CLAIMS

1. A semiconductor device comprising a lead frame having a die pad portion or a circuit board provided with an electrical bonding portion,

at least one semiconductor element having an electrode pad which is stacked on or mounted in parallel on said die pad portion of said lead frame or on said circuit board,

a copper wire which electrically connects said electrical bonding portion provided on said lead frame or said circuit board to said electrode pad provided on said semiconductor element,

and an encapsulating material which encapsulates said semiconductor element and said copper wire,

wherein the wire diameter of said copper wire is equal to or more than 18 μm and equal to or less than 23 μm,

said encapsulating material is composed of a cured product of an epoxy resin composition,

said epoxy resin composition contains an epoxy resin (A), a curing agent (B), a spherical silica (C), and a metal hydroxide and/or metal hydroxide solid solution (D), and

said semiconductor device is obtained through a step of encapsulating by said epoxy resin composition and molding, and then segmenting the resultant into pieces.

2. The semiconductor device according to claim 1, wherein the average particle diameter of said metal hydroxide and/or metal hydroxide solid solution (D) is equal to or more than 1 μm and equal

to or less than 10 μm.

3. The semiconductor device according to claim 1, wherein the content ratio of said metal hydroxide and/or metal hydroxide solid solution (D) is equal to or more than 1% by mass and equal to or less than 10% by mass, based on the total mass of said epoxy resin composition.

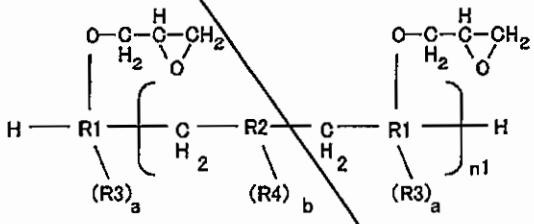
4. The semiconductor device according to claim 1, wherein said metal hydroxide and/or metal hydroxide solid solution (D) contains crystallization water in an amount of equal to or more than 20% by mass.

5. The semiconductor device according to claim 1, wherein said metal hydroxide and/or metal hydroxide solid solution (D) is aluminum hydroxide and/or magnesium hydroxide.

6. The semiconductor device according to claim 5, wherein said epoxy resin composition further contains one or more of aluminum corrosion inhibitors selected from the group consisting of zirconium hydroxide, hydrotalcite and boehmite.

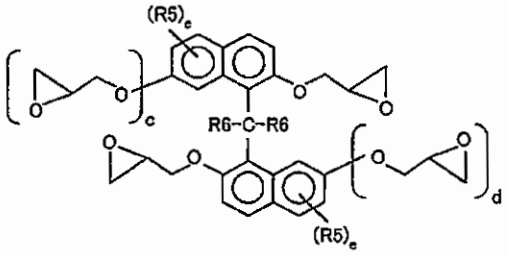
7. The semiconductor device according to claim 1, wherein the mode diameter of said spherical silica (C) is equal to or less than 35 μm, and the content ratio of particles having a diameter of equal to or more than 55 μm contained in said spherical silica (C) is equal to or less than 0.1% by mass.

8. The semiconductor device according to claim 1, wherein said epoxy resin contains at least one epoxy resin selected from the group consisting of an epoxy resin represented by the general formula (1), an epoxy resin represented by the general formula (2), an epoxy resin represented by the general formula (3) and an epoxy resin represented by the general formula (4),



(1)

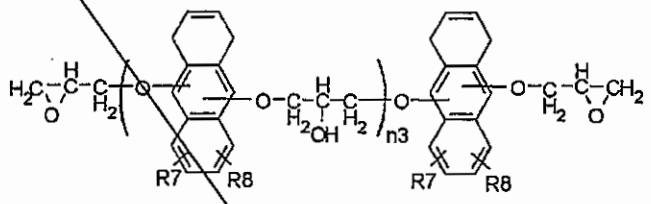
wherein, in the general formula (1), -R1- is a phenylene group or a naphthylene group; the bonding position of the glycidyl ether groups may be any one of α-position and β-position when -R1- is a naphthylene group; -R2- is a phenylene group, a biphenylene group or a naphthylene group; R3 and R4 are groups introduced to R1 and R2 respectively, are each a hydrocarbon group having 1 to 10 carbon atoms, and may be the same or different from each other; a is an integer of from 0 to 5; b is an integer of from 0 to 8; and an average value of n1 is a positive number of equal to or more than 1 and equal to or less than 3,



(2)

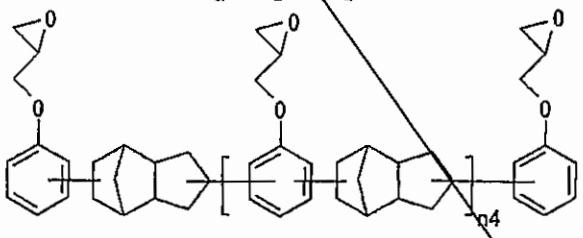
wherein, in the general formula (2), R5 is a hydrocarbon group having 1 to 4 carbon atoms, and may be the same or different from

each other; R6 is a hydrogen atom or a hydrocarbon group having 1 to 4 carbon atoms, and may be the same or different from each other; c and d are each an integer of 0 or 1; and e is an integer of from 0 to 5,



(3)

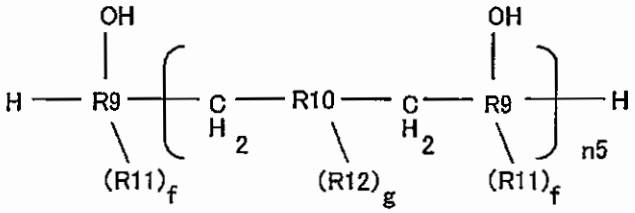
wherein, in the general formula (3), R7 and R8 are each a hydrogen atom or a methyl group; and n3 is an integer of from 0 to 5,



(4)

wherein, in the general formula (4), an average value of n4 is a positive number of equal to or more than 0 and equal to or less than 4.

9. The semiconductor device according to claim 1, wherein said curing agent contains a phenol resin represented by the general formula (5),

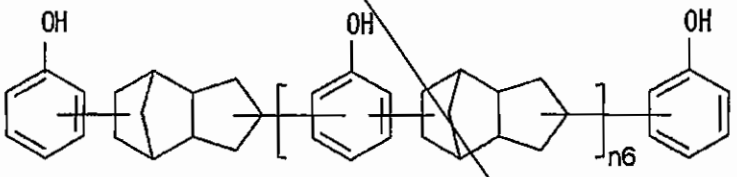


(5)

wherein, in the general formula (5), -R9- is a phenylene group or a naphthylene group; the binding position of the hydroxyl groups may be any one of α-position and β-position when -R9- is a

naphthylene group; -R10- is a phenylene group, a biphenylene group or a naphthylene group; R11 and R12 are groups introduced to R9 and R10 respectively, are each a hydrocarbon group having 1 to 10 carbon atoms, and may be the same or different from each other; f is an integer of from 0 to 5; g is an integer of from 0 to 8; and an average value of n5 is a positive number of equal to or more than 1 and equal to or less than 3.

10. The semiconductor device according to claim 1, wherein said curing agent contains a phenol resin represented by the general formula (6),

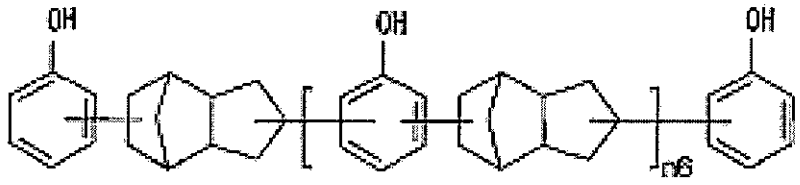


(6)

wherein, in the general formula (6), an average value of n6 is a positive number of equal to or more than 0 and equal to or less than 4.

CLAIMS

1. A semiconductor device comprising a lead frame having a die pad portion or a circuit board provided with an electrical bonding portion, at least one semiconductor element having an electrode pad which is stacked on or mounted in parallel on said die pad portion of said lead frame or on said circuit board, a copper wire which electrically connects said electrical bonding portion provided on said lead frame or said circuit board to said electrode pad provided on said semiconductor element, and an encapsulating material which encapsulates said semiconductor element and said copper wire, wherein the wire diameter of said copper wire is equal to or more than 18 μm and equal to or less than 23 μm, said encapsulating material is composed of a cured product of an epoxy resin composition, said epoxy resin composition contains an epoxy resin (A), a curing agent (B), a spherical silica (C), and a metal hydroxide and/or metal hydroxide solid solution (D), said semiconductor device is obtained through a step of encapsulating by said epoxy resin composition and molding, and then segmenting the resultant into pieces wherein said curing agent contains a phenol resin represented by the general formula (6),



(6)

wherein, in the general formula (6), an average value of n6 is a positive number of equal to or more than 0 and equal to or less than 4.