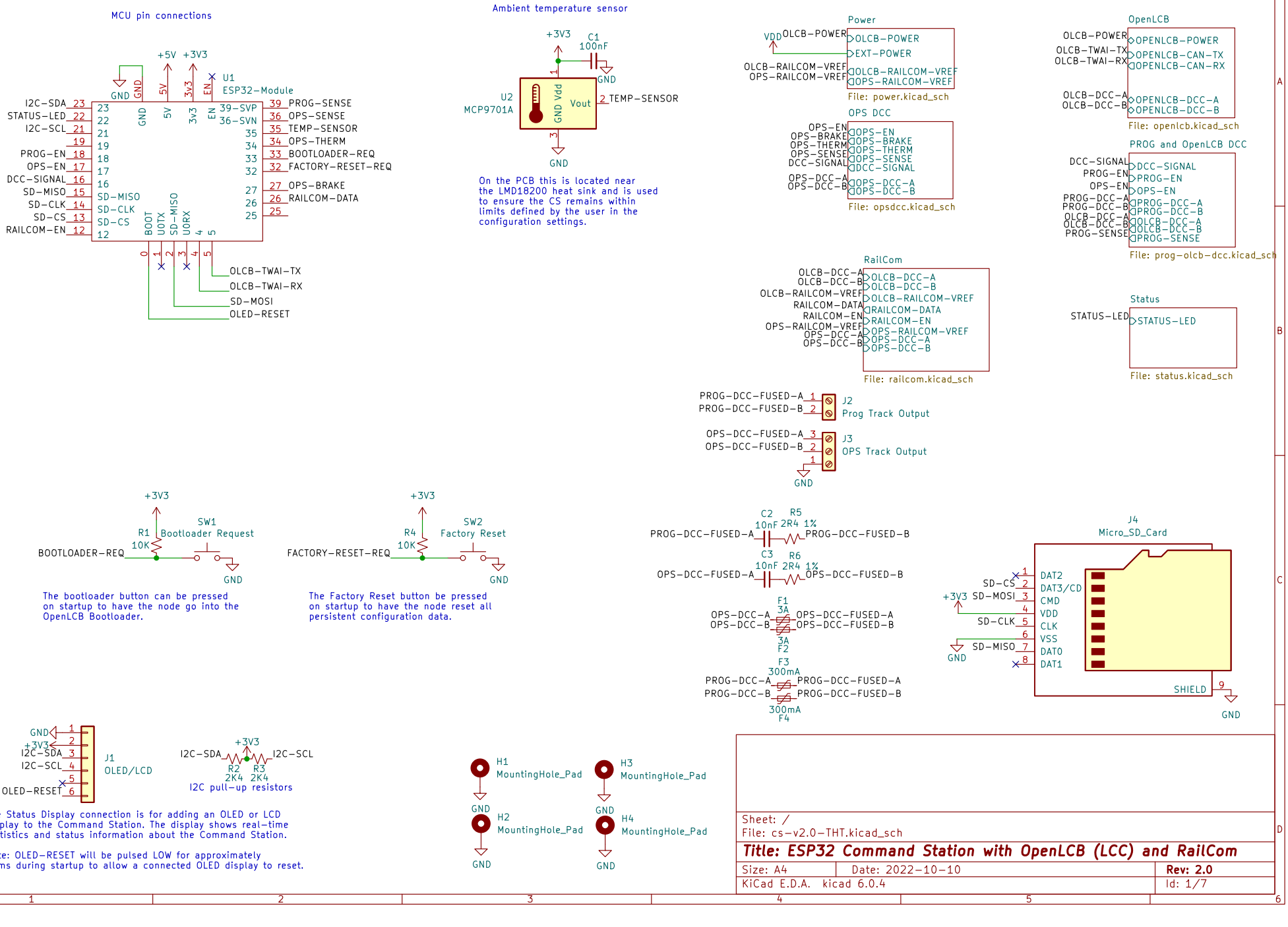
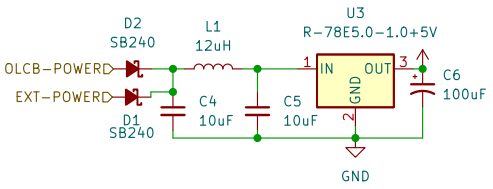
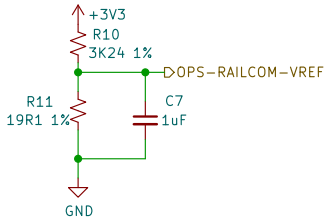

MCU pin connections
U1
ESP32-Module
I2C-SDA
STATUS-LED
I2C-SCL
PROG-EN
OPS-EN
DCC-SIGNAL
SD-MISO
SD-CLK
SD-CS
RAILCOM-EN
PROG-SENSE
OPS-SENSE
TEMP-SENSOR
OPS-THERM
BOOTLOADER-REQ
FACTORY-RESET-REQ
OPS-BRAKE
RAILCOM-DATA
OLCB-TWAI-TX
OLCB-TWAI-RX
SD-MOSI
OLED-RESET
Ambient temperature sensor
U2
MCP9701A
C1
100nF
TEMP-SENSOR
On the PCB this is located near the LMD18200 heat sink and is used to ensure the CS remains within limits defined by the user in the configuration settings.
Power
OLCB-POWER
EXT-POWER
OLCB-RAILCOM-VREF
OPS-RAILCOM-VREF
File: power.kicad_sch
OPS DCC
OPS-EN
OPS-BRAKE
OPS-THERM
OPS-SENSE
DCC-SIGNAL
OPS-DCC-A
OPS-DCC-B
File: opsdcc.kicad_sch
OpenLCB
OPENLCB-POWER
OPENLCB-CAN-TX
OPENLCB-CAN-RX
OPENLCB-DCC-A
OPENLCB-DCC-B
File: openlcb.kicad_sch
PROG and OpenLCB DCC
PROG-DCC-A
PROG-DCC-B
PROG-SENSE
File: prog-olcb-dcc.kicad_sch
RailCom
RAILCOM-DATA
RAILCOM-EN
File: railcom.kicad_sch
Status
STATUS-LED
File: status.kicad_sch
PROG-DCC-FUSED-A
PROG-DCC-FUSED-B
J2
Prog Track Output
OPS-DCC-FUSED-A
OPS-DCC-FUSED-B
J3
OPS Track Output
SW1
Bootloader Request
R1
10K
The bootloader button can be pressed on startup to have the node go into the OpenLCB Bootloader.
SW2
Factory Reset
R4
10K
The Factory Reset button be pressed on startup to have the node reset all persistent configuration data.
C2
10nF
R5
2R4 1%
C3
10nF
R6
2R4 1%
F1
3A
F2
3A
F3
300mA
F4
300mA
J4
Micro_SD_Card
DAT2
DAT3/CD
CMD
VDD
CLK
VSS
DAT0
DAT1
SHIELD
J1
OLED/LCD
I2C pull-up resistors
R2
2K4
R3
2K4
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.
H1
MountingHole_Pad
H2
MountingHole_Pad
H3
MountingHole_Pad
H4
MountingHole_Pad
Sheet: /
File: cs-v2.0-THT.kicad_sch
Title: ESP32 Command Station with OpenLCB (LCC) and RailCom
Size: A4
Date: 2022-10-10
Rev: 2.0
KiCad E.D.A. kicad 6.0.4
Id: 1/7

5V 1A voltage regulator

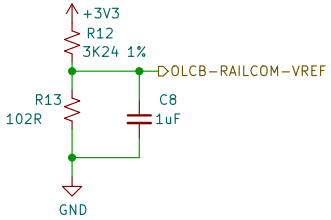


OPS RailCom Reference Voltage



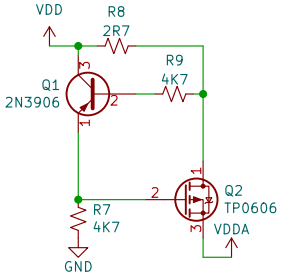
RAILCOM-VREF = (3v3 + R12) / (R11 + R12)
RAILCOM-VREF = (3v3 + 16) / (2700 + 16)
RAILCOM-VREF = 19mA

OpenLCB RailCom Reference Voltage

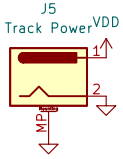


RAILCOM-VREF = (3v3 + R12) / (R11 + R12)
RAILCOM-VREF = (3v3 + 16) / (2700 + 16)
RAILCOM-VREF = 19mA

PROG/LCC-DCC Supply

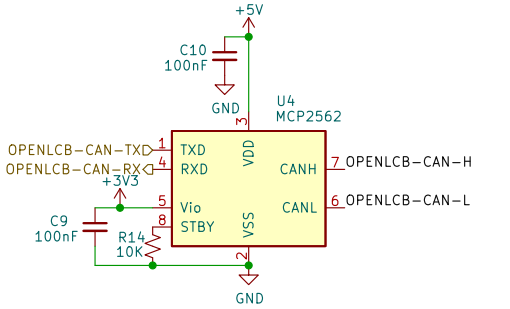


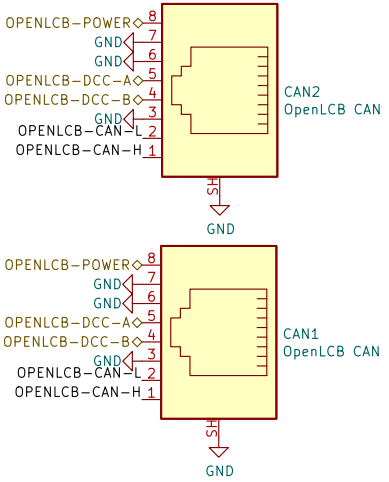
Note: This limits the current to ~250mA.
To increase the current 2R7 can be adjusted.
Or a jumper can be added between the 2N3906 pin 3 to TP0606 pin 3 and all five components can be omitted to disable current limiting.



Sheet: /Power/	
File: power.kicad_sch	
Title: ESP32 Command Station with OpenLCB (LCC) and RailCom	
Size: A4	Date: 2022-10-10
KiCad E.D.A. kicad 6.0.4	Id: 2/7

Rev: 2.0



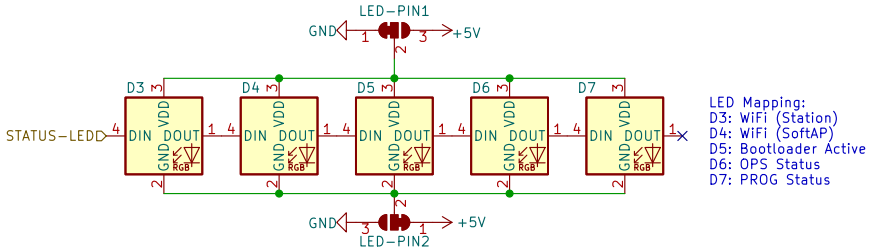


Sheet: /OpenLCB/
File: openlcb.kicad_sch

Title: ESP32 Command Station with OpenLCB (LCC) and RailCom

Size: A4	Date: 2022-10-10	**Rev: 2.0**
KiCad E.D.A. kicad 6.0.4		Id: 3/7

Command Station status output RGB LEDs



LED Mapping:
D3: WiFi (Station)
D4: WiFi (SoftAP)
D5: Bootloader Active
D6: OPS Status
D7: PROG Status

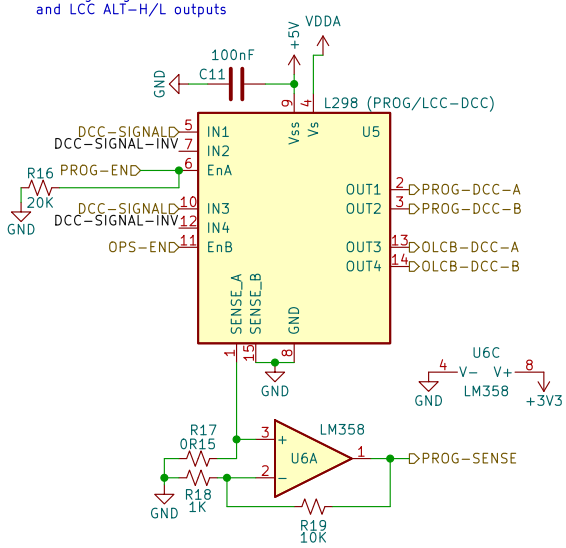
Note: LED-PIN1 and LED-PIN2 set to the APA106 (included in PCB kit).
For WS2812B LEDs cut the traces and add a solder bridge to the opposite pad.

Sheet: /Status/
File: status.kicad_sch

Title: ESP32 Command Station with OpenLCB (LCC) and RailCom

Size: A4	Date: 2022-10-10	**Rev: 2.0**
KiCad E.D.A. kicad 6.0.4		Id: 4/7

DCC signal generator for PROG track
and LCC ALT-H/L outputs

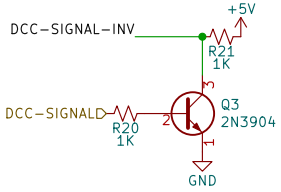


TP1
PROG EN
PROG-EN

TP2
DCC INV
DCC-SIGNAL-INV

Note: LOW side current sense is being used for the PROG track output.
OLCB-DCC output is not monitored. PROG-EN has a PD to force the output
to OFF when not actively used.

OPS track signal split for L298 h-bridge

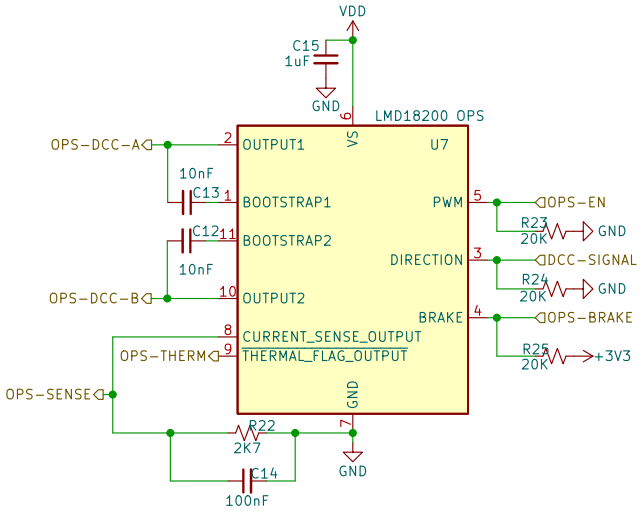


Sheet: /PROG and OpenLCB DCC/
File: prog-olcb-dcc.kicad_sch

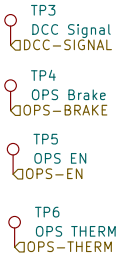
Title: ESP32 Command Station with OpenLCB (LCC) and RailCom

Size: A4	Date: 2022-10-10	**Rev: 2.0**
KiCad E.D.A. kicad 6.0.4		Id: 5/7

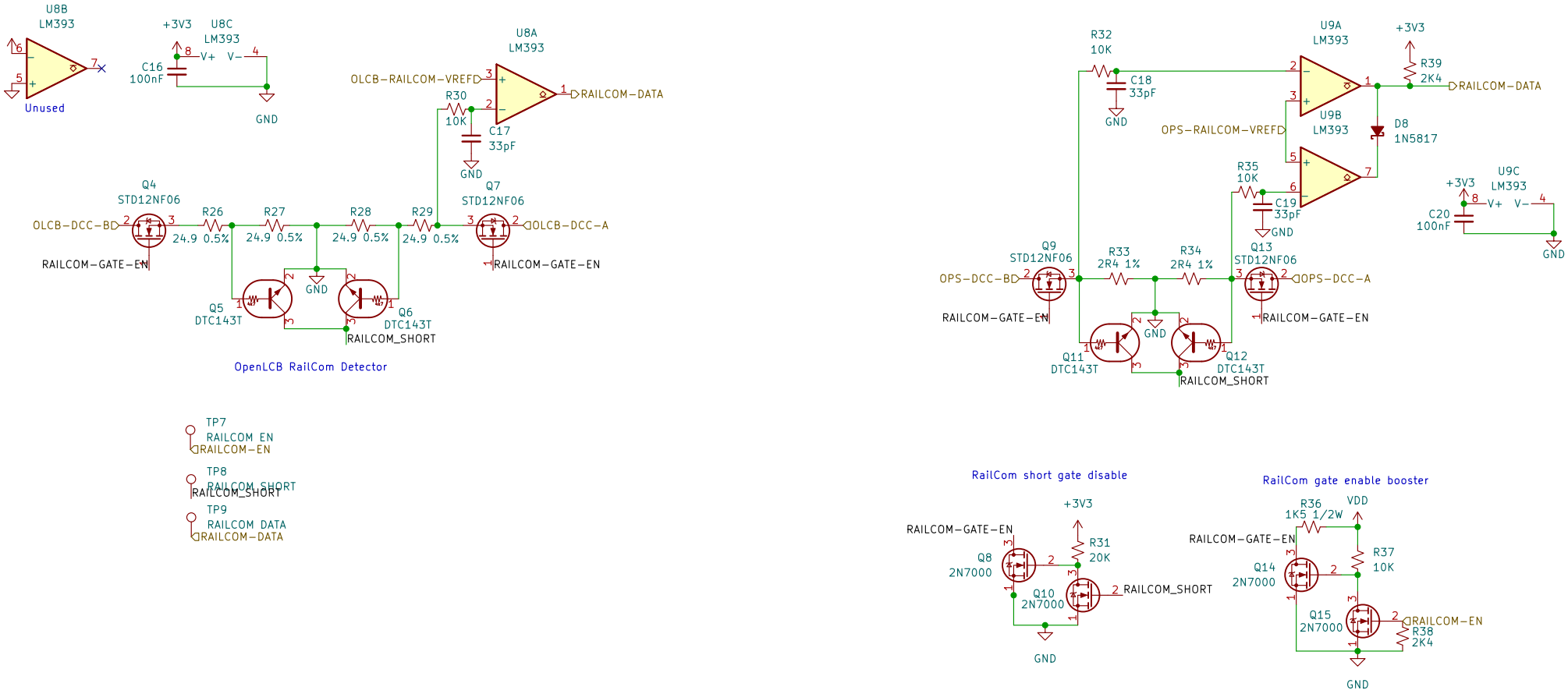
DCC Signal generation for OPS track



Note: The CURRENT_SENSE_OUTPUT is an INLINE output from the h-bridge. The PWM and DIR have a PULL-DOWN and BRAKE has a PULL-UP to force the LMD18200 into a known state on startup (IE: OFF)



Sheet: /OPS DCC/		
File: opsdcc.kicad_sch		
Title: ESP32 Command Station with OpenLCB (LCC) and RailCom		
Size: A4	Date: 2022-10-10	**Rev: 2.0**
KiCad E.D.A. kicad 6.0.4		Id: 6/7



Sheet: /RailCom/		
File: railcom.kicad_sch		
Title: ESP32 Command Station with OpenLCB (LCC) and RailCom		
Size: A4	Date: 2022-10-10	**Rev: 2.0**
KiCad E.D.A. kicad 6.0.4		Id: 7/7