

Theory of operation; Alereon AL5740 wireless A/V Module.

The Alereon AL5740 is a UWB radio device with HDMI, VGA, USB and Stereo Audio interfaces to attached devices. This device is intended to provide a short-range wireless connection for computers to transfer multimedia content to displays and audio speakers. The AL5740 is powered from 120VAC through an external 5 Volt DC adapter. The interface between the AL5740 and attached devices is the industry-standard HDMI or VGA, USB and Stereo Audio. The AL5740 operates in the frequency band defined in the FCC Rules and Regulations for UWB devices. Specifically, it operates between the frequencies of 3.168 to 4.752 GHz, 6.336 to 7.920 GHz and 7.392 to 8.976 GHz per the industry-defined WiMedia 1.1 specification.

The AL5740 RF section is comprised of two integrated circuit devices and supporting circuitry for filtering and power conditioning. The AL5740 can use either the Acon ADM6P antenna, or the AL51000 antenna. The schematic diagram shows a connector, Hirose type U.FL, in the RF path. This connector, is not accessible from outside of the unit housing. Following the antenna connector is a Diplexer type bandpass filter having two sections. The LB section has a passband from 3.1 GHz to 4.752 GHz, the HB section has a passband from 6.336GHz to 9.504GHz. This filter provides suppression of unwanted out of band transmitter emissions below 3.168 GHz and above 9,504 GHz as well as 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 direct 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
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 mode.

The digital interface between the AL5350 Baseband Processor/MAC and the remainder of the product system is selectable by a pin option and in the AL5740 is permanently wired to be the industry defined ULPI.

The remainder of the circuitry of the AL5740 comprises the implementation of the various interfaces to attached display and audio devices.

An SMSC USB3300 converts the ULPI signals of the AL5350 to USB 2.0 for interface to the video and audio interface integrated circuits, the interface devices are connected through an SMSC UWB 2514 USB hub integrated circuit.

The interface to a VGA display is implemented directly by the DL125 USB Video converter integrated circuit.

The interface to an HDMI display is implemented by the DL125 integrated circuit driving an SII9034 HDMI transmitter integrated circuit.

The interface to the audio devices is implemented by a CM108 USB Audio converter integrated circuit.

The interface to USB devices is implemented by the SMSC USB2514 USB hub device.

References.

WiMedia Physical Layer Specification 1.1.

WiMedia MAC-PHY Interface Specification 1.0.