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Design Of Condition Monitoring Module

S.Arunprathap[1] , R.Abinesh[2] , S.Guruprakash[3] , T.Vignesh[4]

Assistant Professor[1], Department of Electronics and Communication Engineering,
M. Kumarasamy College of Engineering, Karur, Tamil Nadu, India.
UG Scholar[2,3,4],Department of Electronics and Communication Engineering,
M. Kumarasamy College of Engineering, Karur, Tamil Nadu, India.

Abstract

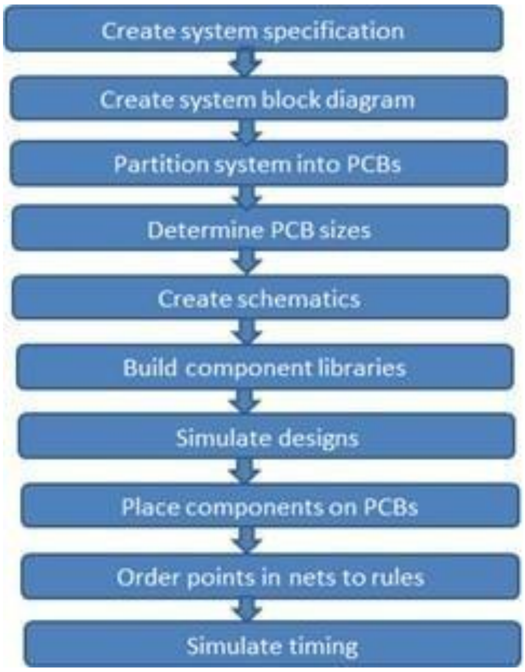
The design of the Condition Monitoring module is based on the need for predictive maintenance, which necessitates a routine or permanent recording of the system condition. To control various sensors and devices, the design includes inputs such as RS-232, RS-485, IO-Link, and resistance temperature detectors (RTds). The primary aim of condition monitoring is to detect a fault, or a deterioration process, that has advanced to a certain symptomatic level, and to provide an early warning of the abnormality before it leads to a functional breakdown. As a result, we're working on a condition monitoring module to identify and correct the malfunction. The primary aim of condition monitoring is to increase plant production capability and profitability. The circuits can be implemented in Printed Circuit Boards using xpedition, and design is used very effectively.

1. Introduction

Printed circuit boards (PCBs) are the boards that function the inspiration for many electronic devices, serving as both a physical support piece and a wiring area for surface-mounted and socketed components. Fiberglass, composite epoxy, or another material are the foremost common materials wont to produce PCBs. the bulk of PCBs for basic electronics are single- layer and straightforward . Hardware with several layers, like special effects cards or motherboards, can have up to 12 layers. Despite the very fact that PCBs are most generally related to computers, they will even be utilized in TVs, radios, digital cameras, and mobile phones. Different sorts of PCBs are utilized in variety of other areas additionally to consumer electronics and computers. Multi-layer PCBs are made from three or more double-layered PCBsstacked on top of every other. These boards are then glued along side a special adhesive and sandwiched between sheets of insulation to stop any of the components from melting. Multi- layer PCBs are available during a number of sizes, from four layers to 10 or twelve layers. 50 layers thick was the most important multi-layer PCB ever installed. Designers may create very dense, complex designs using several layers of computer circuit boards, which are ideal for a good sort of complicated electrical tasks. File servers, data storage, GPS technology, satellite systems, meteorology , and medical equipment are all applications where multi-layer PCBs are going to be helpful.

2. Existing system

The condition monitoring module's integrated circuits and designs allow designers to create applications with a high-speed signal chain, efficient processing, and a variety of wired and wireless interfaces to communicate to the outside world. Imagine if your car could tell you when one of its components, such as a belt, hose, spark plug, or wheel bearing, is about to fail. You could have parts replaced as needed before they wear out and be back on the road in a matter of minutes, similar to how you change a collection of tries today. As a result, you could save a lot of time and money on planned preventive maintenance, which involves replacing worn-out parts with new ones to prevent parts from failing while the machine is running. Scheduled maintenance, which requires leaving the car in the garage all day, may still be required on occasion, but only for a few parts and infrequently. You pay a lot of money for every minute thefactory spends in the garage for repairs. You adhere to preventive maintenance plans to repair parts that might malfunction, however you wish there was a better way—a way to know exactlywhen something would fail and replace it just in time. Most replacements will need only minimalrepairs and could be done at off-peak hours, avoiding the shutdown of an entire line or the factory as a whole. Predictive maintenance is the term for this process. By replacing or supplementing a conventional preventive maintenance programme with creative predictive maintenance, you can save money on components, labour, and factory downtime, and your investment can pay for itself several times over.



3. DESIGN FLOW

Fig 3.1 **fig 3.2**

4. Input power field

Over/under voltage or current protection, as well as miss-wiring protection, can be included in the input power protection. Diodes, fuses, and PTC have also been used to do this. However, as the need for security and efficiency grows, integrated circuit protection options such as E-fuse, Hotswap, and ideal diode are becoming more appealing.

4.1 Non isolated DC power supply

One or more front-end components (ADC, REF, amplifiers, power switches, etc.) on the field side of the module require power from the field supply. We have DC/DC converters, LDOs, and other devices for all power and voltage levels that can help minimize power dissipation and solution size.

4.2 Isolated DC power supply

The backplane is normally galvanically isolated from the field side (ore remote modules). Powerinput can be needed depending on whether the module has a field power link or a non-isolated power supply. Tiny and powerful fly-buck, fly-back, and push-pull topologies are all possible withour systems.

4.3 Input power protection

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Electromagnetic disturbances (EMC), surges, and quick transients events caused by the factoryenvironment can affect input and output signals to and from modules. IEC6100-4-x covers testing against such disturbances. To secure the various modules, we provide a wide range of ESD and TVS support. The vibration sensor input will provide power to the remote sensor and sample the sensor's vibration or acoustic information before sending it to the backplane. One ormore digital processing blocks, such as MPU, MCU, FPGA, or ASIC, are located on the backplaneside and must be controlled by the backplane voltage. DC/DC converters, LDOs, and power management ICs (PMICs) are all available to help minimise power dissipation and solution size.

5. Proposed system

Predictive maintenance detects, pre-processes, and reports on real-time conditions, communications must provide fast signalling and low latency, which are required in many applications by industry standards. The network must support wired and wireless sensor communications, as well as reporting to factory automation control centres, human operators through a human-machine interface, and the cloud. The standards used in today's industrial networks differ widely, and several protocols can be in use on the same factory floor. To make implementation easier, predictive maintenance communications should be consistent with more commonly used standards.

5.1 CC3220MODA

The totally programmable FCC, IC, CE, MIC, and SRRC confirmed remote microcontroller (MCU) module with worked in Wi-Fi network is an incredible spot to begin. The TI SimpleLink CC3220MODx andCC3220MODAx module family, intended for the Internet of Things, is a remote module that consolidates two truly isolated installed sensors MCUs on chips. An application processor—an ARM Cortex-M4 MCU with 256KB of RAM committed to the client and1MB of Serial Flash as another option. Both Wi-Fi and web legitimate layers are controlled by an organization processor MCU. A 802.11b/g/n radio, baseband, and MAC with an incredible cryptomotor for simple, secure web associations with 256-cycle encryption are remembered for this ROM-based subsystem.

5.2 CC2652R

String, Zigbee®, Bluetooth® 5 low energy, IEEE 802.15.4g, IPv6-empowered keen items (6LoWPAN), Wi-SUN®, and exclusive frameworks are completely upheld by theCC2652R multiprotocol remote 2.4-GHz MCU. The CC2652R is essential for the CC26xx and CC13xx group of 2.4-GHz and Sub-1-GHz RF gadgets that are savvy and super low force. Low dynamicRF and microcontroller (MCU) flows, just as sub-A rest flows with up to 80KB of RAM maintenance, guarantee long battery life and permit activity with little coins-cells batteries**.**

5.3 ADS122U04

The ADS122U04 is a 24-bit exactness simple to-advanced converter (ADC) with many inherenthighlights that help limit gadget cost and part include in applications that action little sensor signals. Through an adaptable info multiplexer (MUX), the unit has two differential or four single
-finished data sources, a low-commotion, programmable addition speaker (PGA), two programmable excitation current sources, a voltage reference, an oscillator, and an accuracytemperature sensor, just as a voltage reference, an oscillator, and an exactness temperature sensor.

5.4 MSP432P4111

The Simple Link MSP432P411x and MSP432P401x microcontrollers (MCUs) are upgraded remote host MCUs with a coordinated 16-digit exactness ADC, conveying super low-power execution including 100 µA/MHz in dynamic force and 820 nA in reserve power with FPU and DSP augmentations. The MSP432P411x and MSP432P401x are streamlined remote host MCUsthat empower designers to give more-accuracy simple and memory augmentation to SimpleLink remote correspondence arrangements

5.5 HDC2080

In a little DFN box, the HDC2080 framework is an incorporated moistness and temperature sensor that furnishes high accuracy estimations with low force utilization. The capacitive-based sensor has new coordinated advanced highlights just as a warming component to disperse dampness and buildup. Programmable intrude on edges are remembered for the HDC2080 advanced highlights to give alerts and gadget wake-ups without the requirement for a microcontroller to constantly follow the framework. The HDC2080 highlights programmable inspecting stretches, low force utilization, and 1.8-V stock voltage support.

6. SCHEMATIC DIAGRAM

Overview of the condition monitoring module schematic diagram are beendisplayed below as (**fig 6.1).**

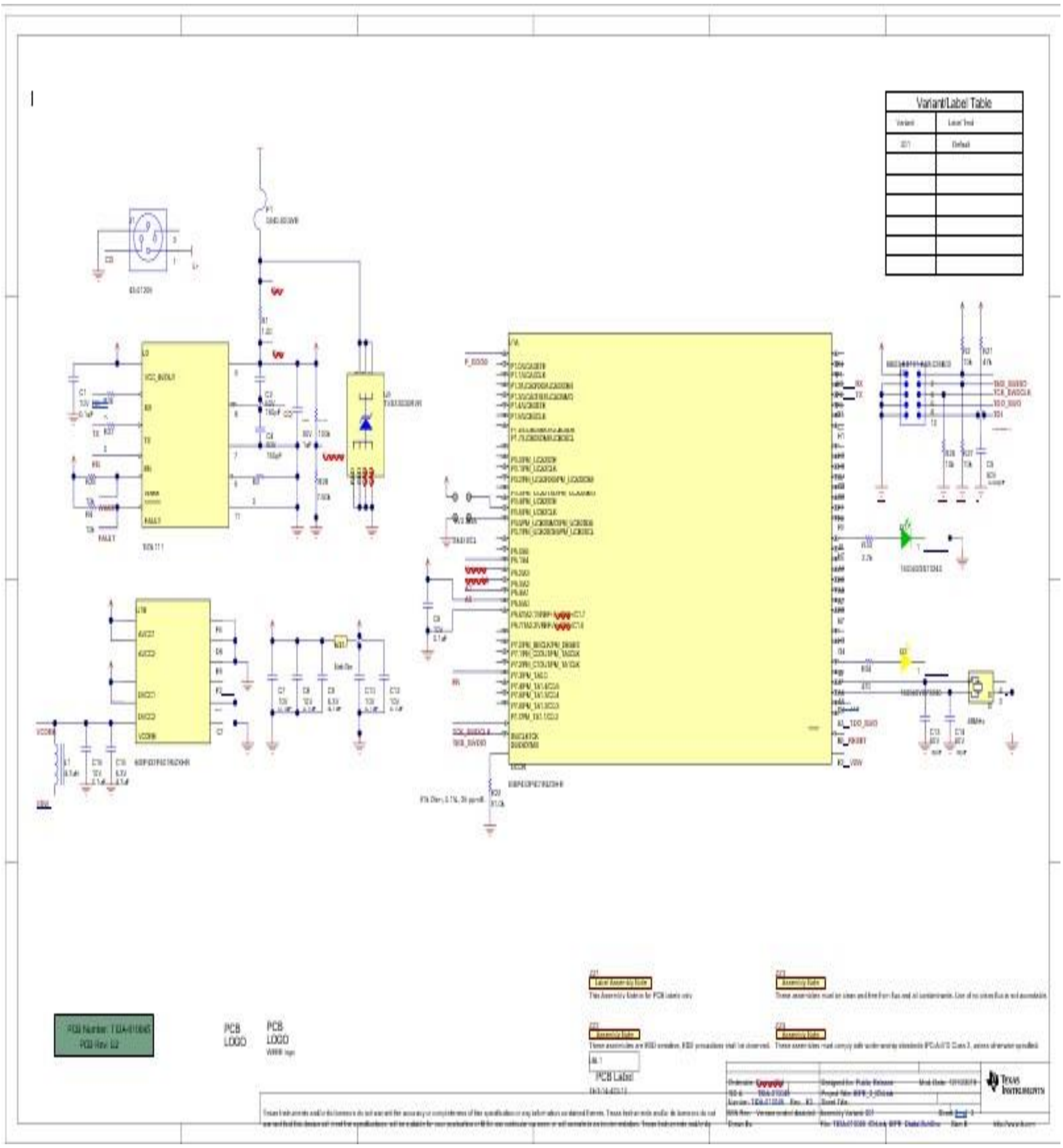


Fig 6.1 schematic diagram of condition monitoring module

7. OUTPUT

7.1 TOP ASSEMBLY DRAWING

The below figure is the Top Assembly drawing for the condition monitoring module. Theelectronic segments are fit onto the PCB utilizing an assortment of get together cycles, for example, surface mount method or a through-opening development. The segments utilizedought to likewise be viable with the get together interaction utilized.

PCB VIEWED FROM TOP SIDE	BOARD #: TIDA-010045	REV: E2	SVN REV: Not In VersionControl
	TID #: TIDA-010045		
PLOT NAME = Top Assembly Drawing	GENERATED : 11/23/2018 4:13:41 PM		TEXAS INSTRUMENTS

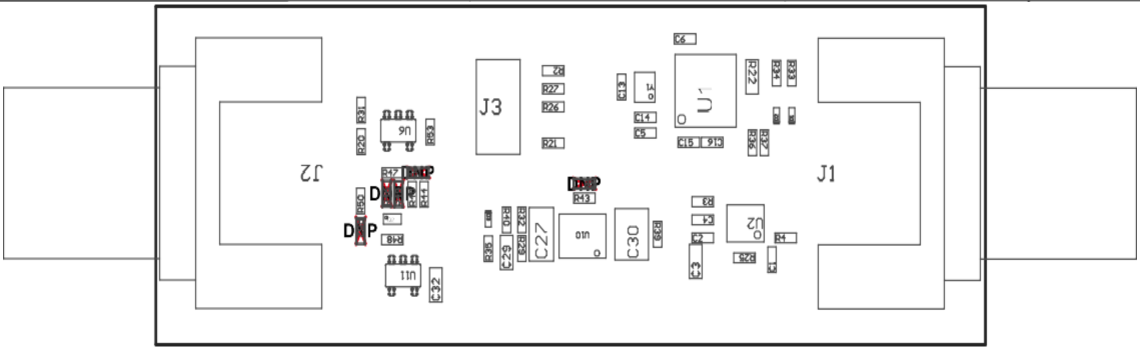


Fig 7.1 Top assembly drawing

7.2 BOTTOM ASSEMBLY DIAGRAM

The below mentioned (**fig 7.2)** shows the Bottom Assembly diagram of condition monitoringmodule.

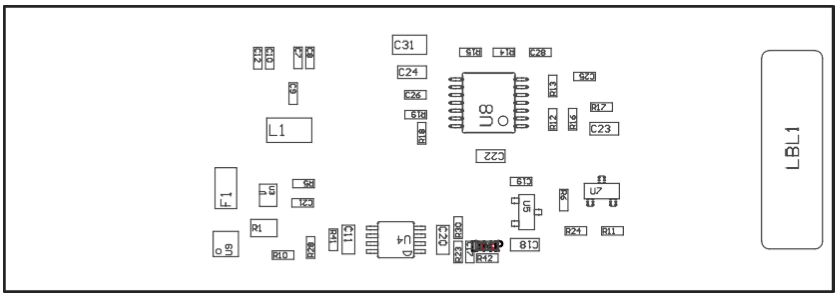
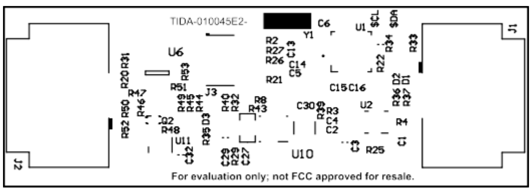


Fig 7.2 Bottom assembly diagram

PCB VIEWED FROM BOTTOM SIDE	BOARD #: TIDA-010045	REV: E2	SVN REV: Not In Version(
	TID #: TIDA-010045		
PLOT NAME = Bottom Assembly Drawing	GENERATED : 4:13:42 PM		

7.3 TOP AND BOTTOM OVERLAY

The below mentioned drawing shows the top overlay(fig 7.3) and bottom overlay (fig 7.4)of the Condition Monitoring Module.



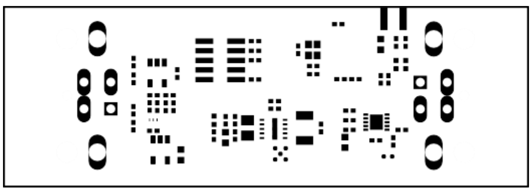


Fig 7.3 top overlay **Fig 7.4 bottom overlay**

8. Conclusion

This project is an example of Condition Monitoring Module Design, which is based on theroutine or permanent recording of machine condition, which is needed for predictive maintenance. They can be quickly alerted and secured in the event of any trouble. When the schematic procedures are finished, this project will be improved by using and creating gerber files, which include the top layer, bottom layer, trace layer, and trace width of the part for quick and accurate results.

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