Quanexum
Accelerating cryogenic semiconductors

In a nutshell

Quanexum is pioneering advanced computing and sensing technologies by pushing the boundaries of cryogenic electronics. This field is rapidly gaining importance due to the increasing demands for high-performance and quantum computing. Operating electronics at low temperatures, such as 77 K and 4 K, offers significant benefits, including faster processing speeds, higher gain, reduced leakage currents, lower thermal noise, and ultra-low power consumption. However, developing low-temperature electronics presents major challenges, largely due to the lack of mature ecosystems to support this cutting-edge technology. To bridge these gaps, Quanexum has developed the QX-Model, which enables accurate cryogenic circuit simulation, along with the QX-AMS, an automated cryogenic measurement system that allows high-throughput data acquisition. These innovations accelerate the development of cryogenic electronics, paving the way for future advancements in computing and sensing.

Why is our technology important?

The absence of reliable transistor models validated at cryogenic temperatures remains a significant barrier to designing electronics that meet stringent specifications for extreme environments. Existing industrial compact models, optimized for room-temperature applications, cannot accurately capture the unique behavior of transistors at low temperatures. As a result, circuit performance under cryogenic conditions cannot be confidently simulated or optimized before fabrication, leading to costly design iterations. Additionally, developing industry-standard models is resource-intensive due to the large number of required parameters, while the limited throughput of low-temperature electrical data—often gathered through manual, labor-intensive processes—further constrains progress. The combination of missing cryogenic transistor models and inaccessible cryogenic data makes the development of cryogenic electronics both costly and inefficient. The QX-Model, verified through comprehensive cryogenic data from the QX-AMS system, addresses this critical gap by enabling accurate circuit simulations for cryogenic conditions, thus playing an essential role in advancing cryogenic electronics and supporting next-generation computing and sensing applications.

The benefits of our solution

- The QX-Model enables pre-fabrication design verification through accurate cryogenic circuit simulation, reducing costly design iterations and associated risks.
- The QX-AMS boosts measurement throughput for lab-level and non-foundry users, streamlining the data acquisition process and significantly shortening development timelines for cryogenic electronics.

Keywords

Cryogenic, electronics, modeling, characterization, automation, transistor, advanced computing.

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Get in touch
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