

基于单片机的直流稳压电源设计与仿真

摘 要

自电子产品诞生以来，电源作为其重要组成部分，有着十分关键的作用，要想给电子仪器平稳正常工作提供重要保障，那么就必须要考虑电源系统本身的稳定性和可靠性。采用传统技术的电源系统受到灵敏度、稳定性等性能的局限，也在一定程度上限制了周边产业的发展。旧式的直流稳压电源存在一些显著的缺点，例如：电压示数不直观、电位器存在磨损现象、稳定系数低、难调准、电路结构复杂、体积大等缺点，而基于单片机控制的开关型多输出稳压电源能较好地解决了以上问题。

本设计的控制方式是以单片机作为控制器，具体型号要求为 AT89S52。电源类型为开关型,采用 PID 控制策略，研制了一个有电压显示的数控直流稳压电源。本次设计采用数码管显示电压的示数,同时可输出两个档位的电压值,系统是以 AT89S52 单片机为控制核心，整体硬件电路图包括了显示部分、单片机最小控制系统、取样电路、调整电路以及数模转换电路等系统。文章全面的介绍了该稳压电源系统的设计方案、不同模块的具体构成以及作用，涉及到具体功能的实现，所以进行了软件编程，设计了系统流程图。并在 proteus 上调试运行成功,实际仿真结果显示输出电压为 3V、5V 三个档位，最大电流为 1A,效率 90% 以上，系统设有直接显示输出电压示数的数码管。该电源具有稳定性好、精度高、电路简单、调节方便、成本低等特点，针对于实验室中的功率较小的电子产品，完全可以为其提供电源。

关键词：单片机；PID；开关电源

ABSTRACT

Since the birth of electronic products, the power supply, as an important part, has a very critical role. In order to provide an important guarantee for the smooth and normal work of electronic instruments, it is necessary to consider the stability and reliability of the power system itself. The power supply system with traditional technology is limited by its sensitivity, stability and other performance, which also limits the development of surrounding industries to some extent. The old type of dc voltage regulator has some significant shortcomings, such as: the voltage indicator is not intuitive, potentiometer has wear phenomenon, low stability coefficient, difficult adjustment, complex circuit structure, large volume, etc.

The design of the control mode is MCU as the controller, the specific model requirements for AT89S52. Using PID control strategy, a nc dc voltage stabilized power supply with voltage display is developed. This design USES digital tube display voltage indicator, at the same time can output the voltage value of three gears, the system is AT89S52 single-chip microcomputer as the control core, the overall hardware circuit diagram includes the display part, single-chip microcomputer minimum control system, sampling circuit, adjustment circuit and digital to analog conversion circuit and other systems. This paper comprehensively introduces the design scheme of the stabilized power supply system, the specific composition and function of different modules, involving the realization of specific functions, so the software programming, the design of the system flow chart. In proteus, the upregulation test runs successfully. The actual simulation results show that the output voltage is 3V and 5V, the maximum current is 1A, and the efficiency is more than 90%. The system is equipped with digital tube that directly displays the output voltage indicator number. The power supply has the characteristics of good stability, high precision, simple circuit, convenient adjustment and low cost, which can provide power for the electronic products with low power in the laboratory.

Keywords: Microcontrollers; PID; Switching power supply

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