

Advanced Control Technologies, Inc.

Technical Description for FCC

Project: ZDP100 – Revision from Atmel to Asic module

Project No.: 0677-01

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The ZDP100 is a plug-in dimmer that is designed for control of up to 300 Watts of incandescent lighting. It plugs into a standard 2 or 3 prong 120VAC, 60Hz receptacle and provides a 2-prong receptacle that a load can be plugged into. While the ZDP100 can work as a stand-alone switch, it is intended to work as a part of a group of similar, compatible modules that are all controlled by a wireless remote control.

The dimmer module uses a high-speed micro-controller to control the switching circuitry, to execute instructions, and to control communications with other devices. It also features a flash memory IC to provide non-volatile retention of certain data.

These transceivers operate in half-duplex fashion to provide two-way communications. The communications, while varied, most often consist of a command from the remote control followed by an acknowledgement by the addressed module(s) that a valid command was received.

The transceiver operates in the 900MHz ISM band at 908.42 MHz. The data, which is digital in nature, is Manchester encoded and sent using FSK modulation at a 9600 bit/sec rate. The deviation of the modulation is plus and minus 20 KHz.

A 7.3769 MHz crystal oscillator is used both as a clock for the micro-controller and also as a reference oscillator for the fractional PLL frequency synthesizer. This PLL is used to generate both the local oscillator for the receiver and the fundamental frequency of the transmitter. The output power of the transmitter portion of the transceiver is controlled by the micro-controller which causes the transmit power to be very low for some setup functions.

Modulation of the transmitter is accomplished in the PLL by having the micro-controller cause it to use one divisor when the modulating data is low and a slightly different one, when it is high.

The receiver is a single conversion type. The local oscillator runs at 908.275 MHz (145 KHz below the receive frequency).

A wireless transmission occurs briefly in response to one of two events: 1) A manually issued command initiated by the User, or 2) An automated command that is initiated when the internal time of day clock matches a previously User-programmed time.

The communications are done using a protocol called the Z-Wave protocol, which is a wireless network protocol that has been especially designed for home automation

products. It defines how various types of information are to be formatted into frames. These frames not only include commands and data, but also source and destination information, as well as checksums that are used for error detection. The ZDP100, the remote control, and other modules make up a wireless local network, where each of the modules can function as wireless repeaters (also half duplex). There is provision within the protocol for intelligent and adaptive routing and also for handling collisions.

Except for a handful of discrete passive components, the entire transceiver is contained in one integrated circuit, the Zensys ZW0102 Asic. The transmitter and receiver share a common antenna. A SAW filter is used to help minimize receiver overload from strong signals on nearby frequencies. The antenna used in the ZDP100 is integrated into the PCB. There are no external connections to the antenna. There is also no provision of any kind for an external ground connection. Any conducted emissions from the transceiver that may appear on the power lines are minimal and within applicable FCC limits.

The dimming function is accomplished by use of a reed triac that is switched on at zero-crossings of the AC line voltage. The duty cycle of the gate signal is varied via the micro-controller according to the desired lighting level. The micro-controller adjusts the lighting level in response to the User pressing the button on the front of the unit, or in response to a command received from a remote control.