Design of Power Electronic Converters
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Module: Hardware Design
Lecture 63
Familiarity with Components - I

Welcome to the course on Design of Power Electronic Converters. So, we were discussing hardware design. So, in this lecture, let us get familiar with some of the components that are used in power converters. Now, many of the components that are used in power electronic converters are by now, in the course, we have looked into are the power semiconductor devices, heat sinks, magnetics or inductors and transformers then capacitors, EMI filters all of it we have looked into. Now, let us look into some of the other components that are used in power converters.

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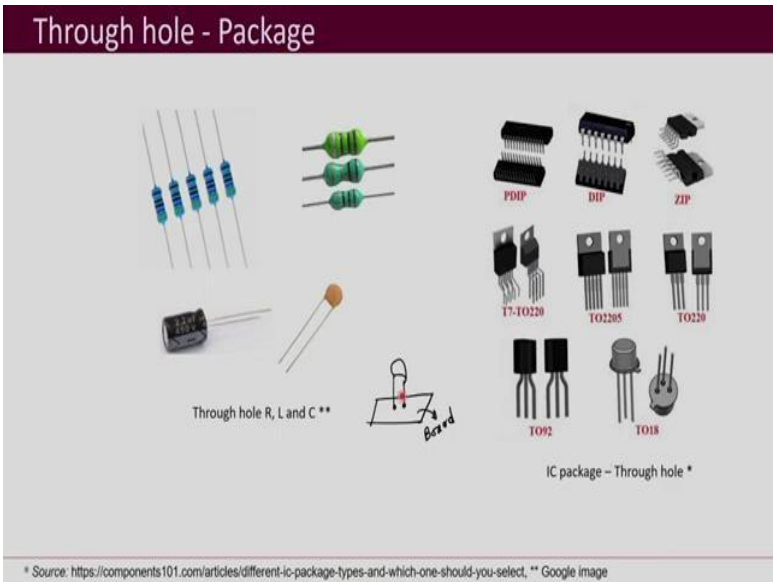

So, mostly you will be having associated control circuits and miscellaneous sensing circuits that will be there as part of the different sections of your power electronic converters apart from just the power electronic circuit. So, there we will be needing small values of R,L, C and various miscellaneous ICs.

The first are resistors, capacitors and inductors which are used in the power electronic circuits as well as the miscellaneous circuits required for various purposes such as control and sensing.

On the slide are the traditional components with leads. The leads go into the holes on the printed circuit board. Such components are called through hole components.

Through hole ICS are also manufactured in different sizes. Some examples shown on the slide are PDIP, DIP, TO220, and TO18.

So, package if we have to understand in a very simple way it is like whatever your component is in what package, what kind of casing, what kind of leads it comes into that, that is your package. And when it is obtained in this manner, where you have got the leads coming out which when you have to solder it into the PCB, so you have to have holes on it. And you have to solder it from the backside means opposite to the side on which the component is place.

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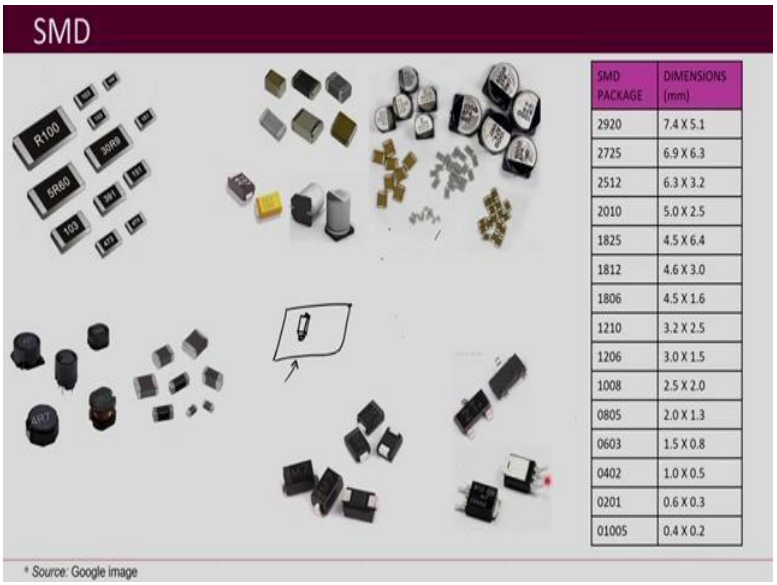

Then next type of package is your SMD i.e. surface mount devices. These are relatively newer than the through-hole packaging. So, for example, on the slide are SMD resistors. SMD components aremuch smaller than the through-hole packaging. Now, we are moving towards miniaturization. We want everything to be very small and compact and so SMD packages help us in making it small and compact because they are much smaller than the through hole package.

Further, you do not need the holes in the PCB since SMD components are mounted on the surface. That means both the sides are then utilized or captured by one component when you are using a through-hole device, whereas when we use an SMD device, it is like you just have

to stick it by the solder to that surface is of the PCB and the other side of the PCB can be used for placing other components or for routing or any other purpose.

So, if we are not able to get the picture, so it is let us say this is the SMD component. So, what we do is we place it like this and here this is on these two sides, it is soldered. So, you do not have to have any holes and your other side of the PCB that need not be that is not utilized by the one particular component that you are soldering on another site.

SMD capacitors are also available. On the slide are also electrolytic SMD caps for small values only. Relatively small values only your SMD can be manufactured. When the ratings become higher then it is not possible to have an SMD package then you have to go for a through hole packaging which is why most of your power semiconductor devices, come in through-hole package and not in your SMD packaging.

And in the SMD also there are different packaging which means the dimensions are different. Now, here on the slide, you can an example of 1825 SMD package, this is the dimension 4.5 into 6.4, here the height is not mentioned only the surface dimension is mentioned. And if you compare it to another one which is 1806 you can see that it is 4.5 into 1.6 which means this is smaller. So, different packagings are there so, how small and compact you want, you can choose the SMD package accordingly.

And there are SMD inductors, diodes, transistors and ICs on the slide. So, many of the electronic components are now available in your SMD package. And in SMD also the various different packages available.

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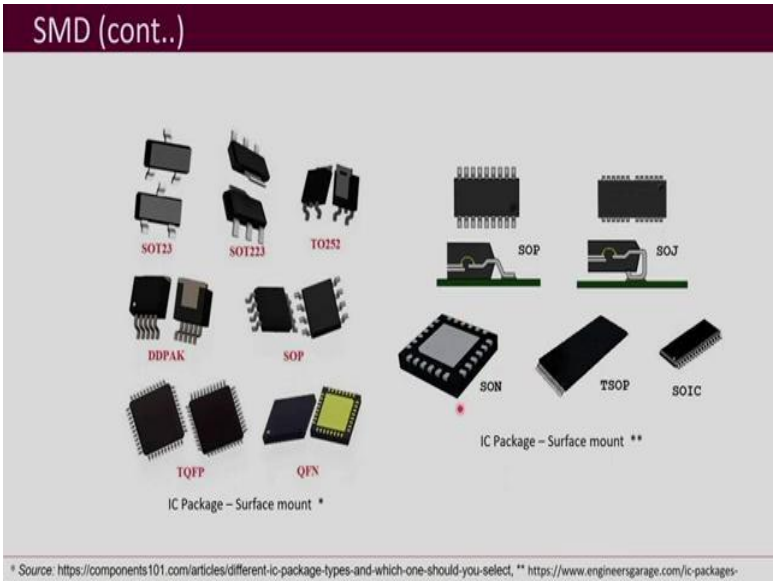

For ICs different SMD packaging shown are SOT23, SOT223 and others. Depending on how large or small you want to make, and how much space you have, you can decide the package of the IC that you need.

So, the important thing to note down is that when you go into the datasheet, you should be looking for the package that you need and what are the packages in which the IC is or the component is manufactured by the manufacturer, because not all packages may be provided by the manufacturer. A few different packages with the same component may be available.

And then when you design the PCB, you should be careful that you put the footprint of the same package and not the other. You should have the information on not only the component that you need but also the package that you are going to use in your board.

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Resistors are required in power electronic circuits for sensing and control circuits. There are different types of resistors available.

The important specifications to keep in mind for the resistor are the resistor value in ohms and the tolerance. Tolerance is by what percentage the value of the resistor is expected to vary from the specified value in ohms. Some examples of tolerances are 5%, 10% etc.

And then the next thing is the wattage rating or the power rating means what is the power rating of the resistor that you require? It is basically associated with the I^2R losses, how much current will be passing through that resistor and how much loss will be occurring. So, these are the three important specifications for your resistors.

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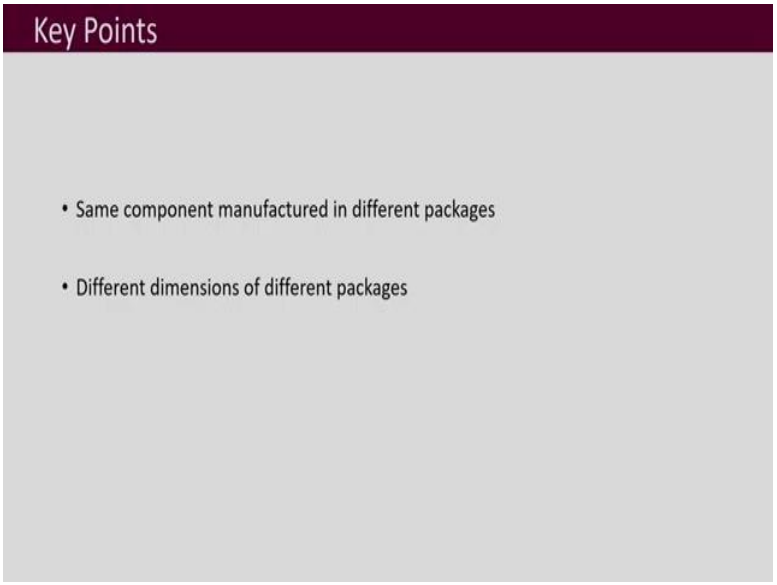

So, the key points of this lecture are that there are different packages for the same component, and each package has got different dimensions. So, if you have 2-3 different types of packages in which the component is being manufactured, so those 3 different packages will have 3 different dimensions. And you should choose the package. What do you need and then be careful to use the same ones in your board. Thank you.