

## THE ROLE OF PCBs AND MICROCONTROLLER IN AUTOMOTIVE ELECTRONICS

*Paper presented in the Business Development Seminar on Automotive Electronic Held in PUNE ( Paper II) By Anil Kumar , Director , S L N Technologies , BANGALORE.*

### Introduction:

*The electronics content in today's automobiles is increasing steadily as numerous applications now use electronics control. Application from entertainment and comfort of power train and body electronics increasingly use electronic control circuits for better reliability and performance.*

*Severe competition and stringent pollution and safety norms and fuel economy are some of the factors influencing auto industry to look for new technologies using electronics controls.*

*For any electronics circuits, Printed Circuit Board (PCB) forms the basic foundation for interconnecting and packaging. Micro-controller can be described in simple words as heart and brain of the electronics circuits.*

*The basic objective of this presentation to create some awareness about the role of PCBs and Micro-controllers, in today's automotive electronics and the present scenario in India to meet the demands of automotive electronics.*

### FACTORS INFLUENCING THE USE OF ELECTRONICS IN AUTOMOBILE

- *Optimum performance, cost and reliability.*
- *Stringent pollution requirements.· Optimum performance, cost and reliability.*
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- *Enhanced safety norms.*
- *Added comfort and ease of operation.*
- *Availability of ready-made solutions.*
- *Short development cycle time.*
- *Low Electro-Magnetic Interference.*
- *Better fuel efficiency.*
- *Continuously falling prices of electronics components & reduced assembly cost.*
- *Low power consumption.*

### APPLICATION OF ELECTRONICS IN AUTOMOBILES

- *Electronic ignition system*
- *Electronics power steering*
- *Climate control*
- *Transmission control unit*
- *Timed wiper*
- *Central door locking*
- *Antilock Braking system(ABS).*
- *Seat heating and seat height adjustment system*
- *Electronic lamp driving*
- *Blinkers*
- *Car radios*
- *Fan speed control*
- *Engine management systems(EMS)*
- *AIR BAGS Control*
- *Navigation system*

### AUTOMOTIVE SEGMENTS

*Air Bags , Climate Control , Cruise Control , Anti-Theft Devices , Power window regulators*

**– DRIVER INFORMATION**

*Dashboard , Navigation, Audio Alert*

**– ENTERTAINMENT**

*Audio Video Systems, Graphic Equalizer, Compact Disc*

### TYPES OF PRINTED CIRCUIT BOARDS (PCBs) USED IN AUTOMOTIVE ELECTRONICS.

*Single side PCBs*

- Used mainly for interconnecting components like diodes, capacitors, relays etc.*

*Single side flexible circuits*

- Widely used in Automobile dash board*

*Double side Flexible Circuits*

- High-density electronics applications using LCD display devices and Micro-controller*
- Optimum and flexible packaging is the main criteria.*

*Double sided rigid PCBs*

- Low to medium density electronics circuits Higher power handling capacity*

*Multi-layer PCBs*

- High Density electronics circuits using Micro-controllers and SMDs low EMI application*

### MICRO – CONTROLLERS IN AUTOMOTIVE ELECTRONICS

*What is Micro-Controller*

*The micro controller is a complete on a chip that integrates a CPU with memory and various peripherals such as analog to digital converter, serial units, high speed input and output units, timer counter units etc. The use of Micro-controller is now increasing in automobile electronics along with the rest of ECU(Electronic Control Unit).*

### SOME OF THE ADVANTAGES OF MICRO-CONTROLLERS

- Low Power Operation*
- Small footprint*
- Easy to design Low cost*
- High integration*
- Low EMI*
- Computational performance for some applications*
- Wide Operating voltage range*
- Supports unique ID codes in every device*

### MICRO-CONTROLLER APPLICATIONS

**Powertrain**

- Mostly 16 and 32 bit Microcontrollers
- Computational Performance Key Decision Factor.
- 4 – 5 year design cycle

**Vehicle Control**

- Mostly 16 – bit Microcontrollers
- Computational Performance Key decision Factor
- 3 – 4 year design cycle

**Body Control**

- Mostly 8 – bit Microcontrollers
- High Integration and Low EMI Key decision factor
- 3 – 4 year design cycle

**Driver Information**

- Mostly 8 – bit Microcontrollers
- High Integration and low EMI Key decision factor
- 3 – 4 year design cycle

**Entertainment**

- Mostly 8 – bit Microcontrollers
- High Integration and low EMI key decision factor
- 3 – 4 year design cycle

**NEW TRENDS IN AUTOMOTIVE ELECTRONICS**

**Hybrid Microcircuits (HMC)**

*Hybrid microcircuit is a small–encapsulated module containing an electronic circuit on a ceramic substrate.*

**Advantages of HMCs**

- HMCs can tolerate harsh environment such as those, prevailing under the hood.
- HMCs can handle high power
- HMCs can be placed closer to the components. They control, the size and complexity of vehicle.
- Wiring harness can be greatly reduced. Circuit secrecy can be maintained.

**CONCLUSIONS**

*The present scenario In India to meet the demands of Automobile Industry*

- 1. There are more than 50 professional grade PCB manufacturers in India. Some of these companies are rated on Par with PCB shops abroad and are ISO 9002 certified.*
- 2. Indian PCB shops are already manufacturing PCBs for Automobile Industry and are exporting PCBs to MNCs abroad.*
- 3. There are number of design houses available in India for Micro–controller applications.*
- 4. Advanced technologies like HMCs and ASICs can be designed and manufactured in India.*
- 5. State–of –the–art manufacturing facilities available for manufacturing high–density electronic*

**PRODUCTS AND SERVICES OFFERED BY SLN TECHNOLOGIES FOR AUTOMOTIVE ELECTRONICS..**

1. *Design, development and manufacturing of Micro-controller based electronics control modules.*
2. *Design and manufacturing of SPMs for auto component testing.*

**Products already manufactured by SLN**

1. *Electronics control unit for power window regulator.*
    - *Micro-controller based*
    - *Intelligent operation*
    - *Passed stringent EMI and environmental tests*
    - *Economical Solution*
    - *Fully developed in house*
  2. *Computer based window regulator tester*
    - *Import substitute*
    - *Highly economical*
    - *Tried and trusted*
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