[0039] On the other hand, if Bi is excessively added, the drop resistance may be deteriorated. Furthermore, because the solidus temperature is lowered while the liquidus temperature hardly changes, ΔT defined as a difference between a liquidus temperature and a solidus temperature becomes large. If ΔT becomes too large, segregation will occur during solidification, leading to deterioration of mechanical properties such as mechanical strength. Therefore, if Bi is contained, in terms of the upper limit, the Bi content is 9.0% or less, preferably 6.0% or less, more preferably 5.0% or less, and even more preferably 4.0% or less.

[0040] (7) Comprising One Or More Selected From The Group Consisting Of Mn, Pd, Au, Pt, Cr, Fe, V, Mo, And Nb Each With An Upper Limit Of 0.01%

The solder alloy according to the present application can comprise one or more selected from Mn, Pd, Au, Pt, Cr, Fe, V, Mo, and Nb, each with an upper limit of 0.01% as an optional element. These elements can improve mechanical properties.

[0041] (8) Balance: Sn

The balance of the solder alloy according to the present invention is Sn. In addition to the above-described elements, unavoidable impurities may be contained. Even if unavoidable impurities are contained, it does not affect the above-mentioned effects. Specific examples of the unavoidable impurities include As and Cd. Furthermore, although the present invention is lead-free and antimony-free, it does not exclude the inclusion of Pb and Sb as unavoidable impurities. If In is contained, the wettability deteriorates, and it is better not to contain it. Furthermore, Mn does not have to be contained because it is oxidized during the production of the solder alloy and it is difficult to produce the solder alloy.

[0042] (9) Relations (1) and (2)

The present invention satisfies the following relation (1):

$$0.00030 < (\mathrm{Ni}/\mathrm{Co}) \times (1/\mathrm{Ag}) \times \mathrm{Ge} < 0.05 \qquad (1)$$

In the above relation (1), Ni, Co, Ag, and Ge each represent the contents (mass%) in the alloy composition.

[0043] The solder alloy of the present invention can exhibit high tensile strength and suppress Ni leaching and voids because the balance of Ni, Co, Ag, and Ge contents is optimized by satisfying the relation (1).

For the Sn-Ag-Cu-Ni-Co-Ge solder alloy and the Sn-Ag-Cu-Ni-Co-Ge-Bi solder alloy according to the present invention, the balance between the contents of Ni, Co, Ag, and