

Theory of operation; Alereon AL4512 USB 4-Port Hub.

The Alereon AL4504 incorporates the functionality of a UWB radio device and a 4-Port USB Hub. This device is intended to provide a short-range wireless USB connection to computers for up to four peripheral units equipped with a USB 2.0 interface. The AL4512 is powered by a +5 Volt power unit which operates from the commercial A.C. power mains. The AL4512 operates in the frequency band defined in the FCC Rules and Regulations for UWB devices. Specifically, it operates between the frequencies of 3.168 and 4.752 GHz per the industry-defined WiMedia 1.1 specification.

The AL4512 is comprised of three integrated circuit devices and supporting circuitry for filtering, interface and power conditioning. The AL4512 employs an antenna external to the device which attaches to the device by a Reverse-Polarity SMA connector complying with the requirements of 47 CFR 15.212(a)(iv). The schematic diagram shows a connector, Murata type MM8430, in the RF path on the printed wiring board. This is a production test connector, it is not accessible from outside of the unit housing. Following the antenna is a bandpass filter with a passband from 3.1 GHz to 4.752 GHz which provides suppression of unwanted transmitter emissions and receiver interference rejection in the 2.4 GHz and 5.1 GHz bands.

The AL4100 RF Transceiver generates the system reference frequency from a 33 MHz crystal resonator. The 33 MHz reference frequency is multiplied to 4.224 GHz internally within the AL4100 by a PLL multiplier. From this frequency the three band frequencies, 3.432 GHz, 3.960 GHz and 4.488 GHz for both transmit and receive modes are derived internally within the AL4100 by direct synthesis. In addition to the band frequencies, a 1056 MHz clock for ADCs and DACs within the AL4200 Baseband Processor is generated.

The interface between the AL4100 RF Transceiver and the AL4200 Baseband Processor consists of the analog RX-I and-Q signals and the analog TX-I and-Q signals all of which are baseband, having 2 MHz to 264 MHz frequency band. The interface also includes a 1056 MHz clock signal and CMOS logic-level control signals which determine the band frequency and TX/RX mode.

The interface between the AL4200 Baseband Processor and the UPD720180 MAC device is the industry-defined MPI consisting of CMOS logic-level: 8 data bits, control signals and a 66 MHz clock signal.

The UPD720180 MAC implements five external USB 2.0 interfaces:

1. A host interface. This interface is used for association of the wireless USB hub and the host P.C. for wireless link security. This interface is connected only during initial association and in normal wireless 4-Port Hub operation is unconnected.
2. Four USB 2.0 device ports which connect peripheral devices.

References.

MultiBand OFDM Physical Layer Specification 1.1.

WiMedia MAC-PHY Interface Specification 1.0.

Universal Serial Buss Specification 2.0.