

Theory of operation; Alereon AL5720 WUSB Mini Docking Station.

The Alereon AL5720 incorporates the functionality of a UWB radio device a 2-Port USB Hub, USB to video and USB to audio which implements a complete wireless desktop with a UWB connection to the host P.C. This device is intended to provide a short-range wireless USB connection to computers for up to two USB peripheral units equipped with a USB 2.0 interface plus the interface to a desktop display and speakers. The AL5720 is powered by a +5 Volt power unit which operates from the commercial A.C. power mains. The AL5720 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 AL5720 is comprised of ten integrated circuit devices and supporting circuitry for filtering, interface and power conditioning. The AL5720 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 F_{mid} 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
	2 (B)	1	0	3696 MHz	3960 MHz	4224 MHz
	3 (C)	1	1	4224 MHz	4488 MHz	4752 MHz
2	4 (A)	0	1	4752 MHz	5016 MHz	5280 MHz
	5 (B)	1	0	5280 MHz	5544 MHz	5808 MHz
	6 (C)	1	1	5808 MHz	6072 MHz	6336 MHz
3	7 (A)	0	1	6336 MHz	6600 MHz	6864 MHz
	8 (B)	1	0	6864 MHz	7128 MHz	7392 MHz
	9 (C)	1	1	7392 MHz	7656 MHz	7920 MHz
6	9 (A)	0	1	7392 MHz	7656 MHz	7920 MHz
	10 (B)	1	0	7920 MHz	8184 MHz	8448 MHz
	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 AL5350 Baseband Processor/MAC is generated.

The interface between the AL5100 RF Transceiver and the AL5350 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 AL5350 has a 20 MHz crystal oscillator which generates its internal clock frequency.

The interface between the AL5350 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.

Following paragraphs are a brief description of the functions of the additional circuitry which comprises the USB hub, USB to display and audio as shown on sheet two of the block diagram.

The C8051F326 Association Controller is connected only during the security association operation when the AL5720 is first placed into operation with a host system. This interface is used for association of the wireless AL5720 and the host P.C. for wireless link security. This interface is connected only during initial association and in normal wireless operation is unconnected. The association connector is an industry-standard USB Type Mini-B, the signal path from this connector is routed through a USB2512 2-port USB hub. The USB2512 has a 24 MHz crystal which generates its internal clock signal.

The USB2413 4-port USB Hub Controller implements two external USB 2.0 interfaces plus the USB signal paths to the display and audio interface devices. The USB2514 USB Hub Controller has a 24 MHz crystal oscillator which generates its internal clock signal.

The USB to display converter consists of a DL160 USB-Video controller and a CH7301 DVI Transmitter. The video display connection is an industry-standard DVI connector. The DL160 has a 24 MHz crystal oscillator which generates its internal clock signal. The clock signal between the DL160 and CH7301 is variable between 27 MHz and 165 MHz depending on the display resolution selected by the host.

The USB to audio converter consists of the CM6300 with L and R stereo inputs / outputs connected to standard phone jacks. The CM6300 has a 12 MHz crystal oscillator which generates its internal clock signal.

References.

MultiBand OFDM Physical Layer Specification 1.1.

ULPI + Low Pin Interface (ULPI) Specification_1.1

Universal Serial Bus Specification 2.0.