



# Scaling quantum systems with SemiQon Cryo-CMOS: World's first fully optimized CMOS electronics for cryogenic conditions

SemiQon's ultra-low dissipation, cryo-optimized CMOS electronics operate directly inside the cryostat at near absolute-zero temperatures, eliminating the need for bulky room-temperature control electronics and making quantum computers scalable, efficient, and commercially viable.

## KEY BENEFITS

- 1,000× lower power consumption than traditional control electronics
- 30% infrastructure cost reduction for quantum hardware manufacturers
- In-house manufacturing and packaging: rapid iteration in a semiconductor pilot line, plus cryogenic packaging expertise
- Applications extend beyond quantum to other critical industries, including space and high-performance computing (HPC)
- Modality-agnostic: compatible with all major qubit technologies

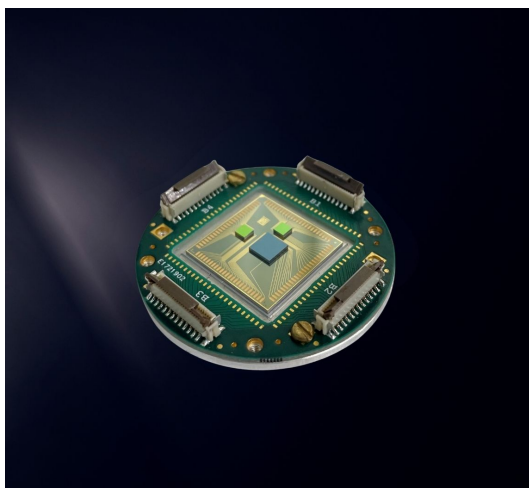
Now available for  
early access:  
Cryogenic RF  
Switches

## GET IN TOUCH

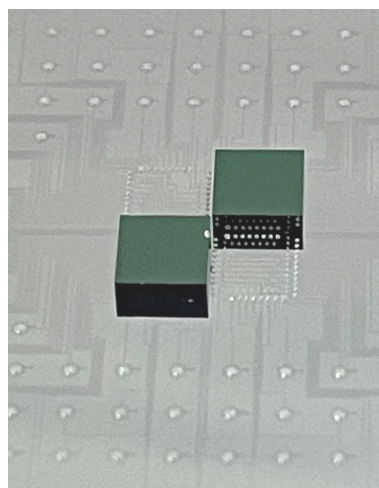
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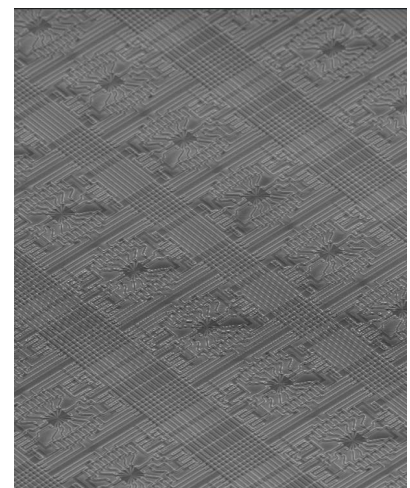
SEMIQON.COM



PACKAGED CHIP



SILICON DIE



MICROGRAPH OF CMOS DEVICE

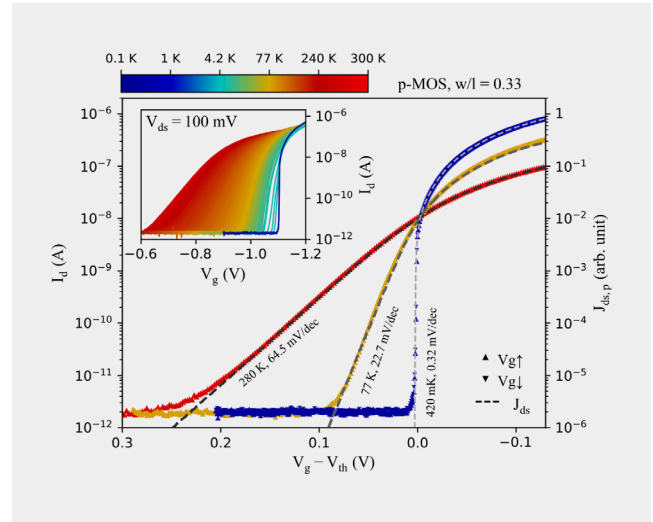
## BREAKING THE BOTTLENECKS IN QUANTUM HARDWARE

Quantum computers are expanding, but to be commercially viable, they must become smaller, more efficient, and cost-effective. Control electronics remains the biggest roadblock to scaling quantum systems.

### SEMIQON'S CRYO-OPTIMIZED CMOS ELECTRONICS SOLVE FOUR CRITICAL CHALLENGES

- Input/output limitations: Room-temperature electronics add cost and complexity to quantum processor interfacing
- Power-intensive control electronics limit scalability
- No design kits for cryogenic silicon ICs exist yet
- No practical solution for qubit control using cryogenic silicon ICs exists yet

SemiQon is breaking these barriers with the world's first cryo-CMOS transistors, paving the way for scalable, affordable and sustainable quantum computing.



### TECHNICAL SPECIFICATIONS

Technology	Min. subthreshold swing (mV/dec)	Subthreshold gain increase (RT/cryo)	ION increase (cryo/RT)	$\Delta V_{th}$ (mV)	Source
SemiQon	0.32	203 x	10 x	Tunable	N. Yurttagül et al. <a href="https://arxiv.org/abs/2410.01077">https://arxiv.org/abs/2410.01077</a> (2024)
14nm FinFET	15	5 x	6 x	80	A. Chabane et al., ESSCIRC 2021 – IEEE 47th European Solid State Circuits Conference (ESSCIRC), Grenoble, France, 2021, pp. 67-70. 10.1109/ESSCIRC53450.2021.9567802
28nm bulk CMOS	20	4 x	—	160	A. Beckers, et al., 47th European Solid-State Device Research Conference (ESSDERC), 2017. 10.1109/ESSDERC.2017.8066592
28nm FDSOI	5	14 x	7 x	Tunable	B. C. Paz et al., 2020 IEEE Symposium on VLSI Technology, Honolulu, HI, USA, 2020, pp. 1–2. 10.1109/VLSITechnology18217.2020.9265034
40nm bulk CMOS	28	3 x	3.5 x	120	R. M. Incandela et al., IEEE J. Electron Devices Soc., vol. 6, 2018. 10.1109/JEDS.2018.2821763
160nm bulk CMOS	23	4 x	3 x	150	R. M. Incandela et al., IEEE J. Electron Devices Soc., vol. 6, 2018. 10.1109/JEDS.2018.2821763
22nm FDX	14	5 x	6 x	Tunable	O. Seidel et al., Fermi laboratory report for DoE, OSTI ID: 2217187. <a href="https://www.osti.gov/servlets/purl/2217187/">https://www.osti.gov/servlets/purl/2217187/</a> (2023)