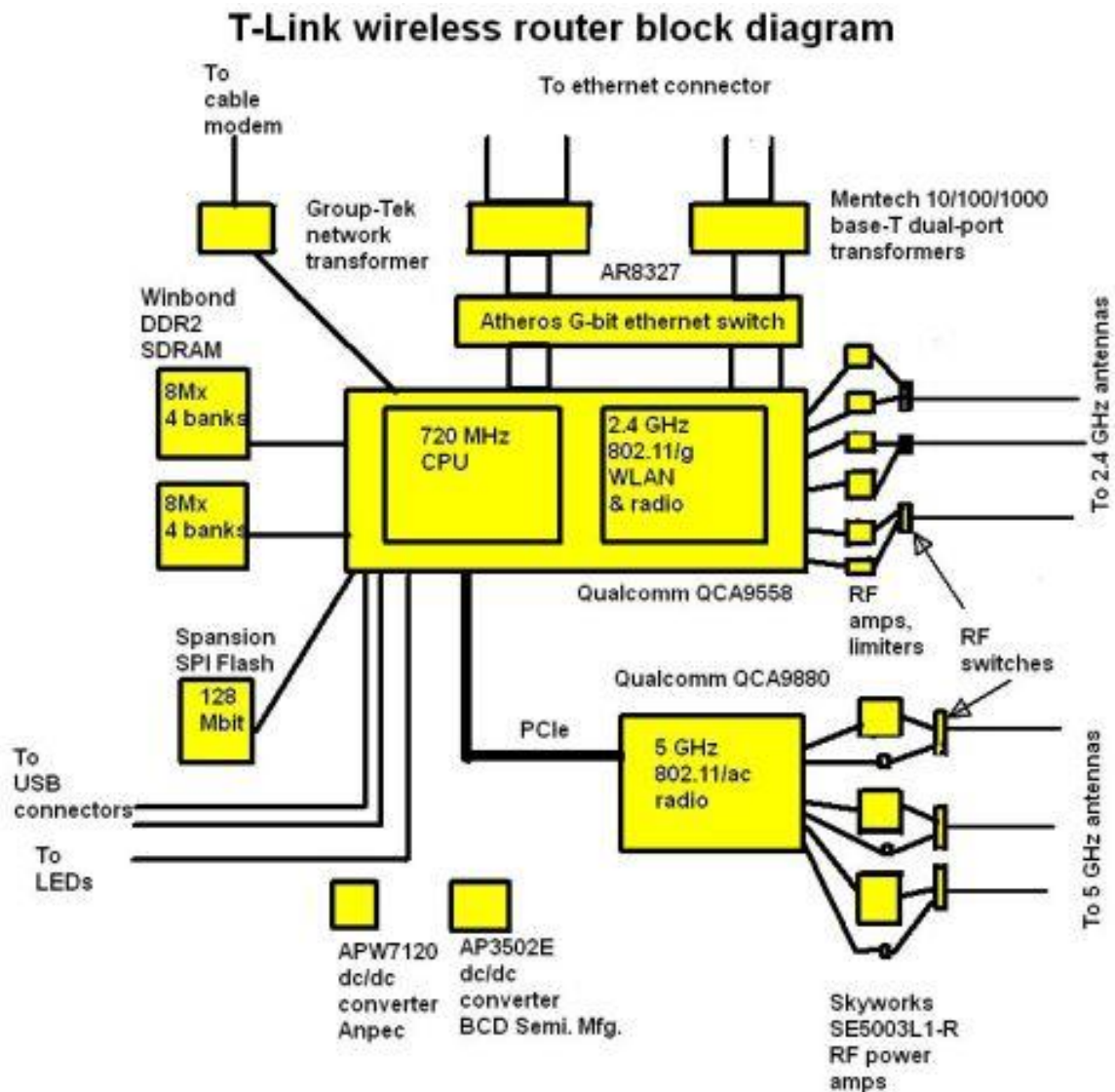


Group 3

Report on Wi-Fi MODEM

Model: P-Link Archer C7 wireless router

Internal Architecture:



Architecture of Router

Data Speed: 1300Mbps over 5GHz

450 Mbps over 2.4GHz

Chipsets used:

1. QCA9558 System on Chip (SoC):

Function: Handles 2.4 GHz Wi-Fi (802.11n) and baseband Ethernet connections.

Features: Integrates radio circuits for the 2.4 GHz band and supports multiple-in-multiple-out (MIMO) antennas.

Technology: 802.11n standard, which includes provisions for MIMO antennas, enhancing data throughput and reliability.

2. QCA9880 Chip:

Function: Manages 5 GHz Wi-Fi (802.11ac).

Features: Sits on a separate mezzanine board along with three RF power amplifiers from Skyworks.

Technology: 802.11ac standard, which supports wider channels (80 or 160 MHz), more spatial streams (up to eight), higher-order modulation (up to 256-QAM), and Multi-user MIMO (though not supported in this model).

3. AR8327 Ethernet Switch:

Function: A seven-port gigabit Ethernet switch that manages wired connections.

Components used:

Memory: Two 16-bit DDR2 synchronous DRAM chips from Winbond.

Transformers: Base-T dual port transformers from Mentech and a network transformer from Group-Tek.

Antenna System: Utilizes fine coax cables for RF signal handling, with a pi network for impedance matching and solid-state switch ICs for switching between transmit and receive modes.

Design Observations

The 5 GHz chip is placed on a separate mezzanine board, which enable both 2.4 GHz and 5 GHz Wi-Fi transmission simultaneously.

The signal-handling path includes fine coax cables soldered directly to the circuit board, with components forming a pi network for impedance matching.

Features of QCA9880

1. Wi-Fi Standard Support:

Primarily designed for 802.11ac (Wi-Fi 5) networks

Also supports 802.11a/n standards for backward compatibility

2. Frequency Band:

Operates in the 5 GHz band

Can be configured for 2.4 GHz operation in some implementations

3. MIMO Capability:

Supports 3x3 MIMO (Multiple-Input Multiple-Output) technology

Enables up to 3 spatial streams for improved throughput and reliability

4. Channel Bandwidth:

Supports channel widths of 20 MHz, 40 MHz, and 80 MHz

Wider channels allow for higher data rates

5. Maximum Throughput:

Capable of delivering up to 1.3 Gbps in 5 GHz mode with 80 MHz channels

6. Modulation Scheme:

Supports up to 256-QAM (Quadrature Amplitude Modulation)

Higher order modulation allows for more data to be transmitted per symbol

7. Power Output:

Capable of up to 21 dBm output power per chain in 5 GHz mode

Up to 20 dBm per chain in 2.4 GHz mode

8. Interface:

Uses PCIe 1.1 interface for connection to the host system

Functionalities in the Modem/Router

1. High-Speed Wireless Connectivity:

Provides the core functionality for high-speed Wi-Fi in the 5 GHz band that enables fast data transfer.

2. Signal Processing:

Handles complex signal processing tasks required for 802.11ac communication and manages encoding/decoding of data streams, modulation/demodulation, and error correction

3. MIMO Operations:

Coordinates multiple antenna operations to improve signal quality and data throughput

Implements spatial multiplexing and beamforming techniques

4. **Dynamic Frequency Selection (DFS):**

Supports DFS to avoid interference with radar systems in certain 5 GHz channels

5. **Power Management:**

Implements power-saving features to optimize energy consumption

6. **Dual-Band Flexibility:**

In some implementations, can be configured for either 5 GHz or 2.4 GHz operation, providing flexibility in network design

7. **Integration with Router SoC:**

Works in conjunction with the main router System-on-Chip (like QCA9558) to provide comprehensive wireless networking capabilities

8. **Advanced Wi-Fi Features:**

Supports features like MU-MIMO (Multi-User MIMO) for efficient handling of multiple client devices simultaneously