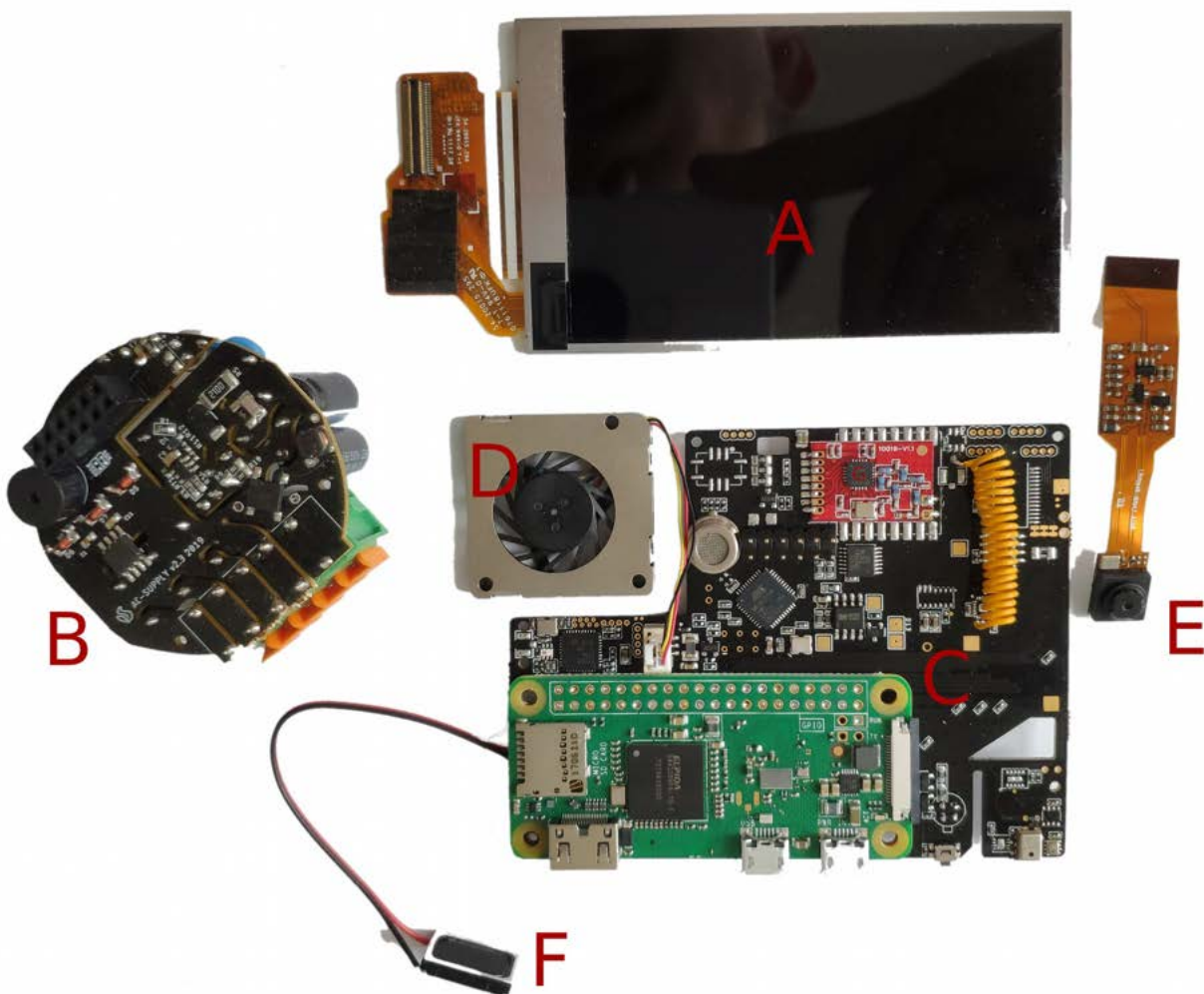


Smart Home Peripheral Interface – Open Smart Home Interface based on Raspberry Pi Zero W

Overview Hardware Internals

- A : AOU A035VW01 Display
- B : AC power supply 100 – 240VAC 50/60Hz
- C : Mainboard with mounted Raspberry Pi Zero W
- D : PWM controlled micro blower
- E : Example Camera for Pi Zero W (optional)
- F : Speaker (optional)
- G : TI CC1101 radio module with antenna (DIY, optional)



GPIO Documentation

SHPI.zero with AC supply



Raspberry PI – GPIO configuration

3.3V Ausgang	3.3V	① ②	5V	5V Eingang
DPI V-SYNC	BCM 2	③ ④	5V	5V Eingang
DPI H-SYNC	BCM 3	⑤ ⑥	GND	Masse
DPI Blue 2	BCM 4	⑦ ⑧	BCM 14	DPI Green 4
Masse	GND	⑨ ⑩	BCM 15	DPI Green 5
DPI Green 7	BCM 17	⑪ ⑫	BCM 18	Bewegungsmelder
Zigbee (P2.1)	BCM 27	⑬ ⑭	GND	Masse
DPI Red 4	BCM 22	⑮ ⑯	BCM 23	DPI Red 5
3.3V Ausgang	3.3V	⑰ ⑱	BCM 24	DPI Red 6
Zigbee (P2.2) Amplifier Enable	BCM 10	⑲ ⑳	GND	Masse
DPI Blue 7	BCM 9	㉑ ㉒	BCM 25	DPI Red 7
RESET ATmega	BCM 11	㉓ ㉔	BCM 8	DPI Blue 6
Masse	GND	㉕ ㉖	BCM 7	DPI Blue 5
DPI DCLK	BCM 0	㉗ ㉘	BCM 1	DPI Enable
DPI Blue 3	BCM 5	㉙ ㉚	GND	Masse
DPI Blue 4	BCM 6	㉛ ㉜	BCM 12	DPI Green 2
DPI Green 3	BCM 13	㉝ ㉞	GND	Masse
frei	BCM 19	㉟ ㊱	BCM 16	DPI Green 6
Touch INT	BCM 26	㊲ ㊳	BCM 20	DPI Red 2
Masse	GND	㊴ ㊵	BCM 21	DPI Red 3

Input	●
Output	●
Display	○
Supply	●

AVR ATmega 32U4

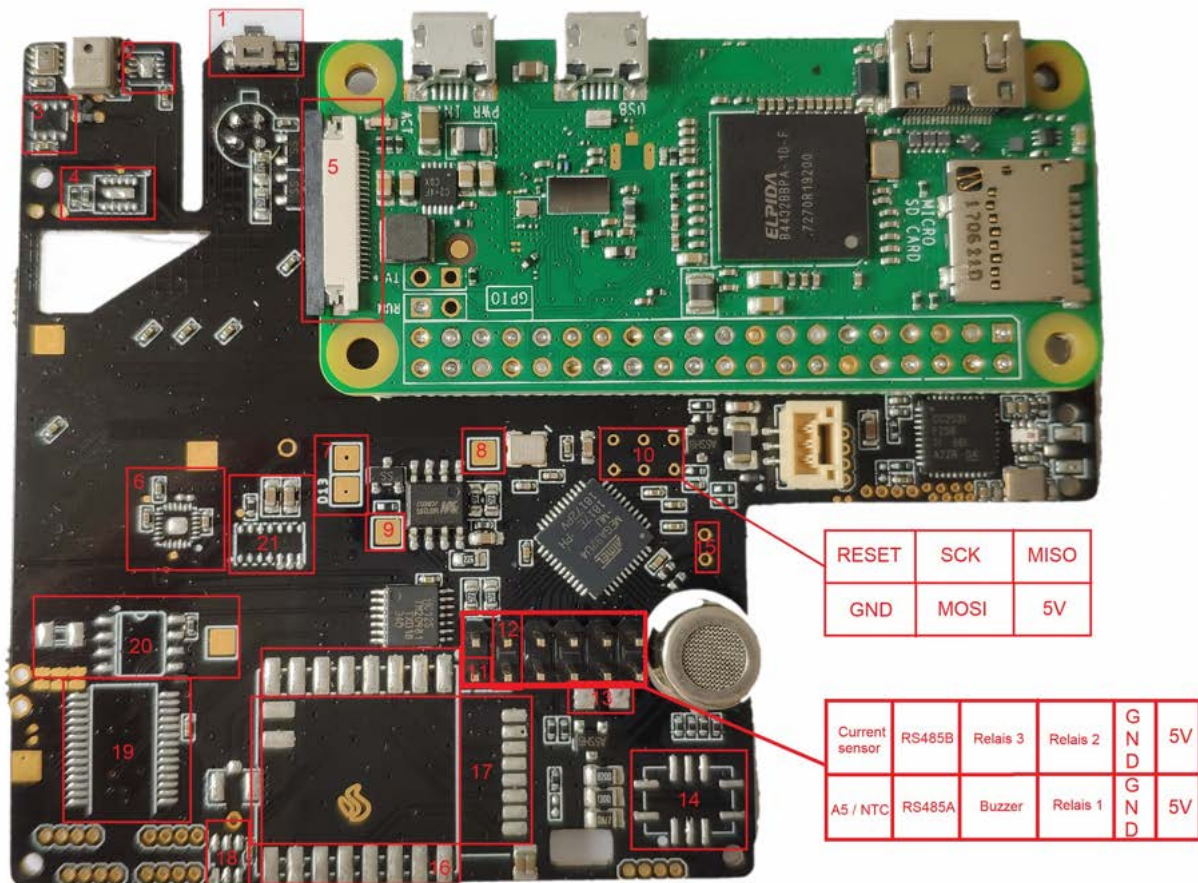
AVR Port	Arduino	Funktion SHPI.zero
PF0	A5	Prepared for NTC 10K (10kOhm to GND)
PF1	A4	VOC sensor MP135 (10kOhm to GND)
PF4	A3	MICS6814 - NH3 (56k nach 5V)
PF5	A2	MICS6814 - NO2 (28k nach 5V)
PF6	A1	MICS6814 - CO (56k nach 5V)
PF7	A0	GD00 - CC1101 radio module
PD2	D0 (RX)	RX / RX RS485
PD3	D1 (TX)	TX / TX RS485
PD1	D2 (SDA)	I2C - SDA 5V
PD0	D3 (SCL)	I2C - SCL 5V
PD4	D4	Chip Select Display (*Backlight Control)
PC6	D5	Relay 1
PD7	D6 / A7	Current sensor relay 1 Allegro ACS712 +- 5A
PE6	D7	GD02 / INT - Funkmodul
PB4	D8	Relay 2
PB5	D9	Buzzer
PB6	D10	Relay 3
PB7	D11	Blower fan PWM
PD6	D12	CSN CC1101 radio module
PC7	D13	Reset Raspberry PI
PD5	TXLED / D30	RGB LED WS2812B / SK6812
PB0	RXLED / D17	Blower fan RPM Signal
PB1	SCK / D15	SCK - CC1101 radio module / display
PB2	MOSI / D16	MOSI - CC1101 radio module / display
PB3	MISO / D14	MISO - CC1101 radio module / display - Bei Funkmodul max. 3.3v an ISP
PE2	HWB	supply enable gas sensors

I2C address configuration

0x20	Microchip MCP23017
0x23	ROHM BH1750/1
0x2A	Atmega32u4
0x38	Asair AHT10
0x40	Sensirion SHT2x
0x44	Sensirion SHT3x
0x45	Texas Instruments INA219
0x48	Texas Instruments ADS1015
0x5A	AMS CCS811
0x5B	Melexis MLX90615
0x5C	Touchscreen
0x60	Microchip MCP4725
0x68	MI DS1307 / InvenSense MPU9250
0x69	Panasonic AMG8833
0x76	Bosch BME680
0x77	Bosch BMP280

Mainboard Top

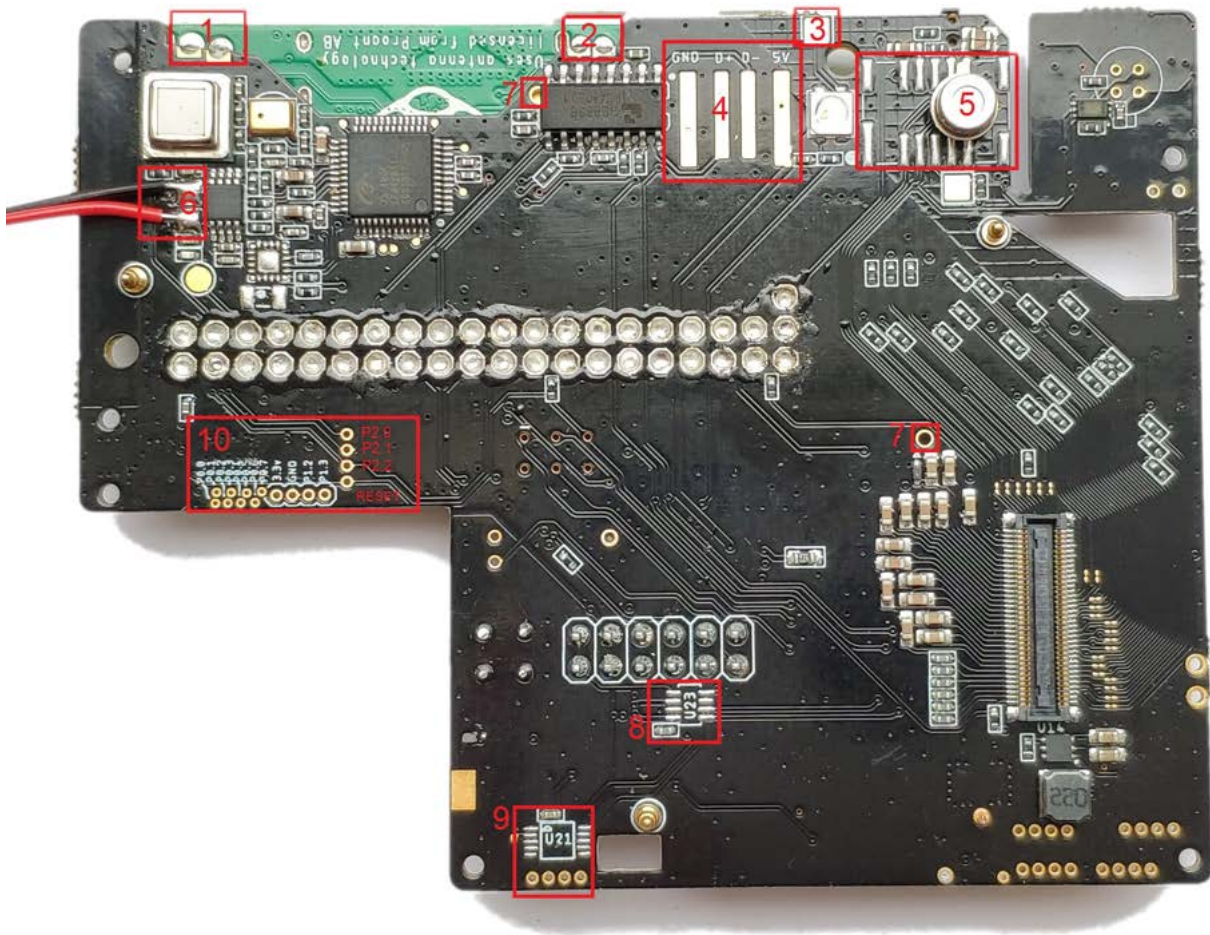
SHPI.zero with AC supply



1. Reset for Raspberry Pi Zero W
2. Footprint for Sensirion SHT2x
3. Footprint for Bosch BME680
4. Footprint for ams CCS811
5. Connector for Pi Zero camera
6. Footprint for InvenSense MPU-9250 / ICM-20948
7. Solderjumper between ATmega32u4 PC7 (D13) and Raspberry reset, for enabling hardware watchdog of linux OS
8. RX of ATmega32u4 (TTL level), connected to RS485 transceiver
9. TX of ATmega32u4 (TTL level), connected to RS485 transceiver
10. ICSP programming connector for ATmega32u4, be aware of DFU firmware and USB boot. If CC1101 module is installed, MISO is only 3.3V tolerant.
11. A5 input of ATmega32u4 available on power supply connector, for external NTC10k or OneWire temperature sensors.
12. RS485 connections.
13. Current sense resistor position for INA219 (U23 Bottom). Recommended value: 50mOhm – 100mOhm. Before adding INA219 and resistor, please cut trace below resistor.
14. Footprint for MICS6814
15. Solder points for NTC10K (also connected to A5)
16. Footprint for RCW69
17. Footprint for CC1101 module
18. Footprint for MCP4725 SOT-23-6
19. Footprint for MCP23017 Port Expander SSOP28
20. Footprint for RTC DS1307 and 32khz crystal
21. Footprint for MAX 30105

Mainboard Bottom

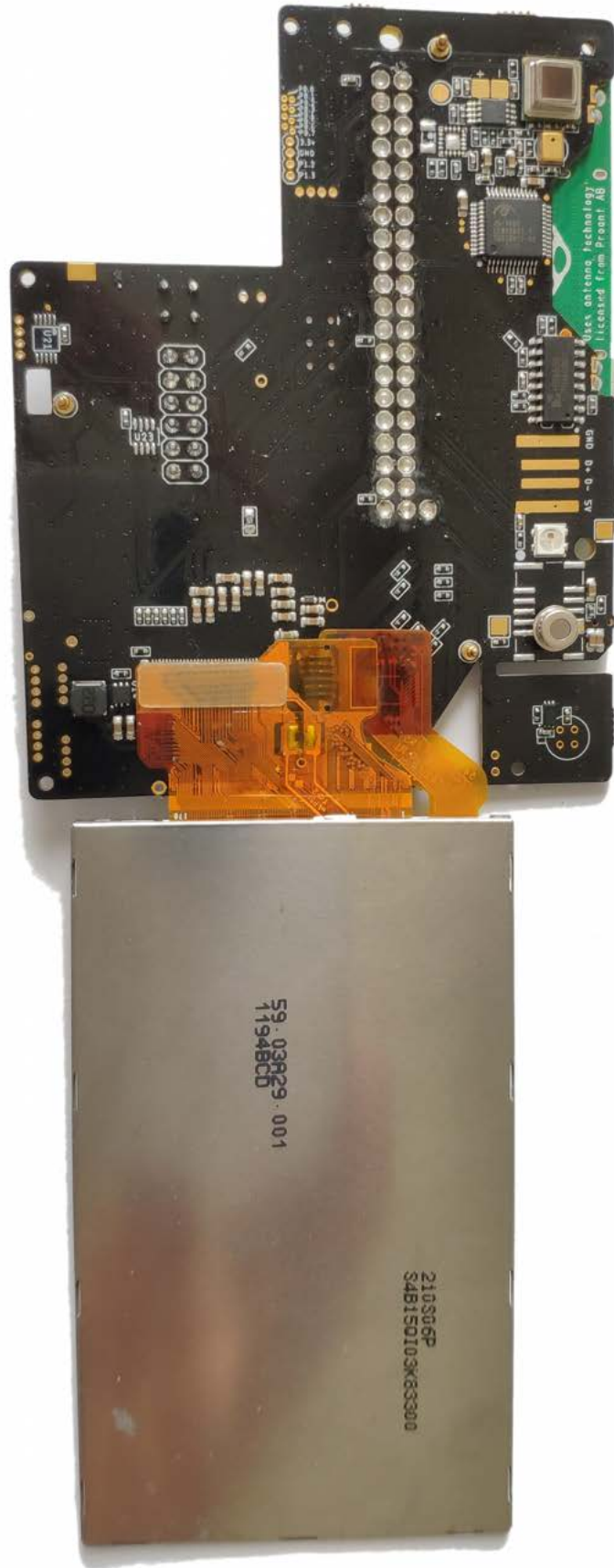
SHPI.zero with AC supply



1. I2C HDMI connection
2. USB connection
3. LED Out for WS2812b / SK6812 LEDs
4. USB Footprint for COB memory sticks
5. Footprint for Panasonic AMG 8833, needs removal of MLX90615
6. Speaker connection
7. 1.8v connection for MAX30105, connect both VIAS with thin wire
8. Footprint for TI INA219 SOT23-6
9. Footprint for ADS1015 MSOP-10
10. Pinout of TI CC2531 Zigbee SoC, P2.1 and P2.2 (DD / DC) are already connected to Raspberry Pi Zero W. Flashprogram (flashcc) and firmware available under https://github.com/shpi/zero_setup

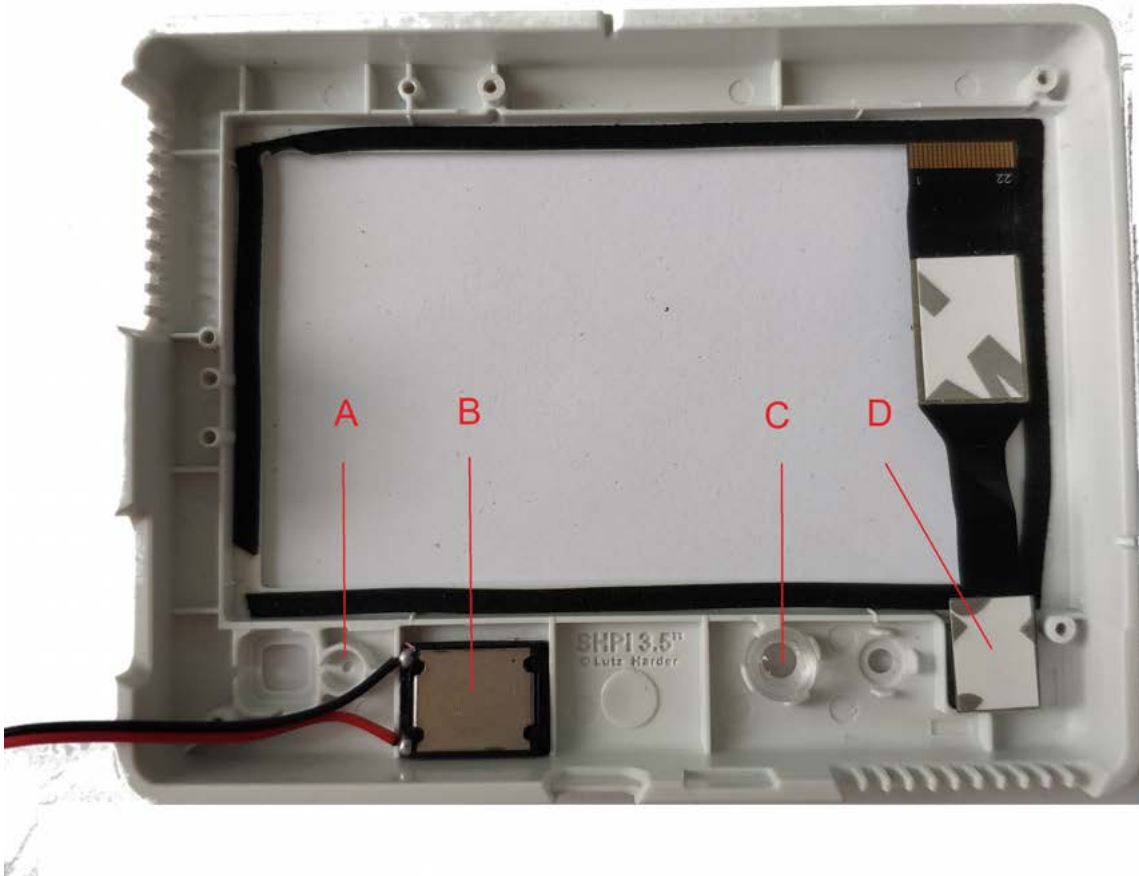
Display mounting

SHPI.zero with AC supply



Fronthousing

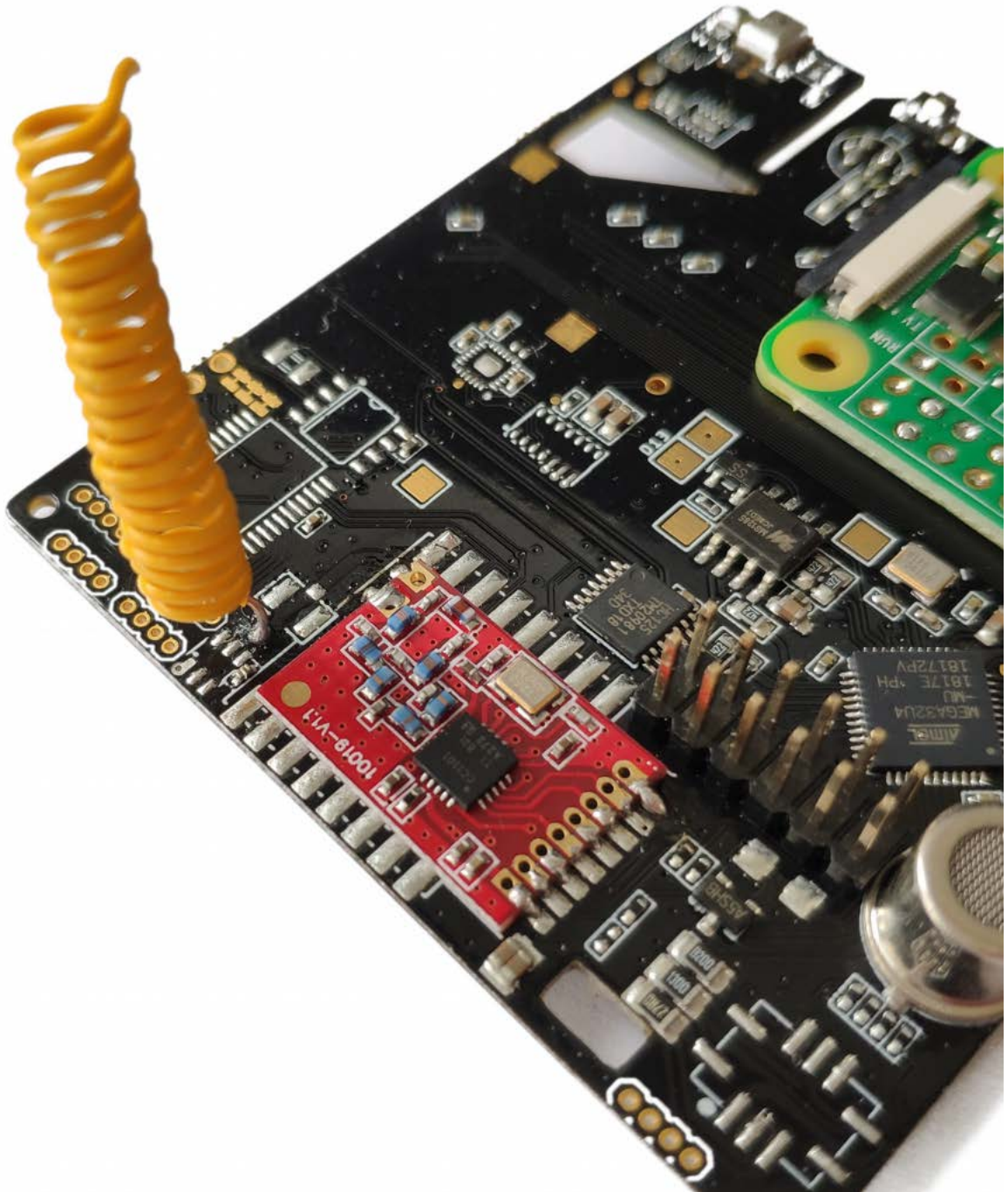
SHPI.zero with AC supply



- A. Hole for microphone opening. Use 1mm drill to open.
- B. Position for speaker
- C. LED lens
- D. Orientation of camera mount

CC1101 radio module mounting

SHPI.zero with AC supply



Instructions: https://github.com/shpi/zero_avr_firmware_culfw