Chapter 22

Design and Implementation of Bipolar Digital Signal Acquisition and Processing System based on FPGA and ACPL–224

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ABSTRACT

This paper proposes new approaches for designing a bipolar DS acquisition system to reduce the harm of external factors on equipment, as well as fulfill system requirements at the veracity and reliability of the equipment to quickly connect. The design method chosen is ACPL-224 for chip of the interface about data acquisition on the FPGA device, including system principle, interface circuit logic, the method of data processing, and so forth. Now that this method has been applied, it has achieved good results, including extending the system’s adaptive range of external signal and enhancing the efficiency of the interface to quickly connect.

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1. INTRODUCTION

Data acquisition is widely used in radar, communication, image, military and medical chemical industry, has important application value (Stevens, 2000; Wei, Liu, & Yuan, 2003). Based on the digital signal acquisition to obtain the state of an external signal, thus obtained testing equipment working state. This design is to achieve the goal of bipolar digital signal acquisition (Wang & Li, 2008). Bipolar signal is digital signal which is composed of a positive or negative amplitude of the one state, and by grounding said it’s another. Previous unipolar digital signal acquisition design cannot adapt to the external signal polarity changes, but also need to strictly distinguish between the input port definition operational errors usually cause the damage of the interface circuit. The design of multi channel by means of AC input phototransistor optocoupler half pitch of ACPL-224 as the interface circuit chip on the external bipolar digital signal, then the use of FPGA and parallel processing ability of the powerful function for multipath signal processing, design a strong data processing capability and with rich interface digital signal acquisition and processing system (PICMG, 2005; Feldstein & Muzio, 2004).

2. SYSTEM PRINCIPLE

The standard architecture of CPCI bus module is used in the digital signal acquisition system. Includes interface circuit, Schmidt shaping circuit, logic processing section, a bus interface part. External digital signal through the interface circuit acquisition, TTL signal is outputed, and then into the logic device EPM7256SRI208-10 after Schmidt shaping circuit, all data processing by its implementation. Bus bridge device using PLX’s PCI9052 Compact PCI bus to local bus is provided to the system using. The system principle block diagram is shown in Figure 1.

3. INTERFACE CIRCUIT DESIGN

According to the requirements of the system interface circuit 32 Road, to meet the needs of light vibration, the input voltage, bipolar input, access to “0” when an external signal end is suspended, the isolation voltage not less than 2KV.

ACPL-224 multi-channel half pitch photosensitive transistor is selected in the design of interface circuit, which has two oppositely connected with the light emitting diode can be adapted to the re-

Figure 1. Bipolar digital signal acquisition and processing system