CLAIMS

1. A lead-free solder alloy comprising:
   3.1 to 3.8 wt. % silver;
   0.5 to 0.9 wt. % copper;
   0.0 to 3.2 wt. % bismuth;
   0.03 to 0.2 wt. % cobalt;
   0.005 to 0.02 wt. % titanium;
   1.0 to 3.0 wt. % antimony and
   balance tin, together with any unavoidable impurities.

2. The lead-free solder alloy of claim 1, further comprising 0.01 to 0.1 wt. % nickel.

3. The lead-free solder alloy of claim 2, comprising 0.05 wt. % nickel.

4. The lead-free solder alloy of claim 1, comprising 3.8 wt. % silver.

5. The lead-free solder alloy of claim 1, comprising either 0.7 or 0.8 wt. % copper.

6. The lead-free solder alloy of claim 1, comprising 1.5 to 3.2 wt. % bismuth.

7. The lead-free solder alloy of claim 6, comprising 1.5 wt. % bismuth.

8. The lead-free solder alloy of claim 6, comprising 3.0 wt. % bismuth.

9. The lead-free solder alloy of claim 1, comprising 0.03 to 0.05 wt. % cobalt.

10. The lead-free solder alloy of claim 9, comprising 0.05 wt. % cobalt.

11. The lead-free solder alloy of claim 1, comprising 0.008 wt. % titanium.

~~12. A lead-free solder alloy consisting of:~~

~~3.1 to 3.8 wt. % silver;~~

~~0.5 to 0.8 wt. % copper;~~

~~0.0 to 5.0 wt. % bismuth;~~

~~0.05 to 1 .0 wt. % cobalt;~~

~~1 .0 to 3.0 wt. % antimony;~~

~~0.005 to 0.02 wt. % titanium; and~~

~~balance tin, together with any unavoidable impurities.~~

~~13. The lead-free solder alloy of claim 12, further comprising 0.01 to 0.1 wt. % nickel.~~

~~14. The lead-free solder alloy of claim 13, comprising 0.05 wt. % nickel.~~

~~15. The lead-free solder alloy of claim 12, comprising 3.8 wt. % silver.~~

~~16. The lead-free solder alloy of claim 12, comprising 0.8 wt. % copper.~~

~~17. The lead-free solder alloy of claim 12, comprising 1.5 to 3.2 wt. % bismuth.~~

~~18. The lead-free solder alloy of claim 17, comprising 1.5 wt. % bismuth.~~

~~19. The lead-free solder alloy of claim 17, comprising 3.0 wt. % bismuth.~~

~~20. The lead-free solder alloy of claim 12, comprising 0.05 wt. % cobalt.~~

~~21~~12. The lead-free solder alloy of claim 1~~2~~, comprising 1.0 wt. % antimony.

~~22~~13. The lead-free solder alloy of claim 1~~2~~, comprising 1.5 wt. % antimony.

~~23. The lead-free solder alloy of claim 12, comprising 0.008 wt. % titanium.~~