Low Loss Superconducting Integrated Circuits (LLSICs)
Technology #18087

Applications

- High-performance electronics
- Superconducting devices
- Integration of heterogeneous technologies and components on same chip

Problem Addressed

Quantum computers are an emergent technology, offering vast amounts of computational power. Superconducting quantum circuits—a leading candidate technology for large-scale quantum computing—require long signal coherence times to optimize fault tolerance. Currently, superconducting qubit coherence time improvements are being driven by design changes to superconducting materials, such as titanium nitride (TiN) superconducting coplanar waveguide resonators with high intrinsic quality factors. A major technical challenge is the wafer material. To be effective, qubit applications require materials with high intrinsic quality factors, near stoichiometric composition across wafers, wafer to wafer reproducibility, stability of milli-Kelvine temperature ranges and scalability.

Technology

The technology is a low-loss superconducting integrated circuit which exhibits all of the characteristics desired in qubit systems. The invention includes an integrated approach to developing flip-chip superconducting interconnects for 3D constructions on various qubit die package configurations. It is capable of depositing High Q TiN on 8” wafer and is capable of generating High Q from various TiN film thicknesses. This versatile invention has been proven effective on a variety of instrumentation systems, enabling easy integration of heterogeneous technologies and components on the same chip.

Advantages

- Flexibility: TiN SCPW resonators with high internal quality factors fabricated from two sputtering systems
- Excellent cross-wafer and wafer to wafer reproducibility
- Easy integration of heterogeneous technologies and components on same chip

Categories For This Invention:

Electronics & Circuits
Superconductors
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