Hardware and Software Implementation of Real Time Detection Systems

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Abstract

A printed circuit board (PCB) mechanically supports and electrically attaché withelectronic components using copper clad conductive materials. Based on lamination PCB's classified as single sided (one copper layer), double sided (two copper layers) or multi-layer(outer and inner layers). But it has some difficulties such as high failure rate, instability of performance and low detection precision andvisualization ability. To reduce these difficulties a Flexible Copper Clad Laminates detecting system is used. The Lab view tool used to designs and develops a sort of embedded smart detecting system. This system used to upgrade Lab view software, open and stretchy of the virtual tool, and the functionality of distributing with multiple tasks in real time embedded system, to accomplish automatic controller by the GPIB bus collaborating with PC. This detecting system can make a suggestivedevelopment in resolution, speed of response and stability, which has anadvanced application value in engineering.

Keywords

PCB, Flexible Copper Clad Laminates, Real time Embedded System, GPIB Interface, Lab view software.

I. INTRODUCTION

Printed circuit boards are used in all electronic products it is a simplest process. Another course of action to PCBs includescable wrap and point-to-point structure. PCBs entail the further design effort to lay out the circuit, but industrialized and assembly can be automated. The all polyimide copper clad flexible laminates (CCL), with high performance Kaptonfused dielectrics, are obtainable in anextensive variety of copper types, thicknesses and construction options.These shields provide lightweight, both thin and thick, andvastlyconsistent substrates including superior circuit trace devotion strength, minorDk and Df properties, risky environmental stability, and larger design latitude for high frequency and impedance controlled applications.

With the cumulativegrowth of science and technology, electronic goods become furtherminiaturized, weightless and diluter in recent years, which promote the Flexible Copper Clad Laminates (FCCL) produce a significant role in the manufacturing and production of electronic components. And Flexible Copper Clad Laminates

recollect the good features of a rigid plate such as dielectric properties, bond strength, and dimensional stability and it has the good refraction characteristics, specifically:

(1) For dynamic linking it can be bending easily.
(2) It is also used to be bound in 3D spaces to narrow the wire space.

LabVIEW (short for Laboratory Virtual Instrument Engineering Workbench) is a system-design raised area and progresssetting for a graphical program writing language from National Instruments.The graphical language is termed as "G". Initially released for the Apple Macintosh in 1986, LabVIEW is normally used for data acquisition, tool control, and engineering automation on a variability of podiums including Microsoft Windows, various versions of UNIX, Linux, and OS X.

LabVIEW basically developed for the production of engineers and scientists. With a graphical program writinglanguage rules that make it modest to visualize, create, and code engineering systems, LabVIEW is unequaled in serving engineers convert their ideas into reality, decrease test times, and transport business perceptions based on collected data.

GPIB (IEEE 488) is interface bus for hardware and software which gives more benefits - better performance, great reliability, and enlarged productivity –that can protect time and money during the course of the life for device control system after development over production and maintenance.The GPIB is an 8-bit parallel transport network interface with data transmission rates up to 1.1Mbyte/s. The bus contains one Scheme Controller, typically a computer, and up to 15 extratools. Because the GPIB is an 8-bit parallel line with wild data transmission rates, it gained popularity in other applications such as intercomputer communication and peripheral control.

II. DESIGN PRINCIPLES

The shell strength, flexible strength (elongation) of the material and chemical conflictare the important test mattersin FCCL. The detection apparatuspractices the principle of perpetual velocity ductile test to complete estimate and the firm among the interlining and the stuff adhesive by calculating the normal value and the diffusion coefficient of all heights on the energy curve through the peel off process of the interlining and fabric.

The detecting system requires two techniques such as the constant pressure and the continual speed. In order to realizethe constant pressure, this detecting system usespre-designed pressure indicationtraining circuitto provide high-sensitivity pressure sensor to exactlytamingzoom thenpermits these inflamed signals to the ARM processor-based PowerPac for high-speed dispensation. Subsequently, these managed data are examined by the PC monitoring LabVIEW software.

As anoutcome of detection techniquespromises the real-time process of the documents and jobs, also progresses the truthfulness of the data processing. In order to increase the constant speed, this detection method uses a high - perseverance optical encoder to exactlyregulate the motor, so that it confirms the stability.For the consideration of above two methods, this detecting system can ultimatelyrealizeanenormous number of good presentations such as specified time, absorption values, specified deformation and spontaneously return to the initial point.

III. HARDWARE IMPLEMENTATION

Hardware implementation is the foundation of attaining the accurate test of the FCCL. The trouble shooting of design will affect entire automaticroutine test of the system. The hardware stage of the detecting system contains the ARM principal module, the GPIB interface module, the pressure signal achievement and conditioning module, the DA control the motor-powered module and the Man-machine interface test software of LabVIEW.

Based on selection of ARM processor will straightly disturb the completepresentation of the detecting system. So we select LM3S8962 microcontroller, which is usuallyconsider for engineering applications including workshop automation, motion controller, testing and measurement tools.

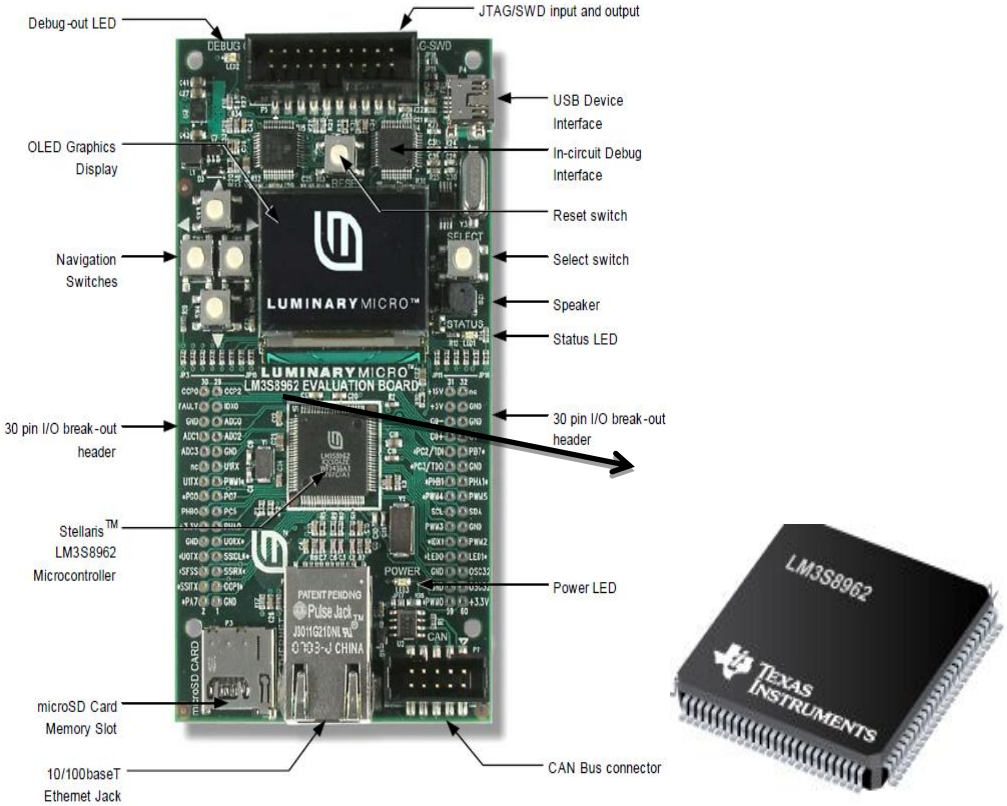

Fig. 1 LM3S8962 microcontroller

A. GPIB Bus Interface Module

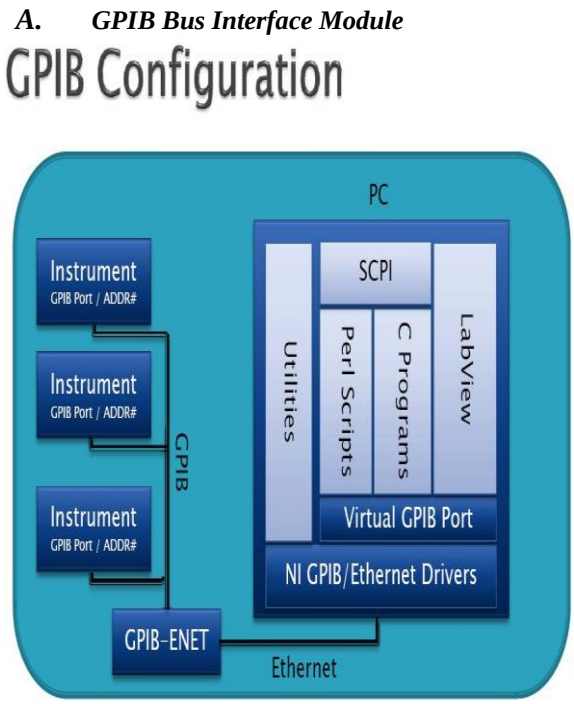

Fig. 2 GPIB interface configuration model

GPIB interface card widely used for various applications its working principles based on IEEE488 protocol.The GPIB is a numerical 8-bit parallel transportations interface with data transferal rates up to 1.1 Mbyte/s. The bus maintains one System Controller, commonly a computer, and up to 15 supplementary instruments. For the reason that the GPIB is an 8-bit interface which transfer the data at very fast. It increased status in other claims such as intercomputer communication and peripheral control.

B. Pressure Sensor Conditioning Module

The pressure sensor signal conditioning circuit as shown in Figure 3, anywhere the detailed design concepts are as follows: initially, lost the pathetic voltage signal of the pressure sensor yield of the two roads and bridges to the plan of pressure sensor signal conditioning circuitsby two-way regular LC low-pass filter path to filter out low frequency jitter triggered by applied voltage signal, and formerlynext the Operational Amplifier filtered AD8222 and improved by the dual-channel adaptable gain ADS1256 variance transmission to internally adjust the gain (1-128 times), low- noise high-resolution 24-bit AD converter. ADS1256 chip automated to control the test group data increases the self-correction and system correction, and then clarified by a programmable digital filter over SPI sequential data port conveying data to ARM.

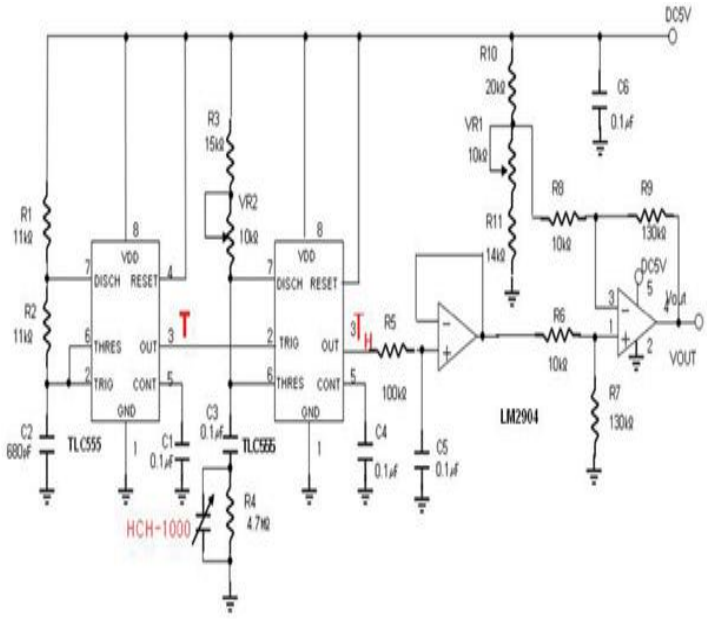

Fig. 3 Pressure Sensor Conditioning

C. Motor Drive Module Design

In detection system module can be control the motor speed, one consumes 12 serial diffusion of high-precision low-voltage DA chip DAC7512 to strategy the circuit. One use the 5V (ERROR_HI) voltage signal twistedworking amplifier OP07 over the driver board to drive the motor.

IV. SOFTWARE DESIGN

IAR PowerPac RTOS is a real-time operating system established on the significance control, which has a great level of inflationcompetences to conquer a very trivial space on the RAM andROM, allowing to the necessity for optimization of rapidity and functionality. Its principal has complete process development modules, file administration module and power component. The IAR EMARM combinedwith LM3S8962 the improvement environment and rich in API functions support to short development cycle. Beneficial todevelop the system co-processing abilities of real-time multi-tasking system, the design accomplishesPowerPac RTOS replacement on the LM3S8962.

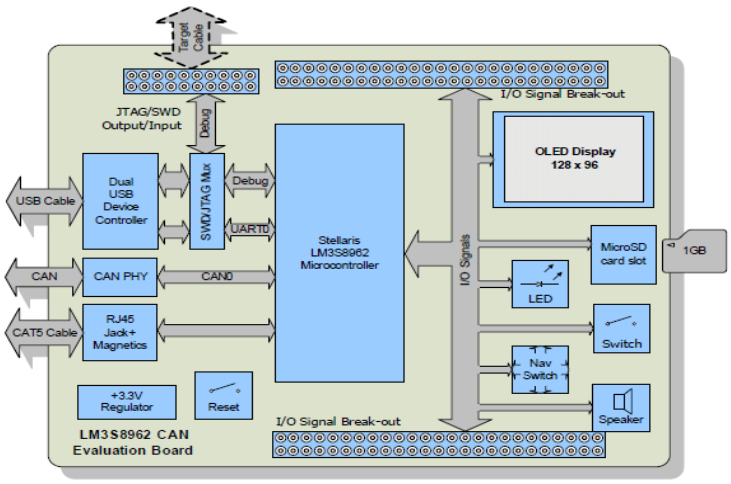

Fig. 4 LM3S8962 control system logic

The elementaryprogram design unit of LabVIEW graphical software design language is a virtual instrument (VI). VI (and sub-VI) consists of the three major parts: the front panel, block diagram, and image / connector. In the submission of this development through the GPIB interface monitoring the ARM, one wantto enterprise the submission based on LabVIEW. The design of monitoring and controller system software uses a consecutiveseparating structure, so the application software is separated into three categories: processing each film interface sub-VI; signal acquirement and processing sub-VI; sub-VI statement with GPIB devices.

V. CONCLUSIONS

This paper precedescomplete advantages of the multitasking real-time embedded systems to guarantee a quick data processing and judicious communications requests, and instantaneouslydecrease the size and power depletion of the controller to increase thepresentation and drop the cost. The considered system can accomplish a good functional system transplant, which is advantageous to theelevation of the system.

LabVIEW real time software is powerful graphical user interface (GUI) can be suitable to accomplish the design of regulator systems and human-machine interface which control PC.LabVIEW virtual device to device control is concerted in the software module that can be used a variability of ways to display the data collected. The effects of the exploration and regulatory process will be more favorable to the improvement of new products.The real operation of the FCCL sensing system displays that it has the noblepresentations in resolution, response speed and stability. This detecting system not only increases the near of automatic inspection, but also increases the assessment accuracy. In accumulation, it is easy to progression and the equivalent upgrade cost is very economy, which increase the worthin the allied industry.

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