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Development of the testbench base on STM32 microcontroller and expansion module

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***Abstract*—The purpose of the development is to create a test layout on the STM32 microcontroller F103C8 series and expansion module. Performing this work had to consider the following steps: analysis of similar devices and expansion modules; develop the spatial structure of the device and its layout; develop the design of the printing module; conduct testing; integrate the test layout and expansion module.**

Keywords—STM32, microcontroller, expansion module, testbench, F103C8, SPI, I2C, GPIO, testing

I. Introduction

A test bench or testing workbench is an environment used to verify the correctness or soundness of a design or model [1]. The Wireless sensor networks (WSN) systems have a lot of problems like security, energy consumption, heterogeneity and other disadvantages that need be solved. Therefore, it is quite difficult to design a sensor network node so that it satisfies the necessary criteria for optimality. If such a node is also used for testing and training, then additional requirements for the construction will be propose to, for example, as in articles of designing microprocessor systems [2] or embedded control systems [3]. Energy monitoring [4] is a key factor for the successful prolongation of life times each nodes in wireless sensor network, for examples reducing the power consumption of nodes [5]. Therefore, can set the task to optimize the structure of the node for as one of approach to designing a wireless sensor network node. One approach is shown in the literature [6].

STM32 is a family of 32-bit microcontrollers from STMicroelectronics. STM32 chips are grouped in series, each using the same 32-bit ARM core.

Performing this work had to consider the following steps: analysis of similar devices and expansion modules; develop the spatial structure of the device and its layout; develop the design of the printing module; conduct testing; integrate the test layout and expansion module.

II. Analysis of Similar Devices and Expansion Modules

We analyzed various approaches to the design of such stands - with the presence of a scheme for additional installation (fig.1) and without it (fig. 2).

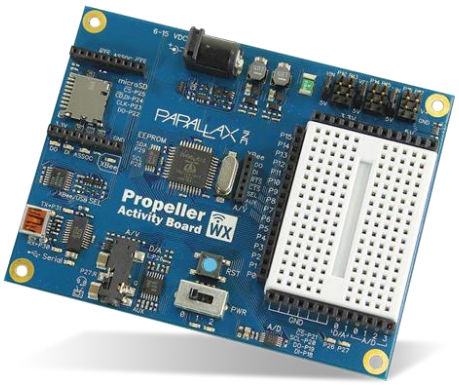

Fig.1 PCB testbench board with additional installation

The stand (fig. 2) is built on a modern element base. The stand includes two standard RS-232C ports, serial Flash memory with I2C interface, program memory and 64KB data memory. The presence of system and peripheral interfaces allows using the stand for debugging any systems.

Fig.2 PCB testbench board with expansion module

III. Development of the Module Structure

Were analyzed STM32 microcontroller F103C8 series (fig. 3).

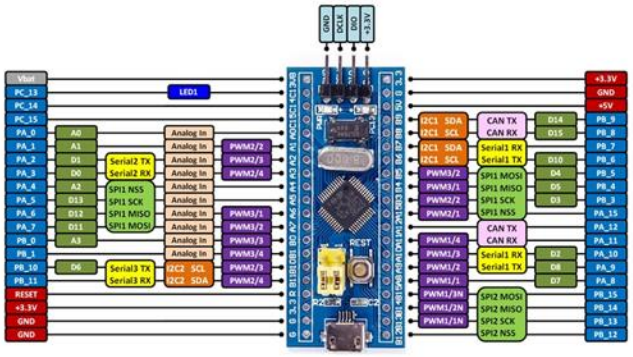

Fig.3 STM32 microcontroller F103C8 series with pireferals

As a result of the analysis and design, a printed circuit board was developed and the module was assembled. The figure 4 shows the appearance of the text layout and its layout.

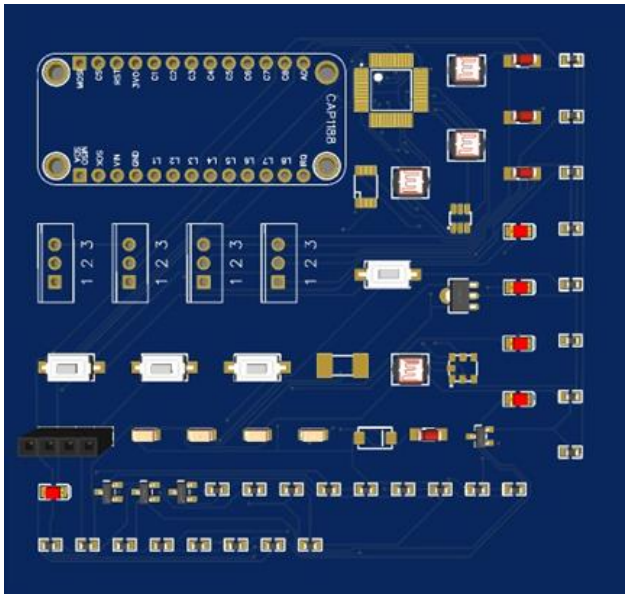

Fig.4 STM32 testbench base on STM32 microcontroller F103C8 series

The developed expansion module is shown in the fig. 5.

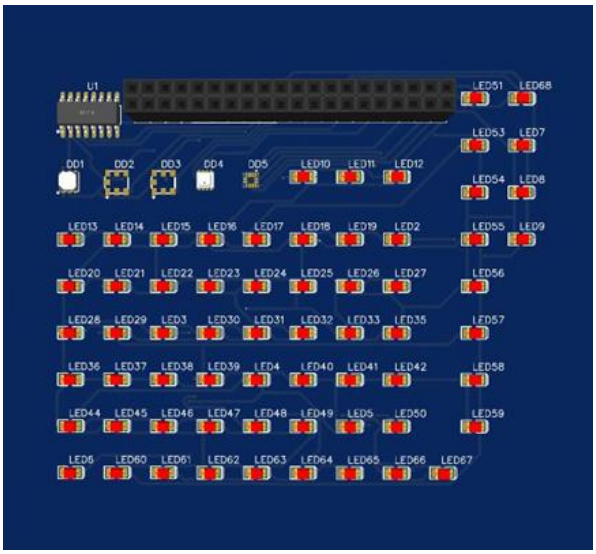

Fig.5 Developed expansion module

The proposed model defining defines different levels of system interaction. Each level performs certain functions in such interaction (fig. 6).

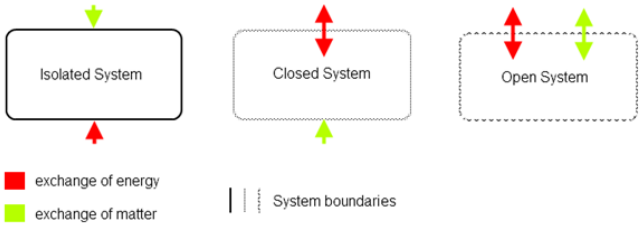

Fig.6 Proposed model for testbench

IV. Conclusion

Similar constructions and modules are analyzed[1,3,6-8]. A test layout based on the STM32 microcontroller has been developed. An extension module for test layouts has been developed. Three different models for testing embedded systems have been proposed.

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