0.10 to 3.00%, Cu: 0.80 to 6.00%, Ni: 0.08 to 0.60%, Ge: 0.0010 to 0.0150%, with the balance being Sn.

[0029] (2) The solder alloy according to any one of (0) or (1) above, wherein the alloy composition further contains 0.1% or less in total of at least one of Bi, Sb, In, Zn, Ga, Mn, Cr, Co, Si, Ti, and rare earth elements.

[0030] (3) The solder alloy according to any one of (0) to (2) above, wherein the alloy composition satisfies the following Relations (1) and (2):

$$0.00043 \leqq Cu \times Ni \times Ge \leqq 0.00149 \quad (1)$$

$$0.09 \leqq Ag \times Cu \times Ni \leqq 0.11 \quad (2)$$

where Ag, Cu, Ni, and Ge in Relations (1) and (2) above represent the contents (mass%) thereof in the alloy composition.

[0031] (4) A solder ball consisting of the solder alloy according to any one of (0) to (3) above.

[0032] (5) A solder preform consisting of the solder alloy according to any one of (0) to (3) above.

[0033] (6) A solder joint including the solder alloy according to any one of (0) to (3) above.

[0034] (7) A circuit including the solder according to (6) above.

[0035a] In an aspect of the present disclosure, there is provided a solder alloy having an alloy composition consisting of, by mass%, Ag: 0.10 to 3.00%, Cu: 0.80 to 6.00%, Ni: 0.08 to 0.60%, Ge: 0.0010 to 0.0150%, optionally at least one of Bi, Sb, In, Zn, Ga, Mn, Cr, Si, Ti, and rare earth elements: 0.1% or less in total, with the balance being Sn and unavoidable impurities.

[0035b] In another aspect of the present disclosure, there is provided a solder ball consisting of the solder alloy as disclosed herein.

[0035c] In a further aspect of the present disclosure, there is provided a solder preform consisting of the solder alloy as disclosed herein.

[0035d] In another aspect of the present disclosure, there is provided a solder joint comprising the solder alloy as disclosed herein.

[0035e] In a further aspect of the present disclosure, there is provided a circuit comprising the solder joint as disclosed herein.

Brief Description of Drawings

[0035] FIG. 1 is a surface SEM photograph of an intermetallic compound formed at a joint interface in a solder joint produced using a solder alloy of Example 3.

FIG. 2 is a surface SEM photograph of an intermetallic compound formed at a joint interface in a solder joint produced using a solder alloy of Comparative Example 4.

Description of Embodiments

[0036] The present invention will be described in greater detail below. In this description, "%" relating to the solder alloy composition refers to "mass%" unless otherwise specified.

[0037] 1. Solder Alloy

(1) Ag:0.10 to 3.00%

Ag contributes to improvement of wettability. Further, the shear strength can be

CLAIMS

1. A solder alloy having an alloy composition consisting of, by mass%, Ag: 0.10 to 3.00%, Cu: 0.80 to 6.00%, Ni: 0.08 to 0.60%, Ge: 0.0010 to 0.0150%, optionally at least one of Bi, Sb, In, Zn, Ga, Mn, Cr, Si, Ti, and rare earth elements: 0.1% or less in total, with the balance being Sn and unavoidable impurities.

2. The solder alloy according to claim 1, wherein the alloy composition satisfies the following Relations (1) and (2):

$$0.00043 \leqq Cu \times Ni \times Ge \leqq 0.00149 \quad (1)$$

$$0.09 \leqq Ag \times Cu \times Ni \leqq 0.11 \quad (2)$$

where Ag, Cu, Ni, and Ge in Relations (1) and (2) above represent the contents (mass%) thereof in the alloy composition.

3. A solder ball consisting of the solder alloy according to claim 1.

4. A solder preform consisting of the solder alloy according to claim 1.

5. A solder joint comprising the solder alloy according to claim 1.

6. A circuit comprising the solder joint according to claim 5.