Theory of operation; Alereon AL5612 UWB 4-Port Hub.

The Alereon AL5612 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 AL5612 is powered by a +5 Volt power unit which operates from the commercial A.C. power mains. The AL5612 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 8.976 GHz per the industry-defined WiMedia 1.1 specification.

The AL5612 is comprised of four integrated circuit devices and supporting circuitry for filtering, interface and power conditioning. The AL5612 employs an antenna external to the device which attaches to the device by a Hirose U.FL-type connector complying with the requirements of 47 CFR 15.212(a)(iv).

Following the antenna is a dual bandpass filter/diplexer with passbands from 3.168 GHz to 4.752 and from 6.336 GHz to 8.976 GHz which provides suppression of unwanted transmitter emissions and receiver interference rejection in the 2.4 GHz and 5.1 GHz bands.

The AL5100 RF Transceiver generates the system reference frequency from a 44 MHz crystal resonator. The 44 MHz reference frequency is multiplied to 16.896 GHz internally in the AL5100 by a PLL multiplier. From this frequency the local oscillator frequencies for band frequencies for both transmit and receive modes are derived internally within the AL5100 by synthesis. The local oscillator frequencies are as listed as Fmid per the following table.

BG	Channel	Ch1	Ch0	F_{low}	F_{mid}	F_{high}
N/A	N/A	0	0	-	-	-
1	1 (A)	0	1	3168 MHz	3432 MHz	3696 MHz
1	2 (B)	1	0	3696 MHz	3960 MHz	4224 MHz
1	3 (C)	1	1	4224 MHz	4488 MHz	4752 MHz
2	4 (A)	0	1	4752 MHz	5016 MHz	5280 MHz
2	5 (B)	1	0	5280 MHz	5544 MHz	5808 MHz
2	6 (C)	1	1	5808 MHz	6072 MHz	6336 MHz
3	7 (A)	0	1	6336 MHz	6600 MHz	6864 MHz
3	8 (B)	1	0	6864 MHz	7128 MHz	7392 MHz
3	9 (C)	1	1	7392 MHz	7656 MHz	7920 MHz
6	9 (A)	0	1	7392 MHz	7656 MHz	7920 MHz
6	10 (B)	1	0	7920 MHz	8184 MHz	8448 MHz
6	11 (C)	1	1	8448 MHz	8712 MHz	8976 MHz

In addition to the band frequencies, a 1056 MHz clock for ADCs and DACs within the AL5300 Baseband Processor/MAC is generated.

The interface between the AL5100 RF Transceiver and the AL5300 Baseband Processor/MAC 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 AL5300 Baseband Processor/MAC and the SMSC3300 USB PHY is the industry standard ULPI consisting of CMOS logic-level: 8 data bits 3 control signals and a 60 MHz clock signal. The SMSC3300 USB PHY has a 24 MHz crystal oscillator which generates its internal clock signal.

The GL852 USB Hub Controller implements four external USB 2.0 interfaces which are the device ports to which external USB devices are connected. The GL852 USB Hub Controller has a 12 MHz crystal oscillator which generates its internal clock signal.

The C8051F340 Association Controller has a USB Mini-B connector which is connected only during the security association operation when a USB Hub is first placed into operation with a host system. 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.

References.

MultiBand OFDM Physical Layer Specification 1.1.

ULPI + Low Pin Interface (ULPI) Specification_1.1

Universal Serial Buss Specification 2.0.