University of Minnesota's first semiconductor officer: 'We can grow as a semiconductor hub'

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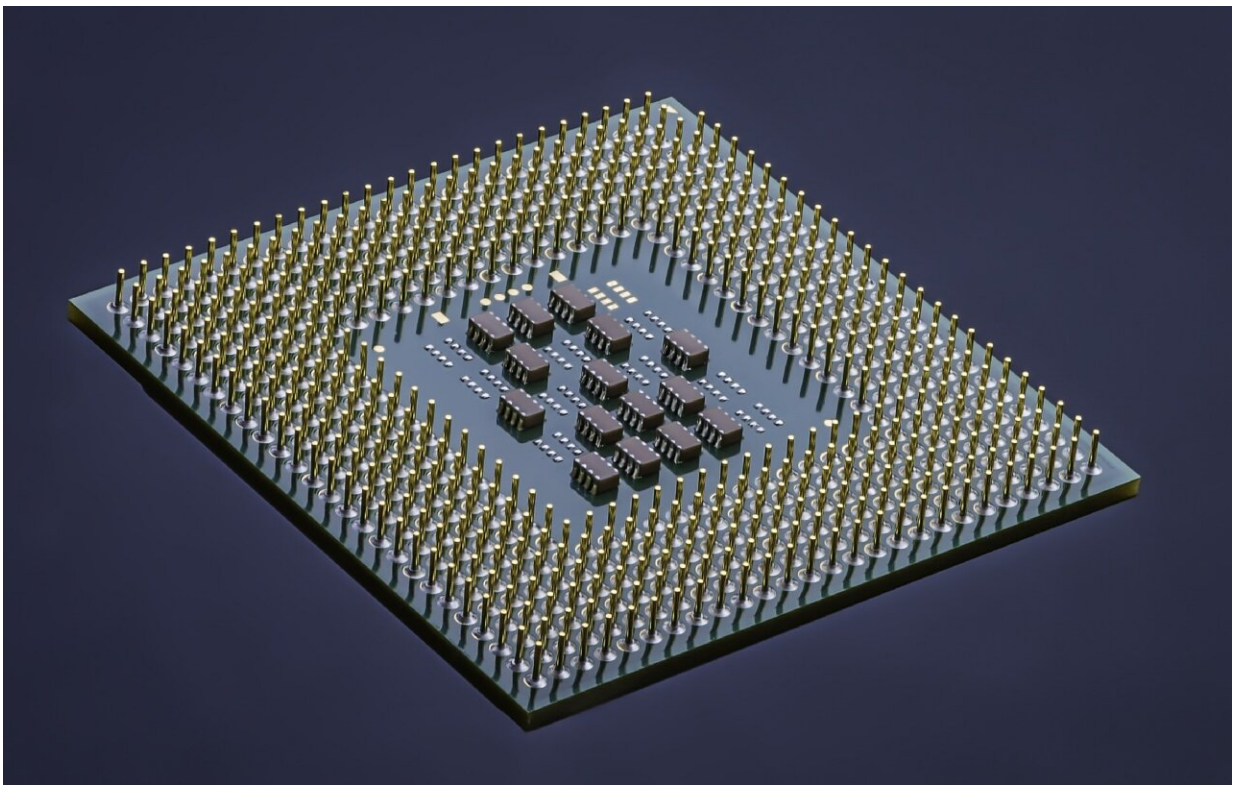

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As the federal government invests heavily in domestic technology manufacturing, the University of Minnesota named its first-ever chief semiconductor officer in May.

The University is taking the action to help companies and public agencies compete for funding from the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act and help Minnesota retain resiliency in the microelectronics industry.

Semiconductors conduct electricity and are essential components in electronic devices like mobile phones and computers. Manufacturers in East Asia dominate the industry, but the CHIPS program aims to make the U.S. more globally relevant and strengthen domestic supply chains. Because semiconductors are also integral to aerospace and defense projects, many feel having better local access to the technology as essential to national security.

Steven Koester, a professor in the University's department of electrical and computing engineering, is doing extensive research that could change the semiconductor industry. Koester joined the University in 2010 and has been the director of the Minnesota Nano Center since 2021. In an interview edited for clarity and length, he discussed his works and its significance to the economy.

It's important because I think there needs to be some high-level coordination for all of the semiconductor innovation that's happening, both at the University and in the entire state of Minnesota. The Twin Cities has a huge amount of semiconductors here. We can grow as a semiconductor hub.

The CHIPS and Science Act has a significant amount of funds that's intending to boost both domestic semiconductor manufacturing and R&D in the United States. So there's a lot of funding opportunities. It's seeding a lot of activity.

My position is intended to really try to provide that kind of coordination between academia, industry, state and federal governments to try to

enhance the ecosystem that we have here in Minnesota.

My current research is in advanced semiconductor devices. We're working on making transistors (semiconductor components that control electrical voltage) that can be made smaller than traditional transistors now. If you can make transistors smaller you can fit more of them on a chip. We're working with advanced materials that will allow kind of the ultimate scaling of semiconductor chips.

Some of my work is currently funded by Intel. They're interested in a novel semiconductor called tungsten diselenide, which has the potential to replace silicon. To replace it is a monumental task. But we're reaching the point where you just can't make transistors any smaller using silicon.

There's actually some activity that's of interest to industry where you would actually replace silicon with another material that can be made much thinner than silicon. If you can make the material thinner, you can make the transistor smaller.

The smaller you can make the transistors, the more powerful your cellphone can be.

You can kind of think of it as a prototyping facility for very advanced concepts in really a wide range of technologies. It can be semiconductors, but it could be in a wide variety of fields: magnetics, spintronics, microfluidics, sensors. A whole range of different technologies can be done in the Nano Center.

We have capabilities that allow you to do state-of-the-art prototypes. Mainly what we're doing is supporting research.

We're doing a couple of things with local companies: Polar (Semiconductor), SkyWater (Technology Inc.), Honeywell, Collins

Aerospace and others. The first thing that we're doing is we're working on training. We're working on workforce development because as they expand their capacity, they're going to need more trained workers to work at the facilities. It's absolutely important that they have a trained workforce.

The second thing that we're doing is that we're hoping to work on advanced R&D projects.

There is a significant amount in the CHIPS and Science Act which is for research and development. We're hoping to be able to partner with some of the local companies on proposals that would be for advanced applications for, say, the Department of Defense and developing new technologies in partnership with them.