W5300 IP 3D Camera over Single Pair Ethernet “ToffeCam” Ethernet Part

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W5300 TCP/IP Offload Engine

The W5300 circuit is a combination of reference circuits for the internal and external PHY. Switching modes is done with the ETH-MEDIA-SEL signal on the TEST_MODE_0 pin. One of two modes is selected: “Internal PHY Mode (Normal Operation)” or “External PHY Mode with Crystal clock”.

In internal PHY mode, there are two options selectable at the manufacturing stage: transformer and transformerless. In the transformer option, the RB1-125BAG1A socket with a transformer is mounted, in the transformerless option, an ordinary RJ45 socket and capacitors. The transformerless version should only be used for diagnostics due to the short range and lack of isolation.

In external PHY mode, the MII interface to the external PHY is used. The ADIN1100 PHY for Single Pair Ethernet is connected.

The W5300 is connected to the MCU in the direct address mode via an 8-bit data bus and a 10-bit address bus.

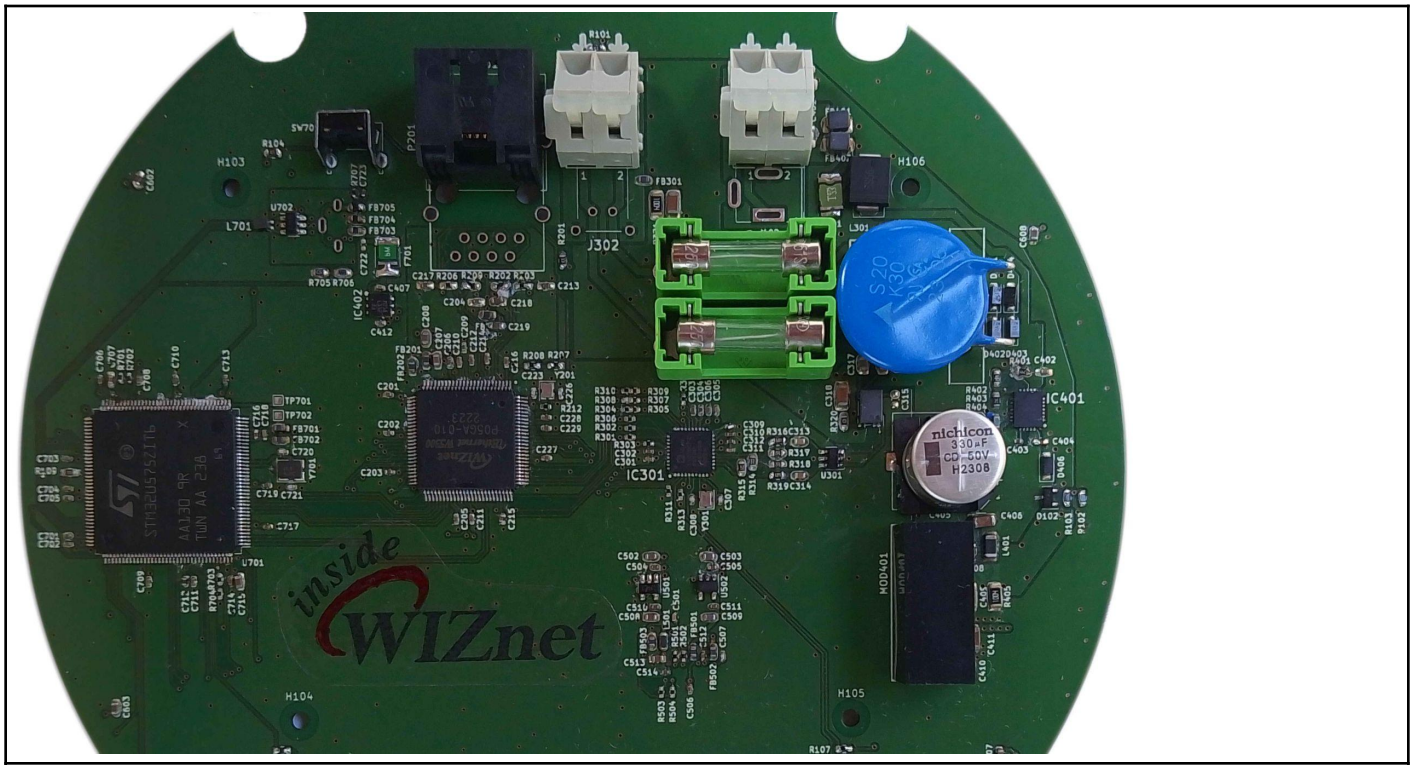

Fig. 1. PCB with transformerless variant

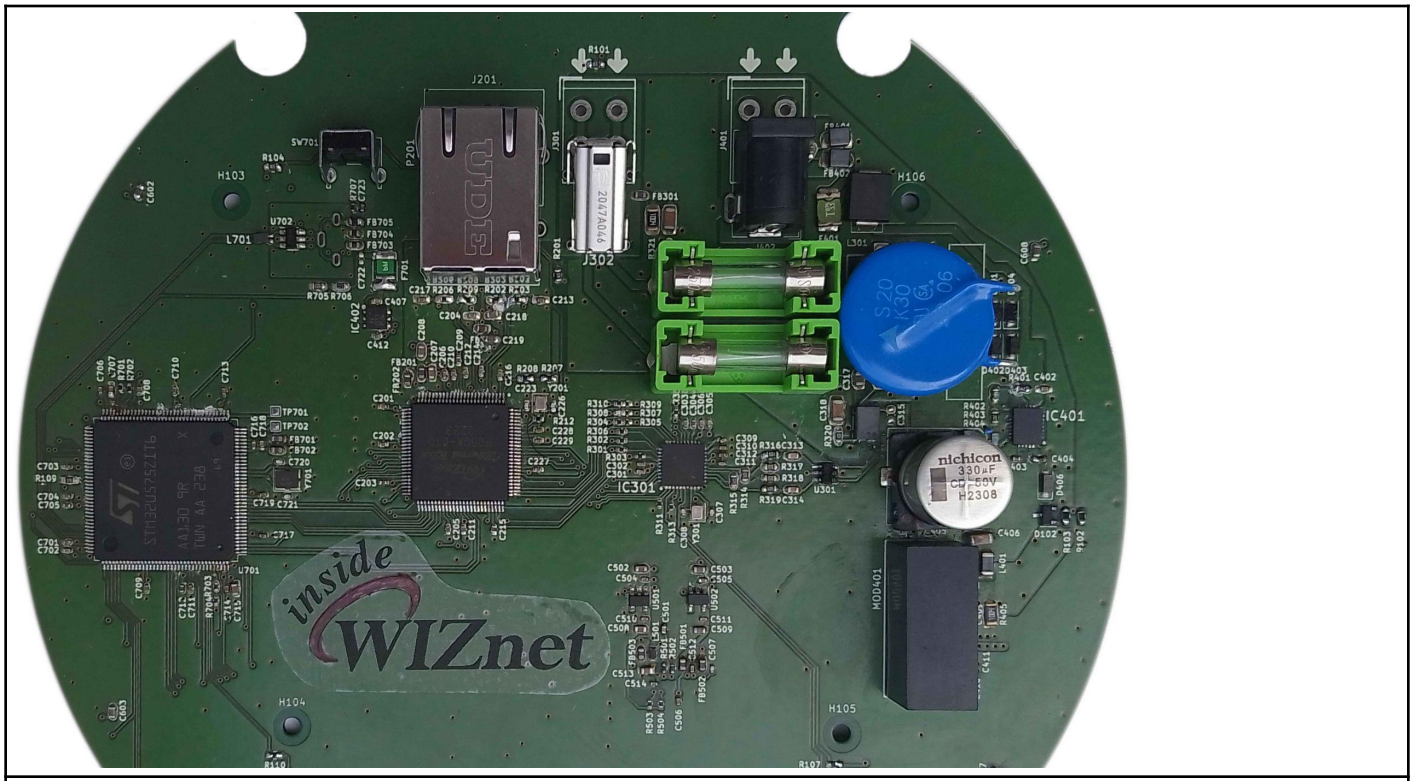

Fig. 2. PCB with transformer variant

ADIN1100 Single Pair Ethernet PHY

The ADIN1100 provides a PHY interface for Single-Pair 10Base-T1L Ethernet. It is connected to the W5300 in unmanaged mode. However, strapping pins allow configuration in any mode, also managed by the MDIO interface. MDIO is emulated in the MCU via SPI.

The input line is transformer isolated and protected against too high voltage.

The standard allows you to connect several devices on one pair of wires. Up to four devices can be connected in a multi-drop configuration. However, managed PoE cannot be used then.

Power over Data Line

The 10Base-T1L standard allows power and data to be transferred over the same pair of wires. The power circuit is separated by a double 100uH choke.

Since the devices will work in a multi-drop configuration, there is no power management. The power supply accepts voltages from 18V to 30V. Power is fed through the Graetz bridge to the TPS26400 protection circuit and then to the isolated DC/DC converter. Output voltage 3.3V.

Schematics

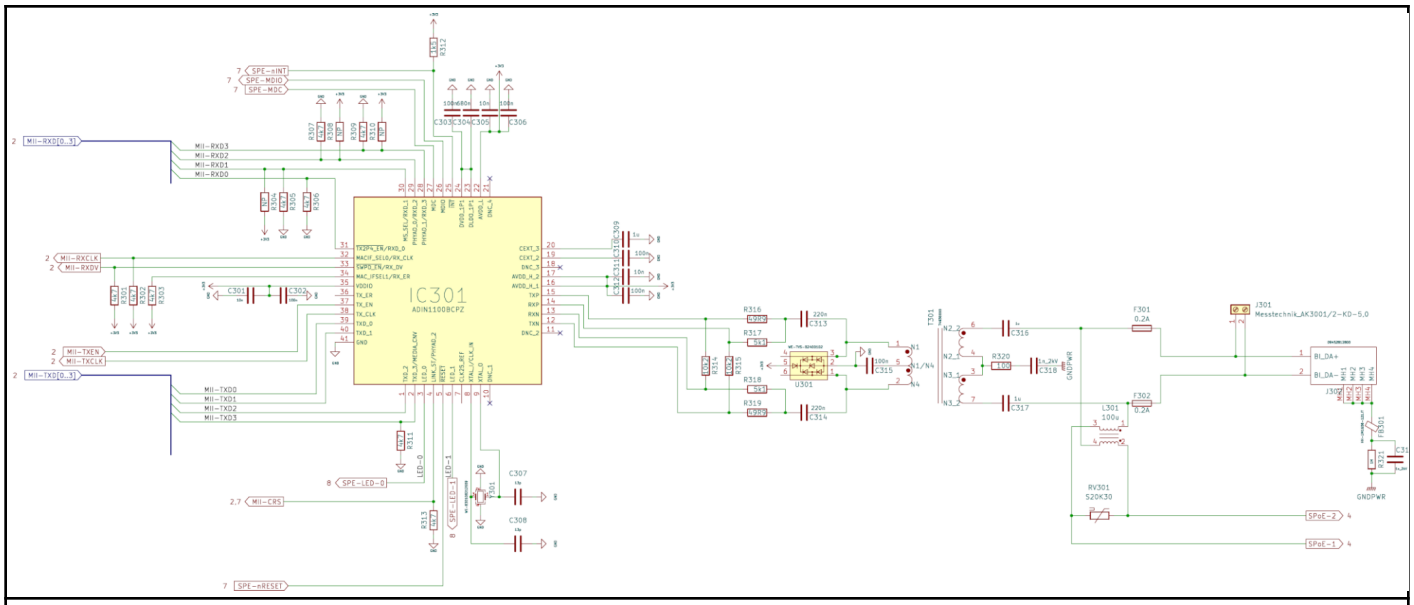

Fig. 3. Single Pair Ethernet

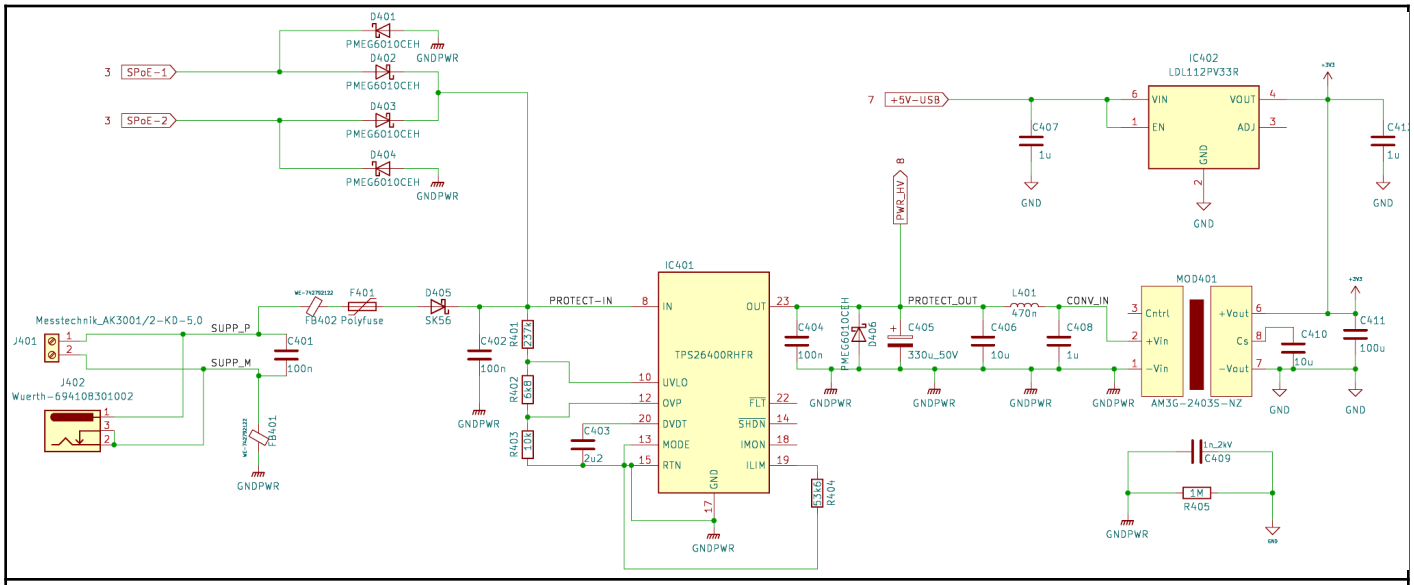

Fig. 4. Power Supply

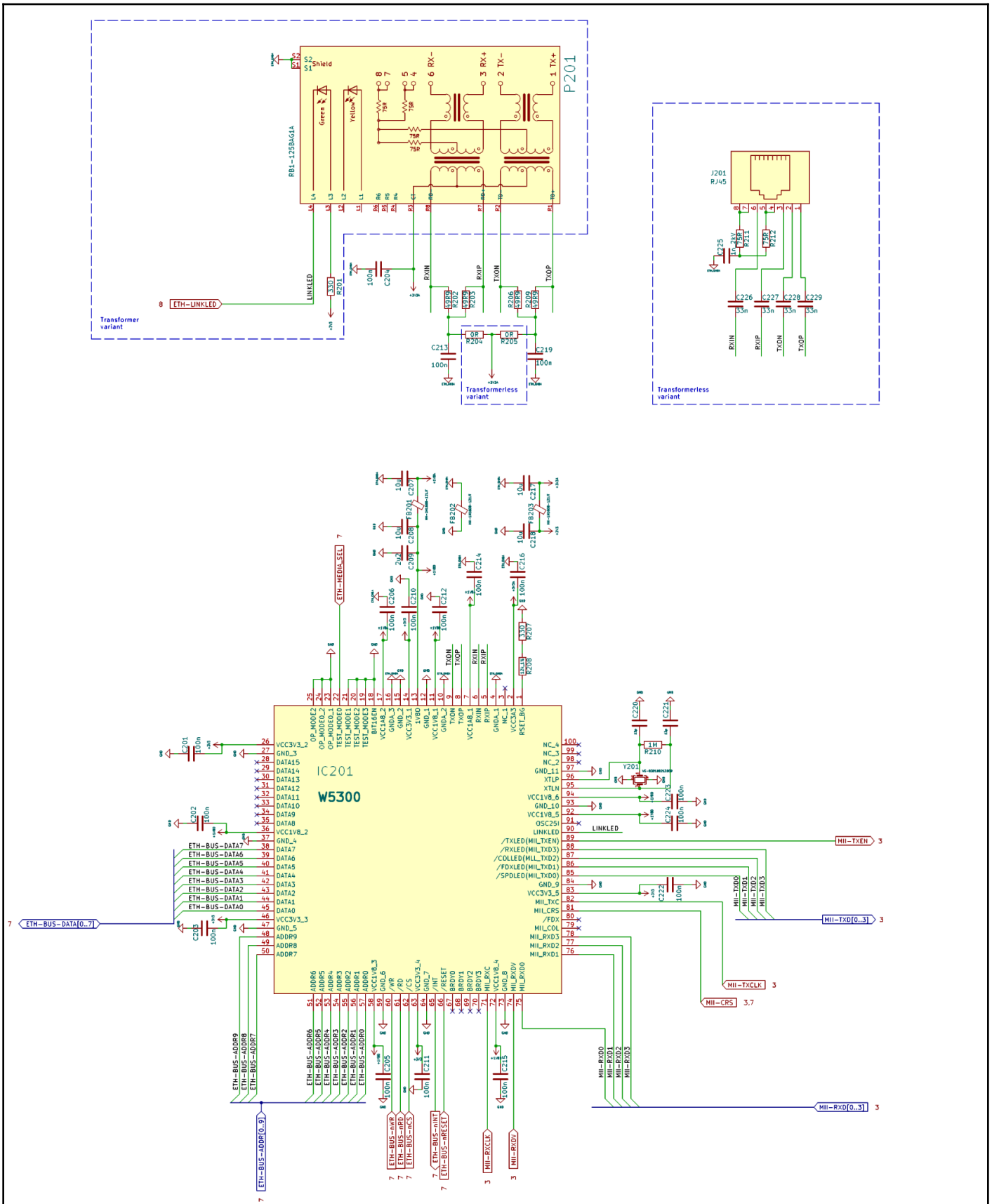

Fig. 5. W5300 TCP/IP Offload Engine