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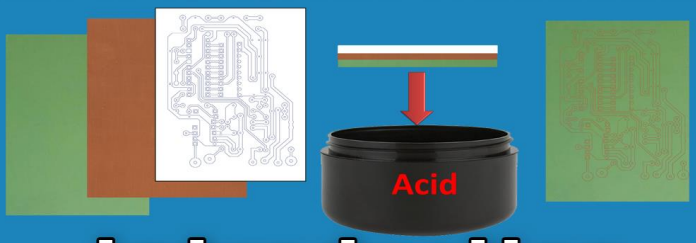
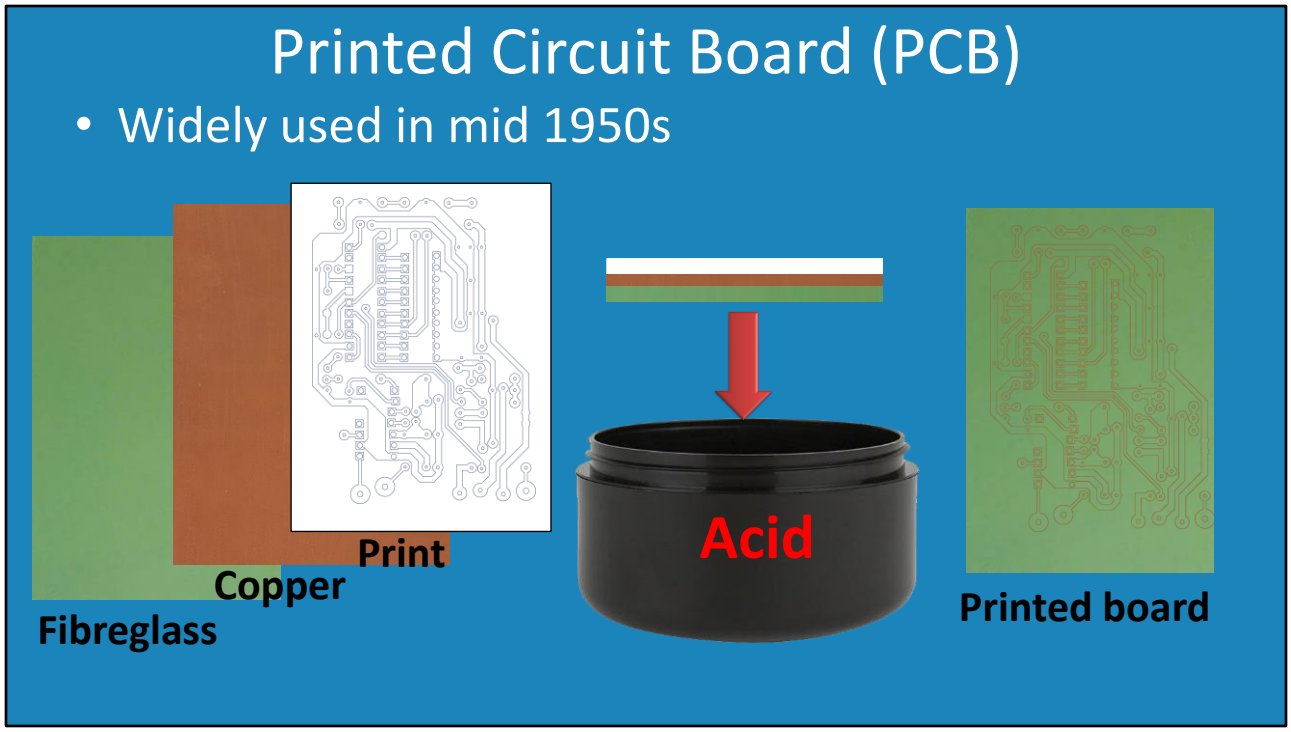


Introduction to Motherboards

For the free video please see
http://itfreetraining.com/ap/1b15

This video will look at the basics of a computer's motherboard. The motherboard connects every piece of hardware together and without it you basically have no computer.



0:09 A motherboard is essentially a printed circuit board or PCB. A PCB is used in everything nowadays; cameras, mobile devices, TVs and of course computers. They are made using a material like fiberglass. Other materials can be used, but fiberglass is a common choice because it is strong and provides insulation, preventing electricity from traveling where it is not meant to be.

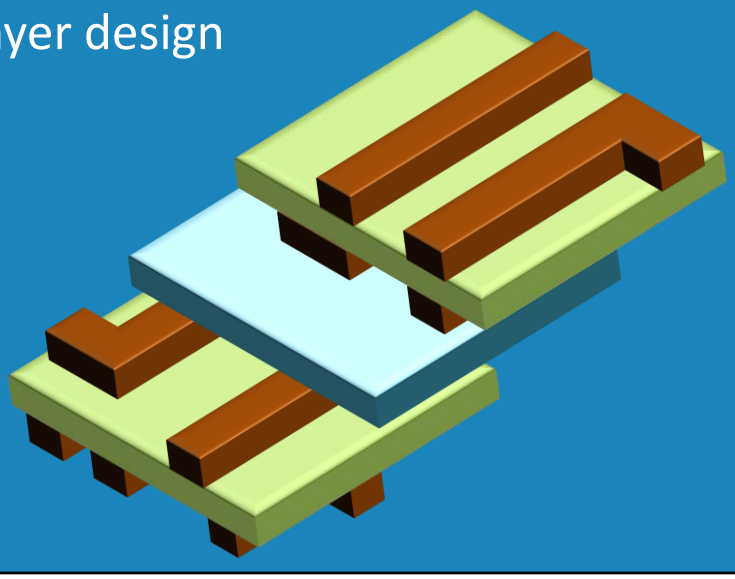
Next a thin layer of copper is placed on top. Copper allows electrical current to pass over it, however just a thin plate is not very useful. The extra copper needs to be removed. To do this, a pattern is applied to the copper. There are a number of different ways to do this. In one method, the PCB's pattern is printed on the copper. Other methods involve placing a material on top that has the pattern on it.

Historically, the next step was to place the PCB in acid, but nowadays photo-resist materials are used so the PCB would simply be exposed to light, most likely ultraviolet light. The result is the same, the process will remove extra copper leaving essentially wire like tracks on the PCB and these are referred to as traces.

PCBs are nothing new; they started becoming widely used in the 1950s. They are found in just about any electrical device on the market. What has changed is how precisely they can be made and that they are now made from multiple layers.

Motherboard

- Main Board, System Board, Logic Board (Mac)
- Multi-layer design



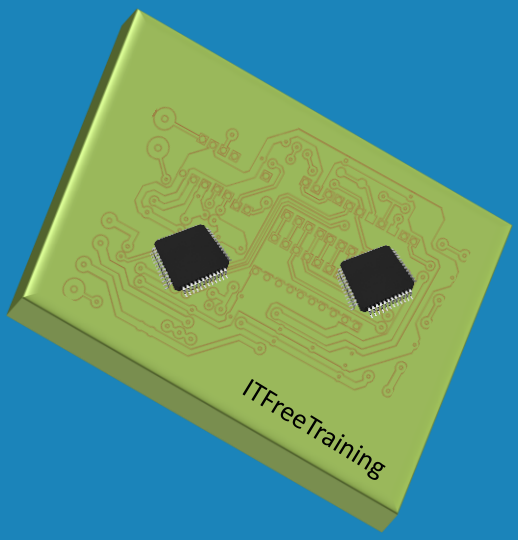
1:41 A motherboard is often referred to by different names. These include, main board, system board and, in the case of Mac, logic board. Nowadays, a motherboard has a number of different layers. The basic manufacturing process of a motherboard involves creating the traces. These are attached to a layer of fiberglass. This in turn, has traces on the other side as well.

To create yet another layer, a second board is placed on top of the first. If the boards were placed directly on top of each other, the traces on the boards would touch each other causing a short circuit. To prevent this from happening, an insulation layer is placed between them.

You can see that there are now four layers of circuits that the motherboard can use, making the motherboard multi-level. You may be wondering why it is done this way. Using multiple layers allows for components to be placed closer together. Closer together means faster speeds can be achieved and also less chance of errors.

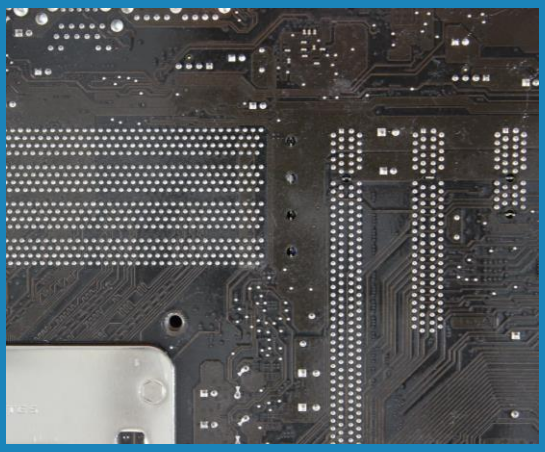
The last step of the process is to create the top and bottom layers. This can involve adding additional traces and will end with a protective layer being added.

Finishing the Motherboard



2:56 Once complete, the motherboard can have print added to it. This makes it easier to find things on the motherboard and also for identifying text like the manufacturer and model of the motherboard. Following this, other components are added to the motherboard. This will give you a complete motherboard. Let's have a look at an actual motherboard.

Example Motherboard



59:59 This motherboard, like most motherboards, is full of components. It seems that everywhere on the motherboard there is either a component or a slot. Manufacturers attempt to keep the motherboard small to reduce costs and also have short traces on the motherboard to allow faster communication with higher reliability.

If I have a closer look at the motherboard, you can see the CPU socket. This motherboard has 2011 pins for the CPU. If you have a close look at the motherboard, you can see the traces that lead away from the motherboard. Without counting them, it is pretty clear there are nowhere near 2011 traces leading away from the CPU. This is the first clue that there are multiple layers used in this motherboard.

The next clue is, if you look at the PCI express slot, each x16 slot has 82 pins, but it is pretty clear there are nowhere near that many traces heading in that direction. Also, you can see the large number of components taking up space on the motherboard. This makes it difficult to run traces around the motherboard simply because the components are in the way.

There is also a large amount of printing on the motherboard. You can also see the model number printed on the motherboard itself. There is also information that informs you which features the motherboard supports. For example, this motherboard supports CrossFire and SLI.

If I move to the other side of the motherboard, you can see there is a large amount of text on this side of the motherboard. This text will inform you what each pin does and also what each plug is for. Useful information if you are attempting to work out where to attach cables to the motherboard.

I will now turn the motherboard over and have a look at the back of it. On the back of the motherboard you can see there are a lot of traces. A lot of these traces appear to be going to the PCI Express slot, but having a closer look shows they in fact do not. They essentially go past the pins on the slot, but do not connect to them. Now if you consider there are very few noticeable traces on the top or bottom of the motherboard going to the PCI Express slot, there must be traces inside the motherboard that connect to the PCI Express slot.

You can start to get an idea of how complex these motherboards are. Not only are you connecting components with a large number of pins, these connections occur across a number of layers of the motherboard.

This concludes this video on the basics of motherboards. I hope to see you in the other videos from our Motherboard series and I would like to thank you for watching.

References
"CompTIA A+ Certification Exam Guide Tenth Edition" pages 205-206

Credits
Trainer: Austin Mason http://ITFreeTraining.com
Voice Talent: HP Lewis http://hplewis.com