below, and the number of moles of the (meth)acryloyl groups in the component (B) is calculated according to Equation (2) below.

Number of moles of glycidyl groups in conductive resin composition = (mass (g) of epoxy resin (A) in conductive resin composition) x (number of glycidyl groups in 1 mol of epoxy resin (A)/mass (g) of 1 mol of epoxy resin (A)) + (mass (g) of compound (B) having (meth)acryloyl group and glycidyl group in conductive resin composition) x (number of glycidyl groups in 1 mol of compound (B) having (meth)acryloyl group and glycidyl group/mass (g) of 1 mol of compound (B) having (meth)acryloyl group and glycidyl group) ··· (1)

Number of moles of (meth)acryloyl groups in component (B) = (mass (g) of 1 mol of (B) having (meth)acryloyl group and glycidyl group in conductive resin composition) x (number of (meth)acryloyl groups in 1 mol of compound (B) having (meth)acryloyl group and glycidyl group/mass (g) of 1 mol of compound (B) having (meth)acryloyl group and glycidyl group) ··· (2)

[0022] [Phenolic resin curing agents (C)]

The phenolic resin curing agent (C) used in the inventive conductive resin composition may be any of phenolic resin initial condensates generally used as curing agents for epoxy resins and may be resole types or novolak types. Examples of the phenolic resin curing agents (C) include bisphenol resins, allylphenol novolak resins, novolak phenolic resins, phenolaralkyl resins, dicyclopentadiene phenolic resins and biphenyl phenolic resins. The phenolic resin curing agents (C) may be used singly, or two or more may be used in combination. In particular, o-allylphenol novolak resins and bisphenol resins are preferred.

[0023] In the conductive resin composition, the content of the phenolic resin curing agent (C) is such that the number of moles of the hydroxyl (OH) groups in the phenolic resin curing agent (C) is preferably 0.25 to 3.5, more preferably 0.3 to 3, and still more preferably 0.4 to 2.5 with respect to the number of moles of the glycidyl groups in the conductive resin composition taken as 100. Here, the number of moles of the glycidyl groups in the conductive resin composition indicates the number of moles of all the glycidyl groups present in the conductive resin composition. The above content of the phenolic resin curing agent (C) ensures that the conductive resin composition can be cured in the second stage reaction at, for example, 130 to 250°C to give a cured product having excellent bond strength while maintaining low specific resistivity. The number of moles of the hydroxyl (OH) groups in the component (C) is calculated according to Equation (3) below.

Number of moles of hydroxyl (OH) groups in component (C) = mass (g) of

2-methacryloyloxyethyl-succinic acid, glycerol dimethacrylate, 2-methacryloyloxyethyl-phthalic acid, γ-butyrolactone methacrylate, 2-methyl-2-adamantyl methacrylate, 2-ethyl-2-adamantyl methacrylate, ethoxylated cyclohexanedimethanol dimethacrylate, acrylates of these compounds, 1,4-cyclohexanedimethanol monoacrylate, methoxydipropylene glycol acrylate, neopentyl glycol acrylate benzoate, propylene oxide-modified diacrylate of bisphenol A, and pentaerythritol triacrylate.

[0029] The (meth)acrylate compound (F) is added to the conductive resin composition in such an amount that the total of the number of moles of the (meth)acryloyl groups in the component (B) and the number of moles of the (meth)acryloyl groups in the component (F) is preferably 8 to 36, more preferably 9 to 35, and still more preferably 10 to 34 with respect to the number of moles of the glycidyl groups in the conductive resin composition taken as 100. Here, the number of moles of the glycidyl groups in the conductive resin composition indicates the number of moles of all the glycidyl groups present in the conductive composition. If the total of the number of moles of the (meth)acryloyl groups in the component (B) and the number of moles of the (meth)acryloyl groups in the component (F) is less than 8 with respect to the number of moles of the glycidyl groups in the conductive resin composition taken as 100, the conductive resin composition may fail to be B-staged (semi-cured) in the first stage reaction at a relatively low temperature (for example, 70 to 110°C) to attain tack-free properties. If the total of the number of moles of the (meth)acryloyl groups in the component (B) and the number of moles of the (meth)acryloyl groups in the component (F) exceeds 36 with respect to the number of the glycidyl groups in the conductive resin composition taken as 100, the first stage reaction, namely, the radical polymerization reaction proceeds too far and the B-staged (semi-cured) composition will not exhibit the desired pressure-sensitive tackiness permitting temporary bonding of parts. The number of moles of the (meth)acryloyl groups in the component (F) is calculated according to Equation (4) below.

Number of moles of (meth)acryloyl groups in (meth)acrylate compound (F) = mass (g) of (meth)acrylate compound (F) in conductive resin composition x number of (meth)acryloyl groups in 1 mol of (meth)acrylate compound (F)/mass (g) of 1 mol of (meth)acrylate compound (F) ··· (4)

[0030] [Amine curing catalysts (G)]

Preferably, the conductive resin composition of the invention further includes an amine curing catalyst (G). The amine curing catalyst (G) is preferably one that has a reaction initiation temperature exceeding 130°C. By containing the amine curing

(manufactured by RHESCA CORPORATION, product name: Tacking Tester) to measure pressure-sensitive tackiness. The tack force (N) was calculated according to the following equation. The average of four samples (n = 4) was obtained as the test value.

Tack force (N) = Measured value (gf) x 0.001 x 9.8

Tack force testing conditions

Immersion Speed: 5 mm/min.

Test Speed: 600 mm/min.

Immersion: 250 gf

Press Time: 3 sec.

Distance: 5 mm

Probe Temp.: normal temperature

Hot Plate Temp.: normal temperature

[0048] After the conductive resin compositions having the chemical makeups shown in Table 1 were B-staged (semi-cured), they were further cured (C-staged) and tested to measure the specific resistivity and the bond strength by the following methods.

[0049] [Specific resistivity]

Onto a slide glass 76 mm in length, 26 mm in width and 1.3 mm in thickness, the conductive resin composition having the chemical makeup shown in Table 1 was stencil printed with a thickness of 120 μm in a 50 mm long and 1 mm wide pattern as illustrated in Fig. 1, thus preparing a test piece (see Fig. 1(a)). The stencil used was a 120 μm thick film. The test piece was semi-cured (B-staged) by drying with an air blow dryer controlled at 90±5°C for 20 minutes followed by cooling. Thereafter, the test piece was cured (C-staged) with an air blow dryer controlled at 165±5°C in 50 minutes. The cured product resulting from the curing of the conductive resin composition was tested on 4261A LCR Meter manufactured by YHP to measure the resistance X (Ω) between both end faces. The thickness Z (μm) of the cured product was measured with a surface roughness profiler (manufactured by TOKYO SEIMITSU CO., LTD., model: SURFCOM 1500SD2). The thickness Z (μm) of the cured product was measured from above the pattern with respect to portions 10 mm in length from the ends of the 10 mm long and 1 mm wide pattern (the two portions indicated with arrows in Figs. 1(b) and (c)). The specific resistivity ρ (Ω·cm) was calculated according to the following equation. The average of five samples (n = 5) was obtained as the test value.

$$\rho\ (\Omega\cdot cm) = (0.1/5.0) \times X\ (\Omega) \times Z \times 10^{-4}\ (\Omega\cdot cm)$$

[0050] [Bond strength]

below, and the number of moles of the (meth)acryloyl groups in the component (B) is calculated according to Equation (2) below.

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Number of moles of (meth)acryloyl groups in component (B) = (mass (g) of compound (B) having (meth)acryloyl group and glycidyl group in conductive resin composition) x (number of (meth)acryloyl groups in 1 mol of compound (B) having (meth)acryloyl group and glycidyl group/mass (g) of 1 mol of compound (B) having (meth)acryloyl group and glycidyl group) ··· (2)

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$$\rho\ (\Omega\cdot cm) = (0.1/5.0) \times X\ (\Omega) \times Z \times 10^{-4}\ (\Omega\cdot cm)$$

[0050] [Bond strength]