# Homework 3

1. What is electronic packaging and what are the main tasks for electronic packaging?
2. What are the drivers in the development of electronic packaging?
3. The so-called Moore's Law describes the IC development. What's the content?
4. How can we define the hierarchy of electronic packaging?
5. If we have 300000 Gate Transistor Functions on a logic IC processor, how many I/Os by the Rents-Law are needed to get full functionality (rounded)?
6. What is the definition of a conductor, an isolator and a semiconductor?
7. Why do we use metals as conductors in electronic packaging?
8. What are the advantages of polymers used in electronic packaging and what are the disadvantages?
9. What is the principle difference between a welding and a soldering process and how can we define soldering in electronic assembling?
10. What is important for different solder alloys related to the soldering process?
11. Why is it important to have a fine and homogenous texture in the solder joints?
12. What are the 3 main assembling processes for the 1$^{st}$ level packaging and what is equal and what different in this technologies?
13. What is a thermo-compression and what is an ultrasonic wire-bond process? Explain both process flows!
14. The flip-chip technology has some big advantages compared to the other processes, what are these and why is this technique so important in the future?
15. What are the 3 main functions for PCBs in electronic devices?
16. What is the difference between subtractive and additive etching technology and how is the sequence for each in the process flows?
17. Why is the Glass transition temperature of organic polymer base materials so important for the PCBs? What is the risk?
18. Describe the process flow for photolithography and the etching processes, (both possibilities).
19. What kinds of PCB test methods are possible?
20. What is a DC Continuity Test and why should we not use the 2-Wire-Measurement?
21. In modern electronic devices it's necessary to use multilayer-boards. Why?
22. Explain the difference between Standard Via; Blind Via and buried via.
23. We have more and more applications in electronic devices with flexible boards, why is this necessary and what are the most used applications?
24. What is the standard substrate material in thick film technology and what is the
25. advantage of this material?
26. Describe the details of the sequence for producing standard thick-film devices.
27. What is the difference between cross-over and complementary thick-film printing technology?
28. If we need a 400 kΩ resistor in our schematic, we have to design the geometric dimensions of $R_{Square}$ for a **minimum of needed space** and how we have to select a thick film resistor paste. Make a calculation for $R_S$ , the thickness is D=25µm.
29. What is LTCC technology and what are the advantages of this technology?



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30. What are the different deposition technologies in thin film technology for creating metal or dielectric layers?
31. What are the different dry etching technologies?
32. What is new in wafer level packaging compared with conventional packaging, where we make our packaging process steps?
33. 2. What is necessary to create a wafer level Chip size package when we are using standard LSI chips on wafer?
34. Explain the process steps to create a WL-CSP and the differences to traditional packaging.
35. What is a System-on-Chip and what a System-in-Package?
36. Today we are using also stacked packages, what kind of different stacked types are possible?
37. Calculate the temperature difference across a 1mm thick adhesive of thermal conductivity 1 W/m · K, assume a 1W heat source spread uniformly over a $1cm^2$ area.
38. Calculate the average temperature of a 20cm x 20 cm PCB dissipating 10W power cooled by natural convection in air 35°C from both sides ($\alpha=5W/m^2K$). Also estimate the power dissipation from this board to maintain the same average temperature, if it were cooled using air in two-sided forced cooling, flowing at a sufficiently high velocity (4-5m/s) across the surface of the PCB to yield an α of $25W/m^2K$.
39. Two painted surfaces with 45cm x 45cm and 5 cm apart, exchange heat across a vacuum. If surface 1 has 100°C and surface 2 is at 75°C and the Emissivity of 0.9, what is the rate of heat loss by surface 1 (Q)?


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