

Theory of operation; Alereon AL5621 UWB Module.

The Alereon AL5621 is a UWB radio device with a digital interface to the host computer. This device is intended to provide a short-range wireless connection for computers and peripheral devices. The AL5621 is powered from the host system to which it is attached. The digital interface between the host system and the AL5621 is selectable by a pin option and is either the industry-defined ULPI or a parallel interface based on the CF+ standard. The AL5621 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 AL5621 is comprised of two integrated circuit devices and supporting circuitry for filtering and power conditioning. The AL5621 has a permanently attached antenna external to the housing. 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 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 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 mode.

The digital interface between the AL5300 Baseband Processor/MAC and the host system is selectable by a pin option on the module and is either the industry-defined ULPI or a parallel data interface based on the CF+ standard.

References.

MultiBand OFDM Physical Layer Specification 1.1.

MAC-PHY Interface Specification 1.0.

CF+ and CompactFlash Specification_3.0

ULPI + Low Pin Interface (ULPI) Specification_1.1