Two major features of this text

試　用

＜This is a text to pass the Japanese national certification examination. ＞

・ Since explanatory materials are systematically made based on subject examination questions, preparation studies are possible about all items of subject examinations without prior knowledge. Therefore, even if you begin studying from text parts, or solving problems, you can understand. It contains examination questions for the past four years.

・Studies other than processes of which you take charge are also easy.

・As for "difficult industry English notation", commentaries are attached.

＜This is an educational text of semiconductor packages and backend processes for new employees.＞

・All the semiconductor assemblies can be understood visually from beginning to end.

・Since the semiconductor packages are introduced in order of developments depending on familiar usage, you can understand why many kinds of packages are required.

・You will understand something with the assembly (the bonding) of the semiconductor.

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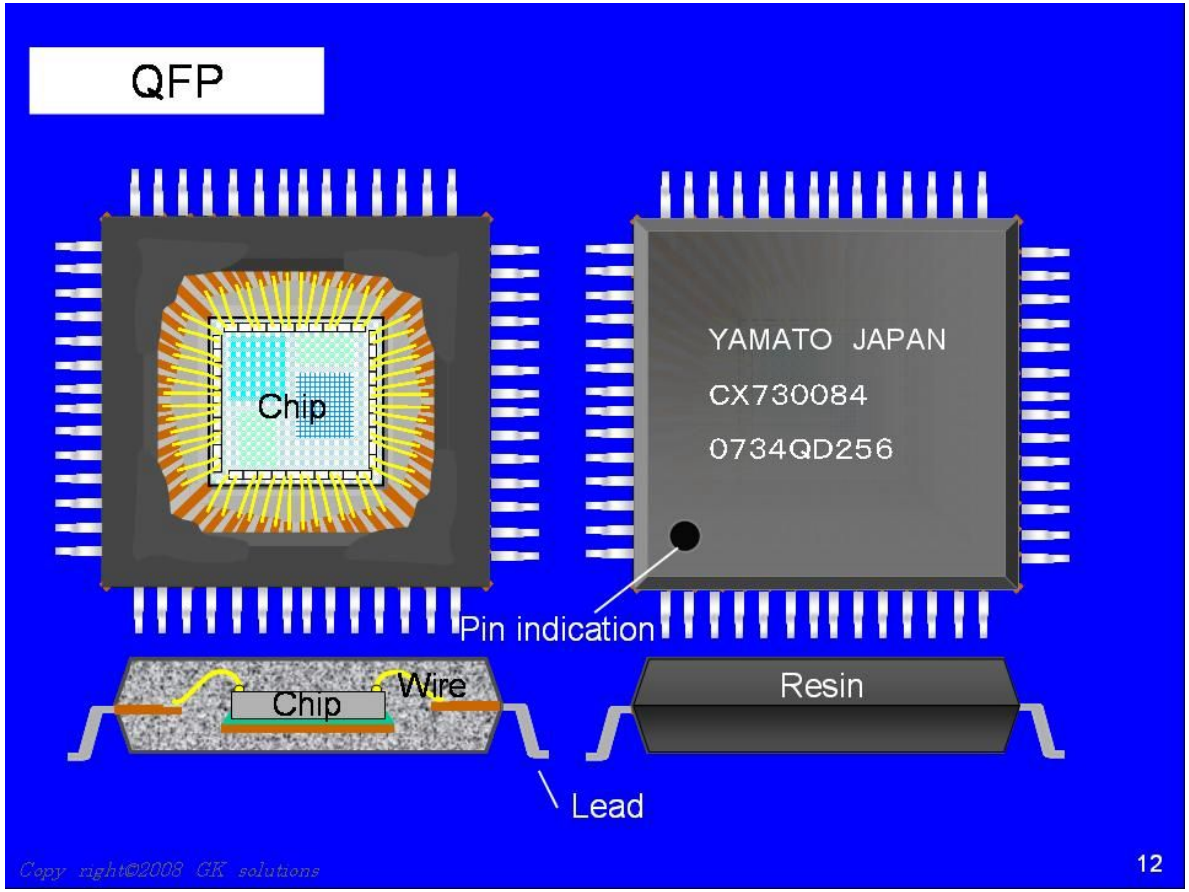
Chapter 1-9 QFP (Quad Flat Package)

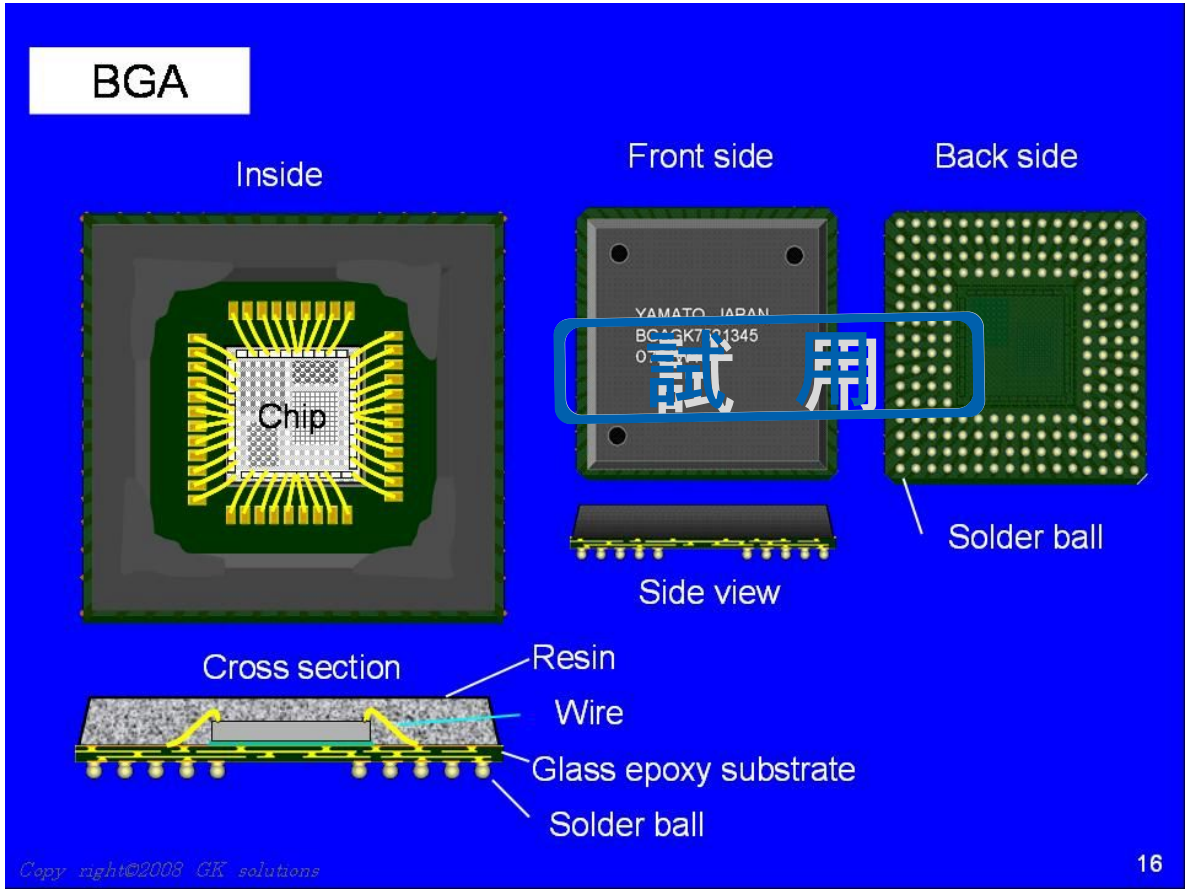
When IC becomes large-scale, it becomes LSI. LSI increased in the number of outside terminals, so DIP couldn‘t cope with any more. Moreover, the number of installing of semiconductors increased also on the electric equipment, and to install in both sides of the wiring substrate, QFP of the surface mount type was developed.The package thickness also became thinning about 1mm from 3 to 4mm.



The surface mount type is called SMD(Surface Mount Device).

Chapter 1-13　BGA (Ball Grid Array)

Since functions of the chip had become complex and compound more and more, it was not possible to catch up with an increase in the number of pins even if QFP was made enlarged, and made toward the fine pin pitch. As this measures, BGA (Ball Grid Array = solder balls are arranged like the lattice) whose terminals are formed with solder balls and whose underside becomes usable everywhere was developed.



The substrate uses the same glass epoxy substrate as the wiring substrate. BGA has rapidly extended the production amount.

Strong and weak points of BGA (comparison with QFP)

＜strong points＞

①The number of terminals is large.

②Connecting the chip and terminals can be changed freely in the substrate.

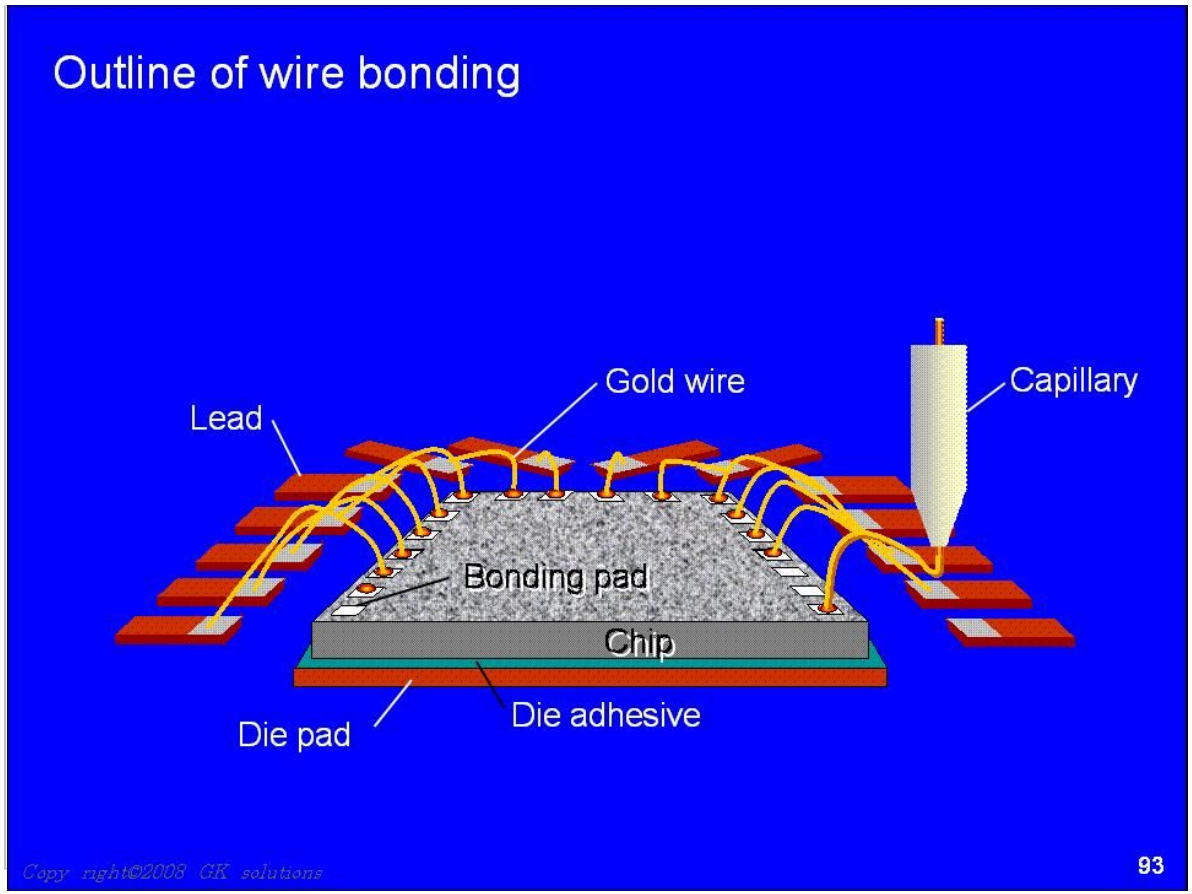
＜Weak points＞

①The joint state of solder balls can't be confirmed from the outside.

②The cost of the substrate is high.

Chapter 4-39 Outline of Wire Bonding

Wire bonding is to connect bonding pads and leads of the chip bonded to the die pad by fine (diameter from 20 μ m to 50 μ m level) gold wires etc. of the purity of 99.99% or more. One gold wire is sequentially connected by using the capillary. Gold wires are formed so as not to contact an unnecessary part, and so as not to flow at the time of the resin molding. The wire bonding using gold wires is inefficient because it does one by one.

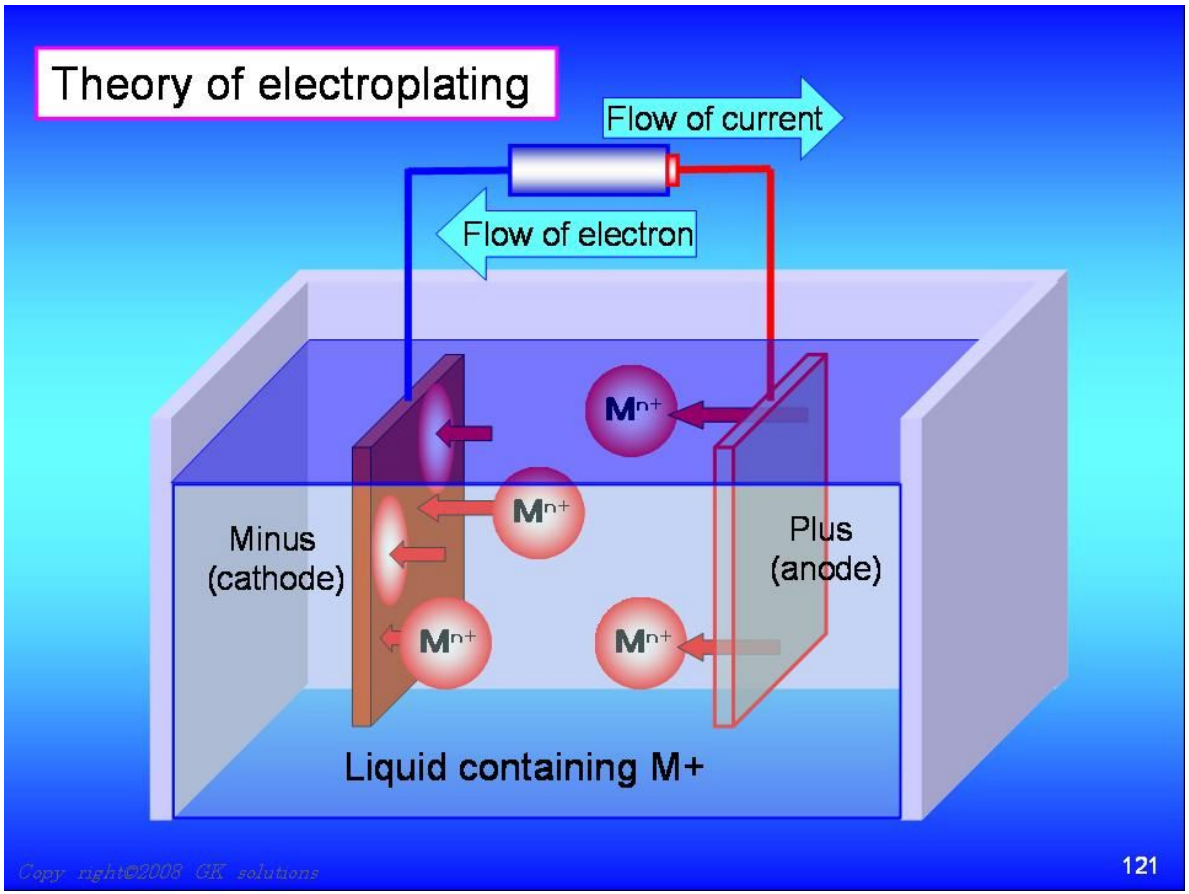


Then, although the method of bonding a large number at once was devised variously, ① it can wire freely, ② the certainty of connecting wires (reliability) is high etc., and it is still main forces of the semiconductor assembly. To contribute most was that the level of making an automatic machine about wire bonder became high, and a high-speed bonding became realized. Although, the wire bonding method using materials other than gold, for example, copper wire, is beginning to be developed since the price of gold is high, it is the point whether the overall cost which includes productivity and reliability becomes cheap.

Chapter4-60 Theory of Electroplating

試 用

Plating of the external terminal (lead) of a lead frame is done by electroplating. The purpose is to improve ① securing the corrosion resistance of the lead, and ② soldering nature with a wiring board. In electroplating, the metal ion (plus) in a liquid adheres to negative pole metal by putting two metal plates into the liquid containing the metal ion used for plating, and turning on an electric current. If metal ions in a liquid run short, it will be supplied one after another from the metal on the plus side.



Characteristics required for plating are as follows:

① Wettability to solder ② Close adhesion nature with the lead material ③ Bonding nature with solder ④ Heat resistance ⑤ Corrosion resistance ⑥ Corrosive protection nature ⑦ To be hard to generate a whisker ⑧ To be able to mass-produce at low-cost.

A whisker is the needle-like metal crystal which is also called 'mustache of a cat', the stress accumulated in plating causes its generation and growth, and it grows up from the surface of plating. Its thickness is from 1 μm to several μm, its length sometimes might reach several mm, and it might be short-circuited between terminals from the prolonged storage and the market environment.