



Advantages of Surface Mount Technology in the Development of Electronic Device Module in Railway Transport

Kholboev Sherzod Fakhridin ugli

The teacher of Tashkent Railway Technical School

Khidirov Erkin Irgashevich

Assistant, Tashkent State Transport University

Kadirova Gulyor Umidbekovna

The teacher of Tashkent Railway Technical School

Abstract: This article is about Surface Mount Technology. There are some advantages of SMT. In this article, the current relevance and practical importance of SMT in railway transport explained. In addition, various types of SMD components are listed in this article.

Keywords: Communication, signaling, centralization and blocking (SCB), Surface Mount Technology (SMT), Printed Circuit Board, SMD components, microelectronic elements.

The Main part:

In these modern days, In order to provide traffic safety in railway transport, communication and signaling, centralization and blocking (SCB) devices are moved from relay to microprocessor systems. This has a significant positive effects on improved communication quality and train traffic safety. Actually, the construction of a microprocessor system is built on the basis of Surface Mount Technology (SMT)

There are much more disadvantages of Fixing electronic components on old-fashioned Printed Circuit Board. One of them is that tens or hundreds of holes must be pierced on the board. This reduces the work efficiency.

Surface-mount technology (SMT) is basically a component assembly technology related to printed-circuit boards wherein the components are attached and connected on the surface of the board using batch solder-reflow processes. SMT differs from other PWB methods where the component leads are inserted into plated through-holes and wave-soldered from the bottom to fill in the holes and interconnect the components. SMT has the advantages of achieving higher packaging densities, higher reliability, and reduced cost than the plated through-hole insertion process. SMT is currently the process most widely used for low-cost, high-production consumer electronic assemblies.

Surface-mount technology (SMT), originally called planar mounting, is a method in which the electrical components are mounted directly onto the surface of a printed circuit board (PCB). An electrical component mounted in this manner is referred to as a surface-mount device (SMD). In industry, this approach has largely replaced the through-hole technology construction method of fitting components, in large part because SMT allows for increased manufacturing automation which reduces cost and improves quality. It also allows for more components to fit on a given area of substrate. Both technologies can be used on the same board, with the through-hole technology

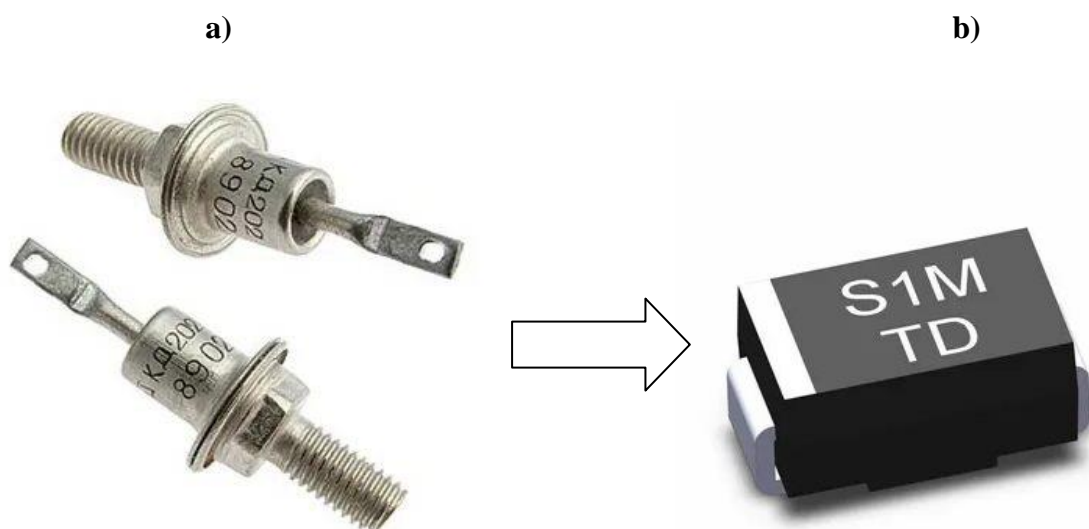


often used for components not suitable for surface mounting such as large transformers and heat-sinked power semiconductors.

An SMT component is usually smaller than its through-hole counterpart because it has either smaller leads or no leads at all. It may have short pins or leads of various styles, flat contacts, a matrix of solder balls (BGAs), or terminations on the body of the component.

The main advantages of SMT over the older through-hole technique are:

- Smaller components.
- Much higher component density (components per unit area) and many more connections per component.
- Components can be placed on both sides of the circuit board.
- Higher density of connections because holes do not block routing space on inner layers, nor on back-side layers if components are mounted on only one side of the PCB.
- Small errors in component placement are corrected automatically as the surface tension of molten solder pulls components into alignment with solder pads. (On the other hand, through-hole components cannot be slightly misaligned, because once the leads are through the holes, the components are fully aligned and cannot move laterally out of alignment.)
- Better mechanical performance under shock and vibration conditions (partly due to lower mass, and partly due to less cantilevering)
- Lower resistance and inductance at the connection; consequently, fewer unwanted RF signal effects and better and more predictable high-frequency performance.
- Better EMC performance (lower radiated emissions) due to the smaller radiation loop area (because of the smaller package) and the lesser lead inductance.
- Fewer holes need to be drilled. (Drilling PCBs is time-consuming and expensive.)
- Lower initial cost and time of setting up for mass production, using automated equipment.
- Simpler and faster automated assembly. Some placement machines are capable of placing more than 136,000 components per hour.
- Many SMT parts cost less than equivalent through-hole parts.

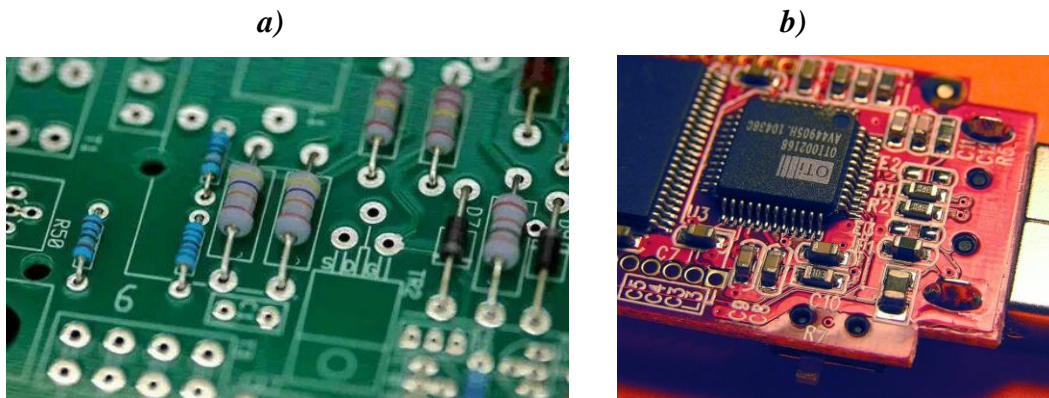


Picture 1. a) THT diode,

b) SMD diode



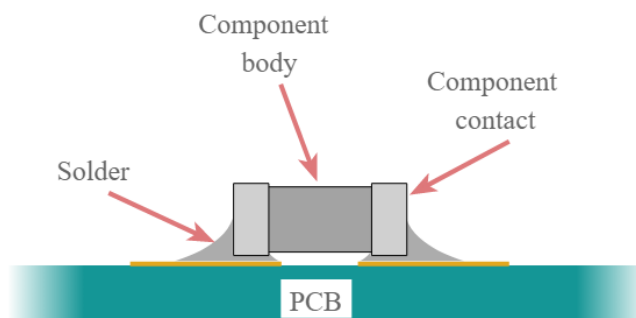
Surface-Mount Technology (SMT) is driven largely by the availability and development of the individual components, or SMDs used. These components are placed onto a printed circuit board (PCB). The reason why SMT is so widespread is that the individual components provide excellent electrical performance. Since they are so small, a large number of components can be placed on any one individual circuit board.



Picture 2. a- PCB with THT,

b-PCB with SMD

Proper SMDs must be able to withstand soldering temperatures, and also be able to be meticulously placed with a minimal margin of error using a high-speed pick and place machine. Unsurprisingly, the sheer range of different SMDs available is staggering. There are components out there to fit just about every purpose an electronics manufacturing firm would desire.



Picture 3. Concept of surface mount technology: a typical passive component

Types of SMD components which are used for PCB

1. SMD Resistor
2. SMD Network Resistor
3. SMD Ceramic Capacitor
4. SMD Tantalum Capacitor
5. SMD Transistor

Scientific research shows that generalized microelectronic modules of traffic lights, arrows and paths control and modern communication devices are developed on the basis of various SMD microelectronic elements. This achieves economic efficiency, reliability, reduced interruptions in train movements, increased operation of signaling blocking and centralization personnel.

Conclusion: As a conclusion in this report, it can be said that various practical works are being carried out in order to improve traffic safety in railway transport. For instance, It is changed to



modern centralization system such as microprocessor centralization system. As we know, This system is designed by SMT. That is why there are many advantages of this technology.

List of used literature

1. <https://www.electronicandyou.com/blog/smd-surface-mount-electronic-components-for-smt.html>
2. https://en.wikipedia.org/wiki/Surface-mount_technology
3. James J. Licari, Dale W. Swanson, in Adhesives Technology for Electronic Applications (Second Edition), 2011.
4. Frank E. Andros, Bahgat G. Sammakia, in Encyclopedia of Physical Science and Technology (Third Edition), 2003.
5. T. Williams, in Instrumentation Reference Book (Fourth Edition), 2010.
6. Ray P. Prasad “ Surface Mount Technology” Second Edition 2014.