

SEMICONDUCTORS

For decades, attorneys at Hamilton Brook Smith Reynolds have protected the intellectual property of innovators for a variety of different semiconductor devices and semiconductor manufacturing equipment.

Semiconductors are the materials used to make the “chips” that are at the heart of today’s computing revolution – whether it be smartphones, wearable devices, Internet of Things (IoT) devices, computers or electronics. They are also the materials that are used to create photovoltaic cells, used in solar panels.

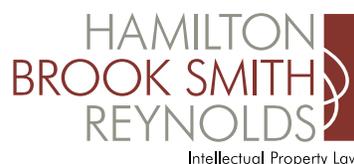
The pace of change in the semiconductor field is phenomenal. The number of transistors in integrated circuits is ever-increasing, while the price of chips and solar cells is getting lower and lower. And the products that use semiconductor chips, such as mobile phones and computers, are getting ever-smaller and lighter. Meanwhile, the capital cost of semiconductor manufacturing increases exponentially over time, which means that semiconductor manufacturing equipment is more and more costly and complex.

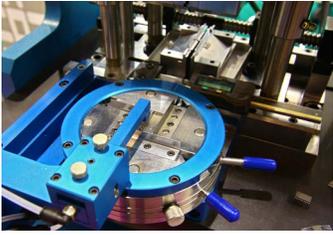
These trends and innovations in semiconductor materials and in the equipment that are used to manufacture semiconductors are transforming both computing and energy production.

Other semiconductor-related technologies include:

- Sensors
- Mobile phones, smartphones and digital devices of all kinds
- Internet of Things (IoT) Devices, such as wearable technology and programmable thermostats
- Medical Devices and Diagnostic Equipment
- Computers
- Car Electronics
- Appliance Electronics
- Control systems
- Military systems
- Satellites
- Digital cameras

We assist clients with protecting innovations related to semiconductor manufacturing equipment. For example, we have assisted a client in developing, over many decades, a large patent portfolio related to vacuum equipment that is used in semiconductor manufacturing. These innovations include those related to cryogenic refrigeration systems and other vacuum processing equipment. We have assisted another client in developing a large patent portfolio related to materials purity and





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cutting-edge processing equipment used for handling liquids and gases used in the manufacturing of semiconductors. These innovations include those related to liquid filtration, electrostatic chucks, and airborne molecular contamination filtration, to name a few.

We have also obtained patents for semiconductor materials themselves, including high electron mobility transistor (HEMT) and heterojunction bipolar transistor (HBT) structures. Specific examples of transistors include bipolar transistors with enhanced transport resulting from selective doping and band gap grading, as well as transistors incorporating iron-doping-stop components and lattice-matched base layers. In addition, we have obtained patents for semiconductor-based laser devices, including distributed feedback lasers and fiber-grating stabilized pump lasers; electro-optical modulators; and optical waveguides.