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基于NiosⅡ的液晶屏控制器SOPC设计

宋跃[1], 卢俊平[1,2], 雷瑞庭[1], 陈卫[1], 程博[1,2]

1. 东莞理工学院 电子工程学院, 广东 东莞 523808;
2. 华南理工大学 电子与信息学院, 广东 广州 510640

摘要： 为实现 TFT-LCD 显示控制器的SOPC-IP设计，选择FPGA-EP4CE6F17C8作为设计验证平台，采用verilog语言，针对全彩AT070TN84 TFT-LCD，由Nios Ⅱ软核处理器、SDRAM控制器、JTAG UART、LCD控制器、Avalon总线等组成TFT-LCD控制器。以Nios Ⅱ软核处理器为核心，各IP核（如SDRAM控制器、TFT-LCD控制器等）通过Avalon总线相连接到Nios Ⅱ上，并通过 Avalon总线接口模块、DMA模块、FIFO模块和时序产生模块完成了TFT-LCD控制器IP核设计，实现800×480分辨率，16 bit颜色深度的彩色图形显示控制。显示实验运行稳定，图像清晰，色彩丰富，无闪屏、错行等现象，视觉效果良好，设计具有良好的可配置性、复用性和移植性。实践证明该设计行之有效。文中给出了控制器的设计原理、实现方法、仿真与实验过程的同时，重点讲述与控制器IP核相关的各设计环节。

关键词： Nios Ⅱ SOPC-IP 液晶屏控制器 直接存储器存取

SOPC design on LCD controller based on NiosⅡ

SONG Yue[1], LU Jun-ping[1,2], LEI Rui-ting[1], CHEN Wei[1], CHENG Bo[1,2]

1. College of Electronics Engineering, Dongguan University of Technology, Dongguan 523808, China;
2. School of Electronic and Information Engineering, South China University of Technology, Guangzhou 510640, China

Abstract: In order to realize SOPC controller design on TFT-LCD,IP core of TFT-LCD controller based on Nios Ⅱ was designed by FPGA-EP4CE6F17C8 and Verilog language.TFT-LCD controller was consisted of the Nios Ⅱ soft-core processor, SDRAM controller, JTAG UART, LCD controller, Avalon bus for a full-color AT070TN84 TFT-LCD.Nios Ⅱ soft-core processor was designed as core, IP cores such as SDRAM controller, TFT-LCD controller were connected to Nios Ⅱ by Avalon bus, IP core design of TFT-LCD controller was mainly completed by such modules as the Avalon bus interface module, DMA module, FIFO module and the timing generator module.The color graphics display control wtih 800 × 480 resolution,16 bit color depth was achieved.Display experiment showed it was of stable, clear images, rich colors, no splash screen, wrong line and other phenomena, good visual effect.Design was of good configurability, reusability and portability.Practice proved that the SOPC design was effective.The design principle, control system simulation and experiment method, process were presented in the paper, relevant links of IP controller core design was mainly focused on at the same time.

Keywords: Nios Ⅱ SOPC-IP LCD controller DMA

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通讯作者: 宋跃，E-mail：eda815@163.com

作者简介: 宋跃 (1963-), 男, 湖南邵阳人, 教授, 研究方向为电路与系统、电子测量与仪器、嵌入式系统。E-mail:eda815@163.com
作者Email: eda815@163.com

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