

CLAIMS

1. A lead-free, silver-free solder alloy comprising:
 - 0.5 to 0.9 wt. % copper;
 - 1.0 to 3.5 wt. % bismuth;
 - 0.02 to 0.08 wt. % cobalt;
 - 0.0 to 0.09 wt. % antimony; and
 - balance tin, together with any unavoidable impurities.
2. The lead-free, silver-free solder alloy of claim 1, further comprising 0.001 to 0.01 wt. % germanium.
3. The lead-free, silver-free solder alloy of claim 2, comprising 0.006 wt. % germanium.
4. The lead-free, silver-free solder alloy of claim 1, further comprising 0.01 to 0.1 wt. % nickel.
5. The lead-free, silver-free solder alloy of claim 4, comprising 0.05 wt. % nickel.
6. The lead-free, silver-free solder alloy of claim 1, comprising 0.7 wt. % copper.
7. The lead-free, silver-free solder alloy of claim 1, comprising 1.2 to 1.8 wt. % bismuth.
8. The lead-free, silver-free solder alloy of claim 7, comprising 1.5 wt. % bismuth.
9. The lead-free, silver-free solder alloy of claim 1, comprising 0.05 wt. % cobalt.
10. The lead-free, silver-free solder alloy of claim 1, comprising 0.05 wt. % antimony.
11. A lead-free, silver-free solder alloy comprising:
 - 0.5 to 0.9 wt. % copper;
 - 1.0 to 3.5 wt. % bismuth;
 - 0.2 to 0.8 wt. % gallium;
 - 0.0 to 0.09 wt. % antimony; and
 - balance tin, together with any unavoidable impurities.
12. The lead-free, silver-free solder alloy of claim 11, further comprising 0.001 to 0.01 wt. % germanium.
13. The lead-free, silver-free solder alloy of claim 12, comprising 0.006 wt. % germanium.
14. The lead-free, silver-free solder alloy of claim 11, further comprising 0.01 to 0.1 wt. % nickel.
15. The lead-free, silver-free solder alloy of claim 14, comprising 0.05 wt. % nickel.
16. The lead-free, silver-free solder alloy of claim 11, comprising 0.7 wt. % copper.
17. The lead-free, silver-free solder alloy of claim 11, comprising 1.2 to 1.8 wt. % bismuth.

18. The lead-free, silver-free solder alloy of claim 17, comprising 1.5 wt. % bismuth.
19. The lead-free, silver-free solder alloy of claim 11, comprising 0.5 wt. % gallium.
20. The lead-free, silver-free solder alloy of claim 11, comprising 0.05 wt. % antimony.