ESP32 WILDLIFE CAMERA

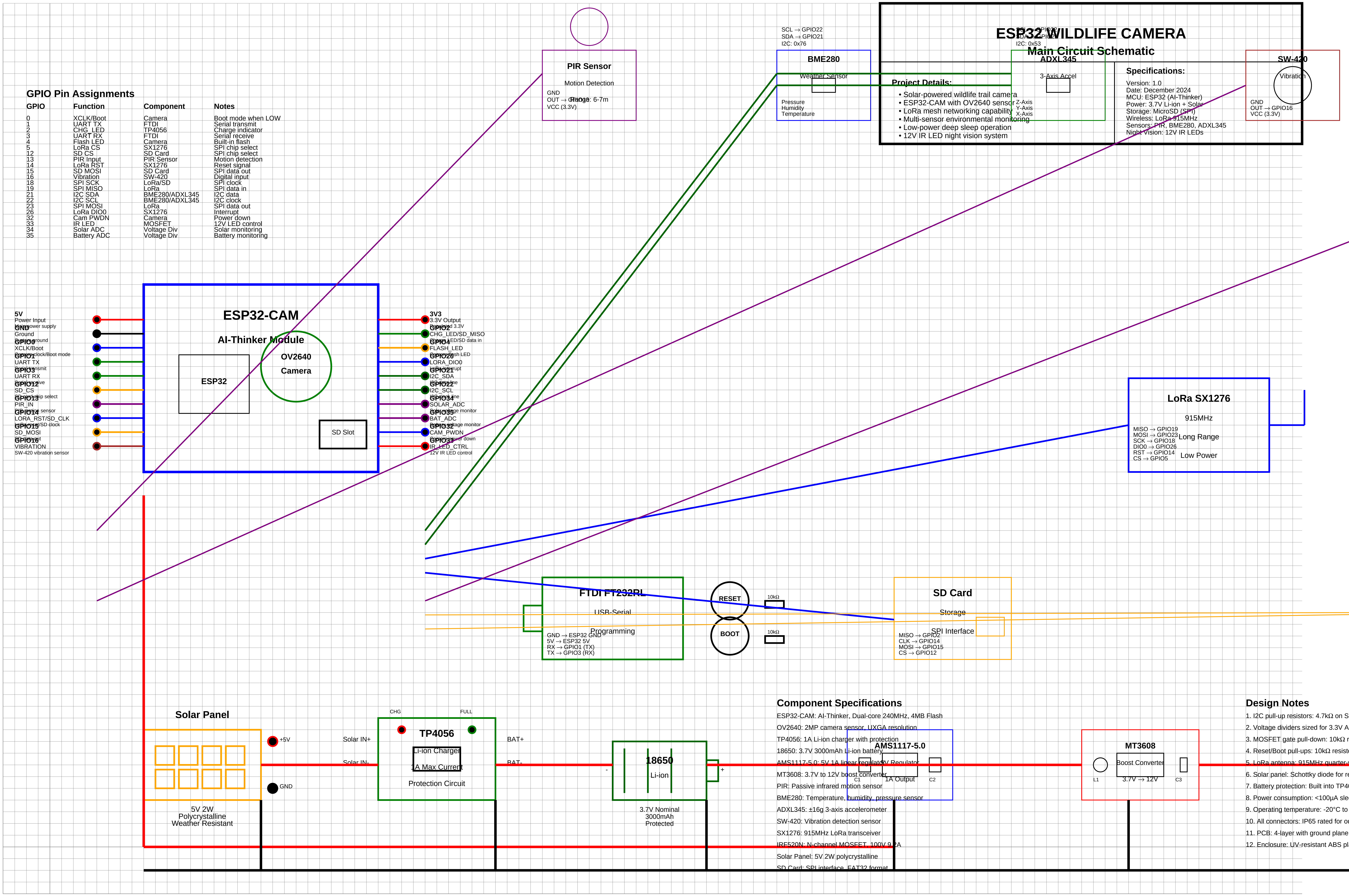
Main Circuit Schematic

Project Details:

- Solar-powered wildlife trail camera
- ESP32-CAM with OV2640 sensor
- LoRa mesh networking capability
- Multi-sensor environmental monitoring
- Low-power deep sleep operation
- 12V IR LED night vision system

Specifications:

Version: 1.0
Date: December 2024
MCU: ESP32 (AI-Thinker)
Power: 3.7V Li-ion + Solar
Storage: MicroSD (SPI)
Wireless: LoRa 915MHz
Sensors: PIR, BME280, ADXL345
Night Vision: 12V IR LEDs



GPIO Pin Assignments

GPIO	Function	Component	Notes
0	XCLK/Boot	Camera	Boot mode when LOW
1	UART TX	FTDI	Serial transmit
2	CHG_LED	TP4056	Charge indicator
3	UART RX	FTDI	Serial receive
4	Flash LED	Camera	Built-in flash
5	LoRa CS	SX1276	SPI chip select
12	SD CS	SD Card	SPI chip select
13	PIR Input	PIR Sensor	Motion detection
14	LoRa RST	SX1276	Reset signal
15	SD MOSI	SD Card	SPI data out
16	Vibration	SW-420	Digital input
18	SPI SCK	LoRa/SD	SPI clock
19	SPI MISO	LoRa	SPI data in
21	I2C SDA	BME280/ADXL345	I2C data
22	I2C SCL	BME280/ADXL345	I2C clock
23	SPI MOSI	LoRa	SPI data out
26	LoRa DIO0	SX1276	Interrupt
32	Cam PWDN	Camera	Power down
33	IR LED	MOSFET	12V LED control
34	Solar ADC	Voltage Div	Solar monitoring
35	Battery ADC	Voltage Div	Battery monitoring

Component Specifications

ESP32-CAM: AI-Thinker, Dual-core 240MHz, 4MB Flash

OV2640: 2MP camera sensor, UXGA resolution

TP4056: 1A Li-ion charger with protection

18650: 3.7V 3000mAh Li-ion battery

AMS1117-5.0: 5V 1A linear regulator

MT3608: 3.7V to 12V boost converter

PIR: Passive infrared motion sensor

BME280: Temperature, humidity, pressure sensor

ADXL345: ±16g 3-axis accelerometer

SW-420: Vibration detection sensor

SX1276: 915MHz LoRa transceiver

IRF520N: N-channel MOSFET, 100V 9.2A

Solar Panel: 5V 2W polycrystalline

SD Card: SPI interface, FAT32 format

Design Notes

1. I2C pull-up resistors: 4.7kΩ on S
2. Voltage dividers sized for 3.3V A
3. MOSFET gate pull-down: 10kΩ r
4. Reset/Boot pull-ups: 10kΩ resist
5. LoRa antenna: 915MHz quarter-
6. Solar panel: Schottky diode for re
7. Battery protection: Built into TP4
8. Power consumption: <100μA sle
9. Operating temperature: -20°C to
10. All connectors: IP65 rated for ou
11. PCB: 4-layer with ground plane
12. Enclosure: UV-resistant ABS pl