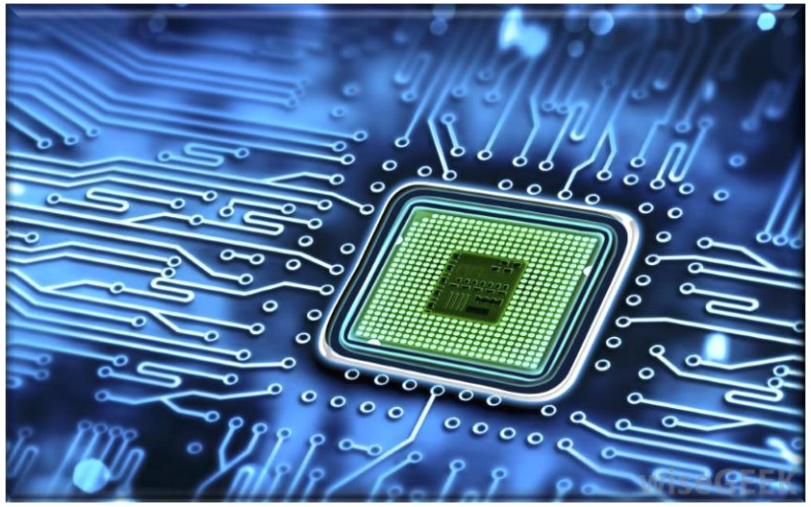
Smartphones - Deposition of Heat Dissipating Layer

GEN TRIZ Case Study

Background

- When power and frequency of modern chips go up, the problem with overheating becomes dramatic. Therefore, it is necessary to cover chips or package in which the chip is incorporated with heat dissipation layers of metal.
- However, thermal methods (e.g., plasma spraying or hot gas spraying) are not applicable, because they overheat the chip and damage internal connections in the chip. Low temperature methods (e.g., chemical vapor deposition) are too expensive and require complicated equipment.
- The Problem: how to deposit heat dissipation layer of metal without chip damaging and extra cost?



Problem Solving

- The Problem:
  - How to deposit heat dissipation layer of metal without chip damaging and extra cost?
- Feature Transfer:
  - Thermal deposition (advantage – low cost, disadvantage – chip damaging)
  - Chemical deposition (advantage – no chip damaging, disadvantage – high cost)
- Base system:
  - Thermal deposition
- Feature of chemical deposition, responsible for damaging absence:
  - Cold media
- Solution:
  - The cold spray technology was suggested: small particles of metal are accelerated in a cold but very fast gas jet. The particles have huge kinetic energy which is transformed into heat when they reach the substrate (e.g., the surface of chip).
  - US Patent 2017047264: Semiconductor Packages and Methods of Fabricating the Same (Samsung)

Advantages

- Undamaged chips
- Low cost technology