

Design of wireless electronic ordering system based on single-chip microcomputer

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Abstract. A point ordering system composed of wireless digital transmission chip and single chip microcomputer is introduced in this paper. The hardware circuit and software of the system are designed. The principle of control transmission of RNF2401 in the ShockBurst™ transfer mode via single chip microcomputer is discussed. The experiment shows that the system is easy to be controlled and can transmit data steadily.

1. Introduction

A la carte, viewing recipes, etc. are done manually at most dining venues. This requires a lot of manual work. It is slow, labor-intensive and error-prone. This leads to low work efficiency and great waste of manpower and material resources. In order to save manpower and time and avoid unnecessary mistakes, after careful investigation and study, it was decided to develop this system^[1].

2. Choice of wireless communication technology

With the development of technology, various short-range wireless communications have been made available. Such as Bluetooth, 802.11b, but each has its own characteristics and applications. In some low-cost applications such as wireless meter reading and wireless ordering, the high cost and complicated development process of HomeRF or 802.11b limits its application. Bluetooth is a very complex system. The chip interface that fully implements the Bluetooth technology protocol system is complex and expensive. Nordic's nRF2401 is a wireless transceiver chip that simplifies the Bluetooth protocol. It realizes low cost and short development cycles for short-range wireless communications. Due to its lower price and simple development, it shows unique advantages in low-cost applications.

3. Wireless electronic ordering system design

3.1 Overall circuit design

The system consists of two parts: one is the base station, which together with the PC constitutes the entire wireless communication control and management; the other part is dozens of handheld terminals.

3.2 A la carte terminal design

According to actual needs, the hardware of the wireless ordering machine is composed of five modules: the core module CPU, the 2.4G RF wireless communication module, the LCD display, the keyboard module and the power supply module.

3.3 Core Control Module

The design of the core control module microcontroller AT89C51 mainly includes reset, crystal, power supply and indicator 4 parts. The circuit diagram is shown in Fig. 1.

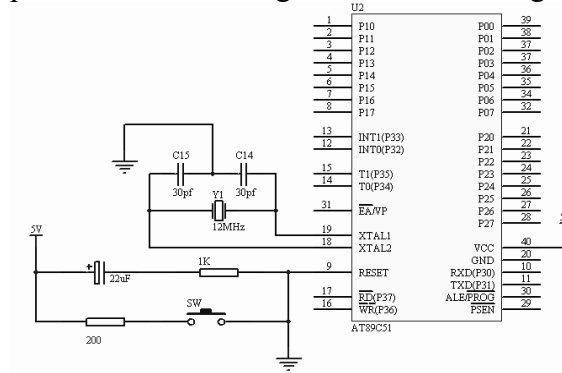


Fig. 1. SCM minimum system

3.4 Wireless Module

This design selects the nRF2401 chip produced by Nordic Corporation. It is a wireless transmission chip that integrates transmission and reception. Its operating frequency is stable and reliable, with few external components and extremely low power consumption. It is suitable for the design of portable and handheld products. Due to the low transmit power and high receiver sensitivity design, radio regulatory requirements can be met without the need for a license, making it an ideal choice for low power wireless transmissions^[2]. The typical application circuit is shown in Fig. 2.

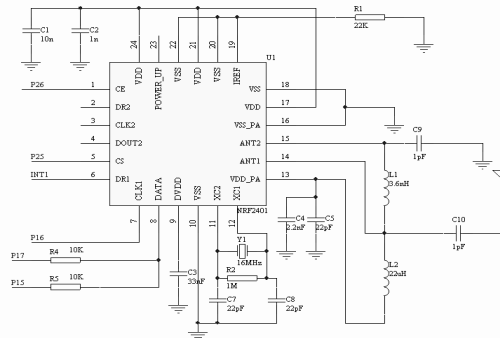


Fig. 2. nRF2401 typical application circuit

3.5 OCM4X8C display module

SK5278 is a keyboard controller that can manage 16 keys. The device has a debounce processing circuit inside it. It can directly output the key-value coding of the keys, and it can be connected to the microcontroller or microprocessor in serial mode. The device can be used. Simplify the keyboard and software interface of the SCM system software and hardware. The circuit diagram is shown in Fig. 3.

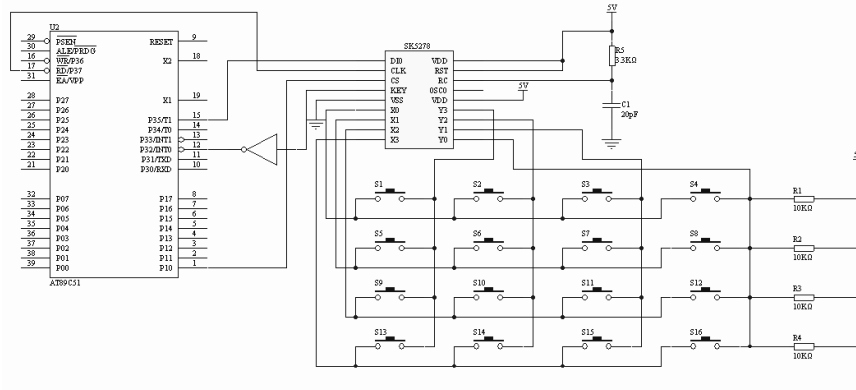


Fig. 3. keyboard module circuit diagram

3.6 Power module

This design adopts a simple power supply circuit, and the exterior adopts a finished home appliance that can directly supply 12VDC power. The microcontroller power supply is 5V, and its circuit diagram is shown in Fig. 4.

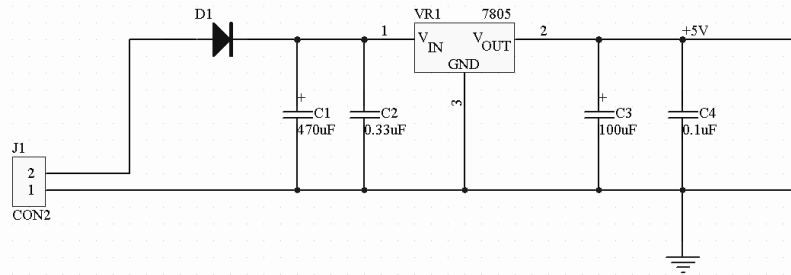


Fig. 4. Power Circuit

Since the nRF2401's operating voltage is 1.9V-3.6V, the operating voltage of more than 3.6V will burn the chip, and the microcontroller power supply is 5V, so in order for the system to work, it must be part of the 5V level converted to a 3.3V level. Its circuit diagram is shown in Fig. 5.

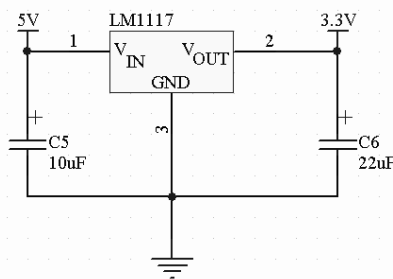


Fig. 5. 5V to 3.3V

4. Software design

First, the waiter logs on to order the machine. When the user is authenticated, the waiter performs the ordering operation according to the customer's request. A la carte can be achieved directly through the encoding of the dishes and the addition and subtraction of keys to achieve a la carte convenient and quick.

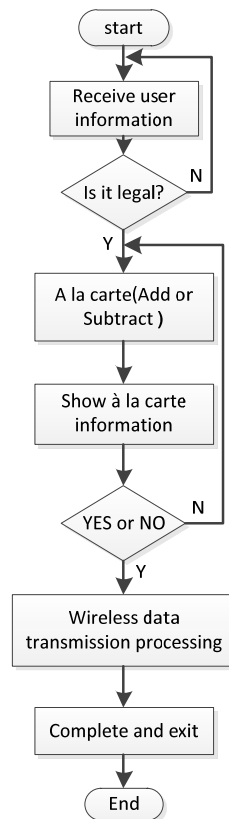


Fig. 6. A la carte flow chart

The nRF2401 data receiving subroutine mainly includes the following contents: The microprocessor first configures the nRF2401 as the receiving mode; the microprocessor sets the CE=1, and the nRF2401 enters the receiving working mode; when the data received by the nRF2401 is the same as the local address and CRC When the test is correct, DR1 outputs a high level; the microprocessor reads the received data through DATA, CLK1; after reading the data, DR1 goes low.

The nRF2401 subroutine for data transmission mainly includes the following contents: The microprocessor first configures the nRF2401 as the transmit mode; the microprocessor configures CE=1, and the nRF2401 enters the transmit operation mode; the microprocessor sends the data to be transmitted through the DATA, CLK1 nRF2401; set CE = 0, nRF2401 shot number; data transmission, the nRF2401 enters standby mode [4].

5. Conclusion

The system has a simple structure, small size, low cost, and saves a lot of manpower, and is suitable for various hotel and hotel, especially small and medium-sized hotels.

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