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Satellite Module Reference Design

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ABSTRACT:
The Satellite Module Reference Design consists of Bluetooth Low Energy with CAN design which can be intended for Bluetooth passive entry passive start (PEPS) and phone as a key, digital key access system. The design demonstrates that how the control area network flexible data rate (CAN-FD) communication capabilities can be implemented with our Bluetooth wireless MCUs for the systems that require higher bandwidth in-vehicle network communications. The higher network bandwidth allows for the raw measurement data, such as angle of arrival IQ data, which can be directly sent to the central car access module for processing. A unique feature which can be implemented in the TIDA-020032 design is the ability to auto-address. Auto-addressing allows all satellite modules to be flashed with the same firmware instead of requiring each module to be flashed with a different CAN ID and thus manufacturing becomes easier. The benefits includes that during the sleep state the power consumption is reduced, and for the improved manufacturing the CAN auto-addressing method can be used, connection monitor capabilities for the better and improved Bluetooth localization accuracy. The compact printed-circuit board (PCB) can be used to measure the Bluetooth angle of arrival (AoA) and the received signal strength index (RSSI).

Keywords: *CAN, Digital key, Satellite, Printed Circuit Board, Micro control Unit*

I. INTRODUCTION

The design of Bluetooth Low Energy with CAN design is designed to achieve the Bluetooth passive entry passive start (PEPS). The design acts as phone as a key and digital key systems. These car access systems may require high vehicle data communication speeds and thus use Control Area Network (CAN) or CAN-FD communications between the satellite modules and the central car access module which is located in the body control module (BCM) or a separate electronic control unit (ECU). The higher network bandwidth allows for raw measurement data, such as angle of arrival IQ data, which can be directly sent to the central car access module for processing. A unique feature implemented in the design is the ability to auto-address on its own. Auto-addressing allows all satellite modules will be flashed by using the same firmware instead of using separate firmware for each module to be flashed with a different CAN ID and thus makes the manufacturing easy. When the car access system is first powered on during the time of manufacturing, each satellite module will receive a unique CAN address which can be associated to the satellite modules location around or inside the vehicle. Hence, the central car access module can identify where the localization measurement data is being received based on the CAN ID. To get the improved localization, the multiple Bluetooth low energy methods are available for system designers to implement including AoA and RSSI. This design has the capacity to evaluate or implement both methods in a compact solution size which can be desired to allow the car access system designers to test their best methods for Bluetooth localization and then add their own combination of techniques to their system

II. ANALYSIS

The principle steps in the PCB configuration measure start with the particular of the planned finished result and proceed by filing or safeguarding the plan file in an arrangement that considers rehashed configuration updates or documentation reformulation if necessary to support progressing improvement. A considerable lot of the PC based techniques that have been created to guarantee that the plan is finished accurately in any case are utilized in this cycle. The treatment for both simple and optical PCBs is something similar. The distinctions in the plan cycle of these two sorts of PCBs are controlled by the intricacy of these two kinds of circuits.

III. DESIGN

The objective of the PCB configuration measure is to make a PCB, including every single dynamic circuit, that capacities appropriately under all typical varieties in segment esteems, segment speeds, materials resistances, temperature ranges, power supply ranges, voltage ranges, and assembling resiliencies, just as to deliver all vital documentation and information.

3.1 Create System Specification:

There must be a list of tasks that the design must perform as well as a set of conditions under which it must work, implement, and effective manner possible.

3.2 System Block Diagram:

The design's block diagram is developed, showing how the structure must be partitioned and linked or related to one another.

3.3 Partition system Into PCB:

The hardware is organized into PCB gatherings, which gathering capacities that will be both consolidate and coordinate.

3.4 Determine PCB Sizes:

The area and scale of each PCB must be calculated; however, the PCB size is predetermined and defined by the norm.

3.5 Create schematics:

The block diagram and schematics are normally created on CAE, which allows the designer to draw their schematic on CRT.

3.6 Build component libraries:

The information of tools has to be entered into the library or a set of library which contains one entry per component which includes type, size, function, characteristics.

3.7 Simulate Design:

The design can execute its intended operation under the specified conditions, and design verifications must be performed during simulation.

3.8 Place components on PCBs:

Placing the components on the aspect of the PCB in marking as per the design where that group logically performs together.

3.9 Order points in nets to rules:

It is necessary to control this high-speed phenomenon. It can be achieved by arranging the connections properly between the loads, terminations, and drivers.

3.10 Simulate timing and transmission lines:

It helps to detect the malfunctioning signals then fix the problem in short time period.

3.11 Adjust ordering and placement:

To get the critical components closer together or to minimize unwanted reflections, the portion positioning may need to be adjusted.

3.12 Test routablity and layout:

Most CAD systems have tools like rats-nest analyzers that help the designer figure out if the design fits within the signal layers allowed.

3.13 Route PCB:

This entails routing the special signals by hand as well as routing the others automatically.

3.13 Check result against specifications:

Check the Gerber Data one last time to make sure the line width and spacing rules were followed and the solder mask was not present.

3.14 Generate production data files:

It entails creating the Bill of Materials, pick-and-place folders, filled board test files, and photo plotting files, among other things.

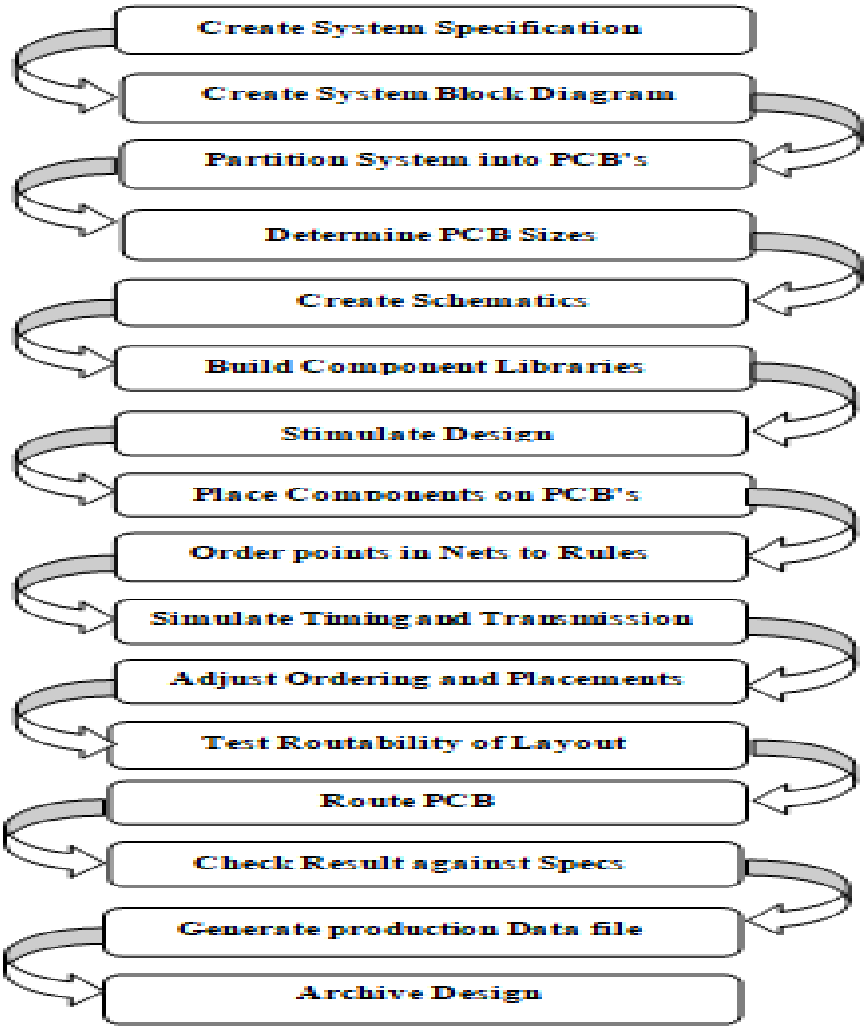

Fig 3.1 Design flow

3.15 Archive Design:

For future reference, the idea data base and production data files are stored on magnetic tapes or other storage media.

IV. DEVELOPMENT

After all of the manufacturing data has been developed, the specification archive and all of the manufacturing data files are stored on a magnetic tape or other storage media that can be used for potential specifications. Updates, as well as a backup in case the production files and sketches are lost or destroyed.

V. IMPLEMENTATION

The Satellite Module Reference Design consists of Bluetooth Low Energy with CAN design. This can be designed to achieve Bluetooth passive entry passive start (PEPS) and phone as a key, digital key access system. The design demonstrates that how the control area network flexible data rate (CAN-FD) communication capabilities can be implemented and function with our Bluetooth wireless MCUs for the systems which require higher bandwidth in-vehicle network communications. The higher network bandwidth allows for the raw measurement data, which can be directly sent to the central car access module for processing. The benefits include that during the sleep state the power consumption is reduced, and for the improved manufacturing the CAN auto-addressing method can be used, connection monitor capabilities for the better and improved Bluetooth localization accuracy can be measured easily.

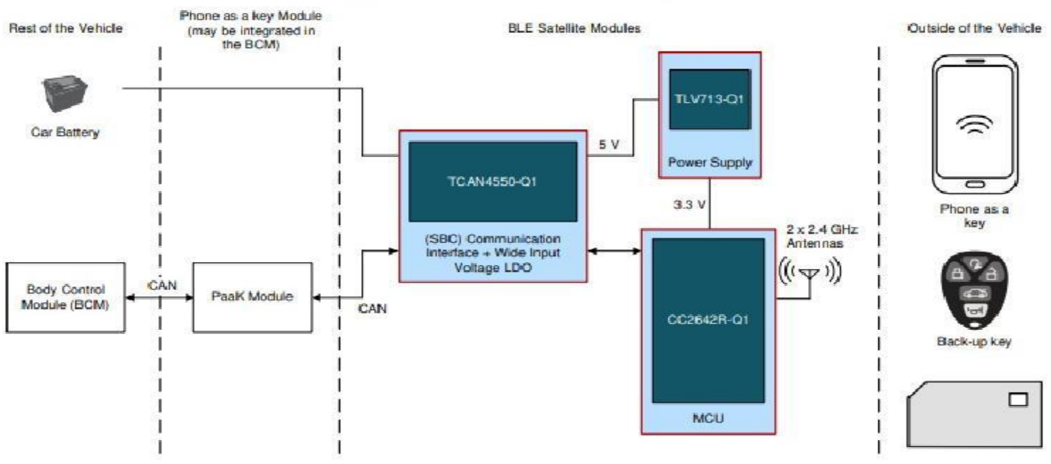

Fig 5.1 Block Diagram

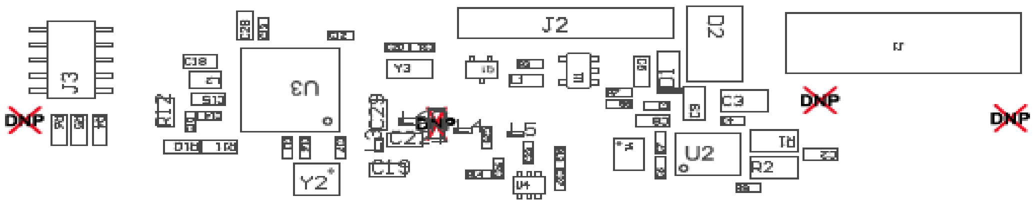

Fig 5.2 Assembly Drawing

5.1 Top Layer:

The top layer is also known as the component layer, which is mainly used to place the components. The double layers and multilayer, the top layer can be used to arrange wire.

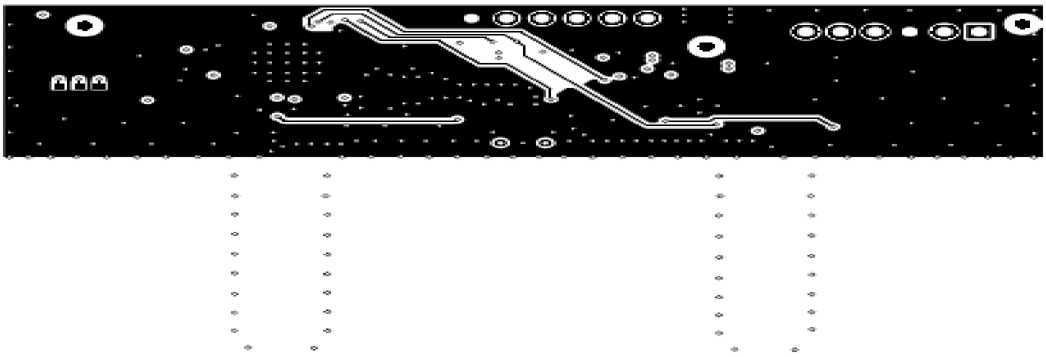

Fig 5.3 Top layer

5.2 Signal Layer:

PCB is defined as a number of copper layers. Copper layers are named layers or also called signal layer. However to complete PCB design, other layers are required. They are named by their functionality and it's position.

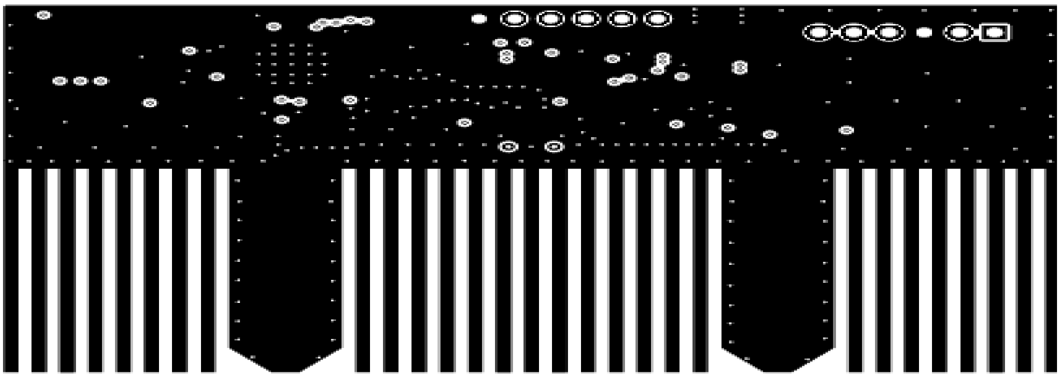

Fig 5.4 Signal Layer

5.3 Bottom Layer:

The solder layer, or bottom layer, is primarily used for wiring and soldering. Components may be placed in the Bottom layer of a double-layer board or a multilayer board. Mid-Layers are used to organize signal lines in multilayer boards and can have up to 30 layers. Power and ground lines are not included in this.

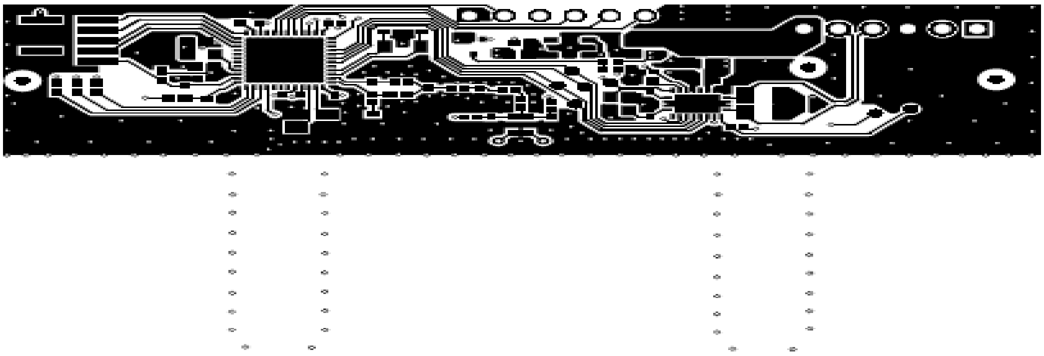

Fig 5.5 Bottom Layer

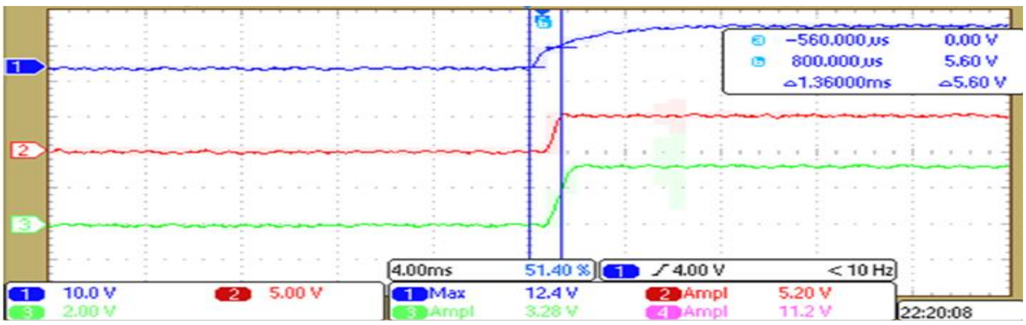

Fig 5.6 System Start-up

VI. EVALUATION

The point of the PCB configuration measure is for the entire interaction to be obvious, from plan to assembling and testing. Instrument helped by PC has progressed and work on increment exactness of each phase of the activity. Instruments can be grouped into various classifications relying upon where they are utilized:

- Computer-Aided Engineering
- Computer-Aided Design
- Computer-Aided Manufacturing

They are perceived by their names since they are utilized in circuit plan, design, uncovered assembling and PCB gathering.

VII. CONCLUSION

The PCB design supports mechanical and electronic components and their wiring connection through the surface mounted copper is really incredible. An integral design of the whole product and it can be the key to success of the product. With the development of satellite module reference design using PEPS technology, easy to access the car using the Bluetooth technology with low consumption of energy. The normal design of satellite module is too big in size. To reduce the size, we design satellite module reference design using the PCB. Through this design, when the user access the signals received by the microcontroller unit. After processing by the microcontroller unit (MCU) in the electronic module, it can be accessed.

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