Tester

+5V +3V3

EVSE_SDA
EVSE_SCL

EVSE_SCK
EVSE_MISO
EVSE_MOSI

EVSE_Reset

EVSE_TX
EVSE_RX

GFCI_Test_15
GFCI_Test_20

Connected
Charge
Vent
Diode

Amp_Read
Pilor_Read

GFCI_Test_Disable

GND

File: Tester.kicad_sch

GND

MCU

+3V3

EVSE_SDA
EVSE_SCL

EVSE_SCK
EVSE_MISO
EVSE_MOSI

EVSE_Reset

EVSE_TX
EVSE_RX

GFCI_Test_15
GFCI_Test_20

Connected
Charge
Vent
Diode

Amp_Read
Pilor_Read

GFCI_Test_Disable

DC_Relay_1_Test
DC_Relay_2_Test
Earth_Disconnect
Test_Power
Test_Mode

ESP32_RX
ESP32_TX
RTS
DTR

GND

File: MCU.kicad_sch

GND

Relay Board

+5V +3V3

DC_Relay_1_Test
DC_Relay_2_Test
Earth_Disconnect
Test_Power
Test_Mode

GND

File: Relay_Board.kicad_sch

GND

Pi Hat

+5V

TXD
RXD
RTS
DTR

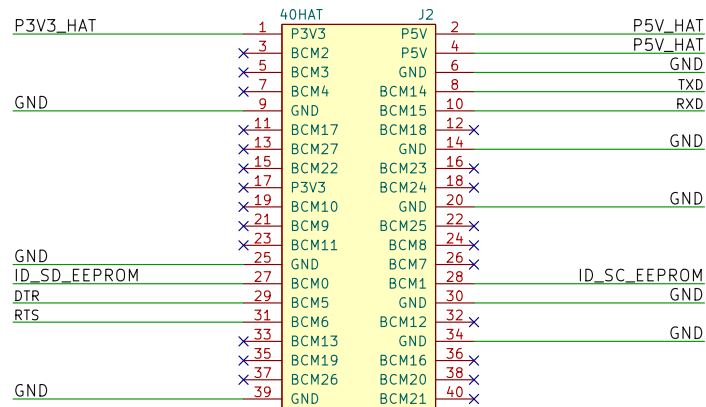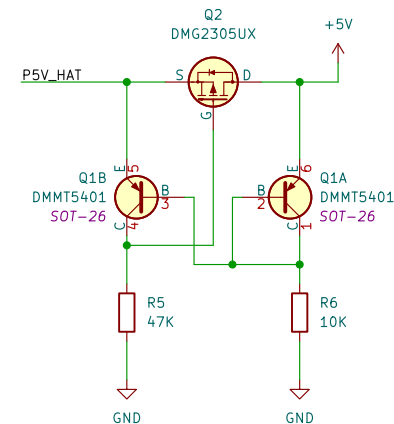GND

File: Pi_Hat.kicad_sch

GND

Sheet: /
File: Control_board.kicad_sch

Title: **Raspberry Pi HAT**

Size: A4 | Date: | Rev: A

KiCad E.D.A. kicad 6.0.2−378541a8eb~116~ubuntu21.10.1 | Id: 1/5

This is based on the official Raspberry Pi spec to be able to call an extension board a HAT.
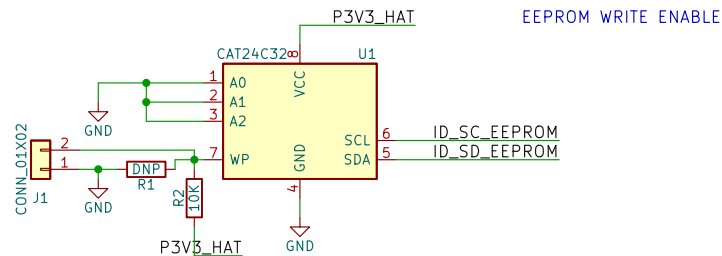https://github.com/raspberrypi/hats/blob/master/designguide.md

40-Pin HAT Connector

40HAT   J2

P3V3_HAT	1 P3V3	P5V 2	P5V_HAT
	3 BCM2	P5V 4	P5V_HAT
	5 BCM3	GND 6	GND
	7 BCM4	BCM14 8	TXD
GND	9 GND	BCM15 10	RXD
	11 BCM17	BCM18 12	
	13 BCM27	GND 14	GND
	15 BCM22	BCM23 16	
	17 P3V3	BCM24 18	
	19 BCM10	GND 20	GND
	21 BCM9	BCM25 22	
	23 BCM11	BCM8 24	
GND	25 GND	BCM7 26	
ID_SD_EEPROM	27 BCM0	BCM1 28	ID_SC_EEPROM
DTR	29 BCM5	GND 30	GND
RTS	31 BCM6	BCM12 32	
	33 BCM13	GND 34	GND
	35 BCM19	BCM16 36	
	37 BCM26	BCM20 38	
GND	39 GND	BCM21 40	

5V back power protection

Q2
DMG2305UX   +5V

P5V_HAT   S   D

Q1B   Q1A
DMMT5401   DMMT5401
SOT-26   SOT-26

R5   R6
47K   10K
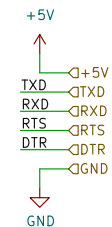
GND   GND

HAT EEPROM

The HAT spec requires this EEPROM with system information
to be in place in order to be called a HAT. It should be set up as write
protected (WP pin held high), so it may be desirable to either put a
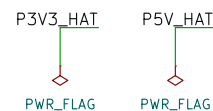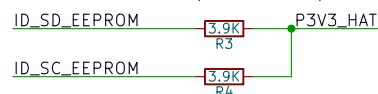jumper as shown to enable writing, or to hook up a spare IO pin to do so.

EEPROM WRITE ENABLE

P3V3_HAT

CAT24C32   U1
1 A0   VCC 8
2 A1
3 A2
7 WP   SCL 6   ID_SC_EEPROM
           SDA 5   ID_SD_EEPROM
           GND 4

CONN_01X02 J1
2
1
DNP   GND
R1   R2
      10K

P3V3_HAT   GND

Mounting Holes

H1   H3
3mm_Mounting_Hole 3mm_Mounting_Hole

H2   H4
3mm_Mounting_Hole 3mm_Mounting_Hole

+5V

TXD
RXD
RTS
DTR

+5V
TXD
RXD
RTS
DTR
GND

GND

Pullup Resistors

These are just pullup resistors for the I2C bus on the EEPROM.
The resistor values are per the HAT spec.

ID_SD_EEPROM   3.9K   P3V3_HAT
                R3

ID_SC_EEPROM   3.9K
                R4

P3V3_HAT   P5V_HAT

PWR_FLAG   PWR_FLAG

GFCI Trip Test

+5V

J3
GFCI_Trip_Test

R8 330
R9 250

Q3 BSS138
GFCI_Test_15

Q4 BSS138
GFCI_Test_20

GND

EVSE Digital Connections

+3V3 +5V

C4 10uF
C5 10uF

GND GND

U3
TXB0108DQSR

OE
VCCA VCCB
GND

EVSE_RX	1	A1	B1	20	EVSE_RX_5V
EVSE_TX	2	A2	B2	19	EVSE_TX_5V
EVSE_MOSI	3	A3	B3	18	EVSE_MOSI_5V
EVSE_MISO	4	A4	B4	17	EVSE_MISO_5V
EVSE_SCK	7	A5	B5	14	EVSE_SCK_5V
EVSE_SDA	8	A6	B6	13	EVSE_SDA_5V
EVSE_SCL	9	A7	B7	12	EVSE_SCL_5V
EVSE_Reset	10	A8	B8	11	EVSE_Reset_5V

GND

EVSE_Reset_5V 6
EVSE_TX_5V 5
EVSE_RX_5V 4
3
2
J6
EVSE_UART
GND

J5
EVSE_Prog
+5V

EVSE_MISO_5V 1   2
EVSE_SCK_5V 3   4   EVSE_MOSI
EVSE_Reset_5V 5   6

GND

EVSE_SDA_5V 4
EVSE_SCL_5V 3
2
1
J7
I2C

GND

+5V
+3V3

+5V
+3V3

EVSE_RX	EVSE_RX
EVSE_TX	EVSE_TX
EVSE_MOSI	EVSE_MOSI
EVSE_MISO	EVSE_MISO
EVSE_SCK	EVSE_SCK
EVSE_SDA	EVSE_SDA
EVSE_SCL	EVSE_SCL
EVSE_Reset	EVSE_Reset
GFCI_Test_15	GFCI_Test_15
GFCI_Test_20	GFCI_Test_20
Pilor_Read	Pilor_Read
Amp_Read	Amp_Read
GFCI_Test_Disable	GFCI_Test_Disable
Connected	Connected
Charge	Charge
Vent	Vent
Diode	Diode

GND

Pilot Test

+3V3

U2
NCS20071SN

+3V3

R10 56K

R12 200K

Pilot

Pilor_Read

R7 150

GND

R11 100K

GND

R13 2K7
R15 1K3
R16 330

Connected
Q5 BSS138

Charge
Q7 BSS138

Vent
Q8 BSS138

J4
Pilot

R14 1K

Diode
Q6 BC818

D1 1N4148WS

GND

GFCI Enable

J8
GFCI_In

J9
GFCI_Out

+3V3

R17 R

Q9 BSS138

GFCI_Test_Disable

CT Output

Amp_Read

J10
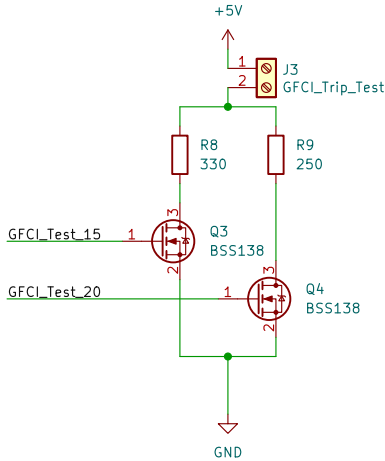AMP_CT

Sheet: /Tester/
File: Tester.kicad_sch
Title:
Size: A4   Date:
KiCad E.D.A. kicad 6.0.2−378541a8eb~116~ubuntu21.10.1
Rev:
Id: 3/5

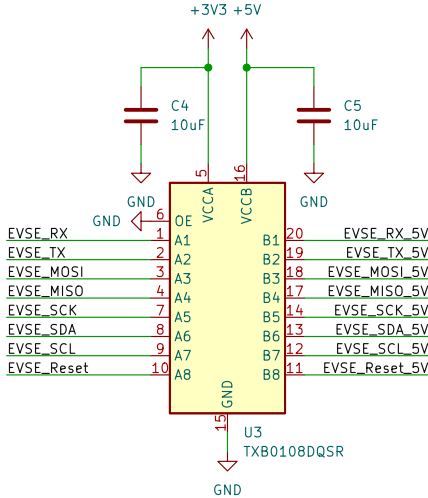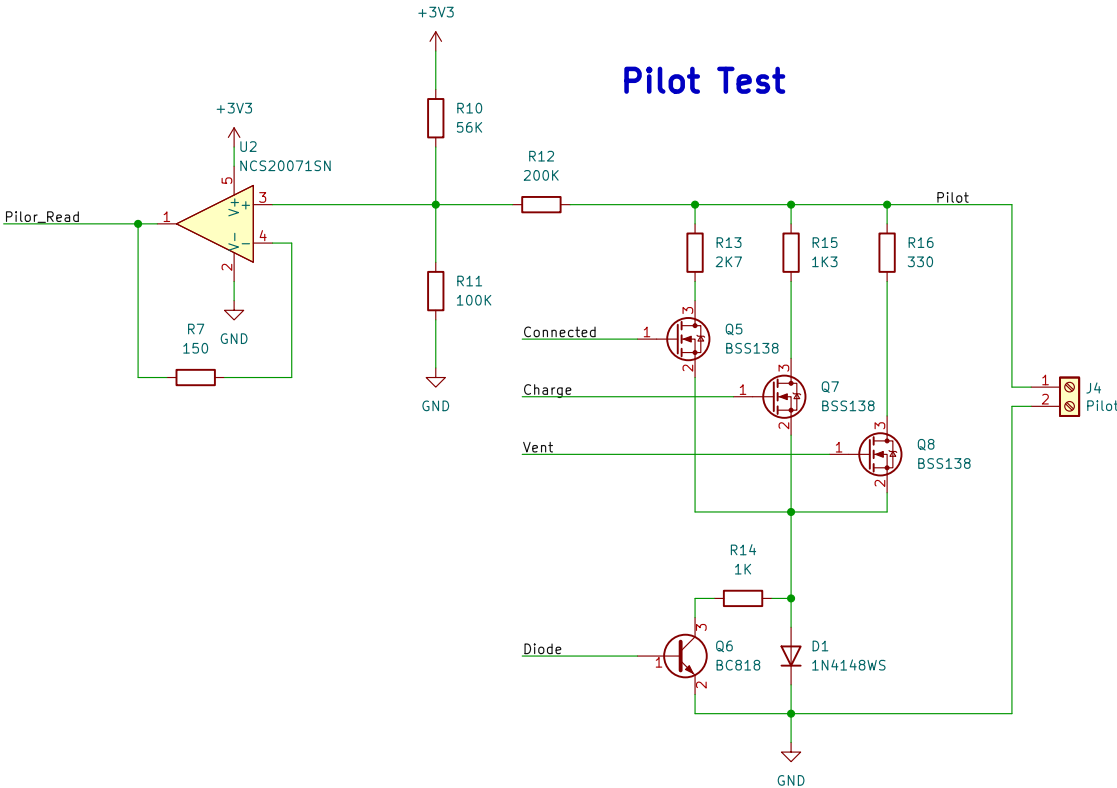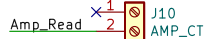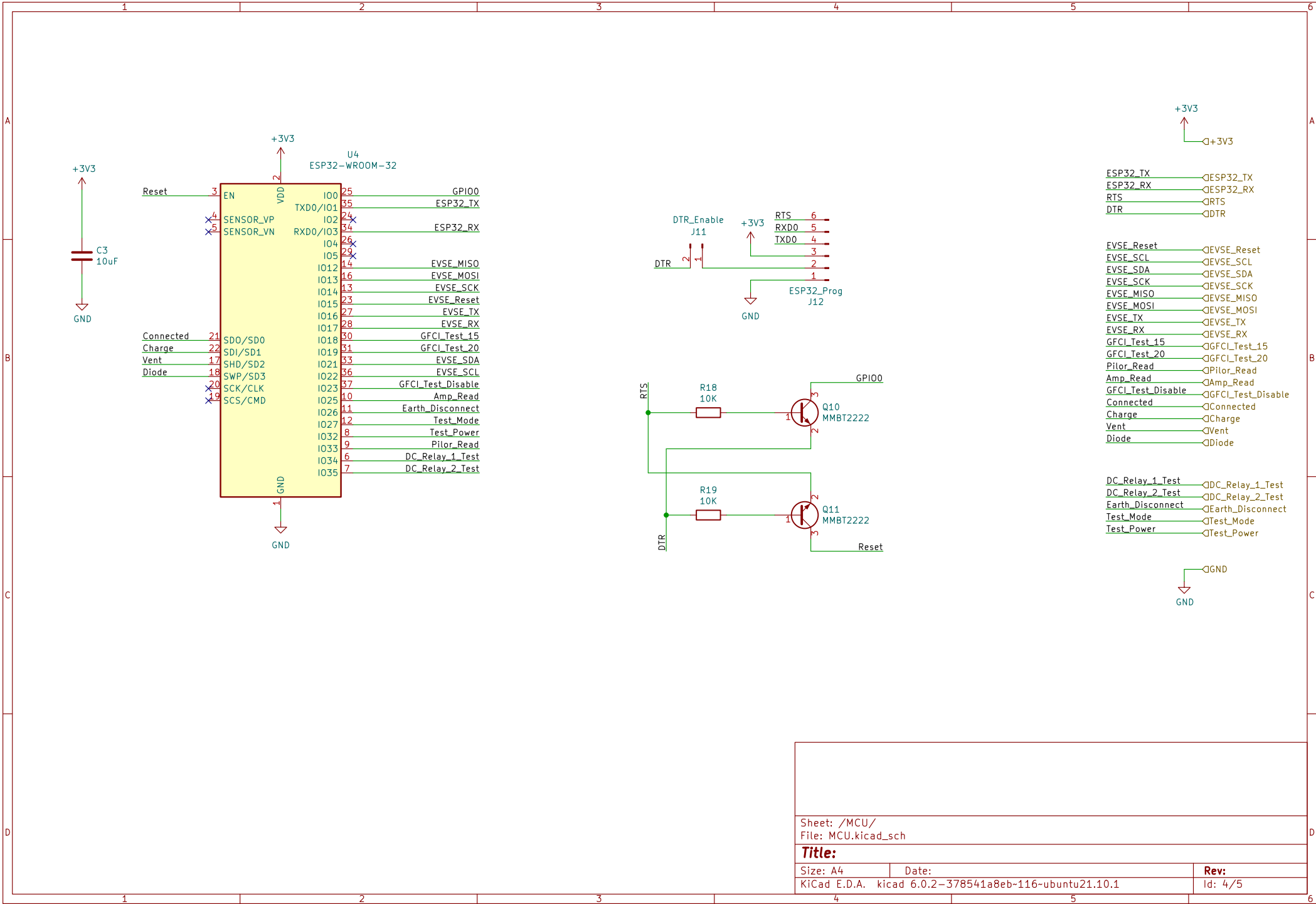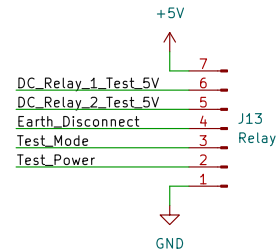## U4
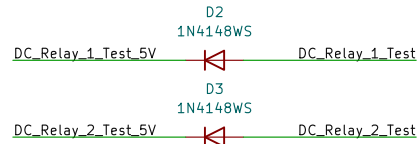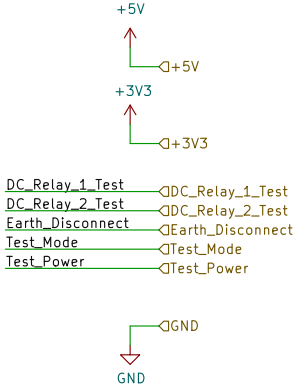### ESP32-WROOM-32

Pin	Signal		Pin	Signal
3	EN	VDD	2	
4	SENSOR_VP	IO0	25	GPIO0
5	SENSOR_VN	TXD0/IO1	35	ESP32_TX
		IO2	24	
		RXD0/IO3	34	ESP32_RX
		IO4	26	
		IO5	29	
		IO12	14	EVSE_MISO
		IO13	16	EVSE_MOSI
		IO14	13	EVSE_SCK
		IO15	23	EVSE_Reset
		IO16	27	EVSE_TX
		IO17	28	EVSE_RX
21	SD0/SD0	IO18	30	GFCI_Test_15
22	SDI/SD1	IO19	31	GFCI_Test_20
17	SHD/SD2	IO21	33	EVSE_SDA
18	SWP/SD3	IO22	36	EVSE_SCL
20	SCK/CLK	IO23	37	GFCI_Test_Disable
19	SCS/CMD	IO25	10	Amp_Read
		IO26	11	Earth_Disconnect
		IO27	12	Test_Mode
		IO32	8	Test_Power
		IO33	9	Pilor_Read
		IO34	6	DC_Relay_1_Test
		IO35	7	DC_Relay_2_Test
	GND		1	

+3V3

Reset

C3
10uF

GND

Connected
Charge
Vent
Diode

GND

DTR_Enable
J11

DTR

+3V3

RTS	6
RXD0	5
TXD0	4
	3
	2
	1

ESP32_Prog
J12

GND

RTS

R18
10K

Q10
MMBT2222

GPIO0

DTR

R19
10K

Q11
MMBT2222

Reset

+3V3

+3V3

ESP32_TX   ESP32_TX
ESP32_RX   ESP32_RX
RTS   RTS
DTR   DTR

EVSE_Reset   EVSE_Reset
EVSE_SCL   EVSE_SCL
EVSE_SDA   EVSE_SDA
EVSE_SCK   EVSE_SCK
EVSE_MISO   EVSE_MISO
EVSE_MOSI   EVSE_MOSI
EVSE_TX   EVSE_TX
EVSE_RX   EVSE_RX
GFCI_Test_15   GFCI_Test_15
GFCI_Test_20   GFCI_Test_20
Pilor_Read   Pilor_Read
Amp_Read   Amp_Read
GFCI_Test_Disable   GFCI_Test_Disable
Connected   Connected
Charge   Charge
Vent   Vent
Diode   Diode

DC_Relay_1_Test   DC_Relay_1_Test
DC_Relay_2_Test   DC_Relay_2_Test
Earth_Disconnect   Earth_Disconnect
Test_Mode   Test_Mode
Test_Power   Test_Power

GND

GND

Level shift Inputs

Relay Board Connector

+5V

	7	
DC_Relay_1_Test_5V	6	
DC_Relay_2_Test_5V	5	J13
Earth_Disconnect	4	Relay
Test_Mode	3	
Test_Power	2	
	1	

GND

D2
1N4148WS

DC_Relay_1_Test_5V ▷|◁ DC_Relay_1_Test

D3
1N4148WS

DC_Relay_2_Test_5V ▷|◁ DC_Relay_2_Test

+5V

+3V3

+5V ▷+5V

+3V3 ▷+3V3

DC_Relay_1_Test ▷DC_Relay_1_Test
DC_Relay_2_Test ▷DC_Relay_2_Test
Earth_Disconnect ▷Earth_Disconnect
Test_Mode ▷Test_Mode
Test_Power ▷Test_Power

▷GND

GND

3.3v power

+5V   U5   +3V3
       AP2112K-3.3

1 VIN VOUT 5
3 EN
   GND

C1   R20   C2
10uF   100K   10uF

GND   GND   GND   GND

+5V

PWR_FLAG

PWR_FLAG

GND