Power-saving Wireless Transceiver for Temperature and Humidity Auto-controlled System

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Abstract In this paper, the power-saving wireless transceiver of temperature and humidity auto control system for the industrial scientific medical (ISM) band of 424.7 MHz is designed and fabricated. In other to minimize output frequency drift over the temperature variation, the temperature compensated crystal oscillator (TCXO) with the stability of 2.5 ppm/℃, is applied to generate the reference frequency of the transceiver. The TCXO current consumption with 1.2 mA at the enable mode is reduced to 4 ~ 5 μA by utilizing the disable function of the enable and disable (E/D) circuit.

1. Introduction

As modern society has developed, it needs the rapid growth of potable automatic control system using a wireless communication system. Especially, the development of the auto-control system by a wireless transceiver can free from space and distance restriction at a everyday life. Many applications for wireless data communication can be found with the development of digital and wireless communication technology.

The ISM band which is prescribed in the ITU (International Telecommunications Union) radio regulation resolution No. 16 is used for industrial, scientific and medical products. For example, a remote control automobile starting system, microwave oven, amateur radio and RFID (Radio Frequency Identification) are representation of the devices for ISM. Configuration of ISM in Korea is shown in table 1. Recently, domestic ISM is applied to narrow applications and we have to consider the additional cost which is occurred to exchange worn-out facilities based on wire-equipment.

This paper is focused on the convenient and the economical efficiency which are caused by auto-control and reducing the cost needed to inspect the equipments for maintaining the optional environment of industrial site, office, school etc. Additionally, it is consider the design factors for the size, the current consumption and the maximum radiation range of suggested auto-controlled system in order to easily move to any places and to apply to any systems.

Table 1. Configuration of domestic ISM[1]

Frequency (MHz)	Service
26.9650 ~ 27.4050	Wireless station
46.5100 ~ 46.9700	Codeless telephone
49.6050 ~ 49.9700	〃
220.0000	Specific low power device
448.7375 ~ 449.2625	Wireless station
424.1375 ~ 424.2625	〃
424.7125 ~ 424.9500	Specific low power device
914.0000 ~ 915.0000	Codeless telephone
959.0000 ~ 960.0000	〃

In this paper, the wireless transceiver using ISM is realized as the system to automatically maintain optional environment automatically by receiving temperature and humidity data from the sensor.

2. The design of wireless transceiver

The power-saving wireless transceiver uses the CC400 of Chipcon company which has lower current consumption of 1 μA in stand by mode. The CC400 has 8 frame registers, and these resisters are operated by firmware controlled microcontroller. The configuration of RF chipset register is shown in Table 2.[1]