Sinhgad Institutes

Electronics & Telecommunication Engineering

Third Year Internship Work Guidelines
T.E. (Electronics &Telecommunications),
2019 Course
(With effect from Academic Year 2023 - 24)

NAME: SUSHIL DILIPRAO DESHMUKH

ROLL NO: 304A055

SAVITRIBAI PHULE PUNE UNIVERSITY

PREPARED BY:

B.O.S. – ENTC, Savitribai Phule Pune University

A

INTERNSHIP REPORT ON

PCB Manufacturing Internship at Excellon Circuits Pvt. Ltd.

SUBMITTED TO SAVITRIBAI PHULE PUNE UNIVERSITY, PUNE

IN THE FULFILLMENT OF THE REQUIREMENTS

FOR THE COMPLETION OF INTERNSHIP

OF

THIRD YEAR ENGINEERING

IN

ELECTRONICS & TELECOMMUNICATION

BY

Sushil Diliprao Deshmukh Exam No. T190233075

UNDER THE INTERNAL SUPERVISION OF

Prof. A. P. Jadhav

Sinhgad Institutes

DEPARTMENT OF ELECTRONICS & TELECOMMUNICATION ENGINEERING

SINHGAD COLLEGE OF ENGINEERING

S. No. 44/1, OFF SINHGAD ROAD, VADGAON

BK, PUNE – 411041

APRIL 2023-2024

CERTIFICATE

This is to certify that **Sushil Diliprao Deshmukh** of class TE E&TC Div **A** Roll No.3**04A055** Examination Seat No. **T190233075** PRN No. **72286174F** has completed Internship of 4 weeks/6 weeks in Industry **Excellon Circuit** Offline satisfactorily, as prescribed by Savitribai Phule Pune University, Pune in the **academic year 2023 - 24 (Semester II)**

Prof. A. P. Jadhav	Dr. M. B. Mali	Dr. S. D. Lokhande
Faculty Mentor	Head	Principal
Department of E &TC	Department of E &TC	SCOE, Pune

Place: Pune

Date:

ACKNOWLEDGEMENT

The Journey started as a student towards the Professional Life with the aim in mind to learn the practical aspect of industry, ended as a memorable experience, also helped me to come off with flying colors.

I express my sincere gratitude to **Dr. S. D. Lokhande, Principal** for providing me an opportunity to undergo 4 weeks of Internship at Excellon Circuits Pvt. Ltd.

I am thankful to **Dr. M. B. Mali, HOD Electronics and Telecommunication** Engineering Department for his valuable support, co-operation and motivation provided to me during the training for constant inspiration and blessings.

He provided me with valuable guidance throughout the internship and made sure that the internship was a great learning experience. I also want to thank Mr. Satish Jodhawat for the wonderful learning opportunity through the internship at Excellon Circuits Pvt. Ltd.

Last but not the least my sincere gratitude to all people who knowingly or unknowingly supported me, for my moral to complete this Internship program.

Sushil Diliprao Deshmukh
T190233075

Vision and Mission of the Institute

Vision of the Institution:

"उत्तमपुरुषान् उत्तमाभियंतृन् भनमाातुं कटीबध्दाः

वयम्" | We are committed to produce not only good engineers but good human beings, also.

Mission of the institution:

Holistic development of student and teacher is what we believe in and work for. We strive to achieve this by imbibing a unique value system, transparent work culture, excellent academic and physical environment conducive to learning, creativity and technology transfer. Our mandate is to generate, preserve and share knowledge for developing a vibrant Society.

Vision and Mission of ENTC Department

Department Vision:

"Department of Electronics & Telecommunication Engineering shall continue to innovate and practice the process to propel development in engineering education, keeping excellence in focus and render services to match the needs of technical education system, industry and society."

Department Mission:

"To create an ambience and provide broad based education where students are urged to develop new ideas and professional skills in equilibrium with the needs of the nation."

Program Educational Objectives (PEOs):

1) To sustain holistic development of students to pursue higher studies, successful entrepreneurship or cater needs of Indian and multinational industries, by providing excellent academic environment.

2) To develop students with solid foundation in mathematical, scientific and engineering fundamentals to solve engineering problems.

3) To nurture students with comprehensive knowledge and skills, to design & develop electronic systems for real life problems.

4) To inculcate in student's effective communication skills, teamwork skills, professional – ethical attitudes and cultivating ability in engineering issues through multidisciplinary domain to broader social context.

Program Outcomes (POs):

Engineering Graduates will be able to -

1) **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2) **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3) **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4) **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5) **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6) **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7) **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8) **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9) **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10) **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

12) **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

13) **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

1) **Concepts:** Understand Electronics & Telecommunication Engineering concepts through mathematics, analog, digital, signal processing, communication, computing, simulation, analysis and implementation. 2)**Methodology:** Emphasize on creative design ideas, assignments and projects to solve problems in engineering and allied fields.

3) **Skills:** Nurture holistic development and skills to pursue higher studies, employability and successful entrepreneurship to cater need of masses and industries.

Quality Policy:

"We the faculty, staff and students are committed and dedicated to ensure state of the art quality in engineering education through the mould of ethics, social responsibilities, eco-system awareness and nationalistic proud."

Long Term Goals:

- *To set up Centre of Excellence in the field of VLSI Embedded and Signal Processing*
- *To keep pace with technology and process through industrial training of faculty, staff and students*
- *To establish close association with state of the art Universities, Industries and Personalities*
- *To inculcate quality, social, ethical and eco-friendly awareness among the students*

Short Term Goals:

- *To intensify industrial training to faculty and staff*
- *To motivate the faculty for qualification up-gradation*
- *To increase number of Memorandums of Understanding (MoU) with industries*
- *To increase number of Patents and Journal publication*

INTERNSHIP DETAILS

Name: - Sushil Diliprao Deshmukh

Roll No.: - 304A055

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Exam No. of TE Second Semester: - T190233075

Cell No.: - 9370620158

Email ID: - sushildeshmukh.scoe.entc@gmail.com

Permanent Address: - At. Karda Post. Mothegaon Tq. Risod Dist. Washim , Maharashtra 444506

Name of the Industry: - Excellon Circuits Pvt. Ltd.

Address of the Industry: - S.N.44/47, Heramb complex Renuka Ind Estates, Shed No 3,4 Paranjape Abhiruchi Parisar , opp. Paranjpe , Narhe , Pune , Maharashtra , 411041

Details of the External Mentor from Industry

Name: - Mr. Satish Jodhawat

Post: - Sr. Embedded Engineer

Contact Number: - 9975522997

Website Address of the Industry: - https://excellon-circuit.business.site/List of the Products/Services/etc. details of the industry –

1. Excellon Circuits provides PCB (Printed Circuit Boards) of different types Such as Single Sided PCB , Double Sided PCBs .

Duration of Internship: 4 Week

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CERTIFICATE

ACKNOWLEDGEMENT

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CHAPTER 1
INTROUCTION

1.1 INTRODUCTION TO INTERNSHIP

PCB (Printed Circuit Board) manufacturing is the process of designing, fabricating, and assembling electronic circuit boards used in various devices and systems. PCBs provide a platform for connecting and supporting electronic components, such as integrated circuits (ICs), resistors, capacitors, and other electronic elements.

During this internship, I had the opportunity to work closely with experienced professionals in the industry and learn about various aspects of PCB manufacturing. Whether I am pursuing a career in engineering, electronics, or manufacturing, this internship will provided me with valuable skills and insights.

As a PCB manufacturing intern, I was exposed to a range of tasks and responsibilities. I learned about the entire PCB production process, from design and layout to fabrication and assembly. I worked with cutting-edge technology and equipment, gaining practical experience in operating machinery, troubleshooting, and quality control.

Some of the key areas I was involved in during internship included:

1. **Fabrication:** I gained hands-on experience in the fabrication process, which includes etching, drilling, and laminating the PCBs. You will learn to operate machinery and tools used in the fabrication process.
2. **Assembly and soldering:** Had the opportunity to be involved in the assembly of electronic components onto the fabricated PCBs. This will include soldering, testing, and troubleshooting the assembled boards.
3. **Quality control:** Learned about quality control procedures and perform inspections to ensure the manufactured PCBs meet the required standards. This includes conducting tests, analyzing data, and identifying and resolving any issues.

Throughout the internship, I worked closely with a team of professionals who guided and mentored me, providing valuable feedback and support. This hands-on experience will complement my theoretical knowledge, allowing me to develop practical skills that are highly sought after in the industry.

1.2 OBJECTIVES OF THE INTERNSHIP

1. **Gain Practical Experience:** My primary goal is to acquire hands-on experience in various aspects of PCB manufacturing. I aim to work alongside professionals and learn about the entire PCB production process, including design review, fabrication, assembly, and quality control. By actively participating in these processes, I hope to develop a solid foundation of practical skills that are valuable in the industry.
2. **Learn about PCB Design Guidelines:** I aim to familiarize myself with PCB design guidelines and learn how to review PCB designs and layouts effectively. Understanding design principles and specifications will enable me to assess designs for manufacturability, ensuring they meet the necessary standards and optimize the production process.
3. **Master Manufacturing Equipment and Machinery:** I intend to gain proficiency in operating the machinery and equipment used in PCB manufacturing. This includes learning how to operate machines for etching, drilling, laminating, and soldering. By becoming skilled in these areas, I can contribute to efficient and accurate production processes.
4. **Develop Quality Control Skills:** Quality control is vital in PCB manufacturing, and I want to develop a keen eye for detail and precision. By learning about quality control procedures, conducting inspections, and performing tests, I aim to enhance my ability to identify and resolve any issues, ensuring that the final PCBs meet the required standards
5. **Enhance Problem-solving and Troubleshooting Abilities:** PCB manufacturing involves overcoming challenges and troubleshooting technical issues. I aspire to sharpen my problem-solving skills by actively engaging in resolving issues that may arise during the manufacturing process. This will allow me to develop a proactive approach and become adept at finding effective solutions.
6. **Gain Industry Insights and Networking Opportunities:** Throughout the internship, I look forward to interacting with professionals in the PCB manufacturing industry. By engaging with experienced mentors, I hope to gain valuable insights into the industry's current trends, emerging technologies, and best practices. Building professional connections and expanding my network will provide opportunities for future collaborations and career growth.

Overall, my objectives in this PCB manufacturing internship are to gain practical skills, expand my knowledge in the field, and lay the foundation for a successful career in the electronics and manufacturing industry

CHAPTER 2
ABOUT THE COMPANY

2.1 INTRODUCTION

A Trusted PCB Manufacturing Partner Excellon Circuits Pvt. Ltd. is a renowned printed circuit board (PCB) manufacturing company located at S.N.44/47, Heramb complex Renuka Ind Estates, Shed No 3,4, Paranjape Abhiruchi Parisar, opp. Paranjpe, Narhe, Pune, Maharashtra, 411041. With a strong commitment to excellence and customer satisfaction, Excellon Circuits has become a trusted partner in the electronics industry.

with a focus on delivering cutting-edge and reliable PCB manufacturing solutions, Excellon Circuits caters to a diverse range of industries including aerospace, telecommunications, automotive, medical devices, and consumer electronics.

In addition to manufacturing expertise, Excellon Circuits provides comprehensive support services including design review, prototyping, testing, and assembly. Their commitment to customer satisfaction is complemented by efficient logistics and supply chain management, guaranteeing timely delivery of orders. Located in Pune, Maharashtra, Excellon Circuits serves clients not only within India but also globally. Their exceptional PCB manufacturing solutions have earned them a reputation as a trusted partner in the industry.

Excellon Circuits Pvt. Ltd. invites customers to experience their commitment to quality, reliability, and customer service. By partnering with Excellon Circuits, customers can rely on their expertise and contribution to the success of their electronic products.

2.2 DOMAIN:

The domain of PCB (Printed Circuit Board) manufacturing internship typically falls under the broader field of electronics engineering and manufacturing. PCBs are an essential component of electronic devices, and their design and production involve various aspects of electrical engineering, circuitry, and manufacturing processes

2.3 COMPANY EQUIPMENTS

Mechanical Fabrication:

- Tool Room
- CNC Driller / router
- Wire Cut Machines
- Auto Guide Hole Drilling Machines
- EDM Drilling Machines
- Power Press 160 to 10 Tons
- Lathe Machines
- Hand Press
- Milling machines
- Shearing Machines
- Surface Grinders
- Fine Piercing System
- Center less Grinder
- Pre Punch Baking Ovens for power press
- VerticMilling Centre V-Grooving Machines
- IR Ovens
- Brushing Machines, Dryers with loaders & unloaders semi automatic screen printing Machines
- U.V. Curing Machines
- Etching ,Stripping, loader, unloaders & Dryers Roller Tinning Machines
- Lacquer M/C with high pressure water rinse and OSP

Measuring Instruments :

- Combination Set
- Multimeters
- Bore gauges
- Height gauges

CHAPTER 3
LITARETURE SURVEY

3.1 DOAMIN DETAILS

Literature survey explores the domain of Printed Circuit Board (PCB) manufacturing, focusing on the techniques, challenges, and emerging trends in the field. PCBs are vital components of electronic devices, and their manufacturing processes have undergone significant advancements in recent years. This survey aims to provide an overview of the current state of PCB manufacturing, highlighting key research findings, technological developments, and areas of ongoing exploration. By examining a wide range of scholarly articles, conference papers, and industry reports, this survey offers insights into the evolution of PCB manufacturing, its challenges, and the emerging trends that shape its future.

PCB Manufacturing Techniques: This section delves into various PCB manufacturing techniques, including subtractive, additive, and semi-additive processes. It explores the steps involved in each technique, such as PCB design, material selection, fabrication, and assembly. The survey covers traditional manufacturing methods as well as advancements in technology, such as advanced circuitry, flexible PCBs, and multilayer PCBs.

What Is PCB ?

A Printed Circuit Board (PCB) is a flat board made of non-conductive material with pathways etched or printed on it, guiding electrical currents to connect various electronic components mounted on its surface. It serves as a base for assembling and interconnecting electronic devices. PCBs are essential in almost all modern electronics, from simple gadgets to complex computers, facilitating efficient electrical connections and compact.

Types Of PCB :-

1. Single Sided
2. Double Sided PTH
3. Multilayer PTH
4. Metal Clad PCB

1. **Single Sided :-**

A printed circuit board with a conductive circuit pattern one side only. Holes in the board are usually not plated through. These single sided printed circuit boards are widely used in various electronics applications. Being single sided circuit board, it connects various electronic components electrically. We can provide customization to our range of single sidedprinted circuit boards. In single side PCB there is a solder sider where soldering in done and other is the component side where components are fixed. The printing in single sided PCB is through screen printing .There are two side in the single sided one is component side and other is side. Component side is called top legend or top side and solder side is called bottom side. SMD components are the components which are fixed on PCB through pasting. In single sided when there are SMD components then there will be bottom legend in the single side PCB.

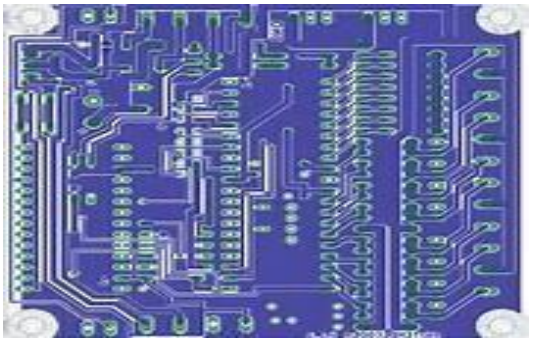


Fig. 3.1 Solder side / Bottom side

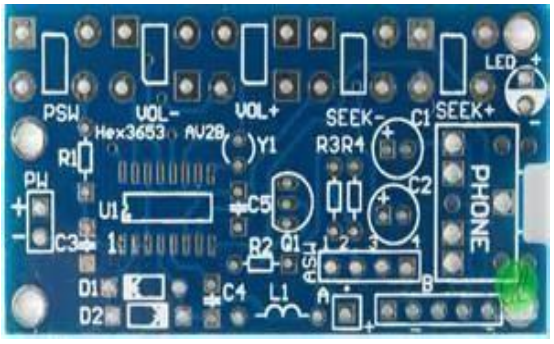


Fig. 3.2 Component side/ Top side

2. **Double Sided PCB :-**

PCB's having circuit or copper on both sides are called double sided PCB's .they have benefit to decrease the complexity of wires of circuit far better than single side PCB's . Double sided consist of both top and bottom legend . They comprise of soldering from both sides . Photo printing is used to print double sided PCB . the best part of double side PCB is that there is cicuit on both side.

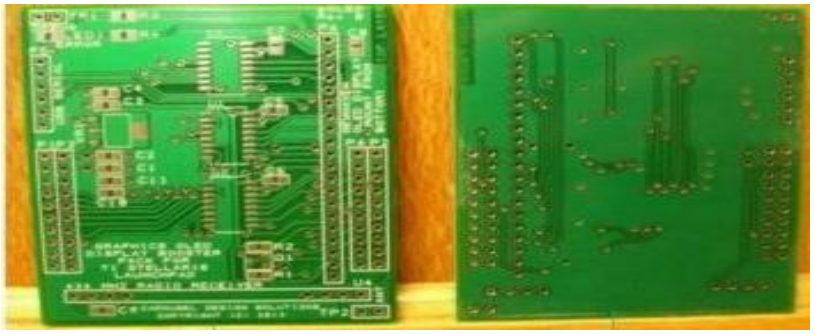


Fig 3.3 Double Sided PCB

3. PCB Layout Design (Gerber File) :-

PCB layout design involves creating a digital blueprint of the printed circuit board, specifying component placement, routing paths, and signal traces. Gerber files generated from this design guide the manufacturing process, providing precise instructions for etching copper layers, drilling holes, and solder mask application, ensuring accurate reproduction of the PCB design.

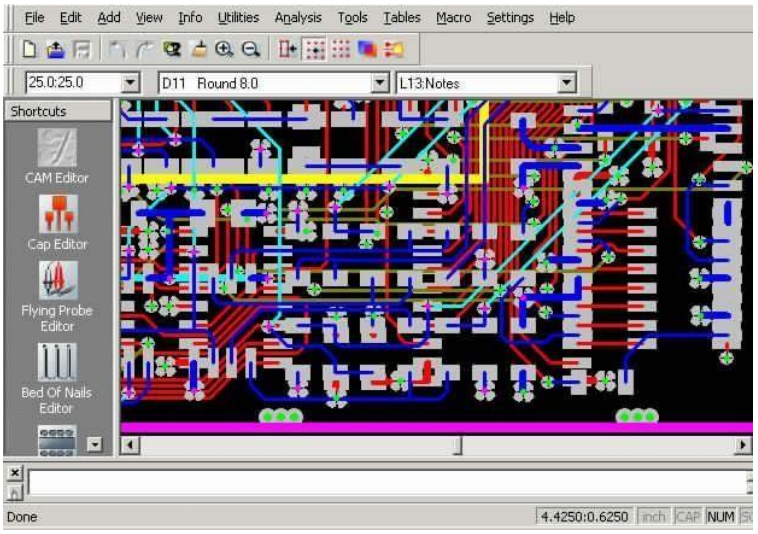


Fig. 3.4 PCB Layout Design (Gerber File)

4. Manufacturing PCB :-

PCB layout design involves creating a digital blueprint of the printed circuit board, specifying component placement, routing paths, and signal traces. Gerber files generated from this design guide the manufacturing process, providing precise instructions for etching copper layers, drilling holes, and solder mask application, ensuring accurate reproduction of the PCB design.

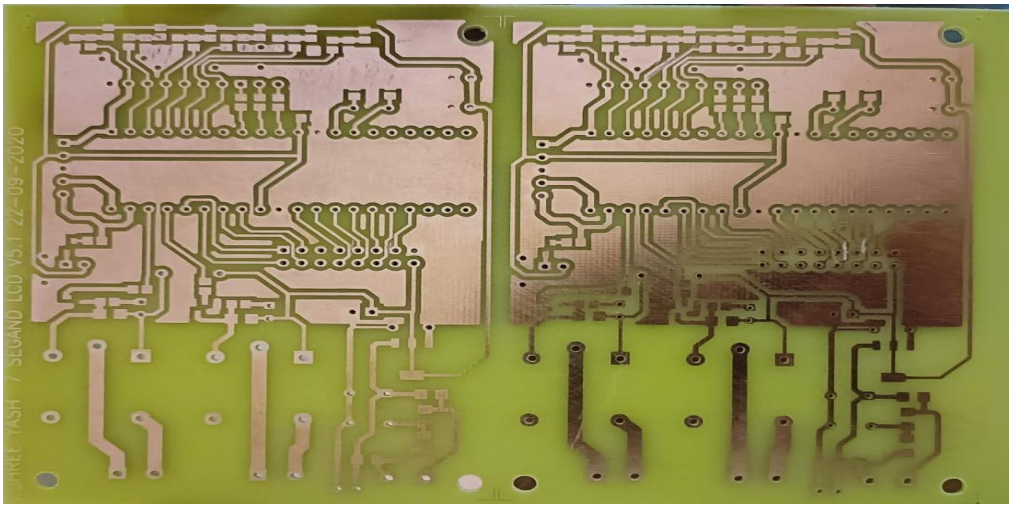


Fig. 3.5 Manufactured PCB

1. **Challenges in PCB Manufacturing:** This section identifies and discusses the challenges faced in PCB manufacturing. It addresses issues such as miniaturization, high-density interconnections, thermal management, reliability, and environmental sustainability. The survey explores the impact of these challenges on the manufacturing process and examine research efforts to overcome them.
2. **Emerging Trends:** This section focuses on the emerging trends in PCB manufacturing. It highlights advancements in areas such as embedded components, 3D printing, Internet of Things (IoT), and smart manufacturing. The survey explores how these trends influence PCB design, fabrication, assembly, and testing processes, as well as their potential impact on product performance and functionality.
3. **Materials and Substrates:** This section investigates the various materials and substrates used in PCB manufacturing. It explores the properties and characteristics of different substrate materials, such as FR-4, flexible materials, and high-frequency materials. The survey also discusses emerging materials, such as nanomaterials and conductive inks, and their potential applications in PCB manufacturing.
4. **Testing and Quality Control:** This section explores testing and quality control methodologies in PCB manufacturing. It discusses techniques for detecting defects, ensuring electrical integrity, and evaluating reliability. The survey examines the use of automated optical inspection (AOI), X-ray inspection, and functional testing, as well as advancements in non-destructive testing methods.
5. **Environmental Considerations:** This section addresses the growing importance of environmental sustainability in PCB manufacturing. It discusses regulations and standards related to hazardous substances, waste management, and recycling. The survey explores research efforts to develop eco-friendly manufacturing processes, alternative materials, and sustainable practices.
6. **Conclusion:** The conclusion summarizes the key findings of the literature survey, highlighting the current state of PCB manufacturing, the challenges faced by the industry, and the emerging trends that shape its future. It emphasizes the need for ongoing research and development to drive innovation and address the evolving demands of the electronics industry.

By conducting a comprehensive literature survey, this study provides a valuable resource for researchers, engineers, and professionals in the field of PCB manufacturing. It offers a deeper understanding of the existing knowledge base, identifies research gaps, and paves the way for future advancements in this critical area of electronics manufacturing.

CHAPTER 4
INTERNSHIP DETAILS

4.1 METHODOLGICAL DETAILS

Processes involved in PCB manufacturing:

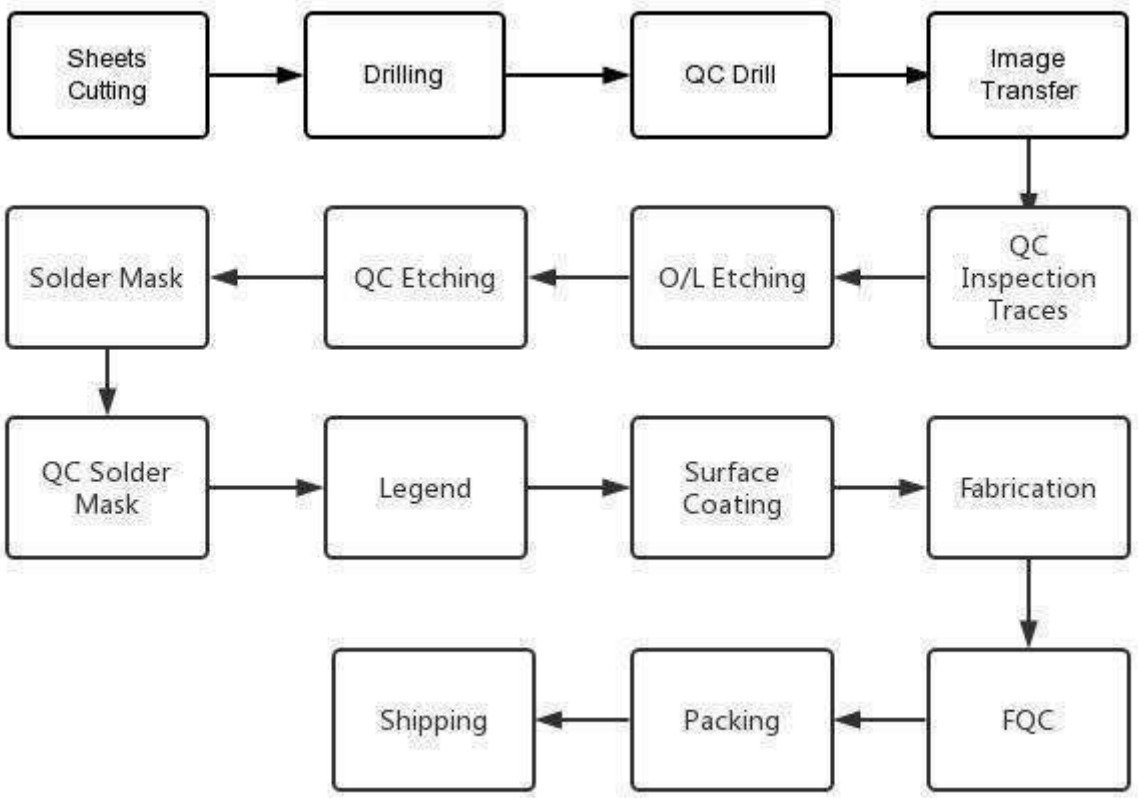


Fig. 3.6 Block Diagram of PCB manufacturing Processes

1. **Design and Layout:** The first step in PCB manufacturing is the design and layout process. This involves creating a schematic diagram of the circuit and translating it into a physical layout using specialized PCB design software. During this stage, components are placed and connected, and design rules and guidelines are followed to ensure proper functionality and manufacturability.

2. **Fabrication:** Once the PCB design is finalized, the fabrication process begins. It involves several steps:
    a. Substrate Preparation: The manufacturing process typically starts with preparing the substrate material, such as a copper-clad laminate (CCL). The CCL is cleaned, and a protective layer is applied to prevent oxidation.
    b. Imaging and Photoresist Application: A layer of photoresist is applied to the substrate, and the PCB design is transferred onto the photoresist using a process called imaging. This is usually done using a photomask and exposure to UV light.
    c. Etching: The exposed areas of the photoresist are chemically etched away, along with the underlying copper, leaving behind the desired copper traces and pads. Various etching techniques, such as chemical etching or plasma etching, can be used.
    d. Drilling: Holes for component mounting and interconnection are drilled into the PCB. High-speed drill bits are used for precise hole placement. The drilled holes are then cleaned and treated to remove any debris or burrs.
    e. Plating: Through-hole plating or electroless plating is performed to deposit a thin layer of metal (typically copper) inside the drilled holes. This ensures electrical continuity and facilitates component soldering.
    f. Surface Finish: The exposed copper surfaces are protected with a surface finish to prevent oxidation and enhance solderability. Common surface finishes include HASL (Hot Air Solder Leveling), ENIG (Electroless Nickel Immersion Gold), and OSP (Organic Solderability Preservative).
3. **Assembly:** The assembly process involves attaching electronic components to the fabricated PCB. This includes the following steps:
    a. Component Placement: Automated or manual pick-and-place machines accurately position surface-mount components (SMDs) onto the PCB based on the component placement information from the design file. Through-hole components may also be inserted manually or by automated equipment.
    b. Soldering: The components are soldered onto the PCB to establish electrical and mechanical connections. Different soldering methods may be used, including reflow soldering for SMDs and wave soldering or hand soldering for through-hole components.
    c. Inspection and Testing: After soldering, the assembled PCBs undergo inspection to ensure proper component placement, solder joint quality, and overall functionality. This

can involve visual inspection, automated optical inspection (AOI), or in-circuit testing (ICT).

4. **Quality Control:** Throughout the entire manufacturing process, quality control measures are implemented to ensure that the PCBs meet the required specifications and standards. This involves thorough inspection, testing, and analysis of the PCBs to identify any defects or issues. Quality control processes include visual inspection, electrical testing, functional testing, and environmental testing.
5. **Packaging and Shipping:** Once the PCBs pass the quality control checks, they are packaged and prepared for shipping. The PCBs are carefully packaged to protect them during transit and are then delivered to the customers.
6. By following these key processes, PCB manufacturers can produce high-quality, reliable, and functional printed circuit boards that meet the specific requirements of various industries and applications.

4.2 TASKS PERFORMED:

1. **Fabrication:** During the fabrication process, I am involved in several critical steps:
    a. Substrate Preparation: I assist in preparing the substrate material, such as cleaning the copper-clad laminate (CCL) and applying a protective layer to prevent oxidation.
    b. Imaging and Photoresist Application: I help apply the photoresist to the substrate and transfer the PCB design onto the photoresist using imaging techniques.
    c. Etching: I participate in the chemical etching process, where we remove the exposed areas of the photoresist and underlying copper to form the desired copper traces and pads.
    d. Drilling: I assist in drilling holes for component mounting and interconnection, ensuring precise placement and cleanliness of the drilled holes.
    e. Plating: I learn about through-hole plating or electroless plating processes, which involve depositing a thin layer of metal, usually copper, inside the drilled holes to ensure electrical continuity.
    f. Surface Finish: I help apply various surface finishes, such as HASL, ENIG, or OSP, to protect the exposed copper surfaces from oxidation and enhance solderability.

2. **Assembly:** As an intern, I contribute to the assembly process, which includes:
    a. Component Placement: I work alongside experienced technicians and engineers to accurately place surface-mount components (SMDs) on the PCB using automated pick-and-place machines or manual methods.
    b. Soldering: I assist in soldering the components onto the PCB, whether it involves reflow soldering for SMDs or wave soldering and hand soldering for through-hole components.

3. **Inspection and Testing**: I actively participate in the inspection and testing phase, which ensures the quality and functionality of the manufactured PCBs. This includes:
    a. Visual Inspection: I carefully examine the PCBs to verify proper component placement and solder joint quality, identifying any visible defects.
    b. Automated Optical Inspection (AOI): I assist in using AOI systems to scan the PCBs and detect any potential defects or anomalies in the solder joints or component placement.

4. **Quality Control:** Throughout the entire manufacturing process, I am involved in quality control measures. This includes adhering to strict quality standards, conducting inspections, and performing tests to ensure that the PCBs meet the required specifications and functionality.

4.3 RESULT:

During my PCB manufacturing internship, I gained valuable experience in assembling and soldering electronic components onto printed circuit boards. I actively participated in testing and quality control processes, collaborated with different departments, and proposed process optimizations. The internship equipped me with technical skills, teamwork abilities, and a solid foundation for my future in electronics manufacturing.

PHOTOS OF RESULTING PROCUTS ARE GIVEN BELOW:

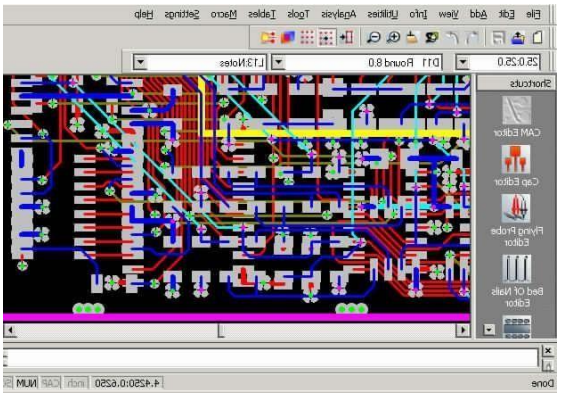


Fig. 4.3 Final PCB layout Design (Gerber File)

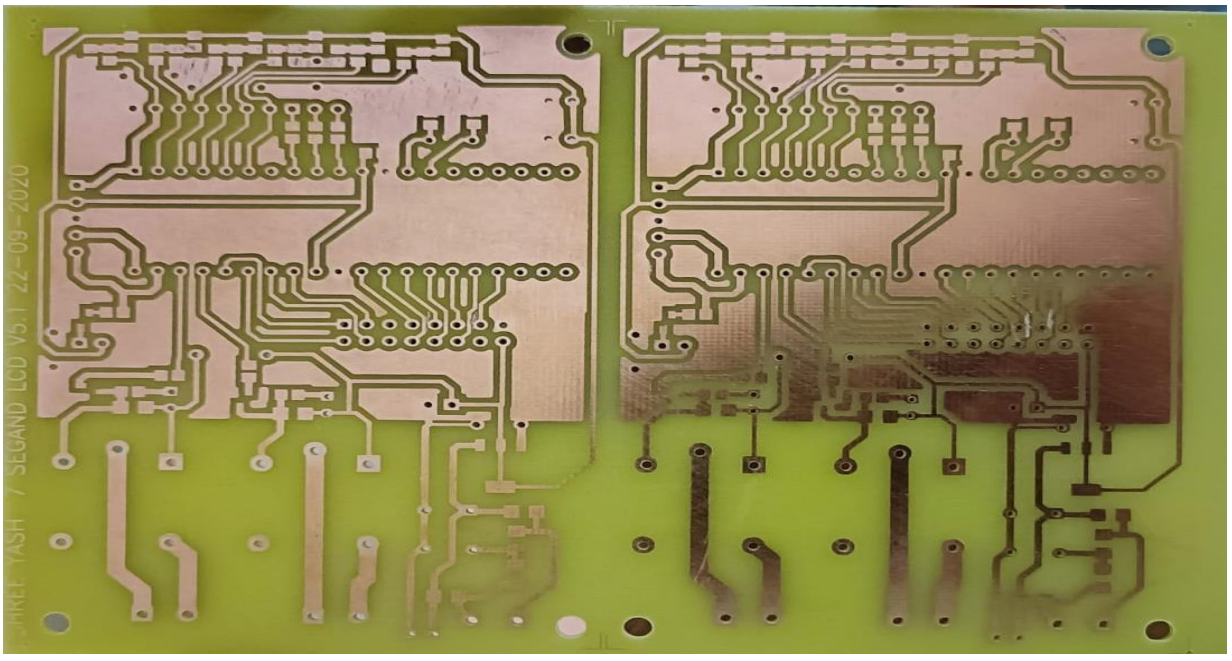
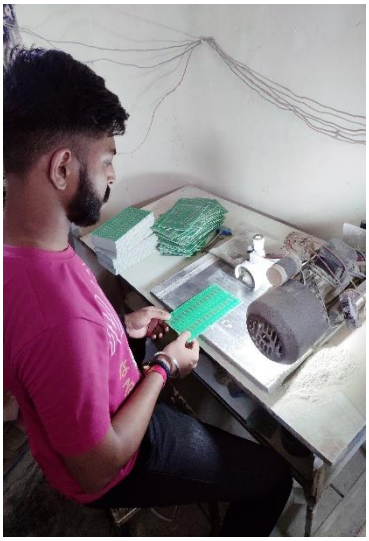
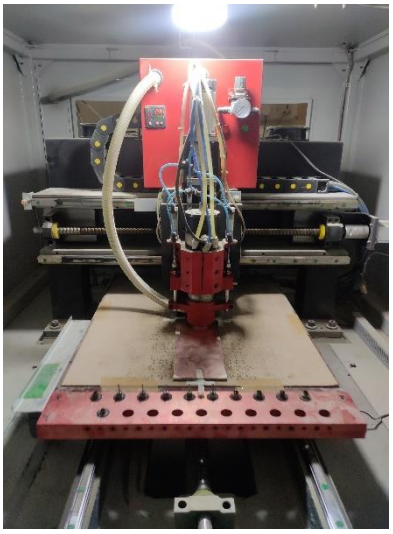
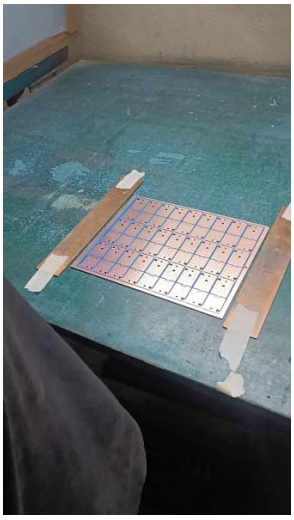


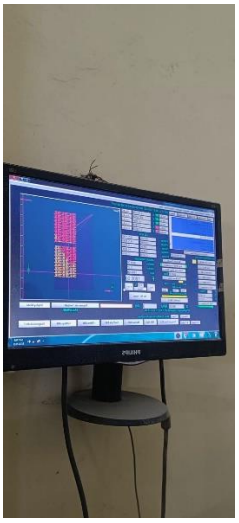
Fig 4.4 Manufactured PCB

Testing components / assembly / Quality assurance:


Drilling/Plating/photoresist application/layout:



CHAPTER 5
INTERNSHIP OUTCOMES

5.1 INFORMATION KNOWLEDGE GAIN

Outcome of Internship: As an intern in the PCB manufacturing program, I am pleased to share the outcomes and achievements of my internship experience:

1. **Practical Skills Development:** Throughout the internship, I have gained invaluable practical skills in various aspects of PCB manufacturing. I have become proficient in using specialized software for PCB design and layout. I have also acquired hands-on experience in fabrication processes such as substrate preparation, imaging, etching, drilling, plating, and surface finishing. Additionally, I have learned and practiced component placement techniques and soldering methods for both surface-mount and through-hole components.
2. **Knowledge of Industry Standards and Best Practices:** My internship has provided me with a solid understanding of industry standards and best practices in PCB manufacturing. I have learned about design guidelines, manufacturing processes, quality control procedures, and environmental considerations. By adhering to these standards and practices, I have developed a keen eye for detail and precision, ensuring the production of high-quality PCBs.
3. **Problem-Solving and Troubleshooting Abilities:** Through hands-on experience and guidance from experienced professionals, I have enhanced my problem-solving and troubleshooting abilities. I have learned to identify and resolve issues that may arise during the PCB manufacturing process. By applying critical thinking and technical knowledge, I have been able to overcome challenges effectively and contribute to the smooth operation of the manufacturing workflow.
4. **Collaboration and Teamwork:** As an intern, I have had the opportunity to collaborate with skilled engineers, technicians, and other interns within the PCB manufacturing team. Working together on various projects and tasks has allowed me to develop excellent teamwork and communication skills. I have learned the importance of effective collaboration, sharing ideas, and supporting one another to achieve common goals.
5. **Exposure to Advanced Equipment and Technologies:** During my internship, I have been exposed to advanced manufacturing equipment and technologies used in the industry. I have

gained hands-on experience with state-of-the-art machinery for PCB fabrication, automated component placement, and soldering processes. This exposure has expanded my technical knowledge and prepared me to adapt to emerging technologies in the field of PCB manufacturing.

6. **Professional Growth and Networking:** Participating in the internship has facilitated my professional growth and networking opportunities. I have had the privilege to work closely with experienced professionals, who have shared their insights, industry knowledge, and career advice. I have expanded my professional network, establishing connections with experts in the field of PCB manufacturing, which may open doors for future collaborations and career opportunities.

Overall, my PCB manufacturing internship has been a transformative experience. It has equipped me with practical skills, industry knowledge, and the confidence to pursue a successful career in the electronics and manufacturing industry. I am grateful for the opportunity to learn and contribute to the field, and I look forward to applying my newfound skills and knowledge in future endeavors.

5.2 REFRENCES

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